Hidden Spaces
Camouflage and the British Landscape, 1936-1945

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2012
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Acknowledgements

This research was funded by Aberystwyth Postgraduate Research Scholarship and I am indebted to this financial assistance in enabling this research to take place.

I would like to acknowledge the support of academic and support staff at the Institute of Geography and Earth Sciences at Aberystwyth University throughout the eight years that I’ve spent there both as an undergraduate and postgraduate. My initial thanks go to my two supervisors, Dr Peter Merriman and Dr Mark Whitehead, for their enthusiasm, ongoing support and critical remarks on earlier drafts of this thesis. I am extremely grateful for their patience and willingness to read long and at some times excessively detailed chapter drafts that sketched out my initial ideas. I also wish to acknowledge the advice and support of my friends and fellow postgraduate colleagues who have been very much a part of my PhD journey – Dr Rhys Dafydd Jones, Dr Lucy Jackson, Katherine and Martin Jones, Dr Cerys Lloyd (née Jones), Dr Sarah ‘Geo Sis’ Mills, Jess Pritchard, Alexander Phillips, Dr Libby Straughan, Jennifer Turner, Dr Marc Welsh, Dr Paul Wright (whose words of wisdom about a PhD shall forever remain immortal) and Dr Sophie Wynne-Jones – I owe you all so very much for helping through this. I also wish to extend my thanks to the ‘new’ human geography post-grads for their lunch-time conversations over the course of my final year – Jon Brettell, Robert MacKinnon, Oliver Morris, – I wish you all the best with your respective PhD journeys. I would also like to thank existing and former members of the department with whom discussions have helped shaped the ideas of this thesis: Dr Chris Bear, Professor Deborah Dixon, Professor Matt Hannah, Dr Jesse ‘The Guv’ Heley, Dr Gareth Hoskins, Professor Rhys Jones, Dr Jessica Pykett, Dr Heidi Scott, and Professor Michael Woods. From the ‘dark side’ of the discipline that is physical geography, I also wish to thank John Balfour, Nia Blackwell, Henry Patton, Rachel Smedley, Rosie Stirling and Hollie Wynne for the Friday night ‘Ship’ conversations. Also, thank you to my Aber friends who started my camouflage journey with me some five years ago: Matt Ruckwood, Charlotte Jones, Rhys Fowler, Sebastian Wildfeuer, Chris Smith.

I also wish to thank various academics, researchers and fellow postgraduates for their academic engagements with my work at various conferences and workshops over the course of the last four years. These discussions helped me think about the geographical
contributions of the thesis as well as challenged me to explore different research avenues which I had initially overlooked. My thanks also go to numerous anonymous reviewers of papers for publication which also helped shaped the ideas of this thesis.

The historical nature of this research has meant that a great deal of the work has been conducted within various archives around the U.K. and I am indebted to the archivists for their assistance. Amongst the archivists I am indebted to are those I visited at the National Archives at Kew, the Image, Film and Documents archives at the I.W.M. London, the Transco National Gas Archive at Warrington, the Julian Trevelyan Archives at Trinity College, Cambridge University and the Wiltshire and Swindon History Centre at Chippenham. My thanks also go to the Suffolk Record Office (Ipswich Branch), the London Transport Museum, the Hull City Archives and the Royal Commission on the Historical and Ancient Monuments of Scotland for dealing with my numerous requests. Finally, I would also like to thank the extremely friendly archivists at the James Gardner Archives, Brighton and the Glamorgan Record Office (Cardiff) for their enthusiasm in my project; although my findings from these locations have not made it into the thesis, I hope to make use of this material in future projects.

Finally, the biggest debt is to my family, to whom I owe the greatest thanks. To Mum and Dad, thank you for your unending support in getting me through to the end; I may have been physically absent, but you have never been far from my thoughts. To my brothers, Richard and Andrew, thank you for the endless banter, humour and the usually well-timed phone calls on your part at mealtimes. To Poppy, for the joy and happiness you have brought to the family. To Gran Robinson, thank you ever so much for your support and belief in me. To Gran Caravan, I will forever cherish the memories of your happiness at me becoming a doctor before your untimely passing; I hope I did you proud. Thank you all for everything.
Summary

This research explores the historical and cultural geographies of camouflage through an empirical focus upon the British ‘civil camouflage project’ of the 1930s and 1940s. In recent years, the practice of camouflage has received an increasing amount of attention across academic disciplines such as art, history, architectural studies, and the biological sciences, but it remains an area relatively unexplored by geography. This research highlights how a critical examination of camouflage can contributed to some of the key debates within cultural and historical geography surrounding such issues as landscape, vision, visuality and visual culture, aerial spaces and practices, and nocturnal and military geographies. Concentrating upon the practice of ‘civil camouflage’ in the immediate years before and after the outbreak of the Second World War, this research examines the attempts of camoufleurs to devise and develop camouflage strategies in order to conceal and hide a variety of ‘natural’ and industrial features in the British ‘Home Front’ landscape. Influenced by the proliferation of aeronautical technologies and anxieties over the threat of bombardment, it examines how civil camouflage emerged as a technological response to the eye in the sky, demonstrating a complex entanglement of aerial and terrestrial spaces. Following on from this, it discusses how established artistic forms of concealment were challenged and negotiated to accommodate for a variety of other knowledges: biological, optical, horticultural, engineering and aeronautical. In doing so, it draws upon a wide range of examples, from the concealment of distinctly ‘modern’ features such as oil tanks and gasometers, nocturnal camouflage, to the concealment of water spaces and interventions in architectural aesthetics and building practices.
# Table of Contents

**List of Plates, Tables and Figures**

**List of Abbreviations**

## Chapter 1: Introduction

1.1: Camouflage Flights over Cambridgeshire and Lincolnshire, 1941  
1.2: Camouflage: Associations/Histories/Geographies  
1.3: The Case Study of Civil Camouflage: Rationales and Limitations  
1.4: Research Questions  
1.5: Structure of the Thesis

## Chapter 2: Theoretical and Empirical Positioning

2.1: Geographical Visions: geography and the visual  
2.2: Envisioning Landscape: landscape and the visual  
2.3: Geographies of the night: nocturnal appreciations of landscape  
2.4: Landscapes of British Modernity  
2.5: Aerial Geographies: aeromobilities, airmindedness and aerial visions  
2.6: Military geographies: military/civil spaces, knowledge production, and the military gaze  
2.7: Conclusion

## Chapter 3: Archival Encounters and Visual Methodologies

3.1: Research Beginnings: navigating the archives  
3.2: Dealing with the fragmentary nature of the past  
3.3: ‘Encounters’ in the archive: autobiographical reflections of an ‘embodied researcher’  
3.4: Negotiating ‘official’ and ‘unofficial’ conceptions of camouflage  
3.5: Gender, representations of conflict and the politics of the archive  
3.6: Critical visual methodologies: aerial photographs, artwork and filmic representations  
3.7: Conclusions

## Chapter 4: Contextualising the Civil Camouflage Project

4.1: ‘Menace of the Clouds’: Britain and the emotional cultures of the ‘aerial threat’  
4.2: Managing morale: air raid precautions and the early days of camouflage (1936-1938)  
4.3: ‘Exposed’ deficiencies: the panic of Munich, 1938  
4.4: New year, new changes: February 1939 to August 1939  
4.5: ‘Phoney war, phoney experts’: September 1939 to March 1940  
4.6: ‘Getting the house in order’: April 1940 to September 1941  
4.7: Nocturnal camouflage and the winding down of the project: October 1941 to July 1945.  
4.8: Conclusions

## Chapter 5: ‘Becoming Aerial’: Profiling, Assembling and Performing as the ‘Bomber Body’

5.1: Engaging with the ‘aerially experienced’: civil camouflageurs and the Air Staff

---

1
5.2: Deconstruction the Bombing Run
  5.2.1: Approach and Navigation
  5.2.2: Recognition and Identification
  5.2.3: The Aiming Run and Attack
  5.2.4: Formulating a working agenda

5.3: Aerial Tactics

5.4: Further reflections on the tactical situation: the reports of the Air
Warfare Analysis Section (A.W.A.S.)

5.5: The bombing eye and the viewing experience

5.6: Surveying the landscape
  5.6.1: Access to R.A.F. operational aircrews
  5.6.2: Direct observations

5.7: Conclusions

Chapter 6: ‘Protecting the Vitals’: Knowing, Simulating and Modifying
the ‘Conspicuous’ Landscape
  6.1: Knowing the landscape: accounting for ‘conspicuousness’
  6.2: Simulating the Landscape: Model-making and camouflage design at
‘The Rink’
  6.3: Modifying the Landscape: camouflage solutions
    6.3.1: Paint-based Methods
    6.3.2: Netting and Screens
    6.3.3: Texturing
    6.3.4: Concealing Smoke Plumes
  6.4: Conclusions

Chapter 7: ‘In the Dark’: Nocturnal Visualities and Concealment at
Night
  7.1: Early Attempts at Nocturnal Camouflage
  7.2: Reassessing the tactical situation: altitude, angular viewing and
navigation
  7.3: Night sight: moonlight illumination and its effects upon the eye
  7.4: Night Flights: aerial surveying and the techniques of nocturnal
observation
  7.5: Accounting for conspicuousness at night: interpreting the nocturnal
landscape
  7.6: Simulating the night: modifying the viewing room and modelling
practices
  7.7: Reconfiguring existing methods of camouflage
  7.8: New methods of concealment
    7.8.1. Ground Treatments
    7.8.2. Water Camouflage
    7.8.3. ‘Shadow Play’: a return to electric illumination at night
  7.9: Demonstration models and camouflage effectiveness
  7.10: Conclusions

Chapter 8: ‘Ordered irregularity’: Camoufleurs, ‘self-concealment’ and
the landscapes of construction
  8.1: ‘Bolt something on’: early interventions in the modification of new
buildings
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.2: ‘Easing the task of concealment’: moving towards the more regular</td>
<td>381</td>
</tr>
<tr>
<td>consideration of new sites</td>
<td></td>
</tr>
<tr>
<td>8.3: Landscapes of Construction I: site discipline</td>
<td>383</td>
</tr>
<tr>
<td>8.4: Landscapes of Construction II: scarred ground and horticultural</td>
<td>386</td>
</tr>
<tr>
<td>camouflage</td>
<td></td>
</tr>
<tr>
<td>8.5: Landscapes of Construction III: artificial alternatives to treating</td>
<td>399</td>
</tr>
<tr>
<td>scars</td>
<td></td>
</tr>
<tr>
<td>8.6: ‘Self-concealing’ architecture I: producing a landscape of ‘ordered</td>
<td>401</td>
</tr>
<tr>
<td>irregularity</td>
<td></td>
</tr>
<tr>
<td>8.6.1: Siting</td>
<td>405</td>
</tr>
<tr>
<td>8.6.2: Layout</td>
<td>410</td>
</tr>
<tr>
<td>8.6.3: Constructional Form</td>
<td>416</td>
</tr>
<tr>
<td>8.7: ‘Self-concealing’ architecture II: some ‘unofficial’ alternatives</td>
<td>422</td>
</tr>
<tr>
<td>8.8: Conclusions</td>
<td>425</td>
</tr>
<tr>
<td>Chapter 9: Conclusions</td>
<td>428</td>
</tr>
<tr>
<td>9.1: Spaces of Camouflage Knowledge Production</td>
<td>429</td>
</tr>
<tr>
<td>9.2: Situated Vision</td>
<td>431</td>
</tr>
<tr>
<td>9.3: Landscape</td>
<td>434</td>
</tr>
<tr>
<td>9.4: Aerial/Terrestrial Spaces, Practices and Bodies</td>
<td>437</td>
</tr>
<tr>
<td>9.5: Future Geographies of Camouflage: some concluding remarks</td>
<td>440</td>
</tr>
<tr>
<td>Archival Sources</td>
<td>442</td>
</tr>
<tr>
<td>Bibliography</td>
<td>447</td>
</tr>
<tr>
<td>Appendices</td>
<td>500</td>
</tr>
<tr>
<td>Appendix 1: Official Camouflage Colours</td>
<td>500</td>
</tr>
<tr>
<td>Appendix 2: Organisation of the Camouflage Directorate, 1941-1945</td>
<td>502</td>
</tr>
<tr>
<td>Appendix 3: Analysis of daylight bombing attacks, Jan 1942 to Sept 1942</td>
<td>503</td>
</tr>
<tr>
<td>Appendix 4: Seed mixes for the concealment of scarred ground</td>
<td>504</td>
</tr>
</tbody>
</table>
List of Plates

Plate 1.1: Camouflage Colours Nos. 1, 2 and 7. 14
Plate 1.2: Camouflage Colours Nos. 5, 12 and 13. 15
Plate 1.3: Stonebridge Park power station, near Wembley, 1944. 22
Plate 1.4: Camouflage design for an airfield [notably Heathrow] to suit local conditions. 26
Plate 1.5: Illustration demonstrating ‘Bad’ and ‘good’ ways of traversing a field. 27
Plate 1.6: ‘Odour-removing’ camouflage clothing. 28
Plate 2.1: Photographic plates taken from The Face of the Land, illustrating contrasts between nineteenth- and twentieth-century factories and ‘inorganic’ and ‘organic’ electricity pylons. 63
Plate 3.1: Visual and cultural artefacts from the National Archives, Kew. 101
Plate 3.2: A notice informing readers of The Times that ‘no more camouflage workers needed’ and a photograph of Binley Lake, Warwickshire, taken from Nature and illustrating its draining for camouflage purposes. 105
Plate 3.3: The front cover of Art of Camouflage and an illustration of ‘the factory of the future’ from Civil Defence. 106
Plate 3.4: Convalescent Nurses Making Nets, 1941, Evelyn Mary Dunbar 108
Plate 3.5: The Rink at Leamington, c.1942, Anne Newman 109
Plate 3.6: The Big Tower, Camouflaged, 1943, Colin Moss. 114
Plate 3.7: Testing Netting at a Camouflage Research Station, Leamington Spa, 1943, T La Dell. 115
Plate 3.8: Stills taken from the British Pathé film ‘Camouflage!’ and from the L.M.S. film unit footage shot at Stonebridge Park power station. 116
Plate 4.1: Freeman’s Meadow electricity generating station. 133
Plate 4.2: L.M. Glasson, circa April 1938. 135
Plate 4.3: The front cover of and illustrations of disruptive patterning from the A.R.P. Handbook No11: Camouflage of Large Installations (1939). 136
Plate 4.4: Notice served to industrial occupiers under Section 45 of the Civil Defence Act, 1939.

Plate 4.5: Advertisements for the Silicate Paint Company, offering ‘a complete service for camouflage work’ and B.E.N.’s paint spraying equipment; An advertisement lorry for Blundell’s Camouflage Paint.

Plate 4.6: Images showing the model of the ‘big factory in the Midlands’ before and after camouflaging by the I.C.R.U.

Plate 4.7: *The Camouflage Workshop, Leamington Spa, 1940*, Edwin LaDell.

Plate 4.8: *Dr R. E. Stradling, CB, MD, FRS, Chief Scientific Adviser on Research and Experiments to the Ministry of Home Security, 1945*, Rodney Burn.

Plate 4.9: Wing Commander T.R. Cave-Browne-Cave, photographed in 1933.

Plate 4.10: Photographs of dummy landing craft on the Thames and an inflatable dummy truck, both used as part of the D-Day deception plan.

Plate 5.1: A diagram utilised in the education of civil camoufleurs in ‘Bombing Technique’.

Plate 5.2: A vertical aerial photo taken by the Luftwaffe on the 23rd March 1943 of the Rolls Royce aero engines factory at Hillington, near Glasgow.

Plate 5.3: The Shredded Wheat Factory at Welwyn Garden City.

Plate 5.4: Three maps from April 1943 illustrating the spatial location of targets attacked under various conditions.

Plate 5.5: Oblique aerial image taken over Queensferry, Fife, Scotland, showing the prominence of the Forth Railway Bridge.

Plate 5.6: An oblique aerial photograph of the camouflaged Provan gas works, Glasgow, by No.1 Camouflage Flight on the 19th April 1943.

Plate 5.7: Image reproduced from *The Times* showing the handheld camera which was utilised by the R.A.F. aircrews and by camoufleurs for aerial survey work.

Plate 6.1: An oblique aerial photograph of the Carmuir's electricity generating station near Falkirk taken on 15th April 1943.

Plate 6.2: An oblique aerial photograph of the gasworks in the Abbotshaugh area of Falkirk, dated 20th May 1941.

Plate 6.3: An oblique aerial photograph of the Grangemouth oil depot, near Falkirk, dated 20th May 1941.
Plate 6.4: The camoufleur at work.
Plate 6.5: Plans for the viewing room located in ‘The Rink’.
Plate 6.6: A camoufleur assesses his work through a variable magnification telescope with a diminishing lens.
Plate 6.7: An illustration of a photometer, an optical device used to check the intensity of lighting with the viewing room.
Plate 6.8: Texture curves representing ‘field’ textures positioned alongside their ‘model’ equivalents.
Plate 6.9: A paint contractor applying camouflage paint via spraying equipment.
Plate 6.11: Extracts for ‘Asbestos Cement: Old’ and ‘Brickwork’ from the Camouflage Paint Surfaces Chart, issued by the National Federation.
Plate 6.12: Comparative oblique aerial photographs demonstrating the ‘toning down’ of the light-toned surfaces of a factory in the countryside.
Plate 6.13: Comparative oblique aerial photographs of power station cooling tower in an urban before and after treatment by ‘toning down’.
Plate 6.14: Comparative oblique aerial photographs demonstrating the use of a disruptive scheme to break up the long, regular form of a factory.
Plate 6.15: Comparative images of the I.C.R.U. model for the Player’s Imperial Tobacco Company factory, Bristol, before and after its camouflaging in a ‘disruptive’ scheme.
Plate 6.16: Diagrams taken from Special Notes on Camouflage for Contractors to the Air Ministry, illustrating the suggested ‘disruptive’ camouflage scheme for factory chimneys in ‘open country’ and in ‘red towns’.
Plate 6.17: Plans for the concealment of Ransomes and Rapier Ltd, Waterside Works, Ipswich through the use of the ‘dwelling house’ imitative method.
Plate 6.18: Two comparative images of an unnamed factory before and treatment with an ‘imitative’ scheme.
Plate 6.20: Comparative oblique images of a gasholder of the Newcastle-upon-Tyne and Gateshead Company showing the gasholder before and after treatment with an ‘imitative’ pattern.
Plate 6.21: Two samples of hessian scrim used for civil camouflage work to garnish: green (E.7/2J) and brown (E.7/2B).

Plate 6.22: *Camouflaging the Pipeline at the British Aluminium Company’s Works at Fort William*, October 1941, Stephen Bone.

Plate 6.23: ‘Ground view of Car Park screened with scrimmed netting on cable grid supported on wood posts’.


Plate 6.25: Diagram illustrating the ‘typical arrangements of camouflage screens’ to remove ‘cast’ shadows.

Plate 6.26: ‘Up-sun’ view of steel wool netting applied as texture to corrugated iron roof.

Plate 6.27: *Fixing Textured Netting for Camouflage*, 1943, T. La Dell.

Plate 6.28: Oblique aerial photographs taken of a gasholder before and after treatment with steel wool texturing; Close-up photograph showing steel wool texturing arranged in a disruptive pattern, spray painted black and secured by cement pads.

Plate 6.29: Results of the experiment into the effect of texturing on retaining incendiary bombs, 11th February 1942.

Plate 6.30: Illustration of ‘loose’ granular texturing, held in place by wooden battens and 1-inch fish netting.

Plate 6.31: A photograph of four of the test panels of ‘textural’ material being inspected by C.D.C.E. camoufleurs in April 1942.

Plate 6.32: ‘A long chimney plume from a power station’.

Plate 6.33: A diagram of the site plan showing the layout of the smoke distributing ducts for the Hams Hall experiment.

Plate 6.34: Photographs of the furnace housing unit and distribution ducting connected to the Halls Hall power station cooling towers.

Plate 6.35: Diagram of the smoke producing unit.

Plate 6.36: Aerial photograph of the Hams Hall power station cooling towers emitting ‘normal’ white plumes and darkened ‘camouflaged’ plumes.

Plate 7.1: A graph produced by the R&E Dept. showing variations in horizontal intensity in accordance with the different phases of the moon.
Plate 7.2: Illustrations taken from *Notes on Aerial Observation at Night*, demonstrating the variations in clarity of view, detail and sense of colour.

Plate 7.3: An illustration showing the set-up for the night vision test to be undertaken by the civil camoufluer selected for nocturnal camouflage work.

Plate 7.4: ‘Scanning’ techniques for the nocturnal camoufluer/observer.

Plate 7.5: A vertical aerial photograph of distinctively shaped wooded area, with offshoots of hedgerows to the right.

Plate 7.6: Diagrams illustrating the effects of varying elevations of the moon upon the ‘darkness’ of natural surfaces.

Plate 7.7: ‘Pale areas: roofs, roadways, scars, steam plumes, etc’.

Plate 7.8: Aerial photographs showing the presence of industrial white smoke plumes and scarred ground as observed at night.

Plate 7.9: An aerial photograph showing the presence of elongated shadows running along the sides of several rows of buildings.

Plate 7.10: An illustration taken from a report into ‘moonlight camouflage’, demonstrating the conspicuousness of long shadows when compared to broken ones.

Plate 7.11: Photographs of models with shadows representative of how they would appear when viewed ‘cross-moon’ and up-moon.

Plate 7.12: A vertical aerial photograph of junctions between a main road, a railway and a river.

Plate 7.13: An oblique aerial photographs showing the prominence of water when viewed from the air during the day time.

Plate 7.14: Diagrams illustrating the effects of still clear water and ‘ruffled’ water on the dispersion of light during night-time conditions.

Plate 7.15: Aerial photographs showing the appearance of a lake in both low moon and high moon conditions; the appearance of a meander when viewed up-moon; and the appearance a lake when viewed from vertically above.

Plate 7.16: An aerial photograph illustrating the visual appearance of ‘shine’ as emitted from a roof surface.

Plate 7.17: A page taken from *Investigation into the Camouflage of Factories for Moonlight Conditions*, illustrating the diverse equipment utilised for work into nocturnal camouflage in the Viewing Room.
Plate 7.18: ‘Toning down’ to facilitate ‘fade-out’.  
Plate 7.19: ‘Patterned Camouflage’.  
Plate 7.20: A ‘distractive’ treatment: decoy roads painted over the top of an industrial building.  
Plate 7.21: Comparative oblique aerial photographs of a factory with extensive areas of water adjacent before and after treatment with coir netting on timber-framed rafts.  
Plate 7.22: Photograph of an experiment being carried out at Compton Verney in April 1941 with rafts covered with Hessian material.  
Plate 7.23: Photographs showing the arrangement of ‘Table’ and ‘Pyramidal’ floating supports.  
Plate 7.24: Diagram illustrating the tensioning and arrangement of the wires over the water’s surface.  
Plate 7.25: The fastening of the cables to the floats; garnishing the netting; and the visual effect created as viewed from the ground.  
Plate 7.26: A photograph of the Coventry Canal camouflaged with a coal dust and fuel oil film.  
Plate 7.27: Photographs taken of experimental work being carried out on Ruislip Reservoir.  
Plate 7.28: Diagrams showing the arrangement of retaining cells for the labyrinth pattern and narrow lane configurations; Photograph taken of the retaining cell used to investigate the retention of coal dust oil.  
Plate 7.29: Aerial photographs showing the appearance before and after the artificial draining of Binley Lake for camouflage purposes.  
Plate 7.30: Photographs showing the appearance of Binley Lake during the initial post-drainage phase and ten months after draining.  
Plate 7.31: Illustrations showing the suggested arrangement of lighting zones.  
Plate 7.32: Comparative vertical photographs of a model of a group of ‘toned down’ factories in day and night conditions.  
Plate 7.33: Comparative vertical photographs of the factory with a NIGHT PLUS ‘minimum’ scheme as viewed during daylight and night-time conditions.  
Plate 7.34: Comparative vertical photographs of the factory with a NIGHT PLUS ‘maximum’ as viewed during daylight and night-time conditions.
Plate 7.35: A vertical photograph of the model of the untreated ‘typical’ power station as viewed in simulated day-time conditions.

Plate 7.36: A vertical photograph of the power station model as viewed in both simulated day-light (top) and night (bottom) conditions with its NIGHT scheme applied.

Plate 8.1: Illustrations showing Bernard’s proposals for the application of ‘disruptive structural additions.

Plate 8.2: I.C.R.U. photographs showing the proposed structural additions to be made to gasholders, showing their appearance before and after.

Plate 8.3: A photograph taken by the I.C.R.U. illustrating their model of a group of six oil storage tanks, representative of the Thameshaven oil depot.

Plate 8.4: An aerial photograph illustrating the damage caused by construction work.

Plate 8.5: One side of the leaflet, Prevention is better than the cure, showing building contractors how they can impose ‘discipline’ upon construction sites.

Plate 8.6: The list of 15 firms where horticultural treatment was deemed necessary to contend with scarred ground.

Plate 8.7: Experimenting with ‘Watson’s Pots’ at Dodwell Farm, July 1941.

Plate 8.8: A Machine for Spraying Scarred Ground, 1943, by T. La Dell.

Plate 8.9: The front cover of Concealment of New Buildings.

Plate 8.10: Siting

Plate 8.11: Aerial photograph illustrating the significance of intersections between rivers, roads and railway infrastructure.

Plate 8.12: Aerial photograph illustrating the characteristic patterns of modern town planning.

Plate 8.13: A cartographic representation of a ‘fictional’ town identifying ‘good’ and ‘bad’ sites for the construction of a new building; Aerial photographs of the ‘good’ locations, sites A and C.

Plate 8.14: Layout.

Plate 8.15: Illustrations showing ‘bad’ and ‘good’ layouts for a building in an urban area.
Plate 8.16: Illustrations showing ‘badly’ planned and ‘effectively’ planned layouts for rural areas, with a further illustration indicating the location of the ‘self-concealed’ factory.

Plate 8.17: Illustration warning that scattered lodging developing continued, ‘the Enemy will know that something big is happening’; Aerial photographs taken of workers lodgings illustrating their ‘bulls eye’ as well as ‘chaotic’ visual appearance from the air.

Plate 8.18: Construction.

Plate 8.19: Plans for a buried Factory Type H; Photograph of the appearance inside a buried factory.

Plate 8.20: An aerial photograph illustrating an example of an ‘unfavourable’ burial of oil tanks.

Plate 8.21: A more ‘effective’ approach to concealing an oil farm through burial.

Plate 8.22: An illustration by Glover, showing his proposal for an improved north light roof.

Plate 8.23: ‘The factory of the future’.

**List of Tables**

Table 7.1: Table showing the estimated amount of time available between sighting a target and releasing bombs.

Table 7.2: A table illustrating the estimated duration of different levels of horizontal intensity over the course of a year.

Table 7.3: A table illustrating the C.C.A.C. classifications introduced in early 1943 and used to determine the level of concealment to be applied.

**List of Figures**

Figure 4.1: A map showing the Civil Defence Regions, 1939. The colour coding signifies which of these regions were combined for the purposes of civil camouflage. Note that Northern Ireland is not included within these designations, as it was considered, in many respects, to be beyond the reach of the Luftwaffe.

Figure 5.1: A map of the UK, illustrating the position of ‘the Line’ and the three priority regions that were produced from this.
Abbreviations

A.R.P.D. Air Raid Precautions Department (under the Home Office, and later the Ministry of Home Security)
A.W.A.S. Air Warfare Analysis Section, Ministry of Aircraft Production
B.G. A material derived from seaweed extracts and utilised to garnish camouflage netting. A precise definition was absent within the archival material.
C.A.P. The Camouflage Advisory Panel (1939-1940)
C.C.A.C. Civil Camouflage Advisory Committee
C.C.O. Chief Camouflage Officer
C.D.A. Civil Defence Act 1939.
C.D.C.E. Civil Defence Camouflage Establishment
C.I.D. Committee of Imperial Defence
CWAECs County War Agricultural Executive Committees
D.R. Dead Reckoning
D.R.50. Defence Regulation 50
E/A Enemy Aircraft
f.c. Foot Candles, a unit of measurement for light intensity
G.A.F. German Air Force (Luftwaffe)
H.E. High Explosive
I.C.R.U. Industrial Camouflage Research Unit
L.M.S. London, Midland and Scottish Railway (1923-1948)
L.R. Long Range
M/F Medium Frequency
MoHS Ministry of Home Security
P.R.S. The Paint Research Station, Teddington
R.A.E. Royal Aircraft Establishment
R&E. Dept. Research and Experiments Department, Ministry of Home Security
R.N.A.S. Royal Naval Air Service
S.C.O. Senior Construction Officer
S.D.O. Senior Design Officer
Sqn Ldr  Squadron Leader
T.S.C.  Technical Sub-Committee
W.A.A.C.  The War Artists’ Advisory Committee
Wng Cmdr  Wing Commander

**Archives-related Abbreviations**

<table>
<thead>
<tr>
<th>Acronym</th>
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<tr>
<td>AIR</td>
<td>Air Ministry</td>
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<td>BP</td>
<td>British Pathé</td>
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<td>CAB</td>
<td>Cabinet Office</td>
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<td>HO</td>
<td>Home Office</td>
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<td>IWM</td>
<td>Imperial War Museum</td>
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<td>LTM</td>
<td>London Transport Museum</td>
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<td>N.G.A.</td>
<td>National Gas Archives (Transco)</td>
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<tr>
<td>J.T.A.</td>
<td>The Julian Trevelyan Archives, Trinity College, Cambridge University</td>
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<td>JOT</td>
<td>Julian Otto Trevelyan</td>
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<tr>
<td>RCAHMS</td>
<td>Royal Commission on the Ancient and Historical Monuments of Scotland</td>
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<tr>
<td>SRO</td>
<td>Suffolk Record Office</td>
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<td>TNA</td>
<td>The National Archives, Kew</td>
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<tr>
<td>W.S.H.C.</td>
<td>Wiltshire and Swindon History Centre</td>
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Chapter One
Introduction

1.1: Camouflage Flights over Cambridgeshire and Lincolnshire, 1941
On 15th February 1941, the camouflage officer Alfred Waldron was assigned the task of observing and assessing from the air several ‘conspicuous’ sites in Cambridgeshire. One of the stops on his flight was an examination of a brick manufacturing plant in the small suburban village of Whittlesey, 6 miles east of Peterborough. Visibility was noted to be ‘good’, with light stratocumulus at 2,000ft. Observing the site from altitudes of 1,000 and 5,000 feet, Waldron described the brickworks as:

‘two flat roofed buildings painted black. Light red brick low walls. Three medium sized stacks of light brick, approx. No.2 in colour. Buildings surrounded by irregular shaped area of mud, No.1 in colour. This gives place to broken ground – colouration No.1 and 7. Nearby a small pit half full of bright green water. Impression is that this is being filled in…bank composed of ashes and vari-coloured rubbish. At time of survey little steam or smoke from chimneys’.¹

Images removed for copyright purposes

Plate 1.1: Camouflage Colours Nos. 1 (left), 2 (centre) and 7 (right).
(Source: TNA, HO186/2769).

Two weeks later, on the 3rd March 1941, Waldron conducted another flight over Lincolnshire, where he made assessments of Sleaford Brewery and some garages at an old aerodrome near Bracebridge Heath. This time, however, conditions were noted to be ‘hazy’ and observations were, therefore, restricted to 2,000ft; this was 3,000ft lower.

than what had become the operational ‘norm’. At Sleaford Brewery, Waldron documented how the site consisted of a:

‘compact block of light red brick. Multistorey. Slate roofs – bluish grey peculiar to district. Windows painted cobalt. Gable ends painted No.5. Adjacent road and area grey, not as blue as No.12’.\(^2\)

Over this site, Waldron was also confronted with:

‘two small gasometers near conspicuous by reason of grotesque camouflage patterning in acid green and red, the latter colour applied in almost geometric whorls. Not within ‘adjacent’ area but firm should be approached to consider toning down with No.13’.\(^3\)

Finally, in his examination of the garages at Bracebridge Heath, he became concerned about the ineffectiveness of the camouflage scheme which had been applied there;

‘Firm should be requested to supply following information: (i) pans/elevations; (ii) sketch plan of camouflage scheme applied, and source of scheme; (iii) if a complete scheme embracing entire site is in existence, would firm submit this to C.D.C.E.; (iv) has firm an objection to painting walls and façade of premises’.\(^4\)

Images removed for copyright purposes

**Plate 1.2: Camouflage Colours Nos. 5 (left), 12 (centre) and 13 (right).**
(Source: TNA, HO186/2769).

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These two examples, representative of several hundred flights which took place over the British landscapes of the late 1930s and during the course of the Second World War, highlight several issues of interest and potential lines of enquiry for the historical and cultural geographer. Firstly, they raise a series of questions about the effects of aeronautical technologies and the utilisation of aerial spaces in shaping our epistemologies and ontologies of the world: How and in what ways have our engagements been transformed through the vertical extension of human activities into these spaces? How do these aerial spaces and practices configure terrestrial spaces? How have ‘ways of seeing’ been altered through the proliferation of vertical visualities that these spaces have enabled? How are particular aerial bodies arranged, assembled and produced by various social, cultural and political groups to view terrestrial spaces from the air?

Secondly, these survey reports highlight the historically and culturally specific ways in which the interpretation of the landscape took place within these aerial spaces. Indeed, within these accounts, landscape comes into being and is mobilised through descriptors of colours, tones, textures, shapes and forms, as well as through labels such as ‘irregular’, ‘conspicuous’, ‘peculiar’, ‘prominent’, etc. How, then, are these understandings and accounts utilised? How are they translated into, re-presented and simulated within different spaces in order to enable the transformation and reconfiguration of the landscape by a variety of social and political actors? How do different atmospheric and perceptual conditions change the ways in which these descriptors are evoked?

Finally, these flights indicate how, in the past, these interpretations of the landscape were taking place for a particular strategic and tactical purpose: to intervene in and challenge established aesthetical norms and to physically transform and re-configure the terrestrial landscape. What affective and emotive responses underpin the motivations for doing this? Against whom are these transformed terrestrial landscapes to work against? What knowledges, methods, techniques, strategies and visual effects are utilised to achieve this? What challenges does the existing form have in determining how effectively this subversion is realised?
This research, under the title *Hidden Spaces: Camouflage and the British Landscape, 1936-1945*, sets out to explore the historical and cultural geographies of camouflage through the case study of ‘civil camouflage’, a particular form of camouflage deployed during the late 1930s and 1940s to conceal a variety of strategically important installations into the British landscape. In doing so, this thesis seeks to engage with a broad range of conceptual and theoretical debates surrounding landscape, vision, visuality and visual culture, aerial spaces and practices, military geographies, and, finally, the complex spatialities of the night; the specific contributions that the thesis seeks to make to these is more extensively detailed in Chapter 2. In this introductory chapter, however, I want to outline the imaginings and existing interdisciplinary approaches to camouflage before focusing upon the specific aims, rationales and structures of this thesis.

1.2: Camouflage: Associations/Histories/Geographies

When one thinks of ‘camouflage’, the impressions usually generated are of its uses in ‘nature’. Certainly, as Darwin evokes in *The Origins of Species* in 1859:

‘when we see leaf-eating insects green, and bark-feeders mottled-grey; the alpine ptarmigan white in winter, the red-grouse the colour of heather, and the black-grouse that of peaty earth, we must believe that these tints are of service to these birds and insects in preserving them from danger’.  

Within the natural world, camouflage is an act which is habitually deployed by a variety of creatures for a multitude of purposes. On the one hand, it can be utilised offensively by predators as a means of approaching prey relatively undetected; the tiger, for example, ‘will approach prey low through foliage, camouflaged through disruptive-patterned stripes, cryptic colouration, and countershading’. 6 In an attempt to reduce their vulnerability, hunted creatures may also resort to the adoption of one (or even a combination) of several forms of camouflage. This protection may take the form of ‘mimetic resemblance’, whereby the colours, patterns and forms of the surrounding environment or, in some cases, the behaviours and habits of other (more ‘dangerous’)

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species, may be simulated. Others may attempt ‘obliterative shading’ or ‘countershading’ in order to misguide the perceptive abilities of their predators; in the former, the ‘hunted’ attempts to break up its shape and form by ‘dazzling’ the predator, whereas in the latter, ‘the undersides of animals are lighter than the surfaces that have greater exposure to sunlight’, enabling ‘merging’ through tonal resemblance. Finally, creatures may also combine these techniques with other more-than-visual methods; cuttlefish, squid and octopi utilise ink as a screen, inhibiting sight and smell, whereas various species of moths are known to utilise ‘radar camouflage’ to confuse the bats which hunt them. Such tactics are considered to be integral to their continued survival, allowing ‘threatened’ species to carry out their daily routines by ‘passively’ (or in some cases, ‘actively’) deterring potential predators.

While these practices of camouflage have been explored in evolutionary terms for nonhuman animals, the presence of camouflage in the human world has been conceived as a social, cultural and technological adaption and appropriation. Indeed, the translation of the epistemologies of ‘natural’ camouflage into the ‘social’ world has been extremely multifarious, with camouflage knowledges, practices and aesthetics being extended and transmuted into a variety of human activities, pursuits and endeavours. Hunters, from the prehistoric period through to the present-day, have and continue to utilise lessons learnt from nature to remove their visual and olfactory ‘presence’; artists have explored the historical relationship between art and camouflage and have drawn upon natural performances of camouflage to inform their own work; contemporary architectural discourses have embraced camouflage

7 Behrens, R.R. 2009: Revisiting Abbott Thayer: non-scientific reflections about camouflage in art, war and zoology, Philosophical Transactions of the Royal Society B: Biological Sciences, 364 (1516), p.498. This is a common technique adopted by several fish species.
9 See Forbes, P. 2011: Dazzled and Deceived: Mimicry and Camouflage, Yale University Press, London.
aesthetics to help facilitate the merging of new, physical structures into the landscape; political commentators have emphasised the use of camouflage patterning and concealment acts as statements of national identity, resistance and militancy; even fashion, from cat-walk to high-street ‘animal print’ brands, bear traces of the cultural appropriation of camouflage.

But perhaps the most commonly recognised translation is in its militarised appropriation as a technology of war, most notably since the First World War, when it:

‘emerged…as an overarching set of [militarised] practices forged by a shifting collective of human and nonhuman actors united in the aim of circumventing aerial reconnaissance technologies’.

Certainly, it was as a result of the multiple applications of vibrant and strongly contrasting colours of paint to guns and maritime vessels and the concealment of trenches and artillery positions under netting that the term ‘camouflage’ itself was coined. Emerging from the French verb _camoufler_ meaning “‘to get made up’,…to be deceptive, to blow smoke, or…to disguise oneself for illicit purposes’, it was first used within popular, political and military discourses to describe these various acts. Since this time, the continuing rise of modern, technological warfare and its effects upon spatial relations has meant that camouflage has now become part of the everyday working and living environment of performing and carrying-out war, with camouflage schemes being developed and deployed to cater for a variety of ‘hostile’ environments: woodland, deserts, snowscapes, and the urban environment. Today, soldiers are provided with camouflage attire, wear camouflaged headgear and mask their faces with face-paint; even military hardware, from motorised vehicles and aeroplanes to guns and

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18 Behrens, 2002, p.171. Shell has also contended that the term ‘camouflage’ emerged from the Italian, _camuffare_, which also means ‘to make up’. See Shell, 2012, p.14.
ships are adorned in camouflage patterns that embody the natural techniques of mimicry, disruption, and countershading.19

While academic and popular attention has been directed towards these cultural, aesthetical and militaristic appropriations of camouflage, it is observed that these existing studies of camouflage have significantly overlooked the spatial dimensions and interactions involved in its practice. Although the relationship between absence, presence and space has been explored in a multitude of geographical-related contexts, from appreciations of landscape20 to ‘spectro-geographies’21 and the effects of virtual technology in transforming conceptions of distance and proximity,22 more focused and critical explorations of camouflage itself, as a spatial practice that encapsulates complex interplays of absence and presence, have been surprisingly absent. In reflecting upon some of the empirical examples presented above, it is clear that camouflage is an inherently spatial practice. At a very basic level, ‘effective’ camouflage is only obtainable through an attentiveness to surrounding conditions, actions and environments. As Leach has written, camouflage is ‘constituted by the surrounding physical environment, the urban fabric of our cities and the landscape of our countryside’.23 It is through such considerations of the immediate vicinity that spaces, places and landscapes are transformed, not just materially, but also imaginatively and symbolically. For instance, camouflage’s close association with ‘nature’ (and its social and cultural imaginings) has meant that social space has become imbued and rendered as an emotional space of sanctuary and refuge, with such attributes often positioned alongside other everyday uses of these spaces.24

In addition to this, camouflage is clearly an inter-disciplinary and hybridic practice composed of and assembled through associations between different ‘specialist’

23 Leach, 2006, p.6.
knowledges: artistic, architectural, biological, optical and aeronautical, to name but a few examples. These knowledges are produced in particular places and mobilised, contested and negotiated through and across space as camouflage practitioners seek to uncover and develop effective visual strategies that can be used to conceal, merge, hide, obscure, and fade-out features, objects and individuals into their immediate surroundings. Attention, therefore, needs to be given to the spaces which these knowledges are constructed, the ways in which they are translated from one place to another, and, finally, how these knowledges are then utilised and drawn upon to transform the appearance of particular spaces, places and landscapes.

A final spatial dimension to be considered here is the assertion that camouflage is a technology that is devised to subvert the gaze of a particular threat (imagined or realised) that occupies a specific space. While Hanna Shell has highlighted how ‘disappearance is…always from something’, I argue that this something has to be located in relation to somewhere. Viewing does not take place from anywhere, it occurs from a particular position and perspective that is socially, cultural, politically and geographically defined. In the act of camouflaging, then, attention is not only focused upon the thing doing the gazing, but also where this gaze is coming from, with it often being contended that the individual seeking to camouflage/hide themselves needs to imaginatively transcend their own positionality in an act of ‘autoscopy’. By putting themselves in the position of the observer observing them, that individual is able to reflect upon the visual appearance of themselves and adapt accordingly to reduce their appearance.

Emerging from these discussions of its inherent spatial dimensions, it is contended that a critical examination of the ‘geographies’ of camouflage can contribute to a variety of key conceptual and theoretical discussions within the discipline. It is a central aim of this research, therefore, to ‘reveal’ these ‘hidden’ spatial aspects of camouflage through the focus upon a particular way in which it has been practised.

25 For geographical work on hybrid geographies, see Whatmore, S. 2002: Hybrid Geographies: Natures, Cultures, Spaces, Sage, London.
Before outlining the specific questions that this research seeks to address, I want to briefly explain the rationale behind the selection of the particular form of camouflage which this thesis focuses upon. At its heart, this thesis concentrates upon the practice of ‘static’ or ‘civil camouflage’, a particular form of camouflage that was undertaken within the British ‘Home Front’ landscapes of the 1930s and 1940s to conceal a variety of artificial and natural features in the landscape. In the first instance, it included the hiding of sites or locations deemed to be ‘vital’ to maintaining the production of wartime materials; this included motor, aircraft and munitions factories, manufacturing plants, oil tank farms, gasometers, electricity generating stations, blast furnaces and mines, to name but a few examples (see Plate 1.3). Moreover, the term encapsulated the concealment of a variety of other features perceived to act as ‘navigational aids’ or landmarks utilised by enemy Luftwaffe aircrews: this included rivers, canals, railway tracks, roads, and chalk figures.
The reasons for selecting this form of camouflage are threefold. Firstly, within existing historiographies on the use of military camouflage in the first half of the twentieth century, discussions of ‘civil’ camouflage have been relatively absent. For instance, if we examine the contemporary text *Britain’s Wonderful Fighting Forces*, a book produced to inspire ‘confidence in Victory’, only brief reference is made to camouflage in the context of concealing aerodromes and aircraft. Elsewhere, in the post-war ‘official’ history of *Civil Defence* produced in 1955 by Terence O’Brien, civil camouflage is briefly discussed in a piecemeal and largely descriptive manner. Instead, greater popular and academic attention has focused upon ‘dazzle’ camouflage, for instance in a naval context, where zebra stripes, chequerboard, patchwork, sawtooth, curve and arc shapes were applied to maritime vessels in order to ‘mak[e] it difficult to determine their size and direction of travel when seen through a periscope’. Developing on from this, detailed accounts have traced the deployment of camouflage in its more ‘active’ and ‘deceptive’ guises, from the arrangement of decoy trucks in the deserts of North Africa, through to the use of dummy landing craft and inflatable tanks in the build-up to D-Day. Moreover, these accounts have focused on deception in all its facets, not just simply visual deception, but also ‘misinformation’ through false documents, radio transmissions and counter-espionage. Only recently has there been a resurgence of interest in ‘civil’ camouflage, predominantly in reference to the role that artists played in the production of these camouflaged spaces. In one sense, then, this

thesis seeks to make an empirical contribution to ongoing interests in this particular form of camouflage.

Secondly, a study of civil camouflage enables some unique discussions to take place. In contrast to the more ‘active’ forms of concealment detailed above, civil camouflage is a practice which sought to subvert a particular type of gaze: direct observation from an aerial observer. In many respects, this makes it significantly different from some of the ‘dominant’ forms of camouflage which have been examined. Indeed, most histories on military camouflage during the First and Second World Wars tend to emphasise its emergence as a result of developments in aerial reconnaissance.\(^3^4\) As Shell writes aerial photography had profound implications upon the conduct of modern warfare;

‘through iterative applications of aerial photography, the repeated photographing of a site over time, it became possible to monitor minute changes in the [military] landscape’.\(^3^5\)

It follows, therefore, that camouflage materialised as a technology to counter and fool the ‘glass eye’, to obscure the visible military traces imprinted in the landscape which could be interpreted in the aerial photograph.\(^3^6\) In stark contrast, civil camouflage emerged primarily as a means of:

‘confusing the fast-flying raider as it dived through the clouds to locate its target, with the crew tense and probably tired after crossing the coast, thus compelling to make another run and so exposing it to the anti-aircraft gun or fighter defences’.\(^3^7\)

In this respect, a study of civil camouflage enables a unique opportunity to interrogate the specific visualities through which terrestrial landscapes were interpreted and engaged with during this time period. While aerial photographs were certainly still


\(^{3^5}\) Shell, 2012, p.93.


\(^{3^7}\) Hartcup, 2008 [1979], p.48.
utilised within civil camouflage practice, it is against acts of direct observation that it is supposed to operate.

Finally, a study of civil camouflage during this particular time period enables a unique intervention point in terms of an examination of the knowledges that constitute camouflage practice. Indeed, if we think about the practices of camouflage during the First World War, these were very much dominated by artistic conceptualisations about how it should be approached. At the same time, commentators such as Peter Forbes have highlighted how camouflage itself became a ‘battleground’ between conflicting interpretations about which principles it should adopt: artistic or biological. The emergence of civil camouflage in the 1930s re-ignited debates about what types of knowledge should constitute ‘effective’ camouflage principles and, indeed, we see a variety of knowledges being negotiated, challenged and incorporated into civil camouflage practice. These debates in themselves warrant particular investigation, not only in terms of the valorisation of particular forms of knowledge, but also how engagements with different types of knowledge produced novel ways of dealing with the ‘civil camouflage problem’.

Invariably, focusing specifically upon one particular form of camouflage as performed during a relatively short-term historical period is not without its limitations. In the first instance, it is clear that the research seemingly valorises one organisation’s understandings, practices and performances of camouflage, namely those endorsed by the Ministry of Home Security’s C.D.C.E. and Camouflage Directorate. As a result, this has culminated, on the one hand, in the favouring of particular geographical debates over others, and, on the other, an absence of any discussion on other camouflage discourses circulating during this period. In relation to the latter, while attempts have been made to overcome this by both negotiating a space for ‘unofficial’ methods of civil camouflage, as well as making allusions to practise of camouflage utilised by the R.A.F. (for example, discussions of their trials of ‘dazzle lighting’ and the use of horticultural treatments in the form of Watson’s Pots), the research for the thesis still centres itself around the Ministry of Home Security’s manifestations of civil camouflage. It should be highlighted here that as part of the research design process, several other forms of

38 For example, see Forbes, 2011.
camouflage were considered that could have been drawn upon either almost exclusively or to even facilitate a comparative analysis between civil camouflage and these other forms of concealment. During preliminary research, two other forms of camouflage from the same time period presented themselves as equally valid case studies which could have enabled this comparative element but also furnished the thesis with links to other contemporary geographical debates. Firstly, airfield camouflage could have been utilised for its emphasis on a wider range of camouflage approaches, from imitation and mimicry to decoy, which drew upon different imaginings of the British landscape to civil camouflage (rural spaces in particular, see Plate 1.4). Moreover, airfield camouflage presented its own unique challenges: fighters and bombers on the ground had to be ‘disciplined’ and located in particular places, whilst runway camouflage had to stand up to and endure the relentless traffic of mobile aircraft as they took off. Finally, decoy lighting used by the R.A.F. for the nocturnal concealment of airfields and urban conglomerations would have provided an interesting comparative case-study in Chapter Seven, for example, through an examination of the unique practices and performances of simulation and deception required on installations such as ‘Q sites’.\(^{39}\)

![Image removed for copyright purposes](Plate 1.4: Camouflage design for an airfield [notably Heathrow] to suit local conditions. (Source: TNA, HO186/2769).)

\(^{39}\) Further discussions on Q sites can be found in Chapter Seven. It should be mentioned here that ‘Q sites’ were deceptive landscapes of ‘action’ comprising simulated explosions, mock-ups of buildings on fire and moving lighting installations to produce the visual effect of mobile aeroplanes, trains and motor cars.
Similarly, a critical examination of Home Guard camouflage could equally have opened up a range of possibilities, both expanding upon some of the broad themes selected for this thesis, but also enabled further discussions of other geographical issues. Firstly, Home Guard camouflage was a technique devised to counter a myriad of visualities, not just from the air, but also from the ground, thereby facilitating a critical narrative of the adaptability of camouflage. Secondly, an engagement with Home Guard camouflage would have enabled critical discussions with a closer focus on the associations between human and non-human actors. Indeed, encounters with training literatures such as the *Manual of Home Guard Camouflage* (1941) and *Camouflage Simply Explained* (1942) suggested that Home Guard camouflage produced and imagined a unique set of interactions with ‘nature’ worthy of exploration, both in terms of the ‘value’ of nature as a pedagogical tool, but also in relation to the organisation’s discursive construction of camouflage as a practice that required a Home Guardsman to be ‘in tune’ with nature. Likewise, examinations of such training literatures could have also contributed to ongoing geographical discussions surrounding governmentality and citizenship training, with these manuals being imagined as ‘technologies of the self’ that encouraged Home Guardsman to think ‘responsibly’, to consider their actions, movements and positionality in relation to their surroundings and to reflect on the possible consequences of ‘bad’ citizenry (for instance, traversing a field in the ‘incorrect’ way to

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produce ‘conspicuous’ tracks, see Plate 1.5). Drawing upon this empirical example, then, would have extended the contributions of this study into the geographies of camouflage.

A second limitation which may also be highlighted concerns the temporal parameters of the thesis. After much deliberation, it was decided to focus the research on the period between 1936 and 1945 due to this being the period in which in-depth discussions of civil camouflage were prevalent, to impose some form of order upon the scope of the research, as well as to enable a concentration upon the shifting in terms of the knowledges going into camouflage production (as outlined above). Equally of value would have been to extend the research to a more contemporary light, both in terms of the empirical contributions, but also the geographical discussions that this would have enabled. Indeed, in the present day, camouflage has become an integral part of the ‘civil’ world, with the rationale for the concealment of industrial and commercial buildings and structures as well as residential architectures being driven more by the concerns for the aesthetical, the environmental and the sustainable. Moreover, a large array of technological devices have emerged which now significantly shape the ways in which we imagine, engage with and adapt the visual appearance of landscapes, from night-vision goggles to infra-red and satellite technologies. Coinciding with this, ‘more-than-visual’ forms of camouflage have materialised, from the recent development of ‘odour eliminating’ camouflage clothing as used by game hunters (see Plate 1.6) to

Plate 1.6: ‘Odour-removing’ camouflage clothing.
(Source: Scent-Lok, http://www.scentlok.com/)

the deployment of stealth technology to subvert the sonic geographies of radar. These changing motivations, technological developments and emergent forms of ‘more-than-visual’ camouflage techniques and the specific social, cultural, political and spatial imaginings that are involved in themselves raises a series of unique geographical questions that would have both complemented and extend the empirical and theoretical merits of the case study selected as well as highlighted the contemporary relevance of camouflage.

While these two aspects of empirical focus and temporal specificity of the selected case study may be considered as limiting the scope and impact of the research, they testify to the whole range of possible courses and thematic discussions which an initial exploration of the geographies of camouflage could have taken. Certainly, these alternative examples indicate how a future geography of camouflage may unfold and the ways in which subsequent research building upon the findings of this thesis might be extended conceptually and empirically. Nevertheless, given the rationales outlined at the start of this section, the extensive amount of material available on civil camouflage and the unique geographical themes that might be explored, this concentrated study upon a specific case study and time period enables a highly detailed, empirically rich and thoroughly critical foundation from which an exploration of the wider geographies of camouflage may emerge and unfold.

1.4: Research Questions
Emerging from the observations made earlier in this chapter about the spatial dimensions of camouflage practice and the specific contributions of civil camouflage, this thesis seeks to address the following research questions:

1. How was the aerial observer profiled and assembled within British discourses of civil camouflage and how were these understandings integrated into civil camouflage practice?

2. What kinds of tactics, strategies, knowledges, and principles were incorporated into British conceptions of camouflage?
3. How were particular camouflage methods and ideals entwined with debates about landscape, modernity and local, regional and national characteristics?

1.5: Structure of the Thesis
This chapter has highlighted the central questions which this research seeks to address and has given an overview of existing approaches and understandings about camouflage. In Chapter Two, *Theoretical and Empirical Positioning*, I develop the theoretical and empirical contributions of this thesis, identifying the key areas of existing literature and debates which this research is located within and which it also seeks to critique and extend. In particular, this chapter examines geography’s longstanding relationship with the visual as well as the centrality of vision within landscape studies and how this has evolved with the progressive transition towards more performative and practice-orientated understandings of landscape. Following on from this, examinations are made of the existing literature on nocturnal geographies and how the unique atmospheric and perceptual conditions of the night produce new and unique ways of engaging with landscape. Moreover, attention is given to the empirical contribution of the thesis in relation to existing work on landscapes of twentieth century Britain. Subsequently, an extensive review of current research into aerial geographies is conducted, with consideration given to the specific historical and cultural construction of aerial spaces, the production and profiling of different aerial subjects, and the implication of the proliferation of vertical visualities upon transformations of the terrestrial landscape. Finally, this chapter concludes with an analysis of work into military geographies and how the practices of camouflage examined within this thesis illustrate not only a blurring of the distinctions between military and civil spaces, but also show how military practices more broadly draw upon different types of knowledge in the conduct of war.

The methodological dimensions of the thesis are explored in Chapter 3, *Archival Encounters and Visual Methodologies*, with an outline given of the archives and materials encountered, the nature of the encounters with the archive and how this has affected the interpretation of the material contained within them, negotiations between ‘official’ and ‘unofficial’ conceptualisations of camouflage and issues surrounding gender, conflict and representation. This chapter also gives an overview of the critical
visual methodologies that have been used and provides contextual information on the illustrative and visual materials utilised throughout the empirical chapters.

Chapter 4, *Contextualising the Civil Camouflage Project*, chronicles a historical narrative of the organisation of static camouflage work, highlighting the contemporary imaginings of Britain’s aerial spaces and the ‘cultures of fear’ that were articulated throughout the interwar period. The chapter examines how civil camouflage emerged as a pre-emptive solution to the aerial threat and was one of several civil defence schemes employed as this time. Following on from this, a historical overview of the development of civil camouflage is given, with attention devoted to particular moments and events that shaped how camouflage as a wartime practice unfolded. Indeed, consideration is given to issues surrounding the government regulation and centralisation of camouflage practice, the emergence of ‘unofficial’ camouflage organisations and individuals, the conflicts between the artistic and scientific approaches to camouflage, the forums and spaces in which camouflage methods were deliberated, the transition to ‘night camouflage’ and, finally, problems surrounding the economical use of materials and labour resources.

Chapter 5, ‘*Becoming Aerial*: Profiling, Assembling and Performing as the ‘Bomber Body’’, establishes camouflage as an affective and vigilant response to the aeroplane and the aerial observer and looks at the accumulation of knowledge by civil camoufleurs about Britain’s aerial spaces and the practices of bombing taking place within them. More specifically, it looks at the development of relationships between camouflage practitioners and ‘airminded’ officials in gathering intelligence about bombing practices, the identification and recognitions of targets and navigational landmarks, and the aerial tactics deployed by the threat that was the Luftwaffe. In addition to this, attention is given to the collation of knowledge about the visual faculties of the bomber body, the effects of meteorology in shaping how landscape was visually consumed. Lastly, the chapter positions the aerial experience as being at the heart of camouflage work, through the use of R.A.F. operational aircrews to provide assessments on the British landscape, but also through observations made by camoufleurs themselves.

In light of these findings, Chapter 6, ‘*Protecting the Vitals*: Knowing, Simulating and Modifying the ‘Conspicuous’ Landscape’, then proceeds to look at how the British
landscape was transformed, predominantly during daylight conditions. It begins by highlighting how the landscape became known within camouflage discourses, paying particular attention to the patterns that the landscape was seen to produce when visually engaged with from the air. Following on from this, the chapter then proceeds to examine the necessity for models in camouflage work and discusses the construction of the Viewing Room, a highly sophisticated space of simulation that permitted camoufleurs to critique and develop camouflage schemes. The remainder of the chapter then profiles the different techniques that were developed to counter the aerial gaze of the bomber body and highlights some of the specific design challenges raised by these. While the initial focus is upon ‘artistic’ methods, this chapter traces some of the alternative techniques that were devised and the role that they played in suppressing certain visual traces as well as the particular camouflage ‘effects’ that they sought to achieve: this includes looking at netting and screening methods, textural treatments and interventions in the darkening of steam and smoke plumes.

Having solely focused upon ‘daylight’ conceptualisations of civil camouflage, Chapter 7, ‘In the Dark’: Nocturnal Visualities and Concealment at Night, considers the temporal shift in camouflage work and how the transition from day to night-time approaches to camouflage signalled a need to re-think camouflage practice. Acknowledging that the atmospheric and perceptual conditions of the night produced new and unique ways of interpreting the landscape, this chapter details how camouflage practitioners sought to evolve their existing knowledge about bombing practices and aerial subjects as well as re-appropriate practices of simulation and active methods of camouflage. In addition to this, attention is also given to the accommodation and development of new and alternative camouflage treatments. As part of this chapter, examinations are made of how particular forms of camouflage, notably the use of artificial illumination, came into conflict with other civil defence measures, and so charts how the methods which were eventually utilised had to negotiate these tensions in order to be accepted for operational use.

In the penultimate chapter, ‘Order Irregularity’: camoufleurs, ‘self-concealment’ and the landscapes of construction, examinations are made into the interventions of civil camouflage practitioners into building practices and ‘emerging’ landscapes of construction, primarily through the promotion of site discipline, the prevention of
scarring and the horticultural and artificial treatments that were produced to suppress their appearance within the landscape. Furthermore, attention is given to how camoufleurs sought to influence architectural design through the articulation of a ‘self-concealing’ aesthetic which either removed the ‘camouflage problem’ or at least make their task much easier to carry out. To conclude, discussions of alternative techniques encouraged by ‘unofficial’ camouflage practitioners are also analysed.

The final chapter, Conclusions, reflects upon the findings of the thesis and the overall contributions of the research.
Chapter 2

Theoretical and Empirical Positioning

In this chapter, I want to consider the key sets of literatures which frame this thesis, critically examining how ways of thinking about landscape, vision, nocturnalities, and military and aerial spaces and practices have helped to shape the theoretical and empirical contributions of this study of camouflage. This chapter is, therefore, structured into six sections: the first discusses geography’s longstanding interest in the visual, visuality and visual cultures. The second section focuses upon the connections between vision and landscape, and charts the different ways in which studies of landscape have thought about the visual and the corporeal engagements between body and space. The third section considers the specific geographies of the night and how variations in atmospheric, sensory and temporal conditions affect the epistemologies and ontologies of landscape. The fourth section outlines landscape research which has explored the landscapes of the twentieth century and attempts to position the empirical contributions of the thesis with respect to this field of enquiry; as part of this, discussions focus upon the discourses surrounding ‘modern’ architectural sensibilities and aesthetics. The penultimate section analyses and addresses geographical interest into aerial spaces and practice, extending discussions on how the landscape is appreciated through the ‘vertical visualities’ of the ‘aerial subject. The final section, then, considers the contribution that the thesis seeks to make to ongoing work into military geographies, highlighting how different spaces and ways of seeing are transformed through militarised appropriations, as well as how military institutions draw upon particular forms of visual and geographical knowledge in the conduct of war.

2.1: Geographical Visions: geography and the visual

Within contemporary society, and throughout our quotidian practices, it has been argued that the visual plays a significant role in shaping and transforming our understandings and experiences of the world. Indeed, the supposed passage from modernity to postmodernity (a debate which has characterised academic discussions on the contemporary condition of society for the past twenty years or so)\(^42\) has produced a

\(^{42}\) For example, see Harvey, D. 1990: The Condition of Postmodernity, Blackwell, Oxford.
situation whereby the ‘human experience is now more visual and visualised than ever before’. Such a transition has been attributed to:

‘a succession of waves of new media: photography, the cinema, television, video, computer graphics, communication satellites, multimedia, the Internet, [and] virtual reality’.44

Drawing upon the ideas of Guy Debord and Jean Baudrillard, contemporary social and cultural theorists often refer to the present-day world as a ‘society of the spectacle’, as a world of ‘hyperreality’ mediated through a plethora of visual images and ‘simulations’.45

Emerging from these broad dialogues, vision has long been considered as being central to the ways in which we accumulate knowledge about ourselves, others and the world around us. Certainly, the visual experience has been identified as being key to the development of the individual throughout the ‘lifecourse’; Berger, for example, in his work on ‘ways of seeing’, has contended that ‘seeing [often] comes before words. The child looks and recognises before it can speak’.46 Furthermore, Conley has also highlighted how vision is:

‘absolutely crucial to the constitution of a healthy consciousness from the very beginning of its development…it gives us the initial means of feeling somatic motion, of tasting, testing and coping with the world’.47

Such assertions have culminated in sight being ‘regarded as the noblest of all senses, as the basis of modern epistemology’.48 If we consider, for instance, the cultures of science, acts of ‘seeing’, ‘looking’, ‘watching’ and ‘observing’ have been situated as being central to the assembling of ‘objective’ knowledge about ‘natural’ processes and

phenomena;\textsuperscript{49} as Rose argues, ‘knowing the world, it seems, is also very often about seeing the world’.\textsuperscript{50} Furthermore, as the eye is never static, sight has been elevated as one of the principle senses through which the individual is able to locate itself within space; Berger writes of how:

‘we never look at just one thing; we are always looking at the relation between things and ourselves. Our vision is continually active, continually holding things in a circle around itself, constituting what is present to us as we are’.\textsuperscript{51}

In this regard, vision and different acts of ‘looking’ are vital sensory processes through which we constitute and reflect upon ourselves and our positionality within space and society; sight structures what we believe and what we know about people, objects and places around us.

It perhaps comes as no surprise, therefore, that geographers have long expressed an interest in the specific role of the visual and of visuality in shaping and transforming our understandings and experiences of the world; in fact, geography has often been referred to as ‘a discipline of global vision’.\textsuperscript{52} Moreover, as Gillian Rose has highlighted:

‘with the exception of anthropology, geography is unique in the way it has relied and continues to rely on certain kinds of visualities and visual images to construct its knowledges’.\textsuperscript{53}


\textsuperscript{51} Berger, 1972, p.9.


Likewise, Cosgrove has contended that ‘geographical space remains space that can be seen, or at least visualised’.\textsuperscript{54} Such an association has been extensively historicised; the historical geographer David Livingstone, in his work on the ‘geographical tradition’, has spotlighted how:

‘the centrality of the picture-making impulse can be traced to the reappropriation during the Renaissance of Ptolemy’s conception of geography as an enterprise essentially concerned with picturing (or representing) the world’.\textsuperscript{55}

Moreover, viewing and observing were positioned as being integral to geography’s methodological approach as the emerging discipline sought to produce ‘scientific’ and ‘objective’ knowledge about the world. Carl Sauer, for instance, in his promotion of fieldwork as being a key methodological device for generating knowledge about landscape, argued that:

‘geography is first of all knowledge gained by observation, that one orders by reflection and retrospection the things one has been looking at, and that from what one has experienced by intimate sight comes comparison and synthesis’.\textsuperscript{56}

Over the course of the last twenty years, however, more critical interrogations of the visual, of visual representations and of different ‘ways of seeing’ have been placed at the heart of historical and cultural geography. This has been increasingly the case since the ‘cultural turn’ of the 1980s, and, subsequently, by what some commentators have called a ‘visual turn’ within the discipline.\textsuperscript{57} As a result of these shifts, geographers have taken the lead in developing more critical methodological approaches to visual

culture which now examine the sites where visual materials are produced, the image itself, and, finally, the spaces where the visual is consumed by audiences, including the researcher themselves. Furthermore, these ‘turns’ have encouraged geographers to expand upon the types of visual and ‘imaginative’ sources which they utilise as objects and subjects for geographical enquiry. This has included not only re-engaging with ‘traditional’ forms of geographical visualisation tools such as maps and the cartographical, but also photographs, videos and filmic representations, art and landscape paintings, video games, and even comic books.

Through these various engagements, geographers have attempted to make a series of connections with a range of social, cultural and political themes. For example, studies on the ‘geographies of empire’ have considered the role of visual cultures in shaping the ‘imaginative geographies’ of colonial spaces, places and landscapes. Such analyses have been inspired by Edward Said’s work on Orientalism, in which the neologism of ‘imaginative geographies’ was coined to denote the ‘practice of designating in one’s mind a familiar space which is ‘ours’ and an unfamiliar space beyond ‘ours’ which is ‘theirs’.

Subsequently, historical and postcolonial geographers have examined a


variety of visual representations and cultures, from landscape art and photography to surveying, and how their deployment and presentation in a multitude of spatial settings (the lecture theatre and the classroom being noteworthy examples) constructed, communicated and shaped ‘geographical imaginings’ of ‘faraway’ spaces and places and relations between ‘colonisers’ and ‘colonised’.66

Another example would be work which has engaged with ‘cinematic geographies’, with it being argued that:

‘cinematic representations… shape our perceptions, imaginations and memories of all sorts of spaces, places and landscapes and the constant process through which geographies are reshaped and rearranged’.67

Through engagements with the cinematic, geographers have, for instance, explored how cities have been culturally constructed through film, the role of cinema in shaping the ‘geopolitical’ imagination, as well as how the ‘moving picture’ can act as a key site for the playing out of the cultural politics of identity.68

While these efforts testify to the focusing of attention on particular forms of visual culture, geographers have also considered a wider range of ocular practices, visual regimes, optic technologies and spaces of viewing and how these have shaped


knowledges about people and places as well as structured socio-spatial relations. For instance, historical geographers have examined the emergence of the ‘spectacle’ in the modern, imperial city, highlighting visual displays, museum and exhibition spaces, as well as architectural and building ‘events’. In addition, they have explored a wide range of spaces where ‘geographical knowledge’ was produced and assembled through visual engagements: zoos and botanical gardens, universities, rural spaces and field sites, and even pirate ships. Finally, they have considered a wide range of visual practices: birdwatching, sightseeing and tourist cultures, surveillance, panoptic and authoritative gazes, the medical regard, as well as the observational training practices of youth and military organisations, to name but a few examples, have all been examined as producing particular viewing or viewed subjects.


78 Robinson and Mills, 2012.
From these various geographical engagements, several observations can be made. Firstly, this work proposes that we need to take the visual seriously, to consider how the visual structures our knowledge about ourselves, others and the spaces around us. Second, it suggests that critical attention needs to be focused upon different types of viewing experiences; acts of ‘looking’, ‘observing’, ‘gazing’, ‘watching’ and ‘surveying’ all need to be deconstructed in order to comprehend how they initiate relationships between the individual and its surroundings. Thirdly, this work highlights that seeing is not simply looking at something, and that it entails a variety of other processes. Viewing is not:

’a single kind of act or process…[but entails] an array of different perceptual activities: looking for, looking at, peering, spotting, inspecting, perusing, seeing as and seeing-at-a-glance’.

Furthermore, viewing accompanies an array of other embodied actions: the ability to record, reflect, judge, and respond to visual sensations. Finally, these engagements between geographers and the visual crucially highlight the different spaces that have been produced to enable or permit certain types of viewing experiences, as well as the role of space itself in creating particular viewing subjects and positions.

2.2: Envisioning Landscape: landscape and the visual

Having considered the wider geographies of vision and visuality thus far, I want to now concentrate on the specific relationship between the visual and understandings of landscape. In particular, I want to consider how landscapes are constituted, shaped and transformed through visual experiences and representations. To begin with, when we think of a ‘landscape’, we usually do so with what Wylie refers to as a ‘scopic emphasis’.

In attempting to differentiate ‘landscape’ from other geographical concepts such as ‘place’, for example, Cresswell has argued that landscape:

‘refer[s] to a portion of the earth’s surface that can be viewed from one spot. It combine[s] a focus on the material topography of a portion of land (that which can be


seen) with the notion of *vision* (the way it is seen). Landscape is an intensely visual idea…We do not live in landscapes – we *look* at them*.\textsuperscript{81}

Such associations were consistently evoked in early academic studies of landscape which presented landscape as a ‘visual idea’, as a scene to be observed, scrutinised and evaluated. Carl Sauer, for example, in his work on ‘The Morphology of Landscape’ contended that ‘reading a landscape…provided the geographer with a window on particular cultures’.\textsuperscript{82} For Sauer, landscape was something to be viewed and interpreted; through the recording of visible traces in the landscape, insights could be derived into past and present societies and cultural processes. Extending earlier discussions on the ‘scientific gaze’, viewing the landscape took place through an objective, detached ‘way of seeing’.

Following on from this, later geographical engagements with landscape continued to emphasise the importance of the visual. In the light of the ‘cultural turn’, geographers such as Denis Cosgrove and Stephen Daniels advocated an iconographic approach to landscape in an attempt to show how landscape acted as ‘a cultural image, a pictorial way of representing, structuring or symbolising surroundings’.\textsuperscript{83} Cosgrove, for example, interrogated landscape painting techniques of the seventeenth century in the search for meaning,\textsuperscript{84} whereas Daniels explored how:

‘landscapes, whether focusing on single monuments or framing stretches of scenery, provide visible shape; they picture nation. As exemplars of moral order and aesthetic harmony, particular landscapes achieve the status of nation icons’.\textsuperscript{85}

In the case of the latter, this triggered an interest in how landscape imagery, both in terms of landscape art and photography, acted as signifiers of national identity.\(^{86}\)

As part of this work, landscape emerged not as a neutral ‘way of seeing’, but as a viewing experience shaped through societal and invested power relations. Indeed, it was contended that landscapes and the representation of them have ‘very real political consequences’.\(^{87}\) As Martin Jay contends, ‘every gaze is sited…every viewer occupies a position in the cultural field’.\(^{88}\) As a result, landscape became acknowledged as ‘a particular way of spatially and visually organising a view, which produced not only a landscape in front of the viewer, but also the viewer as a subject position’.\(^{89}\) Landscape, therefore, became an ideologically charged ‘way of seeing’ that reinforced social difference and put people ‘in their place’. Cosgrove, for example, highlights how through use of perspective:

> ‘painting and garden design landscape achieved visually and ideologically what survey, map making and ordnance charting achieved practically: the control and domination over space as an absolute, objective entity, its transformation into the property of individual or state’.\(^{90}\)

In addition to this, landscape was criticised as being a ‘masculinist way of seeing’, which embodied:

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\(^{90}\) Cosgrove, 1985, p.46.
‘a commonly white, usually male and sometimes scientific and imperialist subject, whose gaze expresses binary, hierarchical distinctions between self and other, male and female, culture and nature’. 91

Finally, landscape was also exposed as a means of accentuating racial difference, as a way of structuring and establishing spaces of belonging and exclusion around particular ethnic and cultural groups.92

While these accounts treated landscape in purely visual terms, critiques of the ‘new’ cultural geography emerged which argued that an emphasis upon representation was producing ‘dead geographies’.93 Such a critique has led to what Nash has referred to as a ‘substantive turn from ‘text’ and representation, to performance and practice’.94 As a result, geographers have begun to look at the more multi-sensory, tactile engagements between the body and space.95 As part of this, it has been contended that ‘the body is our most fundamental device of communication and interaction with the world. We make sense of the world by acquiring information through our body’.96 Indeed, it is

91 Wylie, 2003, p.138. See also Nash, C. 1996: Reclaiming vision: looking at the landscape and the body, Gender, Place and Culture, 3(2), pp.149-170; Rose, 1992; Rose, G. 1993: Feminism and Geography: The Limits of Geographical Knowledge, Polity, Cambridge.
96 Lewis, 2000, p.68-69.
through ‘the body [that] we learn what is near, what is far, that which is above, that which is below’.

This ‘substantive’ shift has had profound implications upon not only approaches to landscape, but also concerning the role of the visual in how the ‘embodied’ individual engages with landscape. In his essay on ‘Landscape and the Obliteration of Practice’, Cresswell is highly critical of the concept, arguing that landscape ‘does not have much space for temporality, for movement and flux and mundane practice …the world of practice is denied – frozen out’. For Cresswell, the:

‘challenge for cultural geographers of landscape is to produce geographies that are lived, embodied, practised; landscapes which are never finished or complete, not easily framed or read’.

Recent re-engagements with phenomenology as well as the conceiving of landscapes as being produced through embodied and ‘more-than-representational’ practices have, in many respects, helped to ‘animate landscape’ and signalled ‘a move towards a new understanding of visible landscape in terms of sensuous practice’. Indeed, studies of landscape now draw attention to the corporeality of the landscape experience, in which vision is positioned alongside the other senses - aural, olfactory, touch, taste - as well as within a body capable of movement. Through this arrangement, landscape emerges ‘as processual, rather than fixed, as a relation of corporeality rather than a mental construct’.

Of importance to these new theorisations has been how embodied experiences of landscape are shaped by varying degrees of embeddedness and separation and by temporal shifts between presence and absence. Landscape, for instance, is often defined

101 For discussions on ‘mobile visions’, see later sections on aerial gazes.
102 Wylie, 2003, page 144.
in terms of presence, by ‘contact, immersion, and immediacy’,\textsuperscript{103} as ‘an imagination of, and a movement towards, presence’.\textsuperscript{104} It is through these particular ‘moments’ of presence that the Earth’s surfaces come into being, enlivened, animated and emergent as a ‘performative milieu’.\textsuperscript{105} However, as Rose and Wylie argue, the tactile and sensory processes that shape the landscape encounter are marked by ‘the tension between presence and absence’;\textsuperscript{106} ‘presence’ is always fleeting and in flux, always at risk of becoming absent as the individual’s embodied sensations and tactile interactions with the Earth’s surfaces become distracted, disrupted and disengaged as they move through and along space. In the course of viewing a landscape, for instance, we are unable to focus on everything, meaning that certain aspects of the landscape come to the fore, while other dimensions fade into the background. Moreover, our visual attentiveness can be distracted by other bodily sensations (kinaesthesis, smells, fatigue, pain, etc), which again results in certain features of the landscape becoming present and others absent. In this sense, our experiences of landscape are situated not only in relation to our physical location, but also mediated by our sensory and tactile engagements with it.

In reflecting upon this relationship between landscape encounters and the conceptualisation of presence and absence as part of this, however, it is contended that these states of presence and absence should not be defined in absolute terms, but rather as relational, multiple, fluid and situated. More often than not, absence is imagined as being something which is not present, as something non-relational, passive, unspeakable, non-evident and unobtainable.\textsuperscript{107} Conversely, presence is cast as something which is not absent, and of interest to the discussions here, as something that is visible, apparent, or even conspicuous. However, rather than reducing absence and presence to their absolute terms, these recent engagements between landscape and self suggest that experiences, imaginings, understandings and attachments with the material landscape are ‘synchronously…[moulded by] the absence of presence, the presence of...

\textsuperscript{103} Wylie, 2009, p.278.
\textsuperscript{104} Rose, 2006, p. 538.
\textsuperscript{105} Wylie, 2005, p.236.
\textsuperscript{106} Rose and Wylie, 2006, p.475.
absence’, that absences and presences are ‘are intricately woven rather than existing as binaries: they are co-constituted and co-exist simultaneously’. Drawing upon the work of Derrida, Rose contends that while elements of a landscape may certainly appear visible, the landscape encounter is itself predicated upon a ‘dream of presence’, with the landscape presented as ‘a set of possibilities held out towards us, clear from afar but always-already unattainable’. These debates highlight the relational position of the viewing subject with the landscape and how the viewing experience is held by this fluctuating tension between presence and absence, without fully becoming either.

In relation to the following discussions on camouflage, this association between landscape and the visual is of the utmost importance. In the first instance, camouflage is very much a practice which is concerned with how landscapes are visually experienced, how they are consumed, interacted with and understood through visual engagements and entanglements. Emerging from this, camouflage is a visual technology which is designed to counteract and subvert particular ‘ways of seeing’ the landscape; in the case of civil camouflage, this is against the ‘eye in the sky’. Within camouflage discourses, these ‘ways of seeing’ are mapped onto particular viewing subjects (one’s adversary) which need to be deconstructed and understood. Furthermore, and quite importantly, camouflage also encourages its practitioners to engage directly with those specific ‘ways of seeing’ in order to comprehend the ‘camouflage problem’, to understand the visual characteristics and attributes that made things, objects and buildings ‘out-of-place’, ‘conspicuous’, or ‘noteworthy’ in the landscape. Through the adoption of the specific visualities of the perceived ‘threat’, camouflage directs its practitioners to think about how landscape can be transformed, to remove visible traces and render them ‘inconspicuous’. This need to deconstruct and immerse oneself in the enemy’s ‘way of seeing’ the landscape is explored in Chapters Five and Six.

Following on from this, and in line with contemporary ways of thinking about landscape and vision in terms of embodiment and ‘processual’ emergence, this study of camouflage does not take vision in isolation as an objective, detached, and static gaze of the landscape, but instead positions it in relation to a mobile and ‘embodied’ individual.

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110 Rose, 2006, p.545.
whose interactions with landscape are shaped through varying degrees of embeddedness and separation. It is contended, for instance, that the viewing experience of an (aerial) observer is mediated through an array of bodily sensations, by movement through (air)space, and through particular body-technology assemblages (explored in greater detail in the ‘aerial geographies’ section of this chapter), all of which enable varying affinities and distantiations between the body and the landscape. Camouflage, therefore, seeks to exploit those ‘moments’ when the attentive capabilities of the embodied (aerial) subject are most affected by these influences; if camouflage is able to further disrupt the capabilities of the (aerial) observer when it faces moments of heightened distraction (for instance, as a result of anti-aircraft defences), then its capacity to deceive is greatly enhanced.

Coinciding with this, camouflage may be conceived as a practice and technology which itself embodies the tension between presence and absence that shapes landscape engagements; while on the one hand, camouflaging may be considered to shape a landscape experience more in terms of visual absence and absolute invisibility, it is argued here that this absence is instead relational and situated. For example, an aerial observer of a camouflaged structure is more likely to be deceived than a grounded observer because of the situated gazes through which civil camouflage is directed to confuse and misguide. At the same time, the camouflaged structure embodies the tension between presence and absence in a multitude of ways. Firstly, the physical structure being concealed or rendered invisible retains a material presence, but in being camouflaged, its presence is reconfigured in terms of both signalling a shift away from a structure perceived as ‘conspicuous’ to one that is ‘inconspicuous’. At the same time, we may consider this movement towards absence as being another form of presence, with camouflage reconfiguring the landscape as an alternative presence when viewed in a particular way or through a situated gaze. In this sense, it is argued that the act of camouflaging embraces the co-constitutive and co-existent relationship between absence and presence rather than falling upon the absence side of a binary in terms of how an individual may visually engage with a camouflaged site; ‘hiddenness…is part of the condition of seeing and part of what is seen is the obscure, confused, dark and nonevident’.

111 Bishop, 2011, p.131.
2.3: Geographies of the night: nocturnal appreciations of landscape

Going into further detail on the contemporary discussions of landscape, geographers have increasingly considered the role of different experiential and atmospheric conditions upon the experiences of the individual in shaping, enabling and inhibiting engagements with landscape. John Wylie, for example, has considered the ‘corporealities and sensibilities’ that shaped a ‘performative milieu of coastal walking’, drawing attention to ‘moments, movements, events…to spotlight tones, texts, and topographic forms from which distinctive articulations of self and landscape arise’. As part of this analysis, he highlights such ‘moments’ as the rhythm of walking, encounters with others, states of breathlessness, the solitude of walking alone, the tones and moods of the sea and sky, and the pain of blisters, all of which significantly shaped a shifting and unfolding entanglement of affinities and distantiations between the body and the landscape and, subsequently, how this framed and shaped how the landscape was understood and engaged with.

Elsewhere, Craig Martin has explored the atmospheric and sensory environments of fog at Dungeness Beach, Kent, and how the viewing conditions that fog produces can lead to the establishment of different epistemologies and ontologies of space. For example, Martin notes how fog ‘dispel[s] normative spatial relations by speaking of disorientation as opposed to clarity and transparency’, in part attributable to ‘excesses’ of light:

‘the quality of light that fog produces is initially reassuring, but concomitantly there is excess – dazzling the onlooker to such an extent that reassurance soon fades into trepidation when one realizes that presence merges into absence’

In visual conditions akin to ‘snow-blindedness’, Martin emphasises how such an ‘excess’ of light radically transforms spatial epistemologies. Indeed, fog is considered to induce ‘feelings of disorientation through the loss of familiar reference points such as architectural structures, the horizon, the shoreline, or indeed fellow companions’. Moreover, in the material and visual absence of a horizon, a coterminous relationship

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112 Wylie, 2005, p.236.
between the ground and the air is said to be forged because there is no surface to separate them; this further exacerbates the state of bodily disorientation.

Although both Wylie’s and Martin’s accounts testify to the various affectual conditions that shape and produce different configurations of the landscape, neither seeks to address fully the implications of the nocturnal environment and its effects upon bodily engagements and understandings of landscape. Certainly, studies of landscape have relatively ignored the alternative ways in which spaces, places and landscapes are comprehended and connected with in the conditions of the night, a point reaffirmed by the cultural and historical geographer Nina Morris, in her work into ‘darkness and sensory perception’:

‘little, if any attention, [has been] given to the fluctuating and unstable relationship between the assumed polarities of ‘light’ and ‘dark’ and the extent to which variations in relative ‘lightness’ or ‘darkness’ can impact upon an individual’s understandings of, and movement through, the landscape’

This relative ‘absence’ of interest in the sensory environments of the night is hardly surprising. As (primarily) diurnal beings, the night-time has been conceived of playing a relatively insignificant and comparatively mundane role in our rhythmic daily lifestyles; for many of us, ‘the night remains…a time of retreat from the outside to the inside, from the street to the house, a time for sleep, rest and regeneration’. As a result, Kraftl and Horton argue that nocturnal practices and spaces have ‘intuitively’ been conceived as ‘too banal, too fey, too useless, and too distant from weightier scholarly concerns to matter’. In addition to this, it has been commonly contended that the night and the conditions of darkness produce a state of sensory-deadness and visual absence through the creation of an environment which significantly inhibits the capabilities of the body

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115 It should be noted that Martin briefly draws upon the work of Michel Serres and his discussions of the night to tease out contrasts and comparisons between the different optical experiences of foggy and night-time conditions. See, Serres, M. 2008: The Five Senses: A Philosophy of Mingled Bodies, Continuum, London.
to sense others and the world around them, leading to a further indifference to the night. As Morris writes;

'[as] highly visual animals, humans are greatly disadvantaged when the lights go out, for the human eye has reduced visual acuity in conditions of lower illumination. Nothing is solid in the dark: it is harder to judge depth and distance, details are obscured and colours muted'.

The ‘blackness’ of the night has, therefore, been popularly imagined as producing an ‘aesthetic vacuum’, with the lack of sensation induced by the nocturnal environment giving way to ‘ghostly’ and ‘haunting’ presences in this empty space.

Although these assertions remain steadfast, academic research has been conducted into the night and the conditions of darkness, albeit with a limited focus. For example, geographers and social scientists alike have engaged in extensive examinations of the ‘Night-time Economy’ (NTE) and the various ‘cultural initiatives aimed at bring people back into the city, the office and residential developments…associated with the night-time’. Emerging from this, geographers have become increasingly interested in two specific areas: firstly, how the extension of the NTE, particularly within U.K. cities, has culminated in the intensified regulation of night-time practices and spaces, leading to the inclusion/exclusion of particular bodies; and secondly, the proliferation of

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121 On ‘ghostly’ and ‘haunting’ presences, see Maddern and Adey, 2008.
nocturnal drinking cultures and their associated effects upon urban planning.\textsuperscript{124} Aside from these social, economic and political dimensions, geographers have also recently begun to critically engage with the night as a time-space for sleep. Such work has not only been critical of the ‘privileged…ways in which behavioural norms are learned and regulated through wakeful practices’, but has also exposed the role of sleep and the night-time in the social configuration of particular subjectivities, notably of youths.\textsuperscript{125}

While these developments testify to a broad geographical engagement with nocturnal spaces and practices, it is historical and cultural work into illumination technologies at night and the ways in which they have transformed understandings and experiences of different spaces which provide an entrance point for the critical discussions within this thesis. Within this field, darkness has been revealed to be historically and culturally constructed as a time and space of chaos, of fear, horror, insecurity, and of the imagination:

‘nightfall bring forces very different from those that rule the day. In the symbols and myths of most cultures, night is chaos, the realm of dreams, teeming with ghosts and demons as the oceans teem with fish and sea monsters’.\textsuperscript{126}

Such an association has been considered to have a long history. Within Greek mythology, Erebus, the god of darkness and shadow, was revered as the son of Chaos and closely connected to the underworld. In medieval times, the dark was greatly feared as a time-space where evil spirits would rise, with the onset of night signalling ‘a retreat indoors, locking and bolting everything…First the city gates…[then] individual houses’.\textsuperscript{127} These overtones would be sustained into the 18\textsuperscript{th} and 19\textsuperscript{th} centuries; during


\textsuperscript{127} Schivelbusch, 1995, p.81.
the time of the Enlightenment, Foucault, for example, highlights a continuing ‘fear of
darkened spaces, of the pall of gloom which prevents the full visibility of things, men
and truths’. In the modern metropoles of London, Paris and Berlin, darkness and
shadows became strongly associated with spaces that concealed misdemeanours and
criminal activity;

‘Darkness obscured visual surveillance and provided a protective cloak for deviant
behaviour. Darkness seemed to bring out the worst in humankind, making the night
something to be avoided beyond the security of home’.

Moreover, within Western, modernist discourses, darkness became a:

‘perceived psychological and physical menace…that took the form of populations
deemed to be aberrant – the mad, the diseased, the criminal – and was understood to be
incubated by darkness, and so came to be represented by darkness’.

Dark spaces, from lightless streets to subterranean spaces such sewer systems, were
therefore all regarded as ‘breeding grounds’ for crime, anarchy, evil, dirt and fear.

In contrast to this, the presence of light and the emergence of artificial illumination from
the late 1700s was characterised within the Western imagination as being emblematic of
progress and clarity. Jakle, for example, emphasises the relationship between
illumination and capitalist enterprise, noting how artificial light ‘made city space

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functional at night, a stimulus to commercial activity and profit-making’. Furthermore, illumination and light became something to be celebrated as a spectacle within the modern, imperial, nocturnal city, ‘demonstrat[ing] the prowess of modernity in overcoming nature’s night’. Through street lighting and ‘spectacular’ light exhibitions such as firework displays, seaside and Christmas illuminations, it was argued that humankind was now able to assert its mastery over an unstable and threatening Nature.

Coinciding with this control over nature, it has been argued that the ‘relentless expansion’ of illumination enabled visual surveillance at night, permitting nocturnal spaces and practices to be monitored and regulated within the modern city. Indeed, most historical and cultural narratives examine how lighting technologies became a means of ‘taking control’ of the night through the extension of the ‘security of the day’;

‘generalized illumination exposed actions to public vision, legibility, recognition, or shame, extending oligoptic visual and moral norms…in certain streets and institutions, into the house of darkness’.

In this sense, illumination technologies enabled the city to be effectively managed and policed, with its ‘dangerous’ areas being removed through the facilitation of surveillance; ‘illumination, and the gazes it makes possible, trap us all’. Furthermore, light became a means of expressing and showing one’s authority over a populace; during time of civil unrest:

137 Otter, 2008, p.4.
‘Night-watchmen carried weapons and a torch with them on their rounds. Torches served to light the way, but their main function was to make their bearers, the forces of order, visible’.

Moreover, artificial lighting would be utilised to illuminate such features as palaces, monuments, and cultural establishments, features in the landscape which expressed, represented and reinforced hierarchical power relations. Conversely, the removal of such lighting became an effective means of resisting against the established order;

‘destroying lanterns in the seventeenth and eighteenth centuries offered the…satisfaction of symbolically unseating the authority they represented: the darkness that prevailed after the lanterns had gone out stood for disorder and freedom’.

These different configurations of artificial illumination throughout the modern city, be it for commercial, entertainment or policing purposes, have been considered to have significantly transformed how different spaces were utilised. Otter, for example, writes how

‘Illumination was used…in operating theatres to scrutinize the inner surface of bodily organs; in factories to allow workers to accurately match colours at night; in warfare to transmit signals or illuminate enemy troop movements; in housing for bedtime reading or comfortable nocturnal visits to the lavatory’.

In many ways, illumination technologies offered greater possibilities about how spaces could be utilised during night-time hours and, therefore, extended the range of habitual and daily routines which could be performed. At the same time, the presence of light has been seen to transform how we come to appreciate the city and how light can shape the ways in which urban spaces are negotiated and experienced. Cauquelin, for example, wrote that:

138 Schivelbusch, 1995, p.82.
139 Schivelbusch, 1995, p.98.
140 Otter, 2008, p.10.
‘I have learnt the alphabet…red – halt; green – walk;…row of street lamps – street; total darkness – stop, forbidden or on your own risk; half-light – caution’\textsuperscript{141}

While aspects of Chapter Seven provide a continuing commentary on the historical and cultural employment of illumination technologies at night, specifically its use by military organisations,\textsuperscript{142} this thesis looks to extend and critique some of the debates taking place within work on the night. Indeed, it is contended that we need to unsettle established assertions about lightness and darkness, as well as reassess the ways in which the human body interacts with spaces, places and landscapes during the night. Firstly, it is argued that in the conditions of darkness, we never truly become disconnected from the world; rather the human body senses and interacts with topographical surfaces and forms through an attunement or acclimatisation of the self to differences in visual acuity and inhibited perceptual capabilities. On the one hand, it has been contended that the human body is not limited to ‘sensing’ the nocturnal world purely through the visual realm; ‘one is obliged to “see” by drawing on other senses such as touch, smell and hearing’.\textsuperscript{143} Indeed:

‘looking is not the only means by which we find out about and orientate ourselves in the world, knowing how a place sounds and resounds (particularly when visibility is restricted) also has an impact on the extent to which we feel ‘at home’ in a place’.\textsuperscript{144}

From this, it is clear that:

‘[the] night does not appear as a time of the absence of all the working of the senses but, on the contrary, as the time when they reach their fullest potential: everything talked through smelling, moving around, seeing colours, perceiving volumes’.\textsuperscript{145}


\textsuperscript{142} Otter, for example, provides a brief discussion on the early use of artificial lighting during warfare, even exploring the effects of arc lighting in disturbing the ‘camouflage’ of the Germany’s submarine fleet in the late 1800s. See, Otter, 2008, p.186-187.

\textsuperscript{143} Morris, 2011, p.316.


\textsuperscript{145} Winkler, 2010.
On the other hand, while touch, smell and hearing may take on a heightened significance in the conditions of darkness, I argue that vision continues to play a role in body-space interactions. In line with the assertions of Morris, it is contended that at night ‘our vision is not completely obliterated, nor do we see different things; we see the same things differently’. Indeed, as the body adapts to the conditions of darkness:

‘one able to see and appreciate ‘the dark’ as a textured realm of sensory perception, as presence rather than absence. Likewise, being immersed in darkness engenders a different sense of self within the landscape (in relation to both the landscape and other people or beings within that landscape) to that which might be experienced during daylight hours’.

While the dark of night may be conceived as being at the ‘thresholds of vision’, landscapes continue to unfold and become present in night-time conditions, albeit through different visual registers from the normative experiences of daylight. It is argued, therefore, that the nocturnally-harmonised body needs to be deconstructed in order to understand how it physiologically adapts itself to the conditions of darkness and, ultimately, how this affects the ways in which it is able to interact and engage with spaces, places, and landscapes. Chapter Seven, therefore, looks at how the nocturnal bomber body was constructed through the acquisition of scientific knowledge by civil camoufleurs. Emerging from this, attention is then given to how the techniques of the nocturnal aerial observer were comprehended and simulated within civil camouflage practice, both in terms of camoufleurs adopting similar observational practices as their Luftwaffe counterparts but also through the adaption of the viewing room environment to reproduce similar visual effects of landscape as were experienced ‘in-the-field’.

Secondly, Chapter Seven seeks to extend discussions about darkness and conceptualisations of threat, resilience and security, looking at how the night can be and has been utilised tactically to achieve certain political and strategic ends. While academic work has clearly associated the dark and shadowed areas as spaces of threat as well as of refuge for the criminal, the research undertaken for this thesis seeks to open up alternative spaces of refuge, protection and concealment that the conditions of darkness engendered.

146 Morris, 2011, p.316.
darkness enables and creates. In a similar fashion to the deliberate extinguishing of lanterns in the 17th and 18th century, the ‘blackout’ of the Second World War was envisaged as a means of resistance against ‘powerful’ gazes, albeit those of the nocturnal enemy bomber, through the fostering of an environment that afforded a sense of security and protection. As Chapter Seven shows, however, the conditions of ‘blackout’ did not produce a state of complete darkness, with traces of the landscape becoming ‘fleetingly’ present through ‘natural’ forms of illumination such as the moon. Nocturnal camouflage, therefore, became about exploring how the tensions between visual presence and absence that the night produced could be tactfully manipulated in order to hide ‘conspicuous’ and valuable features in the landscape. With its focus on the embodied gaze of the aerial subject, Chapter Seven’s examination of the nocturnal landscape provides a revealing insight into how topographical forms can be manipulated and transformed to subvert the already inhibited visual capabilities of the human body.

2.4: Landscapes of British Modernity

Following on from these broad themes on landscape and vision, I want to now consider the empirical contributions of this thesis to ongoing historical and cultural research into the British landscapes of the 20th century, which focus their attentions ‘first to the inter-war period, and then increasingly to the years after the Second World War’. This research has emphasised two key elements. On the one hand, this work has explored the associations between landscape, embodied practice, conduct and citizenship training, highlighting how such a relationship produced a ‘moral geography’ of the English/British landscape. David Matless, for example, in his work on Landscape and Englishness, emphasises the ‘physical cultures of landscapes’ – hiking, cycling, camping, map-reading, orientation and wayfinding, and direct observations of nature – and how understandings of citizenship and landscape emerged through ‘environmental exposure, a sense of more-than-observation, an elemental physicality placing great store

on skin and lungs, rain and wind’. Such assertions culminated in particular locations (predominantly the countryside) being used as spaces for citizenship training and education. In order to help instruct in the ‘arts of right living’, various forms of literatures and material cultures (such as Countryside Code booklets) were produced in order to help shape ‘proper behaviour and conduct’ as well as to expose and emphasise acts of ‘anti-citizenry’. In addition, there was a plethora of travel guidebooks being produced to actively encourage individuals to engage with the landscape, as well as to re-emphasise the landscape’s ‘symbolic’ qualities.

On the other hand, an empirical focus on this period has culminated in extensive critical examinations of the landscapes and architectural geographies of British modernity. These analyses emerged in response to criticisms that historical and cultural geographers were emphasising earlier ‘geographies of modernity’ that ‘stop at 1900’

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151 Gruffudd, 1996; Matless, 1996.


and, therefore, neglected the unique and diverse modern landscapes of the twentieth century.\textsuperscript{155} Subsequently, attention has been devoted to a wide range of modern structures and architectural forms that emerged both during the interwar period and post-World War Two. Long, for example, has examined the production of new ‘modernist’ factories during the late-1920s and early 1930s, highlighting how:

‘influenced by the ideals of scientific management, modernist architects believed that rationalizing space within factories could enhance efficiency by shaping social life and individual behaviour within the premises, alleviating monotony and facilitating surveillance’.\textsuperscript{156}

Elsewhere, Chambers has focused on suburban development and how the rise of ‘suburbia’ was thought to ‘nurture desirable values and lifestyles, through the design of straight, regular streets and houses with spaces around each side, separated by fences so that their occupants could retreat into the private world of the family’.\textsuperscript{157}

In addition to these efforts, attention has been devoted to the impact of increased motor car ownership and the production of ‘driving spaces’ such as the M1 motorway,\textsuperscript{158} the post-war construction of housing, schools and public buildings,\textsuperscript{159} the emergence of ‘modernist’ retail spaces,\textsuperscript{160} new sites of religion,\textsuperscript{161} and, finally, the production of a


‘landscape of power’ through the construction of nuclear and electricity-generating power stations as well as hydro-electric plants.

Of importance to the discussions of this thesis is work in this field which has focused upon the interwar discourses of ‘planner-preservationism’ and the emergence of a particular form of ‘modern’ architectural aesthetics. This research has drawn attention to how ‘planner-preservationists’ were immensely critical of the ‘new England’ which was emerging. The contemporary J.B. Priestley, for instance, wrote that ‘I cannot help feeling that this new England is lacking character, in zest, gusto, flavour, bite, drive, originality, and that is a serious weakness’. Elsewhere, the architect Clough Williams-Ellis was immensely critical of inter-war bungalow development, condemning them as ‘England’s most disfiguring disease’ and the ‘premier epidemic’ of the age. Williams-Ellis also warned of the threat of uncontrolled urban sprawl, arguing that ‘ribbon development not only destroys the country, it will also destroy the town. It will draw the town out like a bit of chewing gum till it snaps in the middle’. This revulsion of ‘jazz-like’, unplanned and haphazard-like building practices extended beyond England, with Gruffudd, in his work, noting how:


Williams-Ellis, 1928, p.25.
‘Wales, like the rest of Britain, was [also] subject to the despoiling forces of modern life – advertising hoardings, petrol stations, and vulgar tea shacks on the roadside, for instance’.168

Finally, ‘planner-preservationists’ expressed their immense distaste for architectural sensibilities which held high regard for the “mock”, the “bogus”, and the “sham”; creosoted planks nailed to the sides of houses to given them a ‘Tudor-esque feel’, for instance, came under intense scrutiny.169 These various developments combined were seen to produce an ‘age of muddle and disorder, an age of which, looking back in the future, one would feel ashamed to have been part’.170

Emerging from this, geographical research has focused upon the role of organisations such as the Council for the Preservation of Rural England (C.P.R.E.), the Council for the Preservation of Rural Wales (C.P.R.W.) and the Design and Industries Association (D.I.A) which sought to prevent the ‘desecration of the countryside’171 and, instead to promote a discourse which held ‘praise for a landscape of progress, of clarity, of function, of harmony, of permanence and of order’.172 As Gruffudd writes:

‘groups like the CPRW and the English CPRE campaigned for planning legislation to impose order…they sought to preserve valuable landscapes yet guide future development, and demanded laws that might offer ‘a light hand’ in compulsion, but a heavy hand on outrage’. Thus [their] campaigns sought, on the one hand, to outlaw sporadic advertisements on the roads, and on the other, to promote modern design and layout’.173

For these organisations, landscape design ‘should be defined by sensitivity to site and confidence in the human additions; development and beauty could be compatible’.174 As a result, planner-preservationists sought to encourage a planned and organised

landscape, composed of simple, geometrical, vernacular, pale-coloured (predominantly whitewashed concrete) buildings.

Plate 2.1: Photographic plates taken from *The Face of the Land*, illustrating contrasts between nineteenth- and twentieth-century factories (left) and ‘inorganic’ and ‘organic’ electricity pylons (right).
(Source: Peach and Carrington, 1930, p.135 and p.36)

In order to articulate this architectural aesthetic which embodied ‘fitness for purpose’, individuals and organisations of ‘planner-preservationism’ were involved in the production of an array of literatures which sought to highlight the necessity for ‘planned order’ as well as the need to maintain the distinctions between urban and rural spaces.175 One such example of this was the contemporary text, *The Face of the Land*, co-edited by Harry Peach and Noel Carrington, which, through a combination of text and the pairing of photographic plates, commended ‘clean’ building designs and practices,

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whilst condemning those considered to be ‘untidy’ and ‘chaotic’. For example, comparisons were drawn between the visual aesthetics of the ‘messy’ nineteenth-century factory and the ‘modern’ twentieth-century factory as well as how forms such as electricity pylons ‘should’ and ‘should not’ appear (see Figure 2.1). Through these comparative appraisals, clear contrasts between ‘unnatural’ and ‘inorganic’ architectural styles and more ‘natural looking’ ones were established and reinforced. In addition to these efforts, planner-preservationist movements would also promote this modern architectural aesthetics through structural design journals such as the Architectural Review, commercial advertisements and exhibition and display spaces.176

Within this critical examination of camouflage, I seek to extend and critique this empirical work into the landscapes and architectural practices of this period. Firstly, it seeks to address a temporal period which has been relatively unexplored within these enquiries, namely that of the landscapes of the Second World War. Although David Matless in his work on ‘Landscape and Englishness’ has paid attention to this era, his discussions have been confined to how the English landscape was represented as being under threat, the centrality of landscape imagery in sustaining the war effort, and wartime discourses surrounding post-war reconstruction.177 In this study of camouflage, however, I want to consider how the wartime landscape was transformed by the conflict, with the imposition of camouflage upon industrial spaces shaping and producing a ‘landscape of defence’.

Secondly, within Chapters Six and Eight, I consider how the shift towards a ‘fit for purpose’ architectural style that was strongly advocated by interwar planner-preservationists posed significant challenges when it came to the matter of concealment. Certainly, it was evident within camouflage circles that the types of ‘harmonious’ design styles which organisations such as the C.P.R.E. were encouraging came into immediate tension with camouflage ideals, culminating in conflictual interpretations of what ‘being in harmony’ was understood to mean. For civil camouflage interrogating the landscape through the visualities of the ‘enemy airman’, the ‘modern’ landscapes

which planner-preservationists had been encouraging were exceptionally ‘conspicuous’ in the landscape, rendering them more ‘targetable’. As a result, when the British civil camouflage project was instigated in October 1936, there was an instant critiquing of many of the architectural practices which planner-preservationism had encouraged; their calls for clarity of form, of regularity and of order were considered to be completely incompatible with the mentality of civil camoufleurs who were responsible for merging strategically important features into the landscape. Chapter Six, therefore, charts the critiques by civil camoufleurs of the ‘planner-preservationist’ landscape and examines the specific design challenges and various techniques and strategies that were deployed by civil camoufleurs to merge and hide ‘conspicuous’, modern structures into the landscape. Following on from this, Chapter Eight considers how civil camoufleurs sought to influence building practices and architectural aesthetics, arguing that ‘prevention’ was better than the ‘cure’. Chapter Eight, therefore, examines how civil camoufleurs invited architects to produce a landscape of ‘ordered irregularity’ through the consideration and reflection upon three design components – siting, layout and constructional form. As part of this, the chapter also pays attention to the role of various forms of visual culture in fostering this ‘self-concealing’ approach, notably drawing upon comparative ‘good’ and ‘bad’ ways of achieving this aesthetical style.

2.5: Aerial Geographies: aeromobilities, airmindedness and aerial visions

Having so far concentrated predominantly upon landscape and vision, I now want to shift attention to the secondary conceptual and theoretical thread which informs this thesis: aerial geographies.

To begin with, then, geographers have long expressed an interest in the ‘geographies of the air’ and the nature of the research they have undertaken has varied significantly over time. Adey, for example, highlights how in the mid-1950s, ideas about and approaches to the ‘geography of the air’ were considerably different from those today. For geographers such as Possony and Rosenzweig, examining the ‘geographies of the air’ was about:

178 At the time, geographers were proposing other titles aside from ‘geographies of the air’, with ‘atmography’, ‘pneumography’ and ‘aerography’ all being proposed. In the end, it was felt that it was ‘best’ to retain the term ‘geography’. Possony, S. and Rosenzweig, L. 1955: The geography of the air, Annals of the American Academy of Political and Social Science, 299, p.1. See also, Adey, P. 2008a: Aeromobilities: Geographies, Subjects and Vision, Geography Compass, 2(5), pp.1318-1336.
the study of the physical differences of the air in various locations and altitudes. More specifically, it is the study of those differences which are most significant in regard to flying, and it attempts to bring out the implications which those differences have as regards human activities in the air.’\textsuperscript{179}

In Adey’s words, such work ‘set out how the physical characteristics of airspace constrained and enabled aerial activity, from the simple implications of air currents, altitudes and temperatures’.\textsuperscript{180}

More recently, however, geographers have begun ‘to think more critically about the vertical dimension, and to consider the ways in which the aerial is represented, experienced, analysed and conceptualised geographically’.\textsuperscript{181} Today, aerial geographies are:

‘concerned with how space has been produced, transfigured and shaped through the technology of the aeroplane, and, as this has happened, how people have been changed too’.\textsuperscript{182}

In some respects, this renewed engagement with aerial spaces has been attributed to the ‘mobilities turn’ and its effects upon contemporary social, cultural and political geography. Indeed, Sheller and Urry (amongst others) have emphasised how ‘issues of movement, of too little movement or too much, or of the wrong sort or at the wrong time, are [now] central to many lives and many organisations’.\textsuperscript{183} Although this ‘turn’ initially inspired a research agenda in which studies of ‘automobility’ came to the

\textsuperscript{179} Possony and Rosenzweig, 1955, p.1.
\textsuperscript{180} Adey, 2008a, p.1318.
fore, it also encouraged geographers and social scientists to interrogate ‘aeromobilities’. Such research asserts that:

‘like other invented necessities – cars, television, internet – it is impossible to imagine life without flight. Air routes provide the backbone of the global economy; the airport is the key entry point to any world city; flight enables goods, knowledge and people to flow across national boundaries’.

Inspired by these developments, academic research into aerial geographies and mobilities has now begun to focus upon several different aspects. Economic and transport geographers have emphasised the contemporary importance of commercial aviation in establishing and sustaining global networks of interconnectivity, as well as its role in ‘accelerating modernity’ and exacerbating notions of ‘time-space compression’. Social and cultural commentators have examined the production and consumption of aerial spaces, remarking upon how airspaces are constituted through ‘subject acts’ and a range of ‘technological renderings’. As Millward has highlighted:

‘airspace is the result of productive activity undertaken by women and men flying for a combination of ideological, personal, and commercial motives. It combines material space (the air, aerodromes, airways, infrastructure) with the discourses interwoven through it (of vision, power, technological prowess, gender and youth)’.

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185 For example, see Adey, 2008a; Cwerner, S.B., Kesselring, S. and Urry, J. (eds) 2009: *Aeromobilities*, Routledge, London.


188 Williams, 2011, p.258.

Williams, for example, has demonstrated how the U.K.’s aerial spaces are brought into being through an array of practices and performances; in particular, she emphasises the role of ‘management, control and usage’ by both military and civilian institutions.\(^\text{190}\) In addition to this, the role of the virtual has also been critically discussed, with computer codes and software giving shape to and producing aerial spaces through computer codes and software.\(^\text{191}\) Finally, within the field of geopolitics, attention has also been devoted to how the assembling of airspace is often entangled with notions of power. Such analyses show how aerial spaces and practices have not only redistributed geopolitical relations (threatening the integrity of the nation-state, for example),\(^\text{192}\) but also how the deployment of aeronautical technology has, and continues to be, used as a tool of power projection, from its use as a means of exercising colonial control, through to the regulation of contemporary urban spaces.\(^\text{193}\)

While these examples testify to the broad range of interest in aerial spaces, for the purpose of this thesis, I want to focus on three observations: critical engagements with airmindedness; the proliferation of vertical visualities; and constructions of aerial subjects.

To begin with, then, emerging from this body of work into aerial geographies has been a critical interest in ‘airmindedness’. For several historical and cultural commentators, the term has been temporally located as emerging during the 1920s and 1930s, in which:

\(^{190}\) Williams, 2011, p.254. For other forms of political management and control of UK airspaces, see Whitehead, M. 2009: *State, science, and the skies: environmental governmentalities and the British atmosphere*, Blackwell, Oxford.


‘to be airminded, as contemporaries used the word, meant having enthusiasm for airplanes, believing in their potential to better human life and supporting aviation development’. 194

But as Edmonds observes, airmindedness:

‘became something else. It became a way of thinking about the world which included the use of air transport and the threat of air power as every-day realities. It was not a simple enthusiasm for or an appreciation of aviation which the founders had sought, it was the unthinking use of aviation as a tool in the same way that other technologies are tools for shaping or relating to the physical world’. 195

In these terms, Adey argues, airmindedness can be ‘conceived as a moral geography that worked to define particular ideas, beliefs and behaviours acceptable for one to attain citizenship of the nation, locality, or city’. 196

Within historical and cultural analyses of ‘airmindedness’, attention has been focused upon three areas. Firstly, these historiographies have explored the spatially diverse ways in which airmindedness was conceived, imagined and performed. In the U.S., for example, the aeroplane was celebrated as the ‘winged gospel’, as a ‘technological and mechanical messiah’ capable of bridging social, cultural and economic difference, as well as boosting civic consciousness and improving the moral well-being of the population. As Corn writes:

‘the airplane elicited virtually no negative comment. Nobody denounced the flying machine for imperilling the beauty of the natural landscape…or warned that the use of airplanes by young men and women would lead to immorality’. 197

197 Corn, 1983, p.42. See also Courtwright, D.T. 2004: Sky as Frontier: Adventure, Aviation and Empire, Texas A & M University Press, College Station, TX.
Elsewhere, airmindedness was conceived of in terms of boosting national efficiency and solidarity, with aeronautical development often being understood as ‘an index of national vitality and strength’.\footnote{198}{Palmer, S.W. 1995: On Wings of Courage: Public ‘Air-mindedness’ and National Identity in Late Imperial Russia, Russian Review, 54(2), p.210.} In Russia, for example, the feat of flight:

‘seemed certain proof that the nation would overcome its backward and stagnant past and establish itself as a leading power among the civilised nations of Europe. Through modern technology and feats of individual heroism, Russia seemed poised to enter the modern world’.\footnote{199}{Palmer, 1995, p.217. See also Palmer, S.W. 2006: Dictatorship of the Air: Aviation Culture and the Fate of Modern Russia, Cambridge University Press, Cambridge.}

However, in Fritzsche’s analyses of interwar German airmindedness, we see a much more varied and contradictory outlook in how the aeroplane was understood. Here, airmindedness was taken:

‘on the one hand to comprehend and embrace all the new fangled possibilities and soaring achievements…but also on the other hand, to soberly acknowledge the stern danger that came with the air age and thus support arming the air force, to purchase gas masks, and accept the social disciplines of the state’.\footnote{200}{Fritzsche, P. 1992: A Nation of Fliers: German Aviation and the Popular Imagination, Harvard University Press, Cambridge, p.218-219.}

Within interwar Germany, airmindedness was about being vigilant and being aware of one’s vulnerability to the aeroplane. The affective response of the Nazi regime, therefore, was to actively organise and discipline the population in matters of civil defence through the allocation of gas masks, the organisation of Civil Defence Leagues and wardens, and regular air raid drills.\footnote{201}{Fritzsche, 1992. See also Adey, 2010a; Fritzsche, P. 1993: Machine Dreams: Airmindedness and the Reinvention of Germany, The American Historical Review, 98(3), pp.685-709. For other examples of national appreciations of airmindedness, see Edmunds, 1993; Kennedy, S. 2000: The Croix de Feu, the Parti Social Français, and the politics of Aviation, 1931-1939 French Historical Studies, 23(2), pp.373-399; Vance, J.F. 2002: High Flight: Aviation and the Canadian Imagination, Penguin, London.} These varying accounts highlight how airmindedness has been imagined and embraced within different spatial contexts and importantly illustrates how attention should be devoted to contextualising the spatially specific ways in which people reacted to and engaged with the aeroplane; as these different examples illustrate, differing conceptions elicited varying affective responses.
and it is only through contextualisation that one can begin to appreciate how the aeroplane shaped cultural imaginaries and social relations.

Secondly, work into airmindedness has examined the multiple contact zones through which the public engaged with the aeroplane. These sites were extremely wide ranging, and included a multitude of visual and literary mediums, material culture and spectacles. For many, the spectacle of flight itself was a key site through which the public imagination was captured, with air shows, flying circuses, and barnstormers all playing their part.\textsuperscript{202} Included within these spectacles were often exhibitions of how the aeroplane could transform what were considered ‘terrestrial practices’; for example, Corn evokes a case from 1929 of an ‘airminded’ cow which at 2,000ft over the city of St Louis was milked, with the milk subsequently being bottled and delivered by parachute over the city.\textsuperscript{203} It was events such as this which demonstrated the potentialities that flight could offer to terrestrial life. Aside from these spectacles, the media also played its part in disseminating news about aerial exploits; as Rieger writes,

\begin{quote}
‘the national daily press, parliamentary records, bestselling autobiographical books and articles, advertising materials, periodicals, radio broadcasts, postcards, films, and photographs…were [all] sites for the production and dispersal of popular knowledge about new technologies.’\textsuperscript{204}
\end{quote}

Each of these media types, it has been argued, played a vital functioning role in enhancing the spectacle of flight but also in shaping the cultural imaginings and representations of the aviator.\textsuperscript{205} Indeed, through these media representations, aviators were celebrated as courageous, skilled, self-disciplined, tough-minded and efficient bodies. In the U.S., representations of them went so far as to refer to them as a new species of humankind, the ‘Alti-man’.\textsuperscript{206} In addition, historical and cultural


\textsuperscript{203} Corn, 1983, p.51.

\textsuperscript{204} Rieger, B. 2005: \emph{Technology and the Culture of Modernity in Britain and Germany, 1890-1945}, Cambridge University Press, Cambridge, p.13.

\textsuperscript{205} For example, see Caprotti, F. 2008: Technology and geographical imaginations: representing aviation in 1930s Italy, \emph{Journal of Cultural Geography}, 25(2), pp.181-205; Corn, 1983; Fritzsche, 1992; Wohl, 2005.

\textsuperscript{206} Corn, 1983, p.41.
Commentators have also drawn attention to the plethora of material culture and visual representations that were produced.\textsuperscript{207}

More recently, however, commentators have examined the more ‘performative’ dimensions of airmindedness, looking at how youth bodies in particular were mobilised by different organisations and groups in order to make them ‘become aerial’. Adey, for example, has explored the role of such organisations as the Air Scouts and the Air Training Corps in producing an ‘aerial life’ that was ‘to take shape through various processes of training and character building’.\textsuperscript{208} As part of this, he highlights the role of gliding and flying school training programmes in mobilising and immersing youths in aerial spaces.\textsuperscript{209} In addition, he emphasises the utilisation of simulated practices such as games, exercises, activities, as well as model cultures as being key to moulding an ‘air-minded subject-citizen’ invested with values of good citizenship and capable of protecting the nation.\textsuperscript{210} These different training programmes suggest that in order to become airminded, the body had to be made active, mobilised and encouraged to engage in aerial practices, even if they were simply simulated acts on the ground.

Finally, and coinciding with the multiple contact zones of airmindedness, is work which has examined the terrestrial spaces that were both produced and shaped by aerial spaces and practices. While work has been produced which has explored spaces associated with aeronautical activities (for example, see earlier discussions on gliding schools and the spaces of the classroom), the airport terminal has often been the focus of this analysis, in part because they are regarded as ‘land spaces that facilitate the movement of passengers from the ground into the air’.\textsuperscript{211} Recent analyses of these spaces have focused upon the critiquing and imagining of these spaces through:

\textsuperscript{207} See, Fritzsche, 1992; Corn, 1983; Gruffudd, P. 1993: Reach for the sky: the air and English cultural nationalism, Landscape Research, 16(2), pp.19-24.

\textsuperscript{208} Adey, 2010, p.26. See also, Adey, P. 2011: ‘Ten thousand lads with shining eyes are dreaming and their dreams are wings’: affect, airmindedness and the birth of the aerial subject, Cultural Geographies, 18(1), pp.63-89.

\textsuperscript{209} For work on German gliding clubs for youths in the Wasserkuppe region, see Fritzsche, 1992.


\textsuperscript{211} Williams, 2011, p.257.
‘[such] terms...as non-place, spaces of flow, placelessness and hetereotopia...the premise being that airports lack the uniqueness and the qualities that make places meaningful due to their trans-national connections and the socially distancing consequences of globalisation’.

In response to these assumptions, analyses of airport spaces have progressively focused on ‘what it means to inhabit these spaces as sites of alienation, strange encounters and inequality...[as well] as a place of home, relative stasis and dwelling’. They are now recognised as spaces which ‘manage’ and ‘choreograph’ the movements of airline passengers through them; this has resulted in ongoing examinations of airport spaces as sites of surveillance, for example through gait recognition technologies. As a result, airports are now seen as much more complex spaces; ‘they are places of distinct feeling and emotion [that] have long and complex histories’.

Of importance to the discussions of the thesis is historical and cultural work which has traced the construction and development of airports since the 1920s. Such work has highlighted the importance attached to them as symbols of ‘national social progress and health’; ‘building an airport...was cast as a process of significant progress. An expression of modernity and a sign of forward thinking’. Moreover, these accounts have emphasised how airport buildings were often ‘designed in such a way to promote

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213 Adey, 2008a, p.1319.
recreation, to encourage people to plane spot and to use the place for a ‘day out’

Through the construction of such spaces, a much larger, non-travelling public could observe and watch the spectacle of flight. Elsewhere, Bednarek has examined how architects and urban planners actively sought to integrate airports into the fabric of the modern city. Even today, airports continue to be positioned as a central structure to urban development with theorists such as John Kasarda advocating the production of the ‘aerotropolis’, ‘a new utopia of urban development around airports’.

Perhaps more significantly, however, is how these narratives on airport development have often focused on the architecture of the airport itself, with attention being devoted to how airports were constructed not only as sites which facilitated flight but which also came to encapsulate and embody feelings of ‘being in the air’. Pascoe highlights how airports have been constructed as the embodiments of avian metaphors, as a ‘meeting place of sky and earth’, where a ‘coterminous’ relationship between the sky and the ground was forged. In the designing of the Berlin-Tempelhof airport, for example, Pascoe comments on how it was to resemble a ‘large bird with great wings outstretched - an eagle landing’. In addition, Gottdiener has also emphasised how the building materials utilised in airport construction as well as the use of large open spaces have all contributed to the feeling of ‘being in the air’ before one has even left the ground;

‘their airy feel, helped along by large plate walls, seems an antidote to the kind of oppressive enclosure of the older airports that have grown by adding on. The spectacular structure of the new terminal spaces seem to float in the air or be poised to take wing…the triumph of airport architects in the last decade has [therefore] been

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218 See also, Fritzscbe, 1992, p.151. Such activities have continued into post-war airport development, for example, Norman Foster’s design for London Stansted. See Pascoe, D. 2001: Airspaces, Reaktion, London, p.150.
223 Pascoe, 2001, p.158.
to...[do] two things well: they have provided a design vision that glorifies flight and created one that eases the transition from the earth to the air.

In many respects, airport spaces and the architectural aesthetics which they have come to embody have been significantly transformed by the very presence of the aeroplane in everyday life; in the words of Lefebvre, airports are very much ‘a space transformed – and mediated – by technology, by practice’. This work into airports suggests that airmindedness produces quite distinctive and unique grounded spaces which incorporate and embody the perceptions and potentialities of flight. However, such work has quite clearly been limited in its scope, privileging the spaces of airport as dominant expressions of airmindedness, and has relatively ignored the ways in which everyday, mundane spaces are transformed by aerial spaces and practices.

Following on from critical examinations of airmindedness, a secondary observation to be made regarding aerial geographies concerns what Schwarzer refers to as the ‘aero-technological transformation of vision’. Principally, work in this field acknowledges the ways in which the aeroplane has facilitated new ways of seeing the world, leading to ‘the emergence of a new form of spatial consciousness’. Certainly, it has been contended that the aeroplane has signalled a transition away from a horizontal viewing platform and extending it into a more vertically-inclined viewing perspective; for Virilio, ‘aviation [has become]… one way, or perhaps even the ultimate way, of seeing’ in contemporary society.

Historically, the elevated viewpoint has long been associated with permitting ‘totalizing visions of the world’. As Cosgrove and Fox write, the aerial view has become akin to ‘what we might call the ‘God’s Eye’ view of the earth…Physical elevation and the

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229 Adey et al., 2007. p.777.
ability to see across great distances of space give a sense of mastery. On the one hand, this mastery has been connected to notions of power and authority, with it being contended that the vertical is ‘the axis of order’, whereas the horizontal is the ‘axis of the masses trapped in syntagm’. On the other hand, it has been argued that the vertical/aerial view has enabled ‘a certain kind of legibility – resembling a map. To look down is to see, and see things not possible from the ground’. It allows us to locate people, places, and things, and ‘to place them in relationship to one another and to a broader topography’. In this sense, the aerial view can be ‘understood as an epistemological gaze – a view that permits knowing although not necessarily understanding’.

In terms of geographical analyses of the aerial perspective, attention has been devoted to how multiple forms of aeromobility facilitate different viewing experiences. For example, the slow ascent and movement of a hot-air balloon enables prolonged viewing. In addition, it has been argued that:

‘the balloon…offered a novel combination of elevation, vision and mobility, with a distinguishing feature being the absence of any ground underfoot that might obscure the view directly below. Aerostatic flight could be understood therefore as a particularly opportune experience through which to develop and enhance the scope of the scientific gaze’.

On the other hand, the perceptual and visual experiences of a body on board an aeroplane are considered to be much more different; their higher velocity, for instance, means that viewing is defined by a ‘greater accelerated pace of consumption’. In many respects, contrasts have been drawn here with the mobilities afforded by road and

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232 Adey, 2008a, p.1321. For discussions on vertical viewing from skyscrapers and legibility, see De Certeau, M. 1984: *The Practice of Everyday Life*, University of California Press, Berkeley, CA.
233 Cosgrove and Fox, 2010, p.9.
234 Adey, 2008a, p.1320-1321.
236 Budd, 2009b, p.79.
railway travel, where the viewing experience is often ‘framed’ by the confines of the interior spaces of the car, train or aeroplane, most notably the window.\textsuperscript{237}

In addition to paying attention to specific modes of flight and the viewing experiences that they enable, historical and cultural analyses have also extensively examined the integral role of the aeroplane in shaping and transforming British interwar cultures of landscape, noting how the ‘newfound ability to survey the landscape from above revolutionized the geographic imagination, cartographic practice, and forms of visual surveillance’.\textsuperscript{238} In her examinations of interwar air travel, for instance, Budd shows how the visual consumption of the landscape from the air was an integral part of the commercial flight journey, with it being highlighted how:

‘the visual scene provided a welcome distraction from the monotony of long distance travel and pilots often deviated from their intended route or flew at a lower altitude to give the passengers the best possible view and shared advice with their colleagues on the best way to approach particular landmarks from the air’.\textsuperscript{239}

Elsewhere, historical and cultural geographers have drawn attention to the use of the aeroplane for regional and local surveying as well as producing cartographic representations of Britain.\textsuperscript{240} Others have noted how aerial surveying also ‘moved hand in hand with the creeping movement of imperial exploration, colonial administration and development’, with the aeroplane being used to map overseas colonies and relatively unexplored areas such as Antarctica.\textsuperscript{241} In addition to this, a great deal of work has been conducted on aerial archaeology and how the aerial perspective helped to

\textsuperscript{238} Budd, 2009b, p.75.
\textsuperscript{239} Budd, 2009b, p.82.
reveal previously hidden features in the landscape.\(^{242}\) Hauser and Bowden, for example, have individually highlighted how aerial photography was utilised by archaeologists such as O.G.S Crawford to reveal a range of ‘hidden’ traces of past societies such as Iron Age hill forts which were uncovered through the aerial perspective.\(^{243}\)

Besides these contributions, work into aviation and aerial photography has also assessed the role of the aeroplane in providing a fresh outlook on the built environment. In the 1930s, the renowned modernist architect Le Corbusier contended that the aerial perspective enabled the ‘exposing’ and revealing of architectural aesthetics and urban development patterns which now appeared grotesque, vulgar, conspicuous and unharmonious when viewed from this elevated position; ‘by means of the airplane, we now have proof, record on the photographic plate, of the rightness of our desire to alter methods of architecture and town-planning’.\(^{244}\) Elsewhere, Matless has written how the:

‘aerial gaze gave both completeness and clarity of vision, a plan to act upon. And the use of the aerial photograph heightened the sense of the distinction being made between the clear and synoptic vision of the preservationists and the jumbled, haphazard, narrows and short-sighted view of those building ‘casually’ over the countryside’.\(^{245}\)

\(^{242}\) For example, see Brophy K, and Crowley, D. 2005 (eds): \textit{From the air: understanding aerial archaeology}, Tempus, Stroud; Deuel, L. 1969: \textit{Flights into Yesterday: The Story of Aerial Archaeology}, Penguin, Harmondsworth.


\(^{245}\) Matless, 1990, p.186. Interestingly, as this thesis will show, the aerial perspective and aerial photographs would also become a way through which civil camoufleurs would interrogate planner-preservationist conceptions of the ‘modern’ landscape.
The presence of the aeroplane was, therefore, considered to constitute a rallying call, an opportunity to critically engage with architectural aesthetics, and to correct the undisciplined and chaotic nature of the built environment.

Elsewhere, Schwarzer, in his seminal work *Zoomscape*, has highlighted how the aeroplane has transformed the ways in which architecture and the built environment are now engaged with, experienced and critiqued from the air. Indeed, he has remarked how some features which are ‘prominent’ when viewed from upward looking and horizontal viewing positions become redundant and meaningless from the aerial perspective, whilst other characteristics and features become greatly emphasised. He writes, for instance, how:

‘spikes and domes, pyramidal and stepped roofs do not dominate our impression, as they would in the view from the ground. Flat roofs come into their own in the aerial view, their smooth expanses packed with heating, air conditioning and ventilation equipment and with water towers’.  

Furthermore, it is ‘large, recognisable buildings [which] grab our attention’. These developments raise important questions about the specific ways in which the landscape is revealed through different forms of aeromobility. In the context of camouflage, this new way of seeing would not simply enable new and unique ways of composing and constructing the built environment, but also see a countermovement away from the production of an ordered, regular landscape to one shaped by ‘ordered irregularity’.

Having considered the proliferation of vertical visualities associated with aeronautical development, studies of aerial geographies have emphasised the need to locate vision within a broader assemblage of sensory engagements in order to comprehend the construction of an ‘aerial subject’. Indeed, work which has been conducted on the embodied geographies of mobility has suggested that we need to focus more attention on the sensory, emotional and ‘affective responses different modes of transport and

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247 Schwarzer, 2004, p.123. For further work on reading the landscape from the air, see Dicum, G. 2003: *Window Seat: Reading the Landscape from the Air*, Chronicle Books, San Francisco.
travel engender’.\textsuperscript{248} Bissell, for example, has explored the embodied geographies of train travel, highlighting the ‘jiggle’ of the train and the ‘unrelenting shakes, quivers and vibrations that the body-in-transit has to endure in order to move’.\textsuperscript{249} These ‘vibrations’ can significantly transform how the body interacts with the spaces around it:

‘the event of vibration brings the carriage and body into closer proximity. This is a connection between a body that is capable of feeling vibration, and a carriage that impresses into the body through the seat and floor. Vibration is a relation that enfolds body and carriage’.\textsuperscript{250}

Similarly, work on aerial spaces and practices has also begun to consider the affective experiences of flight and how the ‘embodied aerial subject’ is produced through ‘atmospheric attunements’.\textsuperscript{251} McCormack, for example, has explored the affective experiences of hot-air ballooning, noting how aerostatic flight produces ‘a processual and affective materialism through the logics of envelopment, inflation and buoyancy’.\textsuperscript{252} Elsewhere, Budd has noted how historical work into civil aviation during the 1920s and 1930s:

‘alerts us to the physicality of aviation…pilots and airline passengers were living, breathing, human bodies who variously experienced feelings of excitement, anticipation, and fear, and encountered (often unnerving) three-dimensional kin-aesthetic sensations during the course of a flight, including pitching (nose moving up and down), rolling (wings moving up and down), yawing (aircraft sliding from side to side), acceleration, climb and descent’.\textsuperscript{253}

Furthermore, different affective experiences of flight could be:

\textsuperscript{253} Budd, 2010, p.1012.
'contingent on the year in which the flights were undertaken, the route and time of day, the aircraft type, the airline, the ability and experience of the flightcrew, prevailing weather conditions, the behaviour of fellow passengers, motivation for travel, and international geopolitical relations.'

Even the types of bodies which were experiencing flight were also emphasised, and Budd highlights how differing sensations and emotions were mapped onto bodies defined in terms of gender, age, nationality, race, and even past experiences of flight. It is contended, therefore, that any consideration of the aerial view must be positioned with an embodied aerial subject in order to comprehend how the specific visual experiences of that body are transformed by the kinaesthetic sensation of movement and the materialities of the transport technology itself.

In addition to this, within this literature the different subject positions occupied within an aeroplane are also accentuated, with it being contended that the performances and experiences of the ‘passenger’ are significantly different from that of the ‘pilot’. Of significance to the thesis here is work which has examined the construction of the ‘pilot body’. While earlier discussions in this chapter highlighted the cultural construction of aviators, of interest to the thesis is how the ‘pilot body’ has been scientifically configured, notably within military discourses. Adey, in his work on the RAF’s flying Personnel Research Committee during the 1920s, has explored how different types of ‘pilot-bodies’ were ‘profiled’ by British scientists ‘in terms of their capabilities and capacities to act’, with the intention to ‘create a subject capable of almost super-human feats of endurance, vigilance and enhanced visual acuity’. As part of this, Adey discusses how attributes such as ‘character’ were utilised to determine the ‘type’ of pilot that a particular individual could be; indeed, ‘different modes of piloting were believed to necessitate different sorts of ‘temperamental constitution’ and ‘certain outstanding

254 Budd, 2010, p.1012.
257 Adey, 2010a, p.115.
motor and cognitive (intellectual) characteristics’’. He recalls how ‘fighter pilots’, for instance, were constructed as being:

‘quick both physiological and mentally; ready to jump to practical conclusions in advance of the actual evidence; able to sustain intense activity for relatively short periods; [and] able to “get up steam” very rapidly… on the other hand, the good bomber pilot should be much more deliberate, ‘more prone to act decisively for reasons or with a plan in mind rather than on risks’. The emphasis was on maintenance of performance for long periods of time, ‘with a concentrated type of attention in which the field is relatively small and the changes often minute; especially resistant to the fatigue of prolonged activity’’.

As Adey demonstrates, these attributes only became known through the physiological and psychological profiling of the pilot-body itself. Such work demonstrates that different types of aerial bodies need to be defined and contextualised.

Emerging from this extensive body of literature, this thesis seeks to make several contributions and arguments.

Firstly, work into airmindedness has emphasised the need to consider the spatially specific materialities and imaginings in which airmindedness was articulated in order to comprehend and contextualise the affective reactions of ‘grounded’ individuals to aerial spaces and practices. Chapter Four, therefore, begins by contextualising Britain’s specific relationship with the aeroplane and focuses upon the different mediums and interactions through which ideas about the potential ‘threat’ that the aeroplane posed to the British industrial landscape were articulated.

Secondly, and following on from this, this work has suggested that we need to examine the different ways in which individuals trained to be ‘airminded’. In many respects, camouflage is very much an airminded technology and practice which has been shaped and influenced by the presence of the aeroplane, by the aerial perspectives that it has enabled and by the threats it has been seen to create. It, therefore, requires its

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258 Adey, 2010a, p.126.
259 Adey, 2010a, p.126-127.
practitioners to become ‘airminded’, to understand how the aeroplane has transformed the ways in which the landscape is engaged with. Camoufleurs needed to be trained to be ‘aerial’ in order to produce schemes which were ‘effective’. Indeed, as Chapters Four and Five illustrate, ‘being airminded’ and ‘being air-experienced’ became indicators of whether one was a ‘successful’ camoufleur or not. In order to articulate an ‘airminded’ camoufleur, this thesis demonstrates how camouflage practitioners were mobilised through various performative techniques: the immersion in knowledge about the aerial experience through camouflage training manuals, engagements with aerial photographs, the conducting of aerial survey flights, as well as engaging in simulated ‘aerial’ acts within the spaces of the camouflage experimental viewing room. Camoufleurs, like the youths which Adey has explored, ‘became aerial’ through active involvement and immersion.

Thirdly, this work highlights the need to differentiate different types of aerial bodies, and pay explicit attention to the ways in which specific aerial bodies are profiled and assembled by military organisations through the production and accumulation of scientific knowledge. Building upon and extending these findings further, Chapter Five examines how civil camoufleurs profiled the ‘bomber body’, assembling knowledge about the bombing experience through engagements with not only scientific and physiological knowledge provided by scientific ‘experts’, but also information gathered on aerial and bombing tactics. This scientific construction of the ‘bomber body’ was key, establishing the ‘bomber body’ as a biological organism constructed of strengths and weaknesses and physical and perceptual limitations. It was the role of the camoufleur, therefore, to interpret and comprehend these limitations, and where possible, exploit them in order to conceal industrial buildings. Within camouflage discourses, the ‘bomber body’ was presented as an embodied individual whose experiences of the world were mediated through a variety of sensations and a multitude of affinities and distantiations with the technologies of the aeroplane itself. These body-technology assemblages shaped the ways in which the aerial observer engaged with the landscape. Camoufleurs recognised that the ‘bomber body’ would be increasingly fatigued by the kinaesthetic motion of being in flight, the vibrating materialities of the airframe, and by the occasional ‘bump’ produced by flak and other anti-aircraft measures. All of these distractive affects could inhibit the attentive capabilities of the
bomber body and make it susceptible to a disrupted visual experience of the landscape; such bodily distractions could play tactfully into the hands of the camoufleur.

At the same time, this research is consciously aware of the limitations and politics of the reconstitution of this ‘bomber body’ through scientifically assembled knowledge. While the objective approach to the construction of the enemy bomber body evident within civil camouflage discourses and re-presented in the thesis is suggestive of a de-personified individual reduced to its physiological and psychological capabilities, the enemy bomber body that is imagined through these discourses would have possessed a series of identity traits associated with gender, age and nationality, to name a few examples. Indeed, inferences may be made that the enemy bomber body was most likely to be mapped onto and conceived of as male, of German nationality, and a youthful, combat-capable individual. Nevertheless, the knowledges utilised to construct this individual were composed through a myriad of sources and bodies subjected to experimentation which in themselves possessed a wide range of identity characteristics. As a result, while the thesis makes use of the term ‘bomber body’, it is acutely aware of its politics and that this is a body constructed through the accumulation and reproduction of scientific knowledge accumulated from a number of individuals embracing varying identities subjected to scientific enquiry.

Finally, it is contended that attention needs to be given to the ways in which airmindedness and downward looking vertical visualities have transformed terrestrial spaces. While academic work has drawn attention to specific spaces such as the airport as being terrestrial expressions of airmindedness, there has been an increasing recognition that aerial spaces and practices can affect a wide range of everyday architectural forms and styles, as well as the visual appearance of ordinary and mundane spaces, places and landscapes. In relation to the empirical focus of this thesis, it is contended that the spaces of concealment are very much airminded spaces; they are sites which are constructed and modified with the aviator, the aeroplane and aerial views of the landscape in mind. However, unlike airports, their visual appearance and architectural style does not embody ‘avian metaphors’, nor do they emulate a sense of being in the air or the aesthetics of the aeroplane. Nevertheless, camouflaged structures are spaces which are transformed through the aeroplane’s presence and through the visualities it has enabled; their visual appearance is moulded through the ‘new ways of
seeing’ enabled by the aeroplane. Chapter Six considers the new and unique ways in which the landscape was revealed through the proliferation of vertical visualities, as well as the ways in which this elevated viewpoint was engaged with to transform the everyday architectures and visual appearance of industrial installations through camouflage. Similarly, Chapters Seven and Eight, also take the aerial view as a start point, highlighting the unique ways in which natural and artificial structures were concealed through aerial viewing practices that took place at night (Chapter Seven), as well as the articulation of disciplined building practices and architectural aesthetics which were attentive to the aerial gaze (Chapter Eight). In this regard, it seeks to contribute to ongoing research into the interwar appreciations of the British landscape from the air.

2.6: Military geographies: military/civil spaces, knowledge production, and the military gaze

The final field which this thesis seeks to make a contribution concerns military geographies. In many ways, Balchin argues, ‘geography has always been vital to the prosecution of war, in three ways: first, intelligence…; secondly logistics (geographical factors influence the deployment of men, materials and firepower); [and] thirdly, in action (geographical factors enter in the decisions on the disposition of forces, where to attack or defend, what routes to follow, where to land invasion craft and so on)’ 260

Geographers have, therefore, extensively interrogated the historical contributions that geography as a discipline has made to military practice, most notably during the twentieth century. 261 Such work has noted how:

'geography is unusual in requiring expertise in all four of the basic communication skills: literacy, numeracy, articulacy and graphicacy. Essays, library studies and reports on project work build up literate ability. Laboratory work underwrites numeric skill. Tutorials, field interviews and project presentations strengthen articulate capacity: while special to the field of geography is the whole range of visual-spatial materials – maps, charts, graphs and diagrams, collectively expressed by the term graphicacy. Experience in field data gathering, information retrieval, problem identification and analysis, and the communication of findings...[all] help to explain the substantial and significant wartime contribution of geographers'.

As part of their investigations into the associations between geography and the military, geographers have examined the specific roles that the discipline has played in military practice, from the role of ‘academic’ and ‘non-academic’ geographers in the production of cartographical material and terrain models, to their involvement in the collation and dissemination of geographical intelligence for military purposes. Furthermore, these analyses have also reflected upon the ways in which military practices and activities have impacted upon the discipline itself, particularly with respect to methodological approaches and the objects of geographical enquiry.

In more recent work, however, critical examinations have begun to focus upon ‘militarism’s geographies’ rather than a ‘Military Geography' which has emphasised the utilisation of geographical information, tools and techniques to resolve military problems. Instead, this renewed engagement considers how:

262 Balchin, 1987, p.177.
265 For discussions on this matter, see Kirby, 1994.
266 Woodward, R. 2005: From Military Geography to militarism’s geographies: disciplinary engagements with the geographies of militarism and military activities, Progress in Human Geography, 29(6), pp.718-740.
‘the continual preparations which states make in order to be able to wage war and engage in military operations shape wider economic, social, environmental and cultural geographies and produce their own ordering of space’.267

Such an approach, therefore, has begun to think about how the military exercises control over space, how it produces (and represents) particular landscapes and how military identities are constructed and negotiated.268

Of importance to the discussions of the thesis though is how, in the contemporary world, distinctions between militarised spaces, practices and identities, on the one hand, and those of the ‘civilian’, on the other, are becoming increasingly blurred. Traditionally, what is considered to be ‘military’ evidently cannot be ‘civilian’. Such an ontological division is often reinforced through a series of material and discursive strategies. Woodward, for example, highlights how particular spaces are demarcated as ‘militarised’ through a range of ‘obvious’ and ‘tangible’ boundaries;

‘as any visitor to an army training area will recall, barbed wire, high fences, red flags and forbidding notices greet the curious. The legitimisation of military land use relies in part on a binary division between military and civilian space, with the demarcation of boundaries around military space to ensure inclusion and exclusion’. 269

Tivers has also highlighted other visible markers which designate a landscape as ‘militarised’: the presence of military vehicles, low-flying aircraft, peace camps and protest marches all serve to give shape to military spaces.270 In addition to these ‘material’ traces, discursive and representational techniques such as recruitment materials and visual images of tanks, artillery guns and soldiers, help to further put the

military ‘in place’. Military spaces are, therefore, shaped as distinct spaces which ‘exclude’ the civilian through particular practices that exist within them and representations that circulate around them.

In a more recent light, the traditional lines which demarcate military and civilian spaces are becoming increasingly fluid and unclear as a result of a series of contemporary processes. Jenkings et al, for instance, remark upon how the utilisation of civilian contractors and ‘the outsourcing of military roles has started to cause problems for our definition of ‘civilian’ and ‘military’ in some contexts’. Furthermore, the reach of militarised practices has been significantly extended, leading to a reconfiguration of the ‘battlefield’. Today, urban spaces (once considered ‘civilised’ or ‘non-militarised’ spaces) have now become the new ‘battlefields’ for the playing out of military and political conflict; as Graham writes:

‘both formal and informal political violence centre on the deliberate destruction, or manipulation, of the everyday urban infrastructures that are necessary to sustain the circulations and metabolisms of modern urban life. As urban life becomes ever more mediated by fixed, sunken infrastructures, so the forced denial of flow and circulation, becomes a powerful political and military weapon’.

In part, this shift has been attributed to the role of a series of technological developments throughout the twentieth and into the twenty-first century. Such developments have led to the further erosion of the divisions between the military and the civilian. Indeed, as Woodward has contended:

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‘military geographies are [now] everywhere; every corner of every place in every land in every part of this world of ours is touched, shaped, viewed and represented in some way by military forces and military activities’. 275

A final dimension to consider here, and building upon discussions from the previous section, concerns the militarisation of the aerial gaze. 276 Indeed, various assessments of the aerial view have been made which consider the entanglements of the aerial view with military practice. Hallion, for example, discusses the early use of balloons for reconnaissance during the Napoleonic, Franco-Prussian and American Civil Wars. 277 Jay has also discussed the use of the aerial perspective during the First World War. He notes how:

‘the western front’s interminable trench warfare created a bewildering landscape of indistinguishable, shadowy shapes, illuminated by lightning flashes of blinding intensity, and then obscured by phantasmagoric, often gas-induced haze’. 278

On a battlefield where effective visual perception was hampered by these effects, and the soldier easily disorientated, the aerial perspective offered the clearest view of a landscape shaped by chaos and destruction. The aeroplane, therefore, became a valuable asset; from the air, observers could easily locate and map enemy trench networks, artillery positions, and other military hardware, as well as record troop movements. 279 Even today, the aerial perspective continues to play a key role in the shaping of battlefields permitting ‘aerial targeting’ through the use of satellites, remote sensing and UAV platforms. 280

275 Woodward, 2004, p.3.
276 For other ‘militarised’ ways of seeing, see Woodward, 1998, p.290.
Of interest to the discussions of the thesis here is how despite the expanded utilisation of vertical perspectives to comprehend the battlefield, fears and concerns about this penetrative gaze on the ground have inevitably triggered a military and defensive response; to use Virilio’s terminology, the extension of the military gaze from grounded, horizontal viewpoints, to downward-looking, aerial perspectives has culminated in spaces of conflict becoming transformed and redefined by the ‘aesthetics of disappearance’. 281 Indeed, fears of the prying eye in the sky have culminated in military institutions and bodies developing and deploying an array of deceptive technologies and counter-surveillance practices which facilitate the ‘operational reversal of the target’s visual logic’. 282 During the First World War, men and war-making technologies were hidden under nets and artillery, ships and other hardware were painted with contrasting colours of paint in order to preserve military resources and mask military intent. 283 Since then, tactically important military features have been located underground, with examples including ‘secret’ Cold War bunkers (such as Kelvedon Hatch, Cheshire) and underground tunnelling and subterranean spaces of production from the Second World War. 284 Even combatants now deploy an array of deceptive tactics; Anderson, for example, has highlighted how insurgents come:

‘to be visibly present in events of violence that disrupt or destroy life (car bombings, Improvised Explosive Devices, suicide bombings). Outside of these events, the enemy blends and blurs with complex environments it disperses into’. 285

In some cases, this entails insurgents disappearing into the local population, thus rendering it difficult to differentiate and locate them, even from the air. These different examples mirror Adey et al.’s assertions that ‘the ground has provided one of the

282 Adey et al., 2011, p.181.
283 Newark, 2007.
greatest forms of resistance to the aerial, the visible and the promise of omnipresent reach’.  

In many respects, this critical examination of camouflage is influenced by this work into military geographies and seeks to make contributions to three key areas of this literature. Firstly, it seeks to extend work into the militarization of the aerial gaze, examining the specific cultures of aerial observation that were produced and engaged with through civil camouflage practice. Moreover, it seeks to contribute a further empirical case study of how militarised aerial gazes are subverted, with camouflage being very much envisioned as a technique to undermine the ‘prying eyes’ of the ‘military airman’.

Secondly, it is argued that the spaces where concealment was undertaken embody a blurring between militarised practices and civilian spaces. In many respects, the spaces under examination may be considered to be ‘civilian’ in that they serve ‘civilians’ with essential amenities (e.g. electricity, gas, water, etc), they are spaces where ‘civilians’, rather than military personnel, are employed and that they operated independently of any sort of military control. At the same time, they may also be conceptualised as ‘militarised’ spaces at different levels and in a multitude of ways: political discourses constructed them as ‘strategically important’ to the war effort, transforming their meaning; Luftwaffe strategic planners and aircrews rendered them as ‘military targets’ through processes of identification and extraction; and, finally, they are spaces which became militarised through the application of camouflage, a ‘militarised’ technology. However, it is contended that the camouflaged spaces explored in this thesis existed as a hybridisation or assemblage of military and civilian practices; they were neither purely ‘military’ nor solely ‘civilian’, but were spaces that were complex entanglements of the two. Furthermore, it may be contended that there is a temporal dimension here. With the focus upon a period of conflict, it is inevitable that the ‘military’ significance of these sites comes to the fore. As the threat dissipates, it could be argued that this military importance begins to recede, reverting these spaces back to their ‘civilian’ form. It is, however, contended that the residues of the military remain and can potentially be

286 Adey et al., 2011, p.181.
reactivated in the wake of a renewed threat. In this sense, they retain their hybridity, even when the threat has rescinded.

A final point to be made here concerns the utilisation of geographical knowledge by military institutions. As some of the work on Military Geography has shown, militarised organisations extensively draw upon a range of geographical knowledges and techniques in order to carry out war. While these studies have tended to valorise the efforts of ‘academic’ and ‘professional’ geographers, this study of camouflage seeks to examine how geographical knowledge, namely of the visual appearance of the British ‘Home Front’ landscape, was produced by a range of other professionals from outside of the discipline for the purposes of military pursuits. While geographers themselves were not directly involved in civil camouflage, the following empirical chapters show how camoufleurs interacted with a range of materials then being utilised and also produced by geographers at the time, such as maps, aerial photographs, and even models of the landscape. These material forms would play a key role in the ‘militarisation’ of the British landscape through camouflage practice.

2.7: Conclusion
Within this chapter, I have established the theoretical and empirical contributions that this research seeks to make to a range of contemporary issues within the sub-disciplines of historical and cultural geography. In doing so, it has highlighted the particular contributions that each of the respective empirical chapters looks to make to these different areas. This chapter commenced with an exploration of geography’s association with the visual as well as the centrality of vision within studies of landscape. It examined how landscape studies have in recent years shifted towards practice-based and tactile conceptualisations of landscape and highlighted how this is of significance to the research in terms of positioning vision within an embodied individual subject. The importance of this ‘embodied’ way of thinking of vision is an aspect which is explored throughout each of the subsequent empirical chapters. Following on from this, this chapter assessed the extensive body of literature related to night-time geographies and highlighted how through this ‘embodied’ way of thinking about vision that reconsideration needs to be given to the ways in which the human body interacts with spaces, places and landscapes in a variety of atmospheric and perceptual conditions. The empirical value of the thesis was developed in the fourth section in relation to ongoing
research into the landscape of twentieth-century Britain, with it being emphasised how the empirical chapters of this thesis seek to not only extend geographical discussions of this period, but also critique the contemporary cultures of landscape which this field has drawn attention to. The fifth section comprehensively reviewed the ‘sub-field’ of aerial geographies, with it being accentuated that the subsequent empirical chapters would focus upon three key areas: the spatially and temporally specific materialities and imaginings of airmindedness, the profiling and ‘training’ of aerial viewing subjects (and the different ways in which this was achieved, including the performative aspect), and effects of vertical visualities upon ways of knowing and modifying the landscape. Finally, consideration was given to work into military geographies and how current insights from this specialised area can be used to understand ways in which military and civil spaces have become increasingly blurred, the impact of militarised institutions upon the production of knowledge, and the transformation of the visual through military practices and the affective responses that such gazes have initiated.
Chapter 3
Archival Encounters and Visual Methodologies

In this chapter, I reflect on the methodological dimensions of the thesis and outline the nature of the ‘archival fieldwork’ undertaken as part of the research project. In doing so, I position these discussions with respect to ongoing methodological debates within historical and cultural geography. Historical geographers, drawing upon insights from within and beyond the discipline, have long been interested in critically appraising the ways in which historical materials are selected, interpreted, analysed and re-presented. Moreover, they have been attentive to the ways in which the spaces and politics of different archival environments can enable and disable certain engagements between researcher and historical artefacts and how this can ultimately shape and transform the historical narratives produced. Indeed, it is now commonly recognised that historical narratives embody:

‘a set of complex processes of selection, interpretation, and even creative invention – processes set in motion by, among other things, one’s personal encounter with the archive, the history of the archive itself, and the pressure of the contemporary moment on one’s reading of what is to be found there’.  

An acknowledgement of the effect of these multifarious processes has meant that rather than viewing the ‘archive-as-source’, historical research has increasingly come to consider the ‘archive-as-subject’. This is particularly clear within the geographical

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literature, where it has been contended that ‘the archive, like all geographical locations for method, should not…be considered as lying passively in the background of the research encounter, but as an active participant in the constitution of relationships’.\textsuperscript{290}

With these critical insights in mind, I want to reflect on my encounters with archival and visual materials as part of this research, considering how materials were initially navigated and selected, the issues pertaining to the fragmentary nature of the past as well as my experiences as an ‘embodied’ researcher in the archives and their role in the shaping of my research. Following on from this, I consider the politics of the different archives that were visited for the project and how interactions with a plethora of ‘official’ and ‘unofficial’ sources have had profound implications upon the historical narratives produced on civil camouflage work during the time period under investigation. As part of this, the chapter assesses the inherent ‘absences’ of the various archives, and the connotations that missing documents, poorly recorded events and obscured individuals have had upon the historical interpretation and representation of past events and practices. Finally, the chapter contextualises the visual materials utilised throughout the empirical sections of the thesis, reflecting upon the mechanisms that enabled their production, their representational form, as well as the issues that they raise in terms of ‘bringing-to-life’ the affectual dimensions of camouflage practice.

3.1: Research Beginnings: navigating the archives

As highlighted in Chapter One, the research began with a whole range of possibilities as to what case studies could be drawn upon if I was to focus upon the specific time period of the 1930s and 1940s. To facilitate this focusing of the research agenda, I undertook a pilot visit to the National Archives, Kew; as the central repository containing documents produced by various governmental institutions at the time, this seemed the ideal place to start. Initially, the net was cast wide, with files and folders from a number of institutions that included the Home Office, the Air Ministry, the Admiralty, the War Office, the Department of Scientific and Industrial Research, the Cabinet Office as well as a couple of private railway companies,\textsuperscript{291} to name a few examples, being consulted. It soon became clear that on a practical level, it would be impossible and unfeasible to cover all


\textsuperscript{291} These files were classified as RAIL and contained the records of a number of railway companies pre-nationalisation in 1947.
of the different forms of camouflage that these files contained information on, with some aspects clearly overlapping and others being somewhat more disparate. Despite this, I became particularly captivated by material that had been created by the Home Office (and subsequently the Ministry of Home Security) and as I engaged with more and more meeting minutes, policy documents, scientific papers and a large number of aerial photographs, I began to see a series of geographical themes and connections emerging. Following this initial scouting trip and my wider reading (both on the subject of camouflage but also geographical work on landscape, vision and aerial spaces), a more defined research agenda began to emerge, shaped not only by the materials that I had encountered in the archives, but also through my own deliberations and reflections as to the specific geographical debates I wanted to speak to. Through these processes of navigation, negotiation and selection, I began to construct and design the parameters of my research as well as isolate what archival materials and sites I could draw upon to support my explorations.

Upon my return to the National Archives, I began to see the archival material in a different light, with the historical artefacts I engaged becoming re-classified and codified in accordance with the geographical debates I had selected, as well as further subsidiary categories being identified which I felt could contribute to the overall structure of the thesis. Furthermore, while I had decided to focus upon the files of MoHS and its practices of civil camouflage, at times I would selectively deviate away from Home Office material to consider other government departments in a bid to help contextualise and position civil camouflage within much broader frameworks of camouflage practice in existence. This required careful navigation on my part as I selectively ‘re-activated’ networks between different departments. This thesis, therefore, also engages with materials generated by the Air Ministry (who was responsible for civil camouflage work from October 1936 until February 1939 and whose representatives were considered to be ‘experts’ from which insights into bombing practices could be obtained—see Chapter Five), the Ministry of Works (in its various wartime guises), the Committee of Imperial Defence and the Cabinet Office. Through such consultations, I felt that insights into discussions about the nature of civil camouflage, government policy as to where and the ways in which it was to be practiced, as well as the assistance afforded through the association of the Camouflage Directorate with the Air Ministry could be elucidated, further helping to inform the
thesis narrative. The archival encounter, then, became a reflexive process, with both myself and the archival materials I encountered acting as ‘active participants’ in the research process, each playing a co-constitutive role in the evolution of the research and its subsequent findings.

3.2: Dealing with the fragmentary nature of the past

As is the case with the majority of historical work, my research inevitably had to make use of the material fragments of the past contained within the archive; as Alan Baker has remarked, ‘the focus of studies in historical geography upon some time or period in the past rather than in the present means that historical geography is constrained in ways that the practice of contemporary geography is not’. 292 It follows, therefore, that the historical narratives produced are always partial in nature, no matter how much the researcher may strive to build a ‘complete’ picture of the past. In many respects, my research was constrained to the use of textual and visual materials available in a variety of archival environments, these providing the only means of gaining ‘access to subjects that may be difficult/impossible to research through direct, personal contact’. 293 In retrospect, had the research commenced several years earlier, the opportunity to collect oral histories and testimonies from a handful of individuals involved in civil camouflage work may have been a possibility. Unfortunately, it soon became clear that the passing of some of the ‘junior’ civil camouflage practitioners such as Colin Moss (who died in 2005) has meant that access to this invaluable resource has been impossible. 294 Although it may be suggested that the constraining of the research purely to the interpretation of visual and textual representations contained within the archive may be detrimental to the ‘vibrancy’ of the narrative, and, therefore, producing an ‘incomplete’ record of the past, it is widely accepted that any attempt to fully recover the events of the past is an impossible task; as Stanford writes, ‘historical evidence may be sparse or it may be plentiful, but it is always inadequate, falling far short of the richness of the

294 While this certainly may be the case, the Sez-U Community Theatre carried out oral histories in 2007 with descendants of key figures such as the son of Lionel Glasson (Chief Camouflage Officer at Leamington Spa) as part of a similar project into civil camouflage work at Leamington. Recordings of their recollections of their relatives’ war work were available via theatre’s website (http://artofdeception.org/index.htm), although this has since closed down. Nevertheless, these testimonies suggested that civil camoufleurs had been quite reluctant to divulge and share their war-time exploits, even with family members; in part, this was due to the very secretive nature of their work.
original reality’. Rather than viewing this in a wholly negative light, however, I recognise that while the fragmentary nature of the past may not produce a ‘complete’ picture, archival research proved to be a most valuable methodology and the only way of engaging with past camouflage practices.

3.3: ‘Encounters’ in the archive: autobiographical reflections of an ‘embodied researcher’

In their critical reflections on the archive, historical geographers have often gone to great lengths to profile the various encounters that they have had in the space of the archive itself and the influences of these engagements upon the interpretation and (re)presentation of the past. Certainly, these accounts of the archival experience have emphasised the significance of ‘autobiographical reflection’, with the researcher thinking through their affectual encounters with archival objects and environments; as Bailey et al. write, ‘autobiographical reflection as an expressive style [now] forms a part of an increasingly important approach to geographical research’. In their critical reflections, historical researchers have frequently evoked the ‘dramas’ and ‘pleasures’ of historical work, alluded to the ‘seduction’ of the archive environment, and the effect of archive regulations in ‘disciplining’ and producing ‘an embodied researcher’.

Likewise, my own research shared similar experiences: the repetitive, yet intensive nature of working a three week stint at the National Archives, the frustration of missing or damaged documents, the excitement of finding the unexpected image of a camouflage model amongst seemingly endless pieces of bureaucratic paperwork, the renewed enthusiasm instilled by the mention of a familiar site or location, the satisfaction (and relief) of locating and pinpointing a camouflaged factory in an aerial photo, and even the enjoyment of the occasional conversation with the archivist interested in the wider aims of my project. At the same time, the different environments that I worked in also affected the ways in which I engaged with the material. I recall, for instance, an episode of great disappointment at the Imperial War Museum, where I was unable to utilise my digital camera to capture a series of instructional posters due to the

strict regulations in place there for reproducing historical material. The situation was then further exacerbated by the fact it was ‘too large’ for their copying services; the end result of such restrictions has meant that such an artefact does not make an appearance within the thesis. Elsewhere, I can remember the feeling of strained eyes caused by the dimly-lit room I was working in at the National Gas Archives, the visual distractions within the grandiose ‘reading room’ at Trinity College, Cambridge University (effectively a large, ornate, high-roofed hall with a handful of desks at one end, surrounded by large bookcases and various exhibits in glass cases), and the warm, modern and very ‘work-inducing’ feel of the new buildings that housed both the Glamorgan Record Office and the Wiltshire and Swindon History Centre.

These different encounters combined to shape the ways in which the material was engaged with and utilised within the thesis. Positive research experiences helped facilitate the easy recall of certain camouflage stories, episodes and the work of particular individuals when it came to designing the thesis outline, whereas archival experiences characterised by dullness, boredom and distraction distanced oneself from the material, requiring a fuller reconnection with particular objects and items outside of the archive in order to help position them within the narrative I wished to tell. It was very clear that these different interactions significantly affected the ways in which particular episodes, peoples, and camouflage knowledges were represented; in this sense, one’s personal and intimate experiences within the archive, and beyond, can help to mould the narratives that the researcher seeks to produce. While positive research experiences may lead the researcher towards ‘glossing over the seemingly mundane and picking out the juicy bits’,298 the key to my approach has been to negotiate between the ‘spectacular’ and ‘ordinary’ encounters in the archive. By merging the two together, I felt that this not only kept the narrative interesting to both researcher and reader, but also helped to support and sustain the historical narrative itself.

3.4: Negotiating ‘official’ and ‘unofficial’ conceptions of camouflage

One of the sustained points of discussion to emerge in relation to archival research is the acknowledgment that the archive is a significant, power-laden space; as Maddrell writes, ‘archives are…sites of power: not least power to tell a particular story from

298 Bailey et al., 2009, p.262.
particular points of view’. Others have remarked that ‘the archive is always a site where authority resides’, and geographers in particular, have been influential in exposing how archival environments have been put to use for a variety of political, imperial and colonial agendas. Even today, it is maintained that ‘as modern states develop, official archives continue to be part of the apparatus of rule and social regulation’. As a result of this, it has been argued that ‘we need to be careful to think about how certain voices are present in the archive, while others are absent or excluded’.

As mentioned earlier in this chapter, the majority of the material utilised to structure and shape the thesis emanated from research carried out at the National Archives at Kew. Within the various files that were consulted at this site, a wide range of materials were engaged with; this included ‘textual’ materials such as meeting minutes, memoranda (early drafts and final versions), camouflage policy documents, ‘officially’ produced handbooks and manuals, scientific papers produced by civil camouflage practitioners and the Ministry of Home Security’s Research and Experiments Branch, and correspondence between different individuals (camouflage practitioners, government officials, owners of firms receiving camouflage treatment, the general public, etc.). In addition to these, a wide range of visual and cultural artefacts were also present in the National Archives collection: aerial photographs of factories which had been observed from the air, technical drawings, diagrams and illustrations, and in some cases, patches of camouflage material and samples of ‘officially’ approved colour cards (see Plate 3.1).

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This eclectic range of materials needs to be recognised as highly important, historically entrenched objects, as a ‘form of artefact produced under certain material conditions embedded in social and ideological systems’. For some documents, it was clear that they served a purely bureaucratic purpose, ensuring the smooth operation of camouflage work. Other papers, however, emerged as highly important documents that significantly transformed the imagining and practice of civil camouflage by directing ways of thinking about camouflage and camouflage methods down particular, ‘officially’ regulated pathways. Through the course of the archival research at the National Archives, and to some extent at the Imperial War Museum, it soon became clear that the

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Plate 3.1: Visual and cultural artefacts from the National Archives, Kew. Clockwise from top left: ‘Careless tracks, invite attacks’ leaflet warning about the need to regulate activities on a construction site to prevent its exposure to the enemy eye (Source: TNA, HO191/3); Front cover of A.R.P. Handbook No11: Camouflage of Large Installations, 1939 (Source: TNA, HO186/964); A sample of green camouflage scrim, used to garnish camouflage netting (Source: TNA, HO186/1986); Aerial photograph of an unnamed establishment treated with a disruptive camouflage scheme (Source: TNA, HO186/2769).

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material present in these repositories reinforced the ‘official’ nature in which camouflage was practiced and regulated by the government. Following the Munich Crisis of 1938, camouflage practice was increasingly controlled by the government, a move prompted by the emergence of several camouflage schemes developed independently of any government involvement and which, despite capturing the popular imagination, were ‘officially’ considered to be operationally ineffective (see Chapter Four). The materials that were present in the archive, therefore, seemingly reinforced these notions both in terms of what they discussed but also in their material form; their very materiality appeared to act as a tool for ‘camouflage governance’. In addition, summary reports and ‘official’ historical narratives that were produced in the last year of the war testify to the Camouflage Directorate wanting to represent themselves and their camouflage efforts in a particular way. Such accounts seemingly valorise their ‘achievements’ and ‘official’ ways of conducting camouflage rather than dwelling on the rather chequered history and haphazard-like nature of civil camouflage work during this time period. In both cases, it is clear that government regulation of camouflage, and selectivity in terms of the ways in which civil camoufleurs wanted to construct themselves and their techniques reflected back on the thesis narrative; in many respects, I found myself dwelling on ‘official’ conceptions of camouflage throughout the analysis, therefore, extending and reinforcing the power relations of the time in terms of the dissemination and regulation of camouflage knowledges.

While such an admission may be considered problematic, elevating the status of the National Archives and the Imperial War Museum as ‘site[s] of authority and meaning’, I decided to actively engage with other archival environments and resources to not only reveal ‘silenced voices’ but also provide insights into alternative practices of camouflage during this time period. Such a practice of making use of different archives to inform historical work is something which has been enthusiastically encouraged within geography, with historical geographers making use of private, domestic, and university departmental archival spaces in their work. Throughout these respective accounts, it is clear that through engaging with archives

that operate at different scalar levels, new dimensions can be brought to historical interpretation, allowing for the establishment of dialogues between the ‘monumental’ and the ‘minute’. While different archival environments can serve a ‘corrective’ function, in the context of this research project, visits to and engagements with different kinds of archives and historical material helped enrich the historical narratives I produced, putting ‘meat on the bones’ by filling in absences in the ‘official’ archives as well as revealing ‘counter-narratives’ of camouflage practice. Moreover, such engagements contributed to the development of my own understandings about the role of space in regulating the flow of knowledge, and how a nationally coordinated practice was translated from a ‘centre of calculation’ to the local level.

As part of my research, then, I decided to seek out and identify a number of different archival spaces as well as consult a multitude of material-obtaining resources. I made visits to regional and local-based archives such as the Glamorgan Record Office and the Wiltshire and Swindon History Centre in order to generate insights into the application and reception of actual camouflage schemes, an aspect surprisingly absent from the National Archives. In the former, material relating to camouflaging at the Barry Tuberculosis Hospital revealed how civil camouflage was not only contested by the hospital’s committee but also how problematic and chaotic the actual application of the scheme proved to be; such impressions of camouflage as being challenged by the public are not a regular occurrence within the National Archives. In the case of the Wiltshire and Swindon History Centre, specific details as to the schemes applied to Moredon Power Station and the County Offices at Trowbridge accommodated for some of the absences in the material held at the National Archives. In reading through the textual material in the official archives, it was clear that each factory that required camouflage would have its own file, composed of correspondence with their respective owners, details of camouflage schemes applied there and collections of aerial photographs of the structure. These files, however, had undoubtedly been destroyed with the end of hostilities; this may have been partially due to the secrecy that surrounded camouflage work, but also due to the vast amount of paperwork this may have constituted.

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308 For further discussions on the importance of the local in opening up new stories about the national, see Naylor, S. 2006: Nationalizing provincial weather: meteorology in nineteenth-century Cornwall, British Journal for the History of Science, 39(3), pp.407-433.
309 Material at the National Archives related to civil camouflage wasn’t released until the mid-1970s.
Material that survives in these regional and local archives, therefore, serves more of a ‘supportive’ role, adding to and supplementing the stories that are present in the ‘official’ archives through providing information into the actual application of camouflage to particular places.

A second type of archive to be engaged with was that of the ‘personal’ archive, namely in the form of an excursion to the Julian Trevelyan Archives, located at Trinity College, Cambridge University. While there are several repositories which hold material for various individuals who worked in camouflage during this period, these exist more as a result of their post-war achievements in art and exhibition work rather than their camouflage experiences. Nevertheless, material traces of their involvement may still be found in such repositories. At the Julian Trevelyan Archives, for example, I accessed archival material profiling the exploits of the Industrial Camouflage Research Unit (I.C.R.U.), with a copy of the organisation’s Report, 1939-1940 detailing their ideas about the application of camouflage. Within the thesis, I decided to draw upon such material to reveal the alternative methods of camouflage which were proposed during this time period, many of which ran counter to the ‘ideal’ methodologies promoted by the government’s camouflage organisation. Through its inclusion, I felt that this significantly enriched the narrative of the thesis and, again, further reinforced notions about how the government sought to privilege certain forms of camouflage knowledge over others.

A further dimension to be reflected upon here in terms of producing and collating alternative narratives to ‘official’ camouflage practice is the role of ‘virtual catalogues’ in shaping the research project. As part of the work undertaken, I analysed The Times via The Times Digital Archives was undertaken, it coming to my attention through secondary sources that this particular newspaper was used to advertise camouflage vacancies, as well as act as a medium through which the general public shared their thoughts and insights into what camouflage could be applied to and how it should be

310 Examples of ‘camoufleurs’ to have their own archives are Roland Penrose, who worked with Trevelyan at the I.C.R.U. but later transferred to teaching camouflage with the Home Guard (see http://www.rolandpenrose.co.uk/archive.aspx) and James Gardner, who was involved with the War Office’s Camouflage Development and Training Centre, Farnham Castle, Surrey (Brighton Design Archives, University of Sussex).

311 For the discussions of the I.C.R.U. and the forms of camouflage this organisation advocated, see Chapters Four, Six and Eight.
enacted. In addition, analysis of the popular science journal *Nature* via electronic means also contributed to the historical contextualisation of how camouflage was understood and contested, with *Nature* acting as a particular forum through which the ‘biological’ school vented its frustrations at ‘inappropriate’ camouflage measures carried out by the government.

Finally, it is worth mentioning the role of eBay in the collection of materials which detailed ‘unofficial’ interpretations of civil camouflage. As DeLyser et al. write, ‘the existence of the now immensely popular on-line auction site eBay opens up a realm of new possibilities and, in so doing, raises a number of important issues for historical geographers’.312 In DeLyser’s section of the article, she writes how ‘the real value of eBay for me has been in the genuinely altered nature of my research: with rare items not collected by libraries and archives now readily available, my perspectives have changed: eBay (and my growing collection) have opened up new avenues and insights in my research’.313 The same could be said in terms of my research, with regular consultations and searches being carried out on eBay for particular pieces of literature relating to camouflage practice. For example, through eBay, I was able to obtain rare copies of Lt. Col. Chesney’s *Art of Camouflage* (1941) and C.W. Glover’s *Civil Defence: A practical manual presenting with working drawings the methods required for adequate protection against aerial attack* (1941) (see Plate 3.3), which have

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313 DeLyser et al., 2004, p.777.
significantly transformed the structure and stories told within the thesis. This is most
oteeworthy in the penultimate chapter which examines ‘self-concealing architecture’,
whereby stories told within these two accounts attest to the need for architects to be
involved in camouflage work (who ‘official’ camouflage practitioners failed to engage
with until after these publications had been released), as well as the alternative ways in
which a building could be structurally transformed to enable it to merge into the
landscape.

3.5: Gender, representations of conflict and the politics of the archive

In addition to exploring the ‘official’ regulation of camouflage knowledges in the
National Archives, I feel it is also important to reflect on the absence of women in the
archives and the effect that this has had upon the highly gendered historical narrative
that this has seemingly produced. In many ways, conflict has been considered to
reinforce gender relations, with warfare being commonly constructed and imagined as
constituting acts of ‘masculine heroism, undertaken to protect the feminine home
life’. Indeed, as Rachel Woodward writes, ‘commentators on the social construction

314 In addition to these, eBay has also been used to source Home Guard training manuals which focus
upon camouflage practices; such works may constitute material for future research work.
315 Maddrell, 2008, p.129.
of masculinity have long identified war and military activity as the locus for the construction of hegemonic masculinities’ through the evoking of such embodied attributes as bravery, fearlessness, toughness, physical fitness etc. More recently, however, work has begun to emerge that reveals the multifarious roles that women have occupied during times of conflict, in part fuelled by critical thinking which has complicated the distinction between ‘combatants’ and non-combatants’. These accounts show that women are not inactive agents during times of conflict but also that they are often ‘systematically’ left out or made ‘absent’ from historical events through archival practices and the established gender relations of particular periods that shape them. In the case of the Second World War, Maddrell’s account of the ‘Map Girls’ and their wider involvement in a range of ‘geographical’ activities (from military training in geographical skills, to their involvement in the production of Naval Intelligence Handbooks and cartographic materials for the Ordnance Survey) highlights how ‘despite the widespread feminism of the labour force, class and patriarchal systems remained largely intact’. It is these patriarchal systems which have served to not only obscure the involvement of women in war work, but which have also ordered and structured the materials preserved within the archives.

While the thesis does not wholly dwell on gender as part of its analytical framework, significant ‘absences’ of women within the archive have seemingly produced the impression of camouflage as a highly masculinised practice, as an endeavour carried out solely by men. To some extent, such an assertion is supported by the very fact that within civil camouflage work, its organisation and experimental work was dominated by male ‘figureheads’; this was purely the product of the contemporary patriarchal systems that shaped ideas about what constituted the military during this time period.


the same time, the ‘presence’ and involvement of women in civil camouflage work should not be denied. While their role may be significantly obscured within the texts and spaces of the archive itself, traces of their involvement can be found in artwork produced at the time, but also in the materiality of the schemes themselves. Rather than being merely makers of camouflage netting (as most accounts of camouflage tend to represent – see Plate 3.4), women made a valuable contribution to camouflage work through assisting and supporting Camouflage Officers at Leamington Spa (home of the Civil Defence Camouflage Establishment) in the preparation and designing of schemes of camouflage (see Plate 3.5). In this sense, their contribution to camouflage work is captured in the models that they worked on and in the schemes that were applied. With the passage of time, however, such fragments have disappeared; camouflage models have been lost and destroyed, and camouflage schemes have been removed. While the remnants of their work may no longer be present, as a researcher, it felt important to emphasise here the role that women played in the production of camouflage work. This example illuminates how the spaces of the archives, shaped through external socio-political conditions and by the materials preserved and stored within them, can often serve to exclude or render absent the voices of certain individuals in the past.

Plate 3.4: Convalescent Nurses Making Nets, 1941, Evelyn Mary Dunbar (Source: IWM, ART LD 1664);

319 See for example, Shell, 2012, p.113.
3.6: Critical visual methodologies: aerial photographs, artwork and filmic representations

Moving on from critical examinations of the archive, I want to now consider the project’s utilisation of visual material. As several commentators have remarked, ‘geography is unique…in the way it has relied and continues to rely on certain kinds of visualities and visual images to construct its knowledges’.\textsuperscript{320} In making use of such visual cultures, however, there has been a gradual transition towards a more critical visual methodology, ‘one that thinks about the agency of the image, considers the social practices and effects of its viewing, and reflects on the specificity of that viewing by various audiences including the academic critic’.\textsuperscript{321} In developing this methodological framework, the work of Gillian Rose has been pivotal in directing critical attention towards the analysis of ‘three sites at which the meanings of an image are made: the site(s) of the production of an image, the site of the image itself, and the site(s) where it is seen by various audiences’.\textsuperscript{322} Within each of these sites, Rose argues that consideration should also be given to what she refers to as ‘modalities’ and what they ‘can contribute to a critical understanding of images’. Firstly, there is the ‘technological’, described by Mirzoeff to be ‘any form of apparatus designed either to


\textsuperscript{322} Rose, 2007, p.13.
be looked at or to enhance natural vision, from oil paintings to television and the Internet’. Secondly, there is the ‘compositional’, referring to the ‘specific material qualities of an image or visual object…[that] draws on a number of formal strategies: content, colour and spatial organization, for example’. Finally, there is the ‘social’ modality, which considers ‘the range of economic, social and political relations, institutions and practices that surround an image and through which it is seen and used’. By attending to these different sites and modalities in my analysis, I argue that fuller understandings of the intents and purposes of particular images can be revealed, and subsequent reflections be made in terms of the geographical knowledges they produce.

In the context of the research undertaken, a wide range of visual materials were selected and engaged with which I felt ‘enlivened’ the stories and methods described in textual form within the archive as well as help visualise and ‘bring-to-life’ the geographical imaginations of those working in camouflage. Within the archives, I encountered drawings and illustrations included within scientific reports, photographs that captured models before and after they had been applied with camouflage designs, as well as plans to be sent to firms to aid them with their camouflage schemes. Aerial photographs taken of vital structures before and after camouflage treatment were also interacted with, these being found within the National Archives but also through analysis of the online catalogues of aerial photographs held by the Royal Commission on the Ancient and Historical Monuments of Scotland. The majority of these photographs were produced by the Camouflage Flight (later renamed No.1 Camouflage Flight), which was set up in October 1939, ‘to advise military and industrial establishments on the subject of camouflage as seen from the air’. These photographs proved to be a useful tool in understanding how the landscape appeared from the air during this time period, but also aided (in some cases) to name specific locations that had received camouflage treatment and the nature of the scheme and methods to have been applied there (again, the absence

323 Mirzoeff, 1999, p.3.
326 Notably, a plan for ‘imitative patterning’ to be applied to a factory in the Ipswich area was obtained from the Suffolk Record Office.
of individual files and the lack of a comprehensive listing of all factories to receive camouflage made pinpointing exact locations in the analysis particularly difficult).

However, rather than viewing these solely as evidence of the appearance of past landscapes and acts of camouflage, these aerial photographs themselves play a much more significant role in the analysis that requires contextualisation. In her discussion on the utilisation of photos ‘as a source for historical geographers’, Rose has noted how they take on a greater importance with geographical research:

‘not because [they] accurately record what places looked like in the past. Like many other historians of photography…these geographers argue that photographs are not simply mimetic of the world they show. Rather, it is being argued that the production, circulation and consumption of photographs produce and reproduce the imagined geographies of the social group or institution for which they were made’.328

The aerial photographs engaged with in the thesis played an integral part of the camouflage process and were, in fact, artefacts produced by camoufleurs to help shape their own geographical imaginings of the British landscape. Indeed, as is explored in Chapters Five and Six, aerial photos contributed to the development of their understandings of the landscape, how objects and structures appeared from the air, how they were ‘conspicuous’ and how they could potentially be transformed to blur into the landscape. Moreover, they were utilised in a variety of other capacities: as visual references in the design and viewing room at Leamington to aid memory recall following flights by the camouflage officer over an installation, who would use them to evaluate a camouflage scheme upon a model; as communicative and educational devices to expose the dangers of conspicuous buildings to wider audiences; as items to facilitate discussions at meetings between other camouflage practitioners and policy makers; and finally, as a means of documenting their war work for future posterity.

While these could also be used to confirm ‘effectiveness’, it should be noted that civil camouflage was designed to operate solely against direct observation from an aircraft rather than against interpretation through aerial photographs; in the case of the latter, it was argued that more time was available for analysis and critical deliberation than in the

328 Rose, 2000, p.555. See also, Schwartz, 1996.
former. For this reason, it should be acknowledged that some schemes may appear more ‘conspicuous’ or discernible than the actual experience of flight would have permitted. Similar critiques could also be directed against the use of Luftwaffe aerial reconnaissance photos within the thesis. Indeed, in attempting to get access to whether or not the Luftwaffe ‘other’ was deceived by these camouflage schemes, aerial photographs from RCAHMS were utilised. However, given the emphasis upon direct observation within civil camouflage discourses, these photos only infer that camouflage could be penetrated by the ‘glass eye’ and not necessarily deceive the eyes of the mobile bomber pilot gaze. Nevertheless, they are important sources that have enabled me access to aerial perspectives and landscapes of the past that I am now cut off from; in the absence of my ability to engage in the same, direct visual and affectual experiences of the civil camoufluer over the British landscape, they provided me with the only means of interpreting and analysing the geographical imaginations of camouflage practitioners during this time period.

While aerial photographs play a vital role throughout the thesis, I also chose to make use of artwork that was available through the Imperial War Museum, London. The majority of the items that were engaged with from this collection were pieces that were produced under the scheme operated by the War Artists’ Advisory Committee (WAAC). As Brian Foss writes, the WAAC was ‘established within the Ministry of Information in November 1939 to purchase and commission works of art to form a historical record of the war’. With Kenneth Clark, Director of the National Gallery, as its chairman, the WAAC was, according to Foss, envisioned as ‘an instrument to raise public taste, foster a national culture, and lay groundwork for a post-war patronage of art by the state’. Throughout the war, the WAAC procured art in different ways: they

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329 Similar critiques could also be directed against the use of Luftwaffe aerial reconnaissance photos within the thesis. Indeed, in attempting to get access to whether or not the Luftwaffe ‘other’ was deceived by these camouflage schemes, aerial photographs from RCAHMS were utilised, but given the emphasis upon direct observation within civil camouflage discourses, these photos only infer that camouflage could be penetrated by the ‘glass eye’ and not necessarily by the moving bomber pilot.

330 It should be noted that renovation work at the IWM during the time that the research was being carried out meant that direct interaction with the paintings themselves and the various mediums they were produced in (watercolours, oil paint etc.) was restricted; in the main, these paintings were only experienced in digital form. Such an ‘indirect’ engagement with such artwork raises some important questions about distance and tactility with one’s research materials.


distributed long and short term contracts as well as encouraging ‘submissions from artists, professional or amateur, serving or civilian’.333 Featuring contributions from over 300 artists, some of its most notable contributors were British artists such as Paul Nash (1889-1946), John Piper (1903-1992), Eric Ravilious (1903-1942), and Graham Sutherland (1903-1980), to name but a few examples.

Commencing in 1942, the WAAC commissioned several camoufleurs (particularly those with a background in art) ‘to paint…picture[s] which would record representative work being done by the Directorate’.334 Camoufleurs to be employed under this scheme included Victorine Foot (1920-2000), Cedric Kennedy (1898-1968), Edwin LaDell (1914-1970), Frank Mason (1876-1965), and Colin Moss (1914-2005), amongst others, who were each ‘given about a month’s paid leave to do paintings of whatever jobs they had designed’.335 This included capturing all forms of camouflage (naval and air force, as well as civil camouflage). The number of pieces of artwork produced and accepted by the WAAC varied from artist to artist; Colin Moss, for example, produced 7 paintings (of which 6 were accepted by the WAAC), whereas Edwin La Dell produced 3. The style of each piece of artwork was also variable, with each one being the product of the particular style that each individual employed. The style adopted by Colin Moss, for example, was that associated with ‘Neo-Romanticism’, an artistic trend that had developed throughout the 1930s and that was to reach its peak during the war years; Moss claimed that his camouflage paintings in particular were influenced by other prolific British artists such as Ravilious and Edward Bawden who had been key proponents of this approach.336 Such a style, it has been argued, produced pictures in particular ways that were ideally suited to the agenda of the WAAC. In Ravilious’s work, for example, ‘people are rarely included, even in views of streets and gardens, though the presence of humanity in land use and architectural form is strongly felt’.337

336 Bennett, 1996, p.17. Interestingly, Eric Ravilious (1903-1942), whose war-time artwork has garnered significant contemporary attention, wrote to the WAAC in July 1942 expressing his desire to capture the efforts of civil camoufleurs to conceal chalk figures, thereby extending his interwar work which has featured, for example, The Long Man of Wilmington. Although his request was to be denied by the WAAC on account of the camouflage work being completed, a lot of Ravilious’s work does capture other forms of camouflage, namely naval.
Plate 3.6: *The Big Tower, Camouflaged*, 1943, Colin Moss.
(Source: IWM, ART LD 3025).
Moss’s work adopts a very similar style, and this, in many ways, helped to reinforce the ‘documentary’ nature of the artwork (see Plate 3.6). In the case of other camouflage artwork, more eclectic mediums were adopted; La Dell’s contributions, for instance, are a mixture of coloured ink drawings and oil painted canvases, with people being incorporated into the scene to show the labour involved in producing camouflage schemes (see Plate 3.7). Despite their differences in terms of style, the use of artwork has, again, added to the interpretation of how camouflage was practiced and performed within the British landscape. As the majority of aerial photographs were shot in black and white, they fail to capture the importance of colour in camouflage work, and, to some extent, their representation in artwork has enabled me to generate understandings as to how exactly colour was utilised in concealing buildings into the landscape. Furthermore, several paintings I encountered captured camouflage work going on ‘behind-the-scenes’, namely in the spaces of the design room, and, therefore, provided access to a workspace that is concealed from the archive and, indeed, from other forms of visual culture.

Plate 3.7: Testing Netting at a Camouflage Research Station, Leamington Spa, 1943, T. LaDell. (Source: IWM ART LD 3017).
A final form of visual material to be engaged with was filmic representations of camouflage, namely in the form of two short films. The first, held at the Imperial War Museum, was a sequence that featured in some brief footage shot by the London, Midland and Scottish Railway Film Unit in 1943. Filmed at their Stonebridge Park power station, the footage captures civil camouflage being applied to the building by a group of workmen, as well as some shots of the camouflage model and the appearance of the power station before and after treatment. The second film was a newsreel entitled ‘Camouflage!’ that was produced by British Pathé in 1939 and which provided a revealing insight into camoufleurs carrying out camouflage design work on a model in the Leamington Spa viewing room.338 In the newsreel, there are scenes which capture the actual construction of the model itself to represent a particular factory, the movement of the turntable in the centre of the room to produce different visual effects as well as the camouflage designer viewing the model through installed optical equipment. These films, however, presented a somewhat difficult challenge in terms of how to represent them in the thesis; indeed, I found myself constraining their presence

338 The newsreel ‘Camouflage!’ can be viewed through the British Pathé website, see http://www.britishpathe.com/video/camouflage-2).
in the thesis purely to stills extracted from both sets of footage (the IWM being a silent film, whereas the Pathé film commentary replicated the material present in the archive) (see Plate 3.8).

3.7: Conclusions

Throughout this chapter, a series of methodological issues surrounding the use of archival and visual materials has been considered, particularly with respect to my navigation of the various archival sites and empirics engaged with as well as the effects of my encounters upon the historical narratives produced on the practices of civil camouflage within the British landscape during the Second World War. Positioned within wider debates in historical and cultural geography, it has profiled some of the difficulties and unique challenges presented by the undertaking of research into not only the geographies of the past, but also surrounding a militarised practice which was performed in a relatively secret manner for a nation perceived to be under threat. More specifically, it has detailed how the fragmentary nature of the past has shaped the research approach, how different archival ‘encounters’ have transformed my engagements with historical artefacts, and how I attempted to negotiate the inherent, diverse politics of the ‘official’ archives to embrace and incorporate alternative narratives of civil camouflage practice. Moreover, it has highlighted how certain misrepresentations exist within the archives which have significantly manipulated the stories presented, and how I attempted to negotiate, expose and account for the absences that the archive has seemingly created. Finally, it has contextualised the wide variety of visual materials utilised for the project and has positioned these with respect to the contemporary mechanisms that enabled their production. In particular, it has been revealed how such forms of visual culture were created for a variety of uses: to record, to document, to facilitate discussion, to educate and to aid memory recall.

In the subsequent chapters, different aspects of civil camouflage performed during this time of global conflict will be discussed, with the diverse range of historical, cultural and visual material found within each of the different archival repositories visited helping to both contextualise as well as provide ‘thick description’ to the accounts produced.
Chapter 4
Contextualising the Civil Camouflage Project

4.1: ‘Menace of the Clouds’: Britain and the emotional cultures of the ‘aerial threat’

Throughout the 1920s and 1930s, flying was beginning to emerge as ‘the normal international mode of travelling’, with notable developments in aeroplane technology being nurtured by the rapid expansion of commercial air travel and the fostering of ‘airmindedness’ within the national consciousness. Around the globe, the promises and dreams of the prosperity that the aeroplane could bring to the modern world were frequently and greatly accentuated. Like many other airminded countries at the time, Britain also seemingly shared a great belief in the aeroplane to effect societal change and modernise the nation-state; indeed, the historian David Edgerton has emphasised ‘English enthusiasm, indeed over enthusiasm, for the aeroplane’ during this time period. In the early 1920s, Britain was considered to possess ‘the largest aircraft industry in the world and a bureaucracy seemingly designed to foster it’. Such a foundation played a significant role in supporting the expansion of Britain’s domestic and overseas air routes through airport development. In order to sustain this expansion even further, British confidence in the aeroplane was being cultivated through a multitude of engagements and experiences: the aesthetics of the new avant-garde, all-metal monoplanes; the viewing of aerial spectacles and demonstrations at air shows and pageants; national celebrations of the aerial exploits of Britain’s aviators such as Alan Cobham; and through the setting-up of ‘airminded’ organisations such as the Air League of the British Empire and the Air Scouts to develop young people’s interests in aviation. Visual and literary representations of aviation and aeronautical feats, as well as a plethora of material culture were also of great importance in adding to

339 Adey et al., 2007, p.774. See also, Cwerner et al., 2009.
340 See discussions of this Chapter Two.
343 Fearon, 1985, p.50. See also Adey, 2006; Myerscough, 1985.
344 Adey, 2011; see also Adey, 2010.
the wave of optimism. Through these various mediums and engagements, the aeroplane was very much cast as a ‘technology of the future’.

Whilst these developments express the optimistic ways in which the aeroplane was embraced, British airmindedness was much more complex, with these more positive dimensions being tempered with the realisation about the true potentialities of the aeroplane. Despite all its promise for future progress, its use and adaptability as a ‘technology of war’ struck great fear into the British populace; writing in 1923, J.F.C. Fuller remarked that:

‘In future wars, great cities, such as London, will be attacked from the air…for several days [it] will be one vast raving Bedlam, the hospitals will be stormed, traffic will cease, the homeless will shriek for help, the city will be in pandemonium. What of the government at Westminster? It will be swept away by an avalanche of terror. Then will the enemy dictate his terms, which will be grasped at like a straw by a drowning man…war [may] be won in forty-eight hours’.

Such evocations as this gave rise to popular imaginings of the aeroplane as a ‘menace of the clouds’, as an unstoppable ‘death-dealing technology’ and ‘invention of the devil’ capable of obliterating human civilisation. Such fears, however, had to come from somewhere; ‘fear does not pop out of the heavens and hover in the ether before blanketing itself across huge segments of cities and societies; it has to be lived and made’.

In many respects, these fears emerged from the very ‘materiality’ of the air itself. Due to the existence of very few natural obstacles, airspace was seen to allow an aeroplane to strike with both speed and surprise; this ability to shock was considered by many contemporaries to be its most fear-inducing facet. In addition to this, the aeroplane was

346 Fuller, J.F.C. 1923: The Reformation of War, Hutchinson, New York, p.150. John Frederick Charles Fuller (1878-1966) was a British Army officer during the First World War and was one of Britain’s leading military theorists during of the interwar period. He is also known as the inventor of ‘artificial moonlight’, namely the use of illumination technologies to extend fighting into the night.
seen to produce a ‘changing geography of vulnerability’\textsuperscript{348} through its capacity to transcend the natural boundaries utilised on the ground to demarcate territories and structure defence networks; this raised significant concerns for interwar governments about the reach of aerial bombers to strike the industrial heartlands of Britain. As Meilinger writes, Britons had become used to being ‘sheltered behind its moat [of the English Channel and the North Sea] for centuries’, with this ‘protective shield’ generating a ‘tradition of invulnerability’.\textsuperscript{349} The aeroplane, however, was considered to destabilise this tradition;

‘Britain [now] felt particularly vulnerable to air attack because the concentration of political, financial, social and industrial power in the London area made it the most valuable target in the country. Worse, because it was so close to the Channel it was within easy striking range of air bases on the Continent’.\textsuperscript{350}

Enduring memories of aerial bombardment by Zeppelin and Schutte-Lanz airships and Gotha aircraft bombers during the First World War served to further reinforce both the perceived vulnerability of the civilian population and the great difficulty in countering and dealing with this threat. Finally, it was contended that the ability of the aeroplane to achieve ‘vertical depth’ and a clear perspective of the world below was also problematic. Although contemporaries had widely celebrated the new ‘ways of seeing’ enabled by the aeroplane,\textsuperscript{351} within discourses of national defence, the revealing and opening up of the landscape from the air was a great concern, with the industrial landscape as well as the ‘collective affects’ of the population such as morale, being rendered present, and therefore, targetable.\textsuperscript{352}

Emerging from this, interwar anxieties about the aerial threat became centred on the fear of the ‘knock out’ blow, with ‘anticipated damage and death on a scale comparable with

\textsuperscript{348} Fritzsche, 1992, p.205.
\textsuperscript{350} Meilinger, 1996, p.261.
\textsuperscript{351} For example, see Budd, 2009; Budd, L. 2011: Selling the early air age: Aviation advertisements and the promotion of civil flying in Britain, 1911-14, \textit{Journal of Transport History}, 32(2), pp.125-144; Hauser, 2007; Le Corbusier 1987 [1935]; Millward, 2008.
what was, subsequently, feared from the use of atomic weapons’. In 1937, the Committee for Imperial Defence predicted that a 60 day offensive could kill as many as 600,000 and leave 1.2 million injured. While these figures caused much alarm, the far greater concern within government circles was the perceived breakdown of ‘stoical endurance’ that these raids would bring; three psychiatric casualties were to be expected for every physical one. Should war break out, it was contended that public morale would be tested to the limits, with individuals expected to suffer from the effects of lack of sleep, strain, ‘war weariness’ and potentially, ‘freezing with fear’; even the queuing for food following an air raid was considered to potentially lead to outbursts of mass panic. Interestingly, this susceptibility to fear was mapped onto both gender and class divisions. Women, in particular, were considered to be most susceptible, as were the working classes. Problems were also to be expected from the middle classes, who, it was argued, would be uncooperative and be more concerned with self-preservation. In some cases, even regional identity was evoked, with the ‘North’ being perceived as being more capable of enduring than the ‘South’, although some cities such as Southampton, which experienced heavy bombing during the war, would later be considered as localised pockets of toughness.

These imaginings of the effects of a bombing raid were significantly heightened through a variety of sources. Within the popular media, the public were exposed to the visual experiences of being attacked from the air in H.G. Wells’ film Things to Come (1936) which showed the destruction of ‘Everytown’ (modelled on London):

‘the scene is one of darkness, screeching sirens, ineffectual antiaircraft fire, and ambulances careening through the streets. Gas bombs are dropped; pedestrians rush

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354 Jones, E., Woolven, R., Du rodié, B. and Wessely, S. 2004: Civilian Morale during the Second World War: Responses to Air Raids Re-examined, Social History of Medicine, 17(3), p.465. The Committee of Imperial Defence had been in existence in various forms since 1902, when it had been established by the then Prime Minister, Sir Arthur Balfour. Its purpose was to act as a ‘centre for strategic planning’, chiefly in matters concerning the defence of Britain and its Empire. Following the outbreak of war in 1939, the Committee was abandoned. See, Johnson, F.A. 1960: Defence by Committee: The British Committee of Imperial Defence, 1885-1959, Oxford University Press, London; O’Brien, 1955.
about in all directions, their eyes filled with panic; buildings crumble; masses of people force their way into a tube station, like frightened animals taking refuge in their burrows in the ground; the face of a dead boy is glimpsed among the rubble’. 358

The press also played a crucial role in the inciting of the ‘Air Panic’. As Holman notes, the press:

‘was for most people still the most important source of information about the wider world. Newsreels could not go into issues in any great depth, and radio did not come into its own until after the Sudeten crisis in 1938...Only newspapers both reached a truly mass audience and provided both information and analysis’. 359

Through ‘interactive reading’, namely through readers contributing letters to the Editor, the public were able to express their own apprehensions, further exacerbating the growing paranoia.

Published manuscripts by key aerial theorists such as P.R.C. Groves360, L.E.O. Charlton361 and J.M. Spaight362, amongst others, were also highly influential in exposing both the dangers of an aerial attack, but also the weaknesses in Britain’s aerial defence systems. In addition to these accounts, the Royal Air Force were also aware of the effectiveness of aerial bombardment, with their own doctrine being centred around the targeting of particular strategic locations, namely industrial sites, and, where ‘legitimate’, worker populations to achieve particular ‘effects’; for the RAF, ‘a nation

358 Wohl, 2005, p.217. ‘Things to Come’ was produced by Alexander Korda and directed by William Cameron Menzies.
360 Percy Robert Clifford Groves (1878-1959) acted as the British Air Representative at the Versailles Treaty in 1919, and later became the British representative on military aviation at the League of Nations. He produced several works which examined the future use of airpower, including Behind the smokescreen (1934) and Our future in the air (1935). See Groves, P.R.C. 1934: Behind the Smoke Screen, Faber and Faber, London; Groves, P.R.C. 1935: Our future in the air, Hutchinson, London.
361 Lionel Evelyn Oswald Charlton (1879-1958) served with the Royal Flying Corps during the First World War and in 1923 he became Chief Staff Officer for the RAF in Iraq. A year later, in opposition to the RAF’s policy of bombing Iraqi villages, he resigned from the post. He would later write War from the Air (1935) and Menace of the Clouds (1937), two striking accounts which analysed and critiqued Britain’s aerial situation. See Charlton, L.E.O. 1935: War from the Air, T. Nelson and Sons, London; Charlton, L.E.O. 1937: The Menace of the Clouds, W. Hodge and Co, London.
362 James Malony Spaight (1877-1968) worked for the Air Ministry from 1918 to 1937 and wrote numerous books on air power both before the First World War and throughout the interwar period. For example, see Spaight J.M. 1938: Air Power in the Next War, G. Bles, London.
was defeated when its people or government no longer retained the will to prosecute their war aim – the desired effect'. It was, therefore, predicted that anyone intent on attacking Britain would adopt similar tactics; visits by RAF officers to Germany in the first half of the 1930s, as well as the successful deployment of military aircraft during both the Second Italo-Abyssinian War (1935-1936) and the Spanish Civil War (1936-39) confirmed such assumptions.

4.2: Managing morale: air raid precautions and the early days of camouflage (1936-1938)

With the rise to power of Adolf Hitler in 1933 and the gradual unravelling of the Versailles Treaty, these different imaginings and realities of a future air-based conflict defined Britain’s foreign and defence policy. In attempting to resolve the situation, various political solutions were sought, with:

‘the Government persistently…tr[ying] to secure international conventions which would provide for limitations on aircraft production, the abolition of the bomber,

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365 During the Second Italo-Abyssinian War (also known as the ‘Abyssinian Crisis’), bomber aircraft of the Regia Aeronautica (the Italian Royal Air Force) were used as a platform from which to deliver mustard gas with the intention of incapacitating and maiming Ethiopian/Abyssinian troops.

366 During the Spanish Civil War, there were several instances where air power was used to devastating effect. On the 30th October 1936, the Nationalists carried out ‘the first ever deliberate mass attack of bombing aircraft on the population of a largely undefended city’ when they bombed the city of Getafe, killing thirty children. However, it was the events of Guernica, described by Beevor as a ‘major experiment in the effects of aerial terrorism which have gathered greater notoriety. On the 26th April 1937, three squadrons from Germany’s Condor Legion carpet bombed the town over the course of two and a half hours, killing 1,654 and wounding 889. Beevor writes that ‘eyewitnesses described the resulting scenes in terms of hell and apocalypse. Whole families were buried in the ruins of the houses…cattle and sheep, blazing with thermite and white phosphorus, ran crazily between the burning buildings until they died. Blackened humans staggered blindly through the flames, smoke and dust’. See Beevor, A. 1999 [1982]: The Spanish Civil War, Cassell, London, p.243-244; Beevor, A. 2001: The Battle for Spain: The Spanish Civil War, 1936-1939, Penguin, London; Stradling, R. 2008: Your children will be next: Bombing and propaganda in the Spanish Civil War, 1936-1939, University of Wales Press, Cardiff.
prohibitions of the act of bombing, a guarantee against air attack and a convention regulating the conduct of air warfare’. 367

Between 1932 and 1934, Britain’s politicians were actively involved in the Geneva Disarmament Conference, 368 as well as promoting the formation of an International Air Force to ensure collective security and disarmament, 369 but both efforts came to no avail. As a result, many British politicians, including Prime Minister Stanley Baldwin, believed that ‘the bomber will always get through’ and, therefore, resigned themselves to accepting that ‘the only defence is in offence, which means that you have got to kill more women and children more quickly than the enemy if you want to save yourselves’. 370

From 1935, however, such a strategy began to fall from favour. Following developments in radar technology, it was increasingly being argued that ‘the notion that bombers could strike virtually anywhere, at any time, from any direction, and achieve tactical surprise was no longer viable: bombers could be detected, intercepted, and stopped’. 371 With outdated biplanes expected to be inadequate against the new, fast monoplanes of the Luftwaffe, industrial output increasingly became geared toward constructing more effective fighters, such as the Hawker Hurricane and the Supermarine Spitfire, rather than bombers, in order to meet parity with German production rates; such a shift reversed a trend which had been in existence since the mid-1920s. 372

Although these developments were seen to significantly reduce the number of enemy aircraft reaching their targets, it was anticipated that some would still slip through the net, inflicting high levels of damage, both materially and psychologically. To counter the breakdown of ‘stoical endurance’ that these air raids might bring, several tools of ‘morale management’ were devised by civil defence planners in order to sustain and

371 Meilinger, 1996, p.266.
372 Despite this, the rate of aircraft production remained below that of the Luftwaffe, eventually only surpassing it in 1940.
regulate the physical and psychological well-being of both the individual and collective society. In the event that war broke out, news concerning its progress was to be regulated through censorship and the production of propaganda. Psychiatric clinics were set up on the outskirts of London to remove the emotionally fragile from society, whilst also seeking to ‘cure’ them of their trauma with patients still being able to hear bombs falling on the capital’s centre.  

But perhaps the most important measure to ‘manage’ morale was the establishment of the Air Raid Precautions Department (A.R.P.D.), founded in 1935 following a meeting of the Defence Requirements Committee in 1934 that called for a more centralised organisation responsible for civil defence. The A.R.P.D was to act as a ‘modulator of emotion’ and was to initially concern itself ‘not [with] the protection of individuals and property from destruction, but the ‘maintenance of the morale of the people’’. As Peter Adey has shown, ARP entailed preparing, controlling and regulating the body, physically and affectively, to contend with the aerial threat. Moreover, it enabled morale to be sustained through ‘active participation’ in defence, with individuals becoming responsible for their own and their neighbour’s personal wellbeing; by putting the body ‘to work’, it was contended that a sense of hope could be articulated. People were, therefore, put in control of their own defence, albeit through guidance by a plethora of training literature (in 1938, every household received a copy of the manual *The Protection of Your Homes Against Air Raids*) or through their local ARP warden. This ‘active participation’ was deemed to be of the utmost importance in preventing the creeping in of a ‘deep shelter mentality’, which, it was argued, could be extremely harmful to war-time production if the British populace chose to withdraw from society by hiding underground in air raid shelters.

In addition to such measures as building air-raid shelters, the issuing of gas masks and the formulation of evacuation procedures, civil camouflage was also put forward as a solution for civil defence. Indeed, it was imagined that camouflage could act as a ‘passive’ means of defence, supplementing not only these solutions, but also operating

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373 Jones et al., 2004, p.468.
as part of a nationally integrated system of more ‘offensive’ modes of resistance composed of fighters, AA guns and radar;

‘The menace of air attack is ever-increasing and every form of defence, both active and passive, will be required to meet it. The concealment or disguise of large installations of national or strategic importance which would be likely to form targets for air attack, would clearly be a valuable method of defence.’\(^{379}\)

On the 30\(^{th}\) October 1936, the Committee of Imperial Defence’s newly established Camouflage Sub-Committee held its first meeting. Under the chairmanship of Sir Frank Smith\(^{380}\), its main purpose was:

‘to undertake the direction and control of research into and experiments in connection with new methods, or the improvement of existing methods, of camouflage in its application to the needs of the Defence Services and of passive defence’.\(^{381}\)

Throughout the course of its existence, the Sub-Committee held seven meetings and in attendance were representatives from the Home Office, the Admiralty, the Air Ministry and the War Office. The initial concern of this Sub-Committee was to identify which types of camouflage had already been developed and, emanating from this, to identify areas in which experimentation and research needed to be conducted; to achieve this, it was contended that ‘an examination of the records of past work in camouflage, carried out during the last War and the few years after the Armistice under the auspices of the Camouflage Committee of the War Office and the Camouflage Experimental Establishment’ was essential.\(^{382}\) Emanating from these investigations, several findings were highlighted within the Sub-Committee’s First Interim Report (released in February 1937) which were to shape the future programme of civil camouflage work.

Firstly, it was argued that ‘the object of static camouflage should…be, not an attempt to conceal the target completely, but so to disguise it as to mystify and mislead the pilots

\(^{379}\) TNA, HO186/14: C.I.D. Report 1301-B, dated 3rd Feb 1937, p.3

\(^{380}\) Sir Frank Edward Smith (1876-1969) was a physicist, and at the time of his appointment to the Sub-Committee, also held the position of Secretary for the U.K. government’s Department of Scientific and Industrial Research.

\(^{381}\) TNA, HO186/14: C.I.D. Report 1301-B, dated 3rd Feb 1937, p.3.

\(^{382}\) TNA, HO186/14: C.I.D. Report 1301-B, dated 3rd Feb 1937, p.3.
of attacking aircraft’. In many ways, this marked a significant change from World War One conceptions of camouflage, where its deployment was considered to be like a game of ‘hide and seek’; field guns, trenches and a variety of other military installations were to be hidden and disguised in order to deceive the aerial photographer. This distinction between an aerial observer/bomber and an aerial photographer was an important one, with the visual experience of the former being considered to be ‘quite different – fleeting and more oblique’ compared with the view of the expert analysing aerial photographs who had ‘the advantages of time and undisturbed concentration’. While these different ‘ways of seeing’ were emphasised, detailed understandings of how an attack on a target was conducted, and the complex visual and affective capabilities of the ‘bomber body’ were not fully comprehended; as will be discussed in the proceeding chapter, knowledge about the ‘bomber body’ would be progressively collated through interactions with the Air Ministry and R.A.F. aircrews as well as through civil camoufleurs engaging in aerial observation survey flights themselves. At this early stage, however, neither the communication nor the infrastructural networks to support this were in place. For the time being, it was felt that ‘any device which makes it more difficult for them [the bomber pilots] to pick up their targets will be of greatest value’.

A second observation to have been made from these initial investigations was that attempts at static camouflage had been extremely limited and that it was, therefore, deemed essential that full-scale experimentation be carried out if full confidence in camouflage was to be attained. Certainly, there were apprehensions over how successful camouflage would be as a means of protection. This is particularly clear in a discussion on the Electricity Grid appearing in the journal Nature, where it was argued that:

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385 Stanley, R.M. 1998: To fool a glass eye: camouflage versus photoreconnaissance in World War, Airlife, Shrewsbury, p.15
‘there is no doubt that the grid with all its associated superstations will be much more vulnerable to aircraft action in war than the old regime with its independent power stations and few overhead lines. Anti-aircraft forces would doubtless be a help, but permanent protection by camouflage or otherwise would be very difficult’.\(^{388}\)

In order to instil confidence in camouflage, the Sub-Committee recognised that a more co-ordinated camouflage research programme was critical if progress was to be made in camouflage technique. Within the first six months of the Sub-Committee’s operations, each of the Services had individually conducted their own research into concealment strategies, but these efforts had been relatively small in scale, and had produced only minor advances in knowledge;

‘the Admiralty have made certain experiments on the concealment of oil tanks, but with little success along the lines to which the experiments were restricted…The War Office are concerning themselves mainly with the application of camouflage in the field. The Air Ministry are conducting some experiments in the camouflage of aerodromes’.\(^{389}\)

However, a more co-ordinated approach to static camouflage was lacking, and the members of the Sub-Committee were of the opinion that ‘no conclusion may be reached as to the value of static camouflage unless further experiments are conducted on a much larger scale than anything hitherto attempted’.\(^{390}\) By the end of 1936, debates had already begun within Sub-Committee meetings as to which types of features would require camouflaging and an extensive list of ‘typical factories’ had been produced; on this list were installations such as motor factories (the Austin Works in Birmingham and the Vauxhall Motor Works at Luton were named specifically), oil tank farms, aircraft and munitions factories, blast furnaces, gasometers, electricity generating power stations and water works, all of which were considered important in sustaining the war effort.\(^{391}\)

Emerging from this, it was contended that ‘as a first step…full-scale trials should be

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\(^{388}\) Anon, 1936: The Electricity Grid, *Nature*, 138(3493), 10\(^{th}\) October 1936, p.611. In many respects, this denigration of the National Grid could be considered as part of a much broader critique of the newly-established system, namely from social and political movements opposed to centralisation. See, for example, Luckin, 1990.

\(^{389}\) TNA, HO186/14: *C.I.D. Report 1301-B*, dated 3\(^{rd}\) Feb 1937, p.4.

\(^{390}\) TNA, HO186/14: *C.I.D. Report 1301-B*, dated 3\(^{rd}\) Feb 1937, p.4.

made in the camouflage of an oil tank farm and of some factory of national importance’.  

Having decided what should be camouflaged first, the Sub-Committee called for ‘an Experimental Establishment to be set up under the Air Raid Precautions Department (A.R.P.D.) of the Home Office to carry out experimental work on static camouflage’.  

Although the proposal for creating such an establishment under the A.R.P.D was initially rejected by Prime Minister Neville Chamberlain (on account of the A.R.P.D. being ‘very busy’ and to which ‘he thought it unwise to add to its burden’), an experimental section was eventually set up at the Royal Aircraft Establishment (R.A.E.) at Farnborough on 14th December 1937. Under the supervision of Colonel Francis Wyatt, this Camouflage Department was assigned the task of investigating ‘the principles of camouflage and [to] decide how far they could be met by the use of paint applied in appropriate patterns’. Ultimately, the decision was taken to camouflage an oil tank depot at Hamble (near Southampton) in order to ‘test theory as to the kind of pattern to be adopted for large objects of this nature and also to acquire information as to the suitability of various paints’.  

Utilising a combination of different paints types (matt paint, sanded paints and sanded distemper), Wyatt and his Camouflage Department sought to deal with the issues of shine and glare produced by oil tanks through the production of a matted surface. However, the results of this initial experiment proved to be somewhat negligible; Wyatt, in particular, expressed his dissatisfaction with the ‘fastness’ of the paints utilised (the presence of salt and heat around the tanks prevented the paint from drying properly) and aerial observations of the site suggested that the oil tanks could still be seen from the air. While the experiment served as an important stepping stone in initiating civil camouflage work, it was clear that the various industrial installations which would require camouflage

\[394\] TNA, HO186/14: Extract from minutes of the 288th meeting of the C.I.D., held on 11th Feb 1937.  
\[395\] Colonel Francis Wyatt had previous experience of camouflage work from the First World War. In 1916, he had been put in charge of the Royal Engineers’ Special Works at Wimereux, which was responsible for the production of a wide variety of camouflage schemes and designs, such as observation posts camouflaged as trees.  
\[396\] TNA, HO186/14: C.I.D. Report 1516-B, dated 9th Feb 1939, p.3.  
\[398\] TNA, CAB16/170: Correspondence: Camouflage of Oil Tanks at Hamble, F.J.C. Wyatt to F.E. Smith dated 23rd June 1938.  
treatment would pose some rather unique challenges which conventional methods such as the use of paint could potentially not resolve; alternative solutions may well have to be resorted to.

4.3: ‘Exposed’ deficiencies: the panic of Munich, 1938

At the same time that the Hamble experiment was being carried out, global political events were to transform camouflage practice. In September 1938, the Sudeten Crisis had created an escalation in tensions towards Nazi Germany and this had caused a great feeling of unease and uncertainty amongst civil defence planners. Fearing that war may break out, the British authorities panicked, and the Camouflage Branch was requested to issue emergency instructions to factory occupiers to enable concealment to be enacted with immediate effect. In these instructions, owners were called to:

‘(i) to paint out all external words or signs denoting the factory which could be seen from the air;
(ii) to darken all high lights, such as light concrete or metal on roofs, frontages, roads and aprons; (Note: the most useful colour for this purpose is dark green with a matt surface. Roof windows can be left to be painted out in the same colour in the last 24 hours before an emergency);
(iii) to consider whether any deceptive marking can usefully be applied to the factory so as to merge it into the characteristics of its immediate neighbourhood (Note: For example, an adjacent housing estate or series of dwelling houses can be continued across the factory by straight lines imitating streets lined with blocks of red or other colour resembling house roofs. Woods can be imitated by variegation of green patches with fence lines and paths)”

These instructions provide an early indication of what features were seen to make buildings ‘conspicuous’ from the air but also the techniques that could be utilised to conceal them, namely toning down and imitation of the surrounding landscape through the use of paint. However, while these instructions were ‘prescribed’ by the Camouflage Department, they gave industrial occupiers a great deal of freedom as to which types of methods and designs they could utilise on their establishments; in the wake of Munich, this ‘freedom’ was considered to create issues over the efficacy of the camouflage design.

Although war was seemingly averted by Chamberlain when he claimed that he had secured “Peace in our Time”, the Munich Crisis, nevertheless, served to expose the chaotic nature and organisation of camouflage work at this time. Colonel Wyatt in a memorandum entitled ‘Notes on Deficiencies in Camouflage Organisation’ lamented the poor coordination of camouflage work. In his review, he highlighted the case of the Bristol Aeroplane Company, who were not only unaware that a camouflage department existed from which to seek advice on camouflage matters, but who had also been ‘unable to get all the green paint they wanted because an essential ingredient (chromium oxide) has been bought up in large quantities for the Air Ministry’. Coinciding with this, Wyatt argued that:

‘the failure to decide early enough what should be camouflaged, and to what extent, led to a grievous waste of paint on unnecessary and ill-considered schemes in the rush both by Government and private concerns to get “camouflaged”: this resulted in a more or less continuous shortage of the ingredients for high class paint’.

This had knock-on effects elsewhere, when factory owners were forced to utilise paint types which were unsuitable to the task required of them; it was contended that ‘the use of paint of inferior quality and of a type inappropriate to the building surface led to a further waste of labour and materials by reason of rapid deterioration and consequent premature renewals’. It was clear that greater regulation of the supply, quality and distribution of paint was required to prevent this problem arising again.

More significantly, however, the Munich Crisis highlighted the fundamental lack of control and regulation over the designing and execution of camouflage schemes for

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401 Historical accounts of the Munich Crisis suggest that the general public felt that war had indeed been averted through Chamberlain’s actions. However, others have suggested that politicians such as Churchill, and the Chiefs of Staff remained pessimistic about the prospects of war. With hindsight, it is clear that the events of Munich unsettled the security of Europe, with even Chamberlain granting greater expenditure on rearmament and national defence than the previous year. See Adams, 1993; Bell, P.M.H. 1997: The Origins of the Second World War in Europe (Second Edition), Longman, London.


industrial buildings. Many factory owners, alarmed at the prospect of war, had taken it
upon themselves to apply camouflage schemes to their buildings. With inadequate
information as to how exactly to carry out the work beyond the brief ‘emergency
instructions’ issued by the Camouflage Department, many of them had consulted
freelance artists or painting contractors, a move which Wyatt was immensely critical of;

‘numerous instances have come to my notice of paint manufacturers and painting
contractors being asked by managers of large factories to camouflage their premises. In
some cases these paint firms have asked me to give them instruction in camouflage but I
have refused…There is no doubt that industry is becoming camouflage conscious and
this fact is being exploited by the paint trade. The evil of this is only too obvious and,
unless it is stopped at once, it will get beyond control’.  

One of the effects of this was that various ‘unofficial’ methods were being adopted,
resulting in the widespread application of designs which Wyatt described as ‘futile
endeavours’. Such critiques arose not just from the actual patterns used but also from
their complete ignorance of the new vertical visualities enabled by the aeroplane. For
example, at Freeman’s Meadow electricity power generating station, located outside
Leicester, giant trees had been painted onto the side of the its cooling towers (see Plate
4.1); such a scheme was considered to completely ignore any sense of scale or
perspective. Surprisingly, schemes such as this provoked a great deal of excitement and
seemingly captured the public imagination. The camouflage scheme at Freeman’s
Meadow, for example, was reported upon within both The Times newspaper and the
journal Popular Science, where the camouflage scheme was applauded for its exoticism;

‘painted like stage scenery, or a mammoth Hollywood outdoor movie set, the vase-
shaped cooling towers have a strange and fantastic appearance when viewed close-
up,…but seen from a distance, it is said, the group is exceptionally hard to identify as
the towers of a power plant’.  

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405 TNA, HO186/390: Notes on Deficiencies in Camouflage Organisation, October 1938, F.J.C. Wyatt,
dated 4th Nov 1938.
406 TNA, HO186/390: Notes on Deficiencies in Camouflage Organisation, October 1938, F.J.C. Wyatt,
dated 4th Nov 1938.
Despite the animated feelings towards such designs, in the eyes of the Camouflage Branch, the operational effectiveness of such schemes was questionable; as Wright points out, these schemes were ‘not deceptive even from the appropriate viewpoint of a passing train, and can hardly have affected high-level bombing, though it may perhaps have puzzled or amused one German pilot who came in low to machine-gun’ the plant.  

In order to address these general problems, several developments were suggested. As part of his ‘Notes on the Deficiencies in Camouflage Organisation’, Wyatt proposed the setting up of a ‘camouflage school’ and even outlined a 5 day camouflage course (along with a staff list) to educate and spread ideas about how camouflage should correctly be undertaken; such a proposal, however, never came to fruition.  

Plate 4.1: Freeman’s Meadow electricity generating station
(Source: Popular Science, 1939, p.129)

410 Christopher John Galpin was a Royal Naval Air Service (R.N.A.S.) pilot, who, in 1917, became a recipient of the Distinguished Service Order (D.S.O.) medal following his shooting down of a Zeppelin
of a specialist camouflage section, to be placed under the supervision of the Air Ministry’s new A.R.P. section (known as A.R.P.A.M.);

‘all records of the factories and visiting arrangements are made from here, and...camouflage is...one part of the complete A.R.P. scheme at a factory, so...camouflage officers must work in close conjunction with the rest of this section in dealing with the scheme as a whole’. 411

It was decided, therefore, that a new Camouflage Section be formed which would be:

‘concerned with the application of camouflage to individual factories and not with research, although in the absence of any very definite technique..., they will have to do a certain amount of experimenting themselves if anything is to be done quickly’. 412

Primarily, however, the Section was to ‘utilise the ideas emanating from the Camouflage Branch now established at Farnborough’ 413. On the 14th November 1938, Captain Lancelot Glasson (Plate 4.2) was appointed to the position of Chief Camouflage Officer (C.C.O.) of this new Camouflage Section. 414 Glasson had been recommended to the position on account of having ‘drive and organising ability, and his business experience is such that he can talk to Managing Directors of Companies with knowledge of their problems’. Furthermore, his enthusiasm for camouflage had also impressed those who sought to employ him:

‘at the interview here he expressed his extreme interest in the subject, and from the questions he asked, it is clear that he has a good grasp of the way to tackle the problem. It was explained to him that this was not an experimental job but the purely practical business of getting it applied to industrial factories. He is not unduly concerned with the airship which was attempting to bomb London. He served as private secretary to successive Secretaries for Air between 1933 and 1936, before becoming involved in the Air Ministry’s A.R.P. plans.

414 Lancelot Myles Glasson (1894–1959) was an ex-Regular Officer with previous experience of camouflage having worked under Wyatt at Wimereux during the First World War. In the interwar period, Glasson had chosen to focus on art and was a frequent exhibitor at the Royal Academy of Arts. In 1932, he was painter of ‘Picture of the Year’ with The Young Rower.
emoluments, provided his expenses are fully covered and would accept £350 a year for his work. In point of fact he is worth considerably more than this.\(^\text{415}\)

In December 1938, the emergency instructions issued a few months earlier were withdrawn and Glasson’s Camouflage Section began the systematic assessment of each individual industrial facility deemed to be ‘vital’ and therefore requiring concealment. In the New Year, several developments would take place which would affect the scale and extent of the work that this new Section would be committed to.

Plate 4.2: L.M. Glasson, circa April 1938.
(Source: National Portrait Gallery).

\(^{415}\) TNA, AIR2/3437: Untitled Memorandum, C.J. Galpin, dated 10\(^{th}\) Nov 1938.
4.4: New year, new changes: February 1939 to August 1939

In February 1939, the C.I.D. Camouflage Sub-Committee formally disbanded, coming to the conclusion that:

‘we feel that we have fulfilled our function in establishing the principles and general lines on which static camouflage should be carried out, and consider that the next step, and one which should be taken with the least possible delay, is the practical application of these principles’.416

As a ‘parting gesture’ of its passing, and to address Wyatt’s recommendation that the ‘dissemination of knowledge of underlying principles of camouflage [was] required’ the Sub-Committee compiled a booklet, entitled A.R.P. Handbook No11: Camouflage of Large Installations (Plate 4.3), in which the Committee outlined ‘the general principles of camouflage, the most suitable materials, and such other authoritative advice, based

*Plate 4.3: The front cover of and illustrations of disruptive patterning from the A.R.P. Handbook No11: Camouflage of Large Installations (1939). (Source: TNA, HO186/964).*

on the experiences of the Camouflage Department’. The booklet, ‘intended for the
directors of factories and public utility undertakings of national importance, those who
may be charged with the preparation and supervision of camouflage schemes, and for
paint manufacturers and contractors who may be concerned with the application of a
camouflage scheme’, represented an attempt by a central government body to
regulate and control the distribution and implementation of ‘official’ camouflage
knowledge. Indeed, it was highlighted how ‘its purpose is to place the art of camouflage
on a common sense basis and so prevent waste of labour and materials on ignorantly
conceived or unnecessary schemes’. With the realisation that the number of factories
requiring camouflage was beyond the current capacity of Glasson’s newly formed
Camouflage Section (which was to focus its efforts on industrial undertakings deemed
to be ‘special cases’), the purpose of A.R.P. Handbook No11 was also to disseminate
general knowledge about how to carry out camouflage work to those firms which were
not to receive special instructions; some of the methods this booklet proposed will be
examined in Chapter Six.

At the time of the booklet’s publication, there were several other developments taking
place which would continue to shape camouflage practice and organisation up until the
outbreak of the Second World War. Firstly, A.R.P.A.M. was transferred to the Home
Office from the Air Ministry, and with it responsibility for the concealment of civil
structures. From this point on, the Home Office (and in its later guise as the Ministry of
Home Security) would be solely responsible for the development, design and execution
of camouflage for vital industrial features until the declaration of peace in 1945. Coinciding
with this, the British mainland was divided into Civil Defence Regions. Twelve of these
were initially established, but it was soon recognised that several of these had very few vital points which required camouflage, and so, within the
Camouflage Section, these were consolidated into eight regions (Figure 4.1 overleaf).

420 It should be noted that these changes in civil defence policy coincided with the increasing belief within
government that ‘the next German move against another state would signify their domination of Europe –
the phrase Recurred more than once in discussion and correspondence’. See Bell, 1997, p.279.
421 Later, in December 1940, each of these eight regions would be assigned a Camouflage Officer who
would ‘hold a “watching brief” over all C.D.C.E. camouflage and things affecting camouflage’. Their role
was to design schemes for establishments that fell within their Regions and to carry out regular
reconnaissance flights to ensure all prominent features were concealed and that any alterations to factories
had been camouflaged as well. Each Regional Camouflage Officer would have a ‘party’ of Camouflage Officers and Technical Assistants working alongside them. See TNA, HO186/975: Regional Responsibility for Camouflage, c. Nov 1940.

Figure 4.1: A map showing the Civil Defence Regions, 1939. The colour coding signifies which of these regions were combined for the purposes of civil camouflage. Note that Northern Ireland is not included within these designations, as it was considered to be beyond the reach of the Luftwaffe.
(Source: Author)
Elsewhere, statutory authority was also being put in place to ensure that camouflage work was put in-hand. In July 1939, the Civil Defence Act was passed, enabling camouflaging to be directed by the government. Under Sections 45 and 46, factory owners would be served a notice that camouflage work should be conducted on their premises and that they would, subsequently, be ‘entitled to reclaim from the Crown 50% of the cost of [camouflage] work’ (Plate 4.4).\(^{422}\) For ‘adjacents’ or ‘prominent landmarks’, arrangements were put in place whereby these would be dealt with under Defence Regulation 50 (D.R.50).\(^{423}\) In these cases, payment was provided in full, as the application of camouflage to such features was deemed to be of the utmost importance if the general effect of concealment was to be successfully attained. In both cases, factory owners were required to apply for tenders which would be approved by the Camouflage Section before any designing or work could be commenced; such an

\(^{422}\) TNA, HO191/3: Camouflage of Vital Factories and Key Points, 1939-1945, MoHS, Section 1, p.4.

\(^{423}\) The term ‘adjacent’ was used to refer to non-industrial buildings or structures which were located alongside industrial establishments and which might serve to make them conspicuous. ‘Prominent landmarks’, on the other hand, came to encompass a wider variety of features, both natural and artificial, from waterways, to road and railway networks.
arrangement ensured the effective regulation of which features would and would not receive treatment, but also the supply of materials and labour that they utilised.

Finally, there were developments taking place within Glasson’s Camouflage Section. Following the move to the Home Office, Glasson’s unit was renamed the Civil Defence Camouflage Establishment (C.D.C.E.), which was now working away at the camouflaging of industrial features. In early 1939, Glasson had outlined a schedule of works which he believed could be completed by the end of March. Based solely on estimated figures – ‘particulars of all firms, which would enable a classification to be made, are not yet available’ – Glasson argued that ‘out of the 500 factories to be dealt with 60% will be situated so as to form an integral part of a city or town’. For these, Glasson wrote that ‘no individual scheme is proposed. Each of these factories forms part of a large whole, and all that can be done is to see that they conform to the general dark tone of their surroundings’. For the remaining 200 sites, Glasson argued that only 50 or so would require immediate ‘special schemes’ and should be completed by the March deadline. All these sites would require ‘rapid inspection from the air’ to determine the level of concealment needed;

‘granted that reasonable flying weather is experienced we consider that it should be possible for an inspection of some dozen factories to be made per day by each officer, and the whole number might be completed, on this basis, in about a fortnight’.

Initially, work would commence on the ‘Special Schemes’ factories, with proposed designs being applied to simple mock-ups of the factories concerned. It was expected that this would take ‘1½ to 2 days after inspection to evolve and carry out the scheme on the model’, but that:

‘when painting is completed, it will constitute an exact guide to the Works Manager of the factory concerned as to the design and colour of the camouflage scheme and from it we consider that a contractor should have little difficulty in carrying out the instruction which will accompany it, without further supervision’.

As Chapters Six and Seven will show, model-making and techniques of simulation would play a pivotal role in the development and trialling of camouflage schemes for a variety of atmospheric conditions.

While this seemed a relatively efficient system, Glasson recognised that there could potentially be unforeseeable delays which may affect the programme. Bad weather, industrial occupiers not providing the required Ordnance Survey maps and models of their factories, and lack of equipment, materials and/or personnel to carry out the work were all considered to be factors which could potentially hold up camouflage execution. Indeed, despite Glasson’s insistence upon meeting the March deadline, civil camouflage work was hit by bad weather restricting flying in early 1939. This was coupled with a significant lack of intelligence as to the nature and size of the camouflage problem; no real figures existed as to how many exact sites needed to be camouflaged. It was only when war broke out that the extent of the problem was truly revealed.

4.5: ‘Phoney war, phoney experts’: September 1939 to March 1940

‘This morning the British Ambassador in Berlin handed the German Government a final note stating that, unless we hear from them by 11 o’clock that they were prepared at once to withdraw their troops from Poland, a state of war would exist between us. I have to tell you now that no such undertaking has been received, and that consequently this country is at war with Germany’. 428

Neville Chamberlain, 3rd September 1939.

With these words, Britain found itself engaged in a global conflict which would last for almost 6 years. Realising that the C.D.C.E. would require expansion to cater for the ever-pressing demand for camouflage, an advertisement was placed within The Times on the 29th September for camouflage designers, whose names and addresses were wanted ‘immediately’. 429 This was greeted with such an overwhelming response that by the 5th October, the call went out that ‘no more camouflage workers [were] needed’. 430

Although there were more than enough people willing to be involved in camouflage, the unprecedented scale of work which still needed to be conducted was creating great anxiety. Since the passing of the Civil Defence Act, 454 establishments had received or were in the process of receiving camouflage under Section 45 and 46, but it was recognised that over 1,700 government vital factories were still to receive treatment; in several cases, ‘some factories had begun on their own account without instruction from the Home Office and it might be found that the work they had done was not of a type which the Home Office would approve’. As had been the case during the Munich Crisis, emergency instructions for camouflage had been prepared by the end of August 1939 to reassure factory owners. Duly distributed, these instructions informed proprietors that they would:

‘in due course, be served with a Notice under Section 45…requiring you to undertake such camouflage as may be necessary at your factory premises. The precise amount of camouflage required in your case can only be ascertained after individual investigation, which is not possible in the present emergency. This will be carried out at the earliest possible moment, but in the meanwhile, it is of urgent necessity that you should consider what can be done to render your factory as inconspicuous a target as possible’.432

For those sites where schemes had already been prepared by the C.D.C.E., occupiers were ordered to proceed with the work, whereas locations where no camouflage had yet been devised, owners were directed to ‘consider at once an extemporary method of effecting concealment’.433 These instructions were, therefore, accompanied with notes which ‘will assist…in devising temporary camouflage of a primitive kind for your buildings until something better can be done, if that proves necessary on further investigation’.434 As they were meant to be only temporary measures, the treatments offered within these notes were relatively simple in a bid to prevent the emergence of ‘exotic’ schemes seen 12 months earlier; they included toning down light surfaces,
painting out glass and roof lights, and making use of green, brown and grey paint to achieve these.\textsuperscript{435}

\textbf{Plate 4.5:} Advertisements for the Silicate Paint Company, offering ‘a complete service for camouflage work’ (top left) and B.E.N.’s paint spraying equipment (top right – both Source: TNA, HO186/964); An advertisement lorry for Blundell’s Camouflage Paint (bottom) (Source: Hull City Archives, DBBS/1/101).

\textsuperscript{435} TNA, HO186/392: CAM/I/A: Notes on Emergency Camouflage, dated Aug 1939.
However, these emergency instructions failed to both ensure the regulation of materials and labour which were already in short supply, nor prevent ‘unofficial’ collectives of artists and paint companies carrying out camouflage work. Paint manufacturers such as the Silicate Paint Company (based in east London) were offering ‘a complete service for camouflage work’, providing not only the paint, but also ‘an experienced camouflage designer’ to help factory owners conceal their premises. Paint spraying machines were also extensively available, and camouflage paint extensively marketed by paint manufacturers (see Plate 4.5). There were also other camouflage corporations which were beginning to emerge. One of these was the Industrial Camouflage Research Unit (I.C.R.U.), whose ideas about camouflage feature throughout the following chapters. Formed in September 1939, the I.C.R.U. operated as an independent camouflage establishment until June 1940 (when it was disbanded by the government\(^436\)) and was comprised of a team of five individuals who all had experience of working in painting, engraving, architecture and/or photography; these were Stanley Hayter, John Buckland Wright, Roland Penrose, Julian Trevelyan and Denis Clarke Hall.\(^441\)

\(^{436}\) According to Hartcup, the closure of the I.C.R.U. alongside other ‘unofficial’ camouflage collectives during mid-1940 was as a result of a fire which ‘had broken out at a firm on the vital list through the use of combustible materials in an unauthorised scheme’, see Hartcup, 2008 [1979], p.56.

\(^{437}\) Stanley William Hayter (1901-1988) was both a painter and printmaker, and is widely known for setting up the ‘Atelier 17’ studio in Paris in 1927. During the Spanish Civil War, he had made a visit to the country at the request of the Republican government; such an experience would inform Hayter’s decision to set-up the I.C.R.U. Following its collapse in 1940 and unable to join the army on account of injury, Hayter left the U.K. for the U.S. to continue his printing career.

\(^{438}\) John Buckland Wright (1897-1954) was an illustrator and engraver originally from New Zealand, who had become acquainted with Hayter when he joined Atelier 17 in 1934.

\(^{439}\) Roland Algernon Penrose (1900-1984) was a surrealist artist who, during the interwar years, had forged significant ties with many influential artistic figures, from Max Ernst to Pablo Picasso. In 1936, he had visited Spain, collecting photographs and information on events taking place during the conflict. Idealistically a pacifist, Penrose joined the I.C.R.U. before becoming an instructor at the Home Guard Training Centre at Osterley Park, and later served as a civilian lecturer in Home Guard camouflage for the War Office.

\(^{440}\) Julian Otto Trevelyan (1910-1988) was a surrealist artist, whose uncle was the historian G.M. Trevelyan. Trevelyan was also associated with Atelier 17, studying there in 1930. He returned to the U.K. in the mid-1930s, and was a participant in Mass Observation between 1937 and 1938. Following the disbandment of the I.C.R.U., Trevelyan joined the Camouflage and Development Training Centre at Farnham Castle, Surrey and eventually would end up supporting camouflage work in North Africa.

\(^{441}\) Denis Clarke Hall (1910-2006) was an architect who joined the Unit due to his experience in structural engineering. In 1941, he joined the Committee for the Industrial and Scientific Provision of Housing and, later, served on the Wood Committee (1943) which was established to consider the construction of post-war school buildings.
In many ways, the I.C.R.U. represented a typical example of a private company jumping on the ‘camouflage bandwagon’. This is something made clear in Trevelyan’s autobiography *Indigo Days*, in which he writes of how:

‘already the rash of squiggly green patterns was breaking out in every part of the country, and Bill [Hayter] felt himself qualified to take some part in this, since he had seen something of it in the Spanish War, and already his creative mind was leaping ahead with theories as to how it could be improved’.

Furthermore, it was clear to the members of the I.C.R.U. that any involvement in camouflage was potentially a profitable pursuit, given the fascination and overwhelming belief in the capabilities of camouflage amongst the general population. Trevelyan, for instance, discusses how:

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'in these early days of the war Industrial Camouflage was a perfunctory ritual that had very little to do with its proper function, which was, presumably, to protect targets from being bombed by enemy aircraft. Much of it was done in an un-coordinated freelance way; the little corner garage in a housing estate was quickly painted in wiggly lines, and so was the laundry and even the roof of the cinema. People seemed to feel that the green stripes were a charm that somehow brought them immunity…; like the paper strips on the windows it made them feel that they had done their little bit, had invested in their small piece of twentieth-century magic….It was easy to sell any kind of camouflage'.

Throughout its existence, the I.C.R.U. was only able to secure one contract for ‘a big factory in the Midlands’, this being the establishment of the Player’s Imperial Tobacco Company in Bristol. In the event, the work was paid for and models were produced of the structure which featured in the Unit’s Report, 1939-1940 (see Plate 4.6), but the actual scheme was never carried out on the factory. Nevertheless, the model of this factory, as well as a whole array of other experimental ‘research models’ that the I.C.R.U. produced for the camouflage of oil tanks, gasholders, car parks, aeroplanes and artillery guns provide a revealing insight into alternative methods of concealment that deviated in many respects from ‘official’ conceptions of camouflage. One of these divergences was the distinct lack of any engagement with the aerial experience, an element which was considered fundamental within ‘official’ camouflage discourses and practices. Writing within Indigo Days, Trevelyan writes that:

‘it has to be confessed that we in our camouflage unit knew very little more about it than the man in the corner garage. We had none of us done much flying, and when we had flown we had not addressed ourselves particularly to the problem of what makes things conspicuous from the air. Had we done so we would soon have realised that a lot of assumptions were false, and that the pattern of the world from above is read very differently from the way in which we had supposed. Moreover, we would have been led to ask the more fundamental questions: ‘Against what are you camouflaging? Against

443 Trevelyan, 1996, p.112-113. Erno Goldfinger, who provided the I.C.R.U. with accommodation to undertake their work, described the unit as ‘the biggest con I have ever been involved in’, see Trevelyan, 1996, p.99.
the low-flying raider? The night raider? The photographer?’ Without an answer to such questions much of our ingenuity was wasted’.

In many ways, the work of the I.C.R.U. suggests that to be ‘airminded’, to think aeronautically, was not enough; in order to become a successful civil camoufleur, one had to become ‘air experienced’, to engage directly in downward-looking, aerial visualities, to know how exactly the landscape came into being and revealed itself from the air and to comprehend how the specific mobilities of the ‘bomber body’ shaped these experiences. It, therefore, becomes clear that only through these direct engagements could one produce an ‘effective’ camouflage scheme; such an assertion would be at the heart of all ‘official’ camouflage work during this period.

Plate 4.7: The Camouflage Workshop, Leamington Spa, 1940, T. La Dell.
(Source: IWM, ART LD 322)

While ‘unofficial’ collectives of camouflage practitioners continued to proliferate, constant changes were occurring to the set-up of the ‘official’ camouflage programme. On the 11th October 1939, the C.D.C.E. was moved from London to Leamington Spa in anticipation of increased aerial attacks on London. Here they took up residency in the local roller-skating arena (which became fondly known as ‘the Rink’), where the designing and trialling of camouflage schemes on models and drawings, from now on, would take place (see Plate 4.7). It was here that a viewing room, which sought to simulate the visual experiences of the ‘bomber body’, was constructed; the techniques of simulation which they utilised to achieve this, and how this space was transformed for night-time conditions are explored within Chapters Six and Seven.

Elsewhere, the unprecedented amount of camouflage work which remained to be done was necessitating the formation of a new government body, the Camouflage Advisory Panel, which was established in October 1939, ‘to advise the Minister [of Home Security] on matters of major camouflage policy, but also to deal with all important questions of technique’. Under the chairmanship of General Sir Ernest Swinton, the panel was ‘to reconcile some of the differing schools of thought in this difficult and controversial subject’. For this reason, the C.A.P. was composed of representatives from a variety of backgrounds: artistic, biological and engineering. This included figures such as Glasson, Wyatt, Norman Wilkinson, Percy Jowett, Walter Kennington, Dr Edward Appleton and Dr Hugh Cott. Also on the Panel were Dr

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446 TNA, HO186/171: Notes of a meeting held to consider collaboration between Departments in regard to camouflage, dated 2nd Oct 1939.
447 Major General Sir Ernest Swinton (1868-1951) was a prominent figure within British military circles, and had cemented his reputation by being a leading proponent in the development of tank and mechanical warfare technology.
448 TNA, HO186/174: Correspondence, Sir J. Anderson, to Viscount Swinton, dated 12th Jan 1940.
449 Norman Wilkinson (1878-1971) was an artist, commonly known as the ‘originator’ of ‘dazzle camouflage’. During the Second World War, he acted as an advisor on camouflage for the R.A.F. under the Director of Works, Air Ministry.
450 Percy Hague Jowett (1882-1955) was Principal of the Royal College of Arts, a position he had held since 1935. He would later work alongside Kenneth Clark on the War Artists’ Advisory Committee.
451 Walter O. Kennington was an engineer and one of the directors at Vauxhall Motors Ltd since 1927. He was appointed to the Panel on account of having undertaken experiments into industrial camouflage at Vauxhall’s Luton plant.
452 Dr (later Sir) Edward Victor Appleton (1892-1965) was a physicist, who had held professorships at King’s College London (1924-1936) and at Cambridge University (1936-1939). In 1939, he was appointed to the position of secretary of the Department of Scientific and Industrial Research, a post he held until 1949. At the time of the C.A.P., he was also serving as Chairman for the Civil Defence Research Committee.
453 Hugh Bamford Cott (1900-1987) was a zoologist and lecturer at Cambridge University between 1938 and 1967, who had received his training from John Graham Kerr (see footnote 446) at Glasgow
Louis Jordan (1892-1964) and Samuel Kerr Thornley (1871-1947), the Director and President, respectively, of the Paint Research Station. Up until April 1940, this Panel was responsible for directing civil camouflage policy, and at the heart of its discussions were issues surrounding the concealment of large areas, such as London, the treatment of highly regular shaped buildings such as oil tank installations, the concealment of railways, roads and water, the deployment of decoys and dummies, smoke screening and examinations into the effects of infra-red photography and direct observation in penetrating camouflage schemes.\textsuperscript{454} While more detailed analysis of these issues will appear throughout the thesis, it is important to highlight that during the lifetime of the C.A.P., some rather significant disagreements about who constituted a camouflage ‘expert’ arose; in some respects, such debates were part of a ongoing tension between the ‘artistic school’ and the ‘biological school’ of camouflage which had shaped camouflage practice since the First World War. The C.A.P. proved to be one forum through which this face-off between different ways of thinking about camouflage materialised. Ultimately, such hostility not only culminated in the demise of the Panel, but also led to significant delays in camouflage execution until further re-organisation in 1941.

At the heart of this dispute was the role of science, and, more specifically, the contribution it could make to the practice of camouflage. In many ways, this was inspired by a much broader feeling that science was being undervalued in terms of its contribution to the war effort; at the annual meeting of the Royal Society in 1939, Sir William Bragg expressed his dissatisfaction ‘that full use is [not] being made of the scientific resources of Great Britain…. Science, that is to say, the knowledge of Nature, is of fundamental importance to the successful prosecution of any enterprise’.\textsuperscript{455} Such sentiments were held by those scientists engaged in camouflage work. Historically, tensions had long existed between artists and scientists in terms of camouflage practice. Norman Wilkinson, for instance, had notoriously been involved in a ‘war of words’

\textsuperscript{454} TNA, HO186/171: \textit{CAP/2: Subjects for Consideration}, C.J. Galpin, dated 14th Oct 1939.
\textsuperscript{455} Anon. 1939: Science and the War, \textit{Nature}, 144(3658), 9th Dec 1939, p.953.
with the naturalist John Graham Kerr over the principles that should shape naval camouflage during this earlier conflict. Whereas Wilkinson maintained that it was artistic principles derived from such traditions as Vorticism and Cubism that formed the basis of ‘dazzle camouflage’, Kerr maintained that naval camouflage should draw upon Abbott Thayer’s work on biological camouflage and utilise such techniques as countershading. In the event, it was Wilkinson who had succeeded in gaining favour with the Admiralty. Combined with the success of artists carrying out the camouflaging of field guns on the Western Front, artistic forms of camouflage had attained a ‘privileged’ position within the discipline.

With the re-institution of the civil camouflage project, the immediate reaction of policy makers and factory owners was to turn to those of artistic persuasion for assistance or to draw upon paint-based methods of camouflage, as was seen during the Munich Crisis. Indeed, even the general public were resorting to paint-based methods; notoriously, in 1940, The Times featured a series of articles showing a great deal of public enthusiasm for ‘car camouflage’, with car owners painting their vehicles in ‘dazzle camouflage’ utilising browns, greens and black. The outbreak of the Second World War, however, provided a new battleground from which these tensions between the artistic school and the biological school were to re-emerge, with a renewed exchange of words taking place not only through the C.A.P. but also through The Times newspaper and the popular scientific journal Nature. Such avenues provided scientists with an opportunity to publicly critique artistic conceptions of camouflage. For example, one anonymous

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456 Sir John Graham Kerr (1869-1957) was a natural scientist who had been a key proponent of the claims of Abbott H. Thayer about the utilisation of camouflage principles derived from nature such as ‘disruptive colouration’ and ‘countershading’. Unlike Wilkinson, however, Kerr never received full recognition for his work by the Admiralty, culminating in the tensions between the two. Between 1903 and 1935, Kerr was a professor of zoology at Glasgow, and it was here that Kerr encountered Hugh Cott as a student.


459 The Times, 1940b: Camouflage for Cars, 27th July 1940, p.6. ‘Car camouflage’ was later discouraged for fear of the disruptive patterning attracting attention, see The Times, 1940c: Camouflage of Road Vehicles, 26th Aug 1940, p.6.

commentator in June 1940 expressed their condemnation at the ‘ineffective’ attempts that had been taken to conceal industrial structures by artists so far:

‘[A] common misapplication of paint, again unfortunately understandable in an artist used to thinking in terms of pictorial representation, is seen in the attempt to camouflage large structures such as hangers with representations of trees done in paint. An extravagant example of this foolishness was the decoration of the cooling towers of a large works to represent a grove of tall trees...when the fact is realised that camouflage research and application are at the present time largely dominated by artists,...controlled by people lacking the necessary scientific training and with no knowledge of the fundamental biological and psychological principles involved, the failure to achieve effectiveness which one sees on every side is rather to be expected than wondered at’. 461

In addition to these criticisms, this commentator also highlighted how the use of paint failed to counteract many of the factors which served to reveal a structure in the landscape. Indeed, they argued that an over-reliance on paint was ‘a serious fallacy...Only rarely is pigment able to counteract the effects of light and shade, and of cast, presented by vehicles, buildings and other solid bodies in the open’. 462 To them, it was clear that:

‘the underlying optical principles which govern visual concealment and deception are biological principles, the discovery and description of which are mainly due to the observations of naturalists and sportsmen. These men, whose labour or leisure has brought them into intimate contact with wild creatures, claim no particular credit for their discoveries, which are essentially an exposition of principles beautifully demonstrated by Nature herself’. 463

461 Anon. 1940: Camouflage in Modern Warfare, *Nature*, 145(3686), 22nd June 1940, p.950. The author for this article is unnamed and could potentially be either John Graham Kerr or Hugh Cott. Presumably, the example of the cooling tower which is referred to here is Freeman’s Meadow power station, following its appearance in *The Times*.


For such essentialist and scientifically-minded individuals such as Kerr and Cott, the ‘neglect, or misapplication, of such basic principles as countershading, disruption, coincident pattern and deflection’\textsuperscript{464} was unacceptable;

‘s so long as the present unsatisfactory state of affairs lasts, injury will continue to be done to the nation’s war effort. The matter is urgent. Camouflage is destined to play a great part in the struggle…Under the present system, the men who know best what should be done seem to be excluded from getting anything done. Unless, and until, the fundamental biological principles are understood and applied by the authorities, attempts at camouflage are merely ridiculous’.\textsuperscript{465}

In response to claims that camouflage had become a ‘very wasteful imbecile’ and ‘a child suffering from arrested development’ that would ‘never develop sanely into manhood nor attain to a life of useful and efficient service’,\textsuperscript{466} some artists such as Wilkinson attempted to counter such claims; in response to an article by a ‘Scientific Correspondent’ on the 3\textsuperscript{rd} May 1939 wrote that ‘I do not know what practical experience [your Correspondent] may have of camouflage today, but I suggest that the child has turned the corner and is really doing quite well’.\textsuperscript{467} Others, however, directed the blame elsewhere; C.H. Rowe, for instance, wrote that:

‘the artist should not be blamed for the present situation,…because he is only too willing to co-operate with the biologist; indeed he is no mean naturalist himself. Leonardo da Vinci, a great artist and scientist, pointed out Nature’s use of protective colouring before Thayer was born. Artists before and since have been fully aware of the principles of ‘countershading’, ‘coincident pattern’, ‘disruption’ and ‘deflection’, only they have been called in art schools since the time of Rembrandt such other names as ‘counterchange’, ‘discord and harmony’, ‘atmospheric and solid perspective’… Let men of science turn their righteous indignation…in the direction of the bureaucrats responsible for the control of camouflage. They will find the artists dour warriors in the same cause’.\textsuperscript{468}

\textsuperscript{464} Anon. 1940: Camouflage in Modern Warfare, \textit{Nature}, 145(3686), 22nd June 1940, p.950.
\textsuperscript{465} Anon. 1940: Camouflage in Modern Warfare, \textit{Nature}, 145(3686), 22nd June 1940, p.951.
\textsuperscript{467} Wilkinson, N. 1939a: Camouflage: To the Editor of the Times, \textit{The Times}, 4th April 1939, p.12.
Overall, these hostile exchanges highlight the intensity of the debates between these different schools of thought, and how it was felt that the privileged position of artistic knowledge should be challenged to accommodate for different ways of thinking about camouflage; one of the purposes of the subsequent empirical chapters is to explore how the practice of camouflage came to embody a variety of ‘expert’ knowledges beyond the artistic – biological, engineering, architectural, chemistry, optical, and aerial. Nevertheless, this particular historical moment exemplifies the inherent tensions about what form camouflage should take and how ‘effectiveness’ could be guaranteed.

Although the intentions of the Camouflage Advisory Panel had been to enable greater discussion between specialists in different fields, the prevailing dominance of artists greatly affected its functioning. Indeed, individuals such as Cott and Kennington felt that their ‘specialist’ knowledge was being ignored in favour of the continuance of an artistic agenda. In his resignation letter dated 21st March 1940, Kennington asserted that ‘during the last few Panel meetings I have felt that I am out of harmony with much of the opinions expressed at the meetings’.469 On the other hand, Cott’s resignation letter on the 27th March 1940 was much more scathing:

‘I looked forward to being able to help in a small way towards correcting the gross errors and waste of money so obviously apparent in much of the camouflage work already carried out…I have now had experience of eleven meetings…and have come to the conclusion I am wasting my time, and therefore would beg leave to resign my membership’.470

Earlier in the month, Cott had submitted a short paper on ‘Disruption’ for inclusion within the C.A.P.’s upcoming Interim Report; within this, Cott had outlined the importance of function, scale, tone and colour as well as pattern in the consideration of camouflage.471 This paper, however, was seemingly ignored, with figures such as Wilkinson continuing to dominate discussion. Furthermore, Cott had been carrying out experiments into ‘baffle lighting’ for night-time conditions, but despite his efforts, these

469 TNA, HO186/668: Correspondence, W.O. Kennington, to Sir W. Eady, dated 21st Mar 1940.
470 TNA, HO186/668: Correspondence, H. Cott, to Sir J. Anderson, dated 27th Mar 1940.
471 TNA, HO186/668: Disruption, H. Cott, dated 22nd Mar 1940.
experiments were ceased by the Panel due to inconclusive findings of an Air Ministry experiment carrying out similar trials. In the end, Cott felt his position was untenable. Cott’s and Kennington’s resignations were to have much more severe consequences, signalling the end of the Panel and its replacement with a new Camouflage Committee.

4.6: ‘Getting the house in order’: April 1940 to September 1941

In the first few months of 1940, it was clear that the inability to compromise between artistic and non-artistic conceptions of and approaches to camouflage were severely hampering camouflage development and execution. In a letter to Sir John Anderson, Swinton noted that progress in the direction of camouflage ‘was far too slow. The curve of progress has fallen since the beginning of the war, and during the month of December only seven schemes have been sent out; there are at least eleven hundred still to be done’.\(^{472}\) Figures presented at the seventh meeting of C.A.P. on the 26\(^{th}\) January suggested that of the 1,700 firms on the ‘vitals list’, only 40\% of these had completed schemes or emergency camouflage, 16\% were ‘in progress’, and 31\% were still ‘awaiting survey or classification’, with an additional 260 premises likely to require camouflage.\(^{473}\) Such progress was also being stalled by limited opportunities to undertake aerial observation, as well as lacking facilities at Leamington to deal with the demand for camouflage; Swinton, for example, described the Leamington headquarters as:

‘dispersed, inadequate and unsafe both as regards security and fire; it should be concentrated and improved without delay, bearing in mind this Establishment is the focus of the expenditure of at least £2,000,000 in public money’.\(^{474}\)

By the summer of 1940, the situation was, therefore, very dire; its practitioners were locked in heated arguments about the foundations and principles which should be adopted in camouflage work, the facilities for research and design were unsatisfactory and were slowing camouflage output, and schemes were being delayed by factory owners as they sought tenders for the camouflaging of their factories.

\(^{472}\) TNA, HO186/668: Correspondence, E. Swinton, to Sir J. Anderson, dated 12\(^{th}\) Jan 1940.
\(^{473}\) TNA, HO186/171: Minutes of the Seventh Meeting of C.A.P., held on 26\(^{th}\) January 1940. For the remaining 13\%, it was felt that camouflage was ‘not necessary’.
\(^{474}\) TNA, HO186/668: Correspondence, E. Swinton, to Sir J. Anderson, dated 12\(^{th}\) Jan 1940; Additional note: £2 million in 1940 is equivalent to £57.4 million in 2010.
In an attempt to regain control of camouflage work and facilitate wider interactions with non-artists, the C.A.P. was disbanded and replaced by a new Camouflage Committee. Importantly, the new chair of this committee was to be the Chief Advisor of the Ministry of Home Security’s Research and Experiment Department, Dr Reginald Stradling (Plate 4.8). In many ways, ‘Stradling’s Committee’ signified a redistribution of power-knowledge relations; by establishing a scientific figure as the head of the main government body on camouflage, greater opportunities were enabled for advocates of non-artistic approaches to contribute to the production of camouflage knowledge. It, therefore, sought to enable a much more ‘balanced’ approach to camouflage, or at least within the eyes of those responsible; this was seemingly confirmed in a report produced in October 1940, which stated that:

475 The Research and Experiment Department, stationed at Princes Risborough, was a department comprised of scientists who undertook a wide range of research into matters concerning civil defence. This included research into lighting restrictions, bomb blast and its effects on structural engineering, fire prevention, amongst other things.

476 Dr (later Sir) Reginald Edward Stradling (1891-1952) had a background in civil engineering. Having served with the Royal Engineers during the First World War, he became a lecturer at the University of Birmingham before becoming Head of Civil Engineering, Architecture and Building at Bradford Technical College in 1922. In 1924, he became Director of Building Research, before taking up his post with the Research and Experiments Department. In 1944 he became Chief Scientific Adviser to the Ministry of Works where he administered the government’s post-war housing programme.
'whether camouflage is a science or an art is a question which is by no means academic since upon the answer to it depends the qualifications required of those engaged in it. The truth is that camouflage is both. The discovery of means and the elaboration of technique are scientific matters requiring scientific training. The execution of schemes and the preparation of designs for particular objects are matters requiring visual training and artistic knowledge. Men of both kinds of qualification are required'. 477

This desire to be more inclusive of non-artistic forms of camouflage knowledge was also evident in the establishment of a Technical Sub-Committee, which was:

‘(a) To examine technical matters connected with camouflage with a view to a solution to outstanding problems, and (b) to ensure the fullest technical co-operation between the camouflage sections of all Departments’. 478

Selected for the position of chairman was William Curtis,479 who had recently been made head of research at the Civil Defence Camouflage Establishment. It was argued that with:

‘the bringing in of an eminent scientist as Chief Superintendent, the whole tendency of the Establishment has been towards scientific research and the elevation of camouflage from a technique which consisted pre-eminently of a creation of illusion by designs carried out in paint to a proper science of deception. A glaring defect to which the Camouflage Advisory Panel constantly called attention has thus been remedied’. 480

This re-thinking of ‘who’ could, therefore, contribute to camouflage work enabled a much broader range of techniques to be cultivated and deployed in the field, thereby providing solutions to cases where the use of paint alone was considered to be insufficient.

477 TNA, HO186/975: Fourteenth Report from the Select Committee on National Expenditure, dated 15th Oct 1940, p.3.
478 TNA, HO217/6: Minutes of the first meeting of the T.S.C. of the Camouflage Committee, held on 6th August 1940.
479 William Edward Curtis (1889-1969) had fought at Gallipoli during the First World War and was Professor of Physics at Newcastle University between 1926 and 1955. In May 1940, he joined the C.D.C.E. before being transferred to the Research and Experiment Department at Princes Risborough in 1942, where he continued to undertake research into camouflage.
480 TNA, HO186/975: Untitled Memorandum, P. James, dated 25th Nov 1940.
As well as seeking to resolve the tensions within camouflage work, the pace of civil camouflage was the next problem to be resolved. In their Fourteenth Report in October 1940, the Select Committee on National Expenditure stated that they were ‘not satisfied with the rate at which vital industrial points are being camouflaged, and…that it should be accelerated’.\(^{481}\) To remedy this, they proposed that the camouflage departments which continued to exist within each of the four Services (MoHS, Army, Air Ministry and Admiralty) should be consolidated and ‘united in a single organisation with its own research staff and administered by the Ministry of Home Security’.\(^{482}\) This was in line with their belief that:

> ‘the defence of this country in so far as camouflage is concerned is essentially a single problem. Though it is true that each unit whether it be building, airfield, road, or moving or movable object must be considered as a unit in relation to its circumstances and the method of camouflage applicable to it, it is equally true that individual schemes for each unit should be correlated and indeed that all schemes of camouflage should be considered as part of a general picture’.\(^{483}\)

It, therefore, seemingly made sense to ‘put the house in order’ by amalgamating all camouflage work within a single organisation, with ideas being pooled and distributed to those who required it (see Appendix 2 for the organisational structure of this new ‘Camouflage Directorate’). As part of this re-arrangement, it was suggested that the administration section, currently based in London, should join with the C.D.C.E. at Leamington, thereby enabling the swifter delivery of schemes and communication between civil camouflage practitioners and industrial proprietors; under the existing arrangement, significant delays were being caused by the two being separate. It was, therefore, recommended that ‘Mahomet \([sic]\) should go the mountain and that we should move the Administrative staff at Cornwall House to Leamington, provided the necessary accommodation can be obtained there’.\(^{484}\) In doing so, it was predicted that


\(^{482}\) TNA, HO186/975: *Fourteenth Report from the Select Committee on National Expenditure*, dated 15\(^{th}\) Oct 1940, p.9.

\(^{483}\) TNA, HO186/975: *Fourteenth Report from the Select Committee on National Expenditure*, dated 15\(^{th}\) Oct 1940, p.9.

\(^{484}\) TNA, HO186/975: *Untitled Memorandum*, A.N. Rucker, to Sir G. Gator, dated 13\(^{rd}\) Nov 1940.
greater fluidity would be brought to the camouflage process. In order to manage this, it was argued that ‘it would be necessary to appoint a Director of Camouflage to supervise the whole machine – Research, Executive Staff and Administrative Staff’.\footnote{TNA, HO186/975: Untitled Memorandum, A.N. Rucker, to Sir G. Gator, dated 13th Nov 1940.} Importantly, it was felt that the individual who should take this role should be selected from outside mainstream camouflage in an attempt to bring a fresh outlook to the whole procedure; from the perspective of the MoHS, it was ‘desirable that the officer selected should be someone other than one of the present senior officers and one who will be capable of directing and administering an establishment of this size and nature’.\footnote{TNA, HO186/975: Untitled Memorandum, C.S. Petheram, to Sir G. Gator, dated 3rd Dec 1940.}

Emanating from these discussions, the Camouflage Directorate was created, to be based in Leamington, where its facilities would be expanded and improved. In the role of Director, the Ministry of Home Security were able to secure the services of Wing Commander Thomas Reginald Cave-Browne-Cave (see Plate 4.9).\footnote{Wing Commander Thomas Reginald Cave-Browne-Cave, CBE, (1885-1969) was Royal Navy Engineer Officer prior to the outbreak of World War One. In 1913, he had transferred to the Royal Naval Air Service, where he was involved in non-rigid airship research development. In the inter-war years, he became Professor of Engineering at Southampton University (served until 1950). From 1938 onwards, he served on various Structural Air Raid Precautions Committees until taking the post of Director of Camouflage. Post-war, he was credited as the inventor of the ‘Cave-Brown-Cave Heating System’ which was designed for and widely adopted by British Transport Company buses until as late as the 1970s.} ‘Cave’, as he was informally known, had been working on various Structural Air Raid Precautions Committees since 1938, and this was considered to provide him with ‘first class knowledge of A.R.P. work’.\footnote{TNA, HO186/975: Correspondence, Sir G. Gator, to Sir A. Street, dated 30th Dec 1940.} His previous experiences of working for the Royal Naval Air Service and the R.A.F. in airship development was also of significance; from these, he was believed to possess a clear understanding of the aerial experience, which he could usefully deploy in directing camouflage work. He was, therefore, considered to ‘probably [be] the most suitable man’, and full of energy and enthusiasm. Almost immediately after he secured, Cave began systematically correlating intelligence on work which had so far been conducted. This entailed an extensive assessment of how camouflage had been organised, how aerial surveys programmes were determined and carried out, how sites were classified based upon these, as well as thinking about how methods could be simplified in order for the civil camouflage programme to be accelerated.

\footnote{TNA, HO186/975: Untitled Memorandum, A.N. Rucker, to Sir G. Gator, dated 13th Nov 1940.}
At the same time as Cave was reviewing camouflage operations under the Camouflage Directorate, civil camouflage was also receiving further scrutiny from the Mabane Committee on Concealment and Deception. Appointed ‘to review the policy to be followed in the protection of vital targets and areas by concealment and deception from enemy air attack’, the Mabane Committee held 14 meetings throughout the course of 1941 at which the members ‘heard evidence from those concerned with the administration and operation of all forms of concealment and deception in various Departments interested’.489 In addition, its members ‘paid visits to various establishments concerned with the research and development of camouflage, decoy, and

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smoke, and…inspected various examples of all forms of concealment and deception’. On the 17th and 18th April 1941, visits were made to both the Directorate at Leamington as well as the MoHS’s Research and Experiments Department, now located at Compton Verney. In a minute to his heads of Research, Administration, and C.D.C.E. sections, Cave informed them that the aspects that he was ‘anxious’ that the Committee saw were:

- ‘slides representing good and bad camouflage and before camouflage
- Models in the Viewing Room with removable nets to show the value of the nets
- Models in moonlight, flare light, day light and sunshine arranged to show the importance of shadow, colour, tone and texture (these should include the model of our new design; this is very important)
- Viewing through a bomb sight
- Water Camouflage. Rafts and Coal Dust at Compton Verney
- Full scale samples of nets with scrim, steel wool and if possible B.G.’

Moreover, he stressed the importance of this visit in terms of the longer-term objectives of the civil camouflage project;

‘we depend greatly upon this visit to make the Committee realise the value and effectiveness of Camouflage. The Committee’s decision will govern the whole camouflage policy probably for the remainder of the War. We must therefore give an adequate account of what we can do in really useful Passive Defence’.

As a result of these interviews and visits to the Directorate and its associated research sites, the Committee suggested several alterations to the camouflage programme. Firstly, it recommended that ‘all Departments responsible for the erection of new buildings of vital importance [must] ensure that advice on concealment is sought at the

491 TNA, HO186/975: Untitled Memorandum, T.R. Cave-Browne-Cave, to W.S. Imrie, W.E. Curtis, and L.M. Glasson, dated 7th Apr 1941. ‘B.G.’ was a material derived from seaweed and utilised to garnish camouflage netting during this period. A precise definition of the term was absent in the archive material encountered and from subsequent research.
earliest possible stage, when not only plans but siting are still under discussion’. In line with this, it was suggested that ‘immediate instruction be issued to all concerned that sites at present about to be developed should not be cleared before reference has been made to those responsible for camouflage to determine how best the natural features can be employed to assist in concealment’. This, then, marked a significant step in camouflage practice, recognising that camouflage needed to be integrated into the designing and erection stages of building work rather than being an afterthought applied once construction had been completed. Emerging from this, there was the proliferation of a new agenda which sought to influence and transform architectural aesthetics; the ways in which the Camouflage Directorate sought to achieve this will be the focus of Chapter Eight.

Furthermore, the Committee advocated the utilisation of simpler camouflage methods which would help improve the pace at which camouflage work was being conducted. For them, the slow pace of work was an extremely disconcerting prospect;

‘there are, at present about 1,300 uncamouflaged vital points in the programme of civil camouflage and there is a constant flow of additions made at frequent intervals by the Key Points Intelligence Branch. Drastic methods are needed to provide schemes as rapidly as possible for all those for which concealment is regarded as necessary and possible’.  

To address the sluggish momentum of production, it was contended that ‘the curtailment of the more elaborate schemes almost entirely to a restricted number of factories in the defined area will reduce the aggregate time spent in the studio on individual designs’. Moreover, it was suggested that the amount of aerial surveying being conducted be cut back:

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‘hitherto, it has been a recognised principle that aerial observation is a *sine qua non* for the best camouflage. While this is not denied, the limitations imposed by bad weather and restricted flying facilities cannot be allowed any longer to retard production of camouflage schemes. It is, therefore, imperative that so far as possible the great store of knowledge based on past flying experience which camouflage officers have acquired should be exploited to the full. Much could be done by ground inspections only and this method of preparation should be adopted for all cases except the limited number of the most important targets for which flying facilities are essential’.⁴⁹⁷

It is evident here that emphasis in camouflage had shifted towards the designing of schemes centred upon more embodied knowledges of the aerial experience, which was now believed to be fully developed within the camoufleur experts’ who had now been practicing camouflage for some time. In many ways, this signified a degree of confidence in camouflage practitioners to produce effective designs without the necessity for an actual aerial observation of a site, and therefore, ensure better efficacy in the progress of camouflage application.

Finally, the Report signalled further modifications to camouflage organisation reflecting the restructuring occurring under the Camouflage Directorate. In October 1941, Stradling’s Committee was ‘reconstituted’, with Cave taking Stradling’s place.⁴⁹⁸ The function of ‘Cave’s Committee’ was ‘to promote unification of design, practice and methods of maintenance’.⁴⁹⁹ Like its predecessor, it had its own Technical Sub-Committee, again with Cave as its head. At its meetings, members were ‘to prepare technical instructions, to consider the development and introduction of new materials and to consider the allocation of certain materials in short supply’.⁵⁰⁰ It was, therefore, from this period that the most comprehensive and complete technical guides on camouflage methods were produced. In the case of both the Committee and its Sub-Committee, meetings were to be held more frequently, enabling greater and more effective discussion on all matters related to civil camouflage and deception. With the

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greater dissemination of camouflage information, and more regular discourse between camouflage practitioners, it was felt that steps were being taken in the right direction.

4.7: Nocturnal camouflage and the winding down of the project: October 1941 to July 1945.

Following this intense phase of transformations and upheavals in camouflage organisation, there was a period of relative stability, with full attention being diverted towards the application of schemes as well as completing research into alternative camouflage techniques; provisions of certain pigment for paint, such as Chromium Oxide, used to colour green camouflage paints, were increasingly in short supply, and substitutes were actively be sought. However, in late 1941, it was noted that the Luftwaffe were increasingly concentrating their efforts on night-time attacks, frustrated in part by the successful resistance of the R.A.F. against their daylight campaign. As a result, the strategic decision was taken to shift attention away from a camouflage agenda shaped by daylight forms of camouflage and to instead produce schemes and adopt methods which would be more suitable for the visual conditions of the night; the solutions which were proposed to achieve this, and the modifications to the ways in which camoufleurs undertook their work will be explored in Chapter Seven.

As for camouflage organisation, the only further modification that was made was the addition of the Civil Camouflage Assessment Committee (C.C.A.C.) to the existing framework of operations. Formed in January 1942, the C.C.A.C. was:

‘to consider the most important cases [requiring camouflage] individually and determine the Scale of Camouflage concealment to be given, having regard to the three cogent factors: the importance of the target; the probability and probable nature of the attack; and the probable effectiveness of concealment which could be achieved in reasonable time’. 501

Referred to as ‘the Triangle’, this committee was composed of Cave (as Director of Camouflage), a representative from the Key Points Intelligence Directorate (K.P.I.D.) and a delegate from the Ministry responsible for the individual factory. At their meetings, the K.P.I.D. and the affected Ministry would provide intelligence on the

‘importance’ of the target, judged in relation to war production, as well as through statistical assessment on the number of attacks committed in the local vicinity, thereby gauging its vulnerability; Glasson, as Chief Camouflage Officer would, then, provide the views of the Camouflage Directorate about the possibilities for concealment. It was through the C.C.A.C., therefore, that efforts could be concentrated on factories which were deemed worthy of continued camouflage in light of the new tactical situation brought about by the shift to night-time bombing. By the time the camouflage project was shutdown, 2,500 cases had been reviewed by the C.C.A.C., of which:

‘only 750 were considered to justify any camouflage treatment or the maintenance of that already applied. Of these, 200 were given assessments which included for concealment in daylight, the remainder being for night only. Many of those excluded from treatment were factories of great importance but, on account of their position, adjacent landmarks or other local factors, camouflage was not justified’.502

The benefits of this new system of assessment were also advantageous at a time when labour and materials were in high demand from other governmental departments. On the 22nd June 1942, the Building Directorate (of the Ministry of Works) decided that ‘the urgency for obtaining labour for certain building operations was so great that camouflage could only be given Category B for labour’.503 Following an appeal by MoHS, Priority A was finally obtained for 212 Category 1A factories (the highest classification in civil camouflage) which were ‘either in need of initial treatment or would become due for re-treatment within the next six months’.504 The assessment by the C.C.A.C., therefore, ensured that attention would be directed to the most ‘important’ and ‘essential’ installations at a time of pressing demand on restricted labour resources.

This episode of labour regulation, nevertheless, provided an ideal opportunity for the camoufleurs to stress the continued significance of their work, particularly in the light of future trends towards a more offensive war strategy. In a discussion on the ‘Reconsideration of Camouflage Policy’ in December 1942, it was argued that the

502 TNA, HO191/3: Camouflage of Vital Factories and Key Points, 1939-1945, MoHS, Section 2, p.2.
503 TNA, HO186/1343: Camouflage Committee: Camouflage of Vital Points and Key Factories, dated 20th Aug 1942.
504 TNA, HO186/1343: Camouflage Committee: Camouflage of Vital Points and Key Factories, dated 20th Aug 1942.
release of labour for other ‘vital’ work ‘must not,…detract too seriously from the effectiveness of camouflage as a means of protection to vital industry and other important targets’.

For the Camouflage Committee, it was clear that camouflage would play a long-term role in civil defence planning;

‘it may well be that if and when guns and fighter defence are moved, we shall depend more than ever upon camouflage to mislead and delay hostile attack…. Camouflage is definitely a weapon of defence; industry depends upon it perhaps even more than the Fighting Services. Our dependence upon it will tend to increase as other weapons are transferred to more active attack’.

To further support their claims, debates surrounding the morale boosting qualities of camouflage continue to emerge in discussions on the ‘effectiveness’ of camouflage. The C.C.A.C., for instance, drew attention to how:

‘in assessing the general importance of camouflage, regard must be had not only to the protection which it may afford against accurate attack but also to its effects upon the morale and energy of personnel. In the comparatively short period since camouflage treatment has been restricted, strong representations have been received from various firms drawing attention to the influence which the absence of concealment has upon the workers and the consequent effect on production of the factory’.

Indeed, the C.C.A.C. drew up a shortlist of twenty industrial installations where ‘factory managements find the morale of their workers influenced by the camouflage scheme’. The owners of Fords at Dagenham ‘wrote a letter to the effect that they and their workers put down their immunity from any serious bomb damage to the camouflage and kept constantly maintaining it’. Elsewhere, the presence of uncamouflaged features in close proximity to a concealed structures was seen to evoke feelings of anxiousness; the occupiers of the Folland Aircraft factory at Southampton ‘wrote several times to express the serious concern of their employees that adjoining white air-raid shelters on a

505 TNA, HO186/1985: Reconsideration of Camouflage Policy, Camouflage Committee, dated Dec 1942.
housing estate invalidated their camouflage scheme’, whereas Cunliffe Owen of
Southampton ‘were insistent that the adjacent cemetery to their premises at
Southampton, the cemetery being CAM.2751, should be camouflaged, as its
prominence was affecting the morale of their workers’.

Finally, the Bristol Aeroplane Company also reported workers getting ‘restless’ as a result of fading camouflage,
resulting in calls for the scheme to be re-applied there. It was clear, in the eyes of the
Camouflage Directorate, that for as long as the war was being fought, static camouflage
would serve a functional and worthwhile purpose, even if that was solely for morale.

Plate 4.10: Photographs of dummy landing craft on the Thames (left) and an inflatable
dummy truck (right), both used as part of the D-Day deception plan.
(Source: IWM, H42527 and H42530).

However, on the 6th June 1944, Allied forces launched a successful invasion of
Normandy. In the months preceding, under the codename of ‘Operation Fortitude’,
camouflage and deception strategies had been actively deployed to ensure that D-Day
was to be a triumph; as part of this, inflatable dummy tanks and wagons had been
placed around the Kent coastline, dummy landing craft were anchored in the Thames,
and deceptive radio traffic were all used to misguide the Germans into thinking that an
continental invasion would take place on the Nord-Pas-de-Calais rather than the
Normandy coastline (Plate 4.10). This shift towards more ‘offensive’ interpretations
of camouflage and deception initiated the winding down of the civil camouflage project.
On 11th August 1944, the Home Defence Executive considered:

511 See for example, Cruickshank, 1979; Hesketh, 2000; Rankin, 2008; Reit, 1979.
‘[an] appreciation by the Air Staff, which indicated that the risk of raids by enemy aircraft had considerably decreased; even in the S.E. part of the Country. Accordingly, the Home Defence Executive decided that the maintenance of camouflage treatment on all factories and key points in all parts of the country could be suspended, with the exception of a very few items of pivotal importance’.

By the time of Victory in Europe Day, concealment was only being maintained on eight sites.

Throughout the course of the war, those involved in civil camouflage work had, nevertheless, achieved a great deal, despite the rather intense in-fighting over the predominance of certain schools of camouflage thought, the incessant re-organisation of camouflage work, and the various factors which had postponed work such as material and labour shortages. From the Munich Crisis until April 1944, it was estimated that some 16,000 items had been considered for camouflage. Of this figure, 9,000 had been disregarded, in spite of the fact that several had appeared on the Vitals List; in many cases, this had been down to the geographical location of the factories concerned, particularly if located within the area of London. This left 4,074 vital factories and key points, and 942 ‘conspicuous non-vitals, adjacents or aiming marks, which received some form of camouflage, be it simple or elaborate in design’. A total of £1.5 million (or £39 million if adjusted to today’s values) had been spent on schemes treated under the Civil Defence Act, and a further £103,000 (£2.7 million today) on D.R.50 sites. The figures for aerial observation were equally as impressive; ‘from March 1940 (prior to which no records are extant) to April 1944, 3,600 flying hours had been arranged, the highest number of sites surveyed in one year being 1,800; the lowest 1,200’.

4.8: Conclusions

In this opening empirical chapter, an historical account has been produced of the development of the British civil camouflage project throughout the 1930s and 1940s. In the first section, an examination was made of the emotional cultures of the aerial threat

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512 TNA, HO191/3: Camouflage of Vital Factories and Key Points, 1939-1945, MoHS, Section 3, p.9.
513 At the Second Meeting of the Camouflage Advisory Panel on 3rd Nov 1939, it was settled that ‘it was not practicable to conceal London at any time from hostile airmen’, see TNA, HO186/171: Minutes of the Second Meeting of the C.A.P., held on 3rd Nov 1939.
which inspired civil defence planners to initiate the camouflage programme, with particular attention being devoted to how aerial bombardment was imagined by interwar Britons and reinforced through acts and representations of aerial violence carried out during this time period by other European powers. In the following section, the response of British policy makers in the form of air raid precautions was discussed, with civil camouflage being positioned alongside a wider framework of protective measures designed to prevent or reduce material damage, as well as sustain and safeguard targetable ‘collective affects’ such as morale. This section proceeded to explore some of the initial experiments carried out, highlighting some of the early issues of adopting a paint-centric methodology; such challenges would later inspire civil camoufleurs to pursue alternative treatments.

The third, fourth and fifth sections, then, examined the ongoing changes made to the organisation of civil camouflage in the wake of the Munich Crisis and into the first few months of the Second World War. These sections highlighted the emergence of ‘unofficial’ conceptions of camouflage that were undertaken in the British landscape and the attempts of the British government to regulate and take control of camouflage practice in order to prevent the wholesale adoption of schemes they considered to be ‘ineffective’ and ‘futile’ because of their ignorance of the aerial perspective. Attention was also devoted to the tensions between artists and biologists as to which principles should be incorporated into camouflage design. The results of this were explored in the penultimate section, which focused on the introduction of ‘non-artists’ into leadership roles within civil camouflage work in order to enable a much broader appreciation of the camouflage problem. Furthermore, the formation of the Camouflage Directorate was outlined, a governmental body which signalled several changes in civil camouflage work: firstly, the shift towards influencing architectural aesthetics in order to make buildings ‘self-conceal’ and, therefore, remove the issue of conspicuous; secondly, the utilisation of less sophisticated methods of concealment in the light of restrictions to labour and materials; and finally, the re-establishment of new spaces of discussion and interaction to facilitate greater dissemination of camouflage ideas. The concluding section, then, briefly historcised the pressing need for nocturnal forms of camouflage, to be developed more fully in Chapter Seven, and the eventual demise of the camouflage project.
In many ways, this chapter has been an important one for not only outlining the individuals and organisations which frequently appear throughout subsequent chapters and giving a general overview of the transitions which were taking place over this time period. Indeed, the chapter has served as an initial ‘springboard’ from which to discuss a whole range of issues which will form the basis of following chapters: the unique challenges posed by countering the vertical visualities of the bomber body; the ‘conspicuousness’ and revealing of certain features within the landscape when viewed from the air; debates surrounding the utilisation of different types of (artistic and non-artistic) knowledge in camouflage practice; the effects of night-time bombing in transforming the camouflage agenda; and the desire to regulate construction work and the designing of new buildings. It is to these different dimensions that attention now turns.
Chapter 5
‘Becoming Aerial’
Profiling, Assembling and Performing as the ‘Bomber Body’

‘Deception gains effect against an attacker in a hurry, in danger from the defence, out of touch with sources of advice, or confronted with an unexpected problem requiring an immediate answer. All these conditions are fulfilled in the case of the air raider. As he runs, he reads the landscape below by the aid of pre-collected maps and notes: if he finds inconsistencies they must be anxiously considered and, if wrongly interpreted, may waste his whole journey’.515

Christopher Galpin, November 1939.

As outlined in the previous chapter, the civil camouflage project emerged in the mid-1930s in response to the imagined and affective realities of the ‘aerial threat’. Indeed, civil camouflage was invested in as a technology which was designed to confuse, frustrate and deter the bomber pilot, aimer or navigator rather than the lens of the aerial photographer or the concentrated, deliberative gaze of the photo interpreter. However, while this distinction was made, it was acknowledged that it was simply not enough to know that it was the eye of the aerial observer that one needed to deceive; more intricate understandings of the practices and the visual, affective and performative operationalities of the ‘bomber body’ along with the effects of both the aerial and atmospheric environment upon this individual needed to be comprehended and constructed if effective concealment strategies were to be developed and applied to civil structures.516 Writing in April 1942, Cave-Browne-Cave asserted that in the devising of a camouflage scheme:

‘the Camouflage Officer must understand the general technique which the attacking pilot may follow, what heights and distance, what angle of view, what duration of visual

search, what direction and strength and light should be considered. Probable combinations of these many variations must be provided for so far as possible.\textsuperscript{517}

While the ‘attacking pilot’, conceived of here as the bomber body, was almost certainly imagined to be German and male, this chapter highlights some of the politics of the constitution of this ‘bomber body’ within civil camouflage discourses. Indeed, as the opening sections of this chapter illustrate, initial relationships forged between civil camouflage practitioners and the Air Staff and discussions at various camouflage committee meetings would prove highly influential in the moulding and profiling of the enemy bomber body. Moreover, the use of scientific knowledge inevitably reduced the Luftwaffe bomber body to a set of physiological and psychological attributes and practices that removed any discussion of other forms of identification; although this is problematic, the chapter is aware of the limitations imposed by this as it attempts to negotiate how the Luftwaffe bomber body was discursively constructed through a whole series of networks and interplays of different types of bodies, each with their own identity characteristics.

Having established the relationships that were forged between civil camoufleurs and the Air Staff in the first section, the chapter begins by examining the deconstruction of the bombing run and the sequencing of an aerial attack within camouflage discourses, with such knowledge being perceived as being intrinsic for any appreciation of the ‘civil camouflage problem’; through this process, ‘crucial moments’ could be identified where camouflage could be utilised to confuse the bomber body.\textsuperscript{518} Following on from this, the second section investigates the continuous reassessment of the ‘tactical situation’ by civil camoufleurs, and how intelligence, gathered through such sources as the Air Warfare Analysis Section, transformed approaches to and the spatial performance of camouflage work. The third section, then, considers in greater detail the construction of the ‘bomber body’ within civil camouflage discourses. In particular, it examines how the vertical visualities of the bomber body were conceptualised as an experience which needed to be ‘scientifically’ understood. Aside from collating knowledge about the physiology and mechanisms of the human eye, civil camoufleurs would also look to

\textsuperscript{517} TNA, HO186/1343: \textit{Memorandum on the Inspection of Finished Camouflage Schemes}, T.R. Cave-Browne-Cave, dated 4\textsuperscript{th} Apr 1942.

\textsuperscript{518} The term ‘crucial moments’ is adapted from Shell, 2012, p.81
incorporate understandings of how the atmosphere in which the bomber body was located, transformed the visual experience of that body. In the final section, I consider how the findings of these various intelligence gathering exercises translated into camouflage practice, with direct observation of the landscape from the air being promoted to both identify ‘conspicuous’ feature as one would as a bomber pilot, but also in assessing the effectiveness of a camouflage scheme.

5.1: Engaging with the ‘aerially experienced’: civil camoufleurs and the Air Staff

In a presentation to the Royal Society of Arts in 1945 on the matter of ‘camouflage for the protection of civil factories’, Cave spoke of how:

‘The Air Ministry and the Ministry of Home Security have been co-operating in the defence of this country against the grave menace of air attack ever since it first threatened us in this “isle set in the silver sea”. Jointly they and ourselves have worked together in close and most friendly associations each in our own sphere, our task being to deal with the messengers, theirs to deal with the missives!’

From 1936 through to the cessation of civil camouflage work in 1944, camouflage practitioners were actively involved in establishing and utilising communication networks with a group of individuals which they perceived to be ‘aerially experienced’ bodies. For many civil camoufleurs, the Air Ministry were very much considered to be the ‘experts’ of the aerial experience, with their in-depth knowledge of the effects of aeronautical technology in not only extending but also inhibiting the capacities and capabilities of the ‘bomber body’ through their scientific research programme, direct access to Royal Air Force (R.A.F.) aircrews, and comprehensive insights into the likely tactics to be deployed by the Luftwaffe. Information which could, therefore, be gleaned and assembled from these airminded sources was considered to be of vital importance, informing not only how civil camouflage work was to progress, but also in aiding policy makers to determine which features required camouflage treatment and which did not.

Such a mentality deeply penetrated those working in civil camouflage; Cave, for example, expressed the view that:

520 See Adey, 2010, p.124-129
’the main factors which in my mind chiefly govern the important decision[s] which [are] to made are really ones which depend upon knowledge and experience available only to the Air Staff and capable of being interpreted only by them’.521

He highlighted, for instance, how:

’the Air Staff will know from Observer Corps reports…what route attacks…have been delivered and whether they are likely always to follow this direction. They will also know what factors…guide…enemy aircraft to their target, whether these be fundamental methods or the recognition of certain prominent landmarks’.522

Finally, he commented that:

’the question as to which features will enable an enemy to deliver an accurate attack on his selected target once he has come into the neighbourhood of it are also matters, the appreciation of which must necessarily depend upon really up-to-date experience’.523

It was clear to Cave that this up-to-date knowledge could only be furnished through interconnections with the Air Staff.

Initially, the involvement of the Air Ministry had been quite significant; early civil camouflage research, undertaken by Francis Wyatt’s Camouflage Department had been taking place at the RAE Farnborough, an establishment under the control of the Air Ministry. Following the transfer of civil camouflage to the Home Office in early 1939, civil camouflage practitioners expressed their desire to retain their associations with the Air Ministry, partially for the wealth of information which could be obtained on aerial attacks from them, but also for continued access to flying facilities which it felt was important to carrying out camouflage assessments. At the second meeting of the Camouflage Advisory Panel (C.A.P.) on 3rd November 1939, it was expressed that ‘the Air Ministry be requested to detail an experienced officer or officers to attend meetings

521 TNA, HO186/1343: Correspondence, T.R. Cave-Browne-Cave, to R.H. Peck, dated Sept 1941.
522 TNA, HO186/1343: Correspondence, T.R. Cave-Browne-Cave, to R.H. Peck, dated Sept 1941.
523 TNA, HO186/1343: Correspondence, T.R. Cave-Browne-Cave, to R.H. Peck, dated Sept 1941.
of the Panel to advise on air matters’. The subsequent attendance of Wing Commander John Hawtrey at subsequent C.A.P. meetings marked the beginning of a much closer liaison between MoHS camoufleurs and the Air Ministry; future camouflage committees would follow a similar pattern, with at least one Air Ministry representative being included to ensure the continued communication with ‘aerial experts’.

5.2: Deconstructing the Bombing Run

With an Air Ministry representative in place, the C.A.P. began to seek knowledge about the ‘bombing run’; for civil camoufleurs, information on the likely approach and the actual sequencing of events in the bombing run was deemed to be of paramount importance for any initial consideration of camouflage technique. Indeed, it was argued that a pre-requisite knowledge of the series of events leading up to the release of bombs was one of ‘the basic elements which the camoufleur has to solve’; only through an understanding of the sequence of the attack could a “camouflage range” be determined

Plate 5.1: A diagram utilised in the education of civil camoufleurs in ‘Bombing Technique’.
(Source: TNA, WORK28/11/8, p.8)

With an Air Ministry representative in place, the C.A.P. began to seek knowledge about the ‘bombing run’; for civil camoufleurs, information on the likely approach and the actual sequencing of events in the bombing run was deemed to be of paramount importance for any initial consideration of camouflage technique. Indeed, it was argued that a pre-requisite knowledge of the series of events leading up to the release of bombs was one of ‘the basic elements which the camoufleur has to solve’; only through an understanding of the sequence of the attack could a “camouflage range” be determined

524 TNA, HO186/171: Minutes of the Second Meeting of C.A.P., held on 3rd Nov 1939.
525 Wing Commander, later Air Vice Marshal, John Gosset Hawtrey (1901-1954) had served with the R.A.F. since 1921 in various capacities and was, therefore, considered a highly experienced air officer. At the time of his attendance at C.A.P., he was on the staff of the Deputy Director of Operations (Home). He would later serve in the Far East as an Inspector of the Royal Iraqi Air Force.
526 TNA, WORK28/11/8: The Principles and Organization of Static Camouflage, prepared by the Camouflage Committee, 1944, p.17
As many camoufleurs had no direct experience of aerial bombardment (in some cases, not even of the bodily sensations of flight), the production of knowledge about an aerial attack was to serve a significant pedagogical purpose; it allowed the ‘novice’ camoufleur with limited or no aerial experience to not simply ‘know their enemy’, but also to acquire a general understanding of the nature of the civil camouflage problem. Moreover, sketching out the bombing run would also assist in cementing airmindedness within the camouflage mentality; thinking and imagining oneself as the ‘bomber body’ would enable the camoufleur to produce a scheme which they felt would confuse the enemy airman. This deconstruction of the aerial attack, therefore, permitted an infiltration of the bomber body and a segmenting of the emotive, sensory and affective capacities of this body at each stage of the aerial attack. Only through this deconstruction would the camoufleur be able to identify those ‘crucial moments’ of viewing which camouflage was intended to disrupt and subvert.

In many ways, C.A.P. meetings provided an important space through which foundational knowledge on the bombing run could be determined. Through interactions with Air Staff representatives on the C.A.P., it was ascertained that there were three general stages to a bombing mission: approach and navigation; recognition and identification of the target; and the aiming run and subsequent release and fall of the bombs (see Plate 5.1). For each of these stages, detailed insights into the specific practices, movements and experiences of the bomber body were actively sought, with each ‘episode’ being considered to elicit different ways of seeing and visually engaging with the ‘grounded’ landscape. It is to each of these stages that attention now turns.

5.2.1: Approach and Navigation

The first stage of an aerial attack was the approach and navigation towards the objective. In order to determine this, it was contended that the purpose of the attack needed to be comprehended. Although it was widely acknowledged that in some cases, bombing attacks upon Britain’s industrial centres were likely to be opportunistic, within civil camouflage discourses, it was suggested that the majority of attacks would be

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527 The term “camouflage range” was utilised to describe the general working criterion from which civil camouflage was to operate. This entailed the setting of rules as to the height and distance from which observation of a target was undertaken.

528 The importance of each of these stages would be emphasised within a plethora of civil camouflage training manuals, such as *The Principles and Organisation of Static Camouflage* (1944) and *Camouflage of Vital Factories and Key Points* (1945), from which some of the subsequent analysis draws.
‘deliberate’ in nature. In a discussion with Hawtrey at the third meeting of the C.A.P., it was maintained that:

‘bombing, generally speaking, is carried out to a strategic plan. Pilots have certain targets allotted to them to attack and possibly, secondary ones in case they fail to reach the primary ones’.

Consequently, deliberate bombing was taken to imply:

‘that the existence, exact location, layout and purpose of the installation is known to the enemy [and] that he [has] planned all the details of attack, and briefed the participating bomber crews accordingly’.

This theorising of the approach to a target emphasized that enemy aircrew would possess a certain degree of embodied knowledge about both the target and its local surroundings; indeed, it was highlighted how enemy aircrews not only utilised intelligence furnished upon them by the superiors, but also knowledge they derived through their past experiences of flying over an area, in order to navigate towards their objectives. In a discussion of intelligence assembled from the interrogation of enemy aircrews, Hawtrey, at the fourth meeting of the C.A.P. highlighted how pilots had access to aerial photographs and plans of the target from which they were able to familiarise themselves with the objective and its surroundings (see Plate 5.2). Furthermore, cartographic material would also aid in shaping the ‘geographical imaginations’ of the bomber body, helping them to navigate through aerial space. Luftwaffe pilots were acknowledged to be provided with three sets of maps: Navigational Long Range (10 miles or more to 1 inch), Navigational Intermediate (4 miles to 1 inch), and Target Maps (including full details of environs – 1 mile or less to 1 inch). These planning devices would enable bomber crews to amass a great deal of geographical knowledge about the visual appearance of their targets, but also wider

529 TNA, HO186/171: Minutes of the Third Meeting of C.A.P., held on 17th Nov 1939.
530 TNA, WORK28/11/8: The Principles and Organization of Static Camouflage, Camouflage Committee, 1944, p.6.
531 For geographical work which has explored the geographies of wayfinding and orientation, see Laurier, E. and Brown, B. 2008: Rotating maps and readers: praxiological aspects of alignment and orientation, Transactions of the Institute of British Geographers, 33(2), pp.201-216.
532 TNA, HO186/171: Minutes of the Fourth Meeting of C.A.P., held 1st Dec 1939.
topographical features and landmarks which they could utilise to help navigate towards and locate their targets.

As the war progressed, the Luftwaffe (as well as the R.A.F.) increasingly began to deploy new technological means of aerial navigation; radio beam navigation was gradually being adopted by Luftwaffe pilots to direct themselves to their targets.\(^{533}\) While camouflage work acknowledged the existence of such technologies, civil camoufleurs were, nevertheless, of the belief that it was the presence of landmarks within close proximity to the target which were the only real means by which an enemy pilot could ascertain their final arrival at the objective;

\(^{533}\) One of the initial systems that the Luftwaffe used for this was called \textit{Knickebein} (translated as ‘Crooked Leg’), which was based on the Lorenz blind-landing system. For further discussions on World War Two German radio beam navigation and British attempts to counter them, see Jones, R.V. 1979: \textit{Most Secret War: British Scientific Intelligence 1939-1945}, Hodder and Stoughton, London.
‘although the attacker may find his way to the neighbourhood of the target by radio or navigational aids, certain outstanding features may act as landmarks and give him much more definite assistance if he is able to see them. Large outstanding landmarks may give a first guide. Minor landmarks or factories adjacent to the target may fix its position within a narrow area’.\(^{534}\)

From accounts provided by the Air Staff, two types of landmark were identified for consideration, each reflecting the different ways they were utilised by Luftwaffe aircrews. The first category was that of ‘navigational’ landmarks, or ‘Class A: Distant Landmarks’, described as ‘all easily recognizable geographical features which are shown in maps together with such artificial ones,…which may be noted in reconnaissance reports’.\(^{535}\) In the case of artificial features, this included:

‘prominent buildings or erection[s] which in the absence of a more pronounced geographical feature might be used as a navigational fix or aid in approaching the target…usually within 10 miles of the target, but might conceivably be at a greater distance’.\(^{536}\)

For instance, at the third meeting of the C.A.P., it was argued that ‘a prominent building such as the Shredded Wheat Factory at Welwyn would prove a good landmark for somebody intent on finding Hatfield’ (see Plate 5.3).\(^{537}\) Furthermore, ‘a building such as a large gasometer might even prove a landmark up to 30 miles distance’.\(^{538}\)

\(^{534}\) TNA, HO191/3: *Camouflage of Vital Factories and Key Points*, MoHS, Section 1, p.1.


\(^{536}\) TNA, HO186/171: *Minutes of the Fourth Meeting of C.A.P., held 1st Dec 1939*.

\(^{537}\) This ‘prominence’ of the Shredded Wheat Factory at Welwyn was initially celebrated when it was first completed in 1926. One commentator described it as the epitome of modern design, as ‘a beautiful structure, looking in the distance as if it had been carved out of white ivory and with innumerable windows sparkling like a diamond in the sunshine’. It is interesting how, over a decade later, this once-celebrated modern building was now being derided as being dangerous to the local area. See Kerr, C.V. 1926: *A New Model Factory, Industrial Welfare*, (May 1926), p.160.

\(^{538}\) TNA, HO186/171: *Minutes of the Third Meeting of C.A.P., held 17th Nov 1939*. 
The second category employed by civil camoufleurs to describe landmarks was that of ‘adjacents’, a term frequently involved to describe ‘features situated close to a vital installation. Their importance is not only that they may assist final location of a target but may also be used as an aiming mark’. 539 ‘Adjacents’ of this nature were sub-divided into two types: firstly, ‘Class B’ or ‘Near Adjacents’, located within 2 miles of the target, which were envisioned as ‘a prominent building or erection which owing to its proximity to the target might narrow down the search’. 540 Secondly, were ‘Class C’ or ‘Sighting Adjacents’, described as:

‘a prominent building or erection sufficiently close to the target to be used to “aim off” in order to bomb the worthwhile target, i.e. if the sights were aimed immediately off the prominent building or erection it would bring the sights on the worthwhile target. This would be within a distance of ¼ of a mile’. 541

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540 TNA, HO186/171: Minutes of the Fourth Meeting of C.A.P., held 1st Dec 1939.
541 TNA, HO186/171: Minutes of the Fourth Meeting of C.A.P., held 1st Dec 1939.
The recognition of each of these different types of landmarks was to be of vital importance to civil camouflage work; direct observations of the landscape would be required to determine which features were likely to aid the bomber body in approaching the target. By doing this, civil camouflage discourses maintained that a clear distinction needed to be made between the two visual-confirmation techniques of recognition and identification, and how these were mapped onto particular bomber bodies, ‘before a rational system of camouflage can be developed’.

5.2.2: Recognition and Identification

Overlapping with the ‘approach and navigation’ was the process of recognising and identifying the target. Although direction-finding through the use of navigational aids would later enhance the capabilities of the bomber body to locate its target, it was initially emphasized that ‘the accuracy of the attack must depend greatly upon visual recognition of the target itself [emphasis added]’. Indeed, it was considered that at this stage of the attack, the bomber body would be systematically scanning the landscape below; as he flew over the landscape, it was contended that:

‘his attention is caught by something which resembles the target or appears striking and unexpected in the general landscape. Then he examines that feature more closely to determine whether it is his target’.

From these visual observations and attentive assessments, the bomber would then make an instantaneous, yet informed decision: if he recognised it as his target, he would proceed to attack it; if it wasn’t, he continued to scan the landscape below.

Interestingly, as part of their investigations into this stage of the attack, camouflage discourses maintained that a clear distinction needed to be made between the two visual-confirmation techniques of recognition and identification, and how these were mapped onto particular bomber bodies, ‘before a rational system of camouflage can be developed’. Within one report on the ‘Camouflage Problem’, it was suggested that:

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542 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 1, p.1.
543 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 3, p.1.
‘there is, for example, the difference between recognition of a friend and identification of a stranger; recognition in this case is instantaneous and unconscious whilst identification is deliberate and critical’.  

Furthermore, it was argued that:

‘personal identification involves the comparison between a photograph and a face, a description and an appearance, an old signature and a new. Recognition is simpler, quicker and more certain than identification’.  

Differentiating these two forms of visual affirmation was of great significance in the camoufleur’s construction of the bomber body, with the visual registers of recognition and identification being associated with different types of aerial observers which possessed their own unique affective capacities and varying degrees of embodied knowledge. For example, recognition, due to its instantaneity, automatic and unconscious nature, was correlated with the body of the ‘experienced’ airman, whereas identification, involving processes of comparison, deliberation and much extended critical reflection, would be the dominant mode of visual verification for the ‘novice’. In line with this, it was argued that:

‘the airman who is familiar with a stretch of country will have an advantage over one traversing it for the first time, reading his maps and working from an imperfect recollection of photographs probably taken in different conditions’.

Although these associations were made, instantaneous recognition of a target was considered to be an extremely rare occurrence, it being argued that it could take up to:

‘20 seconds…depend[ent] on local circumstances at the time. It must be remembered that a bomb aimer has a wide field of view out of which to pick his target; he is also travelling fast and may not be altogether unaffected by the active defence; the light

conditions may [also] be unfavourable. Until he [the bomber] has definitely located his target he cannot begin the aiming run’.

Certainly, it was contended that the visual and affective registers of the bomber body would be greatly affected by external influences. Firstly, based upon knowledge of civilian flying prior to the war, it was felt that that the ‘three dimensional kinaesthetic sensations during the course of a flight, including pitching (nose moving up and down), rolling (wings moving up and down), yawning (aircraft sliding from side to side), acceleration, climb and descent’ would all play their part in ‘unnerving’ the bomber body, and, therefore, disrupt its ability to recognise and identify the target. Moreover, unlike peace-time flying, the bomber body would be confronted by an array of different challenges and dangers, namely the active defences of anti-aircraft guns, flak and fighters, all of which were considered to exacerbate tensions within the bomber body; such a heightened state of emotion was considered to play its part in disrupting the viewing experiences of the bomber body, potentially leading to the misidentification or non-recognition of the target. Combining these different disruptive affects, the raison d’être of camouflage was clear; further ‘delay at this stage may save the target from being bombed’.

5.2.3: The Aiming Run and Attack

The final stage of the bombing mission identified by civil camoufleurs was the aiming run and attack on the objective. During this phase, it was contended that:

‘the pilot is guided onto the true course which must be kept for a specified time to ensure accuracy. This is generally assumed to take 30 seconds, though it is also subject to circumstances of skill’.

Once the target was lined up, the bomber would then proceed on this course until reaching a calculated position at which the bomb aimer would release the payload;

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549 Budd, 2010, p.1012.
'it is obvious that the bomb must be dropped some distance before the bomber reaches the target. For example, if the plane is travelling at 240mph at 10,000ft, the bomb must leave the plane when it is nearly 1⅔ miles short of the target to score a hit’.\textsuperscript{552}

Of all the stages of the bombing mission, the attack run was considered as being the one in which significant variations were to be expected. Certainly, in a memorandum presented to Cave’s Camouflage Committee in February 1942, Sir John Turner, the Air Ministry representative highlighted that:

‘the attacker, when he thinks he sees the target, may make a direct run towards it, drop his bombs, and go away. He may make one or more dummy runs to assure himself of the position of the target. He may circle the target to obtain a better line of approach, especially when up sun or up moon to obtain a glint from painted or smooth surfaces, especially if they are wet…he may [even] carry out his attack on a level keel or put the aircraft in a partial dive…His action[s] will depend on his orders, the visibility, the strength of the active defences and the morale of this crew’.\textsuperscript{553}

While Turner felt that ‘it was dangerous to specify forms of attack in any detail’, intelligence gathered by the Air Staff suggested that four types of air attack were likely to occur. Firstly, was an attack ‘from low level, using cloud cover for approaching and getting away, the attack being delivered from below cloud level, i.e., usually less than 5,000ft’.\textsuperscript{554} In these ‘cloud hopping’ raids, it was argued that ‘the attack may take the form of a shallow dive and a rapid climb to minimise the time spent below the cloud and so the risk from ground defences’.\textsuperscript{555}

The second form of attack was that of ‘leader-led attacks’, a tactic utilised by the Luftwaffe from late 1940 through to 1944.\textsuperscript{556} Predominantly used for night-raids, the ‘leader’ aircraft would locate the target before proceeding to drop incendiary bombs to ‘mark’ the target. A second wave of aircraft would then proceed with ‘the dropping of

\textsuperscript{552} TNA, WORK28/11/8: \textit{The Principles and Organization of Static Camouflage}, Camouflage Committee, 1944, p.7
\textsuperscript{554} TNA, WORK28/11/8: \textit{The Principles and Organization of Static Camouflage}, prepared by the Camouflage Committee, 1944, p.9
\textsuperscript{556} For further information on German Luftwaffe ‘pathfinder’ missions, see Wakefield, K. 1999: \textit{Pfadfinder: Luftwaffe Pathfinder Operations Over Britain}, NPI Media Group, Stroud.
H.E.s [High Explosives] on the fires already started’. 557 The third type of attack which was identified was ‘area bombing’, where

‘a target in an industrial area will probably be attached by inclusion with others…[T]he attack is most likely to be made from high level by day or night, the level being determined by the weather and the enemy’s respect for the local defences. Strong forces are necessary to cause decisive damage’. 558

Finally was ‘deliberate attack at night on an isolated target’. Although this was considered ‘unlikely’, it was nevertheless argued that such an attack would be possible if the target was ‘glaringly conspicuous, defined by an unmistakable landmark or large enough to constitute an area in itself’. 559

Of these four methods of attack, it was argued that civil camoufleurs would be able to provide adequate protection against ‘cloud-hopping’ and ‘leader-led’ attacks. In the case of the former, it was contended cloud cover was not uniform or continuous and that it was breaks in the cloud which permitted the bomber body momentary glances at the landscape from which they would be able to identify the target. Civil camouflage, it was argued, could prevent the bomber body from making the most of these opportunities, forcing the enemy pilot to reveal his aircraft more often than he would like in an attempt to locate his target; emerging from the cloud would increase their vulnerability to more active measures of defence. With ‘leader-led’ attacks, it was felt that civil camouflage could lead to the complete breakdown of a mass aerial attack;

‘individual aircraft [in the second wave] cannot reconnoitre the target themselves but must drop bombs on the run in. If therefore, the leaders are at fault, the raid will be a failure’. 560

557 TNA, HO186/173: Correspondence, J. Dudden, to H. Morrison, dated 1st Dec 1940.
558 TNA, WORK28/11/8: The Principles and Organization of Static Camouflage, Camouflage Committee, 1944, p.9
559 TNA, WORK28/11/8: The Principles and Organization of Static Camouflage, Camouflage Committee, 1944, p.10.
560 TNA, WORK28/11/8: The Principles and Organization of Static Camouflage, Camouflage Committee, 1944, p.9. It should be noted that such a premise underpinned the Air Ministry’s attempts at strategic deception, particularly against night-time attacks, through the implementation of ‘Q sites’, ‘Starfish’ and an array of other methods. See Dobinson, C. 2000: Fields of Deception: Britain’s bombing decoys of the Second World War, Methuen, London.
Concealment against area bombing was considered to be senseless and uneconomical as this would require large areas to be concealed for very little strategic gain; indeed, at the second meeting of the C.A.P., it was considered ‘not practical to conceal London [and other large areas] at any time from hostile airmen’. Finally, camouflage for deliberate night attack was considered to be a highly complex matter which would require investigation (although see Chapter Seven).

5.2.4: Formulating a working agenda

Through the deconstruction of the bombing run, camouflage practitioners were able to not only identify ‘crucial moments’ when civil camouflage would be effective, but were also able to formulate a ‘camouflage range’ for their work. In their Interim Report, the C.A.P. stated that for daylight conditions:

‘we found a general tacit agreement...that the bombing pilot would be not less than 5,000 feet high and three to four miles away from the target at the moment when he is aligning his aircraft to attack...[T]he object of camouflage should be solely to prevent him from recognising his objective at that point. The average cloud ceiling throughout the year is not more than 6,000 feet, and in practice...[it is] considered impossible to conceal a large building effectively from observation from below [3,000 ft] without inordinate expenditure. We assume that a bombing pilot will not be able to make a preliminary reconnaissance at low altitude before commencing his attack.’

Indeed, it was agreed that ‘to camouflage in such a way...is a very good compromise between the various requirements’ and provided a reasonable ‘factor of safety’ when positioned alongside active defences. This ‘camouflage range’ was, therefore, to be maintained throughout the course of the war for daylight conditions and would ultimately shape how camouflage work was undertaken. For night-time conditions, however, a different set of operational parameters would be conceived, these reflecting the different visualities and practices adopted by the ‘nocturnal’ bomber body.

561 TNA, HO186/171: Minutes of the Second Meeting of C.A.P., held on 3rd Nov 1939.
563 TNA, HO186/395: Minutes of the First Meeting of the Camouflage (Policy and Organisation) Committee held on 7th March 1940.
To sum up, this knowledge of the bombing experience, determined through interactions with Air Ministry representatives, provided camoufleurs with an effective working agenda. In the first instance, concealment could be used to prevent successful navigation to the target, thereby confusing and frustrating the bomber into making a mistake. Secondly, concealment could interfere with the processes of recognition and identification, ‘increas[ing] the time for which the attacker must continue his search before he can recognise his target or some adjacent feature in close relation to it’.\textsuperscript{564} Finally, it was contended that camouflage could significantly stall the aiming run; ‘this delay’, it was argued;

‘increases the chance that guns and fighters may destroy him before he can deliver his attack accurately. It may lead to the attack being delivered more or less at random and therefore being far less effective than if accurately concentrated at exactly the right point’.\textsuperscript{565}

It was around these objectives that civil camouflage was to operate.

5.3: Aerial Tactics

While the accumulation of knowledge about the bombing run was accumulated relatively early in the conflict, civil camoufleurs were acutely aware of the need to continually reassess and acquire knowledge about the latest Luftwaffe tactics; at the second meeting of the C.A.P., for example, it was argued that ‘successful concealment demands flexibility in applying camouflagin[1]g policy, which must be always closely related to the latest tactics of the enemy air forces’.\textsuperscript{566} Having an Air Ministry representative attend committee meetings was, therefore, of paramount importance; knowledge of Luftwaffe tactics could be utilised to determine particularly ‘vulnerable’ locations or the scale of treatment which should be applied. As a general rule, it was asserted that attacks conducted at high-level meant features would receive simpler treatments than those likely to be attacked at lower levels where more elaborate schemes would be required. Understanding this tactical dimension was, therefore,

\textsuperscript{564} Cave-Browne-Cave, 1945, p.262.
\textsuperscript{565} Cave-Browne-Cave, 1945, p.261.
\textsuperscript{566} TNA, HO186/1985: Camouflage Policy: Note by the Air Staff, dated 5\textsuperscript{th} Jan 1942.
critical to ensuring that valuable materials and labour were directed to those sites where camouflage was considered to be most effective.

This continual assessment of tactical knowledge would ultimately transform the temporalities and spatialities of camouflage praxis throughout the war. For example, in discussions at a meeting between MoHS and Air Ministry representatives in February 1940, it was suggested that the resistance presented by active defences could inevitably force the Luftwaffe to bomb at night:

‘the present view of the Air Staff is that, on the whole, the strength of defence both in this country and in Germany is forcing the bomber higher. To some extent this will reduce the chances of precision bombing. The defence may even create a position in which night attack rather than day attack may be adopted’.\footnote{567 TNA, HO186/395: Notes of a meeting between Lord Swinton, Air Marshal Peirse, Air Vice-Marshal Peck, Sir Henry Tizard and Wilfred Eady, dated 9th Feb 1940.}

Such a situation clearly emerged following the events of the Blitz in late-1940, a point raised in a report from April 1941 by the Mabane Committee on Concealment and Deception, which commented that:

‘the situation has changed drastically since last autumn. A very large proportion of the damage which has been caused is done at night under conditions in which raiders do not need to see the ground. The danger of air attack by day against which camouflage was primarily directed has receded and it is necessary to determine whether we are devoting too much of our resources to this form of protection’.\footnote{568 TNA, HO186/975: Paper 1: Ministry of Home Security: Committee on Concealment and Deception, c. Apr 1941.}

With 90% of aerial attacks now taking place at night,\footnote{569 TNA, HO186/975: Committee on Concealment and Deception, T.R. Cave-Browne-Cave, to P. James, dated 30th Apr 1941.} there was the progressive transition towards focusing camouflage efforts primarily on night-time conditions; this would transform the temporal practice of camouflage to a different set of operational conditions.
In addition to altering the temporal relevance of camouflage, assessments of Luftwaffe tactics also transformed the geographical performance of civil camouflage work. In 1942, insights from the Air Staff suggested that increased aerial superiority over the British mainland were forcing Luftwaffe bombers into concentrating their attacks on coastal areas in order to avoid greater losses. In line with this, it was proposed that civil camouflage work should be focused upon these areas and be retreated from ‘less
vulnerable’ locations (except for ‘special cases’). Coinciding with inherent spatial concentrations of aerial attacks, civil camouflageurs divided the British mainland into 3 areas based on a line connecting St David’s Head with Bletchley, Goole, Falkirk, Dingwell and Strathey Point (see Figure 5.1); while the Civil Defence regions (see previous chapter) continued to determine the organisation of camouflage work at the C.D.C.E., this new tri-regional map would determine the levels of work permitted to be undertaken. In the ‘Coastal Area’ (Priority 1), an area ‘susceptible to sudden attacks giving little time for defensive measures to operate’, factories of MA, MB and MC classification were allowed to be concealed, whereas in the region known as the ‘Coastal Strip’ (Priority 2), camouflage was to be restricted to ‘MA classification on which nothing better than “Night” was permitted’. Finally, for the ‘Inland Area’, it was considered that as ample warning of attack was possible, no camouflage was permitted except in very special cases’.

It is clear that these insights contributed to the significant transformation of the spatial practice of camouflage during this time period; through a shifting geography of vulnerability, produced by a more effective network of active defences, elaborate forms of camouflage work would now be concentrated in regions of ‘heavy exposure’, whereas low priority areas would receive little or no camouflage treatment.

5.4: Further reflections on the tactical situation: the reports of the Air Warfare Analysis Section (A.W.A.S.)

In addition to deriving intelligence from the Air Staff, the Camouflage Directorate began engaging with Air Warfare Analysis Reports towards the end of 1942 to further enhance their understandings of Luftwaffe tactics. Covering a period from January 1942, through to the end of 1944, these reports, representing a systematic attempt to record enemy bombing activities, were the product of the Air Warfare Analysis Section

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570 TNA, WORK28/11/8: The Principles and Organization of Static Camouflage, Camouflage Committee, 1944, p.15. The classifications of MA, MB and MC correspond with gradings given by the Key Points Intelligence Branch. An MA classification was for a factory producing materials deemed to be of ‘exceptional importance’ and for which ‘no alternative source was available’. Factories of category MB were also ‘exceptional’ but with alternative sites of production were also available. MC’s were of ‘lesser importance’ but again with ‘no alternatives’. See TNA, HO186/1976: Definition of a Key Point and Degree of Grading, O.G. Villiers (Director of the K.P.I.B.), dated 31st Oct 1942.

571 TNA, WORK28/11/8: The Principles and Organization of Static Camouflage, Camouflage Committee, 1944, p.15
(A.W.A.S.), headed by Dr Leslie Cunningham, and controlled by the Ministry of Aircraft Production. Collated from information derived from the Observer Corps nationwide network of watching posts, these reports gave details of every attack to take place during this period, the nature of the weather conditions as well as of the attack itself (altitude, type of aircraft, etc).

As well as providing this information, of significance to civil camoufleurs was the inclusion of details about the types of structures being attacked (see Appendix 3). For fighter-bombers, for example, it was noted that their ‘favourite targets’ were gasworks, power stations, railway targets and service stations on the South coast because ‘they can approach the coast at zero feet with little fear of interception. They have, in fact, been over most of their targets before warning could be given’. On the other hand, long-range, twin-engine bombers were recorded to have ‘concentrated mainly on factories, railway targets and aerodromes’, predominantly along the eastern and southern parts of the U.K. In some cases, the A.W.A.S. reported that bombers were also progressing as far west as places like Manchester, Hereford and Birmingham. Unlike fighter-bombers, they would:

‘either (i)…cross the North Sea at sea level and then fly to the target at tree-top level, or (ii)…at height in cloud, or just below or above cloud cover and, after landfall….continue on a predetermined course by stopwatch till within five minutes flying time of the target, when the E/A [Enemy Aircraft] emerges from cloud cover for its run-up’.

For civil camoufleurs, these analyses of bomber practices by the A.W.A.S. upon the British mainland facilitated an opportunity to reflect upon and re-think their approaches to camouflage. From mid-1942 onwards, regular A.W.A.S. reports would be sent to

572 Dr Leslie Bennet Cragie Cunningham (1895-1946) was a graduate from Edinburgh University where he studied Mathematics, Natural Philosophy and Chemistry. During World War One, he served with the Royal Engineers, before returning to complete his studies at Edinburgh in 1920. He later became Education Officer with the R.A.F. as well as engaging in applied mathematical research for them. In 1930, he was awarded a PhD for his research which explored bomb trajectories.
Professor William Curtis (Scientific Advisor to the Directorate) for further interpretation. Upon receipt of A.W.A.S. reports, Curtis would review each of the cases which had been targeted, and incorporating insights into the types of camouflage found at each of these sites, he would give his assessment as to whether possible revisions needed to be made to the camouflage programme. In April 1943, Curtis produced a summative report which represented:

‘an attempt…to guess the reason for the behaviour of the E/A on a particular raid, and also very briefly to summarise as far as possible the relationship of camouflage or the possibilities of camouflage to the effectiveness of the raids and the other defensive measures used’. 576

Reflecting upon the findings of the A.W.A.S, Curtis felt that because bombing attacks were increasingly being delivered from low-level and, as a result, enemy aircraft were not being detected until the very moment of attack, this was a justifiable reason for the continuance of camouflage as a means of civil defence; although conceived as a passive means of defence, he argued that camouflage would play a more active role when other modes of defence were likely to be delayed or caught unaware by such low-level, undetectable attacks.

Plate 5.4: Three maps from April 1943 illustrating the spatial location of targets attacked under various conditions: by sunlight (left), diffused light (centre) and moonlight (right).
(Source: TNA, HO186/1990: M.H.S. Report GN.36)

In addition to this, the A.W.A.S. reports served to reinforce established understandings about the nature and spatialities of Luftwaffe bombing tactics and the implications of this upon camouflage practice. Within his report, Curtis plotted enemy bombing patterns onto 3 maps of the British mainland, each representing attacks carried out in different lighting conditions; raids by sunlight, by diffused light [cloudy or overcast days] and by moonlight (see Plate 5.4). Through these, Curtis was able to tease out several conclusions. Firstly, this mapping out of aerial attacks served to further justify the division of the British mainland into the three priority regions in relation to ‘the Line’. Secondly, they provided a validation for the continuance of day-time camouflage in certain areas, particularly at a time when labour resources and materials were increasingly being regulated. But perhaps most importantly was that these reports presented an opportunity to review and evaluate existing knowledge on the bombing run, and more specifically, the approach to the target; in a letter to Curtis, dated 22nd January 1943, Cave expressed the desire that information be compiled in the report:

‘about the actual methods by which the enemy found and approached the targets. We are primarily anxious to determine how far he depends upon land marks and also upon the appearance of the target itself’. 577

For Cave, the presence of landmarks was of particular concern, and in February 1943, he had written directly to A.W.A.S. expressing his ‘particular anxious[ness] to ascertain what landmarks or geographical aids to navigation are used by enemy aircraft to confirm their position during attack’. 578 Following subsequent discussions with the A.W.A.S. and the subsequent analysis of their reports, Curtis concluded that:

‘in the majority of the raids examined, landmarks would not appear to have been much used though the position of many of the targets would be very easy to identify [if] situated on headlands or estuaries, or marked by piers, lighthouses, martello towers, etc. In a few cases, however, landmarks…definitely appear to have been of use in setting a course for the target e.g. Sandown Castle in the raid on Betteshanger Colliery, the

577 TNA, HO186/1990: Correspondence, T.R. Cave-Brown-Cave, to W.E. Curtis, dated 22nd Jan 1943.
578 TNA, HO186/1990: Correspondence, T.R. Cave-Browne-Cave, to A.W.A.S., 23rd Feb 1943.
railways lines in the raid on Totnes, the Stoke-in-Teignhead Valley in the raid on Teignmouth’.  

In Cave’s opinion, these various conclusions – of the increasing use of low-level raids, the spatial concentration of attacks on the coast, and the mixed utilisation of landmarks – signalled a need to re-appraise methods of camouflage treatment. Concealment against raids at 1,000ft would require different design parameters from those which had been set at the ‘official camouflage range’ at 5,000ft; in a letter dated 20th May 1943, Cave argued that:

‘we ought now to provide for concealment against an attack which comes in comparatively low and at very high speed. In such an attack, the pilot is not able to get any vision of the plan view of a target until he is far too late to attack it without making another round. Against such an attack, we ought…to conceal the elevation rather than the plan of the target…. [Camouflage should] be designed to produce temporary confusion in a hurried approach at high speed, rather than in the more deliberate search which can be made in approaching at high altitude in daylight, or in certain conditions at night’.  

Cave, therefore, proposed to Curtis that:

‘our concealment should pay special attention to the low oblique view and should aim at causing the pilot to hesitate in the very few moments available before he reaches the target’.  

Indeed, such an assertion was reinforced by the Operational Research Station, Bomber Command, who maintained that:

580 TNA, HO186/1990: Correspondence, T.R. Cave-Browne-Cave, to L.B.C. Cunningham, dated 20th May 1943.  
‘in the case of attacks against lightly defended targets in this country….the Hun would do well to adopt low flying tactics to defeat fighter interception and [we] would suggest that camouflage against such attacks form an important countermeasure’.

Despite this, Cave held reservations about whether the Air Staff would accept such a modification to camouflage policy; writing to Dr Basil Dickens at the Operational Research Station, he felt that:

‘there may be some difficulty in getting Air Staff to change their present general policy, [that] concealment should be for night condition…I think it is clear that we shall have to give most careful consideration to the daylight concealment of isolated targets and that this concealment should be based on a height of 1,000ft at a distance of two or perhaps three miles in bad visibility’.

The response from the Air Staff was as predicted; ‘we feel that there is no reason at the moment to alter the basis upon which we assess factories for camouflage’.

Although no changes were made to camouflage policy, the examination of A.W.A.S reports, as well as regular interactions with the Air Staff, reveal a continuing desire to ensure that ‘successful’ civil camouflage was ‘always closely related to the latest tactics of the enemy air force’. Indeed, such knowledges enabled an ever-evolving geography of vulnerability to aerial attack to be mapped onto the British mainland, with this subsequently being used to inform decisions as to where and to what extent civil camouflage was to be enacted in the landscape. In many ways, this strong association between camouflage practice and knowledge about bombing practices illustrated how grounded and aerial practices were complexly entwined.

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582 TNA, HO186/1990: Correspondence, B.G. Dickins, to T.R. Cave-Browne-Cave, dated 24th Oct 1942. Bomber Command’s Operational Research Station was composed primarily of civilian scientists who were employed to undertake technological and operational research which would aid the performance of the R.A.F.’s bombing campaign. For further details see, Wakelam, R.T. 2009: The Science of Bombing: Operational Research in RAF Bomber Command, University of Toronto Press, Toronto.
583 TNA, HO186/1990: Correspondence, T.R. Cave-Browne-Cave, to B.G. Dickins, dated 27th Oct 1942.
584 TNA, HO186/1990: Correspondence, Wng Cmdr A.J. Banham, to T.R. Cave-Browne-Cave, dated 3rd Nov 1942.
585 Cave-Browne-Cave, 1945, p.262.
5.5: The bomber eye and the viewing experience

Having conducted an examination of the construction of knowledge relating to the practices of bombing, I want to now shift attention to the attempts of civil camoufleurs to gather intelligence into the specific visual experiences of the bomber body. While investigations into the bombing run and the tactics being utilised gave an indication of the positionality and proximity of the bomber body in relation to the target, it was argued that more intricate understandings needed to be developed about the actual viewing experiences of the bomber body. This would require further disassembling of the bomber body itself, with efforts being concentrated on how the human body visually interpreted and comprehend the spaces around it, the physiological limitations of the human eye and how these could potentially be exploited, and the effects of various atmospheric conditions in shaping the visual experience.

With an emphasis on deceiving the eyes of the bomber pilot, it was clear that detailed understandings of the physiological capabilities of the human eye were of paramount importance. While camouflage against aerial reconnaissance required a camoufleur to simply interact with a set of aerial photographs and think about how camouflage could be utilised to manipulate the image taken, concealment against direct observation from the air required the interrogation of the sensory make-up of the bomber body. Through engagements with ‘experts’ at the MoHS’s Research and Experiments Department, civil camoufleurs were able to generate such insights into the specific functionings of the eye. In one summative report, Dr T.A. Littlefield provided a detailed account of the separate roles served by the cornea, lens, iris, the fovea and the retina in shaping visual interpretation. Insights into the role of ‘rods’ and ‘cones’ and how these shaped the capabilities of the human body to perceive shapes, forms and objects in varying conditions of light were also given; for instance, civil camoufleurs were informed that:

> the power of the eye to distinguish detail is, by daylight, many times greater at the centre than in other parts of the field of view. The centre of the retina of the eye has a

586 TNA, HO196/31: R.E.N.537: The Mechanism of Vision, T.A. Littlefield, dated 10th July 1945. It should be noted that while this report was compiled a couple of months after the conflict ended, its purpose was to act as a record of all optical research undertaken throughout the war. Indeed, it was one of several summative reports produced by Littlefield on scientific research into optics; this included the development of new optical technologies, the visual simulation practices of the camouflage viewing room, and of the effects of infra-red upon camouflage practice.
concentration of [photoreceptor] cells [known as cones] which in daylight give the greatest power of perception when an observer looks directly at an object’.\footnote{587 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 3, p.1.}

As a result, it was noted that:

‘when an object catches our attention and we concentrate our critical gaze directly upon it, we bring it into the centre of our field of view, where our power of recognition is many times greater than elsewhere’.\footnote{588 Cave-Browne-Cave, 1945, p.263.}

Unsurprisingly, for clear daylight conditions, it was argued that the physiological functionings of the aerial observer would not be too dissimilar from the observer on the ground; the bomber body would be able to effectively scan and interpret the landscape with the most efficient part of their eyes, the centre. It was only with the onset of darkness that it was noted that the human eye would operate through a different set of physiological processes; this is explored in Chapter Seven.

While the physiological functionings of the aerial observer were considered to be ‘normal’ by comparison with the ground observer, the visual operationalities of the bomber body would still be mediated by a multitude of external influences. Firstly, the effects of movement and distance would transform the capabilities of bomber body to discern features in the landscape. Indeed, comparisons between the experiences of the aerial body and the ‘panoramic perception’ of the car driver and railway commuter were made:

‘every passenger in a peace-time express train…is familiar with the difficulty of seeing objects at close range; many a passenger, indeed, has been grateful to the manufacturers of patent medicines, who used to tell him how far he was from London, for placing their hoardings at a reasonable and readable distance from the railway track. Similarly the driver of a motor vehicle consciously or unconsciously focuses his eyes further ahead as he increases his speed. So from the air, although an observer can hold an object in his
view as the range diminishes, initial identification is facilitated rather than impeded by moderate distance'.

Understanding the effects of both motion and distance upon the human eye’s capacity to discern details within the landscape was, therefore, of great interest to civil camouflageurs. Through their interactions with optical scientists at the R&E Department, it was determined that

‘a man with normal vision can discern a well illuminated object which subtends an angle of 1 minute at his eye; in other words he can just see an object which is 1in. across at 100yd., or 1ft.6in. at 1 mile or 4ft.6in. at 3 miles: the object must offer a strong contrast to its background’. Such a finding was considered to have profound implications on the practice of camouflage; indeed, the effects of both speed and distance upon the visual capabilities of the bomber body were considered to operate ‘favourably in reducing the amount of detail required in the completion of a camouflage design’. Fine detail in camouflage schemes was unnecessary; instead, much larger scale patterns could be applied, mitigating the need for highly-complex and elaborately detailed designs.

A secondary influence that was considered of importance for daylight aerial observations was the effect of atmospheric conditions, such as haze and cloud, upon the visual faculties of the bomber body; indeed, Littlefield argued that ‘vision from aircraft cannot be adequately considered without reference to haze’. While it was maintained that camouflage should be designed ‘to protect against the most vulnerable condition – clear sunny days’, it was recognised that ‘over the British Isles there is usually an

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589 TNA, HO191/8: Summary Report No.3: Camouflage Research, Part I: The Camouflage Problem, undated. For wider discussions on the mobilities of the car and the train and the transformation of the visual experience, see Merriman, 2007; Schivelbusch, 1986 [1977].
atmospheric haze extending up to one or two thousand feet which lowers visibility’. It was, therefore, contended that civil camoufleurs should attempt to understand how the atmosphere would affect the capabilities of the bomber body to see, interact and experience the landscape below.

One of the initial steps taken was an engagement with the findings of a report entitled *The frequency at which Aimed Bombing can be carried out during Day Time*, produced by the Meteorological Office in August 1937. Within this report, data on cloud density and frequency gathered from ‘satellite’ weather stations around the U.K. had been collated together and subsequently been ‘worked up in such a way as to be applicable to the bombing problem’. Through the Met Office’s systematic collection and representation of climatological data, civil camoufleurs were able to determine the ‘frequency of conditions favourable for accurate bombing’ for all four seasons, as well as for varying heights of attack (3,000ft, 5,000ft, 8,000ft and 10,000ft). Within the report, cloud cover datasets had been broken down to represent different geographical spaces; one table covered ‘rural areas’, a second focused on the South and East Coast (‘where attacks were perceived to be most frequent’), another on ‘Areas of Maximum Smokiness’, and one even on the specific locations of Southampton and Portsmouth. What emerged from these tables, then, was a distinct ‘geography of cloudiness’, with certain meteorological conditions being ‘mapped’ onto specific topographical spaces and terrains around the British mainland. For instance, annual means for conditions favourable for bombing were much higher in locations along the South and East coast (39-55%) than in Areas of Maximum Smokiness (25-31%). Based upon these percentage frequencies, it was determined that coastal areas were potentially more

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595 In his book *State, Science and the Skies*, Whitehead has explored how during the Second World War, the ‘bomber bodies’ of the RAF’s Bomber Command took a great interest in meteorology, in part to examine how human-induced pollution contributed to poor visibility at RAF airfields and its subsequent effects upon operational performance. In this sense, fog and haze was seen as something which could significantly inhibit the mobilities of the ‘bomber body’. See Whitehead, 2009, p.139.
596 TNA, HO186/669: *The Frequency with which Aimed Bombing can be carried out during Day Time, Meteorological Office*, dated Aug 1937.
597 The report suggests that data had been collected at these observation posts at 7am, 1pm and 6pm daily.
598 TNA, HO186/669: *The Frequency with which Aimed Bombing can be carried out during Day Time, Meteorological Office*, dated Aug 1937. The term ‘Areas of Maximum Smokiness’ was used to denote locations considered to be ‘very smoky in central areas. Smokiest of all, London and Manchester. Next smokiest, Newcastle and Leeds. Somewhat less smoky, Birmingham, Liverpool, Sheffield’. The figures utilised in the report, however, were derived solely from examinations of London and Manchester. No criteria were given to describe how levels of ‘smokiness’ were measured or categorised.
vulnerable to accurate and aimed attacks due to clearer visibility than urban conglomerations (a geography of vulnerability later re-affirmed by A.W.A.S. reports). In this sense, cloud cover could potentially be even utilised to enhance the effectiveness of camouflage in urban areas through further obscuring the visual experiences of the bomber body.  

Although these insights enabled civil camoufleurs to determine the potential frequency of aerial attacks upon different geographical localities, the report failed to give a real sense of how the bomber’s gaze would be disrupted by atmospheric conditions. As civil camoufleurs began to increase their knowledge of the aerial experience through observational flights made throughout 1939 and 1940, it soon became clear that meteorological conditions significantly affected the transmission of light, and ultimately how the bomber body would visually assess the ground. In the first instance, it was contended that:

‘a surface is seen by the light which comes from it to the observer’s eye. The light has originated from external sources [the Sun, Moon or flares] and after meeting the surface has been reflected in various definite ways…It is this reflected or transmitted light which reaches the eye of the observer and enables him to “see” the surface’.  

Clouds and mist, however, could significantly affect the ‘direct’ flow of light which enabled such surfaces to be interpreted by the human eye; their presence could serve to either obscure the light completely, or transform it into ‘diffused light’. Under ‘diffused light’, the earth’s surfaces would be illuminated in different ways to direct light;

‘diffused light throws no shadow and reduces the blackness of shadows thrown by directed light. When diffused light is uniform over the whole sky, a horizontal surface, which receives light from the whole sky, will get twice as much light as will an equal surface which stands vertical and therefore can only get light from half the hemisphere of the sky’.  

At the same time, it was argued that:

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599 For further historical discussions on the effects of smoke and visual acuity, see Otter, 2008, p.84.
600 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 3, p.2.
601 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 3, p.2.
‘although clouds and mist in front of the sun or moon may greatly reduce the strength of the direct light the presence of cloud in the rest of the sky may make an important addition and build up a greater total illumination than would have been derived from the direct source alone in a cloudless sky’. 602

It was important, therefore, that camoufleurs acknowledge that clouds, and more broadly speaking, meteorological conditions played a dynamic role in ‘exposing’ the landscape in different ways to the bomber body; they could not only inhibit the movement of the enemy observer, but also transform that body’s ability to sense and engage with the topographical landscape. Through the production of diffused light, cloud cover could also reduce the visual presence of shadows which demarcated buildings, as well as increase the general illumination of horizontal surfaces; clouds, therefore, could transform the visual consumption of the landscape by the bomber body.

5.6: Surveying the landscape

With knowledge of the bombing process and of the latest tactics being deployed by enemy pilots, civil camoufleurs believed that it was now important to understand how these ‘bomber bodies’ interpreted the British landscape from the air. From their initial investigations into bombing technique, camoufleurs were now able to comprehend the particular viewing positions and perspectives of the bomber body in relation to the ground, as well as establish the importance of natural and artificial landmarks in wayfinding. However, this intelligence gave no indication as to exact locations and features in the landscape being utilised by enemy aircrews, nor the ways in which industrial installations were ‘conspicuous’ when viewed from the air. In order to address this, it was argued at an early stage in the establishment of the civil camouflage programme that aerial surveying, both by ‘expert’ pilots and by camoufleurs, should be undertaken. In July 1936, before camouflage work officially commenced, civil defence planners were already suggesting that:

‘it is worth while flying over the object at the minimum height at which the enemy is expected, in order to make a special note of the features which betrays its position both

602 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 3, p.2.
as regards outline and colour, its proximity to any obvious landmarks and the tone and nature of its surroundings.  

Later, it was suggested that aerial surveying should be an integral part of the camouflage process, enabling a camoufleur to not only comprehend how a ‘prominent’ industrial feature appeared in the landscape, but also for ‘judg[ing] the effectiveness of finished designs, and at a later stage, to determine whether deterioration has reached such a stage as to prejudice effective concealment’. Aerial observation would, therefore, play a central role in the designing and maintenance of a camouflage scheme, an aspect which will become more apparent throughout the subsequent chapters.

For the time being, however, I want to focus on the deployment of aerial surveying to enable the compilation of a list of prominent landmarks which it was believed would be employed by the bomber body. Drawing upon the experience of R.A.F. bomber crews, this process sought to develop a systematic catalogue of conspicuous landmarks which could potentially require camouflage treatment. In addition to this, I also want to focus on the process of cementing aerial reconnaissance as a means of intelligence-gathering by civil camoufleurs themselves. It was not enough to simply ‘know your enemy’; one had to become ‘aerially-experienced’, to understand what it was like to perform as a bomber body in order to become a successful camoufleur.

5.6.1: Access to R.A.F. operational crews

Earlier in the chapter, it was discussed how the presence of an Air Ministry representative on various camouflage committee was seen to be beneficial for the production of knowledge about the bomber experience. In addition to this, such connections enabled camouflage practitioners the opportunity to interact with active R.A.F. pilots. This ability to converse with R.A.F. aircrews was particularly significant, for it enabled camoufleurs to obtain vital and up-to-date operational knowledge about which topographical features in the landscape would be utilised by bomber crews to navigate towards and identify their targets. At the fifth meeting of the C.A.P. held on 15th December 1939, the Panel conveyed their desire:

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603 TNA, AIR2/2081: Air Raid Precautions: Camouflage, W. Garforth, ARP Dept., dated 31st July 1936
604 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 4, p.11.
‘to obtain a list of prominent [aiding marks] in this country which are considered to be landmarks so outstanding in character, and so well known to pilots and navigators, that they…are likely to be of such use to enemy aircraft’.  

At the subsequent meeting on the 12th January 1940, Hawtrey declared that the Air Staff:

‘would be…willing to circularise all Commands asking for a list of any artificial structures within Category A [Distant Landmarks] which enemy pilots might be expected to use as an aid to navigation’.

Plate 5.5: Oblique aerial image taken over Queensferry, Fife, Scotland, showing the prominence of the Forth Railway Bridge.  
(Source: RCAHMS, ID 006-003-000-225-C).

At the start of February 1940, Bomber, Fighter and Coastal Command stations around the U.K. were notified by the Air Ministry that they were to assess the landscape in the immediate vicinity of their airfields and record any ‘prominent landmarks’ which could be utilised by enemy aircrew. For the following two months, a continuous stream of observational reports was received, with a final ‘List of Landmarks submitted by RAF

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605 TNA, AIR2/2081: Correspondence, Wng Cmndr J. Silvester, to Air Chief Marshal Sir E.R. Ludlow-Hewitt, dated 29th Jan 1940. See also TNA, HO186/171: Minutes of the Fifth Meeting of C.A.P., held on 15th Dec 1939.

606 TNA, HO186/171: Minutes of the Sixth Meeting of C.A.P., held on 12th Jan 1940.
stations’ being amalgamated by early June. Common features to appear within this list were water towers, wireless stations, white horses and chalk figures, reservoirs, iron, steel and cement works, gas holders and glass-houses. In addition to these, more ‘unique’ features were also identified; the Forth Bridge (Plate 5.5), Butlin’s holiday camp at Skegness, Withernsea Lighthouse and the Serpentine in London, to name a few examples, were all highlighted as being ‘prominent landmarks’ in the landscape. Where camouflage was deemed to be possible, these landmarks would receive treatment under Defence Regulation 50.

It should be noted that following the completion of this initial round of systematic aerial surveys, civil camoufleurs continued to approach R.A.F. aircrews on an irregular basis to assess the ‘prominence’ of landmarks; in some cases, this was in response to concerns about certain features raised by members of the public. In early July 1940, for example, the Ministry of Home Security received a letter from a concerned citizen about Blackpool Tower which he considered to be not only

‘a menace to the town and to all the Fylde district…[but also] to the whole of the North Western area of Lancashire. It is a direct landmark for the enemy for at least 50 miles in any direction and in my opinion should be seen to without delay’.608

Indeed, it was even proposed at a meeting of the local Fleetwood Highways Committee that the tower ‘be dismantled for the duration of the war’.609 A request was, therefore, made for visual assessment of the tower to be undertaken by a local R.A.F. station in order to determine its prominence in the landscape. Ultimately, the matter was settled on the 16th July, when it was represented that ‘it will not be necessary to demolish the tower, as there are very much more distinct aids to navigation on the Coast’.610

Coinciding with this programme of ‘exploratory surveys’, civil camoufleurs also sought to utilise the opportunity to interact with R.A.F. bomber crews to assess the effectiveness of camouflage schemes which had hitherto been devised; as their

607 TNA, HO186/1978: List of Landmarks submitted by RAF stations, dated 6th June 1940.
608 TNA, AIR2/2081: Correspondence, F. Robinson, to M. McDonald, dated 26th June 1940; TNA, AIR2/2081: Correspondence, F. Robinson, to MoHS, dated 9th July 1940.
609 TNA, AIR2/2081: Blackpool Tower to Go? newspaper extract, unknown source.
610 TNA, AIR2/2081: Correspondence, Squadron Leader J.H. Harris, to L.M. Baker, dated 16th July 1940.
resources and facilities for flying were limited, it was felt that an engagement with ‘experienced’ aircrews would enable the reviewing of the operational value of camouflage. In February 1940, Air Vice-Marshal Richard Peck, Assistant Chief of the Air Staff, wrote a letter on the behalf of the Camouflage (Policy and Organisation) Committee, to the Commanding-in-Chief of Bomber Command, Sir Edgar Ludlow-Hewitt, in which he expressed the desire of the Committee:

‘to learn the lessons which are derived from the practical experience gained in flying over Great Britain and Germany in regard to the measures of camouflage which have been adopted in both countries’.  

As part of this, Peck wanted to:

‘form an impression…as to the degree in which [camouflage] is achieved in the country by present methods…at any height lower than 5,000 feet;…[the] extent [to which] the measures of camouflage which have been adopted can be said to have increased the safety of the objectives they are intended to safeguard; [and] whether any light can be thrown on the measures of camouflage which have been adopted by the enemy, and the extent to which they may be regarded as effective…it will be greatly appreciated if a symposium of the views of aircraft crews with this experience might be collated’. 

Subsequently, throughout March 1940, assessments on the successfulness of camouflage in particular regions accompanied information on ‘prominent landmarks’ in reports from Bomber Command units. In one response from the Air Vice-Marshal commanding No.3 Group, it was asserted that:

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611 The Camouflage (Policy and Organisation) Committee was a short-lived committee that existed for only a couple of months in early 1940 and was responsible for reviewing camouflage policy ‘from time to time’. It operated alongside the C.A.P. and was effectively dissolved with the formation of Stradling’s Camouflage Committee in mid-1940. Very little archival material survives pertaining to its functioning, although the Committee’s discussions on the value of ‘baffle lighting’ appear in Chapter Seven.

612 TNA, HO186/171: Correspondence, Air Vice-Marshal R.H. Peck, to The Air Officer Commanding-in-Chief, Bomber Command HQ, dated 13th Feb 1940.

613 TNA, HO186/171: Correspondence, Air Vice-Marshal R.H. Peck, to The Air Officer Commanding-in-Chief, Bomber Command HQ, dated 13th Feb 1940.
in general the camouflaging of buildings has achieved its aim in that at heights of 5,000ft and above, such buildings are more difficult to locate whereas uncamouflaged buildings such as water towers and hangers can be easily picked out. 614

This view was further reinforced by observations from No.4 Group;

‘generally speaking camouflage schemes [for] civil and military [features] are well conceived and from any height above 5,000ft should be difficult to recognise by enemy pilots who presumably will either be subjected to A.A. fire or our own fighter opposition when in the vicinity of either type of target’. 615

At the same time, there were also contradictions in terms of the findings; Squadron Leader White of No.5 Group remarked that although camouflaging was ‘generally good’ and facilitated ‘an increased difficulty in pin pointing and identifying factories…on the other hand, over camouflage in some cases has made…building[s] conspicuous’. 616 These sentiments were mirrored by Wing Commander Swain of No.6 Group who noted that:

‘among the classes of target which some crews consider to be particularly noticeable in spite of attempted camouflage are…(a) Industrial and military targets which include in their layout unpainted concrete roads, especially when on a rectangular plan; (b) Aerodromes in which the surface is all the same tone; (c) Hangers with serrated roofs; (d) Industrial targets constructed on a compact plan; (e) Industrial targets in which the camouflage has not extended beyond the actual buildings, i.e. in which the camouflage has not been designed to make the target merge into its surroundings; (f) Cooling towers.’ 617

614 TNA, HO186/171: Correspondence: Effect of Camouflage on Bombing, Wng Cmndr M.D. Ommanney (for Air Vice-Marshal Commanding No.3 Group), to H.Q. Bomber Command, dated 9th Mar 1940.
615 TNA, HO186/171: Correspondence: Effect of Camouflage on Bombing, Wn Cmndr F. Wright (for Air Commodore Commanding No.4 Group), to H.Q. Bomber Command, dated 12th Mar 1940.
616 TNA, HO186/171: Correspondence, Sqn Ldr P.L.M. White (for Air Marshal Commanding No.5 Group), to H.Q. Bomber Command, dated 7th Mar 1940.
617 TNA, HO186/171: Correspondence, Wng Cmndr F.R.D. Swain (for Air Commodore, Commanding No.6 Group), to H.Q. Bomber Command, dated 12th Mar 1940.
Reports from No.2 Group were even more scathing, with attention being drawn to four ‘noticeably badly treated premises’ – Cardington balloon sheds, Coltishall aerodrome and railway sheds at Swindon and Wolverton, – where it was argued that:

‘as a whole existing camouflage is not very effective. Too little attention has been paid to harmonising colour schemes with the immediate natural surroundings…[T]here are many instances of factories which before camouflage…were inconspicuous because their exterior was weathered and smoke blackened exactly as other buildings in the district but [which] now stand out prominently because they have been “dazzle” painted’. 618

Below heights of 5,000ft, the effectiveness of camouflage was also questioned; No.3 Group commented that for altitudes below 5,000ft;

‘the value of camouflage is dependent upon the conditions of visibility and in general does not hide the object which is being looked at. An exception to this rule is the Vickers work at Weybridge, which is considered to be excellent even at 2000ft’. 619

It was, therefore, felt that it would be:

‘difficult to assess the increased safety given to buildings by camouflaging them, as conditions vary according to the amount of light, shadows, outline, shape of buildings and angle of view’. 620

Despite this, the general view of No.3 Group bomber pilots was that ‘on the whole the safety of objectives which have been effectively camouflaged has risen’. 621 Elsewhere,

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618 TNA, HO186/171: Correspondence, Air Vice Marshal C.T. Maclean, Commanding No.2 Group, to H.Q. Bomber Command, dated 12th Mar 1940.
619 TNA, HO186/171: Correspondence: Effect of Camouflage on Bombing, Wng Cmdr M.D. Ommanney (for Air Vice-Marshal Commanding No.3 Group), to H.Q. Bomber Command, dated 9th Mar 1940.
620 TNA, HO186/171: Correspondence: Effect of Camouflage on Bombing, Wng Cmdr M.D. Ommanney (for Air Vice-Marshal Commanding No.3 Group), to H.Q. Bomber Command, dated 9th Mar 1940.
621 TNA, HO186/171: Correspondence: Effect of Camouflage on Bombing, Wng Cmdr M.D. Ommanney (for Air Vice-Marshal Commanding No.3 Group), to H.Q. Bomber Command, dated 9th Mar 1940.
pilots of No.2 Group ‘considered that the safety factor of well camouflaged targets is 50% higher than that of uncamouflaged targets’. 622

In reflecting upon these findings, Wyatt in his report to the Advisory Panel remarked that the results of these R.A.F. aircrew observations were ‘generally very encouraging’, more so considering that the majority of civil camouflage work which had been undertaken had predominantly utilised paint-based methods; indeed, he wrote that:

‘very little camouflage has been carried out during the winter months: it is therefore reasonable to assume that such success as has been obtained is due to paint alone, as structural camouflage is a recent development’. 623

These observations by aircrews enabled civil camoufleurs to reflect upon their practices, and to comprehend the successes and failures of their endeavours through aerial subjects already trained to behaviour and act as a ‘bomber body’. As well as reinforcing their belief that good progress was being made and that the increased application of structural methods would only serve to reinforce their hardwork, these flights also served to further cement the significance of aerial perspectives in the appraisal of camouflage work.

5.6.2: Direct observations

While insights from experienced R.A.F. bomber crews provided unique insights into the operational value of camouflage during this period, it was, nevertheless, felt that camouflage practitioners should engage in direct observation of the landscape from the air themselves. If the camoufleur was to carry out their task of attempting ‘to fit [industrial] installations into the ground pattern by removing…differences’, then it was argued that ‘he must have a clear understanding of their cause’. 624 Observations of the landscape from the air by a camoufleur were, therefore, considered to be of vital importance, both:

622 TNA, HO186/171: Correspondence, Air Vice Marshal C.T. Maclean, Commanding No.2 Group, to H.Q. Bomber Command, dated 12th Mar 1940.
624 TNA, WORK28/11/8: The Principles and Organization of Static Camouflage, Camouflage Committee, 1944, p.17
‘to investigate the original appearance of the buildings and, later, to observe the effects of their camouflage if, as a result of the first impression, camouflage has been deemed necessary…effective camouflage of large buildings cannot be secured with observation from the air’. 625

Such a sentiment was shared by ‘official’ and ‘established’ camouflage figures such as Francis Wyatt. For example, in light of a number of requests for advice on camouflage received from industrial firms in May 1938, Sir Frank Smith, chair of the C.I.D. Camouflage Sub-Committee proposed that Wyatt and members of his Camouflage Department make a visit to the various sites concerned. Wyatt, however, felt that ‘such visits could only be of little value unless the visiting member of his staff could first see the factory or premises concerned from the air’.626 It was, therefore, concluded at the sub-committee’s fourth meeting that:

‘the Camouflage Section…be provided with an aircraft for its exclusive use [and] that the Chairman would write to the Air Ministry and impress upon them the vital necessity of providing a special aircraft and crew for the exclusive use of the Camouflage Section’627

In many respects, getting camouflage practitioners to engage in direct observations of the landscape from the air was deemed to be crucial to knowing, acting and seeing like the bomber body. Indeed, it was contended that only by becoming ‘air experienced’ could one become a true ‘authority’ on ‘effective’ camouflage practice. In the previous chapter, for example, it was highlighted how schemes such as that at Freeman’s Meadow power station were derided for their ignorance of the aerial perspective, and camoufleurs in ‘unofficial’ organisations like the I.C.R.U. considered their work to be ‘ineffective’ because of their very limited opportunities at flight.628 Elsewhere, in the battle between artistic and biological schools of camouflage, Sir John Graham Kerr would also be mocked for his lack of air experience;

626 TNA, CAB16/170: Minutes of the Sixth Meeting of the Camouflage Sub-Committee of the C.I.D., held 4th May 1938.
627 TNA, CAB16/170: Minutes of the Sixth Meeting of the Camouflage Sub-Committee of the C.I.D., held 4th May 1938.
‘Sir J. Graham Kerr is a thoroughly armchair critic. Eighty per cent of camouflage now-a-days is directed at concealing things from air observation, and I am told that Kerr has not flown over a single object, the camouflage of which he criticizes’.629

For ‘official’ civil camouflageurs of the Second World War, being air experienced was an essential attribute if one was to assume a prominent position within the camouflage discipline. Only through direct observation and aerial surveying would a camouflageur be able to gain a full appreciation of the camouflage problem and understand the contrasts and differences that made an industrial complex ‘conspicuous’ when situated within its surroundings.

Attempts at establishing an orderly and regular programme of aerial surveying work by camouflageurs was instigated in early 1939, coinciding with the appointment of Glasson as C.C.O. and the re-naming of the C.D.C.E.. Initially intended to focus solely upon factories responsible for aircraft production, these aerial survey flights would be conducted utilising civilian aircraft, it being highlighted that R.A.F. squadrons were ‘too much occupied with training to be used for purposes of this sort’.630 For these flights, Galpin requested that the C.D.C.E. be supplied with:

‘a machine of the ‘Rapide’ size in order to accommodate the camouflageur during the survey and a second officer under training: otherwise we cannot get the training of new officers done sufficiently quickly’.631

In the first instance, this series of flights was to be conducted in a finite period; the budget of £3,500 (approx. £100,500 in today’s money) covered survey flights for three aircraft for six weeks. Flights would be undertaken from airfields in London and Liverpool and were scheduled to take place in two phases. Firstly, preliminary ‘exploratory flights’ would be conducted to identify features which would require treatment. Following on from this, individual sites would be examined as part of the second phase, the purpose being to enable the devising of a camouflage scheme as well as to check up on the progress of camouflage work already in-hand.

629 TNA, CAB120/781: Correspondence, E.C. Jacobs, to Mr Martin, dated 15th Aug 1940.
630 TNA, AIR2/3437: Camouflage Programme, C.J. Galpin, dated 11th Jan 1939.
631 TNA, AIR2/3437: Camouflage Programme, C.J. Galpin, dated 11th Jan 1939.
Bad weather during January and February, however, restricted flying opportunities, and little progress was made within the projected time. To further exacerbate matters, the shift in responsibility for civil camouflage work from the Air Ministry to the Home Office resulted in a significant increase in the number of factories which required surveying from the air, and subsequently further delays ensured. The budget was quickly exhausted, and, in June 1939, a request for a further £1,000 ‘to clear up the programme’ was made.\(^{632}\) It soon became clear that a much more extensive and flexible programme of aerial surveying needed to be put in place. Moreover, it was felt that the C.D.C.E. required its own dedicated detachment of aircraft to undertake such work; the number of civilian machine available at their disposal was considered to be completely insufficient for the demands being pressed upon it.

With the outbreak of war in September 1939, the C.D.C.E. soon received its own aerial surveying unit. Formed on the 9\(^{th}\) October 1939, the Camouflage Flight (later renamed No.1 Camouflage Unit on the 3\(^{rd}\) November 1939) was composed of ‘experienced’ pilots from the R.A.F. and was to be based at the Baginton aerodrome (6.5 miles north east of the C.D.C.E.’s headquarters at Leamington Spa).\(^{633}\) However, its initial complement was only three aircraft, a figure deemed insufficient to carry out work at a national scale; Galpin, for example, believed that this represented only:

‘a quarter of the strength required for Home Office needs alone. For wider work a Flight would be insufficient. Now that winter conditions are setting in, it is doubly important to have enough aircraft available to make use of every possible flying opportunity that will occur during the next few months’.\(^{634}\)

In January 1940, approval was given for the increase in the number of machines available for camouflage work from three to ten aircraft. In addition, a teleprinter between Baginton and Leamington was to be fitted in order ‘to speed up the authorisation for flights, and cameras, equipment and personnel’\(^{635}\).

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\(^{632}\) TNA, AIR2/3437: Correspondence, D.W. Mitchell, Air Min., to B.W. Gilbert (H.M. Treasury), dated 26\(^{th}\) June 1939.

\(^{633}\) Sturtivant and Hamlin, 2007.

\(^{634}\) TNA, HO186/964: Visual Deception in Home Defence, C.J. Galpin, dated 16\(^{th}\) Nov 1939.

\(^{635}\) TNA, HO186/174: Correspondence, W. Eady, to N. Brook, dated 26\(^{th}\) Jan 1940.
With these arrangements in place, a more comprehensive programme of aerial survey flights could be initiated. Planning for the flights would take place at Leamington, with the Senior Map Officer (S.M.O) of the Map Section arranging sites:

‘into sets which could conveniently be surveyed in a single flight. Maps showing the exact boundaries of the site, together with…[aerial] photographs or other information…[would be] issued to the Camouflage Officer before he made the flight’. 636

It was contended that through these ‘he will have been able to judge the general nature of the problem and…give some preliminary consideration to the way in which he may decide to treat it’. 637 In some respects, this pre-planning of the flight, utilising materials such as maps and aerial photographs, permitted the camouflage officer to ‘mimic’ their counterparts; as was illustrated earlier, enemy bomber crews would be privy to similar materials in the preparation of their attack. In a sense, civil camouflage officers were ‘becoming’ the bomber body, performing and absorbing geographical knowledge through the same forms of material culture that were being utilised by their adversaries.

Although maps and aerial photographs would help to shape and inform the geographical imagination of the civil camouflage officer before the flight, it was the direct observation of the landscape which would ultimately inform the camouflage designer’s ways of thinking about camouflage, enabling the camouflage officer to create a mental picture of the landscape from the air. For each site, surveying was to take ‘about 10 to 15 minutes’, ideally in clear weather conditions. 638 It was, however, accepted that these ‘preferred’ conditions may not always be possible and observational flights could potentially take place in a variety of ‘imperfect’ conditions; on such days, it was contended that:

‘allowance must be made for the changes in appearance with a low sun or…the absence of direct sunlight, or when the surface of the target is wet…[L]ow sun darkens the appearance of the ground by increasing the contained shadows in its textured surface. After rain there will be marked shine from smooth surfaces, but the colour of practically

636 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 4, p.14.
637 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 4, p.14.
638 TNA, AIR2/3437: Camouflage Programme, C.J. Galpin, dated 11th Jan 1939.
all surfaces of buildings and roads and the colour of scarred ground is darker when damp than when dry.  

During the course of each survey, the designer would complete an aerial survey report, one of several tools which would later aid memory recall when designing the camouflage scheme. On this report, it was argued that the camouflage officer should:

‘make particular note of the scale and nature of the pattern of the landscape, the colours and shape of housing, woods, fields, etc. which make up the general pattern. He must also note details of the target itself; local colours, size and shapes and layout of buildings, roads, scarred ground, white plumes of smoke or other conspicuous features which may shine under certain weather conditions’.

Alongside these descriptions, information on the altitude of survey flight, the presence of clouds, levels of visibility, as well as the classification of the district (into one of four spatial categories: ‘Industrial’, ‘Town’, ‘Suburban’ or ‘Country’) were also recorded to help contextualise the observations made. These various details combined would enable the camouflage officer to isolate and focus their attention on those characteristics which rendered a factory ‘conspicuous’, but also think about the techniques they could use in order to fit the feature into the ‘general appearance’ of the surrounding landscape.

In addition to aerial survey reports, aerial photographs would be taken on these flights, these serving both as useful reference aids when it came to designing the camouflage scheme back at Leamington, but also as records of the appearance of the landscape before and after treatment had been applied. Most aerial photographs which were taken were in Black and White (see Plate 5.6), and while these were considered as ‘a useful permanent supplement to the information which the camouflage officer can retain in his memory or record in notes’, it was widely acknowledged that Black and White images would ‘not give quite correct tonal values and gives no record of colour’. Colour photography was still very much in its infancy, and the effects of cloud and mist were known to significantly affect its ability to effectively capture the ‘true’ colours and tones of the landscape below. Despite these technological limitations, Black and White

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639 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 4, p.12.
640 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 4, p.12.
641 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 4, p.18.
photographs were considered to be important ‘memory-recall’ devices for the camouflage designer, and their storage in the C.D.C.E.’s Photograph Library would prove to be of great use during the design phase.  

In order to facilitate the production of such photographs, the camouflage officer would be accompanied by a camera operator, who would, under their instruction, ‘record the appearance of the factory from different angles for the purpose of subsequent notes’. Oblique photographs from the North, South, East and West at angles of 25º from the factory would be taken, as would vertical photographs covering ‘an area of half a mile on each side of the site, in order to embrace any notable landmark which might serve as an aiming-off mark for a bomber’. Photographs taken from different distances from the target would be shot;

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642 Aerial survey reports would be retained at the C.D.C.E. by the Map Section for later reference.
643 TNA, AIR2/3437: Camouflage Programme, C.J. Galpin, dated 11th Jan 1939.
644 TNA, WORK28/11/8: The Principles and Organization of Static Camouflage, Camouflage Committee, 1944., p.30
'the more distant view [taken from 5,000ft at 4 miles] shows the target in relation to its comparatively wide surroundings, those taken at closer range [1,000ft at 3 miles] show much detail which will be useful'.

These various images would be taken either by the photographer operating a standard hand-held R.A.F. Williamson F.24 camera for both vertical and oblique perspectives (Plate 5.7), or a 5 inch Ross, Xpress wide angle lens, fixed into the fuselage, would be utilised for vertical views.

Plate 5.7: Image reproduced from The Times showing the handheld camera which was utilised by the R.A.F. aircrews and by camoufleurs for aerial survey work.
(Source: The Times, 1940a, p.10).

Aerial survey flights, through the production of aerial photographs and observational reports, therefore, played a crucial role in gathering intelligence about the visual appearance of a particular area and allowed camouflage designers to accumulate a

645 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 4, p.18.
646 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 4, p.19.
wealth of embodied and geographical knowledge about local and regional characteristics which they would later deploy in the devising of camouflage schemes. Survey flights presented an opportunity to not only ‘become’ a bomber body, but also to develop an understanding about how the British landscape revealed itself to the aerial observer. It was contended that only by engaging in the same embodied and visual experiences as that of the bomber body could any attempt to subvert its gaze be realised.

5.7: Conclusions
In this chapter, it has been asserted that civil camouflage emerged as an ‘airminded’ technology, shaped and transformed through an attentiveness to aerial spaces and the practices taking place within them. Concentrating on the endeavours of civil camoufleurs to acquire knowledge about the aerial practices and experiences that constituted a bombing mission, the chapter has explored how the ‘bomber body’ was assembled and profiled through discursive interactions between camouflage practitioners and ‘airminded’ and ‘air-experienced’ individuals. In the first section, attention was devoted to the forging of this relationship, with some of the key spaces where these interactions took place being identified, most notably the meetings of the C.A.P.. Through these interactions, bombing practices and aerial attack sequences were disassembled and deconstructed, enabling civil camoufleurs to identify ‘crucial moments’ when the visualities of the bomber body could be distracted, disrupted and agitated; in this sense, such knowledge was deemed to be foundational for any appreciation of the civil camouflage problem. Emerging from these discussions, the civil camoufleurs were able to establish design parameters around which camouflage ‘in the field’ was to operate; the wider implications of this upon camouflage practice are explored in the next chapter.

The following section examined how civil camoufleurs constantly reflected upon the initial insights determined in early discussions on bombing practices in order to re-assess their efforts and approaches to camouflage. Through an examination of the spatial and temporal patterns of aerial bombing by the Luftwaffe, ‘new’ geographies of camouflage were produced: on the one hand, observations on the spatial confinement of attacks to the South and South East culminated in the ‘regionalisation’ of the British mainland in relation to perceived levels of vulnerability, whereas, on the other hand, the
acknowledgement that attacks were increasingly taking place at night would a signal a shift towards nocturnal methods of camouflage which are explored in Chapter 7.

Having thus far focused upon aerial practices and the movement of the ‘bomber body’ through aerial space, consideration was given to the specific ways in which the visualities of the ‘bomber body’ were assembled within civil camouflage discourses. For civil camoufleurs, the ‘bomber body’ was not simply a ‘detached observer’, but an embodied individual subject, whose capacity to interpret and interact with the terrestrial landscape was shaped through dynamic relational processes between body, atmosphere and the technologies of the aeroplane. As part of the discussions on this, attention was given to the physiological operationalities of the human eye and how the act of seeing by the ‘bomber body’ was mediated through a variety of external influences: the unique effects of movement and distance attributed with flight and the presence of haze and clouds, for instance. These different distractive effects, it was contended, would operate ‘favourably in reducing the amount of detail required in the completion of a camouflage design’.647

The final section illustrated how camoufleurs set a precedent for direct observations of the British landscape from the air in order to identify landmarks which revealed and exposed industrial targets as well as to comprehend how patterns in the landscape could be utilised to help shape camouflage techniques and methods. The first half of this section focused upon the intelligence that was gathered through the ‘employment’ of R.A.F. bomber crews to catalogue ‘conspicuous’ features in the landscape which would require camouflage treatment. Furthermore, it was outlined how the ‘aerially experienced’ bodies of the R.A.F. were enlisted to give their evaluations on whether certain features which had caused anxiety within the popular consciousness required camouflage treatment as well as to provide their assessments as to the ‘effectiveness’ of particular camouflage schemes. The latter half, then, focused upon the efforts of the civil camoufleurs themselves to undertake the direct observation of the landscape from the air. Indeed, it was contended that it was not enough simply to ‘know’ how the ‘bomber body’ was capable of viewing the landscape; adopting the ‘scientific’ mentality that ‘seeing is knowing’, camoufleurs were to perform aerial survey flights in order to

help train and hone their camouflage sensibilities, to shape their understandings about ‘conspicuousness’ from the air as well as to determine potential camouflage solutions. As was shown here, becoming ‘aerially experienced’ was to be used as a determinant as to whether one would be an ‘effective’ camoufleur or not. In the next chapter, attention is given to how the aerial observations and accounts of the terrestrial landscape that were produced through these flights shaped how the conspicuousness in the landscape was accounted for, how the British landscape was simulated for experimenting and designing camouflage, and, ultimately, how the terrestrial landscape was transformed to subvert the vertical visualities of the ‘bomber body’.
Chapter 6
‘Protecting the Vitals’
Knowing, Simulating and Modifying the
‘Conspicuous’ Landscape

Having thus far focused upon the aerial geographies of Britain and the engagements of civil camoufleurs with these spaces and the particular practices taking place and being enacted within them by a transgressive enemy ‘bomber body’, this chapter ‘re-grounds’ itself in the realm of the terrestrial, while at the same time, exploring the complex associations between aerial and ‘earthly’ spaces. As was discussed in the previous chapter, aerial survey flights throughout the war provided camouflage practitioners with a perfect opportunity to engage first-hand in the direct and deliberate techniques of aerial observation adopted by Luftwaffe bomber crews. As well as enabling camoufleurs to ‘become aerial’ and experience the vertical visualities effected through the technologies of the aeroplane, surveying flights and aerial observations permitted civil camoufleurs to construct a body of highly-detailed, geographical knowledge about visible traces in the landscape. More specifically, it enabled them to articulate knowledge about what caused visual ‘conspicuousness’ within the industrial landscape, and, emanating from this, ideas and approaches which would enable its suppression.

In this chapter, I want to explore the significance of their findings, outlining how, following aerial observation and surveying, civil camoufleurs sought to modify and transform the visual appearance of the industrial landscape. To begin with, I examine how the engagement in aerial surveying techniques produced a way of knowing and understanding landscape through a new set of descriptive vocabulary and aerial grammar centred upon contrasts in colours, tones, textures and forms as well as the presence of visual traces such as shadows. Following on from this, I explore the ways in which camoufleurs sought to replicate these visual attributes as well as the specific viewing conditions of the ‘bomber body’ within the space of the design room as part of the process of developing camouflage schemes for vulnerable structures. The latter sections of this chapter, then, focus upon the specific camouflage strategies and tactics which were devised in order to counter conspicuousness during day-light conditions. In
each of the different methods outlined, attention is given to how camoufleurs sought to produce an alternative visual experience and landscape aesthetic that subdued and modified ‘conspicuousness’ in favour of a reduced prominence that facilitated the hiding of vital industrial structures into the landscape.

6.1: Knowing the landscape: accounting for ‘conspicuousness’

Through their investigations into the specific embodied visualities of the ‘bomber body’ and from their experiences as aerial observers, civil camoufleurs began to compose a foundational understanding of how natural and artificial features appeared from the air. In doing so, it was contended that, on the one hand, an awareness of what made industrial installations ‘conspicuous’ from the air could be isolated, while on the other, ideas be derived as to how these visual traces could be suppressed, hidden or concealed to blend in with other mundane, relatively inconspicuous features in the landscape. From the ground, it was accepted that a building would achieve a particular ‘prominence’ through dimensions of scale, such as height, as well as through elaborate architectural styling. However, through the ‘aero-technological transformation of vision’, it was clear that these attributes would be rendered redundant and replaced by a new set of ‘aerial grammar’ through which they would become ‘prominent’.

Firstly, the significance of colour in the landscape was emphasised in day-light observations, with this being considered a key visual trait to be recorded in aerial observation reports. As was clear from the reports on flights over Cambridgeshire and Lincolnshire, the colours of particular features in the landscape were to be documented in relation to the set of ‘official’ Camouflage Colours which camoufleurs were now encouraged to utilise (see Appendix 1). Emerging from this, it was discerned that the colours which dominated townscapes were noticeably different from those of the countryside, producing and reinforcing an aesthetical dichotomy between urban and rural spaces. For urban conglomerations, it was contended that:

‘the colours present will be the slate or red of roofs, the bronze green of grass and gardens, the brown of earth, the grey of roads, and the blacks of shadow…the prevailing tones will be dark, unless there happens to be a new building estate’. 650

On the other hand, rural spaces would be defined through seasonal variations of medium and dark greens, ochres, light and dark browns, and, in some cases, even blacks (in the case of ploughed fields). It was contended, therefore, that the selection of colours to be utilised for camouflage purposes should bear this contrast in mind when devising schemes for different types of environments.

Following on from colour, critical aerial observations drew attention to differences in tone. Within Camouflage of Vital Factories and Key Points, it was contended that contrasts in tone were more ‘noticeable’ than differences in colour:

‘where the quantity of light which is reflected is not very great…[For instance] an area of light tone surrounded by dark tones is more conspicuous than, for instance, an area of dark red surrounded by dark green’. 651

When viewed from the air, it was asserted that the ‘natural’ landscape was composed primarily of dark colours and tones, therefore making any light-toned spaces highly conspicuous. Within camouflage discourses, spaces of light tone were often mapped onto artificial features in the landscape, primarily on account of the materials which had been used in modern construction work; the ‘whiteness’ of asbestos and concrete, for example, was noted to produce an exceptional lightness of tone, which acted as ‘perhaps the most conspicuous feature of a great many targets’. 652 The significance of light-coloured building materials such as concrete in rendering a site conspicuous is quite clearly captured in an aerial photograph taken of the Carmuirs electricity generating plant, near Falkirk, by the Camouflage Flight in April 1943 (Plate 6.1). 653

651 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 3, p.3.
652 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 4, p.2.
653 For another example of pale-coloured ‘modernist’ building, see discussions in Chapter Five concerning the Shredded Wheat Factory, Welwyn.
Closely connected with tone was the issue of texture or ‘optical roughness’ as it was referred to in some camouflage literatures. Although tone was seen to distinguish differences between artificial and natural spaces, the nature of the surface itself and the light reflected from it, when viewed from the air, could also produce distinctive visual contrasts. Indeed, it was emphasised how:

‘the apparent brightness of a surface does not depend so much on the basic tone which might be recorded in standard conditions of lighting and viewing as on the capacity of the surface to reflect light in different directions. A smooth dark surface for example may in some cases look almost as bright as a smooth light one, and in some conditions a rough light surface may look nearly as dark as a rough dark surface. The problem of contrast of tone is therefore closely related to the analysis of surface structure’. 654

The landscape, therefore, became interpreted and understood as being composed of two different surface types. Firstly, smooth and shiny surfaces, commonly associated with glass, calm water and wet tarmac, produced a lightness of tone or the effect of ‘shine’;

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'this shine may be so much more intense than any other light coming from the surface that the observer can see nothing but the bright shine and he loses all sense of colour or variation of tone'.  

In contrast to this, medium or rough surfaces, correlated with more ‘natural’ surfaces such as stones, harrowed fields, woodland, and vegetation, were seen to produce varying visual affects according to their composition and the position of the viewer in relation to natural light sources. For example: 

‘a surface made up of pointed stone chips placed shoulder to shoulder would look very dark up-sun, while one made of rounded pebbles will not look so dark because a certain amount of light will be reflected from their smooth upper surfaces’. 

On the other hand, grass was described as having ‘only medium texture because the material is somewhat translucent. The brightness even under directed light is therefore nearly the same from all directions’. In sum, differences between contrasting types of textural surface were thus regarded as serving as ‘clues’ for the aerial observer in distinguishing artificial forms from the natural landscape; in this sense, the object of camouflage, it was contended, should be ‘to apply a rough texture to any smooth surfaces such as factory roofs and roads, which might by their shine reveal the target’. 

Complementing the depiction of the landscape in terms of contrasting colours, tones and textures was its description by camoufleurs in terms of form. Like tone and texture, artificial and natural spaces were ‘purified’ as two distinct ontological zones through the association of particular forms with each: on the one hand, man-made features were characterised through the regularity of form, continuity, repetition uniformity, symmetry and order; on the other hand, discontinuity, singularity, variety, asymmetry, and confusion were all considered to be the ‘hallmark’ of nature. From their aerial survey flights, these attributes were also mapped onto particular geographical features in 

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655 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 3, p.3.  
656 TNA, WORK28/11/8: The Principles and Organization of Static Camouflage, Camouflage Committee, 1944, p.18.  
657 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 3, p.4.  
658 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 3, p.4.  
659 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 3, p.4.  
the landscape. *Continuity*, for example, was described as ‘the primary distinguishing factor of railways, roads and waterways’.\(^{661}\) Elsewhere, *singularity of form* was also emphasised, notably in reference to geometrically defined structures such as gasholders and oil tanks (see Plate 6.2). Although it was asserted that ‘cylindrical forms are, of course, often structurally indispensable’, their form was nevertheless depicted as ‘revealing under the stress of air attack’.\(^{662}\) In relation to form, it was contended, therefore, that the object of camouflage should be to translate the attributes and features associated with the ‘natural’ world into the ‘artificial’ world.

![Image removed for copyright purposes](image)

Plate 6.2: An oblique aerial photograph of the gasworks in the Abbotshaugh area of Falkirk, dated 20th May 1941. In this image, we see the ‘conspicuous’ geometrical form of the gasholder crowns, the regular layout of housing development and the ‘continuity’ of several roads. (Source: RCHAMS, ID 006-003-000-069-C).

The final characteristic to be reflected upon within both aerial survey reports and civil camouflage literature was the presence of shadows.\(^{663}\) Within camouflage discourses, shadows were considered to play a key role within the landscape, providing not only an


indication as to height but also helping to outline an industrial structure; as one manual put it, for:

‘an airmen [who] sees the countryside as a series of planes with little impression of heights…shadow perspective will give him the necessary clues. The desirability of eliminating all shadows is therefore clear’. 664

In their discussions, camoufleurs highlighted two types of shadow which could prove useful to the bomber body. ‘Primary’ shadows were those cast by the height of the building and were regarded as the more difficult to conceal; ‘they can be modified and disguised but they can never be completely eliminated in all conditions of lighting’. 665 Following on from this, there were ‘secondary’ shadows which were dependent more upon particular forms on the building itself, for example, an intermediate roof ridge or a parapet wall. Unlike ‘primary’ shadows, it was argued that these could be removed or manipulated. In both cases, it was contended that the presence of clouds, mists and reflections from surrounding buildings could heighten or reduce the ‘blackness’ of their appearance; for example, it was noted how:

‘When the sky is nearly cloudless the shadows are usually so black that a white surface in the shadowed region appears blacker than a nearly black surface in direct light. Under these conditions shadow contrasts are very strong’. 666

The geographical location of the factory could also impact upon the visual presence of the shadows; it was emphasised, for instance, that ‘if the factory were in an industrial district [shadows] would lose their importance’ as their clarity would be intermingled and dispersed by surrounding buildings.667

666 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 3, p.4.
In the designing of a camouflage scheme, therefore, the camoufleur had to be attentive to the relationship to these five visual attributes; colour, tone, texture, form and shadows, it was contended,

‘all combine to produce a pattern when seen from the air, and as these factors vary in different landscapes so does the pattern alter in scale and character… it is the business of the designer to carry the pattern of the immediate surroundings on to the target or to make the target resemble some feature which occurs frequently in the neighbourhood, and does not excite suspicion’. 668

Furthermore, it was contended that great variances in the interactions between these different elements would mean that each camouflage scheme, while adopting similar techniques, would have to be spatially specific in terms of its design;

‘the decision as to design cannot be by rule of thumb, and schemes must be prepared individually for each target after studying its appearance and that of its surroundings from the air’. 669

It was through an attentiveness to the visual patterning of the landscape that attempts could be made to conceal ‘conspicuous’ features.

6.2: Simulating the Landscape: Model-making and camouflage design at ‘The Rink’

Informed by the lists compiled by the Key Points Intelligence Branch (K.P.I.B.), camoufleurs would begin the design process by aerially assessing the ‘conspicuous’ factory. Indeed, it was contended that the Camouflage Officer must:

‘view it himself from the air. He must analyse…the salient characteristics of the landscape and determine which of the many lines and shapes and colours below him reveal the target area….He must memorise these facts accurately so that he will know when setting out to prepare his scheme, which are the contrasts he must suppress and

668 Emphasis added. TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 4, p.5.
669 TNA, HO191/3: Camouflage of Vital Factories and Key Points, MoHS, Section 4, p.4.
which characteristic features of the background he must try and imitate on the target itself\(^\text{670}\)

Following the flight, camouflage treatment would then be issued in accordance with the level of importance attached to the factory. Sites of low importance would be issued with general written instructions, advising them to ‘tone down’ the building; in some cases, drawings might well be produced. For schemes involving ‘greater difficulty’, however, the owner or occupier would be asked to provide a model; in August 1941, for example, the manager of the oil depot at Grangemouth, near Falkirk was notified that:

\begin{quote}
‘in order that a more detailed scheme may be prepared you should arrange for a simple scale model in wood of the layout of the plant and buildings…to be forwarded to [Leamington]… [the model] should be to the scale of 1:200, [and] need only show the salient features of the buildings and their approaches. Notes should be made on each principal surface stating its material and all areas of glass should be clearly defined. The
\end{quote}

\(^{670}\) TNA, HO186/1648: \textit{Artists in Camouflage}, R.V. Darwin, dated 18\textsuperscript{th} February 1943.
dimensions of a model made in one piece must not exceed 6ft. 6in. square...Expenditure on this item should not exceed £50 without authority'.

Once received by the C.D.C.E., the model would be worked on by the camouflage designer, a scheme finalised, and then returned to the factory owner/occupier with a set of colour cards acting as a ‘guide to the factory concerned as to the tints to be employed’. Occupiers would be requested to retain the model for future use should the scheme require amendments at a later date and were also responsible for preserving its ‘secrecy’; in January 1942, the manager of the Moreton Power Station was informed, for instance, that:

‘you will be responsible for the safe custody of the model. In this connection, you will appreciate that its loss, or any laxity in safe keeping might seriously affect the security of your premises’.  

The use of models was not necessarily unique to camouflage practice; indeed, there were other militarised institutions utilising them during this period. For camouflage work, however, they held their value in several ways. Firstly, they were seen as an economical way of ensuring camouflage structures could be viewed in all conditions. One report commented, for instance, how:

‘assessment of the effectiveness of a camouflage scheme depends...upon the results of aerial observation, as of course, it is against such observation that the camouflage should afford protection....Weather, pressure of work and the limitations of flying facilities [however] make it inevitable that such factories will rarely be examined under

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671 TNA, HO186/1331: Correspondence, C. Clark, to General Manager, Scottish Oils, dated 19th Aug 1941. For further critical discussions on the shaping of a model for particular social, cultural and political purposes, see Pearson, 2002.
673 W.S.H.C., G24/225/63: Correspondence, C. Clark, to the Engineer and Manager of Moreton Power Station, dated 19th Jan 1942.
674 Alastair Pearson, for example, has highlighted how terrain models were utilised for military and strategic planning during the Second World War. Interestingly, there is a connection here between camouflage practice and the wider utilisation of models at this time. The initial model-making groups associated with terrain models began their work under Francis Wyatt at the RAE Farnborough in 1940, and were known as ‘V’ Section. In January 1941, ‘V’ Section was transferred to the RAF’s Central Intelligence Unit at Medenham, Buckinghamshire and would go on to produce terrain maps for a variety of campaigns, including the invasion of Sicily and D-Day. See Pearson, 2002, p.228. See also, Reed, 1946.
[all] critical conditions of lighting….It is, therefore, desirable to supplement experience
gained in flying by observations on models in a viewing room with controlled lighting.
Observations are then independent of weather [and] time…and schemes can quickly be
subjected to the most critical tests.675

In conjunction with this economical dimension, it was also contended that models
provided an opportunity to try out several alternatives at low cost, without having to risk
failing with a full-scale scheme.676

Finally, the use of models enabled experimentation to be carried out in three-
dimensionality. In many ways, this was in accordance with the notion that the oblique
viewing perspectives of the bomber body could be effectively represented in 2-D form.
Models, therefore, enabled the more ‘realistic’ simulation of the bomber body’s viewing
experience, further enhanced through the C.D.C.E. developing a sophisticated viewing
room in which ‘camouflaged’ models would be assessed, critiqued and, if necessary,
modified. Such was their insistence upon simulation of this nature that Robin Darwin677
remarked that ‘there is…the danger that without models and a turn table designs will be
clumsy, crude and ineffective, as I think much Air Ministry camouflage is’.678

In many ways, the viewing room was a significant space within camouflage work, a site
where ‘the designer is able to build up and to judge his scheme under all conditions of
light and from all aspects’.679 From the outset, the necessity for such a room had been
identified early on.680 Following his appointment as C.C.O. in December 1938, Glasson
had requested the use of:

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675 TNA, HO191/31: R.E.N. 525: The Viewing Room of the Research and Experiments Department of the
676 Cave-Browne-Cave, 1945, p.265.
677 Sir Robert ‘Robin’ Vere Darwin (1910-1974) was a landscape artist and the great-grandson of Charles
Darwin. Throughout the war, he worked entirely for the Ministry of Home Security, becoming Secretary
of Cave’s Camouflage Committee in 1941. After the war, he worked at the Council of Industrial Design,
and later became rector of the Royal College of Arts between 1948 and 1971.
679 TNA, HO191/3: Camouflage of Vital Factories and Key Points, 1939-1945, MoHS, Section 4, p.13.
680 It should be noted that this was not the first ‘space of simulation’ to have utilised for camouflage
purposes. Peter Forbes, for instance, has highlighted how periscopes, revolving tables, and background
lights had been set up in a room of the Royal Academy of Arts during the First World War by the Naval
‘a large and lofty room…in which the models can be viewed from a height and distance which will enable the Camouflage Officer to determine the effect of his design and tones as they will be seen from the air’.

In the light of the re-location to Leamington Spa, the local skating rink was taken over by the C.D.C.E. and a section of it converted into their viewing room.

The Viewing Room itself acted as an important space in several ways in terms of camouflage design and research. In the first instance, the viewing room was a significant space of dialogue and discussion, with interactions taking place between

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Plate 6.4: The camoufleur at work: preparing the model (top left), comparing notes (top right) and analysing the finished product (bottom).
(Source: BP, Film ID 1190.15).

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682 Its location with the skating rink gave rise to its affectionate (and self-explanatory) nickname of ‘The Rink’.
different individuals involved in the camouflage process. This included deliberations not only between the camouflage officer and other designers, but also the Senior Design Officer, Glasson as C.C.O., members of the Constructional Section, as well as government officials responsible for determining the future trajectory of camouflage policy. Furthermore, its location in ‘The Rink’ also meant that it was located alongside key reference material from which the designer could draw upon further information; the Map Section and the Photograph Library, for instance, were located within the same building. This meant that camouflage designers could easily consult material from these resources, with provision in the viewing room being made for a projection system enabling the re-analysis of aerial photographs in relation to the model.

But perhaps more significantly is the conceiving of the viewing room as a site of affirmation and verification, as a space where ‘assent was to be secured through the production of experimental findings, mobilized into matters of fact through collective witness’. Indeed, the viewing room was a space ‘actualised by simulation’, where actual aerial and visual conditions were meticulously replicated to determine the validity and operational efficacy of a camouflage designer’s potential scheme. The room itself measured 36ft by 24 ft (see Plate 6.5), with white ceilings and walls illuminated by fluorescent tube lighting:

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683 Throughout the war, this position was held by Captain Gilbert Bernard Solomon (1890-1955). Solomon was an artist who had contributed war art during the First World War, and who was the nephew of the infamous British camouflage, Solomon J. Solomon (1860-1927), himself a painter who had worked as a Royal Engineer devising camouflage netting and publishing the book *Strategic Camouflage* (1920) on his assessments of German camouflage techniques. As S.D.O., Gilbert Solomon was responsible for not only providing advice on schemes devised on models, but would also have to approve the scheme before it was issued. See Solomon, 1920.

684 The Constructional Section were primarily involved in working with netting and screening and so their presence in the Viewing Room was usually to provide technical information as to how netting could be utilised to increase the efficacy of the proposed scheme.


Plate 6.5: Plans for the viewing room located in ‘The Rink’.
(Source: TNA, HO191/3).
‘to give a uniform diffused light such that the intensity of illumination on the horizontal surface was 25 foot candles and that on the vertical surface 12 foot candles’. 687

This diffused light effect was provided through the arrangement of:

‘two rows of lamps at right angles shining on the whitened roof and wall. Sixteen 500 watt lamps are used for this, 12 in one row and 4 in another…each is provided with a large reflector which prevents direct illumination of the model. The reflectors enable the illumination of the walls to be controlled which in turn controls the distribution of diffuse light upon the model’. 688

In the centre of the room was a turntable with an arm above it, which:

‘carried a second arm which could be swung about the same inclined axis so arranged that when the first arm lay north and south the inclined axis pointed to the Pole star. This second arm carried at its outer end a sun lamp of about 2,000 watts…[which] gave the model about 10 times the intensity of illumination given by the diffused lighting’. 689

The model, with camouflage design applied, would then be placed on the turntable, with:

‘its north point…towards the end of the arm which carried the inclined axis. By swinging the second arm about this inclined axis the sun lamp could be brought into all possible positions of the sun relative to the model’. 690

At one end of the room was placed an observational platform, with ‘the height…arranged to give a 15° angle of view’. 691 This corresponded with the angle of

687 TNA, HO191/3: Camouflage of Vital Factories and Key Points, 1939-1945, MoHS, Section 4, p.17. The term ‘foot candles’ is used to denote an English unit of measurement for light intensity. More specifically, it refers to the quantity of light cast per unit of surface area.


689 TNA, HO191/3: Camouflage of Vital Factories and Key Points, 1939-1945, MoHS, Section 4, p.17. Following the transition to night camouflage, this arm would later be adapted for making observations of models in simulated night-time conditions (see Chapter 7).

690 TNA, HO191/3: Camouflage of Vital Factories and Key Points, 1939-1945, MoHS, Section 4, p.17.
viewing anticipated of the bomber body (a height of 4,000ft. at a distance of 5 miles), thereby translating the intelligence gathered on the ‘bombing run’ into camouflage practice. Further ‘staging’ was facilitated in the viewing room through the presence of a foreground, positioned 30ft in front of the observer on the platform, and a background in the form of a cyclorama, it being contended that ‘it is little use viewing a model without its environment as a camouflage scheme must be designed to fit into its surroundings’.  

692 From their elevated viewing position on the observation platform, the camouflage designer would then rotate the turntable, which it was argued, would enable him to ‘imagine himself in an aircraft circling round the target’, and, therefore, make judgements on ‘how effective his camouflage scheme is from all points of view’.

693 In order to facilitate different viewing experiences within the viewing room, several optical devices were developed and deployed to simulate further the techniques of the (aerial) observer.  

694 For instance, to replicate the viewing experience of distance, a variable magnification telescope with a diminishing lens was provided, enabling the camouflage designer to view the target from simulated distances of between 1 and 7 miles (see Plate 6.6). A German bombsight was also available, ‘set-up upon the viewing

Plate 6.6: A camoufleur assesses his work through a variable magnification telescope with a diminishing lens.
(Source: BP, Film ID 1190.15).

693 TNA, HO186/1648: Artists in Camouflage, R.V. Darwin, dated 18th Feb 1943.
694 In his historical work into observation, Crary has also explored the role of different optical devices and technologies in transforming the ‘techniques of the observer’. See Crary, 1992.
platform to enable a better appreciation of [the] bomber’s approach’. New optical technologies were also developed to ensure that the conditions being replicated within the viewing room were the same as those ‘outside’. Different photometers were developed to measure varying degrees of daylight illumination and brightness levels in order for civil camouflage to check the correspondence of the conditions in the viewing room (Plate 6.7). This optical device would be:

’turned so that the light to be measured falls perpendicularly on to the “receiving” surfaces. The “comparison” panel is then made to match them by pulling the wedge in or out. When it matches, the figure shown where the calibrated handle of the wedge enters the box will be a measurement of the light intensity in foot candles’.

Haze devices, simulating mist and fog, were also devised, with models being viewed through a piece of glass, angled at 45° onto which was reflected a light source to produce the desired effect. To replicate haze as viewed from the air, a further ‘ingenious’ haze device, designed by Mr Waldrom of the General Electric Company,

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enabled ‘the model to be seen through a differential haze as one would from an aircraft’. 698

These optical devices were not only developed in conjunction with the spaces of the viewing room, but also to reproduce the necessary textural and surficial effects required on the models themselves. Given that extraordinary lengths had been taken to ensure that the lighting conditions effectively simulated those predicted outdoors, it was argued that:

‘it is vitally important [that] for all indoor observations…the models [themselves] shall reflect the light in exactly the same fashion as the full-scale camouflaged factory and its surroundings…As it is impossible to simulate natural surfaces by paint alone, careful simulation of natural textures is essential, and in making models for viewing room use, care [must] always taken to see that textures [are] equivalent to those already determined for natural surfaces…Model texture must [also] have similar optical properties to that applied to the factory in practice. Unless this precaution is taken, it would only be possible to get a reasonably correct representation for one angle of view and one angle of illumination, and, in general, other angles of view and illumination would be misleading’. 699

In order to achieve this textural simulation, both a texturescope and a texture-meter ‘used out of doors to examine the textures of natural surfaces likely to be found in the neighbourhood of camouflaged sites, and indoors to measure artificially produced textured surfaces’ were devised, with a view to simulating natural surfaces within the spaces of the viewing room. 700 Such instruments enabled civil camoufleurs to plot the texture curves of ‘field’ (outdoor) textures by measuring the distribution of light. These graphs would then be matched up with the texture curves produced by ‘artificial’

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698 TNA, HO196/31: R.E.N.527: Optical equipment required for research in camouflage, T.A. Littlefield, 30th June 1945. This visual simulation of differential haze was achieved through an illuminated white rotating disk, which would be illuminated at different levels of intensity and different angles dependant upon the levels of haze wishing to be produced.


700 TNA, HO196/31: R.E.N.527: Optical equipment required for research in camouflage, T.A. Littlefield, 30th June 1945. In relation to the production of terrain models for the R.A.F., Pearson has shown how different techniques of simulation for the models were utilised. One method was the ‘photo-skinned’ method, whereby aerial photographs were laid over the top of the simulated terrain to give a high detailed visual impression of the features in the landscape. A second method was the ‘egg crate’ method, a much smaller scale model which gave a more general impression of the landscape. See Pearson, 2002, p.238.
(indoor) textures created within the viewing room, enabling the adoption of materials for design work which behaved on a model as they would on the factory (see Plate 6.8).701

The use of such devices enabled the effective simulation of a variety of ‘field’ textures. In terms of natural features, woods, for example, were recreated through:

(i) Natural coloured coffee grounds on a matt brown surface;
(ii) Coffee grounds dyed dark green on a matt green; [or]
(iii) B.G. fibre shaped like trees and glued to hessian painted with No.7 camouflage paint.702

Ploughland was imitated through the use of corrugated cardboard painted in No.1 or No.2, whereas the visual appearance of water was achieved through a dark (still water) or light (rippled) green varnish. As for ‘man-made’ features, roads were simulated through the application of a marble coat on hessian, old roof felt or cartridge paper painted No.12 or 13 (No.5 in the case of concrete roads) and partially sanded. Even the camouflage treatments themselves required scaled-down simulation to the microgeographies of the model; feathered and scrimmed netting was represented through the use of perforated zinc sanded and painted with No.7, strong textures through sawdust, cork chips or coffee grounds glued to cartridge paper and painted in the desired colour, and medium textures through painted sand or hessian. In general, it was noted that:

‘most of the commonly occurring textures can be matched on the model scale by the judicious use of quite common materials, e.g. paint (camouflage), sand, sawdust, cork chips, coffee grounds, hessian, or fine net, perforated zinc, cartridge paper and corrugated cardboard’.703

701 Cave-Browne-Cave, 1945, p.265.
702 TNA, HO196/29: R.E.N.477: Distribution of Light due to Texture, T.A. Littlefield, dated 28th March 1945. More specifically, deciduous woodlands would be represented through (i), whereas (ii) and (iii) represented coniferous woodland.
Plate 6.8: Texture curves representing the ‘field’ textures of (A) Coniferous Woodland, (C) Ploughland, (E) Water, and (G) Feathered Netting positioned alongside their ‘model’ texture equivalents (B, D, F and H, respectively). The vertical axis represents levels of brightness, whereas the horizontal axis relates to angle of viewing.
(Source: TNA, HO196/29).
These methods of simulating different ‘field’ textures were considered to be a central part of the design process, minimising the risk of mistakes and ensuring the best possible degree of effectiveness. The viewing room and the practices going on within it acted as an important transitional space, integrating theoretical and experiential knowledge of both the visual and aerial experience with the practical necessity to design and conceal. In doing so, this space of simulation became a key site of ‘assent’, a proving ground for the transformation of the ‘conspicuous’ landscape into a camouflaged landscape.

6.3: Modifying the Landscape: camouflage solutions

In the remainder of this chapter, attention will now be devoted to the camouflage techniques which emerged from the viewing room and the methods utilised to modify the British landscape. As part of this, focus will be placed upon how these different methods sought to reduce the contrasts between colours, tones and textures that rendered features conspicuous, as well as eradicate shadows and regularity of form. Finally, consideration is also given to some of the specific design challenges which were faced with their deployment; this included the nature of the buildings being concealed, the surrounding landscape and the constraints of war itself.

6.3.1: Paint-based methods

In the vast majority of cases, paint-based solutions were often taken as the de facto response to the camouflage problem. In many ways, this ‘paint-brush supremacy’ as it was referred to, was a legacy of the First World War, further reinforced by the extensive recruitment of artists in the late 1930s for civil camouflage work. During the initial years of the camouflage project, practically all work which was put in hand resorted to this method; for example, the first ‘official’ experiment in civil camouflage on the oil tanks at Hamble by the Camouflage Department in 1937-38 had adopted this paint-based approach. This dominance of paint-based techniques was also evident in some of the early camouflage manuals and booklets; A.R.P. Handbook No.11: Camouflage of Large Installations, for example, was dedicated almost entirely to imitative and disruptive paint schemes, whereas another handbook produced by the Silicate Paint Company claimed that:

704 TNA, CAB16/170: C.A.M.33: Camouflage of Oil Tanks at Hamble, F.J.C. Wyatt to F.E. Smith, dated 23rd June 1938.
‘to camouflage effectively a surface from aerial observation, the use of paint, in one form or another, is for most schemes an obvious need…Paint lends itself to easy and rapid application, and its various forms can produce an infinite variety of surface effects’. 705

This ease of application was further facilitated by the wide availability of spraying equipment, which permitted schemes to be applied quickly and effectively (Plate 6.9). By the end of the war, it was estimated that a total of around 2.35 million gallons of paint materials (including primers, sealers and thinners) had been supplied for governmentally-approved civil camouflage work between 1939 and 1944. 706

![Plate 6.9: A paint contractor applying camouflage paint via spraying equipment. This particular establishment is the Stonebridge Park power station. (Source: IWM, BTF 223)](image)

While the application of paint was considered to be a relatively simple exercise, consideration had to be given to the type of paint to be used. As a start point, it was


706 This figure only represents paint acquired through the Camouflage Paint Scheme. Additional sources of paint acquired outside of the scheme are likely to have been used before and during this same time period.
recognised that using ordinary ‘flat’ paint was ‘not sufficiently matt to overcome…reflection at low angles of vision. It is therefore necessary to add something to roughen the surface’.\textsuperscript{707} In some cases, as initially explored as part of the Hamble experiment, sand or other fine sediments would be added to a flat paint mixture before applying it to the structure. This would produce a simple yet effective texture that would prevent shine.

Following on from this, deliberation as to the colours to be used was of significance. Working in collaboration with the National Federation of Associated Paint, Colour and Varnish Manufacturers of the United Kingdom (hereafter referred to as the National Federation) and the Paint Research Station (P.R.S.)\textsuperscript{708} based at Teddington, the C.D.C.E. developed a standardised set of colours to be used for camouflage work, comprising a variety of browns, greens and black, which it was argued, would be representative of the colours predominantly found in the British landscape. Initially composed of nineteen colours, this would later be reduced to twelve (with three of these possessing variants – see Appendix 1) on account of economy, simplicity and shortages in pigments available to produce the desired colours. This ‘standardising’ of camouflage colours was considered to:

‘have greatly simplified for the designer the problem of selecting colour…a very extensive range of colours is unnecessary, for apart from the difficulties of manufacture very little would be gained, since the range of both colours and tone in the landscape is very small’\textsuperscript{709}

The selection of the colours to be utilised on a camouflage scheme would, therefore, be heavily dictated by the surrounding geography within which the factory or installation to be concealed was located. In rural areas, camouflage schemes would make heavy use of a variety of greens, whereas for built-up areas, ‘tarmac grey’ or ‘dull red’ would be encouraged dependent upon the dominance of slate or red tiled roofs (respectively).\textsuperscript{710}

\textsuperscript{707} TNA, HO186/964: \textit{A.R.P. Handbook No.11: Camouflage of Large Installations}, 1939, p.3.
\textsuperscript{708} The P.R.S. (now the Paint Research Association) was initially founded in 1926, with Samuel Kerr Thornley as its first President and Dr Louis Jordan as its first Director (both of whom would later become representatives on the C.A.P.). The role of the P.R.S. was facilitate interactions between paint companies, to develop new paint types and to carry out research into paint colours and pigments.
\textsuperscript{709} TNA, HO191/3: \textit{Camouflage of Vital Factories and Key Points, 1939-1945}, MoHS, Section 4, p.2.
For disruptive patterning, *A.R.P. Handbook No.11* suggested factory owners restrict themselves to a combination of three colours: Red Brick (A), Bronze Green (B), and Bronze Brown/Earth (C) (Plate 6.10).

Aside from colour, attention to the nature of the surfaces to be treated required attention with this affecting the type of paint to be deployed. As part of the design process, the camoufleurs at the C.D.C.E. would make ground inspections of the installation, taking notes to aid in the selection of a paint type. Moreover, from September 1938, the C.D.C.E. commenced discussions with the P.R.S. on the suitability of certain paint types for different building surfaces. Through this relationship, it was determined, for example, that corrugated iron and steel could only be coated in oil or bituminous paints; silicate, cement and oil-bound water paints would flake off the surface very quickly. Porous surfaces were shown to absorb paint and produce a sub-standard visual effect.711 Acidity and alkalinity were also identified as posing problems to paint selection. In the case of asbestos cement and new concrete, it was noted that:

> ‘during the action of setting, [the cement] undergoes a change which results in the liberation of calcium hydrate, the solution of which salt has a very destructive action upon colouring matters of an organic nature…used in the manufacture of paints…the liberated calcium hydrate also saponifies the linseed or other vegetable oil employed as a vehicle for the pigment, gradually converting the oil into soap and thereby rendering it

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711 For these surfaces, Silicate paints, with a binder, or Portland Cement paint were promoted as these would not penetrate the porous surface.
soft and easily removed from the surface of the cement wall by abrasion or weathering'.

To circumvent these issues, discussions between the P.R.S and the C.D.C.E. led to the production of the Paint Surfaces Chart, a guide to be distributed through the National Federation to paint manufacturers and contractors to ensure the most durable paint type was selected. Structured around the different building materials to be encountered, details would be provided on the paint type to be used, the number of coats required, coverage and information on primers for each surface type (see Plate 6.11).

Images removed for copyright purposes

Plate 6.11: Extracts for ‘Asbestos Cement: Old’ and ‘Brickwork’ from the Camouflage Paint Surfaces Chart, issued by the National Federation.
(Source: TNA, HO186/973).

In addition to this Chart, factory owners and paint contractors were also furnished with additional technical instructions about how to prepare these surfaces. One version of these instructions from 1941, for example, recommended that:

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‘all surfaces…be carefully brushed or otherwise properly cleaned and prepared to receive the paint. Where necessary, in order to ensure satisfactory finish and durability, the surfaces to be painted shall be suitably treated by priming or sealing coat or otherwise. All scale or corrosion of metal, and any efflorescence or deposit on other surfaces shall be removed before paint is applied’. 713

Closely related to the issue of performance raised by different building surfaces was the need to maintain a quality and supply of paint which provided the necessary ‘colour fastness and sufficient durability to avoid frequent renewal’. 714 Following the Munich Crisis of 1938, one of the deficiencies which had been exposed by ‘panic’ camouflage was the poor supply of both camouflage paints and the necessary pigments. Wyatt, in his ‘Notes on Deficiencies’ recorded how green paint became in short supply due to difficulties in obtaining Chromium Oxide. 715 Moreover, he recorded that ‘in some cases, the failure of [camouflage] efforts was due to the fact [factory owners] could not obtain the right colours, so used what they could get’. 716 This meant that in particular instances, the incorrect type of paint was being used, leading to rapid deterioration of the camouflage and, therefore, subsequent renewal being required to bring it back up to standard. This was deemed to be uneconomical and it was suggested that a regulatory framework be put in place to control paint supply and quality. With regards to quality, it was decided that camouflage paints should be capable of enduring at least 18 months of weathering and by early 1940, the C.D.C.E., in association with the Paint Research Station, had developed a performance specification which camouflage paints were required to pass in order to qualify for use in civil camouflage work. 717

715 Chromium Oxide was a key pigment utilised in the colouration of green paint. Throughout the Second World War, the supplies of certain pigments were in constant flux, primarily as a result of Germany’s unrestricted U-boat warfare disrupting their availability. Among the pigments deemed to be particular scarce were Chromium Oxide, ochres from South Africa and ‘earthy’ colours such as Cyprus umber and Persian Gulf red. In response, the P.R.S. was involved in attempting to produce substitutes, but these were of varying success. For discussions on this matter, see TNA, HO186/1985: T.S.C.4: Materials for Paints in Short Supply, undated; TNA, HO186/1986: Note on possible home sources of cobalt and other minerals, G. Palmer, dated 18th Nov 1941; TNA, HO217/5: T.S.C.69: Report on Chromium Oxide Paints and Substitutes, Dr. L.A. Jordan, dated Jan 1943.
717 Under this specification, camouflage paint was to be subjected to drying, weathering and water resistance tests, as well as an assessment to be made on its reflection value to ensure it produced the desired mat effect. See TNA, HO186/1980: C.D.C.E. Specification No.1, dated 16th Jan 1940; TNA, HO186/1985: C.D.C.E. Specification No.2, dated 28th Dec 1940;
In terms of the regulation of supply and good quality paint, the relationship with the National Federation, forged in early May 1940, sought to ensure that paint orders were distributed to paint manufacturers in accordance with their production capacity. In doing so, it was intended to prevent paint manufacturers ‘watering down’ their paints in order to cater for over-demand. In relation to this, Samuel Thornley, head of the National Federation and member of the C.A.P., wrote to manufacturers in June 1940, reminding them of the national significance of their work;

‘it is most important that in the interests of the country, as well as in the interests of our Trade, the paint supplied should be as good as we can make it….There has been a certain amount of failure of Camouflage Paint during recent months, as a result, I believe, of using the cheapest possible paint that could be produced and over-thinning it, in order to get the greatest possible coverage. This must be guarded against. You will, I am sure, agree with me that the production of good Camouflage Paint at the present time is a duty which our Industry owes to the Community’.718

In planning their paint scheme, then, all of these different challenges and issues needed to be negotiated and confronted by the camouflage designer. It was not simply a case of just applying paint, but thinking through the appropriate colours that would be in keeping with the site’s surroundings, the different material surfaces that required concealing, and ensuring that the correct quality of paint was used to ensure the durability of the scheme. Armed with this knowledge, the camoufleur could decide which painted pattern the structure would receive. For civil camouflage work, this took the form of one or a combination of three forms.

In the vast majority of paint-based schemes, toning down was the technique which was widely adopted, it being valued as ‘an easy and inexpensive operation, but one that is only effective in a limited set of conditions’ (Plate 6.12).719 In essence, toning down involved:

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718 TNA, HO186/1980: Correspondence, S.K. Thornley, to Paint Manufacturing Proprietors, dated 7th June 1940.
719 TNA, HO191/3: Camouflage of Vital Factories and Key Points, 1939-1945, MoHS, Section 4, p.1.
‘the darkening of all light surfaces on the exterior of the factory including concrete roads and yards, which are of such a nature as to make the factory a distinctive target from the air. In country and suburban areas this particularly applies to light asbestos roofs, walls and roads. In congested town areas, generally speaking, only light asbestos roofs would require treatment’.

Plate 6.12: Comparative oblique aerial photographs demonstrating the ‘toning down’ of the light-toned surfaces of a factory in the countryside.
(Source: TNA, HO186/2769).

Through the application of a paint which corresponded both in terms of colour and tone with the surroundings, ‘toning down’ enabled the ‘conspicuous’ factory to ‘merge’ into the landscape. As a technique, it was initially included within ‘emergency instructions’ which were prepared in August 1939, just days before war broke out, acting as a ‘stop gap’ until more elaborate designs could be developed. As the war progressed, ‘toning down’ continued to play its role, particularly where the industrial installation was located deep within an urban conglomeration (see Plate 6.13). Glasson, for instance, wrote that where the installation ‘forms part of a large whole…all that can be done is to see that they conform to the general dark tone of their surroundings’. Aside from this, ‘toning down’ was also adopted for ‘non-vital’ landmarks which, on account of their pale appearance, were considered to give-away more important targets; this included such features as schools, hospitals, theatres and cinemas, amongst others. Such sites, it was argued, ‘must not use disruptive camouflage or any form of camouflage that might enable them to be mistaken for a Military target’. In this sense, ‘toning down’ was considered to be more ‘subtle’ than disruption, which if seen through, could heighten the ‘targetability’ of the feature.

Plate 6.13: Comparative oblique aerial photographs of power station cooling tower in an urban before (left) and after (right) treatment by ‘toning down’.
(Source: TNA, HO186/1989).

One such site to be treated by ‘toning down’ was the new Country Offices at Trowbridge, Wiltshire, in July 1940 which on account of its recent completion and construction from pale building materials, was noted to be particularly light in tone and a stand-out feature in the landscape. It was, therefore, suggested that it:

‘should be treated with a distemper which would wear off in course of time, to bring it down to the ordinary grey colour of a weathered Bath stone… If this were carried out with one of the spraying machines such as those used for white-liming buildings, and painting large erections such as gasometers, and the nozzle fitted to a piece of pipe as long as a man could handle, it might be possible to do this by ladders instead of having to go to the enormous expense of erecting scaffolding’.723

While toning down was used in a great number of cases to reduce light tones, there were certain structures which were to be exempt from the treatment as a result of the perceived damage to their ‘character’. The matter of churches and cathedrals was raised at the third meeting of the C.A.P., with the toning down of the lead roof of Canterbury Cathedral being cited as being ‘of little practical value and [had] destroyed the character of the building’.724 It was therefore deemed to be ‘impractical to attempt to conceal cathedrals and other large historic buildings with any form of camouflage’.725 Elsewhere, ‘historic’ and white lime-washed buildings were to be exempt from such treatment, in part due to objections raised by the C.P.R.E.. In one letter to the MoHS, the secretary of the C.P.R.E. wrote of how their Lancashire Branch had informed him that:

‘local police have been going round the charming whitewashed cottages at Rufford, where our Branch act as custodians for Rufford Old Hall, on behalf of the National Trust, requesting the occupiers to darken their walls. Some have already tarred them, with disastrous effects from the amenity point of view… Obviously this action is being taken because it is thought that whitewashed cottages reflect light and could easily be distinguished from the air…[In my view] it is difficult to believe that scattered white houses dimly visible and very small indeed to an observer several thousand feet up would be of any value at all to an enemy bomber searching for a large factory or other

723 W.S.H.C., F2/217/7: Correspondence, unknown, to Mr Walker, dated 12th July 1940.  
724 TNA, HO186/171: Minutes of the Third Meeting of the C.A.P., held on 17th Nov 1939.  
725 TNA, HO186/171: Minutes of the Third Meeting of the C.A.P., held on 17th Nov 1939.
military objective, and it seems unlikely that they would waste bombs on such ridiculous targets…These limewashed cottages are such a feature of many English landscapes – Cornwall, the Lake District, North Yorkshire and elsewhere…We know that much of the beauty of our countryside will have to be sacrificed, but the Council believe that it is worthwhile, in the interests of all concerned, to avoid unnecessary destruction’.  

In light of this, the C.D.C.E. wrote to all Chief Constables around the U.K. notifying them that such action was ‘unnecessary’, with the ‘official’ view being taken that:

‘as to the chances of white houses and cottages being the object of a deliberate attack, one might compare your chances of hitting a small tin with a pebble from the top of a high cliff – and then you would be at an advantage because you are not moving at a high speed’.  

While toning down gathered a reputation for its simplicity and ease of application, its use could also be problematic in certain geographical locations. Indeed, one critique that emerged was that:

‘the painting of all the buildings in a single colour might seem the best match to the surroundings, but would have the effect of revealing the buildings themselves and the shape of the layout to the maximum extent’.  

It was, therefore, proposed that:

‘a better result might be got by disrupting the shape of the site by using a dark tone for some of the buildings and a middle tone for the rest or by using two middle tones of a different colour’ (Plate 6.14).  

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726 TNA, HO186/674: Correspondence, H.G. Griffin (Secretary of the CPRE), to Secretary, MoHS, dated 3rd July 1940.
727 TNA, HO186/674: Draft Correspondence, to Chief Constables, circa July 1940; HO186/674: Minute, P. James, to C.J. Galpin and F.C. Johnson, dated 12th June 1940.
728 TNA, HO191/3: Camouflage of Vital Factories and Key Points, 1939-1945, MoHS, Section 4, p.6.
729 TNA, HO191/3: Camouflage of Vital Factories and Key Points, 1939-1945, MoHS, Section 4, p.6.
‘Disruption’, as a camouflage effect, had gained notoriety during the First World War in the form of ‘Razzle Dazzle’.\textsuperscript{730} However, unlike the artistic origins of Dazzle, the inspiration for the civil camouflage form of ‘disruption’ was considered to have a more ‘natural’ and ‘animal’ centred origin. In \textit{A.R.P. Handbook No.11}, it was noted how:

\textsuperscript{730} For example, see Atterbury, 1975.
‘the animal carries patterns of boldly contrasting colours, one of which attracts the eye of the observer with the result that the form of the animal is disrupted and therefore becomes unrecognisable’.

Taking inspiration from such practices, the object of disruption in civil camouflage was ‘to eliminate as far as possible the general character of the buildings, break up their mass and colour and make the whole tone in with the surrounding district’. In order to make this disruptive effect appear as ‘natural’ as possible, it was contended that:

‘it is most important that [the] pattern...should cross the contours and break the edges of the buildings; a pattern which is wholly contained by the outline and follows its contours will have little disruptive effect: adjacent patterns should differ in tone’.

Furthermore, the use of disruption required the camouflage designer to be attentive to the colours and patterns of the local landscape;

‘the shapes of the camouflage pattern must be carefully designed, and must be related to the pattern of the surroundings so that the vision of the observer will not be interrupted by the change from the natural to camouflage shapes; and at the same time so designed that they distract the eye from the conspicuous shapes of the target’.

This attentiveness to colours, tones and patterns is clear in the I.C.R.U. scheme devised for the Player’s Imperial Tobacco Company factory, Bristol, in early 1939 (Plate 6.15). In this design;

‘the colours used were cement grey, green, brick-red, earth and black, used in patterns designed to give maximum disruption of surface. Total areas of different colours used were unequal, one colour predominating according to the surroundings and roughly in the proportions of 5, 4, 3, 2, 1. The earth colour used is more purple in tone than that used in official scales, giving better complementary with green. Each colour, with the exception of black, was applied in two values, allowing for seasonal variations,

734 TNA, HO191/3: Camouflage of Vital Factories and Key Points, 1939-1945, MoHS, Section 4, p.5.
generally dark on upper edge and on southern aspects to light on lower edges and elevations facing north’. 735

Images removed for copyright purposes

Plate 6.15: Comparative images of the I.C.R.U. model for the Player’s Imperial Tobacco Company factory, Bristol, before (left) and after (right) its camouflaging in a ‘disruptive’ scheme.
(Source: J.T.A., JOT/54/1, p.3B).

In terms of its operational value of ‘disruption’, it was a technique used to break down a variety of ‘complex’ forms characterised by regularity. Geometrical forms such as gasholders and oil tanks which had initially been toned down received disruptive patterning to break down their cylindricality once war had been declared. Tall objects such as factory chimneys also received ‘disruptive’ painting. This is particularly apparent in an example from Special Notes on Camouflage for Contractors to the Air Ministry (1939), where schemes were tailored to different spatial contexts. For factories in open country, the disruptive scheme would make use of contrasting tones of ochre and medium and dark greens to help it merge into the patchwork pattern of hedgerow-lined fields, whereas for urban areas, two different colour schemes were recommended for ‘red’ (red tiled) and ‘grey’ (slate tiled) towns (see Plate 6.16). Finally, disruption was also effectively deployed to break up large roofs. Indeed, it was maintained that

such ‘large unbroken expanses of roof are usually the distinguishing features of a factory as seen from the air’. Disruption was, therefore, employed to disintegrate and enable the resemblance of ‘other innocuous forms in the locality’.  

Plate 6.16: Diagrams taken from Special Notes on Camouflage for Contractors to the Air Ministry, illustrating the suggested ‘disruptive’ camouflage scheme for factory chimneys in ‘open country’ (left) and in ‘red towns’ (right).  
(Source: TNA, HO186/972).

Plate 6.17: Plans for the concealment of Ransomes and Rapier Ltd, Waterside Works, Ipswich through the use of the 'dwelling house' initiative method.

Image removed for copyright purposes
The final of the three paint-based designs to be adopted was the technique of ‘imitation’, where the surrounding landscape would be either replicated or extended onto the structure to be camouflaged. In one handbook, for example, it was suggested that ‘a continuation of the main road leading direct to a factory may be painted over the roof of one or more structures’. In the majority of cases, however, the design to be applied consisted of the ‘dwelling house’ treatment, a particularly useful technique for the concealment of ‘block type’ buildings, whose structural form was notably conducive to its success. Under the ‘dwelling house’ treatment, the structure would be dressed up as terraced housing or a housing estate, with accompanying gardens and green spaces (see Plate 6.17). The Rolls Royce plant on the Hillington Estate, near Glasgow, was one such location to be issued with a scheme of this nature; here:

‘the housing scheme [was] continued along the north side of the railway and northwards along the Hillington Road. The rest of the scheme consists of treatment representing arable and grass land...for the houses, Colours 12 and 13 have been used with No.10 for a few red roofs and No.14 for shadows, windows,...and to make alley-ways between houses....Hedges have been painted over part of the area and it is intended that these should join on to the existing hedges’.

The effectiveness of this form of ‘dwelling house’ treatment can be clearly seen in Plate 6.18 (overleaf); in this example, ‘advantage has been taken of the similarity between the layout of the housing and the layout of the factory buildings’, resulting in the dark, regular and expansive for this (unnamed) factory being transformed through ‘imitation’ to fit into the pattern of the existing houses.

In the application of this imitation of ‘dwellings’, it was contended that an attentiveness to the mobilities of the bomber body and its effects upon the visual experience was of the utmost importance. Indeed, within ARP Handbook No.11, for example, it was noted that:

739 TNA, HO186/2769: Camouflage of Vital Factories and Key Points, 1939-1945.
Plate 6.18: Two comparative images of an unnamed factory before (top) and (after) treatment with an ‘imitative’ scheme.
(Source: IWM, MH24174 and MH24175).
‘the enemy observer is travelling too fast to be able to examine the whole locality in detail, but only sees it as a general pattern; anything which is out of keeping with the pattern invites attention. It is therefore unnecessary to make an exact copy of the surroundings but only to present a picture which is sufficiently in harmony with them to escape notice’.

This effect of motion removed the need for small patterns and fine details; in the conditions of darkness, this scale of pattern was to be further enhanced.

(Source: IWM, ART LD 3024).

Imitation was not, however, confined solely to box-like structures. Indeed, it was utilised to varying degrees of success to conceal cylindrical buildings as well. These structures, on account of their ‘roundness’, presented a somewhat exceptional challenge, and in attempting to deal with these structures, some rather unique and spectacular schemes were produced. Stonebridge Park Power Station, for instance, received a surprisingly colourful and elaborate design by Colin Moss in 1939 (Plate 6.19).

741 Colin Moss (1914-2005) was an artist who had entered the Royal College of Arts in 1934, where he studied in the ‘Painting School’ having been influenced by the British landscape artists Edward Bawden and Eric Ravilious. Following the completion of his diploma in 1937, he took up various appointments, notably the designing of murals for the British pavilion at the 1938 World’s Fair, New York.
Unlike ‘box-shaped’ buildings, the ‘roundness’ of these cylindrical features meant that the camouflage designer had to consider the anticipated direction that the enemy aircrew would be coming from; imitative patterns on these structures would only operate ‘effectively’ when viewed from a particular perspective and at a highly specific ‘moment’ of viewing. Plate 6.20, for example, illustrates an imitative pattern which was designed for a gasholder of the Newcastle-upon-Tyne and Gateshead Company. In this example, the aerial attack was predicted to come from the south/south-east (located between the bottom left and bottom centre of the image) and so the scheme was designed with this in mind. However, while these efforts to conceal cylindrical forms considered the likely direction of an attack, imitation for these structures was not adopted in ‘wholesale’ fashion, in part due to the acknowledgment of the mobile aerial gaze of the bomber body; indeed, an enemy aircraft could circle around a target, thereby rendering the imitative pattern ineffective.

![Plate 6.20: Comparative oblique images of a gasholder of the Newcastle-upon-Tyne and Gateshead Company showing the gasholder before (left) and after (right) treatment with an ‘imitative’ pattern. (Source: N.G.A., NO/NWG/E/F/26 and NO/NWG/E/F/27).](image)

employed in camouflage work for the Air Ministry, he joined the C.D.C.E. on its formation. The power station captured in this painting was one of the schemes which Moss worked on during his tenure with the C.D.C.E., with his biography recounting a tale of how he once got caught during an air-warning whilst painting at the site: “I think it was February – and I was painting away at this thing and the air-raid warning went off, and there was I sitting on top of a power station! I thought about it but didn’t reckon it was worth going down, and so I sat there continuing…the Germans didn’t come, it was a false alarm”. He later joined the Life Guards (part of the Household Cavalry) in 1941 and in the post-war years, became a senior lecturer at the Ipswich School of Art. See Bennett, 1996, p.25.
6.3.2: Netting and Screens

While paint-based solutions remained at the heart of day-time civil camouflage work, a variety of alternative techniques were developed during this period which sought to challenge the dominance of artistic knowledge within the camouflage tradition. For example, Colonel C.H.R. Chesney,742 in his book *The Art of Camouflage* (1941), was particular critical of what he called ‘paint-brush supremacy’, arguing that some structures in the landscape were not wholly suited to receiving paint-based solutions; indeed, his words of concern were that ‘these are unfortunately structures of enormous value and are often the most noticeable features of a landscape’.743 In particular, Chesney highlighted such features as oil storage tanks and gasometers, writing that:

‘no general scheme can be applied to…oil installations. Painting of the tanks, as has already been done in plain or camouflage colours, cannot offer more than 2% immunity value owing to the most objectionable form possible from the camouflage point of view. Money has unfortunately been expended on this comparatively futile work already, with the added disadvantageous result that it has served to increase the evaporation losses in the tanks’.744

Such sentiments were also replicated by those involved in ‘official’ camouflage work. In one report to the C.A.P. in March 1940, Dr Jordan wrote that ‘the treatment of oil tanks with paint alone is ineffective. The tell-tale shadows still remain and a depot is still easily recognisable from the air’.745 Information gathered from aerial survey flights also backed up such claims; in an extract from a survey report of the Avonmouth Oil Tank depot on 8th October 1939, Mr Chappell noted that:

‘the normal “earth and green” painting of the tanks did very little to disguise the presence of the tanks, and in this case, when visibility was so good, the form stood out from background so as to render the tanks almost conspicuous, this applying especially when viewed from a low altitude and distance less than five miles’.746

742 Colonel Clement Hope Rawdon Chesney (1883-1962) had previous experience of working in camouflage having been put in charge of the British ‘camouflage factory’ at Amiens during the First World War. These insights were to inform the ideas he presented within *The Art of Camouflage*.
744 Chesney, 1941, p.110.
746 TNA, HO186/171: *Reports of Camouflage of Oil Tanks at Avonmouth*, dated 1st Nov 1939.
This culminated in the assertion, by early 1941, that:

‘it is doubtful if the disruptive pattern at present applied to tanks achieves any results in concealment, except where the natural background is particularly favourable …A disruptive pattern on other tanks could possibly be effective if the pattern could be continued on the ground around and beyond the tanks, but in practice such ground treatment does not appear to be feasible on a large scale’.\textsuperscript{747}

The issues with the paint-orientated solutions of toning-down, disruption and imitation were twofold. Firstly, paint was unable to conceal the shadows of the camouflaged structure, a problem identified by Jordan in the context of oil and gas holders. Other architectural features were also seen to produce shadows in different ways; ‘north-type’ and ‘ridge and furrow’ roofs, in particular, were highlighted as producing sharp contrasts between light (surfaces facing the sun) and dark (surfaces in shadow) surfaces. Dealing with such shadows was considered to be particular difficult to achieve through the medium of paint. It was noted, for example, that:

‘the difference between any two tones in paint is never as great as that between a surface in strong sunlight and one in shadow. In addition,…shadows change both position and intensity continually and on many occasions do not exist’.\textsuperscript{748}

These temporal variations in the visual appearance of shadows could not be dealt with by a relatively ‘static’ medium such as paint.

Secondly, the nature of the building could also pose significant challenges for paint-based treatments. Gasholders, for instance, were observed to be exceptionally damp throughout the year as a result of condensation caused by the very nature of gas storage. Furthermore, a high percentage of the sides of a gasholder were coated in oil, a necessary lubricant to ensure the easy inflation/deflation of the holder throughout the day. Finally, this rising and falling on a daily basis rendered it difficult to ensure that all

\textsuperscript{747} TNA, HO217/2: \textit{Camouflage Committee Memoranda No.1: Camouflage of Oil Installations}, dated 1941.
\textsuperscript{748} TNA, HO191/3: \textit{Camouflage of Vital Factories and Key Points, 1939-1945}, MoHS, Section 4, p.3.
surfaces that required treatment would be dealt with. In one report from January 1941, it was recorded that:

‘some Companies state that painting of [the] sides is impossible because while [the] holder is full in early morning, it is half down by 2 p.m. and new paint work [is] ruined in the seals’. 749

All three of these issues combined to make the application of a paint scheme especially difficult.

In attempting to overcome these issues, one of the techniques to be resorted to was the use of netting and screens. In contrast to paint, netting had an additional advantage in that it could provide complete concealment through the covering over of a feature and physically hiding it within the landscape. In order to do this, however, the camoufleur had to make sure that the materials utilised produced ‘a surface which behaved optically like grass or whatever was appropriate to the general design’. 750 As blades of grass were ‘somewhat translucent’, it was desirable that the material selected simulated this translucency. Elsewhere, it was remarked that, from the air:

‘the voids between the netting usually show as dark areas and the colour of the netting must, therefore, be lighter and brighter than that of the surface which it is to resemble, for from a distance the colour of the netting and that of the voids will merge to give the appearance of an even middle tone’. 751

Careful selection, therefore, of the types and colours of the materials to be used was essential. In the case of civil camouflage work, camoufleurs made use of coloured scrim (thin strips of hessian, supplied in two colours by 1943; see Plate 6.21), sisal (a stiffer fibre), steel wool (painted in the desired colour), B.G. and ‘feathered netting’ (chopped feathers).

750 Cave-Browne-Cave, 1945, p.265.
751 TNA, HO191/3: *Camouflage of Vital Factories and Key Points, 1939-1945*, MoHS, Section 4, p.4.
As a technique, netting proved to be extremely effective at concealing some of the more complex structures in the landscape aforementioned. In the case of gasholders, the netting could be attached to the external supports of the structure rather than to the movable sections of the holder, thereby negating issues that had arisen in the use of paint. Netting could also be used on a variety of other features deemed ‘impossible’ to camouflage by paint. For example, pipes providing hydroelectric power from the Ben Nevis mountain range for the Alcon aluminium smelter at Fort William were hidden under netting to help contribute to the overall camouflaging of the site; without the netting, it was contended that an enemy aircraft would have been easily directed onto the ‘camouflaged’ plant by virtue of the ‘continuous’ form of the ‘exposed’ pipes (see Plate 6.22).

752 For ‘non-framed’ gasometers, however, additional expense on an independent supporting frame for the netting would have to be incurred. See TNA, HO186/1977: Camouflage of Gas Holders: Recorded Difficulties of Applying Screens and Netting, dated 3rd Jan 1941.
Other ‘adjacent’ features which were considered to ‘expose’ vital factories were also addressed through the use of netting and screening techniques. Car parks, for example, were highlighted as dangerous ‘give-aways’;

‘however efficient the camouflage of a factory may be its presence will inevitably be betrayed by cars parked in its vicinity. It is essential, therefore, that some economical form of camouflage be provided’. 753

To contend with these features, two proposals were put forward. At the C.D.C.E., scrimmed netting supported by cables and wooden posts was recommended, with the edges of the netting to be inclined to eradicate the appearance of shadows and to facilitate the merging of the netting into the landscape (Plate 6.23).

Plate 6.23: ‘Ground view of Car Park screened with scrimmed netting on cable grid supported on wood posts’.

(Source: TNA, HO186/1989).

Another solution, proposed by the I.C.R.U., was to make use of vertical screens to confuse and distort the presence of the car park (see Plate 6.24). Their idea, as demonstrated on a model representing a car park ‘in open surroundings to park about 50

cars of varying descriptions’ entailed the use of material ‘carried on wire rope supported by poles varying from 12 to 18 feet in height, the highest being grouped towards the centre’. This material would be suspended vertically, and arranged in:

‘an asymmetric pattern…designed to break up the lines of cars without obliterating the whole surface of the park… In sunlight the strips of fabric throw a confusing shadow pattern over the park and in dull weather only an indistinguishable tangle of lines and colours is apparent’.

Image removed for copyright purposes

(Source: J.T.A., JOT54/1, p.10A).

While these examples demonstrate the use of netting to physically remove the presence of particular features in the landscape, netting could also be used more ‘tactically’ to deal with visual traces such as shadows; these could be concealed underneath the netting, or manipulated through the use of artificial screens in an attempt to distort them. Consideration, however, needed to be given to the positioning and type of netting and screen to be utilised, with each one being tailored to deal with different shadows and to produce different visual effects. Netting could be erected between buildings to ‘merge’ them together (1), be adjacent to buildings to ‘mask’ shadows cast on the ground (2), or fixed over roof valleys (3), whereas horizontal (4) and vertical (5, 6 and

7) screens of varying degrees of ‘translucency’ could be attached to the building in order to ‘distort’ and ‘re-shape’ cast shadows (see Plate 6.25).

Plate 6.25: Diagram illustrating the ‘typical arrangements of camouflage screens’ to remove ‘cast’ shadows.
(Source: TNA, HO186/1985).

6.3.3: Texturing
A secondary critique directed at paint-based methods was their inability to fully contend with textural contrasts in the landscape. Although camouflage paints were produced that contained additional grits and sediments to produce a matt finish, this was deemed to produce only a light texture, and therefore, failed to capture the more varied textural depths of the British landscape. It was argued, therefore, that techniques which produced a ‘medium’ or ‘heavy’ texture through the introduction of ‘contained shadows’ across the building’s surface should be formulated. Emerging in 1941, texturing as a camouflage method was invested with three aims:

(a) to counteract shine when looking towards the light;
(b) to give an intense black in similar circumstances where paint would be ineffective;

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To achieve these, the imitation of both ‘medium’ and ‘heavy’ natural textures was required. In the case of the former, the intention was ‘to reduce shine only sufficiently to match a middle tone against the light’, for instance, to imitate grassland. For ‘strong’ textures, the objective was:

‘to produce the maximum of “contained shadow” for areas of camouflage pattern which have to be as dark as possible against the light. These will nearly always be black areas imitating woods or shadows, but may occasionally be coloured areas imitating such natural features as turned earth’.

Such textural treatments would be confined to the roofs of a building, it being maintained that ‘walls do not need texturing as any shine reflected off them will be directed downwards’. Moreover, it was noted that across these surfaces, light, medium and strong textures could be combined ‘possibly [even] in conjunction with patches of untextured roof, to form a disruptive camouflage pattern from up-sun views’.

To achieve this simulation, a variety of materials were to be adopted, these being selected due to the visual effects they produced in a multitude of observational conditions and angles. The first category of texturing was ‘fibrous matting’, which to a certain extent, was an extension of the techniques associated with netting camouflage, and in some cases, made use of similar materials. However, it worked in dialectical contrast to it; whereas netting worked against nature through the distorting and concealing of shadows, fibrous texturing was to work with nature, producing shadows and simulating the landscape. For ‘heavy’ texturing, steel wool netting would be used, this consisting of:

TNA, HO186/1343: Draft Memorandum: Texturing, dated Sept 1941.


Plate 6.26: ‘Up-sun’ view of steel wool netting applied as texture to corrugated iron roof'.
(Source: TNA, HO186/1989).

‘19 gauge 2in. mesh galvanised wire netting garnished during manufacture with steel wool…supplied in rolls 6ft wide by 75ft long,…painted green during manufacture and weigh[ing] approximately 2lb. per sq.yd’ (see Plate 6.26).\(^{61}\)

For ‘medium’ textures, B.G sewn mats, supplied in rolls in the standardised colours of grass green, foliage green, earth and black would be utilised. As a material, it was deemed ‘thick enough to cover light surfaces without preliminary painting,…rot-proof and incombustible’.\(^{62}\) With respect to both materials, the rolls would be unravelled on the roof top and secured in place by either wires, adhesives or cement patches (see Plate 6.27). As they came in ‘mat’ form, they could also be cut into particular shapes in order to enable the production of a ‘disruptive’ pattern.

As a treatment, fibrous texturing was to be adopted for a variety of features, but it was again the problematic and complex cylindrical form of such structures of gasholders which were to receive such treatments (see Plate 6.28). At a meeting held between the C.D.C.E. and the Gas Works Safety Rules Committee on 3rd January 1941:


aerial photographs of Gas Works were passed round and Capt. Solomon discoursed on the camouflage of Gas Holders and explained the necessity for forming textures on the tops, gritted paint not being sufficient in itself to prevent shine when the holders are viewed into the light.\(^\text{763}\)

Subsequent discussions throughout the year culminated in steel wool being strongly advocated for such structures; one memorandum declared steel wool to give:

‘the best camouflage effect [for gasholder crowns]…its camouflage properties are inherent and do not depend on the skill of the worker or on careful supervision as is the case with other known treatments… it is [also] very simple to apply and easy to remove. The work can be carried out by unskilled labour’.\(^\text{764}\)


\(^{764}\) TNA, HO186/1977: Textural Camouflage of black areas on Crowns of Gas Holders with Steel Wool Netting, circa Aug 1941.
The effectiveness of this form of camouflage treatment on gasholders was considered to be particular successful. In an aerial survey report from March 1942, Glasson recalled how:

‘I flew over the trial area of new steel wool at about 4.30pm…at heights ranging from 1,000 to 5,000 ft. and viewed the sample from all approaches… As a match for the surrounding grassland…I consider that the general tone and colour of the sample will
strike a very good average for the appearance of grass throughout the year…I recommend its acceptance’. 765

Despite its visual effectiveness, there was a great deal of apprehension expressed by both gasholder owners as well as managers of oil tank depots (where textural treatments were also deployed) concerning the utilisation of fibrous matting. These anxieties surrounded the potential for the matting to catch incendiaries and hamper fire-fighting capabilities. 766 At the meeting with the Gas Works Safety Rules Committee on 3rd January 1941, it was noted how:

‘members of the Committee, particular the representatives of the Midland Group,…brought forward objections to the textured treatments, principally the hindrance they would offer to quick repairs in case of punctures by bombs’. 767

Elsewhere, in an exchange of correspondence with the Camouflage Directorate, W.H. Carr, the Managing Director of the United Kingdom Gas Corporation Ltd, writing in relation to the gasholder at Elland, West Yorkshire, contended that:

‘the original scheme for steel wool secured by wires stretched across the crown was highly dangerous to men who have to climb on to the crown at night to deal with incendiary bombs and shrapnel holes…My experience as Gas engineering Adviser to No.10 North-Western region, has been such that I regard it essential that the crown surface should be maintained as flat as possible to permit of temporary patching with clayed plates which method has been responsible for saving many Holders during enemy attacks in my Region’. 768

766 Such fears had also been expressed concerning the use of netting on these sites; in relation to this, camouflageurs had developed a quick release mechanism to enable the netting to be removed quickly, as well as manufactured ‘fire-proofed’ scrim to enhance fire resistance. See TNA, HO191/8: Summary Report No.3: Camouflage Research, undated, diagram K; TNA, HO217/2: Camouflage Committee Memoranda No.5: Treatment of Scrim for Fire Protection, dated 1941.
768 TNA, HO186/1977: Correspondence, Col. W.M. Carr, to G. Hobbs, dated 16th September 1941.
The response from the camoufleur G. Bryant Hobbs (Deputy S.C.O.) was that steel wool had been selected for such camouflage work not simply because of the visual effect that it produced, but also because it was:

‘a form of textured mat that may readily be removed to enable quick repairs to be made to punctured holders, is not flammable and would not unduly prevent incendiary bombs being knocked off’.\(^{769}\)

In an attempt to persuade gas companies of the value of steel wool matting, the Camouflage Directorate actively sought out firms who had applied the scheme and were strongly in its favour.\(^{770}\) One report, for instance, records a conversation with Dr J Burns and Mr A.S. Heap (both working for London-based gas corporations), who it was noted:

‘have had considerable experience in dealing with incendiary bombs and ignited gas escapes on the crowns of gasholders during air raids, [and] were of the opinion that this material would not hinder action in extinguishing such fires and sealing the holes by means of wet clay mattresses’.\(^{771}\)

Furthermore, a demonstration was also arranged by the Directorate at the Bromley-by-Bow Gas Works on 8\(^{th}\) Sept 1941, where ‘some of the workmen who had actually fought fires there during the ‘blitz’ were present and demonstrated various methods of snuffing out flames from punctures’ to show concerned owners that fibrous texturing did not interfere with fire-fighting operations.\(^{772}\) As a start point, attendees were informed of the behaviour of incendiaries, it being noted that such bombs:


\(^{770}\) Cave even personally wrote to ‘influential’ figures in an attempt to allay fears about steel wool. In one letter from December 1941, he wrote to the head of the Petroleum Department, Mr Reuben Kelf-Cohen (who would later act as Assistant Secretary to the Minister of Fuel and Power between 1942 and 1945), appealing for information on his experiences of incendiaries striking an oil tank. See TNA, HO186/1331: Correspondence, T.R. Cave-Brown-Cave, to R. Kelf-Cohen, dated 10th December 1941.

\(^{771}\) TNA, HO186/1977: Report of an Inspection on Thursday, 7th August 1941 of a Camouflage Scheme, in which Steel Wool woven on to wire netting has been used, on the crowns of three gasholders.

\(^{772}\) TNA, HO186/1977: Report of a visit to a demonstration of fire-fighting on the crown of a Gas Holder where steel wool netting had been applied as a camouflage measure, G.B Hobbs, dated 8th Sept 1941. This site had been selected as it contained 4 ‘blitzed’ tanks, 2 of which had been damaged, but contained holes burnt into the crowns of the tanks by incendiaries; these holes were to be of central importance to the exercise.
‘do not, as a rule, penetrate the Holder crown but hit, bounce once or twice, come to rest on the sheeting then burn a hole through the crown of a size which while varying considerably in actual shape may roughly be covered by an area of 4”x3”’. 773

Following on from this, demonstrations on fire-fighting techniques proceeded. As the report on the ‘spectacle’ illustrates:

‘temporary seals had been made over…holes underneath the steel wool. These seals, one at a time, were drawn away by means of a wire attached to them and the resulting jet of gas was lit and allowed to flare up in a flame some 10ft high and some 6ft across….It is to be appreciated that with considerable eddying it was most uncomfortable to approach nearer than 7ft to the hole…the flame spread but little and never once during the whole demonstration did the steel wool netting burn except where directly in the flame and each time immediately the flame was put out there was no trace of smouldering in the netting’. 774

In attempting to smother the flames, several techniques which had become the mainstay of fire-fighting at gasholders were shown; this consisted of the throwing or pouring of moist blue clay over the hole, the placing of sand bags containing clay, and the rolling of disks over the holes and hammered into place to extinguish the flames. In each case, it was concluded that ‘it was apparent that the steel wool netting in no way interfered with the fire-fighting operations. It was obvious that its presence made not the slightest difference’. 775

This demonstration was subsequently followed by a further experiment arranged in February 1942, the purpose being ‘to discover whether BG or steel wool used as texturing would impede an incendiary bomb rolling off oil tanks or gasholders’. 776

Different angles were trialled and accounts given of the behaviour of the bomb once it struck the building’s surface (see Plate 6.29). From this, it was ascertained that:

773 TNA, HO186/1977: Report of a visit to a demonstration of fire-fighting on the crown of a Gas Holder where steel wool netting had been applied as a camouflage measure, G.B Hobbs, dated 8th Sept 1941.
774 TNA, HO186/1977: Report of a visit to a demonstration of fire-fighting on the crown of a Gas Holder where steel wool netting had been applied as a camouflage measure, G.B Hobbs, dated 8th Sept 1941.
775 TNA, HO186/1977: Report of a visit to a demonstration of fire-fighting on the crown of a Gas Holder where steel wool netting had been applied as a camouflage measure, G.B Hobbs, dated 8th Sept 1941.
‘from the results at present available it would appear that the bomb would roll off at angles steeper than about 12½° and that BG especially and steel wool to a lesser extent seems, if anything, to increase this tendency’.  

Despite these efforts, individual gas firms continued to protest against the use of fibrous texturing, and inevitably, the Directorate was forced to compromise, while at the same time, warning owners of the responsibility of selecting what they considered to be ‘inferior’ treatments. Carr, for instance, proposed to make use of a Spent Tan textural treatment (discussed later), even though it possessed a higher degree of flammability. In response, Cave wrote that:

‘if you advocate the use of the material which appears to us to be less effective as concealment you will no doubt feel justified in accepting the responsibility for the somewhat greater risk of enemy attack which that decision involves’.  

This, then leads into the second form of ‘textural camouflage’ which was developed: ‘granular’ texturing. Granular texturing involved either the placing of loose material or the fixing of aggregates and wood chippings onto the surface to be camouflaged.

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(predominantly roof spaces) by an adhesive to produce dark or heavy texturing. In the selection of the material to be used, one memorandum from May 1942 asserted that:

‘the qualities of a suitable aggregate are that it should be cheap, plentiful and in organised supply, weather-resistant, non-friable, fast coloured, not changing too much in tone when wetted, not too absorbent but wettable by adhesive, and preferably light in weight except where used without adhesive’. 779

Moreover, it was contended that the material to be used be naturally coloured if possible, with black and greys being favoured. It was acknowledged though that not all the desired colours required could be obtained naturally, and so colouring by paint may be required; the paint, however, would have to comply with the specifications drawn up by the C.D.C.E. and the Paint Research Station. 780

Taking these aspects into consideration, several different types of material were utilised to achieve this texturing effect. In the majority of cases, aggregates such as Dolerite chippings, foamed slag (‘a light porous waste product used in concrete’) 781 and crushed limestone would be utilised, these being fixed to the building through the use of Bituminous Emulsion, Bituminous Mixes with Solvents, Hot-applied Bitumen or Coal-Tar. These aggregates were selected because their ‘raggedy’ appearance would produce the desired textural effect; ‘sharp craggy material throws more shadow than the rounded pebble. The change up and down light will therefore match that of a rougher natural surface’. 782 Furthermore, it was noted that problems would be encountered with ‘rounded’ material; it was advocated that ‘gravel should not be used, since the rounded particles do not adhere well’. 783 In addition to stone, wood-based materials were also used. Spent Tan (in the form of Mimosa Bark and Oak Bark), for example, ‘when treated with Iron Tannate solution gives an excellent matt black and is said to be permanent’. 784 Cork granules were also advocated, these being deemed to be:

780 In particular, C.D.C.E. Specifications No.2 and No.3. See TNA, HO217/4: Texturing of Roof Surfaces: Granular Treatment, c. Mar 1942.
781 TNA, HO186/1343: Draft Memorandum: Texturing, dated Sept 1941.
783 TNA, HO217/2: Camouflage Committee Memorandum No. 2: Texturing of Roofs, dated 1941.
784 TNA, HO217/2: Camouflage Committee Memorandum No. 2: Texturing of Roofs, dated 1941.
‘very light in weight and will attach excellently to all adhesives. Size “M.L.” gives a particularly heavy texture, but owing to their scarcity, cork granules should be reserved for sites where their use is essential’.785

For both stone aggregates and wood chippings, however, it was contended that they had to be of a particular size in order to prevent them disappearing into the adhesive; for medium texturing, it was decided that particles which passed through 1/32” would act as a minimum, with it being argued that ‘smaller particle sizes experience[e] “swamping” if painted’.786 For strong texturing, nothing smaller than 1/16” was permitted for the same reason.

At the same time, particle size had to be balanced with the maximum permissible weight which was permitted on top the structure being textured. At a meeting with representatives of the Petroleum Department787 in April 1942, Glasson enquired about the maximum load which cylindrical oil storage tank could take. In response, Mr Evans Jones (Deputy Chief Operating Officer, Petroleum Department) stated that:

‘many…tanks to be camouflaged were at least 50 years old and the roofs were very thin, and you may (therefore) get a very large unsupported area of roof. These roofs have been purposely built light and a safety margin had been allowed so that they could take a certain amount of snow. He therefore felt that they must stick to the safety margin for which the tanks were built and not permit texturing of more than 1lb in weight [per sq. foot]’.788

This dimension, therefore, had to be factored into the application of texture by adhesive to the oil tank crown.

While the majority of these granular treatments were affixed to the building through the careful selection of an appropriate adhesive which was ‘compatible both with the

785 TNA, HO217/2: Camouflage Committee Memorandum No.2: Texturing of Roofs, dated 1941.
787 The Petroleum Department was responsible for the governance of all petroleum industries within the U.K.. In June 1942, it became part of the newly established Ministry of Fuel and Power.
788 TNA, HO186/1331: Minutes of a meeting to discuss the camouflage of Petroleum Installations, held at the Directorate of Camouflage on 13th Apr 1942.
surface (including the sealing coat if such has been necessary) and with the aggregate’, in some cases, loose fragments held in place by either the effects of gravity or wooden frames were suggested. At the gasholder of the Bradford Corporation, for example, wooden battens and 1” fish netting were used to retain coke fragments (see Plate 6.30).

![Image removed for copyright purposes]

**Plate 6.30:** Illustration of ‘loose’ granular texturing, held in place by wooden battens and 1-inch fish netting.
(Source: TNA, HO186/1977).

Elsewhere, experiments were carried out by the C.D.C.E. on a series of (undisclosed) shed roof tops in April and May 1942 to ascertain the operational performance of loose chippings. As part of this experiment, test panels were erected, with each one possessing different loadings (1, 2 and 3 lbs per sq. ft) of loose chippings of Dolerite, broken brick, clinker and coke held at different angles (between 10° and 25°) to observe their effectiveness (see Plate 6.31). The experiment proved to be relatively successful, with it being concluded that:

‘a medium texture can be achieved with a loading of 1lb. per sq. ft. of any of the three materials, and that, roughly speaking, 2lbs. per sq. ft. will suffice to give a strong texture, although rather more than this is desirable in the case of painted Dolerite’.790

As these samples were primarily held in place by gravity, some initial concerns were expressed about the effect of the wind in dislodging the material from the roof. As the experiment seemed to show, the samples proved to be quite capable in resisting the wind experienced on the roof top (which it was estimated could reach up to speeds of 60mph), with it being discovered that ‘brick retained its position more satisfactorily than clinker, particularly on a smooth hard surface’.791

Plate 6.31: A photograph of four of the test panels of ‘textural’ material being inspected by C.D.C.E. camoufleurs in April 1942.
(Source: TNA, HO217/4).

In August 1942, further tests were carried out in the wind tunnels of the RAE Farnborough to investigate the durability of ‘loose’ textural material, with two different types of granular ‘packing’ (100% and 50%) for five different stone types (Clinker, Sandstone, Brick, Dolomite, Black Shale) being subjected to wind speeds of between 65 to 90 mph in the tunnel. As a result, it was concluded that:

'Dolomite and brick are the best materials to use…Sandstone is a good second best and black shale and clinker follow in order of preference; A 100% pack is more satisfactory than a 50% if the roof strength requirements allow it'.

These tests confirmed that the tight packing of aggregates onto the surface of a roof proved to be an equally successful measure, and both adhesive and non-adhesive approaches to granular treatments would be used to simulate the textural appearance of the surrounding landscape.

The final category of ‘textural camouflage’ was that of ‘roughcasting’, a technique primarily devised to protect asbestos and corrugated iron roof sheeting. This roughcasting fell into two categories. The first was cement-based, whereby a thin coat of cement would be applied to the surface and rendered to produce varying degrees of texture. The cement would be applied by trowel, with the use of a cement gun being deemed ‘impracticable’. To aid with the production of the texture, material would be added to the mix, it being acknowledged that

‘generally speaking,…wood mixes will be rougher and will therefore be most suitable for strong texturing, the stone and clinker roughcasts serving for medium texturing’.

A strong texturing mixture or ‘sawdust roughcast’, therefore, consisted of 1 part cement, 1 part sand, 2 parts coarse sawdust, whereas a medium texture would be achieved through a ‘stone roughcast’ (1½ parts cement, 1 part lime, 2 parts sand, 6 parts stone aggregate) or a ‘clinker roughcast’ (1 part cement, 4 parts clinker or coke).

The second form of ‘roughcasting’ was the use of sprayed asbestos, a technique which emerged from early experiments carried out by the gas and oil industry. The first recorded use of this technique was at the Birmingham Corporation Gas Works, Windsor Street, where a mixture of fossil meal (a type of asbestos) and cement at the ratio of 2:3 was used at the site. Amongst the advantages noted by the engineer was its lightness in

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weight, particularly when compared with the use of Portland Cement.\textsuperscript{796} Limpet Asbestos was also experimented with at the Llandarcy oil installation, near Neath, in an attempt to provide a treatment which would support the steel wool camouflage applied there. In the report on observations made at the site, it was recorded that:

‘from the point of view of durability and cost of application and maintenance, the Limpet Asbestos was the better proposition. It is also (and this should be an advantage in the case of gas holders) non-inflammable…The upper crust crumbled leaving a slight furring on the tank. No tank on the site had been treated less than 18 months ago, and none had been retreated. Some tanks, however, had been resprayed, [with] oil bound distemper…, and on these the colour and pattern stood out very well. The tanks which had not been repainted had naturally faded considerably, but the texture remained after exposure of between 18 months and two years. This should be sufficient answer to questions on durability’.\textsuperscript{797}

Both sets of successful experiments meant that asbestos roughcasting, as well as cement-rendering, were finally approved in July 1941 as ‘alternatives to steel wool in cases where gas engineers concerned were not prepared to use steel wool’ on account of their objections to fire risk.\textsuperscript{798}

6.3.4: Concealing Smoke Plumes

Having thus far considered treatments which dealt with the ‘conspicuous’ presence of physical structures of industrial buildings themselves, I now shift consideration to the concealment of other visible traces in the landscape. Indeed, through aerial surveying, there were other elements, both natural and artificial which were considered to ‘expose’ vital installations in the landscape. For example, in their discussions on tonal differences in the landscape, camoufleurs often evoked the visual appearance of smoke and steam plumes, with two different forms of smoke being emphasised as ‘dangerous’. Firstly, there was ‘dark smoke’ which was considered to ‘spell a manufacturing town [or] centres of heavy industry’.\textsuperscript{799} Secondly, there was the presence of white smoke

\textsuperscript{796} TNA, HO186/1977: Texturing of Gasholder Crowns, H. Eccles, dated 19th June 1941.
\textsuperscript{797} TNA, HO186/1977: Report on a Survey of ‘Limpet Asbestos’ carried out on 17th June 1941, at Llandarcy on the premises of the Anglo-Iranian Oil Company, J. Chester, dated 23rd June 1941.
associated with ‘the vapour plumes from a power station cooling tower, the steam cloud from a coke quenching plant, or the smoke from a sugar factory or a cement kiln’. Such plumes, it was contended:

‘stand out clearly when seen from an aircraft against the background of surrounding country and also when seen against the sky which is usually dark enough to give strong contrast’ (see Plate 6.32).

Furthermore, their presence would be adversely affected by meteorological conditions;

‘the vapour plume from a power station condenser is manifest in considerable variety according to the humidity and temperature of the outside air. On a bright clear day the plume is commonly a thin short wisp of tenuous vapour, which is relatively inconspicuous; but when the air is heavy and clouds are low, the discharge of vapour

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Plate 6.32: ‘A long chimney plume from a power station’.
(Source: TNA, HO186/2769).

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becomes a massive cloud, often merging in the natural cloud in which it appears framed'. 802

In reference to power stations, low atmospheric temperatures meant that ‘they can be seen from a much greater distance than can the power station buildings, and thus form a valuable guide to the position of the power station’. 803 On this basis, steam and smoke plumes were considered to serve as valuable landmarks, being ‘of great assistance to the enemy attacking that particular target, unless of course there were many other similar plumes in the district’. 804 In one example, it was noted ‘the smoke from a cement kiln…is always an excellent mark in good visibility, often clearly seen and recognised from a distance of 60 to 80 miles’. 805 Elsewhere, in his lecture to the Royal Society of Arts in 1945, Cave made reference to an unnamed example where:

‘a chimney was seen to be emitting a plume nearly pure white and some fifteen meters long. There is strong evidence to show that this particular plume was used on two occasions for very successful attacks, not upon the works, but upon works of exceptional importance some twenty miles away’. 806

In order to contend with this issue, several solutions were put forward. The first was to attempt to extinguish the smoke as soon as an air raid warning was issued. However, this was deemed to be problematic as it disrupted industrial productivity due to the amount of time taken to reignite the fires and restore them to the desire temperature to continue work. 807 In addition, this was also considered to damage the morale and exacerbate the frustration of factory owners and workers alike in the event that the air raid warning was a false alarm.

The preferential solution, therefore, was to facilitate the darkening or ‘toning down’ of the plumes. First suggested in April 1940, initial conceptions outlined how this could be

804 TNA, HO186/1982: Minutes of a Meeting of the Civil Camouflage Assessment Committee held on 9th October 1942.
806 Cave-Browne-Cave, 1945, p.267.
807 This was an issue of particular concern with coke ovens and smelting plants.
achieved through the use of ‘smoke boxes’, with it being envisaged that 4 or 5 of these would be required to conceal the plumes emitted from a power station. However, concerns were raised as to the prohibitive costs of utilising these; each smoke box was considered to cost about £200 (about £5,700 today) each. Moreover, it was remarked that:

‘the estimated running costs are at present fairly high. They amount…to £10,000 [£287,200 today] per season for Sugar Beet Factories and a figure of £100,000 [£2.87 million] per annum has been quoted for one large Power Station’.  

Nevertheless, initial experiments were approved to take place at the power station at Hardingstone, Northamptonshire, in an attempt to find a suitable material which, when burnt, would produce the desired tone and which would be economical to use. It was realised, for example, the use of fuel oil would be prohibitive, and so it was ‘decided to develop a burner suitable for the use of [coal tar] pitch. Large quantities are available at prices between £1 and £2 a ton’.  

The idea was that the pitch would be:

‘heated in a container…[and] fed [in]to a specially constructed burner where it is injected by steam into a brick furnace. The amount of air available for combustion is so far restricted that the maximum of smoke is formed’.

The results of this technique when trialled at Hardingstone showed that:

‘when burning one ton of pitch per hour the darkening of the steam plume is sufficient to give a tone fully dark enough in relation to all normal surroundings. The distribution of smoke in the plume is also quite satisfactory’.

Subsequent discussions, though, raised some issues which needed to be addressed if effective concealment was to be attained. It was noted that varying rates of smoke and steam were released by different establishments, according to the type of work being

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808 TNA, HO186/975: Civil Camouflage: A Note on the Present Position, P. James, c. Apr 1940.
809 TNA, HO186/1985: Darkening of Plumes of White Smoke, undated.
810 TNA, HO186/1985: Darkening of Plumes of White Smoke, undated.
conducted there, and this was something which needed to be accounted for in terms of camouflage smoke production. Sugar beet factories, for instance, were noted to:

‘discharge large quantities of steam uniformly and from chimneys of comparatively small cross section. There should, therefore, be little difficulty in achieving satisfactory distribution and the introduction of the smoke at the base of the chimney should be quite satisfactory’. 812

On the other hand, coke quenching towers were seen to introduce:

‘serious additional complications because the quenching process is done once every 10 minutes and continues for only four minutes of that period. Even during this four minute period the discharge is far from uniform there being a high maximum at the beginning of the time. In order to provide sufficient smoke to deal with this maximum it will be necessary to install an apparatus more than double the capacity which would be sufficient for the average of the quenching period’. 813

Plate 6.33: A diagram of the site plan showing the layout of the smoke distributing ducts for the Hams Hall experiment.
(Source: TNA, HO196/30).

813 TNA, HO186/1985: Darkening of Plumes of White Smoke, undated.
Despite such concerns, smoke darkening techniques continued to be developed, and the Hardingstone experiment was followed by further trials at the Hams Hall power station (10 miles east of Birmingham) in order to refine the system. Being considered an important leading landmark for attacks on Birmingham on account of the plumes emitted from them, it was felt that anything that could be done to reduce their visual appearance would be of great value. The experiment was, therefore, set several ‘design conditions’:

1. To camouflage the plumes from 6 cooling tower
2. To provide satisfactory camouflage as quickly as possible, on receipt of an air raid warning, at any time of day or night, in all weather conditions
3. To interfere as little as possible with the normal operation of the station
4. To consume only fuels which were readily available
5. To be capable of operation mainly by unskilled labour

Images removed for copyright purposes

Plate 6.34: Photographs of the furnace housing unit and distribution ducting connected to the Halls Hall power station cooling towers.
(Source: TNA, HO196/30).

Planning of the technological apparatus to be used commenced in late 1942, with the six cooling towers being paired up and connected to one smoke unit (see Plate 6.33 and

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814 In one observation flight over Birmingham in December 1942, it was noted that ‘three plumes of smoke were seen which were clearly distinguishable from anything else. It is fairly certain from the description given that one of these was Hams Hall – this was said to be the most easily seen’. See TNA, HO186/1342: Report and conclusions of special operation carried out by R.A.F. and other services on 22nd Dec 1942, to determine what points, if any, might be used by the enemy to fix the position of vital targets in the Birmingham area, L.M. Glasson, dated 31st Dec 1942.

6.34). In November 1942, some initial difficulties in obtaining the necessary 36-inch diameter steel ducting were experienced, leading to significant delays in progress. By June 1943, preparations were slowly advancing; Cave reported to the C.C.A.C. that ‘arrangements had been completed for the installation at Hams Hall A Power Station of the smoke darkening apparatus, which should be in operation by September’. A further report to the C.C.A.C. in December 1943 suggests that the equipment had only been installed to two of the cooling towers, with Cave proposing that materials be sourced for the station’s four other cooling towers to enable completion of the entire scheme by the end of January; however, it was noted by Squadron Leader Whitham that:

‘the risk of air attack in that area was now very small and he was himself of the opinion that the experimental unit should be completed and tried out first before ordering the further apparatus’.

As had been the case at Hardingstone, the smoke to be generated at Hams Hall was to be achieved through the combustion of pulverised pitch, through which it was contended that ‘a satisfactory output can be attained within 5 minutes of receipt of a warning’. In contrast, however, whereas only one ton of pitch needed to be burnt to darken the single cooling tower at Hardingstone, the six tower arrangement at Hams Hall required 6 tons, and so equipment needed to be developed to ensure that a constant and consistent source of smoke was being provided. To enable this, a highly sophisticated and extensive smoke producing system was developed (see Plate 6.35), whereby:

‘pitch in lumps not greater than 6in. cube is shovelled into the pitch cracker [by 2 men] on the right, the lumps are quickly reduced to walnut size or smaller and fall through the grating down the chute into the boot of the elevator. An ordinary bucket elevator transfers the pitch into a hopper of capacity one ton, from which it is fed into an

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816 It was determined that if a single smoke unit was connected to more than two cooling towers, issues would be experienced in terms of the equal distribution of the smoke.
817 TNA, HO186/1985: Minutes of a Meeting of the Civil Camouflage Assessment Committee held on 20th November 1942.
818 TNA, HO186/1985: Minutes of a Meeting of the Civil Camouflage Assessment Committee held on 18th June 1943.
819 TNA, HO186/1985: Minutes of a Meeting of the Civil Camouflage Assessment Committee held on 4th December 1943.
“Atritor” pulverizer…In the pulverizer it is reduced from walnut size to the fineness of flour and is then carried in a current of air into the burner, where it is injected into the furnace…on entering the furnace the pitch is ignited and burns with a very bright, intensely hot flame, producing a large volume of smoke’. 821

Image removed for copyright purposes

Plate 6.35: Diagram of the smoke producing unit.  
(Source: TNA, HO196/30).

This smoke would then be pulled through steel ducts into the cooling tower, by means of natural draught, where it would combine with the water vapour to create a uniformly dark smoke plume. The visual appearance of this, as applied to towers No.1 and 5, is captured below (see Plate 6.36); as noted in the research report:

‘the plumes from the [untreated towers] on the right contrast sharply with the background. The treated plumes [however] have almost the same tone as the background; they are also obscuring the plumes from the two middle towers. The camouflage thus obtained was considered sufficiently good’. 822

The results at both Hardingstone and Hams Hall confirmed the effectiveness of smoke darkening for both day and night schemes, and indeed, even before work had begun at Hams Hall, the C.C.A.C. in April 1942 had already taken the decision to include smoke darkening as part of the NIGHT PLUS treatment. However, by the time that the Hams

Hall experiment had proven its worth, the aerial situation had significantly altered, and as a scheme, smoke darkening was never really fully operationally realised. At Hams Hall, the equipment was kept in place should it require reactivation, but remained unused.

6.4: Conclusions
Following on from the discussions within Chapter Five, this chapter has explored how knowledges about Britain’s aerial geographies, Luftwaffe bombing practices and the vertical visualities enabled by the aeroplane were translated into the development and designing of camouflage schemes to subvert the aerial gaze of the bomber body making observations of the industrial landscape during day-light hours. Such knowledge, it has been argued, had a significant impact upon how the landscape was known, described, simulated and transformed by civil camoufleurs during this time period. In the first section, attention was devoted to how ‘conspicuous’ features were isolated in the landscape, with civil camoufleurs reducing encounters with the landscape to a particular

Plate 6.36: Aerial photograph of the Hams Hall power station cooling towers emitting ‘normal’ white plumes (to the right) and darkened ‘camouflaged’ plumes (to the left).
(Source: TNA, HO186/2769).
set of aerial grammar. Differences in colour, tone, texture and form, for instance, were all used to demarcate particular spaces and reinforce binaries between the ‘natural’ and the ‘social’, the urban and the rural. Moreover, it was through this grammar that civil camoufleurs launched their critique of the inter-war ‘planned’, modern landscape; regularity, continuity, repetition, uniformity, symmetry, order, smooth surfaces and light-toned building materials, were all attributes which had come to define the interwar architectural aesthetic and which were now condemned as making the landscape highly conspicuous when viewed from the air. Furthermore, the presence of shadows as ‘dark’ areas was also emphasised, these serving to outline regular and geometrically-shaped industrial buildings such as ‘block-type’ factories, oil tank farms and gasholders. In order to conceal these ‘conspicuous’ features into the landscape, attention would need to be paid to the relationships between these various visual attributes and the landscape patterns that they produced.

The second section explored the centrality of models in civil camouflage work, highlighting how they were utilised as an economical means of producing ‘effective’ camouflage schemes as well as permitting a factory to be viewed in a variety of visual conditions without the constraints imposed by a limited number of aircraft available for aerial surveying. As part of this section, examinations were also made about the meticulous simulation acts which were carried out to enable the Viewing Room to become a ‘space of assent’, a space where camouflage designs were viewed, discussed, critiqued and effectiveness confirmed not only by the camouflage designer but also a variety of other individuals involved in the camouflage set-up. Moreover, this section focused on the role of various technological devices within this space of simulation: the turntable enabled the camouflage designer to adopt a ‘mobile’ gaze and view the model from all perspectives; scenery in the form of foregrounds and backgrounds allowed the model to be positioned within its surroundings; various optical devices produced a (simulated) aerial observer; and technologies of measurement and calculation enabled the extraction and extrapolation of information about the ‘real’ world to be brought into the simulated environment of the Viewing Room. These various simulation acts would culminate in the Viewing Room becoming a key site within camouflage practice, a transitory space where camouflage ideas were transmuted into camouflage ‘realities’.
The remainder of the chapter charted the various camouflage methods which were deployed ‘in the field’ and how each one sought to deal with particular visual attributes that rendered a building ‘conspicuous’ when viewed from the air. In the first instance, it was demonstrated how camoufleurs initially adopted paint-based solutions, an approach which was very much a residue of the First World War. These paint-based solutions were focused upon three different techniques that produced particular camouflage ‘effects’: merging, disruption of form, and imitation. In the detailing of these different paint methods, consideration was devoted to the challenges which had to be overcome to ensure their effectiveness; camoufleurs had to be attentive to the predominant colours and patterns of the surrounding landscape, the micro-geographies of the surfaces of the structure to be concealed and how these might affect the type of paint to be utilised, and the durability of the paints used to prevent the scheme from falling into disrepair or failing.

Following on from this, the chapter outlined some of the ‘more-than-paint’ solutions which were developed in response to the unique difficulties of concealing ‘complex’ modern structures such as gasometers and oil tanks. Indeed, camouflage netting, screens, and texturing of different kinds were devised as techniques which sought to challenge what was referred to as ‘paint-brush supremacy’, contending with visual attributes such as shadows which a paint-centric methodology failed to address. These methods extended camouflage effects beyond merging, disruption and imitation, to include concealment, manipulation and textural mimicry. The final part of chapter concluded by also illustrating interventions by civil camoufleurs in transforming the presence of white smoke and steam plumes in the atmosphere, with experimental methods in the darkening of the plumes being carried out to reduce their conspicuous; interestingly, these interventions with the atmosphere extended beyond an environmental concern to think instead about the aesthetical presence of smoke and steam plumes in the air.

Across all of these methods, civil camoufleurs had to contend with and negotiate resistance from various group as to the imposition of a camouflage scheme: toning down was contested by preservationist movements such as the C.P.R.E. on the grounds that camouflage was damaging to the ‘national character’ of cathedrals and white-washed buildings, whereas fibrous netting was opposed by oil and gas companies on
account of fire risk, despite efforts from the Camouflage Directorate to alleviate such fears. These moments of resistance suggest that camouflage as a practice is not one which is applied wholesale, but is negotiated through relations between different actors.

Overall, the central aim of this chapter has been to extensively detail day-time approaches to camouflage, the effects they sought to produce and the relations between individuals, materials and the structures themselves in determining the form that camouflage would take. Moreover, it has affirmed the central relationship between aerial spaces and the grounded landscape within camouflage work: the British landscape comes into being and is mobilised through a certain set of aerial practices and grammar, through simulated acts within the Viewing Room that are representative of aerial gazes, and is transformed and re-produced in such a way as to subvert the vertical visualities of the embodied aerial subject. These findings, however, only pertain to one set of atmospheric experiences, namely viewing undertaken during clear, day-light conditions (with occasional haze). In the next chapter, I consider the implications of nocturnal viewing conditions in shaping, re-appropriating and transforming these established assertions.