



Air Power Review

Battle of Britain Edition

Summer 2015

British Strategy in a Certain Eventuality

Introduction by Sebastian Cox

**Imminence of a German Invasion of Great Britain -
Report by the Joint Intelligence Committee**

Introduction by Sebastian Cox

**No 11 Group Instructions to Controllers
and Analysis**

Introduction by Sebastian Cox

**'Battle of Britain Despatch'
by Air Chief Marshal Hugh Dowding**

Introduction by Sebastian Cox

**The Rise and Fall of the German Air Force -
(Air Pamphlet No 248) 1922-1940**

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**'Despised and Neglected?' British Fighter
Defence, 1922 - 1940**

By Group Captain John Alexander

The Battle of Britain: A Not So Narrow Margin

By Wing Commander John Shields

**The Vital Pre-Requisite: The Battle of Britain and
the Enduring Importance of Control of the Air**

By Air Commodore Al Gillespie

Book Reviews

**Churchill and His Airmen: Relationships, Intrigue
and Policy Making 1914-1945**

Reviewed by Sebastian Cox

**The Battle of Britain: Five Months that Changed
History, May - October 1940**

Reviewed by Dr David Jordan

When Britain Saved the West: The Story of 1940

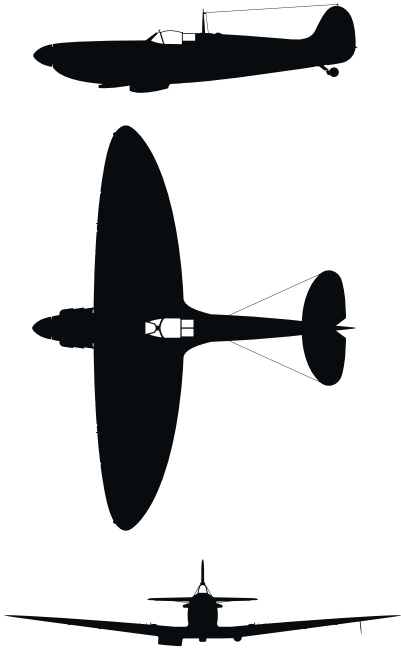
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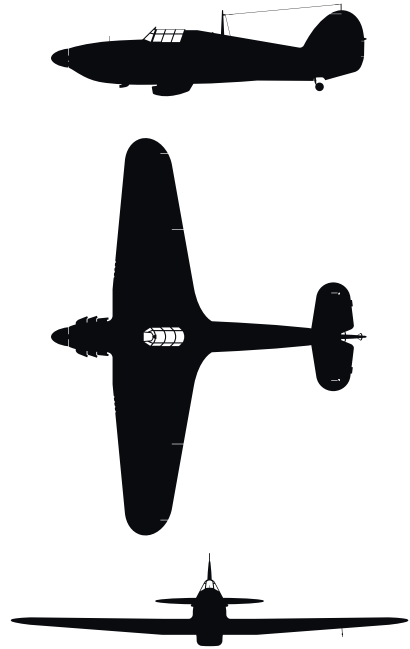
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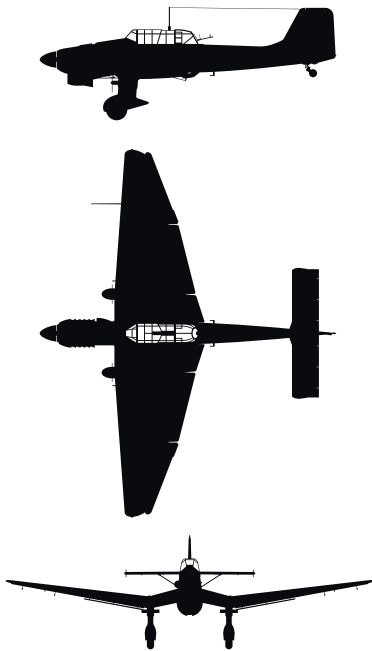
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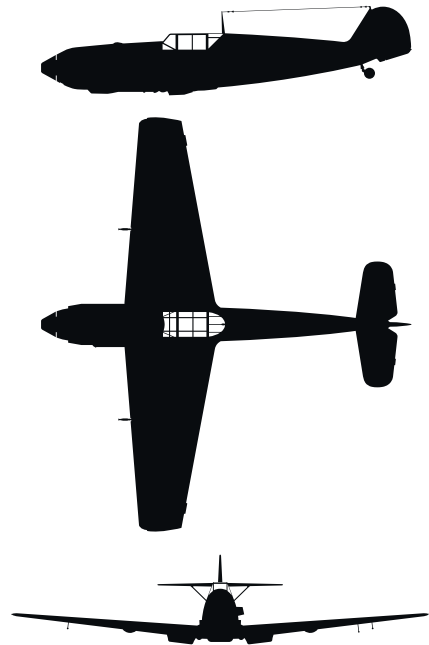
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Armourers work to replenish the guns on Hawker Hurricane I, P3143/NN-D, of 310 Squadron, based at Duxford on 7 September 1940.



Frames from gun camera footage taken by RAF pilots during various engagements during the Battle of Britain. Heinkel He111 bombers under attack.



A Supermarine Spitfire 1A of 19 Squadron being re-armed between sorties at Fowlmere, Cambridgeshire, in September 1940.

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Squadron Leader DRS Bader, Commanding Officer of 242 (Canadian) Squadron pictured on the cockpit of his Hurricane fighter at Coltishall in September 1940.



Flight of Hurricane I fighters flown by pilots of 85 Squadron, RAF Church Fenton. Leading the formation is Sqn Ldr Peter Townsend. Taken 5 October 1940.

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Foreword

By Squadron Leader Paul Baroni

This special edition of Air Power Review (APR) marks the 75th Anniversary of the Battle of Britain. The first decisive British victory of the Second World War, the Battle has assumed a celebrated, almost legendary status in the popular national consciousness. The purpose of this special edition is to cast further light on the events of the Battle of Britain, by digitising original source material and combining it with academic analysis of the Battle that spans the military, strategic and political landscape that provided the backdrop to the events of 1940.

The analysis is provided by academics, serving RAF officers and, unusually for this edition, the senior RAF officers who fought in the Battle writing in the years immediately afterwards. Their interpretation of events is distilled in documents taken from, amongst others, the National Archives and the RAF's Air Historical Branch (AHB). Although many historians and, indeed, those involved on either side of the fighting disagree on the exact dates, the Battle of Britain is officially recorded as taking place between 10th July and 31st October 1940. Though the achievements and sacrifices of RAF Fighter Command during this period are not in doubt, the articles and papers that follow are included to offer a broader perspective on the Battle, in order to expose further insight into any lessons that remain applicable and relevant today for the air power practitioner (from the tactical operator to the political and military-strategic leader).

It is for this reason that this special edition is laid out in a linear, chronological order of events to allow the reader either to build up background and context to the Battle following papers sequentially, or to dip in and out of articles, but aware of what stage of analysis they join at. Each piece of the archive material is expertly introduced to the reader by Sebastian Cox, Head of the AHB, as he reminds us of important historical context to appropriately frame what then follows.

Our first paper is a facsimile transcription of the Chiefs of Staffs' Committee Memorandum *British Strategy in a Certain Eventuality* written in late May 1940. Although through the lens of the modern reader the Memorandum's title seems to beat around the bush somewhat, be ambiguous or even humorous, it addresses the most serious matters of state albeit in a very British way. And as Cox identifies, its predictions proved to be fairly accurate given its genesis during the travails of the ongoing British evacuation from Dunkirk. The Memorandum dedicates large sections to the ability to withstand attack from the air, which, is deemed to be the 'crux of the whole problem', identifying the concentration of German air power against Britain's critical vulnerabilities, namely, aircraft production and the air defence network including the RAF fighter force and their airfields.

The next paper is a Report from the War Cabinet's Joint Intelligence Sub-Committee entitled *Imminence of a German Invasion of Great Britain*. Cox's introduction perfectly highlights the fallibility of human nature, compounded in this regard by organisational failings within Britain's intelligence apparatus. Written in early July 1940, the Report provides a fascinating glimpse into the intelligence organisations and Service Chiefs' thinking on the prospect of an imminent German assault on the British Isles 'involving all three arms' but 'not before the middle of the month'. Intelligence showing an ominous build-up of Luftwaffe units in the Netherlands and France as well as a standing Combat Air Patrol (CAP) over Calais heightened expectations of an imminent air battle, highlighting the level of tension and pressure on the Cabinet and Chiefs at the time.

Next is a series of formal instructions issued by Air Vice-Marshal Keith Park, AOC of No. 11 Group, a key part of Fighter Command; a number are published here in full and highlight both the tempo and scale of the tactical battle. Crucially, the reader will clearly see demonstrated in the *Number 11 Group Instructions to Controllers* both strong leadership and a learning-organisation at work. For example, Instruction No. 4 of 19th August 1940, the first in our series, shows Park's insight as to the significance to the change in focus for the Luftwaffe's bombing campaign away from shipping and ports to RAF aerodromes. In his introduction, Cox emphasises how Park's astute tactical appreciation of the Battle, manifest in his instructions, had a highly positive, perhaps decisive effect on the events that followed.

Moving to the first of our historical documents written after the Battle, Air Chief Marshal Dowding's *Battle of Britain Despatch* was written a full year after the struggle of 1940. Indeed, Cox reveals that it may never have been written if it weren't for Churchill's dogged insistence that he was owed a report by the Air Ministry on the events of the Battle of Britain in their entirety. Though initially classified, the Despatch was publicly released in 1946 and casts a critical light on how the Commander of the Battle of Britain viewed events.

Our last transcription is much of Chapter 4 of *The Rise and Fall of the German Air Force* – otherwise known as Air Ministry Pamphlet 248. Entitled *The First Failure of German Air Power: the Battle of Britain and the Battle of the Atlantic* we focus our transcription on the Battle. Intended as a 'lessons-identified', intelligence report and produced by the Air Ministry in 1946, the writers used Air Ministry documents and captured intelligence from German archives at the end of the War – much of which was later understood to actually have been gained from Enigma decrypts. Cox's introduction helps the reader to navigate around some of the now dated language, doctrine and concepts that are evident throughout. Nonetheless, the Chapter provides an invaluable, contemporary insight into the German Air Force and how and why they were defeated.

By early summer 1940 Prime Minister Winston Churchill was forced to play a short-term game, galvanising a sense of political and national consensus for resisting both German expansion in Europe and a rejection of further appeasement along the lines of his predecessor, Neville Chamberlain. But it was the long-term planning and investment of the previous two decades that made this possible.

Our first full article *Despised and Neglected? British Fighter Defence, 1922-1940* is written by Group Captain John Alexander, an RAF Chief of the Air Staff's (CAS) Fellow, who revisits the inter-war period of enduring competition for resources between the Services and indeed from the Commands within them. The author's evidence and analysis points to the continuous development of air defence between the wars being due to an alignment of political and military imperatives. With the very foundation of the RAF being based upon a need to protect mainland Britain from German air offensives in the First World War, politicians were cognisant of the political – as well as existential – risks associated with strategic bombing. Similarly, the leadership of the new Service was extremely well versed in air defence despite the propensity for successive RAF Chiefs of the Air Staff to favour investment in offensive, strategic bombing, holding Britain's European neighbours at risk. Ultimately, it was the ability to blend the offensive and defensive investment that meant the RAF was able to both win the Battle of Britain and undertake strategic bombing of Germany. The RAF's ability to draw and build upon the lessons of the First World War, technical and scientific developments, research and operational evaluation was an example of the organisation applying thought and a long-term strategic lens to the threat it was likely to face.

Our second article in this edition is written by Wing Commander John Shields, an RAF CAS' Fellow and PhD candidate at King's College London. Shields' paper, *The Battle of Britain: A Not So Narrow Margin* examines how the Battle was won – and lost – and by who, and why. In a fascinating paper the author makes the argument the Battle was lost by the Luftwaffe through a series of errors ranging from decisions made on the formation of the Third Reich's air arm through to tactical failures when fighting the Battle. Shields' methodology is rigorous, analysing both air forces in the build up to the Battle, followed thereafter by their execution and, in particular, the Luftwaffe's strategic air campaign. Finally, the paper's findings are set against Professor Philip Sabin's 'Force Gradient Model' to place in context the natural advantage that defending Britain allowed the RAF.

Our final article of this Battle of Britain special edition looks at the enduring theme of control of the air. In *The Vital Pre-Requisite: The Battle of Britain and the Enduring Importance of Control of the Air*, Air Commodore Al Gillespie, an RAF air defender by profession, examines how victory in the Battle of Britain was founded upon air superiority and effective command and control.

Building on the doctrine and concepts discussed in Group Captain John Alexander's article and the creation of Fighter Command, the author analyses how the RAF retained control of the air over Britain, thus denying the conditions for a successful invasion over the Channel by the German Army in 1940. Importantly, Gillespie discusses the pull-through for control of the air in the contemporary – and future – air environment.

Our summer edition of APR concludes with three book reviews on the people and events surrounding the Battle of Britain. First, Sebastian Cox reviews *Churchill and His Airmen* by the late Vincent Orange, finding it to offer both strengths and weaknesses in its analysis of the leading air power generals of the time and their relations with Churchill. Our remaining two book reviews are both offered by Dr David Jordan of King's College London. In *The Battle of Britain: 5 Months that Changed History, May - October 1940* by James Holland, Jordan describes the book as being a welcome addition to the historiography of the Battle as it considers events in a wider context beyond the exploits and successes of Fighter Command. Robin Prior's *When Britain Saved the West: The Story of 1940* is Jordan's second offering. He describes it as impressive, interesting and an excellent starting point for those unfamiliar with the events of 1940. Yet he also suggests it offers plenty of food for thought, and potentially the basis for vigorous debate amongst those who consider themselves to be well-versed in the Battle's events and significance.

Prizes and Awards

2015 sees the reintroduction of our academic air power prizes that have been in abeyance since 2010/11. We have also created two new academic prizes, namely the Air Power Defence Research Paper Prize and the Chief of the Air Staff's (CAS') Fellows' Prize. This year's winners and further details are below.

The Gordon Shephard Memorial Prize

The Gordon Shephard Memorial Prize is awarded in memory of Brigadier G F Shephard DSO MC RAF. Awarded annually since 1919, previous winners include Flt Lt Slessor MC (1923), Wg Cdr Leigh-Mallory DSO (1930) and Sqn Ldr Graydon (1974). In abeyance since 2011, the prize is awarded to an RAF airman or woman for the best Service paper or essay published through RAF CAPS. The recipient is selected by the 7 academic members of the Air Power Review (APR) Editorial Board.

This year, the prize has been awarded to **Sergeant Paul Marr** who joined the RAF in 1997. A Weapon Systems Operator (WSOp) Electronic Warfare (EW) by trade, Sgt Marr flew on Nimrod and currently works at the UK Maritime Air Operations Centre. Marr recently completed his MA in Air Power Studies at the University of Birmingham.

Marr's paper, *Haig and Trenchard: Achieving Air Superiority on the Western Front*, was published in APR, Summer 14. It examined the influence that these two senior officers had on the development of air power thinking during the conflict. Despite suggestions of a dogmatic, sometimes overly rigid approach to the effective employment of air power in the First World War, the author succinctly captures how both Haig and Trenchard were pivotal in creating a model of an independent air force that was to be emulated by many over the inter-war years.

The Salmond Prize

The Salmond Prize is awarded in memory of Air Chief Marshal Sir John Salmond who was appointed CAS in succession to Lord Trenchard. In abeyance since 2010, the Prize is awarded annually for the best essay on an air power topic submitted to RAF CAPS by a civilian or non-RAF serviceman or woman of any nationality. The recipient is selected by the Director of Defence Studies (RAF) (DDefS (RAF)).

This year, the Salmond Prize has been awarded to **Mr Trevor Nash** who is the Consultant Editor of Jane's Training & Simulation Systems. He has an MA in Air Power Studies from the University of Birmingham where he is currently completing his PhD.

Fit for Purpose? An Analysis of Operational Training in Bomber Command 1934 – 1944, was published in APR, Summer 14. The paper examines how the RAF built a modern, effective and innovative Bomber Force in the lead-up to the Second World War against the backdrop

of austerity, the popular rejection of military intervention and competition for scarce government resources.

Air Power Defence Research Paper Prize - 2015

The inaugural Air Power Defence Research Paper (DRP) Prize is awarded to the Advanced Command and Staff Course (ACSC) graduate who produces the best air power related DRP. This prize is to be awarded annually. The award goes to the highest graded essay as determined by the externally-moderated marking scheme employed by the King's College London Defence Studies Department of the Joint Services Command and Staff College.

This year **Wing Commander Paul Rait** - an RAF Regiment Officer who is currently employed in the International area of the Air Staff – has been awarded the prize. His paper, *Me, myself and I: How important were personality, ego and personal relationships to British Air Land Integration in the Western Desert and Normandy?* examines how Air Land Integration (ALI) in the Second World War was forged in the Western Desert by the British Army and Royal Air Force. This paper examines how important ego, personality and personal relationships were in making ALI so successful.

CAS' Fellows' Prize

In its inaugural year, the CAS' Fellows' Prize has been established to recognise the CAS' Fellow who has made the greatest contribution to the study and promotion of air power. The Prize will be awarded annually and the recipient is chosen by DDefS (RAF) on behalf of CAS.

This inaugural winner is **Squadron Leader Timothy Fawdry-Jeffries** who is an Engineering Officer in the RAF. In 2014 he was selected for a Trenchard Fellowship on the Changing Character of War (CCW) Programme at Oxford University and is currently Senior Engineering Officer on 99 Sqn at RAF Brize Norton.

Fawdry-Jeffries' paper - *The Illusion of Victory: How War is Won or Lost in the Mind of the Observer* - and subsequent presentation of his work on the CCW Programme received excellent feedback from a reviewing audience of respected academics and experts. Further, this paper was published in APR, Autumn 14, followed by a presentation of his work to the CAS' Fellows' Seminar in October 14.

Notes on Contributors

Group Captain John Alexander is the Naval and Air Adviser, Islamabad. An RAF Regiment officer, his specialisation in short range air defence and air-land integration included service in the Falkland Islands in 1982, the Gulf in 1990/91, Iraq in 2003, command of 37 Squadron RAF Regiment, and culminated as Chief Air, Headquarters Allied Rapid Reaction Corps. He has also conceptualised warfare at the RAF's Air Warfare Centre, with the Luftwaffe and drafting the UK MOD's 2009 Future Character of Conflict study. Less conventionally he has spent four years in the Middle East and two of the past three years in the Afghanistan/Pakistan region. He has five degrees from Newcastle, the Open, Cambridge and Pakistan National Defence Universities, and has twice been a CAS' Fellow, at Cambridge and Oxford Universities. He has published articles in the RUSI Journal (based on his work on Taliban outreach), Air Power Review and Asian Affairs.

Sebastian Cox is the Head of the Air Historical Branch (RAF) in the UK Ministry of Defence and one of the three Co-Directors of the Royal Air Force Centre for Air Power Studies. He is an elected Trustee of the International Society for Military History and a member of the Editorial Board of the Royal Air Force Air Power Review. He is also a member of the British Commission for Military History and serves on the Committee of the Royal Air Force Historical Society and the Research Board of the Royal Air Force Museum. He was the historical advisor to the Bomber Command Memorial Trust. He was curator of documents at the Royal Air Force Museum, Hendon, before joining the Air Historical Branch as a researcher in 1984, and then serving successively as a Historian and the Deputy Head before being appointed as Head of the Branch in 1996. His nineteen years as Head of AHB now make him the longest serving of the ten individuals who have held the post in AHB's ninety-seven year history. He was the first person to hold the post without having previous commissioned military service. He has written widely on the history of the RAF and air power, and has edited two book series related to the field. He has also lectured on air power and related topics to military and civilian audiences on four continents, including Military Colleges in the UK, USA, Canada, Australia, France, Germany, Norway and Kuwait.

Dr David Jordan read for his first degree in Modern History at St Edmund Hall, University of Oxford, before moving to the University of Birmingham where he completed a PhD which examined air-land cooperation during the First World War. Following his PhD, he lectured in the School of History at the University of Birmingham from 1997-2000, and joined the Defence Studies Department at the Staff College (then at Bracknell) in 2000. He is one of DSD's air power subject matter experts, and was academic director for the air power aspects of ACSC between 2001 and 2013. He chaired the departmental examination board between 2001 and 2007, followed by a five year stint as Director of Teaching. Most recently, he has served as the Air Warfare Historian for the Higher Command and Staff Course, and is the academic director for the RAF Division at JSCSC. He is a co-director of the RAF Centre for Air Power Studies, member of the Chief of the Air Staff's Air Power workshop and serves on the Editorial Board

for RAF Air Power Review. His most recent book is the co-authored Understanding Modern Warfare (Cambridge University Press), and he has contributed to a variety of learned journals, including US Naval War College Review, Small Wars and Insurgencies and Contemporary Security Policy.

Wing Commander John Shields joined the RAF in 1989 aged 18 years old. On completion of initial officer training and ab-initio navigator training, he was posted to the Tornado F3 Force in 1991 which had responsibility for the Air Defence of the UK and overseas territories as well as preparing for contingent operations. A Qualified Weapons Instructor, John completed front line and instructor tours on the F3 before a staff job at MOD Abbey Wood and a subsequent return to front line flying duties in 2003. A tour at the MOD Main Building in the Capability area preceded promotion to Wing Commander in 2007 upon which he completed a tour in the Strategy, Policy and Plans area at Air Command. Advance Staff College was followed by command of 905 Expeditionary Air Wing in the Falklands and a deployment within the USAF-led CENTCOM Air Operations Center at Al Udeid in Qatar to conduct the Deputy Chief of the Strategy Division role. On his return to the UK in 2012, John was posted to MOD Main Building in order to take up the Chief of Staff post in the Theatre Airspace department – responsible for the merger of various air-related capability departments in order to create a unified Air Capability department within MOD. John arrived at Shrivenham as ACSC Directing Staff in August 2014. His attendance at Staff College and successful completion of his MA in Defence Studies sparked a hidden passion for academia and air power history. Consequently, he was awarded a CAS Fellowship in 2012 to become a PhD Candidate in Defence Studies with King's College London.

Air Commodore Al Gillespie joined the RAF in July 1988 as a University Cadet and completed his BSc(Hons) in Electrical and Electronic Engineering the following year. He spent 10 years flying as a Qualified Weapons Instructor Navigator on the Tornado F3, supporting Ops DENY FLIGHT (Balkans) and RESINATE(S) (Iraq) as well as holding Quick Reaction Alert in the UK and Falkland Islands. He completed staff tours in the Defence Intelligence Staff (DIS) and MOD Directorate of Strat Plans and completed a tour as the Chief of Combat Operations in the AFCENT CAOC, Al Udeid as UK forces withdrew from Basra. Gillespie took command of 23 Sqn (E-3D AWACS) in Jul 08 and, on promotion to Gp Capt, deployed to Bastion Airfield in Oct 09 to assume command of 903EAW as the USMC expanded into Helmand, culminating in support to Op MOSHTARAK. After a staff appointment in HQ Air Command as Gp Capt ISTAR, Gillespie assumed command of RAF Waddington, the RAF's ISTAR hub in Jan 12 and oversaw the introduction of UK-based Remotely-Piloted air operations over Afghanistan. On promotion to Air Cdre, he returned to Al Udeid as the UK Air Component Commander and AOC 83 Expeditionary Air Group, with responsibility for UK air operations across the CJOA and the orderly withdrawal of UK Air Power from Afghanistan.

British Strategy in a Certain Eventuality

Chiefs of Staffs' Committee Memorandum

Introduction by Sebastian Cox

The “Certain Eventuality” somewhat coyly referred to in the title of this paper was the defeat of France and her conclusion of a separate peace with Germany. This did not, in fact, occur until the French Government accepted the German Armistice terms on 22 June 1940. The report had been discussed at the British Cabinet meeting nearly a month earlier on 27 May 1940.

The paper accurately predicted that Italy would enter the War against the UK; in fact Mussolini declared War on 10 June in the hope that he could materially benefit from the defeat inflicted on France by the forces of his Axis partner. As the paper pointed out this made the British strategic position in the Mediterranean and Middle East immensely more complicated, as French control of the Western Mediterranean ceased, and Italy's position was thus strengthened *vis-à-vis* both the British base on Malta and Britain's control of Egypt and the Suez Canal, placing both under threat. The Mediterranean and the North African littoral were henceforward to become the centre of a large part of the British war effort for the next three years. This change in the Mediterranean balance in turn complicated the situation in the Far East with regard to Japan. That much of the British position in Malaya now depended on the United States as no fleet could now be despatched eastwards in the event of Japanese aggression was correctly identified. However, it erroneously assumed that Spain and Portugal would fall under Axis control and that this would probably result in the loss of Gibraltar. In fact, fascist Spain under Generalissimo Franco though sympathetic to the Axis, sought carefully to balance this sympathy with continued neutrality. Portugal maintained a staunchly neutral stance throughout. The authors' assumption that the USA would prove broadly sympathetic to the UK proved essentially correct, although prior to Pearl Harbour President Roosevelt had to move carefully in the face of strong isolationist sentiment in the country and the US Congress.

The paper rightly concluded that the essential immediate strategic issue facing the UK in the event of a French collapse was the maintenance of the economic life and morale of the nation in the face of imminent air attack and possibly invasion. The crux of all three issues was rightly identified as air defence and Fighter Command's ability "to reduce the scale of attack to reasonable bounds". The first priority in air defence was therefore to be fighter aircraft and aero-engine factories and the ports. The paper, in concert with all the air intelligence estimates of the time, grossly overestimated the strength of the *Luftwaffe* at 5,500 frontline aircraft with more than 7,000 in reserve. As indicated in the extracts elsewhere in this edition of APR the actual strength deployed by the *Luftwaffe* during the Battle of Britain was approximately 2,800 frontline aircraft.¹

Interestingly, the paper also pointed out that offensive air power would also prove important and that the nation's bomber force should not be expended "on operations that are not of first importance". It is worthwhile noting in this regard that, when eventually employed against German invasion shipping assembled in the Channel ports on the Continent from late August 1940, Bomber Command attacks sank some 10-12 per cent of the invasion barges.

It is interesting to note that the paper considered the capacity of naval forces alone to defeat any invasion attempt "is dependent on the extent to which our Naval forces can operate in the face of heavy air attack on both ships and bases...". This was a lesson which had only recently been brought home very forcibly to Royal Navy ships off Norway and which was being repeated in the waters off Dunkirk even as the paper was being considered by the Cabinet.

The longer term prospects for defeating Germany were also considered but here its conclusions were more uneven. It noted some of the underlying weaknesses of the German economic position but exaggerated many of them, especially in the short term. The prediction that Germany would have difficulty replacing military equipment by mid-1941 has to be regarded with some incredulity given that the authors did not predict the German campaign in Russia. At almost precisely the moment they were postulating future German equipment difficulties, the *Wehrmacht* instigated a massive military effort against the Soviet Union which initially met with considerable success. Germany's long term oil position was indeed an Achilles' heel but in the short term her position was unaltered because her expenditures of oil in conquering Western Europe in 1940 were almost exactly balanced by the stockpiles she captured from the occupied nations, which included sufficient aviation fuel in France and Holland to sustain her entire air effort through the forthcoming Battle of Britain.² The paper was accurate in its forecast that attacks on the German oil and transportation industries would eventually hasten her defeat, but wildly optimistic both in its assessment of the damage inflicted on these target systems already – which was almost negligible – and the date by which serious damage would help bring about collapse. In fact German oil production increased year on year until the Allied combined bomber offensive began to mount concerted and effective attacks on oil targets in 1944.³

Similarly the prediction of widespread food shortage in Western Europe did not come about until very late in the War, partly because of overestimation of the problem and partly because of an understandable failure to anticipate the invasion of the Soviet Union and to appreciate how brutally the Germans would behave in the occupied areas of Eastern Europe. The high hopes of stimulating significant subversive guerrilla activity in Occupied Europe also proved largely illusory in the early years of the occupation.

One surprising aspect of the paper is its failure to consider the part that offensive land power would play in the eventual defeat of the Axis powers. It is only considered in respect of its ability to defend the UK and other strategic areas in the Middle and Far East. However, to be charitable it is as well to bear in mind that at the time it was being written the Dunkirk operation was just getting under way and was expected to succeed in evacuating only some 45,000 British and French troops and not the 330,000 who were eventually brought back to the UK.

Overall, and allowing for some notable omissions and inaccuracies, the paper accurately predicted much of the future course of the War, including the UK's ability to survive concerted air attack, the efficacy in the long term (much longer than predicted) of blockade and offensive air action against economic targets, along with the hostility of Italy and Japan as well as the support of the USA. It did not predict the German assault on the Soviet Union, or the crucial part played by the land forces of the Grand Alliance in concert with the Combined Air Offensive and blockade in the final German defeat.

Notes

¹ See the relevant figures in the extract from the Rise and Fall of the German Air Force.

² Chiefs of Staff Committee, "Oil as a Factor in the German War Economy", March 1946, p.23.

³ Ibid, table p.24.

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WAR CABINET.

BRITISH STRATEGY IN A CERTAIN EVENTUALITY.

REPORT BY THE CHIEFS OF STAFF COMMITTEE.

THE object of this paper is to investigate the means whereby we could continue to fight single-handed if French resistance were to collapse completely, involving the loss of a substantial proportion of the British Expeditionary Force and the French Government were to make terms with Germany. The assumptions we have made are contained in Appendix A of the Annex. Of these the two most important are that:

- (i) United States of America is willing to give us full economic and financial support, *without which we do not think we could continue the war with any chance of success.*
 - (ii) Italy has intervened against us.
2. In particular we have asked ourselves two questions:
- (a) Could the United Kingdom hold out until assistance from the Empire and America made itself felt? and
 - (b) Could we ultimately bring sufficient economic pressure to bear on Germany to ensure her defeat?

We summarise our conclusions and recommendations below. As regards the latter *there are a large number of measures which we consider should be carried out at once irrespective of whether a French collapse is or is not likely.*

We attach our detailed appreciation as an Annex.

CONCLUSIONS.

3. There are three ways in which Germany might break down the resistance of the United Kingdom – unrestricted air attack aimed at breaking public morale, starvation of the country by attack on shipping and ports, and occupation by invasion.

Air Factor.

4. The vital fact is that our ability to avoid defeat will depend on three factors:

- (a) Whether the morale of our people will withstand the strain of air bombardment;
- (b) Whether it will be possible to import the absolute essential minimum of commodities necessary to sustain life and to keep our war industries in action;
- (c) Our capacity to resist invasion.

All of these depend primarily on whether our fighter defences will be able to reduce the scale of attack to reasonable bounds. This will necessarily mean the replacement of casualties in personnel and aircraft on a substantial scale. Our capacity to resist invasion may, however, depend also to a great extent on the maintenance of an effective air striking force.

These factors cannot be assessed with certainty, and it is impossible to say whether or not the United Kingdom could hold out in all circumstances. We think there are good grounds for the belief that the British people will endure the greatest strain, if they realise – as they are beginning to do – that the existence of the Empire is at stake. We must concentrate our energies primarily on the production of fighter aircraft and crews, and the defence of those factories essential to fighter production should have priority. At the same time it is clear that we cannot afford to neglect our bomber force or to expend it on operations that are not of first importance.

Civil Defence.

5. As long as the present quasi-peace-time organisation continues, it is unlikely that this country can hold out. The present Home Security Organisation was constituted to deal with air attack only by aircraft operating from bases in Germany; it is not sufficient to grapple with the problems which would arise as a result of a combination of heavy air attack from bases on a semi-circle from Trondheim to Brest, invasion, and internal attack by the "Fifth Column".

Land Forces.

6. Germany has ample forces to invade and occupy this country. Should the enemy succeed in establishing a force, with its vehicles, firmly ashore – the Army in the United Kingdom, which is very short of equipment, has not got the offensive power to drive it out.

Naval Forces.

7. Our first naval task is to secure the United Kingdom and its seaborne supplies against naval attack. We have sufficient Naval forces to deal with those that the enemy can bring

against us in Home Waters, and we can provide naval security for our seaborne supplies. Our ability to defeat at sea a seaborne attack on this country is dependent on the extent to which our Naval forces can operate in the face of heavy air attack on both ships and bases, and it is of the greatest importance to strengthen our systems of intelligence and reconnaissance to ensure early and accurate warning of enemy intentions is obtained.

Seaborne Supplies.

8. We have adequate shipping to meet our requirements, but again the provision of air security is the main problem. We may have to abandon our ports on the South and East Coasts for trade purposes, and our ability to carry on the war will then depend on West Coast ports entirely. These, therefore, must be adequately defended. All unimportant imports must be eliminated. If we can maintain 60 per cent of our present imports we can obtain enough food for the population and raw materials to continue essential armament production.

Overseas.

9. On a long-term view, Germany, in concert with Italy, will strive to overthrow our position in Egypt and the Middle East.

10. The immediate effect of a French collapse would be the loss of naval control in the Western Mediterranean. Italy would be able to concentrate all her strength against Malta, Gibraltar and Egypt. Malta could probably withstand one serious assault. We could continue to use Gibraltar as a naval base until Spain became hostile. Even then Gibraltar should hold out for 60 days.

11. To contain the Italian Fleet and secure Egypt a capital ship fleet should be based on Alexandria. In due course a heavy scale of attack could be mounted on Egypt from Libya, and we might have to withdraw the Fleet through the Suez Canal to Aden and block the Canal. Preparations to do this should be undertaken as soon as the contingency considered in this paper arises.

12. The retention of Singapore is very important for economic control, particularly of rubber and tin. To counter Japanese action in the Far East, a fleet, adequately supported by air forces, is necessary at Singapore. It is most improbable that we could send any naval forces there, and reliance would have to be placed upon the United States to safeguard our interests.

13. We should endeavour to maintain our position in all our overseas possessions.

Ability to defeat Germany.

14. Germany might still be defeated by economic pressure, by a combination of air attack on economic objectives in Germany and on German morale and the creation of widespread revolt in her conquered territories.

15. We are advised in the following sense by the Ministry of Economic Warfare. We cannot emphasise too strongly the importance of the substantial accuracy of this forecast, since upon the economic factor depends our only hope of bringing about the downfall of Germany.

16. In spite of immediate economic gains obtained from her conquests, Germany will still be very short of food, natural fibres, tin, rubber, nickel and cobalt. Above all, even with Roumanian supplies, she will still have insufficient oil.

17. Given full Pan-American co-operation, we should be able to control all deficiency commodities at source. There will be no neutrals except Japan and Russia.

18. The effect of a continued denial of overseas supplies to Germany will be:

- (a) By the winter of 1940-41, widespread shortage of food in many European industrial areas, including parts of Germany.
- (b) By the winter of 1940-41, shortage of oil will force Germany to weaken her military control in Europe.
- (c) By the middle of 1941, Germany will have difficulty in replacing military equipments. A large part of the industrial plant of Europe will stand still, throwing upon the German administration an immense unemployment problem to handle.

19. Air attacks on Germany's oil centres will be an important contribution to the enemy's defeat and to the reduction of the intensity of his air offensive.

The pressure we could exert by air action will be extremely limited for some time owing to the effects of the enemy's attacks and the need to conserve our striking power to deal with the contingency of invasion.

20. The territories occupied by Germany are likely to prove a fruitful ground for sowing the seeds of revolt, particularly when economic conditions deteriorate.

21. Finally, we emphasise once more that these conclusions as to our ability to bring the war to a successful conclusion depend entirely upon full Pan-American economic and financial co-operation.

22. In view of our terms of reference and the speculative nature of the problem, we have not considered whether the Empire can continue the war if the United Kingdom were defeated.

RECOMMENDATIONS.

23. The following recommendations were drafted before the Bill conferring on the government complete power of control over persons and property for the prosecution of the

war was passed. We have not had the opportunity of studying the details of this Bill, so some of our recommendations are no doubt covered by its provisions.

We recommend that the following measures should be carried out NOW, irrespective of events in France. These measures are confined to those which we consider necessary for the security of this country against attack during the critical period that may arise in the next few months:

- (i) We should do our utmost to persuade the United States of America to provide aircraft, particularly fighters, as soon as possible and in large numbers, including those from stocks now held by the United States Army and Navy.
- (ii) Measures should be taken to ensure the strictest economy in A.A. ammunition expenditures.
- (iii) The most ruthless action should be taken to eliminate any chances of "Fifth Column" activities. Internment of all enemy aliens and all members of subversive organisations, which latter should be proscribed.
- (iv) Alien refugees are a most dangerous sort of subversive activity. We recommend that the number of refugees admitted to this country should be cut to the minimum and that those admitted should be kept under the closest surveillance.
- (v) In order to ensure the necessary co-operation between the Civil and Military Authorities, operational control of all Civil Defence Forces, including county and borough police, &c., should be vested in the Ministry of Home Security and exercised through Regional Commissioners.
- (vi) Any evacuation which the Government intends to carry out in emergency should be carried out now. We recommend that a modification of the scheme for reception areas, in view of the dangers of invasion, should be carried out.
- (vii) Immediate steps to be taken to obtain destroyers and M.T.Bs from the United States of America.
- (viii) Every possible measure should be directed to obtaining the active support of Eire, particularly with a view to the immediate use of Berehaven.
- (ix) Our intelligence system to be strengthened with a view to getting early warning of German preparations for invasion of this country.
- (x) Dispersal of stocks of raw materials to free our West Coast ports to deal with the heavy increase in imports should now be made.
- (xi) So far as is practicable distribution of food reserves throughout the country with a view to meeting the disorganisation of transport which may occur.
- (xii) Bunkering facilities and other arrangements necessary to deal with a heavy volume of merchant shipping in West Coast and Irish ports should be organised.
- (xiii) All unimportant and luxury imports to be cut out.

(xiv) Finally we consider that the time has come to inform the public of the true dangers that confront us and to educate them on what they are required to do and what NOT to do, if the country is invaded.

(Signed) C.L.N. NEWALL.
DUDLEY POUND.
A.E. PERCIVAL,
A.C.I.G.S. (for C.I.G.S.).

Richmond Terrace, S.W.1.

ANNEX.

BRITISH STRATEGY IN A CERTAIN EVENTUALITY.

APPRECIATION.

Object.

The object of this paper is to investigate the means whereby we could continue to fight single-handed if French resistance were to collapse completely involving the loss of a substantial proportion of the British Expeditionary Force, and the French Government were to make terms with Germany.

2. We have based our investigation on certain assumptions which we have set out in Appendix A. Of these, we would draw particular attention to the assumption that we could count on the full economic and financial support of the United States of America, without which we do not consider we could continue the war with any chance of success. Briefly, the general strategic situation which would arise under these assumptions is as follows:

Strategical and Political Situation.

3. From the first few weeks of a French collapse the United Kingdom and its sea approaches will be exposed at short range to the concentrated attack of the whole of the German Naval and Air forces operating from bases extending from Norway to the North-West of France. The threat of invasion will be ever present. Italy will be in the war, and the Mediterranean – except for the Eastern end and possibly, to a limited extent, the North African coast – will be closed to us.

4. As time goes on – over a period of some months – our enemies will be able to extend their economic and military control to Spain, Portugal and North Africa in the West and to the Balkans, except Turkey, in the East. This will somewhat improve their economic situation, will provide additional bases for attack on British trade in the Atlantic, and enable a heavy scale of attack to be prepared in Libya against Egypt. On the other hand, we have assumed that we can count on the full economic and financial support of the United States, possibly extending to active participation. Japan we see as purely opportunist – prepared to exploit the situation but with a watchful eye on the United States of America. Russia, through fear of Germany's growing determination, may come to an understanding with Sweden and Turkey.

Probable enemy action.

5. The defeat of France will not free Germany from the risks of economic strangulation and air attack. The main objective in German policy must therefore be the rapid elimination of resistance in the United Kingdom.

6. There are three broad methods by which Germany might achieve this end:

- (a) Unrestricted air attack aimed at breaking down public morale.
- (b) Starvation of this country by attack on shipping and ports.
- (c) Occupation of the United Kingdom by invasion.

In all of these the primary factor would be full-scale use of air forces.

7. On a longer term view, in concert with Italy, German strategy will strive ultimately to overthrow our position in Egypt and the Middle East and to open a trade route through the Red Sea.

I – OUR ABILITY TO WITHSTAND ATTACK.

Attack on the United Kingdom and its approaches.

8. To withstand German attack on the United Kingdom and its approaches we must be able to defeat invasion, to maintain a large proportion of our seaborne supplies, to keep factories working and to sustain the morale of the people of this country.

Air Forces.

9. The crux of the whole problem is the air defence of this country. The following are the main factors affecting the enemy scale of attack: The Germans will be free to concentrate the whole of their air force against this country. Its numerical strength at the present time is shown in Appendix B. The area which this force could cover in the situation assumed is as follows: The long-range bomber force could operate over the entire British Isles and the approaches to all West coast ports, including Irish and Scottish ports. The dive-bomber force and long-range fighters could reach an area in southern and central England extending as far as a line drawn between Cardiff and Grimsby, while the short-range fighters could reach South-East England.

10. The Germans will thus be able to concentrate a very heavy weight of long and short-range bomber attack over a large area of this country, including our vital areas in the Midlands and over all probable areas for enemy landings on our coast. The fact that they would be able to escort this force with fighters creates a threat, the seriousness of which cannot be overstressed, since it will involve a very much higher wastage rate in fighters than we have previously estimated. Should they succeed in obtaining a high degree of air superiority, they could deal comparatively unhindered, except by A.A. gunfire, with any objectives they might select. This would enormously increase our difficulties in maintaining the normal life of the country and in meeting invasion.

11. We have, on the other hand, the following factors in our favour: A proportion of the German air force will be operating from aerodromes far removed from their main organisation and supplies and in unfriendly country. The German casualties have been extremely high and will continue, though perhaps at not quite such a high rate. Although the enemy is still able to replace aircraft from reserves and production, the replacement of his most highly trained

crews will seriously affect the efficiency of his Air Force. There is no doubt that the morale of the flying personnel also has suffered, and that it will deteriorate further, so long as our fighter defences remain effective. It is therefore open to doubt whether attacks will be pressed home whole-heartedly, particularly by day, and whether the enemy air force is capable of sustaining a large-scale offensive so long as such opposition exists.

12. The capacity of the German Air Force to reduce the effectiveness of our air defence depends to a considerable extent upon his ability to destroy our aerodromes, aircraft on the ground and our aircraft industry. We have a well-dispersed system of aerodromes and satellite landing grounds. The enemy will certainly have to employ large forces with determination before he begins to inflict serious losses to our first-line strength by attack on aerodromes. During this time his own losses from fighter and A.A. gunfire will be heavy, but protection of aerodromes will absorb a proportion of our fighter strength which would be available for the defence of other vital areas. In our aircraft industry the dangerous weakness is the concentration of the whole of our engine production for the fighter force in two factories. Under a sustained rate of attack it is extremely doubtful if we could expect to receive more than a fraction of our present production figure. Our first-line strength may, therefore, diminish rapidly both because of a high rate of wastage and a low rate of replacement. It will accordingly be of extreme importance to do everything to obtain quantities of aircraft from America and to keep open our sea routes across the Atlantic.

13. Ability to protect both our aerodromes and aircraft industry depends to an over-whelming extent upon the maintenance of a force of fighter aircraft. Its completely dominating position in an Air Defence organisation has been clearly shown during the last few weeks. Including naval forces and fleet bases our fighter organisation has immense areas to cover. Ability to concentrate at decisive places would be of the greatest value in economising fighters, and any steps that can be taken to reduce the vital areas to be defended should be adopted.

14. The second factor in Air Defence is the gun. There are at present of the approved numbers for A.D.G.B. only 44 per cent of heavy and 18 per cent of light equipments available. These meagre resources must also clearly be concentrated in the most vital areas only, and the maximum number extricated from France. It is equally important to economise ammunition and to ensure that plans and preparations are made to modify tactical dispositions to meet successive stages of the enemy's attack.

15. We cannot resist invasion by fighter aircraft alone. An air striking force is necessary not only to meet the sea-borne expedition, but also to bring direct pressure to bear upon Germany by attacking objectives in that country.

16. The fighter and bomber forces, which we have available in this country at the present date, are shown in Appendix C. The strength of this force will no doubt be further reduced before the situation under consideration arises.

It will be noted that our reserves have reached dangerously low totals and that we are therefore vitally dependent on a continued flow of production. The aircraft for operational units due to reach us from the United States of America and Canada are given in Appendix D. The present orders are totally inadequate to replace wastage if our own production ceases. Further orders for fighters now under consideration should be given a very high order of priority, and we should persuade the United States Government to release aircraft from their first line strengths.

Civil Defence.

17. There can be no doubt that, in the circumstances we are considering, the morale of the country will be subjected to a heavier strain than ever before. Not only will the physical damage and demoralisation of continued and heavy bombing attacks sap the nation's courage but these attacks will be directed at important objectives with a view not only to destroying the objective but driving away labour. Furthermore, propaganda and "Fifth Column" activities will play a dangerous part in demoralising the country.

18. As long as the present quasi-peacetime organisation continues there is no guarantee that this country could hold out. The present Home Security Organisation was constituted to deal with air attack only and the volume of such attack was estimated on the basis that the enemy aircraft would be operating from Germany. It does not take into account the new problems arising from a combination of heavy air attack, invasion and "Fifth Column" activities such as has been experienced by the countries already subjected to attack by Germany, and to which we are now liable. An attack of this character may now be regarded as probably based on the channel ports.

We believe that, with proper organisation, this country could hold out, but if we are to survive total war, it is essential to organise the country as a fortress on totalitarian lines.

We are satisfied that the country is ready to accept whole-heartedly any steps that may be considered necessary provided that clear direction is given. At the same time immediate steps must be taken to bring home to the nation the gravity of the problem and the need for individual self-sacrifice in the interests of the Empire.

19. To this end we consider that the following steps, inter alia, should be taken to implement this recommendation.

- (a) That the operational control of all civil defence forces, including County and Borough Police, should no longer be exercised by local authorities but should be vested in the Ministry of Home Security and exercised through the Regional Commissioners.
- (b) That all enemy aliens and persons known to be members of subversive organisations should be incarcerated.
- (c) That no evacuation or movement of refugees should be allowed, in order not to

hamper essential movements. The evacuation problem is thus restricted to one of local "panic" conditions. (It should be noted that the corollary of this is that any evacuation considered necessary should have been carried out before the emergency arises).

Land Forces.

20. Germany would have ample troops (70 divisions or more) for the invasion of this country, even after providing for the occupation of conquered territory, including France, and for limited operations in South-East Europe.

The troops available in this country during the next two or three months will be:

Trained, equipped and mobilised	3½ divisions
Partly trained, mainly equipped except for artillery	3 divisions
.....	2 motor divisions
Relatively untrained, little equipment	5 divisions

and two armoured divisions, of which the equivalent of about two brigades could be mobilised.

In addition, there are 57 Home Defence Battalions employed on the defence of vulnerable points and many men in holding units, training centres, &c. It is unlikely that more than a small portion of the British Expeditionary Force could be extricated from France. Most of its equipment and ammunition is likely to be lost. On the other hand, additional Dominion Forces, which are not fully trained or equipped, are en route to the United Kingdom.

21. The major weakness of our Home Defence Forces is lack of equipment, artillery and ammunition. Should the Germans succeed in establishing a force with its vehicles in this country, our army forces have not got the offensive power to drive it out. The maintenance of the lines of communication of such a force would, however, be a difficult problem for the enemy.

Naval Forces.

22. The first and vital task of our naval forces is to ensure the security of the United Kingdom and its essential supplies against seaborne attack. All other naval commitments are secondary to this; and, if our naval forces at home become depleted through loss or damage, we must at all costs maintain their strength by drawing on outlying stations.

23. It is also important to retain our position in the Eastern Mediterranean, and for this a capital ship force to contain the Italian Fleet will be essential. After providing for this, it will still be possible to match the German Fleet in Home Waters and to provide for ocean convoy escorts. In this we may be helped by any French Naval forces that may not have capitulated.

24. Whatever the strength of our Naval forces in Home Waters, our ability to exercise command of the North Sea and Channel will depend on our ability to operate surface forces

within close range of enemy air bases. Whether we shall be able to maintain effective naval forces in bases on the East and South Coasts in the face of a very heavy scale of air attack is uncertain; if we cannot do so, the chance of intercepting enemy forces before they reach our shores will clearly be less. Finally, whether we shall be able to operate surface forces in strength in the southern part of the North Sea and the Channel at all is also uncertain. At the best, we may be able to continue using our present bases and to operate surface forces in adequate strength off our South and East Coasts without prohibitive loss or damage; at the worst, we may have to face the fact that we cannot do so. All that we can say at the moment is that it would be imprudent to count upon being able to do so.

25. With Germany in possession of ports in Norway, Holland, Belgium and France our Naval dispositions must be planned to meet the threat of seaborne invasion on either the East or South Coasts of the United Kingdom. In such an operation Germany would probably employ the whole of her Naval forces (see Appendix E) and we must therefore base a capital ship Fleet to intercept German heavy forces. Rosyth is the most suitable base in the North Sea for this purpose, but air attack may make it untenable, in which circumstances, Scapa is the next best base.

26. The problem in the Channel is more difficult, as with enemy naval forces operating from French ports, the cover provided by a Fleet in the north is not adequate, and capital ships might have to be based on West Coast or Irish ports. The use of Berehaven as an operational base would be of the greatest importance for this and for our light forces, which will be covering the approaches to the West Coast ports. In this connection, we point out that it will be even more important to prevent Germany from making use of naval or air refuelling bases in Eire, and we consider that the strongest representations should be made to the Government of Eire in this respect.

27. We cannot stress too strongly the importance of strengthening our intelligence systems and reconnaissance patrols to get the earliest possible warning of the preparation of invasion.

28. Our ability to control the North Sea and Channel depends on the number of light forces that we can dispose in these waters and operate there in the face of air attack. We are short of destroyers, and it is essential that every effort should be made to obtain reinforcements from Canada and the United States. Withdrawal from Narvik would make additional destroyers available.

29. Minelaying operations in the Straits of Dover to prevent movement of shipping southward to French ports and the laying of a south-coast barrage should be planned, and minelaying off enemy ports intensified.

30. Apart from defensive methods, operations to destroy enemy shipping concentrations in port must be undertaken, if opportunity offers, to strike directly at the enemy's ability to carry a seaborne expedition.

Seaborne Supplies.

31. We have adequate shipping resources at present to meet our requirements, although we must assume that enemy naval attacks, both on our trade and Naval forces, in Home Waters and overseas, will be intensified.

32. The provision of air security is, however, the real problem in Home Waters. If the enemy launches a full-scale offensive against the United Kingdom, a very heavy scale of air attack will be developed on our ports on the south and east coasts, and we may have to abandon them altogether for trade purposes.

33. Plans have already been prepared to divert all shipping to West Coast ports and, provided we can maintain approximately 60 per cent of our present imports, we believe that we should be able to obtain enough food to support the population and sufficient raw materials to continue our essential armament production, although at a reduced rate. We again draw attention to the importance of reducing now the unimportant imports (such as bananas and children's toys), so that the maximum import of important raw materials may be available to increase our stocks of these essentials. Moreover, even if our imports were reduced to a mere trickle, we should still be able to tide over a critical period of a few weeks by drawing on our reserve stocks, which have been accumulated to meet a crisis of this nature. To increase our ability to hold out in a critical period, we should now put into operation plans for drastic rationing and distribution of stocks. Nevertheless, our ability to carry on the war is absolutely dependent upon the eventual maintenance of supplies through the West Coast ports, and we would point out that this will raise major problems of labour transference. Moreover, the West Coast ports themselves will be subjected to air attack, although possibly on a lesser scale to that on the East and South Coasts.

The influence of the Air Factor in our ability to withstand Attack.

34. The vital fact is that our ability to avoid defeat will depend on three factors:

- (a) Whether the morale of our people will withstand the strain of air bombardment;
- (b) Whether it will be possible to import the absolute essential minimum of commodities necessary to sustain life and to keep our war industries in action;
- (c) Our capacity to resist invasion.

All of these depend primarily on whether our fighter defences will be able to reduce the scale of attack to reasonable bounds. This will necessarily mean the replacement of casualties in personnel and aircraft on a substantial scale. Our capacity to resist invasion may, however, depend also to a great extent on the maintenance of an effective air striking force.

These factors cannot be assessed with certainty and it is impossible to say whether or not the United Kingdom could hold out in all circumstances. We think there are good grounds for the belief that the British people will endure the greatest strain, if they realise – as they are beginning to do – that the existence of the Empire is at stake. We must concentrate our

energies primarily on the production of fighter aircraft and crews, and the defence of these factories essential to fighter production should have priority. At the same time it is clear that we cannot afford to neglect our bomber force or to expend it on operations that are not of first importance.

ENEMY ACTION AGAINST OUR OVERSEAS POSSESSIONS AND INTERESTS.

Naval Forces.

35. The immediate effect of a French collapse on the Mediterranean and Middle East situation would be the loss of naval control in the Western Mediterranean. This would leave Italy free to concentrate the whole of her strength against Malta, Gibraltar, Egypt and our interests in the Near East.

36. Malta has six months' food reserve for the population and garrison, but A.A. guns and ammunition are short, and the island is not likely to withstand more than one serious seaborne assault, nor could it be used as a Naval base.

37. Gibraltar, provided it was not attacked by gas, could hold out for 60 days against a hostile Spain, and it is even probable that supplies could be made available to extend this period. It would be possible to continue using Gibraltar as a naval base until Spain became hostile.

38. It would be impossible, with the forces at our disposal, to control sea communications in the Western as well as in the Eastern Mediterranean. We should, however, retain light forces in the Atlantic approaches with a view to intercepting raiders, coastwise shipping and blockade runners. In the event of Gibraltar becoming unusable, we might occupy Casablanca, failing which the nearest bases are Dakar and Freetown, both of which are too far away to be of much value. It would be important to prevent enemy forces using the Azores, Canary Islands and Cape Verde Islands as bases, and, should we be unable to use Casablanca, we might require to base naval forces on these islands ourselves.

39. The only naval bases left in the Mediterranean would be Alexandria and Haifa in the Eastern basin, and so important is it to hold our position in Egypt in order to maintain economic pressure that we consider a capital ship fleet should be based on Alexandria.

40. We estimate that sufficient force could be made available to contain the Italian fleet and still leave us sufficient Naval units for operations at Home and elsewhere. Supply by the Red Sea route would be subject to attack from Italian East Africa, and the Fleet itself would operate continuously within range of enemy bomber forces. In spite of this, we believe it should be retained there as long as possible for the security of Egypt and as a stabilizing influence on Turkey and the countries of the Middle East. Furthermore, it would, by its presence, contain a large proportion of Italian Naval forces from making sorties into the Western Mediterranean and Atlantic.

Land and Air Forces.

41. In the early stages the situation in Egypt would not be greatly altered from that already envisaged in the event of war with Italy. Our land forces are strong enough to meet Italian attack in that area and equipment and ammunition reserves are sufficient for 90 days at full wastage rates. There is, however, a serious shortage of aircraft and anti-aircraft guns and the air defence problem is a serious one even in the scale of attack at present envisaged. The problem of further maintenance would be acute with a closed Mediterranean and hazardous Red Sea. The scale of attack in the Red Sea would, however, gradually diminish, as the enemy would find difficulty in maintaining his air effort in Abyssinia.

42. After a period of some months the Germans and Italians would no doubt gain military and economic control of the whole of the Balkans, except Turkey, or Spain and of French North Africa. The scale of attacks mounted from Libya would be greatly increased and in the meantime the internal security problem in the Middle East would have grown. Eventually, after a period of months, a heavy attack supported by considerable air forces could be launched from Libya, in which case it is doubtful whether we can maintain our position in Egypt. If we could not, it will be necessary to withdraw the fleet to Aden and block the Canal. Preparations for this should be put in hand as soon as the contingency considered in this paper materialises. Unless previous to this it were possible to increase the scale of air defence in Egypt, it is doubtful whether the garrison could hold out.

43. The situation in Iraq depends chiefly on the maintenance of internal security in that country. No immediate deterioration might follow the French collapse. After some months, however, our position up country might become untenable, in which case it would be necessary to withdraw to a position at Habbaniya to protect Basra and the Anglo-Iranian Oilfields. A division could be provided from India for this purpose.

44. There will be no direct military threat to India, but we could not rely on being able to withdraw any British troops from India.

The Far East.

45. A threat to our interests in the Far East can only arise in the event of a hostile Japan. With America actively on our side Japan would be unlikely to make a direct attack on British territory; though she would no doubt exploit any opportunity that offered. The retention of Singapore is extremely important from the point of view of our economic control – particularly of rubber and tin.

46. To counter Japanese action in the Far East, a fleet, adequately supported by Air Forces, is necessary at Singapore. What forces we can send can only be judged in the light of the situation at the time. It is most improbable that we can send any naval forces to the Far East. Therefore we must rely on the United States of America to safeguard our interests in the Far East.

47. Australia should be asked to consider a reinforcement of the garrison in Singapore.

Other Overseas Garrisons.

48. We should endeavour to maintain our position in all our overseas possessions. In view of the necessity for concentration of all British resources at vital points, it is for consideration whether responsibilities for isolated garrisons might not be taken over by the Dominions, e.g. Canada might be asked to take over the defence of the West Indies and of Iceland.

II – ABILITY TO DEFEAT GERMANY.

49. The defeat of Germany might be achieved by a combination of economic pressure, air attack on economic objectives in Germany and on German morale and the creation of widespread revolt in the conquered territories.

Economic Pressure.

50. The following general conclusions which we have reached on this wide economic problem have been arrived at after consultation with a representative of the Ministry of Economic Warfare.

51. German control of the resources of Western Europe and a part of Northern Africa will secure for her a number of immediate economic assets. Nevertheless Germany and the area under her control will still depend on outside sources for certain essential commodities, particularly natural fibres for clothing and footwear, rubber, tin, nickel and cobalt. Moreover the occupied territories of Western Europe will aggravate the food shortage which is already a serious problem in the Reich; and the whole oil output of Roumania, Poland and Germany together with such supplies as are likely to be available from Russia will not suffice to maintain German and Italian stocks, which would have to be drawn on from the outset.

52. With genuine and extensive pan-American co-operation and with the Dutch, Belgian and French Empires at our disposal, we shall be in a strong position to control all deficiency commodities at source, except for Japan and Russia and a few isolated territories, there will be no neutrals. It will no longer be practicable by normal contraband control methods involving visit and search.

Our ability to apply economic pressure of this nature will depend primarily upon American co-operation. On this assumption, and provided that we can maintain control over the Allied Overseas Empires and naval control of the wider oceans and focal points leading to the blockaded area, the trickle of supplies reaching Germany by blockade running will be negligible.

53. The effect of the denial of overseas supplies to Germany will manifest itself in the following ways: Firstly, food shortage. Dependent upon the yield of the harvests in 1940,

which are expected to be low, German-controlled Europe will be somewhat short of bread-stuffs. There will also be a widespread scarcity of essential fats and fruits. Life will be sustained for a period by the heavy slaughtering of immature animals. This will be necessary because, after the end of the grazing season, there will be a dearth of feeding-stuffs. It will probably be only a matter of months before hoarding by the peasant population creates a really acute shortage of food in the industrial areas, including parts of Germany herself.

54. Secondly, Germany's war potential itself must be expected to decline through deficiency in oil. The whole of her own and of Italian stocks of petrol plus the whole output of Roumania and small supplies from Russia will nearly suffice to provide the lubricants and petrol needed to maintain orderly administration and the minimum industrial activity in the Continent as a whole. As soon as the initial stocks are exhausted, and if synthetic plants can be destroyed, the German garrisons would be largely immobilised and her striking power cumulatively decreased.

55. A third effect will be on the quality of Germany's war equipment. It is impossible to estimate the amount of war material that the German fighting forces will have to consume under the conditions postulated. But it is certain that deprived of all imports of certain essential non-ferrous metals, alloys, rubber and cotton and wool, Germany will not be able to maintain a high rate of replacement, and the quality of her war equipment, including aeroplanes, must be expected to decline. Even with practically no consumption of war equipment a large part of the industrial plant of Europe will stand still, throwing upon the German administration an immense unemployment problem to handle.

56. With regard to the time factor, effective denial of these supplies is, we are advised, likely to produce widespread starvation in many of the industrial areas, including parts of Germany, before the winter of 1940 (assuming an early French collapse). By the same date the depletion of oil stocks will force Germany to weaken her military control in Europe or to immobilise her armed forces. By the middle of 1941, Germany will find it hard to replace her military equipments. This process of exhaustion would be somewhat hastened by destruction of Germany's synthetic oil plants and of Roumanian wells, by blockage of the Danube and the diversion of Russian oil supplies.

Air attack on economic objectives in Germany.

57. Economic factors have shown that the primary objective for our air attack should be the enemy's oil resources and focal points in his transport system. We have already made progress in the systematic elimination of the key objectives (the effect of which have not been allowed for in the estimate of supplies above) and if we can maintain these attacks, even on a light scale, an important contribution will be made towards the enemy's defeat. Moreover, shortage of lubricating oils and petrol may have a very important effect on the intensity of the air offensive against this country in the ensuing months.

58. The pressure we could exert by air action would, for some time, be extremely limited, owing to the effects of the enemy's offensive and the need for conserving a proportion of our striking power to deal with the contingency of invasion. We could not expect to do more than maintain a very limited scale of attack until we could obtain additional resources from the Dominions and from the United States. In the course of time we could hope to bring a heavier scale of attack on Germany by developing the United Kingdom as an advanced base for the operation of large long-range bombers flown from production centres across the Atlantic.

Subversive Action.

59. The only other method of bringing about the downfall of Germany is by stimulating the seeds of revolt within the conquered territories. The occupied countries are likely to prove a fruitful ground for these operations, particularly when economic conditions begin to deteriorate.

In the circumstances envisaged, we regard this form of activity as of the very highest importance. A special organisation will be required and plans to put these operations into effect should be prepared, and all the necessary preparations and training should be proceeded with as a matter of urgency.

Political aspects of economic pressure.

60. The political and moral issues involved in imposing on the mass of Europe the severe effects of economic pressure may present serious difficulties. It will be necessary to realise, however, that it is only by this pressure that we can ensure the defeat of Germany, and that by holding out we shall remain as a nucleus on which the rebuilding of European civilisation may be attempted.

If, on the other hand, we do not persevere, the economic collapse of Europe and the United Kingdom under a corrupt Nazi administration would only be postponed for a short while, and we should have no chance of contributing to Europe's reconstruction.

APPENDIX A.

Assumptions as to the Political Background.

1. THE precise political situation cannot be foretold, but we consider the most likely assumptions that we can make are:
 - (a) Italy will be hostile.
 - (b) All French European and North African territory will be accessible to enemy forces in course of time, and will be treated as hostile territory. French armed forces in Europe and North Africa will cease to fight. Parts of the fleet and certain land and air forces in outlying parts of the French Empire will continue to assist in the war.
 - (c) Spain, Portugal and all the Balkan States (excluding Turkey), together with their resources, will eventually fall under German or Italian military and economic domination.
 - (d) Our prestige in the Middle East generally will suffer a great set-back, which is likely to involve us in serious internal security problems in Egypt, Palestine and Iraq. The extent of our trouble will be largely conditioned by the attitude of Turkey, who may not remain as an active Ally in the circumstances envisaged.
 - (e) Japan will exploit the situation to her advantage in the Far East, though whether she would go to the length of a direct attack on British territory will depend on the attitude of the United States.
 2. On the other hand, we assume that:
 - (a) The whole Empire, with the possible exception of Eire, would increase their efforts in support of the United Kingdom. The attitude of India might, however, be doubtful and would be largely influenced by the situation in the Middle East and the extent of our difficulties at home.
 - (b) We could count on the full economic and financial support of the United States of America, possibly extending to active participation on our side. This example is likely to be followed by the remainder of the American States. The degree to which American forces might assist us would depend on the extent to which America became involved with Japan.
 - (c) Russia will be really frightened of the increasing might of Germany. She will try to improve her position vis-à-vis Germany if she can do so without becoming involved in a major Military commitment. To this end she might come to an understanding with Turkey and Sweden.
-

APPENDIX B.

Statement of German Aircraft Position.

—	10.5.40.		Lost over period 10.5.40 - 24.5.40	Produced by period.	Balance.	Reserves at 24.5.40.
	1 st Line	Reserve.				
L.R. Bombers }						
Bomber Recce }.....	2,600	3,300				
Dive Bombers.....	500	1,200	1,000	500	-500	7,000
Fighters	1,500	2,500	100 slightly			less 100
Army Co-operation....	400	200	damaged			slightly
Coastal	350	300				damaged
	5,350	7,500				
<i>Bomber Transport.</i>						
Ju. 52.....	500	300	} 400	25	-375	- 75
Ju. 86.....	100	...	}			
	600	300				

NOTE – 1. B.A.F.F., French and Dutch reports of German aircraft losses have not given details of types. It is therefore not possible to state the losses of the individual categories.

2. Reserve trained crews are estimated at 100 per cent of 1st line crews.

APPENDIX C 1.

Strength of the Home Based Air Force on May 17, 1940, excluding all
Aircraft based in France.

Types.	<i>Operational Strength, including –</i> All 1st line aircraft in operational squadrons serviceable within 7 days.	<i>Reserve of Operational Aircraft immediately available, including –</i> (i) Serviceable reserve aircraft in squadrons. (ii) Aircraft in operational training units and non-operational squadrons. (iii) Serviceable aircraft stored.	<i>Reserve of Operational Aircraft not immediately available, including –</i> (i) Aircraft repairable in units. (ii) Stored aircraft short of equipment. (iii) Aircraft of service types in Training and Reserve Commands, some percentage of which may be fully equipped.
<i>Heavy Bombers</i>	316 (including Reserve Squadrons which can operate if necessary).	148	445
<i>Medium Bombers –</i>			
Blenheim	84	98	264
Battle .....	...	103	753
<i>Fighters –</i>			
Hurricane, Spitfire, and Defiant	491	134	528
Blenheim	145	63	157
Gladiator	8	27	50
<i>Army Cooperation</i>	...	134	200
<i>Coastal –</i>			
General Reconnaissance and Torpedo Bomber Land-planes	184	221	820 (inc 643 Ansons)
Flying-boats	33	13	20

- (a) Above return does not include aircraft crashed beyond the capacity of units to repair or aircraft without engines.
- (b) Total operational strength differs from past statements in that it takes account of serviceability.
- (c) Losses since May 16 amount to 114.

APPENDIX C 2.

*British Air Forces, not included in Table of Home-Based Units, which have been
or are Employed in France.*

A.A.S.F. in France on May 22.

Battle	52
Hurricane	38
Blenheim – Returned to United Kingdom	number unknown

Air Component returned to United Kingdom.

Blenheims	number unknown
Hurricane	45 } Reported
Gladiator	15 }
Lysander	number unknown

*Detachment from Fighter Command returned to
United Kingdom on May 21.*

Hurricane	possibly 30 - 40
-----------------	------------------

Total of above.

Blenheim	unknown
Battle	52
Hurricane	120 approximately
Gladiator	15
Lysander	unknown

Norway.

Hurricane – returning	18
Gladiator	16

May 23, 1940.

APPENDIX D.

Forecast of Home (and Dominions) Production of Aircraft, May-October 1940.

About 90 per cent of these aircraft will be delivered to Air Storage Units to await certain items of equipment. Some of the May production is probably included in the Reserves shown in Appendix C.

NOTE: It has recently been decided to concentrate on the production of existing models at the expense of the long-term production of new types. This may make some alteration in the figures given.

	May	June	July	Aug	Sept	Oct	Totals
<i>Bombers.</i>							
1. Blenheim	145	145	145	108	145	145	853
2. Hampden	28	19	16	17	18	20	118
3. Hereford	20	20	15	...	...	...	55
4. Whitley	26	27	28	21	30	30	161
5. Albemarle .....	...	1	2	6	20	20	41
6. Wellington	47	51	51	50	79	79	348
7. Manchester	2	3	5	7	10	15	42
8. Stirling	3	4	7	7	15	21	57
9. Halifax	1	3	4	6	6	6	26
<i>Bombers produced for Training.</i>							
10. Battle	30	20	10	...	...	...	60
11. Battle (target towing)	60	60	60	45	60	60	345
<i>Fighters.</i>							
12. Defiant	38	40	48	40	60	60	286
13. Hurricane	130	140	150	120	170	180	890
14. Tornado .....	...	...	...	...	...	6	6
15. Spitfire	75	86	95	88	111	125	580
16. Beaufighter	12	18	24	24	35	40	153
17. Whirlwind	6	8	12	10	16	16	68
<i>Reconnaissance.</i>							
18. Anson	80	80	80	60	80	80	460
19. Beaufort	30	35	40	30	40	40	215
20. Botha	41	48	46	46	59	59	299
21. Sunderland .....	...	1	2	2	3	4	12
<i>Army Co-operation.</i>							
22. Lysander	64	72	80	87	94	100	497
<i>Training.</i>							
23. Training types	304	340	434	382	482	438	2,380
24. Service types produced..... for training. See 10 and 11	...	...	...	...	...	...	...

Approximate Forecast of Deliveries from United States, May-October 1940.

- 25. Hudson (General Reconnaissance).....120
- 26. Brewster (Fighter).....30
- 27. Harvard (Trainer).....190

APPENDIX E.

Comparison of Naval Forces.

	<i>Great Britain.</i>	<i>Germany.</i>	<i>Italy.</i>
Capital ships.....	13 (plus 1 in September)	2 (plus 1 during summer)	2 (plus 4 more possibly In June)
Aircraft carriers	6 (plus 1 in May)	1	...
Armoured ships.....	...	2	...
8 in. cruisers.....	14	2 (plus 1 in autumn)	7
6 in. cruisers.....	24 (plus 5 during summer)	4	12
Old cruisers.....	15	...	4
A.A. cruisers	6	...	...
Destroyers	170 (plus 14 during summer)	9 to 15	67
Torpedo boats.....	...	...	55
Submarines	67 (plus 6 during summer)	45 to 50 (plus 25 to 30 in summer)	155
M.T.B.s	18 (plus 12 approximately during summer)	30 to 40	100

Notes.

- (a) Ships undergoing long refits or damage repairs and not likely to be available within the next three months not included.
- (b) Japanese forces not shown, as we should hope that any Japanese threat would be countered by the American fleet.
- (c) Our own position would be correspondingly improved if American destroyers become available by purchase.

MOST SECRET.

Attention is directed to the particularly secret nature of the attached paper. It is requested that particular care is taken for its security and that it may be returned to the War Cabinet Offices as soon as it is no longer required.

(Signed) E.E. BRIDGES.

Richmond Terrace, S.W.1.,
26TH MAY, 1940.

Imminence of a German Invasion of Great Britain - Report by the Joint Intelligence Committee

Introduction by Sebastian Cox

This paper, prepared by the Joint Intelligence Committee [JIC] on 4 July, was the first attempt by the JIC to assess German intentions following the fall of France. The JIC had utterly failed to predict the German invasion of Denmark and Norway in April 1940, partly because “underestimating Germany’s capacities, it had been too much disposed to discount evidence.”¹ It had also been hampered because structural weaknesses in the intelligence organisation meant that intelligence was not properly co-ordinated and assessed on a joint as opposed to individual Service basis. Determined to avoid these mistakes it moved to set up an *ad hoc* sub-committee, the Combined Intelligence Committee, in late May with officers from all three Services charged to look at all intelligence relating to a possible invasion of the UK. Unsurprisingly, perhaps, the CIC and to a lesser extent the JIC itself now leaned in the opposite direction and began to overestimate German capabilities.

This assessment refers to “evidence that Germany is making preparation for raids in force, or for invasion of the British Isles” and assumes that “these preparations are well advanced”. In fact Germany had done no proper detailed planning for an invasion of the UK and indeed Hitler had only instructed the *Wehrmacht* to prepare such plans on 2 July, just two days before the JIC assessment was written. Later Directives laid down the earliest date for mounting Operation *Sea Lion* (the German codeword for the invasion plan) as early September. The JIC, however, postulated that Germany could mount a full-scale invasion as early as mid-July and that large scale raids, by all three arms of the *Wehrmacht*, could be expected “at any moment”.

The JIC was now guilty of vastly overestimating Germany military capability, most especially in the short-term, and of reading too much into the available evidence. This evidence, such as it

was, is contained in the Appendix to the report. The grading of the reports, as indicated, was by reliability of the source, graded A to E, and the likelihood of its being correct, graded 1-5. Most of the references to A.1 reports refer to the *Luftwaffe* and were derived either from low-grade sigint or decrypts of high-grade German Enigma traffic. These, being first-hand evidence from German military sources, were considered reliable on both counts. They still, however, required interpretation. Thus, the supposition that an invasion would not come before mid-July resulted from an Enigma decrypt [item 7] stating that German air units would have completed refitting by mid-July. It also revealed the German plans for a triumphal parade in Paris, though quite why this was thought to be of relevance to the threat of invasion remains a mystery [item 17].² The move of German Ju87 Stuka dive-bomber units into position in France and Belgium had also come from decrypts [item 14].

Intelligence reports emanating from agents are generally graded B2. The SIS had by this time established a rudimentary agent system in Norway³ and this was clearly the source of some of the reports on Norwegian fishing vessels and German troop movements [items 1 and 3] alongside Enigma and photo-reconnaissance [items 4 and 5].

In point of fact, of course, nearly all the most reliable intelligence from decrypts pointed, not directly to imminent invasion, but rather to the German preparations for their air assault on the UK to gain air superiority as a preparatory phase before Operation *Sea Lion* could be mounted.

Notes

¹ F H Hinsley, E E Thomas, C F G Ransom, R C Knight, *British Intelligence in the Second World War* (HMSO, London, 1979), Volume 1, p.168.

² *Ibid*, p.174.

³ *Ibid*, p.173

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4TH JULY, 1940.

COPY NO. _____

WAR CABINET.

IMMINENCE OF A GERMAN INVASION OF GREAT BRITAIN.

Report by the Joint Intelligence Sub-Committee.

In accordance with the instruction of the Prime Minister we have had under urgent consideration the question of the imminence of a German invasion of Great Britain.

2. On 1st July we considered, in Paper No. J.I.C.(40)144 what was likely to be "Germany's next move" now that France has collapsed. Our view was that there is at present little direct evidence to indicate what this next move is likely to be, and Germany's military superiority is such as to enable her to move in any direction she pleases with little or no warning. Since that date we have had little further conclusive evidence.

3. Assuming however that Germany's next move will take the form of an invasion, we have examined all the evidence available as to the likelihood and imminence of such an invasion. This evidence is attached in Appendix "A".

4. We are satisfied from this evidence that Germany is making preparation for raids in force, or for invasion of the British Isles. In view of the fact that these preparations are well advanced Germany may well move at any time at a date most suitable to her. The evidence available however, suggests that Germany's full strength will not be developed until 15th July.

5. We must point out however, that some of the evidence contained in Appendix "A" is capable of more than one interpretation. Furthermore, the question of Germany's immediate action is much confused by the flood of tendentious reports and propaganda which are being deliberately put about.

CONCLUSIONS.

6. We consider that large-scale raids, on the British Isles involving all three arms, may take place at any moment. A full-scale invasion is unlikely to take place before the middle of July. This matter is under our daily review.

(Signed) V.F.W. CAVENDISH-BENTINCK.

J.N. GODFREY.

F.G. BEAUMONT-NESBITT.

A.R. BOYLE.

Richmond Terrace, S.W.1.

4TH JULY, 1940.

APPENDIX A.

THE IMMINENCE OF A GERMAN INVASION.
AVAILABLE EVIDENCE.

<u>Evidence.</u>	<u>Source.</u>	<u>Reliability.</u>
<u>NORWAY.</u>		
1. There are reports of an increase in the numbers of troops in Norway; the increase is said to include some parachute troops.	Secret Report.	B. 2
2. The merchant shipping is considered to be enough for the transport of 2 divisions.	Known fact.	—
3. There are some 800 fishing cutters available in Norway and easily hidden in innumerable fjords, while reports of the requisitioning and arming of Norwegian craft of all types continues to be received.	Norwegian and secret sources.	B. 2
4. There are 250-300 bomber aircraft based in Norway.	Secret Report.	A. 1
5. On 29th June there remained one 8" cruiser and one unidentified warship (not a battle-cruiser) at Trondheim.	Reconnais- sance.	Fact.
<u>GERMANY, THE BALTIC PORTS AND DENMARK.</u>		
6. Recent reinforcement of troops in DENMARK.	Secret sources.	B. 4
7. The majority of the units of the German air force will not have completed their refitting before 15th July.	Secret sources.	A. 1
8. Troop-carrying aircraft were recently withdrawn from training schools to first line units.	Secret sources	A. 1
9. Aerial photographs on 30th June indicated that special rafts had been built at Keil that were being loaded on to small vessels, possibly of trawler type. Exact nature and intended use of the raft still unknown.	Reconnais- sance	Fact.

<u>Evidence.</u>	<u>Source.</u>	<u>Reliability.</u>
10. Reports indicate the transport of motor boats from Italy and Austria to Germany.	Secret sources.	B. 2
11. It is reported that large scale landing exercises have recently been practiced at Memel in the Baltic.	Neutral master. Stockholm	B. 3

NETHERLANDS AND FRENCH COAST.

12. Reports have been received of increase of German infantry in Holland and of the move of two parachute regiments and air units from Austria and from Berlin area to Belgium.	Secret sources.	B. 2
13. Special assault detachments are being formed from reconnaissance units which did well on the Western front.	Secret sources.	B. 3
14. The German air force in this area is in process of being reorganised and regrouped and this process is nearing completion. Dive bombers are being concentrated in Belgium and N.E. France.	Secret sources.	A. 1
15. A standing fighter patrol over the Calais area indicates some activity to be concealed.	Known fact.	—
16. Barge traffic is abnormal in amount and in routes. This may represent the provision of supplies for the armies of occupation or for an invasion.	Air reconnaissance.	—

GENERAL.

17. Information from a most reliable source is to the effect that the Germans will hold a parade of their armed forces in PARIS some time after 10th July.	Secret sources.	A. 1
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Note: A – E indicates reliability of source.

1 – 5 indicates probability of report.

No 11 Group Instructions to Controllers and Analysis

Introduction by Sebastian Cox

Instead of producing a straightforward narrative of the Battle of Britain this article will consider the fighting by analysing a number of the formal Instructions Air Vice-Marshal Keith Park, AOC of No 11 Group Fighter Command, issued to his Group and Sector fighter controllers as the battle unfolded. These Instructions illustrate very clearly the changing tactical issues taxing the AOC and his controllers and his response to them. They also illustrate, from a Commander's perspective, some of the internal issues with which he had to contend, notably the famous issue of reinforcement from the neighbouring No 12 Group north of London and the problem of tactical integration and innovation when Groups have differing perspectives and operating procedures.

The British officially recognised the start of the Battle of Britain as being the 10th July [see Dowding Despatch reproduced elsewhere in this journal – paras 11-13] when large scale air battles began over the Channel. The Germans identify this first phase as a separate battle, which they called the *Kanalkampf*, or Channel Battle, which was fought out over the following month as the Luftwaffe mounted attacks on coastal convoys and ports. The Germans considered that they only opened their main attack, the Battle of Britain itself, with their assault on airfields and radar stations in mid-August, which began with some preliminary sparring over the Thames Estuary and some small scale attacks on airfields and radars, building up to a full scale effort codenamed *Adler Tag* [Eagle Day] which was originally scheduled for 13th August. On that day the morning's *Adler Tag* operation proved to be something of a fiasco, with the German C2 system losing control of the operation at an early stage and sowing confusion and disarray among its own ranks. A late attempt at a weather cancellation was only received by some of the units already airborne, with the result that many units, notably among the fighter escorts, aborted the operation, whilst others, mostly in the bomber formations, did not. The morning's operation thus went off at half-cock. In the afternoon a better co-ordinated operation saw large formations attacking airfields and ports. Ineptly handled though it was, the initial *Adlerangriff* [Eagleattack] marked the start of a period of intense fighting during which the Luftwaffe pounded RAF airfields and radars, and Fighter Command reacted equally ferociously in their defence.

It was this intense fighting which caused Keith Park to issue his Instruction Number 4 to his controllers on 19th August. It sets out some of the key factors underlying Park's conduct of the Battle and also foreshadows some of the issues, which were to arise as the fighting intensified. Park cautions against engaging enemy formations over the Channel (unless protecting shipping) or overzealous pursuit of German aircraft towards France – by instigating combat only near the coast or over the UK any pilots who baled out stood a good chance of surviving and returning to combat, whereas a descent into the Channel at a time when there was no SAR service made survival problematic. A keystone of both Park's and Sir Hugh Dowding's, approach was conservation of their assets, both human and material. Due to faulty intelligence they believed the Luftwaffe to be much stronger than it was and that they potentially faced a long battle of attrition with a numerically stronger enemy, hence their strategy of conservation. Park's airfields, and indeed his C3I system, were, however vulnerable,

with only the Group and Command operations centres in hardened facilities. Both his aircraft and his Sector Operations Centres were based at airfields within easy reach of the enemy and they lacked any form of hardening. Once the Germans began to attack these facilities their defence now assumed the priority as this Instruction shows, and the protection of northern 11 Group airfields by the neighbouring 12 Group squadrons enters the picture. As is well known to students of the Battle this requirement was to become inextricably linked to the increasingly contentious issue of the Big Wing.

There is a tendency to assume that the Chain Home radars and the associated Integrated Air Defence System provided a fully comprehensive air picture – they did not. Radar was in its infancy and the radar operators were looking at a small cathode ray tube about the size of a modern I-Pad screen and trying to interpret spikes along the horizontal axis of the CRT in order to determine the range and strength of an enemy raid. The radars only looked out to sea, once the enemy crossed the coast they could only be tracked by the Royal Observer Corps using the Mark One eyeball, binoculars and, when aircraft were above cloud, tracking by sound. The RAF's fighter squadrons were all relatively inexperienced at working with the system against multiple threats inland and, with the formation leader's mind understandably focussed on the imminent prospect of combat, initially they gave little thought to contributing to the recognised air picture themselves. In the fighting on 24th August the percentage of squadrons making interceptions before the *Luftwaffe* formations dropped their bombs was disappointingly low. This is clearly shown by Park's injunction in Instruction No 6 on 26th August for formation leaders to give an accurate enemy report to the sector controller on first making visual contact. He thus made clear that the responsibility of the fighter leader to communicate his situation and that of the enemy did not end when his sector controller put him in contact with the target raid. What he could actually see as he went into combat was a vital supplementary intelligence source to enhance the accuracy of the air picture.

The very next day Park issued Instruction No 7. Here we see exposed for the first time the cracks at the seams of the Fighter Command IADS: the lesson being that, no matter how good your system and organisation may be, it is dependent on people who both understand that it functions in a certain manner and accept that they should work within it despite its limitations. Personalities inevitably intrude into every system, and can undermine the most careful planning. Park makes very plain (perhaps surprisingly so for a document aimed at his subordinates) his aggravation with the neighbouring 12 Group's apparent inability or unwillingness to mount CAPs over his more northerly airfields. He refers to two recent occasions where 12 Group squadrons requested to patrol over 11 Group airfields had not done so and the stations were then heavily bombed. Park was in all probability referring to the bombing of North Weald on 24th August and Debden on the 26th August. In Instruction No 10 of 5th September we see the theme repeated, with 11 Group controllers told to keep patrols above the clutch of 11 Group airfields north of the Thames estuary until the 12 Group squadrons actually arrived before the 11 Group squadron could be moved forward to "the

main battle". No such injunction was made regarding the airfields to the south-west and west of London where assistance was to come in from 10 Group to the West. The issue was in part that 12 Group squadrons, notably those led by Douglas Bader from Duxford, the principal reinforcing sector for 11 Group, resented what they saw as 11 Group hogging the battle whilst they were merely expected to act as aerial sentries for empty airfields. The ever-aggressive Bader was not interested and tended to ignore this tasking to go looking for Germans. As we shall see, this caused problems not just when airfields were hit, but within the IADS system itself.

Instruction No 10 also highlighted the crucial need to defend the aircraft factories in the south and south-east. The Hawker factories at Kingston-upon-Thames and Brooklands were building Hurricanes and the factories in Southampton "of vital importance" included the main Supermarine Spitfire factory in the city at Woolston. The latter was in fact hit during a Luftwaffe raid on 26 September and almost entirely destroyed, but arrangements had fortunately already been made for production to be dispersed and the large Shadow Factory at Castle Bromwich was also coming on stream ready to produce Spitfires. Park refers to an attack on the Brooklands works in the next Instruction.

Park issued Instruction No 12 on the very day the Germans famously switched the focus of their attacks to London. It neatly illustrates an insoluble dilemma for the defending squadrons. If they were to meet the *Luftwaffe* escort fighters on anything near equal terms they needed to avoid, so far as possible, conceding the enemy the height advantage, but as Park's Instruction shows the understandable tendency for everyone in the chain of command to add height to the original order often meant that the bombers got through at lower altitudes. It is difficult to say whether this Instruction had any noticeable effect on the actions of the Squadron Commanders. Probably not, since the Germans made the tactical problems of the defenders immeasurably easier by focussing on London and simultaneously, at Goering's behest, tying the fighter escorts more closely to the bombers. As many of these instructions show, Park did his best to solve the conundrum by sending the Spitfire squadrons to tackle the high-level fighter escorts and the slower and less manoeuvrable Hurricanes after the lower bomber formations. However, in practice the enemy and the vagaries of three-dimensional warfare meant that the situation in the air did not always neatly conform to the pattern.

Instruction No 16 of 11th September reflected the change in German targeting to London and the increased size of the attacking formations as they concentrated on this single target. Although this change simplified the tactical conundrum facing the 11 Group Controllers, Park's Instruction shows that he was aware that the mass formations posed a different tactical problem, that of meeting not just superior numbers, which had often been the case thus far, but overwhelming mass. This instruction again neatly encapsulates the difficulty Park faced. He was aware that this change required some attempt to concentrate his own forces in response, but the reality was that the time factor worked against him. A radar on the coast of Kent gave about twenty minutes warning of a raid building up over the Pas de Calais.

It took about four minutes for the system to process this information and pass it through to appear as a plot on the operations room tables. As the later Instruction No 28 indicates it took a Spitfire squadron in a battle climb some thirteen minutes to reach 20,000 feet and a Hurricane squadron three minutes longer. If he was to get his squadrons up to height and into position in time the Controller had little margin for error. Hence Park's compromise of despatching squadrons in pairs which, whilst still incurring a time penalty of 10-12 per cent [*vide* Instruction No 28] did provide more strength against the large formations.

The next Instruction reproduced here, No 18, shows that a commander's issuing of an instruction is one thing, but its implementation by the chain of command below him is quite another. Instruction No 18 was issued the day after the series of mass attacks on London on 15th September, which is generally reckoned to have been Fighter Command's most successful day and which we now celebrate as Battle of Britain day. To Park, however, there were still tactical deficiencies which needed correcting, not least in the implementation of Instruction No 16. This follow-up Instruction shows that Park had appreciated that, with the Germans apparently no longer interested in targeting his airfields, he was no longer compelled to defend so far forward. This in itself affected the crucial time factor and allowed the additional flexibility to operate squadrons in pairs, but farther back. Not all his controllers had apparently appreciated this, hence his anxiety to ensure that in the new tactical situation squadrons were not exposed too far forward where they were more likely to be "bounced" by the enemy with a height advantage. In the context of the subsequent controversy which has raged ever since regarding No 12 Group's use of Big Wings [i.e. up to five fighter squadrons acting in concert] it is interesting to note that in this Instruction [para 5 iii] Park is quite prepared to countenance operating a Wing of three squadrons if possible but again there was a time penalty of 15-18 per cent [*vide* Instruction No 28]. We may note here that Park had used wings of squadrons in the Dunkirk fighting in May and June 1940. He clearly recognised the tactical advantage of injecting some mass into the battle if possible. The Tangmere and Northolt sectors were, in the specific context of the September battles over London, the most rearward sectors of 11 Group, effectively constituting Park's immediate reserve. Lastly, paragraph 4 of this document reinforces the point referred to above regarding Instruction No 6 that the recognised air picture presented by the IADS was far from perfect.

The time penalties of attempting to use Wings even of three squadrons clearly loomed large in Park's mind, however, and on 26th September in Instruction No 20 he reverts to a preference for pairs of squadrons over Wings of three. By October the Germans had switched to operating the great bulk of their bomber forces by night, opening the so-called *Blitz* which, unlike the day battle, was to continue unabated until May 1941. By day the Germans now adopted the tactic of sending fighter sweeps both large and small, with fighters intermingled with fighter-bombers. Although the weight and accuracy of the bombs dropped in these raids was insufficient to cause any significant wide scale damage to important targets they were immensely difficult to defend against. There were several reasons for this. They operated at greater heights than the bombers, they were faster, and, of course,

more difficult to shoot down. They also inevitably pitted Hurricanes against the superior performance of the Messerschmitt 109. The greatest weakness of the Chain Home radar was its height finding ability, which required manipulation of the aerial arrays and was rudimentary at best, and this was a grave disadvantage when trying to counter combined fighter and fighter-bomber sweeps.

All of these factors are present in the final series of Instructions reproduced here. The short warning provided by the radar [referred to as RDF – radio direction finding – the acronym for radar during the Battle] meant that Park was forced to form a special flight of Spitfires, No 421 Flight [first referred to in Instruction No 24], at Gravesend equipped with Spitfire Mark IIs, which had a higher ceiling than the Mark I, and VHF, as opposed to the standard HF, radios. At the first sign of enemy activity in the Pas de Calais aircraft from the Flight were sent up to reconnoitre and shadow enemy formations passing information on their height and composition direct to the 11 Group Controller at Uxbridge via the VHF link [Instruction No 30 para 3(1)]. The first of these sorties were flown on 9 October. It was a dangerous activity – in the first ten days of operations aircraft of the Flight, despite instructions to avoid combat, were attacked seven times, and four of the Flight's pilots were shot down. Thereafter the Flight sent aircraft off in pairs to provide some mutual protection. Park also had a Spitfire squadron on patrol near Maidstone flying at 15,000 feet, a height which enabled them to conserve their limited oxygen supply for the combat to come, before being ordered to 30,000 feet when it looked as if a raid was about to cross the English coast. If the threat developed sufficiently for other squadrons to be ordered into the air the single Spitfire squadron was there ready to protect them against being bounced by the incoming sweep as they climbed for height [Instruction No 26]. Even these innovations did not prove sufficient, however, and Park is progressively forced to put squadrons in the air on standing patrols at specific times, at first a single squadron [Instruction No 30 para 2(2)] and then a pair of squadrons [Instruction No 34]. Standing patrols were the antithesis of the system, the whole focus and intention of which was to provide the capability to keep aircraft on the ground until a threat had been identified and then "launch on warning". Standing patrols were fatiguing for pilots, seriously affected aircraft serviceability and were wasteful of precious fuel. In addition, if the enemy did not mount an attack while the patrol was in the air, they achieved little positive result.

The last Instruction reproduced here, Instruction No 35, is principally of interest for what it tells us about the difficulty of co-ordinating and integrating the operations of No 12 Group's Duxford Big Wing under Bader with those of 11 Group. The reference to certain aircraft from the Wing being fitted with radio crystals is particularly of note. One of the issues with the early operations of the Wing, as we have seen, was Bader's tendency to operate as he saw fit and not as the 11 Group Controller had requested. Fighter Command aircraft had their position fixed by an automatic system called Pipsqueak which transmitted for a fifteen second period every minute on set frequencies enabling Direction Finding ground stations to fix the squadron's position. Because the frequencies were set using crystals in the radio sets before the aircraft left the ground, when No 12 Group operated in 11 Group's area the

latter's D/F system could not necessarily track the 12 Group squadrons. With Bader operating independently on his own initiative in a large formation of single-engined aircraft, at a height where the aircraft type was difficult to discern, in an area where he was not expected to be, unsurprisingly his formation was on occasions mis-reported by the Observer Corps as being German, causing not a little consternation in 11 Group's operations rooms. Hence the later instruction to fit a crystal, which could be interpreted by the 11 Group Sector Controller at Hornchurch and the information passed to the Observer Corps. In addition the instruction for a formal system of notification between the two Group controllers was intended to ameliorate the time issue inherent in scrambling and assembling the Big Wing.

In practice this Instruction shut the stable door after the horse had bolted. The Big Wing, if properly controlled, certainly had merit as a mass tactical reinforcement for 11 Group, particularly against the large German formations attacking London in mid-September. By October, however, with the Germans resorting to hit and run fighter sweeps it had few, if any, tactical advantages. In the latter part of October the Duxford Big Wing was ordered into 11 Group's area of operations on ten occasions, and on only one of these did it make contact with the enemy, shooting down a single Messerschmitt 109 [see Dowding Despatch para 204]. The issue of the Big Wing became mired in controversy at the time and that has continued ever since. This was unfortunate and largely stemmed from Bader's surprising failure to understand that "freelance" activity in another Group's area of operations was counterproductive, rather than the actual tactical merit of the innovative formation itself. Discussion of the latter was obscured by the issue of its control in the air, which stemmed from the former, and which in turn was bedevilled by personality clashes. All concerned were genuinely intent on inflicting maximum harm on the enemy, but under the intense pressure of an existential fight for the nation it is perhaps unsurprising that tempers became frayed.

What can be said, and can be seen from these Instructions, is that Park's own tactical responses to the changing circumstances of the Battle were invariably correct and that had a less tactically astute officer been in Command of 11 Group the result of the Battle might well have been different.

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 4

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers and Sector Commanders, for Sector Controllers

Date: 19 August 1940

The German Air Force has begun a new phase in air attacks, which have been switched from coastal shipping and ports on to inland objectives. The bombing attacks have for several days been concentrated against aerodromes, and especially fighter aerodromes, on the coast and inland. The following instructions are issued to meet the changed conditions:

- a) Despatch fighters to engage large enemy formations over land or within gliding distance of the coast. During the next two or three weeks, we cannot afford to lose pilots through forced landings in the sea;
- b) Avoid sending fighters out over the sea to chase reconnaissance aircraft or small formations of enemy fighters;
- c) Despatch a pair of fighters to intercept single reconnaissance aircraft that come inland. If clouds are favourable, put a patrol of one or two fighters over an aerodrome which enemy aircraft are approaching in clouds;
- d) Against mass attacks coming inland, despatch a minimum number of squadrons to engage enemy fighters. Our main object is to engage enemy bombers, particularly those approaching under the lowest cloud layer;
- e) If all our Squadrons around London are off the ground engaging enemy mass attacks, ask No 12 Group or Command controller to provide Squadrons to patrol aerodromes DEBDEN, NORTH WEALD, HORNBURCH;
- f) If heavy attacks have crossed the coast and are proceeding towards aerodromes, put a Squadron, or even the Sector Training Flight, to patrol under clouds over each Sector aerodrome;
- g) No 303 (Polish) Squadron can provide two sections for patrol of inland aerodromes, especially while the older Squadrons are on the ground refuelling, when enemy formations are flying over land;
- h) No 1 (Canadian) Squadron can be used in the same manner by day as other Fighter Squadrons.

Note: Protection of all convoys and shipping in the Thames Estuary are excluded from this Instruction (paragraph (a))

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 6

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers

Date: 26 August 1940

Group Controllers, Instruction No 6

The following signal, addressed today to all Sectors, is repeated for the information of each Control:

'Our fighter squadrons are frequently engaging greatly superior numbers because other squadrons despatched to engage fail to intercept owing to accidents of cloud and inaccuracies of sound plotting by ground observers. To enable Group and Sector Controllers to put all squadrons in contact with the enemy formation leaders are to report approximate strength of enemy bombers and fighters, their height, course and approximate position immediately on sighting the enemy. A specimen R/T message would be, "Tally Ho! Thirty bombers forty fighters Angels twenty proceeding North Guildford". These reports should enable us to engage the enemy on more equal terms and are to take effect from dawn 27 August. Acknowledge.'

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 7

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers

Date: 27 August 1940

Group Controllers, Instruction No 7

REINFORCEMENT from 10 and 12 GROUPS

1. Thanks to the friendly co-operation afforded by 10 Group, they are always prepared to detail two to four Squadrons to engage from the West mass attacks (100 or more) approaching the Portsmouth area.
2. The AOC 10 Group has agreed that once his Squadrons have been detailed to intercept a group of raids coming into Tangmere Sector, his Controllers will not withdraw them or divert them to some other task without firstly consulting us.

3. Because of the above, Controllers are clearly to understand that once they have detailed Tangmere Squadrons to intercept raids entering Middle Wallop Sector, they must not withdraw them without first informing 10 Group of the intention; to do otherwise might embarrass Middle Wallop Sector.
4. Up to date 12 Group, on the other hand, have not shown the same desire to co-operate by despatching their Squadrons to the places requested. The result of this attitude has been that on two occasions recently when 12 Group offered assistance and were requested by us to patrol our aerodromes, their Squadrons did not in fact patrol over our aerodromes. On both these occasions our aerodromes were heavily bombed, because our own patrols were not strong enough to turn all the enemy back before they reached their objective.
5. As acceptance of direct offers of assistance from 12 Group have not resulted in their Squadrons being placed where we had requested, controllers are from now onwards immediately to put their requests to Controller, Fighter Command, stating clearly when and where reinforcing Squadrons from the North are required to patrol, eg two Squadrons required to patrol North Weald-Hornchurch, 10,000 feet, immediately, to protect aerodromes in absence of our own Squadrons on forward patrol. These requests will only be submitted to Command when mass attacks are approaching in such strength (160 or more) that it appears that our own Squadrons are unlikely to prevent their reaching inland objectives.
6. Such requests via Command will be a little slower in obtaining assistance but they should ensure that the reinforcing Squadrons from the North are in fact placed where they can be of greatest assistance. Because of the delay in the arrival of these Squadrons, their obvious task is to patrol aerodromes or other inland objectives to engage enemy formations that break through our fighter patrols, that normally engage well forward of our Sector aerodromes.

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 10

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers and Sector Commanders, for Sector Controllers

Date: 5 September 1940

Instruction to Controllers No 10

The Commander-in-Chief has directed that the following aircraft factories shall be given the maximum fighter cover, (not necessarily close patrols), during the next week:

Hawkers, Kingston-on-Thames

Langley

Brooklands

Southampton aircraft factories

2. As the enemy bombing attacks on our fighter aerodromes during the past three weeks have not outwardly reduced the fighter defence, he is now directing some of his main attacks against aircraft factories, especially in the West and South-West of London. The only direct protection that we can at present afford is to obtain from 10 Group two Squadrons to patrol the lines, (a) Brooklands-Croydon, and (b) Brooklands-Windsor, whenever there is a heavy attack South of the Thames river. The task of these Squadrons is to intercept bomber formations that may elude 11 Group fighters that are despatched to engage the enemy well forward of the factories and Sector aerodromes.

3. The Southampton factories are of vital importance to the RAF, and 10 Group have agreed to reinforce the Tangmere Sector by up to three or four Squadrons whenever a mass attack approaches the Southampton-Portsmouth area from the South.

Hawkinge and Manston or Rochford Squadrons

4. Whenever time permits, these two Squadrons are to rendezvous over Canterbury, and then be detailed to engage the enemy.

The Main Attack

5. The enemy's main attack must be met in maximum strength between the coast and our line of Sector aerodromes. Whenever time permits, Squadrons are to be put into the battle in pairs. Some Spitfire Squadrons are to be detailed to engage the enemy fighter screen at 20,000 or more feet. The Hurricanes, because of their inferior performance, should normally be put in against the enemy bombers, which are rarely above 16,000 feet by day.

Aerodrome Protection

6. North of the Thames, 12 Group Squadrons are to be requested, via Command, to cover North Weald, Stapleford, Hornchurch, also Debden. Pending arrival of 12 Group Squadrons, the Group Controller should cover our Sector aerodromes by one or two Squadrons. These must, however, be sent forward into the main battle immediately 12 Group Squadrons arrive.

7. The aerodromes West and South-West of London can be covered by 10 Group Squadrons. Biggin Hill, Kenley and Croydon aerodromes can be covered by a maximum of two Squadrons; normally one flight should be adequate for each aerodrome, because the enemy should already have been engaged before he reaches the line of these Stations.

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 12

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers, and all Sector Commanders

Date: 7 September 1940

Group Controllers, Instruction No 12

Interception of Enemy BOMBER Formations:

1. From reports by RAF personnel at aerodromes, also from AA gun Stations, and lastly from our own fighter formations, it is evident that during the past week some enemy bomber formations have proceeded uninterrupted to their inland objectives. This has happened on numerous occasions when we have had from twelve to twenty Squadrons despatched to intercept and to cover aerodromes. The reason is mainly that our fighters are patrolling so high that they are normally becoming heavily engaged with the enemy fighter screen, flying above 20,000 feet.
2. On one occasion yesterday, only seven out of eighteen squadrons despatched, engaged the enemy. On another occasion on the same day, seven out of seventeen squadrons engaged the enemy.
3. It is obvious that some of our Controllers are ordering Squadrons intended to engage bombers to patrol too high. When Group orders a Squadron to 16,000 feet, Sector Controller in his superior knowledge, adds on one or two thousand, and the Squadron adds on another two thousand in the vain hope that they will not have any fighters above them. The net result has been that daily some of the enemy bomber formations slip in under 15,000 feet, frequently without any fighter escort, and bomb their objectives, doing serious damage as at Brooklands. In fact, the majority of the enemy bomber formations have only been intercepted after they have dropped their bombs and are on the way out.

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 16

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers and Sector Commanders, for Sector Controllers

Date: 11 September 1940

Engagement of Mass Attacks

The enemy has recently dropped his plan of making two or three separate attacks by two or three hundred aircraft in one day. Recent attacks in the 11 Group area have been made by three or four hundred aircraft in two or three waves following in quick succession, the whole engagement covering about 45 to 60 minutes.

The object of the following instruction is to ensure that we meet the enemy in maximum strength, employing our fighter Squadrons in pairs of the same type where possible.

READINESS SQUADRONS: Despatch in pairs to engage first wave of enemy. Spitfires against fighter screen, and Hurricanes against bombers and close escort.

AVAILABLE 15 SQUADRONS: a) Bring to Readiness in pairs;
b) Despatch in pairs to engage second wave.

AVAILABLE 20 SQUADRONS: a) Bring to Readiness;
b) Despatch singly to protect aircraft factories or sector aerodromes, or to reinforce Squadrons already in the air.

If there is a third wave and it is necessary to despatch these Squadrons, they should be sent in pairs as follows:

DEBDEN and NORTH WEALD Squadrons together;
HORNCHURCH and BIGGIN HILL Squadrons together;
KENLEY and NORTHOLT Squadrons together.

TANGMERE SQUADRONS: When not required to protect the Portsmouth-Southampton area in conjunction with No 10 Group Squadrons, the Tangmere Squadrons should be employed within the Kenley or back Tangmere Sector to engage enemy formations that approach London from the South, or endeavour to pass round the South of London to attack aircraft factories at Kingston, Brooklands and Langley.

Whenever time permits, the Readiness Squadron and the Available 15 Squadron should be despatched to work as a pair after having rendezvoused at base.

RENDEZVOUS OF SQUADRONS: The Group Controller must name the base over which pairs of Squadrons are to rendezvous, as they normally occupy separate aerodromes within a Sector. Sector Controllers should inform Group Controllers immediately a pair of Squadrons have rendezvoused over any given point. Group Controller should then detail those Squadrons to a raid and leave the rest to Sector.

SELECTION OF SQUADRON TO LEAD A PAIR OF SQUADRONS: The detailing of the directing Squadron should be done by Sector Controller, who should know which Squadron is best suited to lead. Section Controllers must also repeat to the Squadron being led all orders issued to the directing Squadron in case those units become separated by clouds. Sector Commanders must impress on Squadron Commanders the importance of leading squadrons in a pair joining up and maintaining contact with the Squadron being led.

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 18

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers and Sector Commanders, for Sector Controllers

Date: 11 September 1940

Engagement of Mass Attacks

During the air fighting of the last week, I have noticed the following deficiencies in our control by Group and Sectors:

- A) Individual Squadrons failing to rendezvous as detailed;
- B) Individual Squadrons being detailed to big raids;
- C) Pairs of Squadrons being placed on patrol too far forward, too low, resulting in their being attacked by German high fighter screen;
- D) Individual Squadrons being given a rendezvous so far forward as to become engaged before meeting their paired Squadron;
- E) Very high raids of between 100 and 150 fighters being allowed to draw up nearly all the Group prematurely – the bomb raids then approaching about 45 minutes later when a number of our Squadrons are on the ground refuelling;
- F) A persistent tendency of Group Controllers to delay in detailing pairs of Squadrons that have reached their height and rendezvous on to individual raids or on to a suitable patrol line across the line of approach;
- G) Failing to check Sectors when they report in error less pilots and aircraft effective than are reported on the evening state of Squadrons.

FRESH INSTRUCTIONS

Very High Enemy Fighters:

2. The Spitfire Squadrons of Hornchurch and Biggin Hill are, in clear weather, to be detailed in pairs to attack the high fighter screen which is normally between 25,000 and 30,000 feet.

Rendezvous:

3. When the sky is almost completely overcast, Squadrons should rendezvous over an aerodrome below cloud base, otherwise they should rendezvous high over an aerodrome or point well in advance of the enemy's raids, in order not to be dived on while still climbing.

Patrol Lines:

4. Whenever it is not possible to get fairly reliable information about the strength, height and composition of strong incoming raids, fighter Squadrons must be detailed to short patrol lines, if necessary two Squadrons very high and two Squadrons between 15,000 and 20,000 ft.

Diversions by Enemy Fighters:

5. If it appears that the first wave of raids are high flying fighters, act as follows:
- (i) Detail not less than several pairs of Spitfires to fighter screen;
 - (ii) Get ample Hurricane Squadrons rendezvoused in pairs in the region of Sector aerodromes;
 - (iii) Get Northolt and Tangmere Squadrons to Readiness in despatch as wings of three Squadrons to intercept the enemy's second or third wave, which normally contains bombers.

State of Preparedness:

6. During the coming months there will be a few days in which cloud conditions are suitable for the enemy to assemble mass attacks covered by high fighter screen. Whenever these conditions obtain, we must maintain a higher State of Preparedness, and fresh instructions to this end have been issued.

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 20

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers and Sector Commanders, for Sector Controllers

Date: 28 September 1940

Engagement of Daylight Raids

1. Attention is called to Instruction to Controllers No 18 which deals with enemy heavy attacks covered by high flying fighter screen.
2. Enemy attacks during the past three days along the South coast have shown that he is reverting to bomb raids covered by close escort. Owing to difficult cloud conditions that will probably obtain on most days, future bombing attacks in the 11 Group area will probably be made without the cover of a very high fighter screen.

Wing Formations:

3. To counter enemy mass attacks, it had been hoped to develop patrols by wings of three fighter Squadrons. Experience has shown, however, that even with quite a small amount of cloud, Squadrons take a long time to form up, and also have great difficulty in maintaining contact on patrol. Moreover, the time taken to get three Squadrons to a point seems to be double the time required for a pair of Squadrons. With the RDF giving us shorter warning than during mid-Summer, we cannot afford to waste from five to fifteen minutes while Squadrons are assembling and sorting themselves out in wings of three. Therefore unless the sky is clear of cloud layers and the Group Controller gets ample warning of a heavy scale attack forming up over the French coast, he will despatch pairs of fighter Squadrons as described in Instruction to Controllers No 16 during the Winter months. This does not mean that wings of three Squadrons will not be required on occasion in the Winter, and frequently in the coming Spring, when it is hoped we shall be permitted to take a more offensive role and attack the enemy before he reaches the Kentish coast.

State of Preparedness:

4. Controllers should note that the NORMAL STATE fits in more readily with the employment of pairs of Squadrons than of wings of three. Nevertheless, when the Group is at ADVANCED STATE, it does not follow that Controllers are to detail wings of three unless they get ample warning from the RDF, and weather is clear of clouds.

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 24

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers and Sector Commanders, for Sector Controllers

Date: 4 October 1940

Height of Fighter Patrols

With the prevailing cloudy skies and inaccurate heights given by the RDF, the Group Controller's most difficult problem is to know the height of incoming enemy raids. Occasionally reconnaissance Spitfires from Hornchurch or Biggin Hill are able to sight and report the height and other particulars of enemy formations. Moreover, the special fighter reconnaissance flight is now being formed at Gravesend (attached to No 66 Squadron) for the purpose of getting information about approaching enemy raids.

2. Because of the above-mentioned lack of height reports and the delay in receipt of RDF and Observer Corps reports at Group, plus longer times recently taken by Squadrons to take off, pairs and Wings of Squadrons are meeting enemy formations above, before they get to the height ordered by Group.

3. 'Tip-and-run' raids across Kent by Me110s carrying bombs, or small formations of long-range bombers escorted by fighters, give such short notice that the Group Controller is sometimes compelled to detail even single fighter Squadrons that happen to be in the air to intercept the enemy bombers before they attack aircraft factories, Sector aerodromes, or other vital points such as the Docks, Woolwich, etc. Normally, however, Group Controller has sufficient time to detail from one to three pairs (two to six Squadrons) to intercept raids heading for bombing targets in the vicinity of London.

4. Whenever time permits, I wish Group Controllers to get the Readiness Squadrons in company over Sector aerodromes, Spitfires 25,000 feet, Hurricanes 20,000 feet, and wait till they report they are in position before sending them to patrol lines or to intercept raids having a good track in fairly clear weather.

5. This does not mean that the Controller is to allow raids reported as bombers to approach our Sector aerodromes or other bombing targets unengaged because pairs or Wings of Squadrons have not reported that they have reached the height ordered in the vicinity of Sector aerodrome or other rendezvous.

6. I am sending a copy of this Instruction to all Sector Commanders and Controllers, also Squadron Commanders, in order that they may understand why their Squadrons have sometimes to be sent off to intercept approaching bombers before they have reached the height originally ordered or perhaps have joined up with the other Squadron or a pair or Squadrons of a Wing. Our constant aim is to detail one or more pairs of Squadrons against incoming bomb raids, but the warning received at Group is sometimes not sufficient and

our first and primary task is to intercept and break up the bombers before they can deliver a bombing attack against aircraft factories, Sector aerodromes, Docks, etc.

7. Circumstances beyond the control of Group or Sector Controllers sometimes demand that Squadrons engage enemy bomber formations before they have gained height advantage and got comfortably set with the other Squadrons detailed by Group.

8. I wish the Squadron Commanders and Sector Controllers to know that everything humanly possible is being done by Group to increase the warning received of incoming enemy raids. Meanwhile, Squadrons can help by shortening the time of take-off, assembly and rendezvous with other Squadrons to which they are detailed as pairs or Wings.

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 26

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers and Sector Commanders, for Sector Controllers

Date: 8 October 1940

Height of Fighter Patrols

The following instruction is issued in amplification of para 3 of Instructions to Controllers No 25.

2. When a Spitfire Squadron is ordered to Readiness Patrol on the Maidstone Line, its function is to cover the area Biggin Hill-Maidstone-Gravesend, while the other Squadrons are gaining their height, and protect them from the enemy high Fighter Screen. The form of attack, which should be adopted on the high enemy fighters is to dive repeatedly on them and climb up again each time to regain height.

3. The Squadron is not to be ordered to intercept a Raid during the early stages of the engagement, but the Sector Controller must keep the Squadron Commander informed as to the height and direction of approaching raids.

4. The object of ordering the Squadron to patrol at 15,000 feet while waiting on the Patrol Line for Raids to come inland is to conserve oxygen, and to keep the pilots at a comfortable height. Pilots must watch this point most carefully, so that they have ample in hand when they are subsequently ordered to 30,000 feet which is to be done immediately enemy raids appear to be about to cross our coast.

5. When other Squadrons have gained their height and the course of the engagement is clear, the Group Controllers will take a suitable opportunity to put this Spitfire Squadron on to enemy raids where its height can be used to advantage.

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 28

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers and Sector Commanders, for Sector Controllers

Date: 14 October 1940

Rate of Climb of Fighter Formations

Owing to the very short warning given nowadays by the RDF Stations, enemy fighter formations (some carrying bombs), can be over London within twenty minutes of the first RDF plot, and have on occasion dropped bombs on South-East London seventeen minutes after the first RDF plots.

2. Under these circumstances, the only Squadrons that can intercept the enemy fighters before they reach London or Sector aerodromes are the Squadrons in the air on Readiness patrol, or remaining in the air after an attack, plus one or two Squadrons at Stand-By at Sectors on the East and South-East of London.

3. In these circumstances, it is vitally important for Group Controllers, also Sector Controllers, to keep clearly in mind the time taken for Squadrons and other formations to climb from ground level to operating height. The following times are those for a good average Squadron of the types stated:

(A)	Spitfire (Mark I)	13 minutes to 20,000 feet
		18 minutes to 25,000 feet
		27 minutes to 30,000 feet
(B)	Hurricane (Mark I)	16 minutes to 20,000 feet
		21 minutes to 25,000 feet

Pairs: The rate of climb for a pair of Squadrons in company will be 10% and 12% greater than the time given above.

Wings: The rate of climb of Wings of three Squadrons is between 15% and 18% greater than the times given above.

Rendezvous

4. In view of the above, Controllers will see the importance of ordering pairs of Wings to rendezvous over a point at operating height in order that they can climb quickly, singly, and not hold one another back by trying to climb in an unwieldy mass. Bitter experience has proved time and again that it is better to intercept the enemy with one Squadron above him than by a whole Wing crawling up below, probably after the enemy has dropped his bombs.

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 30

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers and Sector Commanders, for Sector Controllers

Date: 17 October 1940

Engagement of High Fighter Raids

The general plan is to get one or two Spitfire Squadrons to engage enemy fighters from above about mid-Kent, in order to cover other Spitfire and Hurricane Squadrons whilst climbing to operating height at back patrol lines East and South of London.

Preparation:

2. Whenever the cloud conditions are favourable for high raid by fighters the following preparations will be made:

(1) *Reconnaissance Aircraft:* One or two reconnaissance aircraft to be kept on patrol near the Kentish coast, height depending on cloud layers.

(2) *Readiness Patrol:* A patrol by one or two Squadrons to be maintained on Maidstone Patrol Line at 15,000 feet, between 0800 hours and 1800 hours.

(3) *Stand-By Squadron:* One Squadron at Sector providing patrol at (2) to be at Stand-By during the peak periods – breakfast, noon and early tea-time.

(4) *London & Debden Squadrons:* State of Readiness of Hurricane Squadrons to be advanced state whenever cloud conditions are suitable for very high fighter raids.

Attack:

3. Immediately enemy formations are plotted over the French coast or Dover Straits, the following action will be initiated:

- (1) *Reconnaissance Aircraft*: Despatched to the area enemy raids are plotted, to locate, shadow and report.
- (2) *Readiness Patrol*: Ordered to climb to 30,000 on the Maidstone patrol line to cover other Squadrons whilst climbing over base patrol lines.
- (3) *Stand-By Squadrons*: Despatched to operating height over base, and then to join the Readiness Squadrons at 30,000 feet.
- (4) *Readiness Squadrons*: Despatched to rendezvous over base at 20,000 to 27,000 feet, and when assembled, detailed to raids or forward patrol lines.
- (5) *Squadrons at Available, Spitfires*: To be brought to Readiness, and if necessary despatched to assemble in pairs on back patrol lines at 25,000 to 30,000 feet, and then detailed to raids.
- (6) *Squadrons at Available, Hurricanes*: Brought to Readiness, and if there is a second or third wave, assembled in pairs over back patrol lines so as to protect Sector aerodromes and London area whilst climbing.
- (7) *Hurricane Squadrons from Tangmere and Debden*: Despatch in Wings or pairs at 20,000 to 27,000 feet, according to time and weather conditions, for one of the following purposes:
 - (a) To reinforce London Sectors if there is a second or third wave of enemy raids.
 - (b) To protect Sector aerodromes and London area whilst the earlier Squadrons are refuelling.
- (8) *Close Defence of Important Bombing Objectives*: If enemy raids are approaching aircraft factories, London area, Sector aerodromes, etc, single Hurricane Squadrons that have not been included in pairs or Wings should be detailed to protective patrols between 15,000 and 18,000 feet, depending on clouds.

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 31

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers

Date: 17 October 1940

Engagement of Mass Bomber Attacks on the London Area

General Plan:

To engage enemy high FIGHTER SCREEN with Spitfire Squadrons from Hornchurch and Biggin Hill half-way between London and the coast, and so enable Hurricane Squadrons from North Weald, Kenley and Northolt to attack bomber formations plus close escort before they reach the line of fighter aerodromes East and South of London. The remaining Squadrons around London that cannot be got up in time to intercept the first wave, to provide a rear screen by climbing over the line of aerodromes East and South of London.

2. The Squadrons from Debden and Tangmere (if disengaged), to be despatched and employed in Wings or pairs, so as to form a screen East and South-East of London to intercept third or fourth wave coming inland, also the retreating earlier waves.

Spitfire Squadrons:

3. Assembled at height in pairs on back patrol lines, then detailed to engage high fighter screen at 30,000 feet.

Role: To protect pairs or Wings of Hurricane Squadrons whilst climbing up, also while attacking bombers plus escort. If the high fighter screen withdraws to the coast, a proportion of the Spitfires may be detailed to attack the escorts to incoming bomb raids.

Hurricane Squadrons:

4. Squadrons at Readiness to be despatched in pairs to back patrol lines covering line of aerodromes. Immediately pairs have reached operating height, detail to bomb raids or to forward patrol lines under Spitfires. Squadrons at Available to be brought to Readiness and assembled in pairs at operating height on back patrol lines covering Sector aerodromes, and detailed to second wave of bomb raids.

5. Whilst gaining height the latter Squadrons may have to be detailed to split raids by bombers that attempt to attack vital points on the flank of the mass of bombers plus escort.

Hurricane Squadrons from Flank Sectors (Debden, Tangmere, and possibly Northolt):

6. Despatch in pairs or Wings, according to the clouds, to patrol mid-Kent patrol lines at 20,000 to 25,000 feet, to engage

- (i) Third or fourth wave attacks of bombers plus escort;
- (ii) Retreating bomb raids of first and second wave;
- (iii) To protect fighter aerodromes whilst the earlier Hurricane and Spitfire Squadrons are refuelling.

Reinforcement from Other Groups:

7. Immediately the enemy numbers appear to be more than 150, request two or three Squadrons to cover the Northern approaches to London, or the South-Western Group of vital points near London, as directed in Controllers Instruction No 7 dated August 27th 1940.

(Sgd) K R Park
Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 34

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers and Sector Commanders, for Sector Controllers

Date: 24 October 1940

Readiness Patrols Against High Flying Fighter Raids

Experience gained during these attacks confirms that the only sure method of countering a series of raids by bomb carrying *fighters* is to keep a pair of Hurricane or a pair of Spitfire Squadrons, from the same Station if possible, continuously on patrol in clear weather and to relieve them in ample time, keeping them at 15,000/18,000 feet until raids appear imminent, when they should be ordered to full operational height. Though less economical in flying hours this method is far more effective and economical in lives than our long established method of intercepting from ground level, which was most successful against bomber formations. Those Squadrons should be on a common R/T Frequency whenever possible.

2. During the present short days and when weather conditions are suitable for heavy high flying fighter raids, Controllers should maintain standing patrols as indicated.
3. Such standing patrols should only be maintained during the full light period of the day, ie at present between 0800 and 1700 hours, and when the base of clouds is above 2,000 feet. Group and Sector Controllers must be on the alert to withdraw Standing Patrols before new cloud or thick ground mist closes down on the parent and adjacent aerodromes. These patrols must be relieved while they retain adequate petrol to allow for delays in finding a clear-weather fighter aerodrome.
4. Squadrons proceeding to Readiness Patrol are normally to gain height over base before going forward to relieve the Squadrons on patrol.

(Sgd) G Harcourt-Smith, G/C
for Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

No 11 GROUP INSTRUCTIONS TO CONTROLLERS No 35

From: Air Officer Commanding, No 11 Group, Royal Air Force

To: Group Controllers and Sector Commanders, for Sector Controllers

Date: 26 October 1940

Group Reinforcement by No 12 Group Wing from Duxford

The following arrangements have been made for the operation of the No 12 Group Wing from Duxford in No 11 Group area.

- (i) The No 12 Group Controller will advise the AOC, or the Deputy Controller of the hours between which the Duxford Wing will be at "Readiness". This information will if possible, be given by 09.00 hours daily, in order to fit the Duxford Wing into the programme for the day.
- (ii) As soon as the Group Controller gets a clear indication of raids building up over the French Coast, he is to request No 12 Group Controller to despatch the Duxford Wing to patrol East of London on an approximate line North and South through Hornchurch. The arrival of the Wing on the Patrol Line will be communicated to No 11 Group Controller who will indicate to the No 12 Group Controller the best position in the Estuary or Northern Kent to which the Wing should be directed to effect an interception.
- (iii) The No 12 Group Controller will inform No 11 Group immediately the Duxford Wing has left ground.
- (iv) No 11 Group Controller is then to inform Sector Controller, Hornchurch, who is to fix the position of the Duxford Wing. This will be possible as two aircraft of the VHF Squadron in the Duxford Wing are fitted with the Hornchurch fixer crystals (one working, one in reserve).
- (v) On arrival on the Patrol Line, Hornchurch will give Zero to the Duxford Wing on its operational frequency. Hornchurch will hold a crystal of the leading Squadron's frequency in the Duxford Wing and set up a channel on their frequency. With R/T facilities as indicated, Hornchurch Controller will be able to fix the Duxford Wing and inform the Observer Corps via the Group Observer Corps Liaison Officer, flank Sectors and Group Operations, of the positions of the Duxford Wing, at frequent intervals.

(Sgd) G Harcourt-Smith, G/C
for Air Vice-Marshal
Commanding No 11 Group
Royal Air Force

‘Battle of Britain Despatch’ by Air Chief Marshal Hugh Dowding GCB GCVO CMG ADC

Introduction by Sebastian Cox

As is generally well-known Sir Hugh Dowding was replaced as C-in-C of RAF Fighter Command in November 1940 by Air Marshal Sir Sholto Douglas and the AOC of Number 11 Group, the then Air Vice-Marshal Keith Park was also replaced by AVM Leigh-Mallory, previously AOC of 12 Group with whom he had clashed during the Battle. Dowding's and Park's replacement by Douglas and Leigh-Mallory has been the cause of much comment and controversy ever since, not all of it well-informed. Dowding was then sent on a tour of the then neutral United States in order to help garner both political and material support for the British war effort, including buying military aircraft, at a time when there was still a strongly isolationist element in the US Congress and the country generally. This was a task for which the somewhat taciturn "Stuffy" Dowding was not well suited and he was recalled in some haste after some of his comments were deemed unhelpful. In mid-June 1941 Winston Churchill remembered that Dowding was supposed to have written a Despatch and asked to see it whereupon the Air Ministry, somewhat embarrassed, discovered that they had never authorised it.¹ Dowding was promptly set to work to write the Despatch and the result of his labours are reproduced here. It was completed in the summer of 1941, almost exactly a year after the Battle had reached its maximum intensity the previous summer. For fairly obvious reasons the Despatch was initially classified, but it was released and published as a Supplement to the London Gazette in September 1946. This brief introduction is intended to identify some of the important elements contained in the Despatch.

Dowding starts his Despatch with a brief discussion of exactly what is meant by the "Battle of Britain". This has been a subject of discussion ever since. We might note in passing that the Germans believed it ran from the middle of August until May 1941, since they excluded the fighting over the English Channel in July, which they refer to separately as the *Kanalkampf* [Channel Battle], but included the night bombing of the UK, which started during the summer and ran through the autumn and winter with increasing intensity into the following spring at which point the *Luftwaffe* decamped *en masse* for airfields in eastern Europe in May 1941, prior to the invasion of the Soviet Union. Dowding concedes that any decision on the dates of the Battle is in part subjective, and himself toys with 8 August [para 11], a date more closely aligned with the German view, but plumps in the end, and reasonably enough, for 10 July 1940, on the grounds that the *Luftwaffe* mounted its first attack by a "really big formation (70 aircraft)" on that day [para 13]. He does not actually specify an end date in the text of the Despatch, merely stating that it "may be said to have ended when the Fighter and Fighter-Bomber raids died down". However, his comparative table of operations and casualties, which cannot be reproduced here because it cannot be compressed to fit the current page size without becoming illegible, ends on 31 July 1941. The official dates of the Battle are now set in stone, literally in the case of some of the Memorials, and run from 10 July to 31 October 1940.

It is interesting to note that Dowding, despite himself identifying the formal date of 10 July, goes on to state that, for him, the Battle started in the autumn of 1939 [para 14]. He follows this with a brief excursive preamble concerning the situation on the outbreak of War and

the drain that operations in France were likely to impose on his Command [paras 15-16]. He suggests that it was at this time that he made the first of what were in truth to become increasingly difficult exchanges with the Air Staff on the subject of reinforcements for France. In fact, though he does not mention it, he first wrote to the Air Ministry on the subject in a letter sent in July 1939, two months before the outbreak of War, stating that if the latter's plan, to earmark six more fighter squadrons for France above the four already planned, were implemented the air defence of the UK would "be gravely imperilled".² We should be clear, however, that the root cause of this dispute lay outside the control of the RAF. It was, quite simply, the grand strategic *volte face* performed by the British Government earlier in 1939. When Germany reneged on the Munich Agreement in March 1939, almost before the ink on it was dry, and occupied the whole of Czechoslovakia the British Government responded in April by announcing peacetime conscription for the first time in the nation's history and the wholesale expansion of the Field Force [i.e. what became the British Expeditionary Force in France] from an initial four Divisions to some 32 Divisions, an eight-fold increase. The air support predicated for the former force was only four fighter squadrons, but the Army, reasonably enough, promptly demanded a concomitant expansion in the RAF fighter force to be provided. None of this expansion had been foreseen, and it was not factored into the production programmes for single-engined fighters [see para 15] that had been planned. These squadrons could therefore only come from Fighter Command.

Dowding, as he reveals in the following paragraphs, pressed for further squadrons to be formed, and in fact the Air Staff went some way to meet his demands, but the truth of the situation, not really covered in the Despatch, was that the demands on fighter production for Fighter Command, the BEF, and overseas theatres such as Egypt, far exceeded the current supply. He also, however, complained vociferously in his letter of 16 September [para 16] that the original four squadrons had been despatched to France immediately on the outbreak of War, though he does not mention this in the Despatch. The Air Council, not unreasonably, replied that he himself had been aware of and had signed off on the plan to send these four squadrons. It was plainly unrealistic of Dowding to expect that the British Government would send the BEF to the Continent with no air cover at all and only move the squadrons if and when an air threat materialised, by which time, of course, it would have been too late. Strangely, Dowding himself recognises that refusing to provide fighter cover for the BEF from Britain's exiguous fighter resources was "politically untenable" [para 16], which indeed it was, but it was also militarily untenable. Yet there is a strong implication in the wording of these paragraphs that suggests somehow this reality should have been ignored by the Air Staff and that Dowding's position was in some distinct way more sensible than theirs'. These were the early exchanges in a dispute between the Air Ministry and the C-in-C Fighter Command which was to come to a head in May 1940.

In discussing the Battle of France the Despatch refers to the "loss" of 16 squadrons [paras 30-34] and 250 Hurricanes [para 37]. This does not mean that they were literally destroyed to a man, although the loss of RAF aircraft and pilots in the French campaign was grievous.

In all during the course of the campaign in France, including the protection of the Dunkirk and later evacuations [paras 38-39 and 43] the RAF as a whole lost 386 Hurricanes and 67 Spitfires.³

Dowding refers [para 40] to his own appearance before the War Cabinet in May 1940 to plead the case for halting any further fighter reinforcements to France. He does not mention his famous letter of 14 May addressed to the Vice Chief of Air Staff in which he made the same case, though this has now passed firmly into the realms of Battle of Britain mythology. The reader of the Despatch is nevertheless left with the undoubted impression that Dowding was the man responsible for making the case against reinforcement, and that it was he alone who persuaded the War Cabinet to send no more fighters to France. In fact equal if not greater credit should fall to Air Chief Marshal Sir Cyril Newall, the Chief of the Air Staff in May 1940. The Cabinet minutes show that it was mostly Newall who spoke at the meeting and there is little doubt that, as the professional head of the RAF and the government's chief air adviser, it was the CAS's opinion which carried the greater weight. Had Newall argued in favour of further reinforcement, one doubts that Dowding alone would have carried the day. Just how finely balanced the arguments were may be evinced by the fact that the very next day, without Dowding present, the War Cabinet reversed itself and decided to send the equivalent of four more squadrons and possibly a further two to follow. It was Newall, not Dowding, who successfully opposed this further reversal in policy, substituting instead the "shuttle" service of Hurricane squadrons mentioned at paragraph 36.⁴

There is a tendency to regard Dowding's intervention in mid-May as an act of infinite wisdom where others lacked his clarity of vision. This is surely too simplistic a view. It is a fact that, had sending more fighter squadrons across the Channel provided the capacity to stabilise the Allied front in France and stop the German breakthrough at Sedan, then strategically that was the most sensible option for the UK, not least because it would have prevented the Germans gaining air bases in France thus rendering the air defence of the nation very much more complicated. The real judgement, therefore, was precisely whether the situation in France in mid-May was irretrievable, and that judgement militarily rested on the shoulders of Sir Cyril Newall and not those of Sir Hugh Dowding. The latter was merely restating a position he had stubbornly held to since early 1939, but which in truth was lacking in a broader strategic understanding of the vital part France played in the defence of Western Europe including the UK, not least because the French Army was at the time the only force of sufficient size to contemplate taking on the *Wehrmacht*.

At paragraphs 54 to 57 Dowding describes the radar chain as a 'vital factor' in the UK's Integrated Air Defence System. He also describes the role of the Royal Observer Corps [ROC] and notes that it was the only method of tracking raids once they had crossed the coast. It is of particular interest to note the flow direction of the plots which is discussed at paragraphs 69-71. The reason that the radar plots go initially to Fighter Command's Filter Room to allow all spurious plots to be eliminated is self-evident. The reason ROC visual and sound plots go

in the other direction is more interesting. By their very nature such plots are local, and thus of crucial immediate interest to the nearest Sector operations room and above that Group, because it may well be the Sector's airfields which are the intended target, but irrespective of the enemy's intention the Sector controller urgently needs to know of any enemy aircraft in his immediate vicinity. Hence, the ROC plots travelled the other way up the C2 chain, going to Sector and Group first, with the latter "telling" the plot to Fighter Command, whose need to know was important but less critically urgent.

Fighter Command had also worked out before the War how the C2 system would operate [para 75] with the tasks for each level of command clearly laid out. Thus, Fighter Command at Bentley Priory was responsible for identifying and classifying incoming raids and allocating them to Groups where they were approaching along inter-Group boundaries. The Group was responsible for responding to the raid and ordering specific squadrons into the air to meet specific raids. Once the squadrons were airborne the Sector controller was responsible for effecting the interception, and was the only man in the C2 chain who spoke directly with fighter formation leaders in the air. This ensured that the sensory load on any particular part of the system was not insupportable and that individual controllers at each level could cope with the inputs and make the relevant decisions without becoming overloaded.

The system also needed to track friendly fighters. Although a crude system of IFF came into use during 1940 [para 72] the radars could not cope with tracking friendly and enemy formations, so the former were tracked by Direction Finding using a system called Pipsqueak, which automatically triggered a transmission from the fighter's HF radio every 15 seconds which was then tracked by D/F ground stations within each sector [paras 79-80].

The discussion of aircraft types is largely uncontroversial except that it probably leans too heavily in favour of the Spitfire. The Hurricane's principal weaknesses are discussed fairly accurately, but the common weaknesses of this type and the Spitfire were the lack of fuel injection which caused problems with the carburettors in the initial moments of a dive, and lack of cannon armament when compared to the German fighters. The Despatch perpetuated the myth of the existence and participation of the Heinkel 113 fighter [para 100]. This aircraft never existed. The designation He113 was initially allocated by the German Air Ministry to a Heinkel design contender for the dive-bomber specification which led to the Stuka, but Ernst Heinkel asked that it be changed to He118 to avoid disturbing superstitious pilots. Heinkel did design a single-engined fighter to the same specification as the Messerschmitt 109, but this was designated the He 112. It appeared in public before the War and may have been the genesis of the He113 myth in the RAF. In fact only 68 He112s were ever built and all were exported.⁵ None saw service with the *Luftwaffe*, but this did not stop the RAF producing recognition material on the aircraft, nor pilots reporting it in combat, nor Dowding reporting it in his Despatch, despite the fact that, unsurprisingly, not one He112/113 was ever shot down on British soil. Myths can be tenacious beasts and difficult to slay, as this one clearly shows.

Dowding's views on the Air Ministry pamphlet *The Battle of Britain* [para 104] are noteworthy because the publication came in for much criticism at the time and since on the grounds that it did not name Dowding, Park or any of the other senior commanders.⁶ Dowding himself does not seem to have found this at all perturbing. What did perturb him was the suggestion that Fighter Command was stronger at the end of the Battle than it was at the beginning [para 106]. Dowding was clearly far from persuaded that mere numerical strength was a sufficiently reliable calculus on which to base such an assessment. His view was that the diminution of pilot experience and thus skill more than outweighed the improvement in the fighter supply situation [para 107]. There is much merit in Dowding's argument, although, of course, the same argument applied to the Germans who suffered an unsustainable near 25 per cent casualty rate in their fighter force in September 1940. Nevertheless, Dowding is forced to downgrade many of his squadrons from what might be called "fully operational status" [see below] and draw on pilots from other Commands [para 107] to bolster his pilot strength. Though he cannot really have known, his assessment that German morale cracked [para 108], whilst undoubtedly exaggerated, nevertheless accurately reflected the fact that the *Luftwaffe's* spirit after several months of unrelenting combat was certainly depressed by the autumn.

At paras 111-116 he discusses the vexed question of claims. It is now accepted that both sides exaggerated the damage they were inflicting on the enemy. Though Dowding refers to the strenuous efforts of the intelligence staff to verify claims his belief that the figures were "reasonably accurate" [para 116] was not well founded. The defences overclaimed by about one third between 8 August and 3 October. The Germans, fortunately, were much worse and, what is more, were serial offenders – for example claiming 4.5 times the true British loss in the week of 12-19 August.⁷ Since British intelligence had seriously overestimated *Luftwaffe* strength at the start of the Battle this did not alter Dowding's approach of conserving his strength. On the German side, however, these overestimates did lead to the erroneous conclusion that Fighter Command was approaching the point of exhaustion in early September encouraging the Germans to change their strategic approach and attack London. The estimates of German strength in the Air were often equally inaccurate, largely because of the inadequacies of the radar technology of the time [see the explanation in the accompanying article on 11 Group Instructions to Controllers] and the difficulties the Observer Corps faced in counting enemy aircraft at high altitude [para 116].

Dowding pays a well-deserved tribute to Air Vice-Marshal Keith Park for his tactical adjustments during the Battle which are discussed in more detail in the accompanying article [para 128]. Dowding comments briefly on the German attacks on radars in mid-August [para 134] but does not point out that, had the Germans continued with such attacks on a systematic basis the UK IADS would have been seriously degraded with incalculable effects on Park's capacity to conduct the Battle. Some idea of what might have happened can be extrapolated from Park's difficulty in dealing with the fighter bomber threat in October which is also discussed in the accompanying article. This was one of the most obvious mistakes made by the German High Command and stemmed in large part from poor intelligence and

a flawed understanding of how the IADS worked. Fighter Command was forced to abandon some of its advanced landing grounds [para 135] but it never had to contemplate such drastic action in respect to the Sector stations which were further back around London and far more vital to the defence. It was also fortunate that Park's predecessor, AVM Leslie Gossage, had instigated a move to provide redundancy in the C2 system by providing off-site back-up facilities for the Sector Operations rooms [para 147].

Dowding comments on the efficient and effective German air-sea rescue service, which was far better organised and equipped than its somewhat *ad hoc* British counterpart [para 156]. AVM Park, in conjunction with Vice-Admiral Dover, Sir Bertram Ramsey, organised a local rescue service with light naval craft, RAF high speed launches, and some Lysander aircraft borrowed from Army Co-operation Command. In mid-August the Air Ministry took steps to place the SAR organisation on a more permanent footing.⁸ The German attempt to use SAR floatplanes marked as Red Cross aircraft was soon scotched and their true combatant status pointed out to the Germans not least by the simple expedient of shooting them down [para 156]!

Dowding makes reference to the introduction of Canadian, Polish and Czech squadrons into his order of battle [paras 162-164], and reveals that his own doubts about the wisdom of integrating other nationalities (shared by many others in the RAF) were soon proved to be little more than prejudice. The Poles, in particular, were to prove formidable opponents for the *Luftwaffe*. The inclusion of foreign aircrews was one way in which Dowding was able to meet the increasing difficulty of keeping squadrons up to strength in the frontline but the problem nevertheless became increasingly acute [paras 167-176] and Dowding was forced into the unwelcome expedient of categorising his units as A, B or C class squadrons, with only the A and to a lesser extent the B Squadrons kept up to strength with operationally qualified pilots. It behoves us to remember that just under twenty per cent of Battle of Britain aircrew came from overseas nations and the Commonwealth.

The discussion of the problems of managing the training pipeline in War is instructive [paras 184-187]. The difficulty, indeed impossibility, of accurately predicting casualties a year or more in advance are self-evident yet the measures put in place to meet the anticipated rate of loss are potentially crucial to the outcome. When casualties amongst aircrew exceed the supply of replacements emerging from the training system there are only three unpalatable alternatives:

- 1) Accept that the force will decline in step with the delta between the two rates.
- 2) Transfer pilots from other areas/specialisations, but this expedient can only be carried out to a limited extent and for a limited period and in any case will clearly have a deleterious effect elsewhere.
- 3) Curtail the training period for replacements, with concomitant unwanted effects on their combat effectiveness.

Dowding was forced to mitigate his pilot shortage by adopting the measure at both the second and third of these alternatives. By the end of the Battle Dowding was feeding new pilots into the C Class Squadrons whilst posting experienced pilots into 11 Group and the contiguous sectors of the neighbouring Groups [para 192]. Dowding makes the point that the *effective* strength of his Command, though not its overall strength, was declining, but this unwelcome truth applied equally to the German side, though this was not obvious to Dowding. Interestingly, having earlier stated that German morale "cracked" towards the end of the Battle here he states that he found little concrete evidence to that effect [para 193]! The Despatch briefly discusses the unsuccessful German attacks on northern England on 15 August [paras 194-5] and the German switch to London. The discussion which follows concerning the Big Wing and its merits and the associated controversy is unstinting but measured in its support of Park's viewpoint [paras 198-204], but it is fascinating to note that Dowding at no point in the Despatch refers to AVM Trafford Leigh-Mallory by name, although Park is mentioned several times and AVM Sir Quintin Brand, AOC of No 10 Group once. The switch by the Germans to targeting London and the consequent culminating point of the Battle on 15 September is accurately identified, although again the German losses are exaggerated by a factor of 2.5 [para 205]. The final stage of the Battle, and the concomitant tactical difficulties in dealing with the "fighter – bomber phase" merits a mere four paragraphs [paras 206-209] before final victory is attained [para 210].

Dowding goes on to discuss a range of technical and tactical factors affecting the fighting. These included the tactical importance of height and the need for a high ceiling for fighters [paras 212-13] and the need to develop pressurised fighters. The need for astute tactical leadership and the concomitant need to promote tactically aware individuals from within the ranks to vacant commands in fighter squadrons, which was an implicit criticism of the Air Ministry's posting policy [para 219] and the need to change the organisational structure of fighter squadrons to reflect the new reality that the old tactical formation of a Vic of three aircraft was outmoded and dangerous and that aircraft needed to operate in pairs [para 220]. Similarly the best harmonisation distance for the fighter's armament was a cause of much discussion and it is open to argument whether Dowding's view that a distance of 250 yards represented the best compromise was actually sound – many would argue for an even closer harmonisation [paras 222-225].

The discussion of the night interception problem that follows accurately sets out the great difficulties which the night fighter and anti-aircraft crews faced in the last half of 1940. These included, the lack of suitable aircraft [paras 245-6], the inadequacies of the searchlights and ROC at night, where it rapidly became apparent that reliance on sound location could not cope with the speed of modern aircraft or the height at which they operated [paras 234-238] and the relative ineffectiveness of the early Air Intercept radars fitted in the Blenheim nightfighters. In particular the AI suffered from excessive ground clutter at lower altitudes and, because of the frequency at which it operated, had a minimum range of 1000 feet [para 239]. As the nightfighter crews initially had to be vectored onto the target by an IADS relying on

sound location largely based on guesswork, it is hardly surprising that they seldom got close enough to pick up the enemy with an AI radar with a maximum range of two to three miles [para 238] and suspect detection in azimuth [para 245], and when they did get an AI contact the crews were frequently unable to obtain visual contact at above 300 yards, at which point the trace disappeared in the clutter from their own instruments. An interim solution to the initial detection of enemy raids was provided by utilising Army gun-laying radars [paras 240-242] and ultimately the development of proper GCI radars [para 249] and the introduction of the Beaufighter, although the latter suffered from a number of teething problems and was not fully effective before Dowding was replaced in November. It is interesting to note that Dowding accepted that later experiments with day fighters operating as “cats-eye” interceptors enjoyed some success, as he had himself opposed the suggestion to use fighters in this manner [para 255]. This was one solution to the problem of mass raids which tended to overwhelm the GCI system. Later in the War the Germans faced the same problem with their GCI system and also resorted to operating single-engined fighters using visual interception methods, a system they referred to as *Wilde Sau* [Wild Boar]. We might note in passing that Dowding’s perceived resistance to innovations suggested by a Committee which investigated night air defence problems was one of the principal factors which led to his replacement in November 1940, an event which was accelerated by the famous *Luftwaffe* raid on Coventry very early in the month, in which German bombers processed across the city for several hours without a single successful interception by Fighter Command taking place.

Overall the Despatch provides a fascinating perspective on the Battle of Britain from the senior Commander who bore the principal burden of ensuring victory. It is occasionally argued that even had Fighter Command been defeated this would not have spelt the end for the UK since the Royal Navy remained in being and was considerably stronger than the *Kriegsmarine* and would have prevented invasion. This conveniently ignores two salient points. First, that a defeat for the RAF would have meant that German air power could have ranged across the UK more or less at will, and that this would almost certainly have made Winston Churchill’s position as Prime Minister untenable. It seems likely that he would have been replaced by a Government anxious to seek a compromise peace with Germany to save the nation from further destructive attacks, but one on far less favourable terms than those Hitler had offered after the fall of France. Those politicians who had earlier favoured such an accommodation, such as Lord Halifax and “RAB” Butler, had not simply disappeared from the political scene. Second, the Germans would not have needed to mount the invasion immediately, they could have bided their time and deployed their air power to devastate the dockyard facilities on which the RN relied, not to mention the warships in harbour, thus reinforcing the message that the UK would do better to sue for peace as France had done.

Notes

¹ Richard Overy, *The Battle of Britain* (Penguin, London, 2004) p.119.

² T C G James, *Air Historical Branch Narrative: “The Growth of Fighter Command 1936-1940”*, published edition (Frank Cass, London, 2002), p.57.

³ Dennis Richards, unpublished Air Historical Branch Narrative: The Campaign in France and the Low Countries September 1939 – June 1940, p.474.

⁴ James, "Growth of Fighter Command", p.89.

⁵ William Green, *Warplanes of the Third Reich* (MacDonald, London, 1970) pp.309-315 & p. 325.

⁶ See Vincent Orange, *Dowding of Fighter Command* (Grub Street, London, 2008), p.221-222.

⁷ See Sebastian Cox, A comparative analysis of RAF and Luftwaffe Intelligence in the Battle of Britain, *RAF Air Power Review*, Vol 3, No 3, Autumn 2000, pp.45-46 & 51-52.

⁸ Unpublished Air Historical Branch Monograph, *Air Sea Rescue*, pp.5-6.

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BATTLE OF BRITAIN

**DESPATCH BY
AIR CHIEF MARSHAL SIR HUGH C. T. DOWDING
GC.B., G.C.V.O., C.M.G., A.D.C.**

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NOTE.—Papers marked * have been contributed by the Commander-in-Chief, Anti-Aircraft Command, to whom my thanks are due.

Appendices "A.A.," "B" and "D" are in the form of charts, bound in at the back of this Despatch.
[Not reproduced]

PREAMBLE.

1. I have been instructed by the Air Council to write a Despatch on the Air Fighting of last Autumn, which has become known as the "Battle of Britain." The conditions are a little unusual because, firstly, the Battle ended many months ago, secondly, a popular account of the fighting has already been written and published, and, thirdly, recommendations for Mention in Despatches have already been submitted.

2. I have endeavoured, therefore, to write a report which will, I hope, be of Historical interest, and which will, in any case, contain the results of more than four years' experience of the Fighter Command in peace and war.

August 20, 1941.

THE BATTLE OF BRITAIN.

Part 1.—PRELIMINARY.

3. In giving an account of the Battle of Britain it is perhaps advisable to begin by a definition of my conception of the meaning of the phrase. The Battle may be said to have started when the Germans had disposed of the French resistance in the Summer of 1940, and turned their attention to this country.

4. The essence of their Strategy was so to weaken our Fighter Defences that their Air Arm should be able to give adequate support to an attempted invasion of the British Isles. Experiences in Holland and Belgium had shown what they could do with armoured forces operating in conjunction with an Air Arm which had substantially achieved the command of the Air.

5. This air supremacy was doubly necessary to them in attacking England because the bulk of their troops and war material must necessarily be conveyed by sea, and, in order to achieve success, they must be capable of giving air protection to the passage and the landing of troops and material.

6. The destruction or paralysis of the Fighter Command was therefore an essential prerequisite to the invasion of these Islands.

7. Their immediate objectives might be Convoys, Radio-Location Stations, Fighter Aerodromes, Seaports, Aircraft Factories, or London itself. Always the underlying object was to bring the Fighter Command continuously to battle, and to weaken its material resources and Intelligence facilities.

8. Long after the policy of "crashing through" with heavy bomber formations had been abandoned owing to the shattering losses incurred, the battle went on. Large fighter formations were sent over, a proportion of the fighters being adapted to carry bombs, in order that the attacks might not be ignorable.

9. This last phase was perhaps the most difficult to deal with tactically. It will be discussed in greater detail later on.

10. Night attacks by Heavy Bombers were continuous throughout the operations, and, although they persisted and increased in intensity as Day Bombing became more and more expensive, they had an essentially different purpose, and the "Battle of Britain" may be said to have ended when the Fighter and Fighter-Bomber raids died down.

11. It is difficult to fix the exact date on which the "Battle of Britain" can be said to have begun. Operations of various kinds merged into one another almost insensibly, and there are grounds for choosing the date of the 8th August, on which was made the first attack in force against land objectives in this country, as the beginning of the Battle.

12. On the other hand, the heavy attacks made against our Channel convoys probably constituted, in fact, the beginning of the German offensive; because the weight and scale of the attack indicates that the primary object was rather to bring our Fighters to battle than to destroy the hulls and cargoes of the small ships engaged in the coastal trade. While we were fighting in Belgium and France, we suffered the disadvantage that even the temporary stoppage of an engine involved the loss of pilot and aircraft, whereas, in similar circumstances,

the German pilot might be fighting again the same day, and his aircraft be airborne again in a matter of hours.

13. In fighting over England these considerations were reversed, and the moral and material disadvantages of fighting over enemy country may well have determined the Germans to open the attack with a phase of fighting in which the advantages were more evenly balanced. I have therefore, somewhat arbitrarily, chosen the events of the 10th July as the opening of the Battle. Although many attacks had previously been made on convoys, and even on land objectives such as Portland, the 10th July saw the employment by the Germans of the first really big formation (70 aircraft) intended primarily to bring our Fighter Defence to battle on a large scale.

14. I had 59 squadrons in various stages of efficiency. A list of these units, with supplementary information, is given in Appendix A. Many of them were still suffering from the effects of the fighting in Holland and Flanders, at Dunkerque, and during the subsequent operations in France. Others were in process of formation and training. But, if the lessons of the Battle are to be correctly appreciated, due consideration must be given to the factors leading up to the situation existing when it began. Leaving out of account peace-time preparations and training, the Battle of Britain began for me in the Autumn of 1939.

15. The first major problem arose during the discussion of the question of sending Fighter Squadrons to France. The decisive factor was that of Supply. Our output at the beginning of the war was about 2 Hurricanes and 2 Spitfires per diem; and, although there were hopes of increasing Hurricane production, there was then no hope that Spitfire production would be materially increased for about a year. It is true that certain optimistic estimates had been made, but there were reasons to believe that these could not be implemented. At that time, we in England were out of range of German Fighters, and I had good hopes that unescorted bomb raids on this country could be met and defeated with a very small loss in Fighters; but there could be no illusions concerning the wastage which would occur if we came up against the German Fighters in France.

16. I therefore regarded with some apprehension the general policy of sending Home Defence Fighter Units to France; but, as it was clear that such an attitude was politically untenable, I wrote on the 16th September, 1939, a letter to the Air Ministry. In this letter I pointed out that the Air Staff's Estimate of the number of Fighter Squadrons necessary for the defence of this country was 52, and that on the outbreak of war I had the equivalent of 34 (allowing for the fact that some Auxiliary Squadrons were only partially trained and equipped).

17. I wanted 12 new squadrons, but asked that 8 should be raised immediately, and made proposals for their location and employment. In a letter dated the 21st September the Air Ministry regretted that the most they could do towards meeting my requirements was to form 2 new squadrons and 2 operational training units. I was invited to a meeting of the Air Council on the 26th September.

18. On the 25th September I wrote expressing my disappointment and asking for a reconsideration. As a result of this letter, the Air Council Meeting, and a further meeting under the Chairmanship of the Deputy Chief of Air Staff, the Air Ministry wrote on the 9th October sanctioning the immediate formation of 8 new squadrons, though 6 of these could be formed

initially only as half- squadrons owing to shortage of resources. This correspondence is too lengthy to reproduce here, but it deals also with my apprehensions concerning Hurricane wastage in France, which were realised in the Spring of 1940. It also dealt with an estimate worked out by the Air Ministry Organisation Staff that after 3 months of fighting we might expect the Fighter strength to have been reduced to 26 squadrons. The papers can be found in Air Ministry Files S. 2116 and CAS/Misc/4.

19. In October 1939 the Air Ministry further reconsidered their policy, and ordered the formation of 10 additional Fighter Squadrons, 4 of which were destined for the Coastal Command.

20. In January 1940 the Northern flank of our continuous Defence organisation was on the Forth, and the South-Western flank was at Tangmere in Sussex (with the exception of an isolated station at Filton for the local defence of Bristol and the mouth of the Severn). On the 2nd and 4th February I wrote two letters (F.C/S. 18993) pointing out these limitations, and asking for an extension of Aerodrome facilities, Intelligence cover and communications.

21. On the 9th February I was told that a paper was in preparation, and that I would be given an opportunity to remark on the proposals at a later stage.

22. On the 16th March I received the paper referred to (S. 3553) and forwarded my comments on the 23rd March.

23. On the 8th May I received a letter, S. 3553, saying that a reply had been delayed. The proposals were now approved, and decisions would shortly be taken.

24. This delay was presumably unavoidable, but the result was that the organisation and development of the defences of the South and West of England were very incomplete when they were called upon to withstand the attacks which the German occupation of French aerodromes made possible.

25. The fighting in Norway has only an indirect bearing on this paper. Certain useful tactical lessons were gained, particularly with regard to deflection shooting, and I trust that the story of the epic fight of No. 263 Squadron under Squadron-Leader J. W. Donaldson, D.S.O., near Andalsnes, may not be lost to History.

26. The outcome, as it affects this account, was the virtual loss of 2 squadrons in the sinking of the Aircraft Carrier *Glorious* after the evacuation of Narvik.

27. Next came the invasion of Holland, and the call to send Fighters to the assistance of the Dutch. The distance to Rotterdam was about the extreme range of the single-seater Fighter, which therefore operated under the disadvantage of having a very brief potential combat-time, followed by the necessity of a long sea crossing on the homeward way. The Blenheims, of course, had the necessary endurance, but they had not been designed as fighters, and their use against day fighters proved costly in comparison with the limited success which they attained.

28. The Defiants were used here for the first time, and, although they proved very effective against unescorted bombers, they, too, suffered heavy casualties when they encountered fighters in strength. As the result of this experience I formed the opinion that the Blenheims should be kept exclusively for night fighting, if possible, while I retained an open mind about the Defiants pending some experience of short-range fighting.

29. Then began the fighting in Belgium and Northern France, and at once my fears about the incidence of wastage in this type of fighting began to be realised.

30. At the beginning of April 1940 there were 6 Fighter Squadrons in France.

31. Then 4 more complete squadrons were sent when the fighting began.

32. Then on the 13th May 32 pilots and aircraft were sent—say the equivalent of 2 squadrons.

33. Almost immediately afterwards 8 Half-Squadrons were sent. This was done under the impression that the loss of 8 Half-Squadrons would affect me less than that of 4 entire Squadrons, because it was supposed that I should be able to rebuild on the nuclei left behind. But this assumption was incorrect because I had neither the time nor the personnel available for purposes of reconstruction, and the remaining half-squadrons had to be amalgamated into Composite Units with a resulting disorganisation and loss of efficiency. At this time, too, I was ordered to withdraw trained pilots from squadrons and to send them overseas as reinforcements.

34. I had now lost the equivalent of 16 Squadrons, and in addition 4 Squadrons were sent to fight in France during the day and to return to English bases in the evening.

35. Other pilots were withdrawn from the Command through the system by which the Air Ministry dealt direct with Groups on questions of Personnel.

36. It must be remembered that during this period the Home Defence Squadrons were not idle, but that Hurricane Squadrons were participating in the fighting to a considerable extent, 4 Squadrons daily left S.E. England with orders to carry out an offensive patrol, to land and refuel in France or Belgium, and to carry out a second sortie before returning to England.

37. Hitherto I had succeeded generally in keeping the Spitfire Squadrons out of the Continental fighting; The reason for this, as stated above, was that the supply situation was so bad that they could not have maintained their existence in face of the Aircraft Casualty Rate experienced in France: between the 8th May and the 18th May 250 Hurricanes were lost.

38. When the Dunkerque fighting began, however, I could no longer maintain this policy, and the Spitfires had to take their share in the fighting.

39. When the Dunkerque evacuation was complete I had only 3 Day-Fighting Squadrons which had not been engaged in Continental fighting, and 12 Squadrons were in the line for the second time after having been withdrawn to rest and re-form.

40. All this time, it must be remembered, the attack on this Country had not begun; with a few accidental exceptions no bomb had been dropped on our soil. I was responsible for the Air Defence of Great Britain, and I saw my resources slipping away like sand in an hour-glass. The pressure for more and more assistance to France was relentless and inexorable. In the latter part of May, 1940, I sought and obtained permission to appear in person before the War Cabinet and to state my case. I was accorded a courteous and sympathetic hearing, and to my inexpressible relief my arguments prevailed and it was decided to send no more Fighter Reinforcements to France except to cover the final evacuation.

41. I know what it must have cost the Cabinet to reach this decision, but I am profoundly convinced that this was one of the great turning points of the war.

42. Another decision, of perhaps equal importance, was taken at about this time. I refer

to the appointment of Lord Beaverbrook to the post of Minister of Aircraft Production. The effect of this appointment can only be described as magical, and thereafter the Supply situation improved to such a degree that the heavy aircraft wastage which was later incurred during the "Battle of Britain" ceased to be the primary danger, its place being taken by the difficulty of producing trained fighter pilots in adequate numbers.

43. After the Evacuation from Dunkerque the pressure on the Fighter Command became less intense, but it by no means disappeared. Hard fighting took place along the coast from Calais to Le Havre to cover the successive evacuations from that coast. Then the centre of gravity shifted to Cherbourg and its neighbourhood, and the "Battle of Britain" followed on without any appreciable opportunity to rest and re-form the units which had borne the brunt of the fighting.

44. The above considerations should be kept in mind when Appendix A (Order of Battle on the 8th July, 1940) is being studied.

45. The Guns and Searchlights available for the Air Defence of Great Britain were arranged as shown on the map which constitutes Appendix B.

46. The fall of Belgium and France had increased the danger to the South and West of England, and had necessitated a considerable modification of the original arrangements when bombing attacks could start only from German soil.

47. The distribution of Army Units was, as a matter of fact, in a condition of perpetual change to meet new situations as they arose, and I must pay a very sincere tribute to the flexibility of the Army organisation, and to the tact, patience and loyalty of the Commander-in-Chief of the Anti-Aircraft Command, Lt.-Gen. Sir Frederick A. Pile, Bart., K.C.B., D.S.O., M.C., which enabled these constant changes to be made without disorganisation.

48. In theory the Commander-in-Chief, Fighter Command, was the authority responsible for settling the dispositions of all guns allotted to the Air Defence of Great Britain; but this was little more than a convenient fiction. The number of guns available was so inadequate for the defence of all the vulnerable targets in the country, and the interests concerned were so diverse and powerful, that it was not to be supposed that any individual member of any one Service would be left to exercise such a prerogative uninterruptedly. A disproportionate amount of my time was taken up in discussions on gun distribution, and each decision was at once greeted with a fresh agitation, until finally I had to ask that all proposals should be discussed by a small Committee on which all interests were represented, and I normally accepted the recommendations of this Committee during quiet periods. During active operations I consulted General Pile, and we acted according to our judgment. One rather important lesson emerged from our experience, viz., that the general fire-control of all guns in the Air Defence System should be vested in the Air Defence authorities. I do not, of course, mean that, if an invasion had taken place, the guns co-operating with the troops in the Field should have been subordinated to any A.A. Defence Commander, but the existence of "free-lance" guns, the positions and even the existence of which were unknown to me, was an appreciable handicap, especially at night. It was impossible to acquaint them with the approach of enemy raiders, or of the fact that our own aircraft were working in the vicinity.

49. When the night attacks on London began to be really serious, General Pile, in

consultation with myself, decided to send heavy reinforcements. Within 24 hours the defences to the South and South-East of London were approximately doubled, and the great increase in the volume of fire was immediately noticed and had a very good effect on public morale. The physical effect in the shape of raiders destroyed was by no means negligible, but the main effect was never generally known. The track of every raid was, of course, shown on various operations tables, and on some nights as many as 60 per cent of the raiders approaching London from the South turned back after dropping their bombs in the open country or on the fringe of the Barrage.

50. The A.A. Guns at Dover enjoyed unusual opportunities for practice, with the result that their crews became acknowledged experts in the art of Anti-Aircraft Gunnery. Their skill, however, was attained through the circumstance that they and the Dover Balloon Barrage were continuously the objectives of German attack; they manned their guns continuously night and day, and I must pay a high tribute to their morale, enthusiasm and efficiency. A report from the 6th A.A. Division, which was busily and typically employed, is included at Appendices C, C.A, C.B. and C.C.

51. A short Appendix (C.D) is added showing the number of rounds fired per aircraft destroyed, for the whole Anti-Aircraft Command.

52. On the map which constitutes Appendix A.A. are shown the boundaries of Groups and Sectors, and also the positions of the Balloon Barrages, together with an indication of the front covered by Radio Location Stations and the area covered by the Observer Corps.

53. The Balloon Barrages had, at this stage, had little opportunity of justifying their existence, except perhaps at Rosyth and Scapa Flow, since bombing attacks against land objectives in Britain had not yet begun. It was thought, however (and later experience confirmed this opinion), that the heavy cost of their installation and maintenance, and their drain on man-power, were on the whole justified. It is true that their material results, in terms of enemy air craft destroyed, were not impressive, they suffered staggering casualties in electric storms, and had brought down a number of our own aircraft; on the other hand, they exercise a very salutary moral effect upon the Germans and to a great extent protected the vital objectives, which they surrounded, against low-altitude attacks and dive-bombing.

54. This is not the place to give an account of the romantic discovery and development of Radio Location. It may be explained, however, that the back bone of the system consisted of a - series of large "chain" stations at intervals averaging about 30 miles. These gave warning, by means of reflected electrical echoes, of the presence of aircraft within the radius of their effective action, which attained to nearly 200 miles in the most favourable circumstances. The average effective radius was about 80 miles, but they had the serious limitation that they failed altogether to give indications of aircraft flying below 1,000 feet.

55. To overcome this disability, which was particularly hampering to operations against low-flying minelayers, smaller units called "C.H.L." Stations were included in the protective line.

56. These had a restricted range (about 30 miles), and were incapable of giving heights with any degree of accuracy; they were, however, extremely accurate in azimuth; and constituted an essential feature of the Defensive and Warning Systems.

57. The Radio Location system was growing so fast and had to meet so many calls from

overseas that the training of the technical personnel and the maintenance of the elaborate scientific apparatus presented great difficulties. In spite of these handicaps, however, the system operated effectively, and it is not too much to say that the warnings which it gave could have been obtained by no other means and constituted a vital factor in the Air Defence of Great Britain.

58. The functions of the Observer Corps (since granted the "Royal" prefix) are too well known to require description here. Suffice it to say that this loyal and public-spirited body of men had maintained their watch with admirable efficiency since the beginning of the war and throughout a winter of exceptional severity. It is important to note that, at this time, they constituted the sole means of tracking enemy raids once they had crossed the coast line. Later experience was to show that "sound plots," which were all that could be given for night raiders, and aircraft flying above clouds or at extreme altitudes, were not adequate for purposes of accurate interception; but their work throughout was quite invaluable. Without it the Air Raid Warning system could not have been operated, and Inland Interceptions would rarely have been made.

59. The credit for building up and developing the Observer Corps in recent years is due largely to its Commandant, Air Commodore A. D. Warrington Morris, C.M.G., O.B.E.

60. The Air Raid Warning System was operated centrally from Fighter Command Headquarters (with a small exception in the Orkneys and Shetlands)

61. The country was divided into about 130 "Warning Districts," the boundaries of which were determined by the lay-out of the public telephone system. These districts were shown on a map in my Operations Room, and the tracks of all enemy raids, whether over the land or sea, were plotted by means of counters deposited and removed as necessary by a number of "Plotters."

62. The counters were of three colours, according to the 5-minute period in which they were placed on the table. This was necessary to facilitate their removal at the end of 15 minutes, and so to obviate the confusion caused by "stale plots."

63. Three telephone operators were in continuous communication with the Trunk Exchanges in London, Liverpool and Glasgow, and when a raid was within 20 minutes' flying distance of a warning district the Air Raid Warning officer would send a message, as, for instance: "10. Norwich. Yellow." The London operator would transmit this to the London Trunk Exchange, and the London operator would immediately retransmit it to Norwich, where other operators would pass it on to approved recipients in the Warning District. This was a preliminary caution for the information of Police, Fire Stations, &c., and involved no public warning.

64. About 5 minutes later, if the same District were still threatened, a "Red Warning" would be given. This was the signal for the Sirens to sound. A "Green" signal indicated "Raiders Passed," and the Sirens sounded the "All Clear."

65. At night, when it became essential to maintain exposed lights in Dockyards, Railway Sidings and Factories up to the last minute, so as to obviate unnecessary loss of working time, a "Purple" warning was introduced. This was a signal for the extinction of exposed lights, but it did not connote a public warning.

66. There were also subsidiary warnings, transmitted by a fourth operator, to close down Radio Stations which might assist the enemy's navigation by enabling him to use wireless Direction Finding.

67. The credit for working out this system in conjunction with the Home Office is due largely to Air Vice-Marshal A. D. Cunningham, C.B.E.

68. The Fighter Command was divided into Groups and Sectors in accordance with the arrangement shown in Appendix A. B. Only Nos. 11, 12 and 13 Groups were fully organised at the beginning of the Battle. Each Group and Sector Headquarters had an Operations Table generally similar to that already described at Command Headquarters, but covering an appropriately smaller area. The British Isles and neighbouring seas were covered by an imaginary grid which was used by all concerned for plotting purposes. An expression consisting of one letter and four digits gave the position of a point with an accuracy of 1 square kilometre.

69. Plots from which tracks could be built up were received first from the Radio Location Station, and later from the Observer Corps (and to a small extent from Searchlight Detachments) after a raid had crossed the coast.

70. All Radio Location plots came to a "Filter Room" table at Command Headquarters (next door to the room in which the Operations Table was situated), and, after surplus Information had been eliminated, tracks were passed by direct telephone line simultaneously to my Operations Table and to those of Groups and Sectors concerned.

71. Observer Corps plots, on the other hand, went first to Observer Group Centres (where plotting tables were also installed) and thence to Sector and Fighter Group Operations tables. The tracks were then "told" to my Operations Room from the Group Tables.

72. In order to avoid waste of flying effort and false Air Raid Warnings it was obviously very necessary to differentiate between friendly and enemy formations, and this was the most difficult as well as the most important task of my Filter Room. Liaison Officers from Bomber and Coastal Commands were permanently on duty, and they were in possession of all available information concerning the operations of our own Bombers and Coastal patrols. During 1940 an electrical device became generally available which modified the echo received by the Radio Location System from our own aircraft in a characteristic manner. This was of the greatest value.

73. The credit for working out the complicated details of the Filter Room belongs largely to Wing Commander (now Group Captain) R. G. Hart, C.B.E.

74. It appeared to me quite impossible to centralise Tactical control at Command Headquarters, and even Group Commanders would be too busy during heavy fighting to concern themselves with details of Interception.

75. The system was that the Command should be responsible for the identification of approaching formations and for the allotment of enemy raids to Groups where any doubt existed. Group Commanders decided which Sector should meet any specified raid and the strength of the Fighter force which should be employed. Sector Commanders detailed the Fighter Units to be employed, and operated the machinery of Interception.

76. Various states of preparedness were laid down, e.g., Released, Available (20 minutes),

Readiness (5 minutes), and stand-by (2 minutes), and Sectors reported all changes to Group Headquarters, where an up-to-date picture of the state of affairs was recorded by lights on the walls of the Operations Room. Various liaison officers from the Observer Corps, guns and searchlights were maintained in Group and Sector Operations Rooms.

77. It will be seen that the Sector Commander had on his table the best available information as to the position and track of an enemy formation; but, in order to effect an accurate interception, it was necessary that he should also know the position and track of his own Fighters.

78. This was recorded by means of R/T D/F (Radio Telephony Direction Finding). R/T signals were transmitted automatically for 15 seconds out of each minute by selected Fighter aircraft and were picked up by two or three D/F stations installed in Sectors for the purpose. The readings were passed by direct telephone lines to Sector Headquarters and a mechanical plotting device gave an almost instantaneous plot of the Fighter's position.

79. In the more recently organised Sectors these D/F stations had not been installed, and it was necessary to keep track of the Fighters by giving them precise orders as to speed and direction, and plotting their tracks by Dead Reckoning. This method was adequate only if the force and direction of the wind at various altitudes could be correctly estimated.

80. The Sector Commander could thus see on his operations table the positions and courses of enemy formations and of his own Fighters, and was enabled so to direct the latter as to make interceptions with the former in a good percentage of occasions by day. Interception depended, of course, on the Fighters being able to see the enemy, and, although the system worked adequately against enemy formations in daylight, the degree of accuracy obtainable was insufficient to effect interception against night raiders not illuminated by Searchlights, or against individual aircraft using cloud cover by day.

81. Orders were given to pilots in their aircraft by means of a very simple code which could be easily memorised. For instance "Scramble" meant Take off. "Orbit" meant Circle. "Vector 230" meant Fly on a course of 230 Degrees.

82. I realised that the enemy might pick up the signals and interpret them, but any elaborate code was out of the question if it included reference to some written list in the air.

83. As a matter of fact the enemy did pick up and interpret the signals in some cases, but not much harm was done, except when they were able to discover the height at which a formation was ordered to operate, and the time when it was ordered to leave its patrol line and land.

84. "Pancake" was the signal for the latter operation, and I therefore introduced several synonyms, the significance of which was not obvious to the enemy.

85. The code word for height was "Angels," followed by the number of thousands of feet; when it appeared probable that the enemy were taking advantage of this information I introduced a false quantity into the code signal. Thus "Angels 18" really meant Fly at 21,000 and not 18,000. On more than one occasion German Fighter formations arriving to dive on one of our patrols were themselves attacked from above.

86. The system as a whole had been built up by successive steps over a period of about four years, and I was not dissatisfied with the way in which it stood the test of war.

87. The steps taken to devise a system of night Interception are described later in this Despatch.

88. I must now give a brief account of the characteristics of the aircraft commonly employed on both sides. As regards the Fighter types available in the Command, the bulk of the force consisted of Hurricanes and Spitfires; the former were beginning to be outmoded by their German counterparts. They were comparatively slow and their performance and manoeuvrability were somewhat inadequate at altitudes above 20,000 ft. The Spitfires were equal or superior to anything which the Germans possessed at the beginning of the Battle.

89. The Hurricanes and Spitfires had bullet-proof windscreens and front armour between the top of the engine and the windscreen. They also had rear armour directly behind the pilot, which was previously prepared and fitted as soon as we began to meet the German Fighters. The early adoption of armour gave us an initial advantage over the Germans, but they were quick to imitate our methods. While German aircraft remained unarmoured, I think it is now generally agreed that the single-seater multi-gun fighter with fixed guns was the most efficient type which could have been produced for day fighting. With the advent of armour some change in armament and/or tactics became necessary, and the subject is discussed in more detail in Appendix F.

90. The Defiant, after some striking initial successes, proved to be too expensive in use against Fighters and was relegated to night work and to the attack of unescorted Bombers.

91. The Blenheim was also unsuitable for day-time combat with Fighters, owing to its low speed and lack of manoeuvrability. It had been relegated to night duties for these reasons, and because adequate space was available in its fuselage for an extra operator and the scientific apparatus which was necessary for the development of a new night-interception technique. The cockpit had not been designed for night flying and the night view was extremely bad. Its already low performance had been further reduced by certain external fittings which were essential for the operation of the Radio Detecting apparatus.

92. The Beaufighter was looked on as a Blenheim replacement in which most of the above disadvantages would be overcome. Its speed promised to be adequate and its armament consisted of 4 20-mm. Cannons instead of the 5 .303-inch Brownings of the Blenheim. There was thus hope that decisive fire could be brought to bear in the short period during which visual contact could be expected to be maintained at night.

93. Like the Blenheim, it had not been designed as a Night Fighter (it was an adaptation of the Beaufort Torpedo Bomber), and the night view from the cockpit was bad; but Air Vice-Marshall Sir Q. Brand, K.B.E., D.S.O., M.C., D.F.C., a veteran night fighter of the previous war, had designed a new cockpit lay-out, which did not, unfortunately, materialise during my tenure of the Fighter Command. The output of Beaufighters was also very low.

94. Another type which was pressed into service as a Night Fighter was the Douglas D.B.7 (now the Havoc). It had low fire power and comparatively poor performance with its original engines. Its chief advantage lay in its tricycle undercarriage, which proved very popular for landings in bad visibility. Only one Squadron of these was in being when I left the Command.

95. One Squadron of Gladiators was still in use in the Command. As explained above,

the organisation of No. 10 Group was not complete, and there was no large aerodrome close enough to Plymouth to allow of direct protection being given to that town and to the Dockyard at Devonport. A squadron of Gladiators was therefore located at a small aerodrome called Roborough in the immediate vicinity. The Gladiators, though slow by modern standards, were very manoeuvrable, and had given good results in Norway by deflection shooting in the defence of fixed objectives, where the Bombers could not avoid the Gladiators if they were to reach their targets.

96. Some American single-seater aircraft were in Great Britain, but the types then available were deficient in performance and fire power and were not employed to any material extent.

97. The Whirlwind raised high hopes in some quarters. It claimed a very high top speed and carried 4 Cannon Guns. It had, however, a totally inadequate service ceiling (about 25,000 ft.) and a poor performance at that altitude. It also suffered from a continuous series of teething troubles, and the single Squadron equipped with this type was never fit for operations in my time.

98. It is very difficult to give any kind of concise description of the types of Enemy Aircraft used during the Battle. The Germans, while adhering to broad standard types, were continually modifying and improving them by fitting more powerful engines and altering the armament. The original Messerschmitt 109, for instance, had a performance comparable with that of the Hurricane, but the latest type could compete with the Spitfire, and had a better ceiling. Some of them had 4 machine guns and others had 2 machine guns and 2 cannons. Some of them were fitted to carry bombs and some were not.

99. The Messerschmitt 110 was a twin-engined fighter designed primarily for escorting Bombers and used also as a Fighter-Bomber. It was somewhat faster than the Hurricane, but naturally much less manoeuvrable than the single-engined types. Its usual armament was 2 fixed cannons and 4 machine guns firing forward, and one free machine gun firing to the rear. Our pilots regarded it as a less formidable opponent than the later types of M.E. 109.

100. The Heinkel 113 Fighter made its appearance in limited numbers during the Battle. It was a single seater, generally resembling the M.E. 109. Its main attributes were high performance and ceiling, so that it was generally used in the highest of the several layers in which attacking formations were usually built up.

101. The Junkers 87 was a single-engined Dive-Bomber. It had a low performance (top speed well under 250 m.p.h.). It had 2 fixed machine guns firing forward and one free gun firing to the rear. When it was able to operate undisturbed by Fighters it was the Germans' most efficient Bomber against land or sea targets owing to the great accuracy with which it dropped its bombs; but when it was caught by fighters it was nothing short of a death-trap, and formations of JU. 87's were practically annihilated on several occasions.

102. The Heinkel 111 and the various types of Dornier (17, 17Z and 215) constituted the main element of the German striking force. They were twin-engined aircraft and were generally similar, although the former was slightly the larger. Their speed was something over 250 m.p.h., and their armament consisted normally (but not always) of 4 free machine guns firing backwards and one firing forwards. Their radius of action varied with tankage and bomb

load, but, if necessary, all objectives in England and Northern Ireland could be reached from aerodromes in France.

103. The Junkers 88 was the most modern of the German Bombers. It also was a twin-engined type with a performance of about 290 m.p.h. Its armament was generally similar to that of the H.E. 111 and the Dorniers and it had a slightly longer range. It could be used on occasions as a Dive-Bomber and, though probably somewhat less accurate than the JU. 87, was much less vulnerable owing to its superior performance and armament.

104. Before beginning an account of the Battle, I must refer briefly to the publication entitled *The Battle of Britain*, issued by the Air Ministry. This, if I may say so, is an admirable account of the Battle for public consumption, and I am indebted to it, as well as to the book *Fighter Command*, by Wing Commander A. B. Austin, for help in the compilation of this Despatch. There is very little which I should have wished to alter, even if circumstances had permitted my seeing it before publication (I was absent in America at the time), but there are two points to which I should like to draw attention:-

105. In the diagram on page 7 the speed of the Hurricane is seriously over rated at 335 m.p.h. I carried out a series of trials to obtain the absolute and comparative speeds of Hurricanes and Spitfires at optimum heights. Naturally the speeds of individual aircraft varied slightly, but the average speed of six Hurricanes came out at about 305 m.p.h.

106. The second point is of greater importance. I quote from page 33: "What the Luftwaffe failed to do was to destroy the Fighter Squadrons of the Royal Air Force, *which were, indeed, stronger at the end of the battle than at the beginning.*" (The italics are mine.)

107. This statement, even if intended only for popular consumption, tends to lead to an attitude of complacency which may be very dangerous in the future. Whatever the study of paper returns may have shown, the fact is that the situation was critical in the extreme. Pilots had to be withdrawn from the Bomber and Coastal Commands and from the Fleet Air Arm and flung into the Battle after hasty preparation. The majority of the squadrons had been reduced to the status of training units, and were fit only for operations against unescorted bombers. The remainder were battling daily against heavy odds.

108. The indomitable courage of the Fighter Pilots and the skill of their Leaders brought us through the crises, and the morale of the Germans eventually cracked because of the stupendous losses which they sustained.

109. Any attempt to describe the events of the Battle day-by-day would make this Despatch unduly long and would prevent the reader from obtaining a comprehensive picture of the events. I have therefore decided to show the main features of each day's fighting in an Appendix on which our own and the Germans' aircraft casualties will be shown graphically. I shall then be able to deal with the progress of the Battle by phases, thus avoiding the tedious and confusing method of day-to-day description. The information is given in Appendix D.

110. As regards our casualties, we generally issued statements to the effect that we lost "x" aircraft from which "y" pilots were saved. This did not of course mean that "y" pilots were ready immediately to continue the Battle. Many of them were suffering from wounds, burns or other injuries which precluded their return to active flying temporarily or permanently.

111. It might also be assumed that all German crews who were in aircraft brought

down during the Battle, were permanently lost to the Luftwaffe because the fighting took place on our side of the Channel. Such an assumption would not be literally true, because the Germans succeeded in rescuing a proportion of their crews from the sea by means of rescue boats, floats and aircraft which will be later described.

112. The decisive features of the Battle were the Ratio of Casualties incurred by ourselves and the Germans, and the Ratio of Casualties to the numbers actively employed on both sides. Appendix D has been drawn up with these points in mind.

113. I must disclaim any exact accuracy in the estimates of Enemy losses. All that I can say is that the utmost care was taken to arrive at the closest possible approximation. Special intelligence officers examined pilots individually after their combats, and the figures claimed are only those recorded as "Certain." If we allow for a percentage of over-statement, and the fact that two or more Fighters were sometimes firing at the same enemy aircraft without being aware of the fact, this can fairly be balanced by the certainty that a proportion of aircraft reported as "Probably Destroyed" or "Damaged" failed to return to their bases. The figures, then, are put forward as an honest approximation. Judging by results, they are perhaps not far out.

114. The German claims were, of course, ludicrous; they may have been deceived about our casualties, but they know they were lying about their own.

115. I remember being cross-examined in August by the Secretary of State for Air about the discrepancy. He was anxious about the effect on the American people of the wide divergence between the claims of the two sides. I replied that the Americans would soon find out the truth; if the Germans' figures were accurate they would be in London in a week, otherwise they would not.

116. Our estimate of German casualties, then, may be taken as reasonably accurate for practical purposes; but our estimates of the strength in which attacks were made is based on much less reliable evidence. The Radio-Location system could give only a very approximate estimate of numbers and was sometimes in error by three or four hundred per cent. This is no reflection on the System, which was not designed or intended to be accurate in the estimation of considerable numbers; moreover, several stations were suffering from the effects of severe bombing attacks. As the average height of operations increased, the Observer Corps became less and less able to make accurate estimates of numbers, and, in fact, formations were often quite invisible from the ground.

117. Even the numerical estimates made by pilots who encountered large formations in the air are likely to be guesswork in many instances. Opportunities for deliberate counting of enemy aircraft were the exception rather than the rule.

118. Although Secret Intelligence sources supplemented the information available, it is possible that on days of heavy fighting complete formations may have escaped recorded observation altogether.

119. This is unfortunate, because it is obviously of the greatest importance to determine the relative strengths of the Attack and the Defence, and to know the ratio of losses to aircraft employed which may be expected to bring an attack to a standstill in a given time. History will doubtless elucidate the uncertainty, but perhaps not in time for the information to

be of use in the present war.

120. My personal opinion is that, on days of slight activity, our estimates are reasonably accurate, but that they probably err on the low side on days of heavy fighting when many and large formations were employed.

121. As has been explained above, few squadrons were fresh and intact when the Battle began. No sufficient respite has been granted since the conclusion of the Dunkerque fighting to rest the Squadrons which had not left the Fighter Command, and to rebuild those which had undergone the ordeal of fighting from aerodromes in Northern France. These last had been driven from aerodrome to aerodrome, able only to aim at self-preservation from almost continuous attack by Bombers and Fighters; they were desperately weary and had lost the greater part of their equipment, since aircraft which were unserviceable only from slight defects had to be abandoned.

Part II - THE BATTLE.

122. The Battle may be said to have divided itself broadly into 4 Phases: First, the attack of convoys and Coastal objectives, such as Ports, Coastal Aerodromes and Radio Location Stations. Second, the attack of Inland Fighter Aerodromes. Third, the attack on London. And, fourth, the Fighter-Bomber stage, where the target was of importance quite subsidiary to the main object of drawing our Fighters into the air and engaging them in circumstances as disadvantageous to us as possible. These phases indicated only general tendencies; they overlapped and were not mutually exclusive.

123. It has been estimated that the Germans sent over, on an average throughout the Battle, four Fighters to each Bomber or Fighter-Bomber, but any such estimate must be very rough.

124. I must emphasise, throughout, the extreme versatility of the German methods both in the timing and direction of their attacks, and in the tactical formations and methods employed.

125. They enjoyed the great advantage of having a wide front from which attacks could be delivered. First a blow would be delivered from Calais, perhaps against London; then after a carefully-timed interval, when 11 Group Fighters might be expected to be at the end of their petrol endurance, a heavy attack would be made on Southampton and Portland. Other attacks, after being built up to formidable dimensions, would prove to be only feints, and the Bombers would turn away before reaching the coast of England, only to return again in half an hour, when the Fighters, sent up to intercept them, were landing.

126. Time-honoured methods of escort were at first employed. A strong Fighter formation would fly a mile or so behind and above the Bombers. When the Germans found that our Fighters could deliver a well-timed attack on the Bombers before the Fighters could intervene, or when our Fighters attacked front ahead or below, each move was met by a counter-move on the part of the Germans, so that, in September, Fighter escorts were flying inside the Bomber formation, others were below, and a series of Fighters stretched upwards to 30,000 feet or more.

127. One Squadron Leader described his impressions of the appearance of one of these

raids; he said it was like looking up the escalator at Piccadilly Circus.

128. I must pay a very sincere tribute to the Air Officer Commanding 11 Group, Air Vice-Marshal K. B. Park, C.B., M.C., D.F.C., for the way in which he adjusted his tactics and interception methods to meet each new development as it occurred.

129. Tactical control was, as has already been stated, devolved to the Groups; but tactical methods were normally laid down by Command Headquarters. During periods of intense fighting, however, there was no time for consultation, and Air Vice-Marshal Park acted from day to day on his own initiative. We discussed matters as opportunity offered.

130. He has reported on the tactical aspects of the Battle in two very interesting documents, which are, however, too long to reproduce here. Their reference numbers are 11G/S.493, dated the 12th September and the 7th November, 1940.

131. A close liaison was kept between Nos. 10 and 11 and 12 Groups. It sometimes happened that, in the heaviest attacks, practically all 11 Group Fighters would be in the air. 11 Group would then ask 12 Group to send a formation from Duxford to patrol over the aerodromes immediately East of London so that these might not be attacked when defenceless.

132. Mutual help was also arranged between Nos. 10 and 11 Groups. When Portsmouth was attacked, for instance, No. 10 would help No. 11 Group, and vice versa when the attack was on Portland or some Convoy to the West of the Isle of Wight.

133. The amount of physical damage done to Convoys during the first phase was not excessive. About 5 ships (I think) were actually sunk by bombing, others were damaged, and Convoys were scattered on occasion. It was, of course, much easier to protect the Convoys if they kept as close as possible to the English Coast, but one Convoy at least was routed so as to pass close to Cherbourg, and suffered accordingly. Later, it was arranged that Convoys should traverse the most dangerous and exposed stretches by night, and Convoys steaming in daylight either had direct protection by Fighter escorts, or else had escorts at "Readiness" prepared to leave the ground directly danger threatened.

134. Three of the Radio Location Stations in the South of England suffered rather severe damage and casualties. No Station was permanently put out of action, and the worst damage was repaired in about a month, though the Station was working at reduced efficiency in about half that time. The operating personnel, and particularly the women, behaved with great courage under threat of attack and actual bombardment.

135. As regards aerodromes, Manston was the worst sufferer at this stage. It, Hawkinge and Lympne were the three advanced grounds on which we relied for filling up tanks when a maximum range was required for operations over France. They were so heavily attacked with bombs and machine guns that they were temporarily abandoned. This is not to say that they could not have been used if the need had been urgent, but, for interception at or about our own coast line, aerodromes and satellites farther inland were quite effective.

136. Heavy damage was done to buildings, but these were mostly non-essential, because aircraft were kept dispersed in the open, and the number of men and women employed was not large in comparison with the number at a Station which was the Headquarters of a Sector.

137. Works personnel, permanent and temporary, and detachments of Royal Engineers were employed in filling up the craters on the aerodromes. Experience at this stage showed that neither the personnel nor the material provided were adequate to effect repairs with the necessary speed, and the strength and mobility of the repair parties was increased. Stocks of "hard-core" rubble had been collected at Fighter aerodromes before the war.

138. It may be convenient here to continue the subject of damage to Fighter Stations other than those attacked in the first Phase.

139. Casualties to personnel were slight, except in cases where a direct hit was made on a shelter trench. The trenches commonly in use were lined with concrete and were roofed and covered with earth; but they gave no protection against a direct hit, and, in the nature of things, they had to be within a short distance of the hangars and offices.

140. Only non-essential personnel took cover; aircraft crews and the staff of the Operations Room remained at their posts. The morale of the men and women of ground crews and staffs was high and remained so throughout.

141. At Kenley and at Biggin Hill direct hits were sustained on shelter trenches, at the latter place by a bomb of 500 kg or more. The trench and its 40 occupants were annihilated.

142. Wooden hangars were generally set on fire by a bombing attack, and everything in them destroyed.

143. Steel, brick and concrete hangars, on the other hand, stood up well against attack, though, of course, acres of glass were broken. Hangars were generally empty or nearly so, and those aircraft which were destroyed in hangars were generally under repair or major inspection which made it necessary to work under cover.

144. It must, nevertheless, be definitely recorded that the damage done to Fighter aerodromes, and to their communications and ground organisation, was serious, and has been generally under-estimated. Luckily; the Germans did not realise the success of their efforts, and shifted their objectives before the cumulative effect of the damage had become apparent to them.

145. Damage to aerodrome surface was not a major difficulty. It was possible for the Germans to put one or two aerodromes like Manston and Hawkinge out of action for a time, but we had so many satellite aerodromes and landing grounds available that it was quite impossible for the Germans to damage seriously a number of aerodromes sufficient to cause more than temporary inconvenience.

146. This is an important point, because, in mobile warfare, Fighter aerodromes cannot be hastily improvised in broken country, and the number of aerodromes actually or potentially available is a primary factor in the "Appreciation of a Situation."

147. Sector Operations Rooms were protected by high earth embankments so that they were immune from everything except a direct hit, and, as a matter of fact, no direct hit by a heavy bomb was obtained on any Operations Room. Communications were, however, considerably interrupted, and I must here pay a tribute to the foresight of Air Vice-Marshal E. L. Gossage, C.B., C.V.O., D.S.O., M.C who commanded No. 11 Group during the first 8 months of the war. At his suggestion "Stand-by" Operations Rooms were constructed at a distance of two or three miles from Sector Headquarters, and a move was made to these when serious attacks

on Fighter Aerodromes began. They were somewhat inconvenient make-shifts, and some loss of efficiency in Interception resulted from their use. Work was put in hand immediately on more permanent and fully-equipped Operations Rooms conveniently remote from Sector Headquarters; these though in no way bomb-proof, were outside the radius of anything aimed at the Sector Aerodrome, and owed their immunity to inconspicuousness. Most of these were finished by October 1940.

148. Aerodrome Defence against parachute troops, or threat of more serious ground attack, was an important and a difficult problem, because Home Defence troops were few and were needed on the Beaches, and the majority of troops rescued from Dunkerque were disorganised and unarmed. The Commander-in-Chief, Home Forces, did, however, make troops available in small numbers for the more important aerodromes, and armoured vehicles were extemporised. The difficulty was enhanced by a comparatively recent decision of the Air Ministry to disarm the rank and file of the Royal Air Force. The decision was reversed, but it was some time before rifles could be provided and men trained in their use.

149. The slender resources of the Anti-Aircraft Command were strained to provide guns for the defence of the most important Fighter and Bomber Aerodromes. High Altitude and Bofors guns were provided up to the limit considered practicable, and the effort was reinforced by the use of Royal Air Force detachments with Lewis guns and some hundreds of 20-mm Cannon which were not immediately required for use in Aircraft.

150. A type of small Rocket was also installed at many aerodromes. These were arranged in lines along the perimeter, and could be fired up to a height of something under 1,000 feet in the face of low-flying attack. They carried a small bomb on the end of a wire. Some limited success was claimed during a low-flying attack at Kenley, and they probably had some moral effect when their existence became known to the Enemy. They were, of course, capable of physical effect only against very low horizontal attacks.

151. The main safeguard for Aircraft against air attack was Dispersal. Some experiments on Salisbury Plain in the Summer of 1938 had shown that dispersal alone, without any form of splinter-proof protection, afforded a reasonable safeguard against the forms of attack practised by our own Bomber Command at the time. Thirty unserviceable Fighters were disposed in a rough ring of about 1,000 yards diameter, and the Bomber Command attacked them for the inside of a week with every missile between a 500-pound bomb and an incendiary bullet, and without any kind of opposition. The result was substantially:- 3 destroyed, 1 damaged beyond repair, 11 seriously damaged but repairable, and the rest slightly damaged or untouched.

152. I therefore asked that small splinter-proof pens for single aircraft should be provided at all Fighter Aerodromes. This was not approved, but I was offered pens for groups of three. I had to agree to this, because it was linked up with the provision of all-weather runways, which I had been insistently demanding for two years, and it was imperatively necessary that work on the runways should not be held up by further discussion about pens. I think that the 3-aircraft pens were too big. They had a large open face to the front and a concrete area, of the size of two tennis courts, which made an ideal surface for the bursting of direct-action bombs. Eventually, splinter-proof partitions were made inside the pens, and till

then some aircraft were parked in the open. Losses at dispersal points were not serious; the worst in my recollection was 5 aircraft destroyed or seriously damaged in one attack. Small portable tents were provided which could be erected over the centre portion of an aeroplane, leaving the tail and wing-tips exposed. These protected the most important parts and enabled ground crews to work in bad weather.

153. About this time an improvised Repair System was organised and worked well. With the hearty co-operation of the Ministry of Aircraft Production it was decided that Units should be relieved of all extensive repairs and overhauls, both because of their preoccupation in the Battle and because of the danger of further damage being done by enemy action to aircraft under repair. Broadly speaking; any aircraft capable of returning to its base was capable of another 15 minutes' straight flight to a Repair Depot: aircraft incapable of flight were sent by road. Small repairs, such as the patching of bullet holes, were done by the Unit. Two such Repair Depots were improvised about 30 miles to the west of London, and this undoubtedly prevented an accumulation of unserviceable aircraft at Fighter Stations.

154. It was also about this time that the final decision was made to relegate the Defiant to night operations. It had two serious disabilities; firstly, the brain flying the aeroplane was not the brain firing the guns: the guns could not fire within 16 Degrees of the line of flight of the aeroplane and the gunner was distracted from his task by having to direct the pilot through the Communication Set. Secondly, the guns could not be fired below the horizontal, and it was therefore necessary to keep below the enemy. When beset by superior numbers of Fighters the best course to pursue was to form a descending spiral, so that one or more Defiants should always be in a position to bring effective fire to bear. Such tactics were, however, essentially defensive, and the formation sometimes got broken up before they could be adopted. In practice, the Defiants suffered such heavy losses that it was necessary to relegate them to night fighting, or to the attack of unescorted Bombers.

155. The above remarks have carried me beyond the first phase of the Battle and into the second; but I find it impossible to adhere to a description of the fighting phase by phase. The Enemy's Strategical, as well as his Tactical, moves had to be met from day-to-day as they occurred, and I give an account of my problems and the lessons to be derived from them roughly in the order of their incidence. The detailed sequence of events is sufficiently indicated in the Diagram at Appendix "D."

156. Throughout the Battle, of course, fighting continually occurred over the sea, and German aircraft, damaged over England, had to return across the Straits of Dover or the English Channel. Far more German than British crews fell into the sea. The Germans therefore developed an elaborate system of sea-rescue. Their Bombers had inflatable rubber dinghies, and various other rescue devices were adopted. Crews were provided with bags of a chemical known as fluoescine, a small quantity of which stained a large area of water a vivid green. Floating refuges with provisions and wireless sets were anchored off the French coast. "E Boats" and rescue launches were extensively employed, and white-painted float-planes, marked with the Red Cross, were used even in the midst of battle. We had to make it known to the Germans that we could not countenance the use of the Red Cross in this manner. They were engaged in rescuing combatants and taking them back to fight again,

and they were also in a position, if granted immunity, to make valuable reconnaissance reports. In spite of this, surviving crews of these aircraft appeared to be surprised and aggrieved at being shot down.

157. Our own arrangements were less elaborate. Life-saving jackets were painted a conspicuous yellow, and later the fluorescine device was copied. Patrol aircraft (not under the Red Cross) looked out for immersed crews, and a chain of rescue launches with special communications was installed round the coast. Our own shipping, too, was often on the spot, and many pilots were rescued by Naval or Merchant vessels.

158. This is perhaps a convenient opportunity to say a word about the ethics of shooting at aircraft crews who have "baled out" in parachutes.

159. Germans descending over England are prospective Prisoners of War, and, as such, should be immune. On the other hand, British pilots descending over England are still potential Combatants.

160. Much indignation was caused by the fact that German pilots some times fired on our descending airmen (although, in my opinion, they were perfectly entitled to do so), but I am glad to say that in many cases they refrained, and sometimes greeted a helpless adversary with a cheerful wave of the hand.

161. Many of the targets attacked during the first two phases of the Battle were of little military importance, and had but slight effect on our War Effort. Exceptions to this were day-attacks carried out, on the Spitfire works at Southampton and the sheds at Brooklands where some of our Hurricanes were assembled and tested. Both these attacks had some effect on output, which would have been serious but for the anticipatory measures taken by Lord Beaverbrook.

162. About this time one Canadian, two Polish and one Czech squadrons became fit for Operations.

163. A squadron of Canadian pilots of the Royal Air Force (No. 242) had been in existence for some months, and was one of the squadrons which went to France in June to cover the evacuation from the West Coast. On its return it became one of the fighting Squadrons in the Command, under the leadership of the very gallant Squadron Leader (now Wing Commander) D. R. S. Bader, D.S.O., D.F.C., No. 1 (Canadian) Squadron, now also came into the line and acquitted itself with great distinction.

164. I must confess that I had been a little doubtful of the effect which their experience in their own countries and in France might have had upon the Polish and Czech pilots, but my doubts were soon laid to rest, because all three Squadrons swung in the fight with a dash and enthusiasm which is beyond praise. They were inspired by a burning hatred for the Germans which made them very deadly opponents. The first Polish Squadron (No. 303) in No. 11 Group, during the course of a month, shot down more Germans than any British unit in the same period. Other Poles and Czechs were used in small numbers in British Squadrons, and fought very gallantly, but the language was a difficulty, and they were probably most efficiently employed in their own National units. Other foreign pilots were employed in British Squadrons, but not in appreciable numbers. The American "Eagle" Squadron was in process of formation during the Battle.

165. The Auxiliary Squadrons were by this time practically indistinguishable from Regulars. It will be remembered that the Scottish Auxiliaries were responsible for the first Air success of the War in the Firth of Forth. To set off against the discontinuity of their training in peace time they had the great advantage of permanency of personnel, and the Flight Commanders at the outbreak of the War were senior and experienced. At the same time, this very permanence led to the average age of the pilots being rather high for intensive fighting, which exercises a strain which the average man of 30 cannot support indefinitely. This point has now ceased to be of importance because of fresh postings. It is mentioned only because it is a factor to be kept in mind in peace time. No praise can be too high for the Auxiliaries, both as regards their keenness and efficiency in peace time and their fighting record in war.

166. I may perhaps mention the question of the Long Range Guns which were mounted along the coast of France near Cap Grisnez [sic]. They were within range of our coastal aerodromes, which they occasionally subjected to a desultory shelling. Their main targets, however, were Dover and the Convoys passing through the Straits. So far as I am aware, neither they nor the guns which we installed as counter measures, had any great Influence on the air fighting, but they did of course make it impossible for any of our warships to approach the French Coast in clear weather, and might have had an important effect if it had been possible for the Germans to launch an invading army.

167. About the end of the second phase, the problems of keeping units up to strength and of relieving them when exhausted began to assume formidable proportions. It was no new experience, because the drain of units and pilots to France, coupled with the Dunkerque fighting, had created similar problems in the Spring.

168. The comparative relaxation in the intensity of the fighting in June and July had afforded a little respite, but units had only partially recovered and were neither fresh nor up to strength when the fighting again became intense.

169. When Squadrons became exhausted, obviously the most satisfactory way of reinforcement was by means of moving complete units, and this was done when time allowed. Serviceable aircraft were transferred by air, and Operational Aircraft Crews (about 35 men per Squadron) were transferred by Civil Aircraft put at my disposal for the moves. The remainder of the personnel travelled by train or motor transport according to circumstances. Some of the distances involved were considerable, as for instance when a Squadron from Wick had to be brought down in the London Area.

170. The First-line strength of a Squadron was 16 aircraft, of which not more than 12 were intended to be operationally available at any one time. The other 4 would normally be undergoing Inspection or Overhaul. In addition to this there was a small reserve of three to five aircraft per Squadron available on the station.

171. There was a limit to the number of trained pilots which could be kept on the strength of a Squadron even in times of operational passivity, because not more than about 25 could be kept in full practice in Flying Duties.

172. A fresh squadron coming into an active Sector would generally bring with them 16 aircraft and about 20 trained pilots. They would normally fight until they were no longer capable of putting more than 9 aircraft into the air, and then they had to be relieved.

This process occupied different periods according to the luck and skill of the unit. The normal period was a month to six weeks, but some units had to be replaced after a week or 10 days.

173. Air Vice-Marshal Park found that the heaviest casualties were often incurred by newly-arrived Squadrons owing to their non-familiarity with the latest developments of air fighting.

174. It soon became impossible to maintain the to-and-fro progress of complete unit personnel from end to end of the country, and the first limitation to efficiency which had to be accepted was the retention of the majority of personnel at Sector Stations and the transfer only of flying personnel and aircraft crews. This limitation was regrettable because it meant that officers and men were strange to one another, but worse was to come.

175. By the beginning of September the incidence of casualties became so serious that a fresh squadron would become depleted and exhausted before any of the resting and reforming squadrons was ready to take its place. Fighter pilots were no longer being produced in numbers sufficient to fill the gaps in the fighting ranks. Transfers were made from the Fleet Air Arm and from the Bomber and Coastal Commands, but these pilots naturally required a short flying course on Hurricanes or Spitfires and some instruction in Formation Flying, Fighter Tactics and Interception procedure.

176. I considered, but discarded, the advisability of combining pairs of weak units into single Squadrons at full strength, for several reasons, one of which was the difficulty of recovery when a lull should come. Another was that ground personnel would be wasted, and a third was that the rate at which the strength of the Command was decreasing would be obvious.

177. I decided to form 3 Categories of Squadron :—

(a) The units of 11 Group and on its immediate flanks, which were bearing the brunt of the fighting.

(b) A few outside units to be maintained at operational strength and to be available as Unit Reliefs in cases where this was unavoidable.

(c) The remaining Squadrons of the Command, which would be stripped of their operational pilots, for the benefit of the A Squadrons, down to a level of 5 or 6. These C Squadrons could devote their main energies to the training of new pilots, and, although they would not be fit to meet German Fighters, they would be quite capable of defending their Sectors against unescorted Bombers, which would be all that they would be likely to encounter.

178. The necessity for resorting to such measures as this indicates the strain which had been put on the Fighter Command and the Pilot Training organisation by the casualties which the Command had suffered in this decisive Battle.

179. In the early stages of the fight Mr. Winston Churchill spoke with affectionate raillery of me and my "Chicks." He could have said nothing to make me more proud; every Chick was needed before the end.

180. I trust that I may be permitted to record my appreciation of the help given me by the support and confidence of the Prime Minister at a difficult and critical time.

181. In the early days of the War the question of the provision of Operational Training

Units (or Group Pools, as they were called at that time) was under discussion. It was referred to in the correspondence which I have mentioned in paragraph 17 of this Despatch. At that time I was so gravely in need of additional Fighter Squadrons that I was willing to do without Group Pools altogether while we were still at long range from the German Fighters.

182. The function of these Group Pools, or O.T.U.s., was to accept pilots direct from Flying Training Schools or non-fighter units of the Royal Air Force and train them in the handling of Fighter types, formation flying, fighting tactics, and R/T control and interception methods. I realised that the Fighters in France could not undertake this work and must have a Group Pool allotted primarily to meet their requirements, but I felt that, so long as we at Home were out of touch with German Fighters, I would prefer to put all available resource into new Squadrons and to undertake in Service Squadrons the final training of pilots coming from Flying Training Schools, provided that they had done some formation flying and night flying, and had fired their guns in the air.

183. Of course, when intensive fighting began, final training of pilots in Squadrons could no longer be given efficiently, and at the time of the Battle three O.T.U.s., were in existence. It was found that three weeks was about the minimum period which was of practical value, but that a longer course, up to six weeks, was desirable when circumstances permitted.

184. During the Battle the output from the O.T.U.s. was quite inadequate to meet the casualty rate, and it was not even possible to supply from the Flying Training Schools the necessary intake to the O.T.U.s.

185. The lack of flexibility of the Training system, therefore, proved to be the "bottle-neck" and was the cause of the progressively deteriorating situation of the Fighter Command up till the end of September. This statement is in no sense a criticism of the Flying Training Command. The problem, as I state it here, can have no ideal solution and some compromise must be adopted.

186. Assuming that in periods of maximum quiescence the Fighter Squadrons of the Royal Air Force require an intake of x pilots per week, in periods of intense activity they require about ten times the number.

187. It is necessary to start the flying training of a pilot about a year before he is ready to engage Enemy Fighters, and therefore the training authorities should be warned, a year ahead, of the incidence of active periods. This is obviously impossible. If they try to be ready for all eventualities by catering for a continuous output to meet a high casualty rate, the result is that, during quiet periods, pilots are turned out at such a rate that they cannot be absorbed, or even given enough flying to prevent their forgetting what they have been taught. If, on the other hand, they cater for the normal wastage rate, Fighter Squadrons are starved of reinforcements when they are most vitally needed.

188. The fundamental principle which must be realised is that Fighter needs, when they arise, are not comparative with those of other Commands, but absolute. An adequate and efficient Fighter force ensures the Security of the Base, without which continuous operations are impossible.

189. If the Fighter defence had failed in the Autumn of 1940, England would have been

invaded. The paralysis of their fighters in the Spring was an important factor in the collapse of the French resistance. Later, the unavoidable withdrawal of the Fighters from Crete rendered continued resistance impossible

190. Day Bomber and Army Co-operation aircraft can operate when their own Fighters are predominant, but are driven out of the sky when the Enemy Fighters have a free hand.

191. I submit some suggestions by which the apparently insuperable difficulties of the problem may be reduced.

(a) Start by aiming at a Fighter output well above that needed in quiescent periods.

(b) Ensure that at Flying Training Schools, pupils earmarked for other duties may be rapidly switched over to Fighter training.

(c) Organise the O.T.U.s. with a "Normal" and an "Emergency" Syllabus the latter lasting for 3 weeks and the former twice as long.

(d) Fill up the Service Fighter Squadrons to a strength of 25 pilots; or whatever the C-in-C considers to be the maximum which can be kept in flying and operational practice.

(e) Form Reservoirs, either at O.T.U.s. or in special units where surplus pilots may maintain the flying and operational standard which they have reached.

(f) When the initiative lies in our hands (as, for instance, when we are planning to deliver an offensive some time ahead), the intake of Flying Training Schools should be adjusted to cater for the additional stress which can be foreseen.

(g) (And this applies principally to overseas theatres of war where rapid reinforcement is impossible.) Let the Day Bomber and Army Co-operation Squadrons have a number of Fighters on which they can fly and train as opportunity offers. This is a revolutionary suggestion, but it is made in all seriousness. If their Fighters are overwhelmed the day Bomber and Army Co-operation units will not be able to operate at all. No very high standard of training should be attempted, especially in Radio-controlled Interception methods: but the intervention of these units as Fighters, working in pairs or small formations, might well prove to be the decisive factor in a critical situation.

192. It will be observed that, at the end of the second Phase of the Battle; the power of reinforcing by complete units had substantially disappeared. We still possessed an effective reserve of trained pilots, but they could be made available only by stripping the Squadrons which were not engaged in the South and South-East of England.

193. The effective strength of the Command was running down, though the fact was not known to the public, nor, I hoped, to the Germans. They for their part must certainly be feeling the effect of their heavy losses, but there was very little indication of any loss of morale, so far as could be seen from a daily scrutiny of the examinations of Prisoners of War. Our own pilots were fighting with unabated gallantry and determination.

194. The confidence of the German High Command probably received something of a shock about this time. The sustained resistance which they were meeting in South-East England probably led them to believe that Fighter Squadrons had been withdrawn, wholly or in part, from the North in order to meet the attack. On the 15th August, therefore, two large raids were sent, one to Yorkshire and one to Newcastle. They were escorted by Fighters. The distance was too great for ME. 109s, but not for ME. 110s.

195. If the assumption was that our Fighters had been withdrawn from the North, the contrary was soon apparent, and the bombers received such a drubbing that the experiment was not repeated. I think that this incident probably had a very depressing influence on the outlook of the German High Command.

196. As I have said, our own pilots were fighting with the utmost gallantry and determination, but the mass raids on London, which were the main feature of the third phase of the Battle, involved a tremendous strain on units which could no longer be relieved as such. Some Squadrons were flying 50 and 60 hours per diem.

197. Many of the pilots were getting very tired. An order was in existence that all pilots should have 24 hours' leave every week, during which they should be encouraged to leave their station and get some exercise and change of atmosphere: this was issued as an order so that the pilots should be compelled to avail themselves of the opportunity to get the necessary rest and relaxation. I think it was generally obeyed, but I fear that the instinct of duty sometimes overrode the sense of discipline. Other measures were also taken to provide rest and relaxation at Stations, and sometimes to find billets for pilots where they could sleep away from their Aerodromes.

198. During this third phase the problem arose, in an acute form, of the strength of Fighter formations which we should employ. When time was the essence of the problem, two squadrons were generally used by A.V.M. Park in No. 11 Group. He had the responsibility of meeting attacks as far to the Eastward as possible, and the building up of a four-squadron formation involved the use of a rendezvous for aircraft from 2 or more aerodromes. This led to delay and lack of flexibility in leadership.

199. On the other hand, when No. 12 Group was asked to send down protective formations to guard the aerodromes on the Eastern fringe of London, it was often possible to build up big formations, and these had great success on some occasions, though by no means always. A somewhat unfortunate controversy grew up round the two points of view, and Air Vice-Marshal Park was subjected to some external criticism with which I did not agree. Fortunately, however, the disagreement did not become acute until mid-October, when the battle had been virtually won.

200. Both in justice to Air Vice-Marshal Park, and because a similar situation may well arise in future, I think that it is desirable to enter into some detail in this connection.

201. I may preface my remarks by stating that I am personally in favour of using Fighter formations in the greatest strength of which circumstances will permit, and, in the Dunkerque fighting, where we could choose our time and build our formations on the outward journey, I habitually employed four-Squadron formations as a preferable alternative to using two-Squadron formations at more frequent intervals; but, during the attacks on London, the available strength of Fighters did not admit of this policy, nor was time available.

202. I quote from Air Vice-Marshal Park's report :—
"The general plan adopted was to engage the enemy high-fighter screen with pairs of Spitfire Squadrons from Hornchurch and Biggin Hill half-way between London and the coast, and so enable Hurricane Squadrons from London Sectors to attack bomber formations and their close escort before they reached the line of fighter aerodromes East and South of London.

The remaining Squadrons from London Sectors that could not be despatched in time to intercept the first wave of the attack by climbing in pairs formed a third and inner screen by patrolling along the lines of aerodromes East and South of London. The fighter Squadrons from Debden, Tangmere, and sometimes Northolt, were employed in wings of three or in pairs to form a screen South-East of London to intercept the third wave of the attack coming inland, also to mop up retreating formations of the earlier waves. The Spitfire Squadrons were predisposed so as to concentrate three Squadrons at each of Hornchurch and Biggin Hill. The primary role of these Squadrons was to engage and drive back the enemy high-fighter screen, and so protect the Hurricane Squadrons, whose task was to attack close escorts and then the bomber formations, all of which flew at much lower altitude."

203. I think that, if the policy of big formations had been attempted at this time in No. 11 Group, many more Bombers would have reached their objectives without opposition.

204. Air Vice-Marshal Park also quotes the results of the ten large formations ordered from Duxford into No. 11 Group in the last half of October, when the Germans were employing Fighter-types only. Nine of these sorties made no interception, and the tenth destroyed one Me. 109.

205. The most critical stage of the Battle occurred in the third phase. On the 15th September the Germans delivered their maximum effort, when our Guns and Fighters together accounted for 185 aircraft. Heavy pressure was kept up till the 25th September, but, by the end of the month, it became apparent that the Germans could no longer face the Bomber wastage which they had sustained, and the operations entered upon their fourth phase, in which a proportion of enemy Fighters themselves acted as Bombers.

206. This plan, although the actual damage caused by bombs was comparatively trivial, was aimed primarily at a further whittling down of our Fighter strength, and, of all the methods adopted by the Germans, it was the most difficult to counter. Apart from the previous difficulty of determining which formations meant business, and which were feints, we had to discover which formations carried bombs and which did not.

207. To meet this difficulty, Air Vice-Marshal Park devised the plan of using single Spitfires, flying at maximum height, to act as Reconnaissance aircraft and to report their observations immediately by R/T.

208. A special Flight was organised for this purpose, and it was later recommended that the Spitfires should be employed in pairs, for reasons of security, and that the Flight should become a Squadron. A special R/T receiving set was erected at Group Headquarters so that reports might be obtained without any delay in transmission from the Sector receiving station. There is reason to believe that the Germans also adopted a system of using high-flying H.E. 113s as Scouts. Their information concerning our movements was transmitted to the ground and relayed to their Bombers in the air.

209. In the fourth phase, the apparent ratio of losses in our favour dropped appreciably. I say "apparent" because, in fighting at extreme altitudes, fighters often could not see their victims crash, and the percentage reported as Certainly Destroyed was unfairly depressed. Our own casualties, nevertheless, were such that the C. Category squadrons, which I was hoping to build up to operational strength again, remained in their condition of

semi-effectiveness.

210. Serious as were our difficulties, however, those of the enemy were worse, and by the end of October the Germans abandoned their attempts to wear down the Fighter Command, and the country was delivered from the threat of immediate invasion.

211. The Order of Battle at the beginning of November is shown at Appendix E. Categories of Squadrons (A, B or C, *vide* paragraph 177) are indicated.

212. Increasingly throughout the Battle had the importance of a high "ceiling" been manifested. It is by no means necessary that every Fighter shall have its best performance at stratospheric heights; any such policy would result in a loss of performance at lower altitude, and we must never lose sight of the basic principle that the Fighter exists for the purpose of shooting down Bombers, and that its encounters with other Fighters are incidental to this process.

213. There are, nevertheless, arguments for giving to a percentage of Fighters a ceiling (determinable by specific physiological tests) above which no enemy can climb without the use of Pressure Cabins. Just as the "Weather Gauge" was often the determining factor in the tactics of sailing ships, so the "Height Gauge" was often crucial in air combat. Exhaust-driven turbo-super-chargers have certain advantages over gear-driven blowers at great height, and should be considered for adoption in spite of their disadvantages.

214. It must be remembered also that the initiative always rests with the Bomber, who can select at will the height at which he will make his attack. We must be prepared, therefore, for the appearance of the pressure-cabin Bomber, flying at a height unattainable by any non-pressurised Fighter. (I should perhaps explain that there is a height, about 43,000 feet, above which the administration of any quantity of oxygen at atmospheric pressure becomes ineffective because it cannot be inhaled, and a pressure cabin or a pressure suit becomes essential.) Of course, a pressure-cabin Bomber is inefficient and vulnerable, because it is difficult to operate free guns from a pressure cabin, and pressure leakage from holes made in the walls of the cabin will prostrate the crew. The threat from pressurised Bombers is therefore serious only if we have no Fighters to meet them, and for this reason we should always possess a limited number of pressurised Fighters.

215. Various other lessons were learned from the experience of fighting at extreme altitudes. One very tiresome feature was that a considerable proportion of ultra-high-flying raids was missed by the Intelligence system, or reported so late that time was not available to climb and intercept. This made it necessary to employ standing patrols just below oxygen height (about 16,000 feet). These patrols climbed to intercept at extreme height when ordered to do so. This cut at the roots of the Fighter Command system, which was designed to ensure economy of effort by keeping aircraft on the ground except when required to make an interception.

216. Another lesson was that the system of using an "Above Guard" should be retained even when an attack was initiated from extreme altitude.

217. Flying and fighting-fatigue increases with altitude, and the comfort of the pilot requires unremitting attention. Cockpit heating and the meticulous pursuit and elimination of air leaks are of great importance. Attention should also be paid to the elimination of icing on

cockpit hoods (which are apt to freeze immovably) and on the inside and outside of windscreens.

218. A serious handicap, which I have not hitherto mentioned, was the fact that the change over from 'High Frequency' to "Very High Frequency' Radio Telephony was still in progress. The V.H.F. was an immense improvement on the H.F., both in range and clarity of speech; but the change over, which had started nearly a year before, was held up by the slow output of equipment. This meant that much work had to be done on aircraft Radio equipment during the Battle, and Squadrons equipped with V.H.F. could not communicate with H.F. Ground Stations, and vice versa.

219. Some of our worst losses occurred through defective leadership on the part of a unit commander, who might lead his pilots into a trap or be caught while climbing by an enemy formation approaching "out of the sun." During periods of intense activity promotions to the command of Fighter squadrons should be made on the recommendation of Group Commanders from amongst Flight Commanders experienced in the methods of the moment. If and when it is necessary to post a Squadron Leader (however gallant and experienced) from outside the Command, he should humbly start as an ordinary member of the formation until he has gained experience. Only exceptionally should officers over 26 years of age be posted to command Fighter Squadrons.

220. The experience of the Battle made me a little doubtful if the organisation of a squadron into 2 Flights, each of 2 Sections of 3 aircraft, was ideal. It was, of course, undesirable to make any sweeping change during the Battle, and I relinquished my Command shortly after its termination; but the weakness lay in the Section of 3 when it became necessary to break up a formation in a "Dog Fight." The organisation should allow for a break up into pairs, in which one pilot looks after the tail of his companion. A Squadron might be divided into 3 Flights of 4 (which would limit the employment of half-Squadrons), or it might consist of 2 Flights of 8, each comprising 2 Sections of 4. This latter suggestion would upset standard arrangements for accommodation.

221. The matter is not one which can be settled without consultation with various authorities and Branches of the Air Ministry. I therefore, merely raise the point without making any definite recommendation.

222. A great deal of discussion took place before and in the early stages of the war as to the best method of "harmonisation" of the guns of an 8-gun Fighter: that is to say the direction, in relation to the longitudinal axis of the aircraft, in which each gun should be pointed in order to get the best results.

223. There were three schools of thought:-

One maintained that the lines of fire should be dispersed so that the largest possible "beaten zone" might be formed and one gun (but not more than one) would always be on the target. The second held that the guns should be left parallel and so would always cover an elongated zone corresponding with the vulnerable parts of a Bomber (Engines, Tanks and Fuselage). The third demanded concentration of the fire of all guns at a point.

224. Arguments were produced in favour of all three methods of harmonisation, but in practice it was found that concentration of fire gave the best results. Guns were harmonised

so that their lines of fire converged on a point 250 yards distant: fire was therefore effective up to about 500 yards, where the lines of fire had opened out again to their original intervals after crossing at the point of concentration.

225. It was very desirable to get data as to the actual ranges at which fire effect had been obtained. The Reflector Sight contained a rough rangefinder which the range of an aircraft of known span could be determined if it was approached from astern, but, in spite of this, pilots, in the heat of action, generally underestimated the ranges at which they fired.

226. Cinema guns, invaluable for training purposes, were used in combat also; and many striking pictures were obtained, from which valuable lessons were learned.

227. The types of ammunition used in the guns varied during the course of the Battle. It was necessary to include some incendiary ammunition, but the type originally available gave a distinct smoke-tracer effect. Now tracer ammunition in fixed guns at any but very short range gives very misleading indications, and I wished pilots to use their sights properly and not to rely on tracer indications. (The above remarks do not apply at night, nor to free guns, where tracer is essential for one of the methods taught for aiming.)

228. During the Battle "de Wilde" ammunition became available in increasing quantities. This was an incendiary ammunition without any flame or smoke trace, and it was extremely popular with pilots, who attributed to it almost magical properties. 8-gun Fighters, of course, were always liable to be sent up at night, and it was therefore desirable to retain some of the older types of incendiary bullets. These were preferred to the "tracer" proper, which gave too bright a flame at night.

229. A typical arrangement, therefore, was:-

Old-type incendiary in the 2 outer guns,
de Wilde in one gun while supplies were limited,
Armour piercing in 2 guns, and ball in the other 3.

230. A discussion on the offensive and defensive equipment of aircraft will be found in Appendix F. It will be of interest to all concerned with the Design of Technical Equipment of Aircraft.

Part III. NIGHT INTERCEPTION.

231. No story of the Battle would be complete without some account of the Night operations. It is true that they constituted only a subsidiary activity in comparison with the main German objective of fighting us to a standstill by day so that Air Superiority might be attained as a preliminary to Invasion. The night attacks did little directly to affect the efficiency of the Day Fighting Squadrons, though they had certain indirect effects. Although actual casualties were insignificant, disturbance and loss of sleep were caused; damage was done to factories where aircraft engines and accessories were produced; and the stress of continuous operations, day and night, imposed a very heavy strain on Formation Commanders and Staff officers, and upon the personnel of all Operations Rooms.

232. I had long been apprehensive of the effect of Night attacks, when they should begin, and of the efficacy of our defensive measures.

233. We relied on daytime interception methods, and on the Searchlights to illuminate

and hold the Bombers. If they were capable of doing this, all would be well, since the distance at which an illuminated Bomber can be seen by night is comparable with the range of visibility by daylight.

234. The first night attack worthy of the name was made early in June and the results were encouraging. Aircraft were well picked up and held by the Searchlights and 6 were shot down. The attack was, however, made at comparatively low altitudes (8,000-12,000ft.) and the Germans, profiting by this lesson, resorted thereafter to greater heights at which the Searchlights were practically ineffective. In close consultation with myself, General Pile tried every conceivable method of operation, but without material success.

235. About this time Radio Location instruments were fitted in Blenheims and it became necessary to develop at high pressure a system of operation which should enable Night Fighters to make interceptions even against unilluminated targets.

236. The difficulty of this task will be realised when it is considered that it became necessary to put the Fighter within one or two hundred yards of the Enemy, and on the same course, instead of the four or five miles which were adequate against an illuminated target.

237. It may be asked why the Searchlights were so comparatively impotent when they had afforded an accessory to successful defence at the end of the last war. The answer lies partly in the height factor already discussed, and partly in the greatly increased speed of the Bomber, which was about three times that obtaining in 1914. The sound locator, on which Searchlights mainly relied at this time, naturally registered the apparent position of the source of sound and lagged behind the target to the extent of the time taken by sound to travel from the target to the Sound Locator. When the speed of the target is low it is comparatively easy to allow for this lag, but at the speeds of modern bombers the angular distance which must be allowed for in searching is so great that the Searchlights were generally defeated.

238. The first thing which appeared obvious to me was that a "sound Plot" track transmitted from the Observer Corps with a variable and unpredictable "lag" was good enough only for Air Raid Warning purposes and was much too inaccurate to be of use for controlled interception at night: height indications also were little better than guesswork. The Radio Location apparatus (known as A.I.) fitted in twin-engined fighters had a maximum range of 2 or 3 miles, but it was limited by the height at which the Fighter was flying. If, for instance, the Fighter was flying at 10,000 feet, ground echoes were reflected from all ranges greater than this, and an aircraft echo from 10,500 feet would be indistinguishable among the ground echoes.

239. The minimum range of the A.I. was also restricted at this time to about 1,000 feet. Below this distance the aircraft echo was swamped by instrumental disturbance. Continuous and intensive development work was in progress to minimise these limitations.

240. No Radio Location apparatus was available at this time for inland tracking, and I turned for help to the Army, which had developed for use with guns a Radio Location apparatus known as the G.L. Set. Within a limited range (about 40,000 feet) this set could give very accurate position plots, and, moreover, could read height to within plus or minus 1,000 feet at average ranges.

241. Although these sets were few in number and were urgently required for their

original purpose of gun control, General Pile realised the urgency of our need and made available about 10 sets for an experiment in the Kenley Sector on the usual line of approach of London Raiders, which commonly made their landfall near Beachy Head.

242. The G.L. sets were installed at Searchlight Posts, and direct telephone communication was arranged with the Kenley Sector Operations Room. Here a large blackboard was installed, and the G.L. plots were shown at intervals of about 30 seconds and with a greater accuracy in height than had before been possible by any means.

243. The track of the pursuing fighter was determined by means of the R/T Direction Finding Stations.

244. Major A. B. Russell, O.B.E., T.A.R.O., co-operated in the development of this system in the Kenley Sector. His practical knowledge and tireless enthusiasm were of the greatest value.

245. Promising results were obtained almost from the first and numerous instances occurred where echoes were obtained on the A.I. sets in the aircraft. Practical results were, however, disappointing, partly because the A.I. apparatus proved to be unexpectedly capricious in azimuth, and partly because the Blenheim was slower than many of the German Bombers and was deficient in fire-power. Many Germans escaped after an initial A.I. "pick-up" and even after visual contact had been effected.

246. The A.I. apparatus was then fitted into the Beaufighters, which were just beginning to appear in Service. The machines and their engines suffered from "teething trouble" to an unusual degree, and the adaption of A.I. to a new type was accompanied by certain difficulties. In addition, they were operating from a wet aerodrome at Redhill, and the development of delicate electrical apparatus, combined with a new type of aircraft and engine, with rudimentary maintenance facilities, was a matter of the greatest difficulty. In nine cases out of ten something would go wrong with the aeroplane or with the A.I. set or with the R.T. Direction-Finding apparatus or with the Communication system before an interception could be made. No. 219 Squadron, under Squadron Leader J. H. Little, were engaged in this work and operated with great energy and enthusiasm under extremely adverse and difficult conditions.

247. It would, of course, have been desirable to carry out all this development work by day when faults would have been much more easily detected and remedied, but the low rate of Aircraft Serviceability precluded Day-and-Night work, and London was being bombed almost every night, so that I could not afford to neglect the chance of getting practical results. These, though disappointing, were not entirely negligible; several Bombers were shot down in this area during the experimental period, and many discovered that they were pursued and turned back before reaching their objectives. Night Fighting Development work was also going on at the same time at the Fighter Interception Unit at Tangmere in Sussex.

248. A supplementary use was found for the A.I. by the installation of A.I. "Beacons" in the vicinity of Night Flying Aerodromes. These afforded a valuable Navigational aid for "Homing" in cases where any defect occurred in the R/T D/F system.

249. Shortly before I left the Command a new piece of Radio-Location apparatus became available in the shape of the "G.C.I." set with the Plan Position Indicator. This was an Inland-Reading Set which showed the position of all aircraft within its range on a fluorescent

screen as the aerial was rotated.

250. The main advantages of this set were that it had a longer range than the G.L. set and it was possible to track the Bomber and the Fighter by the same apparatus instead of following one with the G.L. and the other by R/T D/F. Moreover it was found that in some circumstances the accuracy of the R/T D/F method was inadequate for night interceptions.

251. On the other hand, the accuracy of height readings by the G.C.I. apparatus was less than that obtainable with the G.L. I understand that this has now been improved.

252. Whatever the exact technical method of plotting positions and tracks of aircraft, the object was to place the Fighter behind the Bomber, and in such a position that the echo of the latter would show in the Fighter's A.I. set. The Fighter then tried to overtake the Bomber until it became visible to the naked eye.

253. At that time only multi-seaters could be fitted with A.I., and therefore, concurrently with the Night Interception experiments, methods were tried of using the Searchlights as pointers for Night Fighters, even if the targets were out of range of the Searchlight Beam. Experiments were made with the Searchlights in "clumps" to increase their illuminating power and the visibility of their beams to Fighters at a distance.

254. A small Radio-Location set was designed to fit to the Searchlight itself, so as to get over the time-lag which was such an insuperable obstacle to the use of Sound Locators. It is probable that if Searchlights can substitute the speed of light for that of sound they may take on a new lease of useful life.

255. The disadvantage of relying entirely on Radio-controlled methods of Night Interception is that "saturation point" is quickly reached, and when mass raids are in progress only a limited number of fighters can be operated. Results obtained in the Spring of 1941 show that Day Fighters can obtain important results in conditions of good visibility, especially if attention is paid to all methods of improving the night vision of pilots.

256 During the Battle the "Intruder" system was initiated on a small scale. Night fighters without A.I. were sent across to France in an attempt to catch Bombers while taking off from, or landing at, their aerodromes; or to intercept them at points where they habitually crossed the French Coast.

257. I had to leave the Development of Night Interception at a very interesting stage; but it is perhaps not too much to say that, although much remained to be done, the back of the problem had been broken. The experiments had, of course, been carried out in a small area, and raiders which avoided the area could be intercepted only by previously existing methods; but the possibilities had been demonstrated and could be applied on a larger scale as soon as the necessary apparatus was provided.

258. The method is, of course, also applicable to the day interception of raiders making use of cloud cover, which have hitherto proved, extremely elusive; and it is not too much to hope that the eventual development of very high frequency A.I. may enable accurate fire to be opened against unseen targets, so that not even the darkest night nor the densest cloud will serve as a protection to the Raider.

259. The day may come when every Single-Seater. Fighter is fitted with A.I., but this is not yet feasible. What can be done is to fit all Searchlights with Radio-Location apparatus so

that every Searchlight Beam is a reliable pointer towards an enemy, even if the range is too great for direct illumination. If then the Fighter can be informed in addition of the height of the Raider, Day Fighters will be able to join usefully and economically in night operations on dark nights.

APPENDIX "A."

FIGHTER COMMAND.

Order of Battle, 8th July 1940.

No. 10 GROUP.

Squadron.	War Station.	Type of Aircraft.
87	Exeter	Hurricane.
213	Exeter	Hurricane.
92	Pembrey	Spitfire.
234	St. Eval	Spitfire.

No. 11 GROUP.

43	Tangmere	Hurricane.
145	Tangmere	Hurricane.
601	Tangmere	Hurricane.
FIU Unit	Tangmere	Blenheim.
64	Kenley	Spitfire.
615	Kenley	Hurricane.
245	Hawkinge	Hurricane.
111	Croydon	Hurricane.
501	Croydon	Hurricane.
600	Manston	Blenheim.
79	Biggin Hill	Hurricane.
610	Gravesend	Spitfire.
32	Biggin Hill	Hurricane.
54	Rochford	Spitfire.
65	Hornchurch	Spitfire.
74	Hornchurch	Spitfire.
56	North Weald	Hurricane.
25	Martlesham	Blenheim.
151	North Weald	Hurricane.
1	Northolt	Hurricane.
604	Northolt	Blenheim.
609.	Northolt	Spitfire.
236	Middle Wallop	Blenheim.

No. 12 GROUP.

Squadron.	War Station.	Type of Aircraft.
19	Duxford	Spitfire.
264	Duxford	Defiant.
85	Debden	Hurricane.
17	Debden	Hurricane.
29	Digby	Blenheim.
611	Digby	Spitfire.
46	Digby	Hurricane.
23	Wittering	Blenheim.
266	Wittering	Spitfire.
229	Wittering	Hurricane.
66	Coltishall	Spitfire.
253	Kirton-in-Lindsey	Hurricane.
222	Kirton-in-Lindsey	Spitfire.

No. 13 GROUP.

41	Catterick	Spitfire.
219	Catterick	Blenheim.
152	Acklington	Spitfire.
72	Acklington	Spitfire.
249	Leconfield	Hurricane.
616	Leconfield	Spitfire.
603 "A"	Turnhouse	Spitfire.
141	Turnhouse	Defiant.
602	Drem	Spitfire.
603 "B"	Montrose	Spitfire.
3	Wick	Hurricane.
504	Wick	Hurricane.

NON-OPERATIONAL SQUADRONS.

(Forming or reforming.)

Group.	Squadron.	Aerodrome.	Type of Aircraft.
10 Group	238	Middle Wallop	Hurricane.
	1 (Canadian)	Middle Wallop	Hurricane.
11 Group	257	Hendon	Hurricane.
12 Group	242	Coltishall	Hurricane.
13 Group	73	Church Fenton	Hurricane.
	605	Drem	Hurricane.
	607	Usworth	Hurricane.
	263	Grangemouth	Hurricane.

APPENDIX "C."

6TH A.A. DIVISION, JULY-OCTOBER 1940.

Glossary of Abbreviations.

H.A.A.	...	...	Heavy Anti-Aircraft.
L.A.A.	...	...	Light Anti-Aircraft.
G.O.R.	...	...	Gun Operations Room.
A.A.L.M.G.	...	...	Anti-Aircraft Light Machine-Gun.
V.I.E.	...	...	Visual Indicator Equipment.
G.P.O.	...	...	Gun Position Officer.
G.L.	...	...	Radio Location Set for Gun Laying.
V.P.	...	...	Vulnerable Point.
F.A.S.	...	...	Forward Area Sight.
S.O.R.	...	...	Sector Operator's Room.
G.D.A.	...	...	Gun Defended Area.

1. Layout of A.A. Defences.

(a) The area covered by 6th A.A. Division coincided with the R.A.F. sectors Debden, North Weald, Hornchurch, Biggin Hill and Kenley (i.e., the major part of No. 11 Fighter Group, R.A.F.). Thus the coastal boundary extended from Lowestoft (exclusive) in the North to Worthing (exclusive) in the South; the internal boundary matching with that of the Metropolitan area.

(b) Distribution of A.A. defences was briefly as follows :—

(i) H.A.A. Guns.

The Divisional area contained four main "gun defended areas" at Harwich, Thames and Medway North (guns emplaced along the North bank of the Thames Estuary), Thames and Medway South (guns emplaced along the South bank of the Thames Estuary and defending Chatham and Rochester) and Dover (including Folkestone). In addition, H.A.A. guns were deployed for the defence of certain aerodromes.

Each "gun defended area" was based on a Gun Operations Room: at Felixstowe, Vange, Chatham and Dover respectively. This G.O.R. was connected directly to 11 Fighter Group Operations Room at Uxbridge, from which it received plots of enemy raids, which were in turn passed down to all gun sites.

The armament of each H.A.A. site consisted of the following: 4 (sometimes 2) 4.5, 3.7 or 3-inch guns with predictor. Appendix "A" shows the H.A.A. defences as at the beginning of August 1940 and the end of October 1940.

(ii) L.A.A. Guns.

45 Vulnerable Points in the Divisional area were defended by L.A.A. guns. These V.Ps. consisted of Air Ministry Experimental Stations, Fighter Aerodromes, Dockyards, Oil Depots, Magazines, Industrial Undertakings and Factories.

Armament consisted of the following guns: 4 Bofors (with Predictor No. 3 and Forward Area Sights), 3-inch, 20 cwt. (Case I), A.A.L.M.G. and 20-mm. Hispano. Appendix "B" shows the V.P.s. with their armament as in August and October 1940.

(iii) *Searchlights.*

Searchlights were deployed in single light stations at approximately 6,000 yards spacing throughout the area, but with a closer spacing in certain instances along the coast and in "gun defended areas" where the distance between lights was approximately 3,500 yards.

These lights were deployed on a brigade basis following R.A.F. sectors, and each light was connected by direct telephone line and/or R.T. set No. 17 to Battery Headquarters via troop H.Q. and thence to an army telephone board at the R.A.F. Sector Operations Room.

The equipment of a Searchlight site consisted of the following:-

90-cm. Projector with, in most cases, Sound Locator Mk. III. In some instances sites were equipped with Sound Locators Mk. VIII or Mk. IX. During the late Summer and Autumn the number of Mk. VIII and Mk. IX Sound Locators gradually increased, and V.I.E. equipment and 150-cm. Projectors were introduced. Each Searchlight site was equipped with one A.A.L.M.G. for use against low-flying aircraft and for ground defence.

2. Enemy Tactics.

(a) *High Level Bombing Attacks.*

These took place generally between heights of 16,000/20,000 feet. Bombers approached their targets in close protective formations until running up to the line of bomb release, when formation was changed to Line Astern (if there was a definite objective to the attack). Attacks frequently occurred in waves, each wave flying at approximately the same height and on the same course. On engagement by H.A.A. guns, avoiding action was taken in three stages:-

Stage 1. - The bombers gained height steadily and maintained course and formation.

Stage 2. - Formations opened out widely and maintained course.

Stage 3. - Under heavy fire, formations split and bombers scattered widely on different courses. It was after this stage had been reached that the best opportunity was provided for fighters to engage.

(b) *Low Level and Dive Bombing Attacks.*

In the latter stages of the enemy air offensive numerous instances of low level and dive bombing attacks occurred, in particular against fighter aerodromes (Manston, Hawkinge, Lympne, Kenley).

L.A.A. and H.A.A. employed in dealing with these forms of attack met with varying success, but in cases where no planes were brought down the effect of fire from the A.A. defence almost invariably disconcerted the dive bomber so that few bombs were dropped with accuracy.

Considerable efforts were made by Me. 109's and Ju. 87's to destroy the balloon barrage at Dover, and, though at times they partially succeeded, excellent targets were provided for the Dover H.A.A. and L.A.A. guns.

3. Part played by H.A.A. Guns.

Targets of all types presented themselves to H.A.A. sites, ranging from solid bomber formation to single cloud hopping or dive bombers, balloon strafers or hedge hoppers, all of which were successfully engaged by appropriate method, of fire.

The action of the defence achieved success in the following ways :-

(a) The actual destruction or disablement of enemy aircraft (see Appendix "C").

(b) The breaking up of formations, thus enabling the R.A.F. to press home attacks on smaller groups of bombers.

(c) Destroying the accuracy of their bombing by forcing the enemy aircraft to take avoiding action.

(d) By pointing out to patrolling fighters the whereabouts of enemy formations by means of shell bursts.

The following methods of fire were in operation at this period :-

(a) Seen Targets.

(i) Each gun site was allotted a zone of priority and responsibility for opening fire on a target rested with the G.P.O.

(ii) Targets could be engaged by day if identified as hostile beyond reasonable doubt or if a hostile act was committed. By night, failure to give recognition signals was an additional proviso.

(iii) It was the responsibility of the G.P.O. to cease fire when fighters closed to the attack.

(b) *Unseen Targets.*

Unseen firing at this time was in its infancy and considerable initiative was displayed in evolving methods for engaging targets unseen by day or by night.

The following methods were employed :-

(i) *Geographic Barrages.*

Many forms of barrage were used by different G.D.As but all were based on obtaining concentrations at a point, on a line, or over an area, through which the enemy aircraft must fly.

Suitable barrages for lines of approach and heights were worked out beforehand.

Approach of enemy aircraft was observed by G.L. and, by co-ordination at G.O.Rs., the fire from each site could be controlled to bring a maximum concentration of shell bursts at the required point.

(ii) *Precision Engagements.*

Method A. - Due to poor visibility or wrong speed settings searchlight intersections were often made without actual illumination of the aircraft. By obtaining slant range from G.L. and following the intersection on the Predictor, sufficient data were available to enable shells to burst at or near the intersection.

Method B. - This provided for engagement without searchlight intersections. Continuous bearings and slant ranges from the G.L. were fed into the predictor and engagement of target undertaken on the data thus provided. For sites which were not equipped with G.L. the appropriate information was passed down from G.O.R.

It will be appreciated that procedure varied with different Gun Zones, according to circumstances and the equipment available. It should be remembered that all engagements

of unseen targets, were subject to the express permission of the Group Controller at Uxbridge, so that danger of engaging friendly aircraft was obviated.

(c) Anti-Dive-Bombing Barrage.

Special barrages against dive bombers were organised round the following V.Ps: Harwich Harbour, Thameshaven Oil Installations, Tilbury Docks, Chatham Dockyard, Sheerness Dockyard, Dover Harbour, Purfleet Oil and Ammunition Depots.

This barrage could be employed at any time at the discretion of the G.P.O. when he considered that other and more accurate methods were unlikely to be effective. The barrage was designed for a height of 3,000 feet and assumed a dive angle of 60°. It was based on a barrage circle round each gun site which was divided into 4 quadrants in which the barrages were placed.

The maximum effort from H.A.A. guns was required from the 19th August to the 5th October during which time the crews had little rest, continuous 24 hours manning being required at Dover, a "duty gun station" system being worked in all areas.

Evidence is available to show how time and time again enemy bombers would not face up to the heavy and accurate fire put up by gun stations. Particularly worthy of mention are two attacks on Hornchurch aerodrome when on both occasions fighters were on the ground for refuelling. A.A. fire broke up the formation and prevented any damage to the station buildings and aircraft on the ground.

4. Part played by L.A.A. Guns.

The targets which offered themselves to L.A.A. guns were in the main small numbers engaged in dive bombing or low level attacks on V.Ps. Opportunity usually only offered fleeting targets, and quickness of thought and action was essential to make fullest use of the targets which presented themselves.

Success against targets by L.A.A. guns was achieved in the following ways :-

- (a) The destruction or disablement of enemy aircraft (See Appendix "C.")
- (b) The prevention of accurate bombing causing the bombers to pull out of their dive earlier than they intended.

Methods of firing employed by L.A.A. guns as follows :-

(i) Bofors.

Fire was directed either by No. 3 Predictor or by Forward area Sights; some Bofors were not equipped with the predictor when the latter method only could be used.

The Predictor equipped guns require a 130 Volt A.C. electric supply which was provided either from engine-driven generators or from the mains. Shooting with the Predictor achieved very great accuracy amid the results and destruction of aircraft and the average ammunition expenditure proved the efficiency of this equipment (see Appendix "C"). The F.A.S. method permitted quick engagement of targets although without the accuracy afforded by the Predictor.

(ii) 3-inch 20-cwt. Guns (Case I).

Some V.Ps. were equipped with the 3-inch 20-cwt. gun without Predictor which was fired from deflection sights; shrapnel was normally used. H.E., however, was used for targets at greater height.

(iii) *A.A.L.M.G.*

Lewis Guns on A.A. mountings proved extremely effective in attacking low-flying enemy aircraft. These guns were mounted in single, double or quadruple mountings and were fired by the Hosepipe method using tracer ammunition.

(iv) *Hispano 20-mm. Equipment.*

A few of these weapons only were deployed and, owing to shortage of ammunition and lack of tracer, were not found very effective.

5. Part Played by Searchlights.

(a) *Day.*

Owing to the close spacing of Searchlight sites they formed a valuable source of intelligence and rapid reports were able to be made upwards of casualties to friendly and enemy aircraft, pilots descending by parachute and other incidents of importance. In addition, they have been able to provide valuable reports of isolated enemy aircraft, trace of which had been lost by the Observer Corps.

The value of the A.A.L.M.G. with which each site was equipped cannot be too highly stressed, and during the 4 months under review no less than 23 enemy aircraft were destroyed, confirmed, by A.A.L.M.G. at Searchlight sites (this includes a few in which A.A.L.M.G. at H.A.A. sites also shared). Prisoner of War reports showed that it was not generally known by the German Air Force pilots that Searchlight sites were equipped with A.A. defence.

(b) *Night.*

Tactical employment of Searchlights at night was by either—

(i) 3-beam rule, in which 3 sites only engaged the target; or

(ii) by the Master-beam system, in which one Master beam per three sites exposed and was followed by the remaining two beams acting under the orders of the Master beam.

The decision to engage was the responsibility of the Detachment Commander, and no direct tactical control was exercised from Battery Headquarters.

In the early stages of the Battle of Britain night activity was on a small scale and Searchlights had few raids to engage. Some illuminations were effected, but throughout it was difficult, by ground observations, to assess the actual numbers. Frequently illuminations were reported by sites not engaging the targets. The difficulty of illumination was increased as the number of night raids increased, owing to the difficulty of sites selecting the same target.

There is evidence to show that Searchlight activity, whilst being difficult to measure, forced enemy aircraft to fly at a greater height than they would otherwise have done. Bombs were frequently dropped when enemy aircraft were illuminated, which were possibly intended to discourage Searchlights from exposing. Evasive tactics by the enemy consisted of changing height and speed continuously to avoid being illuminated rather than a violent evasive action upon illumination.

6. G.L. Equipment.

At the beginning of August experiments had just been completed to determine whether G.L. equipment could satisfactorily be used as a Ships detector. Apart from the results of this

experiment three other facts emerged : -

(a) The G.L. principle was of considerable value when used in conjunction with Searchlights.

(b) That G.L. sets sited in an anti-ship role, i.e., on the top of a cliff, were of considerable value in detecting low-flying aircraft.

(c) It showed the value of small R.D.F. detectors within the main R.A.F. chain, in plotting enemy aircraft direct to sectors.

At the beginning of the Battle of Britain, 21 G.L. sets were in use by 6th A.A. Division, and by October this number had been increased by another 14.

(i) *G.L. at Gun Stations.*

The main function of these equipments was to provide data for Unseen target engagements as described above. One other function of these sets is worth special mention.

Two sets were specially sited on the cliffs at Dover to pick up targets at low level. These sets were able to register aircraft taking off from the aerodromes immediately behind Calais, thereby obtaining information considerably earlier than could be provided by the main R.D.F. station on the coast. This information was reported back to Uxbridge Operations Room by a priority code message which indicated the approximate number of aircraft which had taken off and their position. This report was received some 5/6 minutes before it could be received through the usual R.D.F. channels, and therefore enabled the Controller to order his Fighters off the ground correspondingly earlier than would otherwise have been the case. This system, which was also adopted somewhat further along the coast in the neighbourhood of Beachy Head, was of all the more value as the enemy were heavily bombing the R.D.F. stations, which were consequently sometimes out of action.

(ii) *G.L. Stations with Searchlights.*

During the latter stages of the offensive, when the night raids on London commenced, it was realised that the G.L. would be of considerable assistance to Night Fighters. An "elevation" attachment to the equipment was produced and this enabled height to be obtained, which in conjunction with a plotting scheme at S.O.R., enabled Searchlight beams to be directed more accurately on a target to assist night fighters. The results obtained from this were not completely satisfactory, but they showed the way to the development of the present system.

(iii) *Mine-Laying Aircraft.*

It was found that the experiments conducted in the ship-detector role could be very satisfactorily applied to detecting mine-laying aircraft which flew in at a height too low to be picked up by the C.H. Stations. It enabled accurate tracks of these aircraft to be kept which were afterwards passed to the Naval Authorities, who were then able to sweep up the mines which had been laid by these aircraft.

7. Statistics.

Careful records have been kept of ammunition expenditure and enemy aircraft shot down, and details are shown in Appendix "C."

The following points are worthy of note :—

(a.) The total enemy aircraft Destroyed, Confirmed Category I by 6th A.A. Division during the months July-October 1940, inclusive, was 221; of this total 104 were destroyed on seven days, thus :—

15 August, 1940	...	...	...	15
18 " "	...	...	...	22
24 " "	...	...	...	10
31 " "	...	...	...	20
2 September 1940	...	...	...	13
7 " "	...	...	...	14
15 " "	...	...	...	10

				104

(b) A considerable number of enemy aircraft were claimed as Probably Destroyed and Damaged.

(c) The total amount of H.A.A. expended was 75,000 rounds.

(d) The total amount of Bofors ammunition expended was 9,417 rounds.

8. Ground Defence.

Preparations were made by all A.A. defences to assume a secondary ground defence; Bofors were provided with A/T ammunition, and sited to cover approaches to aerodromes, V.Ps, &c. Certain 3.7-inch guns suitably sited were given an anti-ship role and preparations were made for barrages to be put on certain beaches. Under the immediate threat of invasion in May 1940, mobile columns of A.A. troops were formed, but these troops reverted to their A.A. role before the Battle of Britain began.

9. Lessons Learnt.

(a) The outstanding lesson learnt from this intensive air attack was undoubtedly the soundness and suitability of the organisation and arrangements of the control and direction of the anti-aircraft defences. These measures devised in peace time and perfected during the earlier and quieter period of hostilities, stood the severe test with amazing resilience and adaptability. No major alterations in the system were indicated or, indeed, were made subsequent to these operations. The way in which the activities of the anti-aircraft linked in and were capable of co-ordination with the major partners in the venture – R.A.F. Fighter Command, No. 11 Fighter Group, and sector commands – is perhaps worthy of special note.

(b) Other lessons learnt are by comparison of minor import. Chief among them was the great vulnerability of aircraft if caught by accurate H.A.A. fire when in close formation. A good instance of this occurred in an action on the 8th September, when a geschwader of 15 Do. 17s, flying in formation at 15,000 feet, approached a gun site South of River Thames. The opening salvo from the four 3.7-inch guns brought down the three leading aircraft, the remaining machines turning back in disorder, scattering their bombs on the countryside in their flight to the coast.

The value of H.A.A. fire as a means of breaking up bomber squadrons to enable them to be more easily dealt with by our fighters was demonstrated on numerous occasions in the Thames Estuary. The importance of A.A. shell bursts as a "pointer" to fighters, even though the guns cannot themselves effectively engage the enemy, was also frequently demonstrated.

(c) A somewhat negative lesson was the inability of A.A. guns, however well served, to completely deny an area to penetration by determined air attack. Evidence, however, was overwhelming that accurate fire, apart from causing casualties, did impair the enemy's aim, and thus avoid, or at least mitigate, the damage to precise targets.

(d) A rather unexpected result was the high proportion (about 10 per cent.) of planes brought down by A.A.L.M.G. fire. It is doubtful, however, whether with the increased armour now carried by enemy aircraft this lesson still obtains.

(e) The value of training in recognition was repeatedly emphasised throughout these operations. Fortunately, very few instances of friendly aircraft being engaged occurred. Apart from the accuracy of the information as to movement of aircraft furnished to gun sites, this was no doubt due to a reasonable standard in recognition having been attained. It was, and still is, continually brought home to the A.A. gunner that, before all else, he must not engage a friendly aircraft. With this thought firmly impressed on the G.P.O., some instances of late engagement or failure to engage perforce occurred. In some cases, had the standard of training been higher, to enable the earlier recognition of a machine as "hostile beyond reasonable doubt," the number of machines destroyed would have been increased.

Chelmsford, August 2, 1941.

APPENDIX "C.A."

H.A.A. Gun Defended Areas and Armament

G.D.A.	August 1940			October 1940		
	4.5-in	3.7-in	3-in	4.5-in	3.7-in	3-in
Harwich	...	15	8	...	8	7
T. and M. North	32	8	12	24	4	12
T. and M. South	32	32	14	28	20	10
Dover and Manston	...	12	16	...	12	16
Wattisham	...	...	4	...	...	4
Biggin Hill	...	...	4	...	...	4
Kenley	...	...	...	...	...	2
North Weald	...	+4	4+2	...	...	4

APPENDIX "C.B."

L.A.A. V.Ps and Armament

V.P	August 1940					October 1940				
	40-mm	A.A.L.M.G. (No of Barrels)	Hispano	3-in Case I	Misc	40-mm	A.A.L.M.G. (No of Barrels)	Hispano	3-in Case I	Misc
Aerodromes										
Debden	4	A	...	...	...	4	17	...	...	...
Wattisham	...	12	...	...	...	4	8	...	...	...
Biggin Hill	3	2	...	...	...	6	3	...	...	...
Manston	4	4	...	...	...	4	4	...	...	...
West Malling	2	10	...	...	...	4	10	...	...	...
Croydon	...	12	...	...	...	4	8	...	...	...
Kenley	4	8	...	2	...	4	10	...	3	...
Redhill	...	...	...	...	...	3	...	...	...	...
Gravesend	4	4	...	...	...	4	...	...	...	...
Shorts (Rochester)	...	...	...	...	...	4	8	3	...	...
Detling	...	...	...	...	...	2	12	2	...	...
Eastchurch	...	...	...	...	...	2	10	...	...	...
Hawkinge	4	4	...	...	...	4	4	...	...	...
Lympne	...	...	...	...	...	...	2	...	...	...
North Weald	3	12	...	...	...	5	8	...	...	...
Martlesham	4	10	...	...	...	4	11	...	...	...
Rochford	2	8	...	...	...	4	12	...	...	...
Hornchurch	3	7	...	...	...	5	7	...	...	...
Stapleford Abbots	...	...	...	...	...	2	...	...	...	...
A.M.E. Stations										
Darsham	2	7	...	...	...	2	8	...	...	...
Dunkirk	3	6	...	...	...	3	7	...	...	...
Rye	3	6	...	...	...	3	11	...	...	...
Pevensey	3	6	...	...	...	3	21	...	...	...
Bawdsey	...	...	...	...	...	3	3	...	...	...
Great Bromley	...	...	...	...	...	3	11	...	...	...
Canewdon	3	4	...	...	...	3	12	...	...	...
Industrial and Oil										
Crayford	...	8	...	...	...	3	30	3	1	...
Dartford	...	...	...	...	...	1	20	4	...	...
Northfleet	...	...	...	...	...	...	16	...	...	...
Grain (Barges)	2	4	...	...	...	2	34	2	1	...
Chelmsford	...	8	...	...	...	2	21	...	...	...
Murex (Rainham)	...	20	...	...	...	...	20	...	...	...
Purfleet	...	14	...	2	...	...	16	...	2	...
Canvey	...	12	...	2	...	...	12	...	1	...
Thameshaven	...	4	...	4	...	...	...	...	3	...
Shellhaven	...	8	...	3	...	...	8	...	1	...
Naval										
Chatham	...	...	...	...	...	...	24	4	3	...
Chattenden	...	...	...	...	...	...	28	...	...	...
Sheerness	...	...	...	...	...	4	22	5	...	...
Landguard	...	...	...	...	...	...	15	...	1	...
Wrabness	...	...	...	...	...	...	23	...	...	...
Parkeston Quay	...	...	...	...	...	...	10	...	...	...
Dover	5	9	...	4	...	9	16	4	...	4 A/T
Tilbury	...	14	...	...	...	...	18	...	...	...
Southend Pier	...	...	...	...	1 2-pdr	...	...	...	...	1 2-pdr

APPENDIX "C.C."

I. -Ammunition Expenditure and Claims, Category i.

	Total Ammunition Expended	Enemy Aircraft Destroyed	Average Rounds per E/A
H.A.A. (seen targets)	48,155	161	298
H.A.A. (barrage and unseen fire)	26,869	11	2,444
L.A.A. Bofors only	9,417	47	200
A.A.L.M.G. (at S.L. and H.A.F. sites)	Not recorded	23	...

NOTES:-

- (i) The above table gives records from September 3, 1939 to November 3, 1940.
- (ii) The total enemy aircraft destroyed during the months inclusive July-October was 221.
- (iii) The following ammunition was expended from September 3, 1939 to June 30, 1940 –

H.A.A.	...	...	...	2,995
L.A.A.	...	...	...	1,919

- (iv) All the enemy aircraft destroyed by L.A.A. (47) have been credited to Bofors for the purpose of the average; in practice, Lewis guns had a considerable share in several of these as well as in two cases Hispano (2,941 rounds) and 3-in. Case I (194 rounds).
- (v) Bofors average may be still further sub-divided thus:-

With Predictor	...	...	...	179 (3,187 rounds)
With F.A.S	...	...	...	232 (6,230 rounds)

II. Table showing Types of Aircraft destroyed July-October 1940.

TypeNo.				
He.111	...	...	...	30
Do.17	...	...	...	39
Do.215	...	...	...	14
Ju.87	...	...	...	15
Ju.88	...	...	...	19
Me.109	...	...	...	80
Me.110	...	...	...	15
Unidentified	...	...	...	9

221

III.

Destroyed by day	...	...	203
Destroyed by night	...	...	18

221

APPENDIX "C.D."

*Ammunition Expenditure and Enemy Aircraft destroyed throughout Anti-Aircraft
Command for July, August and September 1940*

July 1940 –

Day*	...	...	...	}	344 rds. per aircraft.
Night	...	...	...		(26 a/c = 8,935 rds.)

August 1940 –

Day*	...	...	...	}	232 rds. per aircraft.
Night	...	...	...		(167 a/c = 38,764 rds.)

September 1940 –

Day	...	...	...	}	1798 rds. per aircraft.
Night	...	...	...		(144 a/c = 258,808 rds.)

* Mainly by day, little night activity.

¹ Including considerable night activity and large expenditure of ammunition by night.

APPENDIX "E."

FIGHTER COMMAND.

Order of Battle, November 3, 1940.

No. 9 GROUP.

Squadron.	War Station.	Type of. Aircraft.	Category.
312 (Czech)	Speke	Hurricane	C
611	Ternhill	Spitfire	C
29 (½)	Ternhill	Blenheim	Night-Flying

No. 10 GROUP.

79	Pembrey	Hurricane	C
87 (½)	Bibury	Hurricane	B
504	Filton	Hurricane	C
609	Middle Wallop	Spitfire	A
604	Middle Wallop	Blenheim	Night-Flying
238	Middle Wallop	Hurricane	A
56	Boscombe Down	Hurricane	A
152	Warmwell	Spitfire	A
601	Exeter	Hurricane	C
87 (½)	Exeter	Hurricane	B
234	St. Eval	Spitfire	C
247 (½)	Roborough	Gladiator	C

No. 11 GROUP.

25	Debden	Blenheim and Beaufighter	Night-Flying
73	Castle Camp	Hurricane	Night-Flying
17	Martlesham	Hurricane	A
229	Northolt	Hurricane	A
615	Northolt	Hurricane	A
302 (Polish)	Northolt	Hurricane	A
257	North Weald	Hurricane	A
249	North Weald	Hurricane	A
46	Stapleford	Hurricane	A
264	Hornchurch	Defiant	Night-Flying
41	Hornchurch	Spitfire	A
603	Hornchurch	Spitfire	A
222	Rochford	Spitfire	A

141	Gravesend	Defiant	Night-Flying
74	Biggin Hill	Spitfire	A
92	Biggin Hill	Spitfire	A
Squadron.	War Station.	Type of. Aircraft.	Category.
66	West Malling	Spitfire	A
421 (½)	West Malling	Hurricane	Reconnaissance
605	Croydon	Hurricane	A
253	Kenley	Hurricane	A
501	Kenley	Hurricane	A
219	Redhill	Blenheim and Beaufighter	Night-Flying
145	Tangmere	Hurricane	A
213	Tangmere	Hurricane	Night-Flying
422 (½)	Tangmere	Hurricane	Night-Flying
602	West Hampnett	Spitfire	A
28	Ford	Blenheim	Night-Flying

No. 12 GROUP.

303 (Polish)	Leconfield	Hurricane	C
616	Kirton-in-Lindsey	Spitfire	C
85	Kirton-in-Lindsey	Hurricane	C
151	Digby	Hurricane	C
1	Wittering	Hurricane	C
266	Wittering	Spitfire	C
29 (½)	Wittering	Blenheim	Night-Flying
72	Coltishall	Spitfire	C
64	Coltishall	Spitfire	C
242	Duxford	Hurricane	A
310 (Czech)	Duxford	Hurricane	A
19	Duxford	Spitfire	A

No. 13 GROUP.

607	Turnhouse	Hurricane	C
65	Turnhouse	Spitfire	B
232 (½)	Drem	Hurricane	C
63 (½)	Drem	Hurricane	C
1 (Canadian)	Prestwick	Hurricane	C
32	Acklington	Hurricane	C
610	Acklington	Spitfire	C
600 (½)	Acklington	Blenheim	Night-Flying
43	Usworth	Hurricane	C

54	Catterick	Spitfire	C
600 (½)	Catterick	Blenheim	Night-Flying
245	Aldergrove	Hurricane	C

No. 14 GROUP.

Squadron.	War Station.	Type of. Aircraft.	Category.
3	Castletown	Hurricane	C
111 (½)	Dyce	Hurricane	C
111 (½)	Montrose	Hurricane	C

NON-OPERATIONAL SQUADRONS.

Group	Squadron.	Station.	Type of Aircraft.
9 Group	308 (Polish)	Baginton	Hurricane
12 Group	306 (Polish)	Church Fenton	Hurricane
	307 (Polish)	Kirton-in-Lindsey	Defiant
	71 (Eagle)	Church Fenton	Buffalo
13 Group	263 (½)	Drem	Whirlwind

NOTE.—Two "B" Squadrons, Nos. 74 and 145, had already been thrown into the battle leaving only two available at the end.

APPENDIX "F."

Note on the Offensive and Defensive Equipment of Aircraft.

1. The general principle of developing the maximum possible fire power, which is accepted in all Armies and Navies, must presumably be applicable to Fighter Aircraft, provided that this can be done without unduly sacrificing Performance and Endurance.

2. The 8-gun fighter may be said to exemplify this principle, and at the beginning of the war its results were decisive against German Bombers, which were unarmoured at that time.

3. Our Fighter pilots were protected against the return fire of Bombers by their engines, and by bullet-proof glass and armour, for their heads and chests respectively.

4. Furthermore, at this time the return fire from German Bombers was negligible. They had concentrated on Performance as the principle means of evasion (a false lesson drawn from the low speed of the Fighters used in the Spanish War) and the few guns which they carried were manually controlled, and so badly mounted that they were practically useless. These facts, in combination with the fire power and armour protection of our own Fighters, made the latter virtually immune to the fire of unescorted Bombers, and their casualties in Home Defence fighting up to the Spring of 1940 were quite negligible.

5. The German Bombers had good self-sealing tanks, and this was perhaps the only important particular in which they were ahead of us. In our Development work we had demanded that tanks should be "Crash Proof" as well as self-sealing, and the drastic conditions, which our experimental tanks had to meet had made them unduly heavy and cumbrous.

6. So far as our Fighters were concerned, the wing tanks in the Hurricane were removed and covered with a fabric known as "Linatex" which had fairly good self-sealing characteristics. The reserve tank in the fuselage was left uncovered, as it was difficult of access and it was thought that it would be substantially protected by the armour which had been fitted.

During the Battle, however, a great number of Hurricanes were set on fire by incendiary bullets or cannon shells, and their pilots were badly burned by a sheet of flame which filled the cockpit before they could escape by parachute.

7. The reserve tanks were therefore covered with Linatex as a matter of the highest priority, and a metal bulkhead was fitted in front of the pilot to exclude the rush of flame from the cockpit.

8. The Germans soon began to fit fuselage armour to protect their pilots and crews, but for some unexplained reason neither side had fitted armour behind the engines of their Bombers. The back of the engine is much more vulnerable to rifle-calibre bullets than the front, owing to the mass of ancillary equipment which is there installed. While the back of the engine lies open to attack, the rifle-calibre machine gun remains a useful weapon, and the fact is a fortunate one for us.

9. The application, of armour to Bombers did not, of course, come as a surprise to us,

and its implications had long been discussed.

10. Excluding devices such as hanging wires, exploding pilotless aircraft &c., I have always thought that the courses open to the Fighter, when rifle-calibre machine-gun fire from astern becomes ineffective, may be summarised as follows :-

- (A) Deliver fire from ahead or from a flank.
- (B) Pierce the armour.
- (C) Attack the fuel tanks with incendiary ammunition.
- (D) Destroy the structure of the aircraft by means of direct hits from explosive shells.
- (E) Use large shells with Time and Percussion fuzes.

Discussing these in order :-

11. - (A) Fire from ahead or from a flank is effective but difficult to deliver accurately at modern speeds. Fire from ahead proved very effective on occasions during the Battle, but relative speeds are so high that the time available for shooting is very short, and Fighters generally find themselves in a position to deliver such an attack more by accident than by design.

12. Beam attack is very difficult to deliver accurately, owing to the amount of deflection which had to be allowed. The deflection ring on a Fighter's sight allows for an enemy speed of 100 m.p.h., and therefore a full diameter outside the ring must sometimes be allowed.

13. The method is effective against formations, when the aircraft hit is not always the one aimed at, and certainly the Gladiators in Norway developed this technique with great success. On the whole, however, Fighters which were constrained to this method of attack would have a very limited usefulness.

14. - (B) The simplest reaction for the Fighter is to pierce the armour, but it entails the use of bigger calibres. It must be remembered also that it is not sufficient merely to pierce the armour, but the bullet must have sufficient remaining velocity to do lethal damage thereafter. High velocities, in addition to bigger calibres, are therefore necessary.

15. The .5-inch gun appeared, at first sight, to be the natural successor to the .303-inch, but experiments showed that the type available to us in the Autumn of 1940 was practically defeated by the 8 mm. armour carried in the M.E. 109. It was true that the bullet would pierce 20 mm. or more of armour in the open, but it was found that the minute deceleration and deflection of the axis of the bullet, caused by its passage through the structure of the fuselage, exercised a very important diminution on its subsequent penetrative powers.

16. Experiments carried out with .5-inch guns of higher velocity in America have given encouraging results, and it is not at present possible to dogmatise on the subject. It would, however, be foolish to adopt a gun which could be defeated by a slight thickening of the armour carried by the Bomber, and the aim should be to defeat the thickest armour which it is practically possible for the enemy to carry.

17. We have at present no gun of a calibre between .5 inch and 20 mm. (.8 inch). The latter was originally adopted by the French because it was of about the right size to fire an explosive shell through an airscrew of a Hispano Suiza engine, and was adopted by us from them. If, therefore, it proves to be of the best weight and calibre for an armour piercing, that is due to accident rather than design.

18. A study of available data might lead one to suppose that a calibre of about 15 mm. would be the ideal, and I understand that this size has recently been adopted by the Germans; but we cannot now start designing a new gun for this war, and we must choose between the .5 inch and the 20 mm. We shall soon get reliable data from American Fighter types in action. They have faith in the .5-inch gun.

19. The Armament of the Royal Air Force is not its strongest point, and in my opinion we should do our own Design and Experimental work, and satisfy our requirements without being dependent on Woolwich and Shoeburyness.

20. - (C) Incendiary ammunition may be fired from guns of any calibre and Bomber tanks have been set on fire by .303-inch ammunition. The bigger the bullet, however, the bigger the hole, and a small bullet stands a good chance of being quenched before it can take effect. In any case, the fuel tanks of a Bomber constitute so small a proportion of the whole target that they cannot be made the sole objective of attack; and it seems that the adoption of a large-calibre gun and the use of a proportion of incendiary ammunition therein will afford a satisfactory compromise.

21. - (D) It was assumed by the French that the 20 mm shell would be effective against the structure of modern aircraft. I do not know what trials they carried out, but the tests done by us at Shoeburyness and Orfordness indicate that the effect of a 20 mm. shell exploding instantaneously on the surface of an aircraft is almost negligible, except in a small percentage of lucky strikes. The normal effect is that a hole of about 6-inch diameter is blown in the surface, and that the effect at any distance is nil, since the shell is blown almost into dust. Occasionally the fuze penetrates and does some damage, but this is slight in comparison with the total weight of the shell. Even the big 37-mm. shell, though it may do spectacular damage, will not often bring a Bomber down with a single hit. Greater damage is done if the fuze is given a slight delay action, so that it bursts inside the covering of the aircraft, but small delay action fuzes are unreliable in operation and difficult to manufacture, and, on the whole, it seems doubtful if explosive shells are as efficient as armour-piercing and incendiary projectiles, especially as they will not penetrate armour. Another point must be remembered, viz., that a drum of explosive shells is a very dangerous item of cargo: if one is struck and detonated by a bullet it is not unlikely that they will all go off and blow the aeroplane to pieces.

22. - (E) The use of large shells (comparable to Anti-Aircraft types) from Fighter aircraft is practically prohibited by considerations of weight if a gun is used. The gun itself must be heavy and the structure must be strengthened to withstand the shock of recoil. The walls and base of the shell also have to be made uneconomically heavy to withstand the discharge. All these difficulties, however, can be overcome if the Rocket principle is used. It is true that a Rocket can be discharged only in the direct line of flight, but that is no particular handicap to a Fighter. It can have a light firing tube, there is no recoil, and the shell can be designed for optimum fragmentation effect. (I have been told that a 3-inch Rocket shell develops the same explosive and fragmentation effect as a 4.5-inch Anti-Aircraft gun shell). It also starts with an advantage over the terrestrial rocket in that it has an initial velocity of about 300 m.p.h. through the air, which gives it enhanced accuracy. For this weapon a "Proximity Fuze" would

be ideal, but, pending the development of this, there is no reason why the Rocket should not be used with a Time and Percussion Fuze used in conjunction with a range-finder in the Aircraft.

23. This item was put on the programme about 7 years ago, and I think it a great pity that it was allowed to drop. True, unexpected difficulties may be encountered, and nothing may come of the project, but it is an important experiment, and our knowledge of what is and is not possible will not be complete until it has been tried.

24. I think that our decision to adopt the 20-mm. gun is probably the wisest which we could have taken, but to carry increased load efficiently something bigger than the Hurricane or Spitfire is needed. The Typhoon with 2,000 h.p. should be ideal when it has been given an adequate ceiling.

25. In the meantime the Hurricane must be somewhat overloaded with 4 Cannons, and mixed armament (2 Cannons and 4 Brownings) in the Spitfire is merely a compromise necessitated by loading conditions. Might not the high velocity American .5-inch gun prove a suitable armament for the small fighter?

26. As regards ammunition for the 20 mm gun, the so-called "solid" bullet was merely a cheap steel bullet produced by the French for practice purposes. Its mass and velocity have enabled it hitherto to smash through armour to which it has been opposed, but an improved design will probably be needed before long; doubtless the matter is receiving attention. I understand that the incendiary bullet—the equivalent of the de Wilde .303-inch—has been giving good results.

27. One other attribute of a naked steel bullet must not be overlooked, viz its incendiary effect when it strikes a ferrous structure. During ground trial a Blenheim was set on fire by the second hit from a "solid" bullet; Unfortunately, German aircraft do not normally contain much iron or steel.

28. If we look into the not too distant future, I think we shall find that an additional and quite different reason may arise for the adoption of the high velocity gun with a comparatively heavy projectile. I refer to the increasing intensity and effect of return fire from Bombers.

29. Our Fighters are protected to a very large degree from the return fire of Bombers which they attack from astern, so long as they have to sustain the impact only of rifle-calibre bullets.

30. The situation will be quite different, however, if turrets with 5-inch guns are commonly used in Bombers. The Bomber has the comparative advantage over the pursuing Fighter of firing "down-wind" (one may get a clear idea of the situation by imagining both aircraft to be anchored in space, with a 300 m.p.h. wind blowing from the Bomber to the Fighter). The result is likely to be that effective armouring of Fighters against return fire will be impossible, and fighting ranges in good visibility may be considerably lengthened. In such circumstances high velocity, flat trajectory and a heavy projectile will attain increasing importance; attention will also have to be paid to accurate methods of sighting, and allowance for gravity drop.

The Rise and Fall of the German Air Force - (Air Pamphlet No 248) 1922-1940

Introduction by Sebastian Cox

The following pages contain the introduction and a chapter on the Battle of Britain and the Blitz taken from a work entitled *The Rise and Fall of the German Air Force 1933-1945*. This was an unusual publication, which was written and produced by the RAF's Air Intelligence [AI] organisation following the end of the Second World War. It first appeared in 1948 with an introduction by the then head of Air Intelligence, Air Vice-Marshal "Tommy" Elmhirst. It was originally classified, though at a fairly low level, and was widely distributed within the RAF, and was then published by Arms and Armour Press in 1983 in a new edition for sale to the general public, with an introduction by the then Head of the Air Historical Branch, the late Air Commodore Henry Probert.

The principal authors for *Rise and Fall of the GAF* were three individuals who had each spent a major part of the Second World War working in the AI organisation. The editor was Cyril March, who had served in AI1(K), later ADI(K), the Assistant Directorate of Intelligence responsible for all PoW interrogations, including postwar interrogations of senior Luftwaffe officers. He was assisted by Wing Commander Asher Lee, who served in AI3(b) from early 1940 until the end of 1944, during which time he had the prime responsibility for intelligence on the Luftwaffe's Order of Battle. Lee himself actually published a short history of the Luftwaffe in 1946 with a foreword by none other than Lieutenant General Carl Spaatz, Commanding General of the United States Army Air Forces. That the most senior serving USAAF officer should agree to write the foreword speaks volumes for the regard in which Asher Lee, a mere Wing Commander, was held. Spaatz wrote that Lee "knew more about the German Air Force than Goering." Squadron Leader Geoffrey Barraclough, the third member of the writing team, served in AI3(b) from August 1942 to the end of the War in Europe. All three men brought their unique knowledge and insight on the German air arm to bear.

Although by its very nature the text is an Anglo-centric perspective on the Battle (e.g. its lauding of the Spitfire and Hurricane in comparison to the Messerschmitt 109 is somewhat overdone [paras 29 & 30]) it nevertheless includes some reasonably accurate analysis of many of the Luftwaffe's failings. German overconfidence and poor intelligence, the two perhaps not being unconnected, were certainly major contributory factors in the Luftwaffe's defeat. The authors clearly had access to much German documentary material, including not only Luftwaffe directives and intelligence assessments [e.g. paras 8,24,25,20], but also records of the dissension and disagreements between the senior German airmen which famously emerged at the meeting in the Hague early in September [para 22]. Serviceability was also an increasingly serious problem for the Luftwaffe during the Battle of Britain and on into the Blitz [paras 27 & 40]. One of the Luftwaffe's major problems was its inability to follow one of the principles of War, the selection and maintenance of the aim. For much of the Battle of Britain and the Blitz the Germans not only spread their effort too widely, but constantly changed the focus of that effort to boot [see, for example, Goering's target priorities and orders set out in para 47].

The original work was not sufficiently highly classified to include reference to the Ultra decrypts of German Enigma signals, to which all three AI officers would have had wartime access, but there are occasional references to material which probably originated in Ultra, as for example with the reinforcement of Luftflotte 2 from Luftflotte 5 in August 1940 [para 24].

The Rise and Fall of the German Air Force remains a valuable source for historians of the air war in 1940 and a useful and succinct analysis looking to consider enduring lessons from the 1940 air campaigns.

Foreword

by the Assistant Chief of Air Staff (Intelligence)
Air Vice-Marshal Sir T W Elmhirst, K.B.E., C.B, A.F.C.

This volume is our first attempt to relate the operational history of the German Air Force during the war of 1939 to 1945. It recounts in some detail the progress of the principal campaigns, and traces the problems encountered, both in the field and in the direction of the air war at the higher staff level. It must be left to the historians to make a more extensive study, but this book, written at the command of the Air Council, is designed to provide in the interim for the needs of staff colleges. The short time that has elapsed since the events described took place make it impossible for the account be anything but imperfect but it has been written by the men and women who themselves conducted the intelligence attack against German Air Force during the war years, and, insofar as rapid demobilisation has permitted, it constitutes the best contribution air intelligence can make to cover the period until authoritative and comprehensive histories are available.

So far as it goes therefore, the present work may be regarded as a reasonably accurate historical record, presented in a form which, while avoiding technicalities as far as possible, should be acceptable to most readers. It is, throughout, based on reliable German documents and statistics, either captured during the war or subsequently recovered from scattered archives of the Luftwaffe. While the course of the first 18 months of German air operations may be generally known, the launching of the Norwegian and French campaigns and the Battle of Britain as seen from the German side will make fresh reading. The account of the part played by the German Air Force and events on the Russian front, and the details of its operations in the Mediterranean, are also largely new, and story of the struggle against Allied daylight bombing offensive in 1943 and 1944 is like to be of considerable interest. The final vicissitudes of the Luftwaffe, losing battle of the German Air Staff against the obstinacy of Hitler and the incompetence of Goering, and the inability of German supreme command to appreciate the consequences of their declining air superiority, reveal only too clearly the errors of lack of foresight of those directing the Nazi war effort to enslave Europe, defeat Britain and dominate the world.

Every effort has been made to approach the subject, in an objective and unbiased viewpoint, and full credit has been given to the undeniable successes of the German Air Force. Many German shortcomings are revealed, the principal probably being the lack of objective policy directed by experts in air warfare, able to express their views and translates them into action untrammelled by the dictates of political intrigue and unhampered by the whims of incompetent and vacillating superiors. It must be remembered, however, that, in spite of these weaknesses, those directing the German Air Force were faced throughout the war with an undeniable restriction of resources of every kind. In short, Hitler bit off more than he could chew, and the Germans had insufficient resources to provide an adequate air force to support the operations to which it became committed. Although hopelessly

outnumbered and fighting a losing battle from 1943 onwards, the Luftwaffe remained a substantial force to be reckoned with in all military calculations up to the closing stages of the war. It is doubtful if a greater realisation of the importance of their power, as we come to understand it, would have been done more than to prolong war. The German Air Force would certainly have given a different account of itself if those controlling its destiny had not underestimated the threat of Allied air power. If they had realised the vital necessity for air supremacy, if final effort in the technical field had not been made too late, the story might well have been different.

Every aspect of the work and organisation of the German Air Force during this time is covered in existing reports and captured documents. So they may be written up and issued in a form which can be read in conjunction with this book. Studying this history the readership will find many situations where decisions which were taken by high-level command are puzzling. If the background of the decisions is not fully appreciated the character of Hitler and Goering and the cumbersome machinery of the supreme command were ever present factors in air force policy and through action. Short study of the workings of the supreme command has been prepared and appears in appendix to this book.

Chapter 4

The First Failure of German Air Power: the Battle of Britain and the Battle of the Atlantic

The Battle of Britain

The Battle of Britain August to September 1940

German Conception of Invasion

1. The conclusion of the campaign in the Netherlands and France on June 25th left the German General staff with the task of preparing and executing an invasion of Great Britain within the three months of good weather to be expected before autumn gales would make the undertaking impossible. The necessary regrouping of the armies and air forces, and the collection of suitable vessels precluded the possibility of any immediate exploitation of the rapid victory just achieved.

2. It is perhaps not surprising, in view of the successes of the German Armed Forces from the Polish campaign onwards that the General Staff retained a purely continental conception of an invasion across the Channel. The now well tried formula of the annihilation of the enemy air force, followed by rapid advance of the German armies with powerful direct air support, was held also to apply to Great Britain. There was, in the German conception only one difference, the RAF. As the most powerful single air force yet encountered, it would require a destruction time longer than the 12 to 40 hours previously allotted to other air forces.

3. Deliberations by the German Combined Staffs produced a directive from Field Marshal Keitel on July 12th to the effect of the German lack of command of the sea could be substituted by supremacy in the air. The directive recognised that in an invasion of Great Britain no strategic surprise was possible, but landings must take the form of a powerful river crossing with the air force acting as artillery. The first condition before such crossing could take place was the defeat of the RAF so that the essential prerequisite of German air supremacy would be assured. The German High Command, in regarding the whole undertaking in the same light as a large-scale crossing the river such as the Meuse, allotted to the air force its normal preliminary task and, as before, planning of this task was left in Air Force hands.

Disposition of Luftwaffe Forces

4. The regrouping of the German Air Force in preparation for the expected final stage of the Western campaign showed few changes as compared with the Battle of France. Luftflotten 2 and 3 merely extended the areas into France and took over existing airfields. The common boundary on the channel coast at the mouth of the Seine was extended northwards through the centre of England and each was allotted to its own sphere of operations. The subordinated Fliegerkorps remained as before, with the exception that II and IV were exchanged between the two Luftflotten, largely because Fliegerkorps IV disposed of the main units specialising anti-shipping operations and could be better employed in the Western Approaches, St George's Channel and the Irish Sea areas. These two Luftflotten were given the task of delivering the main attack on England, while the forces of Luftflotte 5 in Norway were to be brought in to create a diversion of British defensive forces to the north-east coast of England.

5. Another development was the grouping of the single and twin-engined fighters of the Fliegerkorps in Luftflotten 2 and 3 under tactical fighter commands known as – Jagdfuehrer or Jafues – which, within the framework of the main operations by the Luftflotten, retained a measure of independence in the planning of fighter escorts and sweeps. These Jafues could be compared with RAF fighter groups in their functions, but at this stage suffered from the disadvantage, which was to prove to be the undoing of the whole German fighter effort, that they had at that time no method of plotting of enemy air forces or controlling their own aircraft once airborne. Although they performed the functions of operational commands, operations themselves had to be flown blind, and without further direction from the ground. The two Jafues in question, Jafue 2 under Luftflotte 2 and Jafue 3 under Luftflotte 3 control respectively

460 single engined and 90 twin-engine fighters and 300 single-engined and 130 twin-engined fighters respectively.

6. At the end of the campaign in France many of the units of the German Air Force had been withdrawn to Germany to rest and refit, particularly fighters, dive bombers (Stukas) and short-range reconnaissance (Army Cooperation) the latter having suffered heavy losses. Meanwhile Luftflotten 2 and 3 disposed small forces bombers to continue the day and night attrition against the supply of Great Britain by sea. During July the air forces were gradually dispersed to airfields between Hamburg and Brest, and by the 17th of that month, when the order for full readiness was given, the striking force had been built up to its intended strength. The actual strength of the forces controlled by Luftflotten 2 and 3 for the assault on southern England and the Midlands comprised:

- Long-range bombers 1200
- Dive Bombers 280
- Single-Engine Fighters 760
- Twin-Engine Fighters 220
- Long-Range Reconnaissance 50
- Short-Range Reconnaissance (Army Cooperation) 90
- Total 2600

7. The additional forces based in Norway in the control of Luftflotte 5 cannot be said to have taken part in the Battle of Britain, at least in its early stages, but they did play a diversionary part of value to the Germans in forcing the RAF to retain fighter defences in the North. The striking forces available in Norway, as distinguished from those held for purely defensive purposes were:

- Long-range bombers 130
- Twin-Engine Fighters 30
- Long-Range Reconnaissance 30
- Total 190

The Luftwaffe Plan

8. Within the wider Combined Staff plans for the invasion, the task of the German Air Force was twofold. In the middle of July orders by the Air Force Operation Staff to the Luftflotten made clear the two main aims as follows

- (a) To eliminate the RAF, but as a fighting force and in its ground organisations.
- (b) To strangle the supply to Great Britain by attacking its ports and shipping.

The elimination of the RAF was to be accomplished in two stages. In the first place the fighter defences located to the south of the line between London and Gloucester were to be beaten

down, and secondly, the German offensive was to be extended by stages northwards until RAF bases throughout England were covered by daylight attacks. As part of the same plan, the daylight bombing offensive was to be directed against the British aircraft industry.

9. Elimination of the RAF and the British aircraft industry was to begin in early August, and the day for its launching was given the somewhat dramatic codename Adler Tag (Eagle Day). It was considered by the Germans that the first phase, the destruction of the RAF Fighter Command in the South would take four days and the whole process of eliminating the RAF four weeks. The invasion itself, with the Luftwaffe in full support of a Blitzkrieg type and with negligible opposition from the now beaten RAF was to be aimed in its greatest strength at the coast between the Isle of Wight and Dover. On August 6th Goering called a conference of the Luftflotte chiefs at Karinhall, as a result of which Adler Tag was provisionally fixed for August 10th, given favourable weather. The invasion itself could take place at sometime in the first two weeks of September.

The Opening Phases: Testing of Fighter Command

10. From June 25th, until the middle of July air attacks on England had been confined to scattered night raids and minelaying sorties – sometimes by as few as two aircraft on one target – directed mainly against the ports and centres of the aircraft industry. After July 17th, when the German Air Forces had been ordered to be at full readiness, activity immediately began to increase and in the ensuing four weeks worked up to a crescendo which marked the launching of the full-scale offensive on Adler Tag. Fliegerkorps VIII whose Stukas had distinguished themselves as the moving artillery barrage for the advancing armoured columns in France, was now given the task of closing the Western Channel to all British shipping by day. The heavy bombers would make shipping movements and port activity impossible by day and night, and aircraft would lay mines in shipping channels. In the last fortnight of July and in the early days of August shipping and ports in St George's Channel, the English Channel and on the East Coast were attacked on a mounting scale, while small numbers of aircraft continued with night attacks on the aircraft and associated industries.

11. From this time onwards the German bomber forces began to show themselves in greater strength over the English Channel, Straits of Dover and the south-east coast areas of England during daylight. Their activities were still, however, mainly confined to the ports and shipping and occasionally to coastal airfields. It was at this stage that the Luftwaffe began to test the qualities of the RAF fighter force and to embark on the process of wearing it down. Large German fighter formations were sent inland over England with the sole object of seeking combat. At first the response from RAF was satisfactory; formations of Spitfires and Hurricanes came up to fight, but they were at a serious disadvantage in that they were obliged to climb to combat height and were vulnerable from above. The close formation fighting tactics which they had adopted at this stage also put them at a disadvantage, but the RAF soon saw it as an error and its modified loose formations met with some success.

12. The small formations of 8 to 12 bombers with escorts of 9 to 30 fighters which attacked shipping imports in the area of south-east England during this period were also largely designed to draw the RAF fighters into combat. The larger formations were still being aimed mainly at shipping imports – for instance on August 8th two waves, respectively of 57 and 82 Junkers 87s with fighter escorts, attacked convoys off the Isle of Wight and on August 11th 38 Junkers 88s attacked the port installations at Portland and another heavy attack was directed against Dover. With the smaller formations, the duties of the escorts were to protect bombers, while the other fighters were detailed to inflict losses on the RAF fighters which attacked, weakening Fighter Command for the final test of strength.

13. The German losses at this stage were bearable, but the Luftwaffe was meeting with increasing difficulties. It was clear that the RAF was still an effective fighting force that was not suffering sufficiently heavy casualties in the actions on the coastal fringe. It became necessary for the German bomber formations to penetrate further inland so that the escorting fighters would be able to engage Fighter Command decisively. This deeper German penetration allowed more time to the defending fighters to climb to combat altitude, and so to fight on more equal terms. It was only at this stage the Germans realised that the RAF fighters were controlled from the ground by new procedure, for the intercepted R/T orders directing the fighters to the German formations with great accuracy.

14. The German intelligence appreciation of Fighter Command's control system circulated on August 7th to the operational commands, is worth quoting in full as an indication of the conceptions which led the Germans to mount large-scale penetrations in the belief that what they regarded as a rigid territorial control system could be swamped by mass attack:

As the British fighters are controlled underground by R/T the forces are tied to their respective ground stations and thereby restricted ability, even taking into consideration the probability that the Crown stations are partly mobile. Consequently, the assembly of strong fighter forces at determined points and at short notice is not to be expected. A mass German attack target area can therefore count on the same conditions of light fighter opposition as in attacks on widely scattered targets. It can, indeed, be assumed that considerable confusion in the defensive networks will be unavoidable during a mass attack, and that the effectiveness of the defences thereby be reduced."

In point of fact, RAF Fighter Command's control system was sufficiently flexible for the maximum number of fighter formations to be simultaneously and separately controlled within the zone of operations.

15. German intelligence was fairly well-informed on the order of battle and ground organisation of Fighter Command, and it is evident from the above quotation that they now knew the early warning radar system was connected with fighter control. The Luftwaffe had, however, neglected this aspect of the defence of Great Britain in their pursuit of the Blitzkrieg,

and Goering was in no mood to listen to any possibility of serious opposition to the Luftwaffe. The German fighter commanders who met daily at their Jafue headquarters to discuss and plan operations began to see the difficulties, and to realise that the 980 single engined and twin-engine fighters (Messerschmitt 109 and Messerschmitt 110) were insufficient to gain a decisive superiority over the 675 fighters which German intelligence estimated at the disposal of the RAF [Editor's note: RAF Fighter Command had 603 single-engined fighters operational on 15 July], and which could be used so economically with the aid of their efficient control.

16. As the preliminary stage drew to its close the German fighter forces found themselves seriously split. The Messerschmitt 110 twin-engine fighter was proving a failure as an escort fighter, being too vulnerable to the more manoeuvrable Spitfire and Hurricane. The fighter forces found themselves obliged to provide escort roughly 3 times as great as the bombers which they were protecting, and in addition more fighters had to be held back to meet returning bomber formations, so persistent were the RAF fighters in chasing the bombers to the French coast.

Adler Tag - The Battle Begins

17. Up to August 9th, it had been foreseen by the German Air Force Operations Staff that the launching of the full air assault on the RAF would begin on the 10th, but meteorological reports caused the day to be deferred until the 13th. Even on the day itself Goering had to postpone the start until the afternoon. It was then that large-scale bombing attacks began to be directed against RAF airfields in the South of England which were likely to be used as part of the defensive organisation of Fighter Command. The German scale of effort on August 13th by the aircraft of Luftflotten 2 and 3 was 485 bomber sorties and 1000 fighters. The bomber forces of Luftflotte 5 were brought into operation on August 15th, the third day, with diversionary attacks in the Newcastle area. On that day, and in the succeeding week, the scale of attack on airfields of all types in southern England was on the heaviest scale and great air battles were continuously fought over southern England. Meanwhile, the day and night attacks on ports and shipping continued, while the special targets of the aircraft industry were singled out for bombing.

18. The short range reconnaissance aircraft, which had been used with such effect in France, could not be employed over England owing to the fighter opposition, and the long-range reconnaissance units were unable for the same reason to produce a picture comparable to that which had kept the German High Command so well-informed in previous campaigns. Nevertheless, reconnaissance showed the landing areas and installations of many of the airfields vital to Fighter Command to be heavily damaged. In spite of this physical damage the RAF was still able to offer considerable effective opposition, and by the 19th of the month, when bad weather forced a five-day break in operations, the Luftwaffe seemed to be no nearer to forcing a decision.

19. In this phase of the battle German losses of both fighters and bombers had increased, but rapid replacement of both aircraft and crews allowed the rate of serviceability to be held

at a level which still permitted large-scale operations. On August 17th serviceability of the single-engined fighter units engaged, both in aircraft and pilots stood at 85% of strength as against 95% on July 15th; comparable figures for the long-range bombers, however, remained at approximately 70% throughout the period.

20. On August 20th, the German Air Force Operations Staff issued a further order to the forces engaged to continue the fight against the RAF. They were to engage in ceaseless attacks which would force the British fighter formations into combat and reduce their strength. Special attention would continue to be paid to the ground organisation, as well as to the aircraft and aluminium industries and rolling mills. When, on August 23rd the weather improved, the attack was once more opened on the RAF ground installations. Reconnaissance had shown that the main forces of Fighter Command had been withdrawn to the area surrounding London, and the main strength of the German attacks were shifted accordingly.

21. It was now that the bombers began to suffer more heavily, both in losses and in damaged aircraft. Their armament was not sufficient to discourage fighter attack. Their escorts, primarily the Messerschmitt 109 found themselves troubled firstly by limited endurance, which could not permit more than a short period of combat en route or over target areas, and secondly by the rapidly improving fighter tactics of the RAF. The Messerschmitt 110 twin-engine fighter which had seemed to the Germans to be ideal for long-range escort purposes, was forced into defensive circles by the RAF long before the bombers had reached the target. It soon became necessary for the Messerschmitt 109 to protect the Messerschmitt 110s as well as the bombers. The twin-engine fighter units continued to make fantastic claims of victories – which in the prevailing Blitzkrieg spirit were believed – and the Messerschmitt 110, which should have been withdrawn at this stage, was allowed to continue operating. The Junkers 87 dive bomber too proved costly failure in attacks on Dover, on shipping in the English Channel, and on airfields near the south coast. On August 19th Fliegerkorps VIII, which possessed 220 of the total of 280 Junkers 87s engaged was withdrawn from the Cherbourg area and put under the control of Luftflotte 2 in the Pas de Calais area. This move, besides pointing to the realisation by the Germans that the dive bombers had been a failure in attacks on shipping, was in effect a new disposal of forces in preparation for the invasion itself. The dive bombers were now in place to provide tactical position for army support in the coming invasion operations in a similar manner to the continental campaigns.

22. At the end of August the RAF was still inflicting damaging losses on German attacking forces while little progress was being made in the Luftwaffe programme – already far behind schedule – in its first aim of destroying Fighter Command within four days, and little nearer to its secondary aim of achieving mastery of the air by mid-September. The German Air Force Staff conference, at which Kesslering and Sperrle, as Air Officers commanding of Luftflotten 2 and 3 were present, was held early in September at The Hague. The directive of August 20th to bring the British fighters to an exhausting combat, had been pursued but still no decision had been obtained over the RAF. Doubts now began to rise as to the true

strength of Fighter Commands' forces. Kesslering gave his opinion that the RAF was finished, but Sperrle thought it still had 1000 aircraft at his disposal. The Chief of Intelligence had taken serviceability towards the end of August to be as low as 100 fighters, in spite of reinforcement from the Midlands and the North, but considered that the rest imposed by bad weather had allowed a recovery to about 350. The pilot position, the RAF's true difficulty, was not considered, in spite of the fact that intelligence had established that bomber pilots were being called in to replace losses.

Second Phase: The Bombing of London

23. The creation of the hoped-for conditions for invasion had not been, and possibly could not be, brought about by pursuing the original twofold plan. On the night of the 25th RAF bombers had attacked targets in and around Berlin and Hitler, in a speech on September 4th, seized upon this attack as an excuse for announcing his intention for the revenge bombing of London. According to the rigid pattern of previous campaigns, where the Polish and Dutch army capitulated after the bombing of the main centres of population and the Danish government capitulated at the threat of such a bombing, it was hoped that similar tactics would paralyse the British Government into submission. Hitler's order to the Luftwaffe, dated September 2 – two days before his speech – directed the attack should be made on the populations and defences of the large cities, particularly London, by day and night.

24. This decision was in part the admission of failure by the Luftwaffe High Command, but at the same time Goering still hoped that the RAF fighter arm might be finally exhausted and another turn of fortune would produce a victory at the last moment. On the afternoon of September 7th a force of 372 long-range bombers escorted by single and twin-engined fighters attacked thickly populated areas of the docks in East London and caused large fires and considerable damage. On this day the German fighters made 642 sorties and that night 255 bombers followed up with an attack on the same area, which was still illuminated by the fires of the daylight attack. During the succeeding days and nights forces of similar strength – although never reaching the scale of September 7th – were in operation and extended the target area to central London generally. On September 9th for example, 230 bombers and 529 fighters operated by day, and on the 15th, 123 bombers and 679 fighters by day and 233 bombers by night. (Towards the end of August, 120 bombers under Luftflotte 5 had been transferred from Norway and added to the strength of Luftflotte 2).

25. Again German losses began to be serious, and differences of opinion arose between the bomber and fighter arms, with accusations and counter accusations which caused the direct intervention of Goering in the dispute. The fighter arm wanted an escort system of loose formations built up of elements of four, with top cover and a freelance patrol at high altitude to engage the RAF fighters before they could attack. The bomber arm, whose losses were causing anxiety, wanted close escort in twos or threes with a form of wider escort in close formation and the addition of top cover. In the opinion of the fighter arm such escort was too rigid and precluded any early engaging of the attacking fighters. In addition, the bombers flew altitudes

of 21,000 feet to 23,000 feet to avoid anti-aircraft fire, at which height they were slow and were loaded with bombs. The low speed further increased the difficulties of the fighters, which were forced to weave continuously to maintain the required close escort. The weaving, which at intervals took fighters away from the bombers, apart from further limiting their own endurance, made the bomber crews more nervous, and resulted in them demanding through Goering a still closer escort. Goering, who had allowed himself to be influenced by the bomber arm, promptly gave orders accordingly.

26. The single and twin-engine fighters were to be bound to the bombers and could not leave until attacked, giving RAF fighters the advantage of surprise, initiative, altitude, speed, and above all fighting spirit. The German fighter men pressed Goering to give way to their point of view. The whole of their experience gained from the Spanish war onwards was being thrown away. Goering, however remained adamant, and the bomber arm as well as the fighter arm – already badly shaken by the superiority of the Spitfire – suffered accordingly.

27. As September drew to a close the Germans found that the large bomber formations were not paying a dividend comparable to the losses, and on the 27th of that month there was a change of tactics involving the sending of small bomber forces composed of about 30 of the fast new Junkers 88 bombers escorted by 200 to 300 fighters. In this period German indecision was clearly demonstrated by the manner in which one form of tactics gave way to another in a groping attempt to achieve satisfactory results. The mass formation attacks have now given way to smaller and smaller bomber formations with ever greater fighter escort. Daylight bomber operations then began to give way to the fighter-bombers operating singly and in small groups, penetrating as far as the London area. It had still been possible to maintain a fair rate of serviceability in the units engaged – single-engine fighters had dropped by the end of September to 68%, and long-range bombers to 52% of aircraft and 68% in crews – but the continual drain on strength at the steady rate from July the 15th onwards could eventually lead to a serious situation.

28. Early in October the Luftwaffe was glad of the excuse of deteriorating weather conditions to call off daylight operations. It was Goering himself who made the decision. The Battle of Britain had been lost to the Luftwaffe, although nobody would admit the fact, but it was still hoped Great Britain could be worn down to the point of capitulation by resorting to mass night attacks on its industrial cities and by making seaborne supply impossible through the destruction of the main ports, and by sea mining and shipping attacks.

Factors in the German Defeat

29. The foregoing account about the Battle throws light on the main factors which contributed to the defeat of the Luftwaffe. The main factors may be summarised as follows.

- (a). A fundamental failure in German air strategy and policy, which

concentrated on the doctrine of attack, and thereby led to a disproportionate weakness of the fighter arm as opposed to the strength of the bomber and dive bomber forces. The armament of the German Heinkel 111, Dornier 17 and Junkers 88 bombers which, in conjunction with the speed, had been relied upon in part to offset the deficiency of the fighters, proved inadequate and led to a wasteful use of the limited strength of the fighter escort to disastrous quarrels at a crucial point in the battle.

(b). A lack of foresight in planning the strategic use of air power in circumstances which involved the large-scale employment of big escorted formations against strong defences.

(c). A lack of appreciation by German intelligence of British early warning radar system and its possibilities when employed in conjunction with the control of the defensive fighter forces.

(d). German failure to take sufficient account of the fighting qualities of the Spitfire and the Hurricane, which had first become evident in France and over Dunkirk. The single and twin-engined fighter force employed in the Battle of Britain – which was thought to be ample in strength – was consequently outclassed when first rate aircraft were combined with the British system of plotting and fighter control.

(e). A misconception of the fighting power of the Messerschmitt 110 twin-engine fighter. Dependence had been put on this type for long-range escort work, when it failed, the Messerschmitt 109 single-engine fighters had not sufficient endurance (the drop tank employed later in the war had not yet been developed) nor were they sufficiently numerous to press the battle on to the London area and beyond.

30. It must be fully appreciated that opinion in the Luftwaffe, and indeed the whole of the German forces, after the rapid continental victories, ignored the mere possibility of any serious opposition to the great and victorious Luftwaffe. Goering himself was dazzled by his own self-esteem, and the whole of the Luftwaffe were subconsciously affected in their judgement by the outpourings of the German Propaganda Department. The German fighter men had begun to see the possibility of a tough adversary in the Spitfire and Hurricane, but the series of easy victories from Poland onwards had prejudiced their judgement in assessing the capabilities of the RAF; indeed anybody who as much as hinted at the possibility of a fighter superior to the Messerschmitt 109 incurred the risk of the serious disapproval of his superiors.

31. The attitude of Hitler and Goering themselves, rather than any lack of foresight on the part of the German Air Force General Staff, may be said to have been responsible for the launching of the offensive on Great Britain with a minimum of forethought. The probability that the employment of large forces of bombers with fighter escort over England would meet

with a new set of conditions was ignored in an almost incomprehensible mood of confidence. The experience of escorted bomber operations during the campaign in France was thought to be adequate, and consequently the Battle of Britain was begun without the advantage of preliminary planning, preparation of tactics, and training of aircrews. When the new conditions were encountered the inevitable result was confusion, friction, accusations and counter accusation.

32. The existence of the British radar system had certainly been known to the Germans at some point before the war – the airship Graf Zeppelin during its peacetime cruises had been charged with obtaining data on the transmissions – but the secret of the highly developed plotting system linked with fighter control had been well-kept by the British.

33. A similar set of conditions applied to the bomber force. From the Spanish Civil War onwards the Junkers 88, Dornier 17 and Heinkel 111 had been able to outpace any existing fighter and, as the Luftwaffe had air superiority in all succeeding campaigns, it came to be accepted that bombers could look after themselves. It was not until after the assault on Fighter Command had opened that the strength of the British defensive fighter force was realised; but then it was too late to put heavier weapons and armour into the bombers. In a flash it was found that the use of powerful fighter escort was essential to counteract this shortcoming, but at this critical juncture the fighter force proved to lack the necessary strength, while a substantial part of it, the twin-engine fighter was more a liability than an asset. The German failure to foresee that the bomber types were not immune from fighter attack was one of the main factors in losing the battle. The consequence of this inadequate equipment was, that with the twin-engine fighter a failure and with the single engined fighter possessing inadequate range, the attempt to follow up the destruction of Fighter Command – a real threat in the early stages – failed once Fighter Command withdrew its bases beyond the effective escorted range.

34. Thus, by early October when the Luftwaffe began to throw the weight of its bombing effort into night attacks on ports and cities, its General Staff had dropped the original first objectives of destroying the fighter defences in the South and then the RAF itself. The new aim was to bomb Great Britain into submission by direct attack on its civilian population and its whole war economy. The one objective to which the High Command held throughout the Battle of Britain, and continued to hold during the subsequent night assault, was the continuous attack by small numbers of bomber and minelaying aircraft on shipping and ports.

35. In studying the German bombing and selection of targets to be bombed, the question arises as to whether the German bomber force was used strategically or tactically. The answer is that the Germans were not clear themselves. The opening aim of bomber forces was certainly tactical and had it achieved success the invasion could have taken place and operations could then have followed the familiar Luftwaffe pattern. As it was, with the failure to achieve the two opening objectives, German thinking became confused in the extreme. They were forced into improvisation on their original plan and the Chief of Air Staff found it

impossible to draw up any clear alternative amidst the conflicting opinions and advice thrust upon Goering from all sides. The Navy demanded minelaying and attacks on shipping. The original programme called for the bombing of British aircraft industry. Other industrial experts suggested concentrating on the railways, blast furnaces and the Sheffield steel industry; the Chief of Intelligence tried to draw attention to a ponderous and academic work called the Blue Study which set out British industrial undertakings in essential services such as gas and sewerage and their relationship to the country's economy. Hitler, above all, wanted the destruction of cities and revenge for the RAF's bombing of Germany. Hitler had his way, but attempts were at the same time made to attack targets of a strategic and even a tactical nature. Thus, by the time the true Battle of Britain had passed, the air war had moved by gradual stages from tactical to strategic and then to nothing but an attempt to produce a quick victory by an attack on civilian morale. When the latter bid fair to fail the Luftwaffe continued with a combination of planned strategic bombing and attacks on cities.

The “Blitz” on Great Britain October 1940 to May 1941

Night bombing of British cities

36. In the Luftwaffe assault on Great Britain between July and November 1940, the changes from one form of attack to another were the clearest indication of the Germans' continuous search for new expedients to replace each successive failure. The various phases of the assault cannot, however, be said to follow one another in any clear-cut sequence. From September onwards the daylight offensive against Fighter Command continued on a gradually reducing scale, heavy bomber attacks giving way to raids by escorted fighter-bombers. During the same period the attempt to produce a quick surrender of the British Government by massed raids on London was followed by a full-scale night assault on the capital. In November, this assault on London spread to other British cities and centres of industry. The attack alternated between a pure attempt to break the nation's morale and carefully planned strategic assaults on supply and production. These phases of the night assault, beginning with the raid on London on September 7th and dragging on through the winter to cease finally in May 1941 came to be known in Great Britain as the Blitz.

37. The main reason why the Germans finally threw their heaviest effort into night bombing was that during September losses and damage to aircraft in battle were causing serviceability in the bomber force to fall at such an alarming rate that night operations, with their comparative immunity from fighter attack, were the only alternative. The large-scale night bombing can only be said to have been an improvisation forced upon the German Air Force Staff, and it had only been foreseen by a few – much less by Goering. The German objectives at this stage still remained clear, however; London was to be pounded to the point where the Government would find it impossible to continue the war in the face of a collapse in civilian morale.

38. For the Luftwaffe, night bombing immediately brought with it the additional problem of navigation and bomb aiming. The German bomber force, with the exception of a few specialised units, not only lacked training in night bombing, but the loss of a large proportion of its more experienced crews during the prodigal days of the Battle of Britain had, by October, seriously reduced efficiency. The Germans, however, considered that any lack of training in night navigation and bomb aiming would be more than compensated by the employment of their recently perfected radio bombing beams. These beams – a novelty in aerial warfare – had been under development at least since 1937, and had been used in one form experimentally in Poland, and in another form had been employed occasionally against special targets in the United Kingdom since the fall of France. Yet another form was reaching the operational stage early in October. The beams had been devised as aids to daylight bombing in cloudy weather. It was the fact that they were available which gave the Germans the fortunate opportunity of continuing the assault.

39. The premature use of each of these bombing beams over England from June onwards had in turn compromised the secrecy and once they began to be used in massed bombing attacks, British radio countermeasures robbed them of much of their effectiveness. Quarrels, uncertainty and improvisation again beset high quarters in the Luftwaffe and resulting confusion in the policy of employment of the beams. Added to this, the ever present differences of opinion as to selection of targets, produced – with a few notable exceptions such as Coventry – a lack of concentration of bombing effort, a failure to pursue advantages gained after bombing certain types of target, and a continually improvised plan of campaign. The winter assault, although on a massive scale, gave the British civilian population time to recover from attacks, and the damaged industries opportunity to repair, improvise and disperse.

The Strength of the Bomber Force

40. The bomber force available for the Blitz comprised the same units of Luftflotten 2, 3 and 5 as had been engaged in the Battle of Britain, with the addition of some 90 aircraft which had meanwhile been held in Germany. A strength of about some 1300 bombers were available on paper but serviceability during August and September had reduced effective strength to a maximum of about 700. During the whole of the Blitz period the Luftwaffe was never able to recover its bomber serviceability, which remained around 50%. The reduction in wastage of aircraft in battle was offset by an equal wastage due to bad landings at night on airfields – many in France – as yet undeveloped for night flying and for use in wet weather.

Brief Appearance of the Italian Air Force

41. The RAF had in the meantime been causing Mussolini some embarrassment by the continual bombing of the industrial centres in Italy, such as Turin, with bomber aircraft based in England. It was a political gesture as much as a serious military effort, Mussolini dispatched 40 BR20 bombers and 54 CR42 single-engine fighters to bases in the Brussels area, where they could take part in the assault on England. This force arrived early in October and making use of German radio networks, opened in early November with a night bombing sortie by 24

bombers on the south coast of England. On November 11th, a force of 10 bombers escorted by some 40 fighters attempted to attack the harbour installation at Harwich. Losses to both bombers and fighters were heavy, and the next sortie by 10 bombers on a convoy off the Essex coast on November 17th had an additional heavy escort of German fighters.

42. November 23rd saw the last Italian attempt at an attack in the form of fighter sweep over the Kentish coast; some Italian bombers also took part in the raid on the same night. After that the Italians withdrew to their own country, and never again flew against England.

The Assault, and the Bombing Beams

43. After the mass daylight attack on London docks on September 7th the Luftwaffe continued to make London its main target. On every day during the remainder of the month there were raids by bomber forces varying from 35 to 280, and on every night by 60 to 260 bombers. By the early part of October, when attacks began to be confined to the hours of darkness, the Germans began to realise that the bombing beams on which they founded their hopes – the Knickebein – which they were employing over London was being seriously upset by British radio countermeasures. Although they had the 2 other types of beam, the “X” – first employed in Poland – and the “Y”, these could not be employed as could the Knickebein for navigating large forces of bombers to a target. For the transmitting equipment available on the Western continental coast for “X” and “Y” beams was insufficient for this purpose, and the rather more complicated training which their use entailed had only been confined to two specialist units.

44. With the realisation that the Knickebein system was being rendered useless in massed attacks, the Germans adopted a temporary measure of relying upon periods of bright moonlight for large-scale raiding, when the bomber forces could see their target area and could navigate independently. Such was the totalitarian discipline, nobody dared to admit the failure of the Knickebein, and during the early part of October nightly assault continued on London by forces of bombers of an average strength of 200. On the 9th of that month, however, orders were passed to the Luftflotten to prepare for large-scale raids on London during the full moon period in the middle of the month. The first of these raids was a heavy one by 1940 standards and was aimed at London by 487 aircraft carrying 387 tons of high explosive bombs and some 70,000 1-Kilogramme incendiary bombs. On succeeding nights the attack was repeated with forces of 307, 150, 303 and 320 bombers. The Luftwaffe was hammering London to produce the expected surrender, but the effects of the bombing were too scattered to produce large-scale destruction. The Germans also began to realise that the high explosive bombs they were employing, by far the larger percentage of which were 50 kg, were not sufficiently destructive. They resorted to the use of parachute sea mines where their powerful blasting effect somewhat compensated for this shortcoming, but their inaccuracy when released from great heights could not improve concentration of attack. The realisation of this partial failure and the fact that London civilian morale had not collapsed brought another change in policy, this dictated by Goering.

The Final Plan of Strategic Bombing

45. If Great Britain could not be beaten down and invaded immediately, at least she must not be allowed to gain time for replacing the army lost in France or for increasing her war production. Goering took the decision in early November to extend the Luftwaffe effort to long-term attrition against the whole British industrial effort. The objective was to destroy the main industrial centres with their populations. Parallel with this new plan had come the decision to employ the "X" beams in massed attack. KG 100, the one specialist unit capable of using this system would act as target finders. Aircraft of this unit were to proceed ahead of the main force and, acting on highly accurate bomb aiming data supplied by the beams, light the target areas with incendiary fires to permit visual bombing by the main force.

46. Once more the Germans were beset by quarrels in high places, with attempts by protagonists of the "X" and "Y" navigational systems to force their sole operational use. The result was that both systems were employed and, like Knickebein, were introduced prematurely so that their effect was largely impaired by the inevitable British radio countermeasures. The latter led to further quarrels and uncertainty was extended to the operational units. It brought about a general lack of confidence in the ability of the fire raising units to find their targets accurately. The Germans had only now come to realise that the British were using the only powerful defensive weapon which they possessed at that time – radio countermeasure. The radio high-frequency war, which was to have such a far-reaching effect on the Luftwaffe strategy had begun. It found the Germans unprepared.

47. From mid-October onwards the nightly attacks in London continued with an average strength of 150 bombers and with occasional employment of Knickebein. Reliance was placed on the surprise element. Early in November, however the new plan for strategic bombing was launched by Goering in a new set of orders given to the Luftflotten as follows.

1. London to remain main target
 - (a). In daylight attacks by escorted fighter-bombers and when there is cloud cover by single bombers
 - (b). In night attacks of equal forces of Luftflotten 2 and 3.
2. Attack industrial areas of Coventry, Birmingham and Liverpool by small forces at night.
3. Mining of the Thames, Bristol channel, Mersey and Manchester shipping canal by Fliegerkorps IX.
4. Destruction of the Rolls-Royce aero engine works at Hillington (Glasgow) by a Gruppe of KG 26 (using 'Y' for target finding).

5. Damaging of enemy fighter arm by fighter sweeps.
6. Attacks, with fighter escort on convoys in the English Channel and on assemblies of shipping in the Thames.
7. Destruction of the enemy aircraft industry by special crews of Luftflotten 2 and 3.
8. Attacks on enemy night fighter bases.
9. Preparation for attacks on Coventry, Birmingham and Wolverhampton using "X" beams.
10. Bomb load in proposed two large-scale attacks on London –
 - (a). Half with heavy and heaviest bombs
 - (b). Half with incendiary bombs

This plan shows the beginning of the use of "Y" beams by small numbers of aircraft against special targets and of "X" beams in the large-scale attacks on Coventry, Birmingham and Wolverhampton (the latter cancelled owing to prior British knowledge). The fire raising aircraft of KG 100 (at that time based at Vannes in Brittany), preceded the main forces. The attack on Coventry took place on November 14th and was undertaken by a force of 469 bombers, carrying 420 tons of high explosive bombs and large numbers of incendiaries. This raid marked the first operational use of the "X" system for pathfinding and was extremely successful. The Birmingham attack, by over 700 aircraft, took place on the 19th and was followed during the remainder of that month and December by a succession of large-scale raids on London, Bristol, Plymouth, Liverpool, Southampton and Sheffield.

Burning of the City of London

48. The year 1940 closed with a sharp attack on London in the evening of December 29th. The raid was called off by the Germans some two hours after its commencement owing to a deterioration in weather conditions, nevertheless, in this short attack the main part of the City area of London was destroyed by fire. It is interesting to note that, contrary to common belief the raid was not a premeditated attempt on the part of Goering to destroy the City of London by fire – no order to that effect appears to be in the German staff documents covering this period – but was to be merely another routine night raid on London. That evening the "X" beam was, in fact directed on London as an aid to navigation by KG 100 the Pathfinder force, but the line of the beam was actually laid in a south-eastern north-west direction over the Charing Cross Road and Tottenham Court Road. A fresh south-west wind was blowing at the time and the Pathfinders, evidently giving insufficient allowance for this wind, placed the first incendiary marker bombs about a mile east and immediately to the north-west of St Paul's

Cathedral. Aircraft of the main bomber force, seeing the resultant fires, contributed a load of high explosive and incendiary bombs without further question, and so the City of London burned.

The Main Ports As Targets of Attack

49. By December, London had ceased to be the main nightly target for attack, and the assault continued on the main ports and industrial centres, albeit with varying success owing mainly to the growing British mastery of the "X" beam and the development of elaborate decoy fire systems near main target areas. By January the general lack of confidence in the navigational bomb aiming systems was such that, for the next three months, German aircraft only penetrated to inland targets in force during moonlight. The main attention of the Luftwaffe was focused on the chief ports, such as Plymouth, Bristol, Swansea, Cardiff and Hull over which the beams could still be employed with minimum disturbance.

End of the Blitz: Withdrawal of Bomber Forces

50. In April, 1941, the Balkan campaign was already underway, and some of the bomber units in the West, amounting to a total of about 150, were quietly withdrawn from France and north-west Germany. Other types of aircraft such as dive bombers, single-engine fighters and reconnaissance had already been taken southwards during the winter and early spring. Fliegerkorps X had moved from Norway to the Mediterranean at the end of 1940 in order to reinforce the Italians in their attempt to deny the Mediterranean to British shipping. During May 1941 preparations for attack on Russia were already afoot and some ground units of Luftflotte 2 and then some of the flying units were being moved eastwards. As a cover for these moves there were raids on Great Britain accompanied by spoof radio traffic to simulate larger forces. On May 10th, a large-scale night attack was launched on London as a demonstration that if there were rumours of moves, the Luftwaffe was still facing Great Britain in strength. The raid, the heaviest of the whole of the Blitz was made by 550 aircraft – a scale achieved largely by double and even treble sorties on airfields in France and Belgium. They carried 708 tons of high explosive bombs and 86,700 incendiaries, and caused tremendous damage in Greater London. Three nights later the raid was repeated in similar strength.

51. At the end of May, Kesslering moved the whole of Luftflotte 2 to the East in readiness for the attack on Russia. The bomber units of Fliegerkorps IV and V were also withdrawn from Luftflotte 3 leaving only a small mixed force of bomber reconnaissance and minelaying aircraft, together with single-engine fighter forces for defensive purposes in France and Holland, to continue with a holding war against Great Britain. The programme for the beating of Great Britain had overrun its time and, although considerable damage had been brought on the cities and industry, the time for the hoped-for collapse had passed. The Germans had every opportunity to bring Britain to her knees but failed because they had no firm and continuous policy of attack. Had the Germans been prepared for radio warfare, the navigational beams, themselves an improvisation in their application to night bombing, could have achieved disastrous damage to British cities and industry. The lack of policy at staff level had all too

frequently resulted in allowing hard-pressed cities to recover from large-scale attacks when one more attack would have produced complete breakdown. The only solution now lay in starving Great Britain of food and supplies by combined air and sea attack on shipping and waiting for or forcing surrender after the expected defeat of Russia in the autumn of 1941.

The Anti-shipping Campaign and the Battle in the Atlantic 1939 to 1942

Development of Shipping Attack

52. Early in 1939 there existed in the High Command of the Armed Forces a vague conception of the possibility of combined air fleet operations, but ideas had not yet crystallised to the same extent as in the case of combined army and air force operations. The aircraft had indeed been considered as a means of laying minefields in the high seas and trials had taken place, but with negative results. Minelaying was still regarded as a strictly naval affair and there was no clear conception of aerial minelaying in shallow coastal waters and harbours. Bombing, too, had progressed little further where shipping attack was concerned, though early in 1939 courses of training for bombing of ships were held over the North Sea. A Junkers 87 dive bomber unit was envisaged for the new aircraft carrier Graf Zeppelin. In torpedo attack with sea planes slight progress had been made, but development was handicapped by the unsuitability of the existing naval torpedo for airborne operations and the personal prejudices of Udet. The torpedo bomber did not come into its own until 1942.

53. The German Air Force as a whole, with the exception of its fleet reconnaissance units, remained completely untrained in navigation over the sea and in August 1939, was unprepared for anti-shipping warfare. The Fleet reconnaissance units comprised a small elite of Fleet Air Arm officers and men who had been drawn almost entirely from the Navy and the Merchant Service. They were already highly trained in sea navigation. The command of these forces lay within the hands of General der Luftwaffe beim Oberkommando der Kriegsmarine (Air Officer with the Naval High Command) who was responsible for equipment training and operations. Operations would always be in cooperation with the Naval High Command. Subordinate to Ob. d. M were the Fuehrer der Seeluftstreitkraefte (Air Officer Commanding Fleet Air Arm) East and West whose retrospective areas of responsibility corresponded to those of the equivalent naval commands. The forces at the disposal of the Fleet Air Arm at the outbreak of war were an establishment of 220 aircraft. Many of the types available were obsolescent. The Heinkel 59 a twin-engine biplane with float – for minelaying and torpedo work, the Heinkel 60 single engined biplane seaplane for close range and shipborne reconnaissance, and the Dornier 18 twin-engine flying boat for long-range reconnaissance were all due for replacement with more modern types. Experimental formations of Junkers 87 dive bombers and Messerschmitt 109 single-engine fighters existed in readiness for aircraft carriers.

54. In the late summer of 1939 the Luftwaffe General Staff became convinced of the necessity of providing modern bombers for attacking enemy naval forces which might attempt to enter the German waters, as well as the possibility of bombing of British warships in their own anchorages where German naval forces could not penetrate. The Fleet Air Arm could not be employed for this purpose as it possessed neither the crews, training or necessary aircraft, besides which the Naval High Command was prejudiced in favour of the employment of aircraft solely as the eyes of the fleet. The only alternative was to train crews of the Luftwaffe bomber force in navigation over sea and in attacks on ships. The first step in this direction was taken when General Geisler (later to become Air Officer Commanding of Fliegerkorps X) who was appointed in April, 1939, and General Special Purposes Luftflotte 2 at Kiel and was charged with organising the Luftwaffe anti-shipping forces.

55. Two Luftwaffe bomber units KG26 and KG 30 equipped respectively with the Heinkel 111 and the Junkers 88 – the latter the most modern bomber aircraft – were chosen to undertake shipping attack. The best possible crews were selected, who after receiving the necessary training, began operations as soon as war broke out. No previous background and experience in the bombing of warship existed, and the small band of enthusiastic officer pilots engaged in these operations evolved and perfected their own methods of attacking warships in the North sea and at the anchorages, mainly at Scapa Flow and the Firth of Forth. The extension of these activities to convoys of merchant shipping was a natural and obvious step and the successful results achieved in convoy attack began to have their effect on the German Air Force Staff.

56. General Geisler's small command under Luftflotte 2 was elevated and became Fliegerdivision 10, with Major Harlinghausen as Operations Officer. The reconnaissance units of the Fleet Air Arm cooperated closely with Fliegerdivision 10 and reported targets for attack, but still operated under the orders of the Naval High Command. As 1939 drew to a close the bomber units KG 26 and KG 30, were being rapidly expanded and each reached a strength of some 40 aircraft. In February 1940, General Geisler's Division was again upgraded to become Fliegerkorps X. With the experience in tactics of shipping attack now accumulated, the Fliegerkorps had come to be recognised as an expert in the field, was the obvious choice for leading the Luftwaffe the Norwegian campaign in April 1940.

Development of Minelaying

57. Parallel with the development of shipping attack by bombing, a small nucleus of enthusiasts in the Fleet Air Arm, without any direction from above, was evolving new tactics for aerial minelaying. In August, 1939 General Coeler, the Air Officer Commanding Fleet Air Arm West, was given operational command under Ob d M of the whole Fleet Air Arm and took over the title Air Officer Commanding Fleet Air Arm. General Coeler immediately began agitating permission to conduct aerial minelaying operations in British ports and coastal waters. This permission was finally granted by the Navy, and after agreement as to the areas of operation, his Heinkel 59s began to lay naval mines in the Downs, Thames estuary and

off Sherness. At this time the Navy demanded prior approval of each and every sortie, but finally General Coeler obtained permission to continue with independent operations. A firm agreement with the Navy provided the Fleet Air Arm also to cover such shallow coastal waters as were out of reach of naval vessels. These waters included the Clyde, Firth of Forth, Plymouth, Liverpool and Belfast.

58. The Luftwaffe High Command had as yet no interest in minelaying and there was nobody but General Coeler and his staff who were competent to pronounce judgement on the subject. From September, 1939 onwards the Heinkel 59s of the minelaying units were replaced by Heinkel 111s and Dornier 17s, but as operations were extended the British defences began to develop and losses began to mount up. This brought the personal interest of Goering who in mid-December, 1939 called General Coeler to headquarters to give an explanation. Coeler succeeded in pointing out that though losses were heavy, successes against British shipping were correspondingly great. The result of the interview was that Goering became convinced of the usefulness of minelaying and undertook to create a special Luftwaffe command for minelaying forces. In February 1940 this command was formed and named Fliegerdivision 9.

Decline of the Fleet Air Arm

59. On the formation of Fliegerdivision 9, the unit of the Fleet Air Arm which had been responsible for developing minelaying was withdrawn from the command of Ob d M and the direct influence of the Navy. This move marked the beginning of the disintegration of the Fleet Air Arm, a tendency which became more pronounced between the latter part of 1940 and 1942 as one unit after another was seconded to the Luftwaffe proper and then absorbed. There was much disagreement between the German Air Force and Navy staffs as to the functions of the Fleet Air Arm. The Navy always maintained that these forces should be employed solely for fleet reconnaissance. As one unit after another converted to land-based aircraft and then added bombing to its reconnaissance duty, losses were suffered which the coastal training schools were unable to keep pace. The Luftwaffe supplied replacement crews from the bomber schools and obtained a lasting grip on the units. The Norwegian campaign saw an acceleration of this tendency as many of the Fleet Air Arm reconnaissance units were thrown into the common effort of shipping reconnaissance and bombing, and then seconded to the Luftwaffe never to be returned.

60. The Navy held to its Fleet Air Arm theories until the end of the war. The Luftwaffe and Goering however failed to employ to the full advantage the anti-shipping forces which they had built up or acquired. From the time of the fall of France and through the Battle of Britain and the Atlantic these forces were continually devoted to overland bombing duties. This misuse of forces was largely due to the weakness of Ob d M Felder who failed to form a coordinated anti-shipping command from the forces which were at hand. Another important factor was that the two and then three front war which the Luftwaffe was fighting could not allow sufficient forces to be dispersed in the West for a simultaneous assault on Britain and her shipping.

From the Norwegian campaign to the Battle of Britain

61. At the opening of the Norwegian campaign, the Luftwaffe anti-shipping forces had reached a recognisable stage of development. As Fliegerkorps X was leading the Luftwaffe in the campaign, its forces were inevitably expanded by the addition of bomber, dive bomber and fighter units seconded from other Luftflotten. The nucleus of specialised shipping attack units, however still continued with the task of attacking the British Navy at its bases and supply traffic between Great Britain and Norway. The Fleet Air Arm, continued the conversion of its aircraft and obsolete types to the Heinkel 115 floatplane and the Heinkel 111 and Dornier 17. The reconnaissance activities of some of its units had been extended to bomber reconnaissance and experimental torpedo carrying.

62. During the campaigns in the low countries and France the aircraft of Fliegerkorps X continued their attacks on naval and merchant shipping and improved the tactics and the bombing of coastal convoys in British waters. The large force which Fliegerkorps X had taken to the battle of Norway was, however no longer available, and for anti-shipping work the Fliegerkorps was reduced to its two original units KG 26 and KG 30. The bomber and other forces were largely withdrawn to take part in the campaigns for Holland, Belgium and France. Fliegerdivision 9 was able to increase minelaying forces after the fall of France by a whole Geschwader of some 100 Heinkel hundred and 111 aircraft – KG4 – which had taken part in the Norwegian and French campaigns as a bomber unit. In the period of preparation for the Battle of Britain in late June and July 1940, planned minelaying operations were continued on increasing scale and the successes claimed for the minelaying justifiably high.

63. When the Battle of Britain opened on August 13th, shipping attack became part of the campaign as a whole. At the outset the forces of Fliegerkorps X in Norway continued with their attacks on the British Fleet and convoys, but the full effort of the Luftwaffe was soon thrown into the bombing effort. The minelaying forces of Fliegerdivision 9 (raised to the status of Fliegerkorps IX in October), as well as the anti-shipping units of Fliegerkorps were withdrawn from Norway and attached to Luftflotte 2 to swell the bomber forces. Conversely, other Luftwaffe forces such as the dive bombers of Fliegerkorps VIII were thrown in for attacking both shipping and land objectives. The whole concentration of effort this time was on beating down the RAF and the aircraft industry and then on bombing Great Britain into surrender. It was not until March 1941, when the chances of a quick decision against England began to vanish, that the Luftwaffe Operations Staff turned its full attention to the supply of Great Britain from the sea.

64. A blockade of Britain had now become inevitable and a plan for shipping attack was accordingly evolved for the first time as a clear and single objective, however, Fliegerkorps X had been withdrawn for a move to Sicily and attention already turned to the Balkans, with Russia in the background, so that the forces which would be available to pursue this plan would sooner or later have to be seriously depleted.

‘Despised and Neglected’? - British Fighter Defence, 1922-1940

By Group Captain John Alexander¹

Seventy-five years after the Battle of Britain, the conventional wisdom remains that the Battle was won by the innovation of the ‘Dowding system’, which integrated radar and eight-gun fighters, and the skill and courage of the RAF’s fighter pilots. This article examines the design of the London Air Defence Area in 1917-18, the formation of the Home Defence Air Force in 1922-23 and the reorientation of Britain’s air defences to face Germany in 1934 to demonstrate that Britain continuously developed strategic air defence from 1922 to 1940 because of the alignment of both political imperative, defence strategy and the RAF’s institutional air defence expertise. While successive Chiefs of the Air Staff favoured strategic bombing, the RAF, formed in 1918 to prevent German raids on London, had many air defence experts and advocates. Therefore, while strategic bombing was largely unproven and its impact exaggerated, air defence was based on lessons from the First World War, and increasingly on science, operational research and operational evaluation. Furthermore successive British governments, not just Chamberlain’s, pursued a deliberate defensive strategy, recognising Britain’s strategic vulnerability to the bomber and public anxiety, while seeking to use Britain’s technical, industrial and air strength in a long war and avoiding a bloody continental commitment. This combination ensured victory in the Battle of Britain but also contributed to the Fall of France, without which the Battle of Britain would not have been fought.

It was the universal belief that there was no defence against attack from the air. Baldwin expressed this when he said: 'The Bomber will always get through'. It was expected that every great city would be levelled to the ground immediately [...] The only answer was supposed to be 'the deterrent' of a bomber force as large as the enemy's. [...] All these calculations turned out to be wrong. The Germans never planned for independent bombing. Their bomber-force was an auxiliary for the army on the ground, and they had to improvise the air-attack on Great Britain in the summer of 1940. The Germans were answered and defeated not by British bombing, but by fighter-command, *which had been despised and comparatively neglected before the war*. [...] The pre-war years ran their course under the shadow of hideous misapprehension.²

Seventy-five years after the Battle of Britain the conventional wisdom remains that it was an unexpected victory, won by a miracle of innovation: the 'air defence system that Dowding had built' with its radar and eight-gun fighters, as well as by the skill and courage of the Few.³ According to the military historian Terraine, it had needed 'a miracle to bend RAF thinking to the notion that bombers must not get through, and could be prevented from doing so'.⁴ Historians continue to attribute this miracle to the intervention of scientists and Air Chief Marshal Sir Hugh Dowding's creation of 'the world's first fully integrated air defence system'.⁵ According to Murray, writing in 2011, 'within the RAF's conception of air war, there was little role for air defence'.⁶ Yet both the RAF's official narrative and history acknowledge the legacy Britain's 1940 air defences owed to developments before the formation of Fighter Command in 1936.⁷

In contrast the historiography of British inter-war defence strategy and the appeasement of Germany have been subject to substantial revision. The initial judgements of British defence strategy were highly critical and immediate. *The Guilty Men* - written between the Fall of France and the Battle of Britain - charged Neville Chamberlain and leading figures of the National Government with causing Britain's near defeat by failing to stop Hitler's aggression or to rearm sufficiently.⁸ Post-war memoirs, most influentially Churchill's *The Gathering Storm*, also denounced Chamberlain and his policy of appeasement.⁹ Taylor's *Origins of the Second World War*, quoted above, was a forerunner of a revisionist interpretation which sees Chamberlain as a strong-willed and capable leader whose widely-supported foreign and defence policies were based upon a realistic assessment of Britain's economic and military weakness, and its declining power and influence in the world.¹⁰ These weaknesses included Britain's vulnerability to air attack, the declining British aircraft industry's inability to build a deterrent bomber force, and the public's fear of the bomber.¹¹ More recently a counter-revisionist interpretation criticises Chamberlain's wholly defensive military strategy, which neither defended Britain or her ally France, nor deterred Hitler, despite Britain's industrial strength.¹² By 1940 Britain had mobilised its economy for a long war, and was the world's largest aircraft producer, out producing German aircraft production by fifty per cent.¹³

This article challenges A. J. P. Taylor's assertion that Fighter Command was 'despised and relatively neglected before the war' by examining the alignment of successive British

governments' defensive strategy and its independent air force formed to ensure the strategic air defence of Great Britain. It also addresses the political scientists who cite of the development of Britain's fighter defences to explain theories of military innovation and adaptation. Posen argues militaries favour offensive and civilian leadership defensive doctrines, hence the British government's imposition of a defensive strategy upon the RAF, initiating the development of radar from 1934 'as almost nothing of any use had been done before' and prioritising fighters from 1937. Dowding, he suggests, was an outsider and innovator who countered the RAF's preference for strategic bombing.¹⁴ In contrast, Rosen argues the evolutionary development of air defence had the support of the RAF leadership from 1923 onwards.¹⁵ The historian Ferris goes further, arguing that the RAF's institutionalised and continuous development of air defence from 1923 onwards, based on the lessons of defending London in 1917-18, meant the Battle of Britain was a walk-over.¹⁶

The article focuses on three periods of change. The first is 1917-18 when in response to German air raids the War Cabinet decided to organise London's air defences under a unified command and subsequently to form an independent air service. The second is 1922-23 when successive Liberal and Conservative governments decided to form a Home Defence Air Force in response to the French air threat despite the assumption there would be no war in Europe for ten-years. Moreover the ratio of fighters and bombers in this force was carefully considered despite Chief of the Air Staff (CAS) Sir Hugh Trenchard's bomber preference. The third is 1934-35 when the government recognised the long-term threat of Germany, before Hitler dismantled the Versailles settlement, and when the RAF reoriented Britain's air defences to face Germany using scientific help. The article concludes by briefly reviewing the continuities in fighter defence development after the formation of Fighter Command in 1936.

The London Air Defence Area, 1917-18

The Naval and Army air services' inability to prevent the German Gotha bomber raids of 1917 resulted in both the creation of the world's first integrated air defence system and independent air service. Before the First World War various Zeppelin scare stories like H. G. Wells' 1908 *The War in the Air* had foreseen destructive air raids would threaten Britain's sense of strategic invulnerability and cause panic.¹⁷ The public outcry following a Gotha daylight raid on London on 13 June 1917 which killed 162 people and injured 432 led the War Cabinet to appoint a two-man committee on 11 July consisting of the Prime Minister David Lloyd George and the South African Lieutenant General Jan Smuts to examine air defence and the organization of the air services.¹⁸

Their report on air defence just eight days later established the key principle of unified command of fighters and ground based air defences, a principle that applies to this day.¹⁹ By 31 July Major General E. B. Ashmore, an ideal choice as both an artilleryman and pilot, was appointed to command all of London's air defences. He established a belt of anti-aircraft guns twenty-five miles east of London, with a fighter zone behind it. He also improved landline communications between ground observers and his operations centre to reduce fighter

response times, and used wireless equipped aircraft to track the raids. Following these improvements two further raids in August were turned back and the Gothas, like the Zeppelins previously, switched to night raids. In response, Ashmore moved his guns further out, deployed barrage balloons and more searchlights, and started equipping fighters with wireless. On 19 May 1918 the defences shot down six Gothas (three to fighters and three to guns) and the night raids stopped.²⁰ Ashmore's concept, adapted to the geometry of detection ranges, aircraft speeds and response times, remains the model of an integrated air defence system.

Smuts had been convinced of the theory of independent air power. The second report of 17 August 1917 concluded:

*As far as can be foreseen, there is absolutely no limit to the scale of its future independent war use. And the day may not be far off when aerial operations with their devastation of enemy lands and destruction of industrial and populous centres on a vast scale may become the principle operations of war.*²¹

In an example of what the historian Edgerton calls 'liberal militarism', the report also noted the need to use 'mechanical power' in war in order to get the maximum fighting power from Britain's limited manpower resources. On 24 August 1917 the Cabinet accepted the report's recommendation to form a separate Air Ministry, to combine the Navy and Army air forces into one service, and to form the Independent Force for the strategic bombing of Germany. Despite the subsequent troubled beginnings of the Air Ministry, with Trenchard's resignation as CAS, his replacement by Frederick Sykes and Trenchard's subsequent conversion to the doctrine of strategic air attack,²² the War Cabinet's direct intervention resulted in the formation of an independent air service to both defend London from air attack and to conduct strategic bombing.

The Home Defence Air Force, 1922-23

The Ten-Year Rule of August 1919 concluded 'that the British Empire will not be engaged in any great war during the next ten-years' and led to a period of disarmament until repealed in 1932.²³ Despite Smuts' apparent foresight, the immediate post-war period was uncertain for the RAF, reducing from 22,000 aircraft to 200 and from 240,000 men and women to 30,000 men in the five months from November 1918.²⁴ Lloyd George appointed Winston Churchill, uniquely, as both Secretary of State for War and for Air in January 1919, perhaps, some thought, to disband the RAF. Churchill sacked Sykes as CAS and reappointed Trenchard, liking his prudent proposals for a small, part-cadre, peacetime RAF.²⁵ Both Churchill and Trenchard saw the Ten-Year Rule and its requirement to police the empire 'making the utmost use of mechanical contrivances' to save manpower as an opportunity to exploit their faith in the 'morale effect' of bombing and to give the RAF a peacetime role.²⁶ By 1922 eight flying squadrons and two armoured cars companies had replaced two Army divisions in Iraq, much to the General Staff's disgust.²⁷ Trenchard used his limited resources to literally build the foundations of an independent service – a college for officers and another for apprentices –

rather than easily disbanded squadrons. By 1922 the home defence force had been reduced to just twenty-four aircraft and all of London's anti-aircraft guns and searchlights withdrawn.²⁸ Meanwhile the RAF was telling military and public audiences how the Independent Force's night raids had terrorised Germany.²⁹

The Twenty-three Squadron Home Defence Force

The Government's realisation that a superior air force within striking range could threaten London led to the creation of a home defence air force despite both the Ten-year Rule and Government committees continuing to scrutinize both expenditure and the need for a separate Air Service. Former Prime Minister Lord Balfour's 1922 committee on imperial defence recommended the RAF retained its autonomy and also highlighted increasing French air power at a time of Anglo-French tensions over the Versailles settlement and the Middle East.³⁰ As a result Lloyd George's government decided in August 1922, just before it fell from power, to form a twenty-three squadron home defence force.

The Fifty-two Squadron Home Defence Air Force

Lloyd George's successor as Prime Minister, Bonar Law, primed by Sykes, his son-in-law and former CAS, was minded to abolish the RAF and withdraw from Iraq.³¹ His Secretary of State for Air, Samuel Hoare, later named as one of the 'Guilty Men', convinced Bonar Law to appoint a committee under Lord Salisbury to reconsider the decision. Salisbury's committee also highlighted the threat of the 600-aircraft French strategic bomber force, said to be able to drop in one day the same weight of bombs as dropped on London in the whole war.³² In a phrase reminiscent of the Royal Navy's two-power standard of 1889 which required it to be as large as the next two biggest navies combined, the government decided that the RAF must be 'of sufficient strength to adequately protect us against Air attack by the strongest Air Force within striking distance of this country'.³³ As a result, in June 1923, the Cabinet decided, with 'melancholy necessity', to form a fifty-two squadron home defence air force. The decision, made despite the Ten-Year Rule, secured the RAF's independence.³⁴

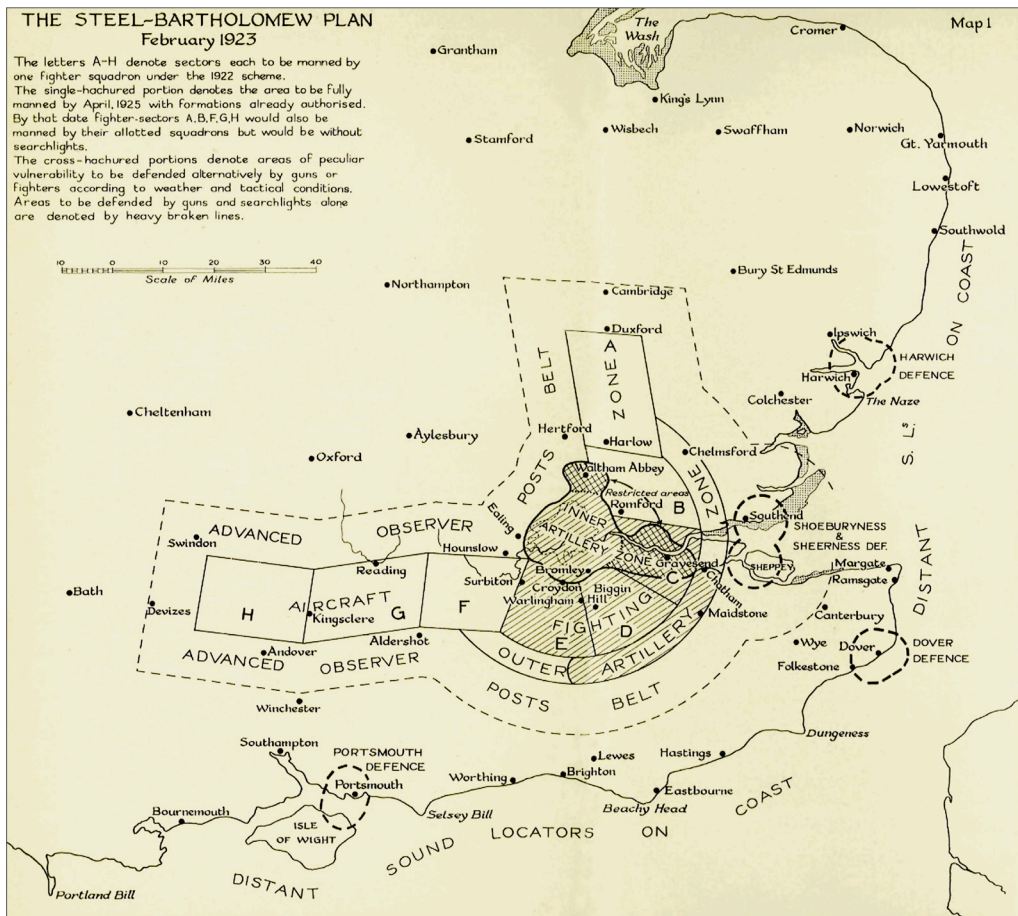
The Steele-Bartholomew Plan

If the decision to form a Home Defence Air Force demonstrated successive governments' recognition of the need for air defence, Army and RAF planning showed the lessons of the First World War were not forgotten. According to Smith, Trenchard's bomber doctrine meant that he 'initially put the ratio at two bombers for every fighter. This was arbitrary, to say the least, and was difficult to square with experience, limited though that was'.³⁵ But this was not the case in 1922 when Air Commodore J. M. Steel and Colonel H. W. Bartholomew's joint Air Ministry and War Office committee devised a defence scheme for the 1922 twenty-three squadron force with a ratio of fourteen bomber and nine fighter squadrons. The critical consideration was the number of fighter squadrons required to protect London.³⁶

The calculations were precise. Based on Ashmore's 1917 integrated air defence system, the Steel-Bartholomew scheme required:

the necessary warning of attack to allow defending fighters to reach fighting height before the arrival of the enemy, anti-aircraft guns for the protection of vital points; and the speedy collation and dissemination of information and intelligence regarding the movement of friendly and enemy aircraft.³⁷

Shown at Map 1 (below), the scheme's fifteen-mile deep Aircraft Fighting Zone was divided into nine squadron areas, running parallel to the coast from Cambridgeshire to Wiltshire, and lit by searchlights for night fighting. An Outer Artillery Zone allowed anti-aircraft guns to indicate approaching aircraft and attempt to break-up formations. An Inner Artillery Zone defended London, and guns protected ports such as Portsmouth and Dover.³⁸ The scheme required 264 anti-aircraft guns and 672 search-lights which the War Office had in store but could not man.



Map 1 – The Steel-Bartholomew Plan February 1923.³⁹

The Bomber-Fighter Ratio

To plan the fifty-two squadron scheme, Trenchard held a series of meetings in July 1923. According to historians Hyde and Smith this is when Trenchard started imposing his bomber preference on the RAF.⁴⁰ But the minutes of these meetings (by a young Charles Portal, a future CAS) show Trenchard was prepared to listen to his air defence advocates. His original proposal was for twenty-four day bomber squadrons plus fifteen of night bombers, and only thirteen fighter squadrons, a much higher preponderance of bombers than the 1922 scheme.⁴¹ Though Trenchard accepted fighters were more effective in defence than anti-aircraft guns alone, there was, he thought:

*A tendency to tackle the problem of air defence in the wrong way, in that provision was made for the defensive element without first taking into account the needs of the offensive. The correct way was to decide on the proportion of the force required for attack, and to use the remainder for defence.*⁴²

He equated bombing with a football match, saying the sides that just defended their goal could not win and could not stop the bombing. He also thought the French would 'squeal before we did' in a bombing duel. Fighter escorts for bombers were discounted.⁴³

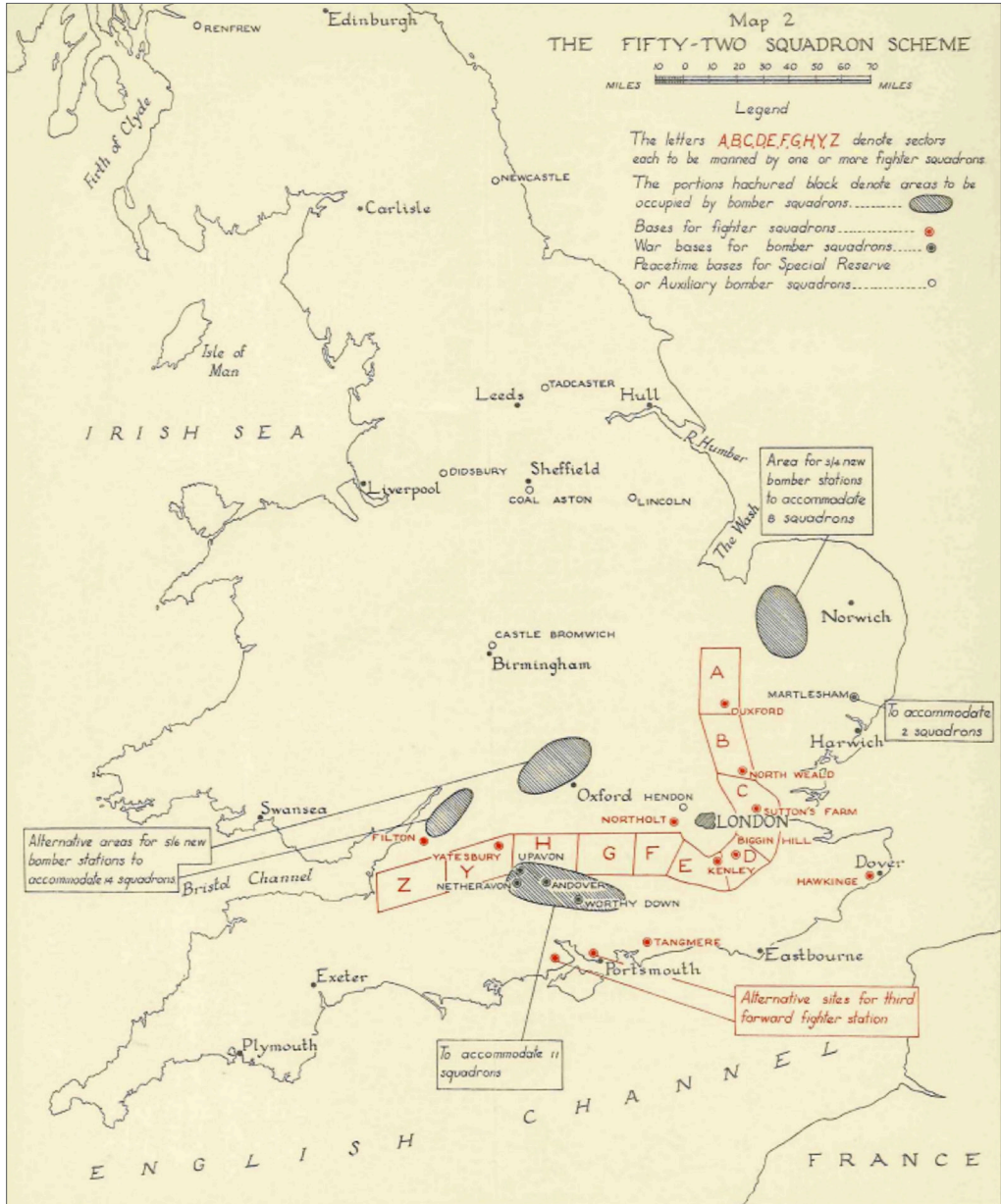
Trenchard was persuaded by his four UK-based air vice marshals, despite the rhetoric, that the ratio should be two-to-one in order to provide adequate fighter coverage. H. R. M. Brooke-Popham of the RAF Staff College, said by one historian to be institutionally pro-bombing,⁴⁴ proposed thirty-eight bomber squadrons and fourteen fighter; Vyvyan, Air Officer Commanding (AOC) Coastal Area, thirty-six and sixteen; J. F. A. Higgins, Ashmore's deputy in 1917-18 and now AOC Inland Area, thirty-three and nineteen; Steel, Deputy Chief of Air Staff, former naval air service and co-author of the 1922 scheme, thirty-two and twenty. Trenchard's decision was thirty-five bomber and seventeen fighter squadrons.⁴⁵ In practice the proportion of fighters was higher as the fighters squadrons were manned by regulars whereas thirteen bomber squadrons were to be part-manned by reserves. Also, fighter squadrons formed first because they were easier to man, equip and base. Hence the first eighteen squadrons formed were nine each of fighters and bombers.⁴⁶

The Fifty-two Squadron Scheme

The air defence plan for a fifty-two squadron scheme was also calculated and not arbitrary. As shown at Map 2 (opposite), the Aircraft Fighting Zone was extended to Bristol and divided into ten zones; the four around London manned by two squadrons of zone fighters and the others by one. In addition, three interceptor (fast day fighters) squadrons were stationed near the coast to harass enemy bombers. The thirty-five mile gap between the coast and the Aircraft Fighting Zone was dictated by the time it took ground alert fighters to take-off and climb to the 14,000 feet altitude of the attacking bombers; only more warning or faster response times would allow fighters to be based further forward for longer engagement time. Holding fighters at ground alert required fewer aircraft than continuous combat air patrols.⁴⁷

Aircraft

Contrary to suggestions that Trenchard's legacy to the RAF was obsolete aircraft designed for imperial policing, the RAF's highest priority operational requirements were fighters designed



Map 2 – The Fifty-Two Squadron Scheme.⁴⁸

for the scheme; as Higgins put it, 'obviating the need to design tactics to suit the machines available'.⁴⁹ In 1928 the highest priority of the sixteen-types in RAF service was the single-seat zone fighter, a necessary compromise requiring a fast rate of climb to get to fighting height quickly, but also needing a low landing speed and heavy radio for night fighting. The RAF accepted the consequent penalty that it was slower than the single-engine day bombers in service. The second highest priority was the daylight only interceptor. With a higher landing speed and no radio they could be much faster. Fighter performance continually improved. In 1918 Sopwith Snipes took over ten minutes to reach 10,000 feet. By 1931, the Hawker Fury interceptor reached 20,000 feet in under eight minutes.⁵⁰ The lowest priority operational requirement was imperial policing for which obsolete First World War Bristol Fighters and DH9As were retained until the early 1930s.⁵¹

The Romer Committee

The overriding principle of unity of command was confirmed by the tri-service Romer Committee of 1923. The Air Officer Commanding-in-Chief (AOC-in-C) Air Defence of Great Britain (ADGB) commanded all UK-based bomber and fighter formations and AOC Fighting Area was responsible for all fighter and Army ground based air defences. All raid intelligence, including that from the Coastguard, warships and government signals intelligence stations, was collated at ADGB Headquarters at RAF Uxbridge and disseminated to all air defences and civil defence authorities by a dedicated Post Office telephone circuit.⁵² The system was routinely exercised.

Exercises

Notwithstanding Robertson's accusation of bomber bias in the exercises, RAF exercise reports comment favourably on the performance of the air defences.⁵³ In the 1927 exercise the defenders intercepted fifty per cent of the raids, though seventeen fighter squadrons were recognised as too few to defend the whole country. Fighters were successful when clear weather conditions and available Observer Corps allowed detection of the bombers. The bombers were successful when hidden by clouds which contained gaps to bomb through. Night bombers were intercepted on clear nights.⁵⁴ The 1928 exercise results were better still: of fifty-seven day bomber raids only nine evaded the defences. In the 1931 exercises eighty-three per cent of daylight raids and forty-six per cent of night raids on London were intercepted by fighters holding ground alert using ground controlled interceptions.⁵⁵ A widely cited contemporary account implying that bombers were classed as twice as effective as fighters in the exercises may well be a misreading of the RAF's use of Lanchester's N2 Law for 'Aircraft in Warfare' where casualties are inversely proportionate to the square root of strengths.⁵⁶ Rather than bomber bias, the model emphasised the importance of concentration and the ability to mass fighters onto bomber formations. Headquarters ADGB attributed the improved interception rates since 1917 to the improved ability to direct fighter formations onto bombers.⁵⁷

Fighter defence development continued under the Labour and National Governments, with further adaptation by the 1929 Holt committee, but slowed following the Locarno Treaties of

1925 which seemed to secure the post-war territorial settlement in Western Europe and again in 1932 in anticipation of the World Disarmament Conference.⁵⁸ By 1932 a total of forty-two home defence squadrons had been formed with completion of all fifty-two planned for 1938.⁵⁹ Nevertheless, from 1925 Britain possessed the world's only integrated air defence system as a result of the government recognising the need for air defence and the RAF's retained institutional expertise.

'The Bomber will always get through'

Given the interception rates achieved in exercises, Baldwin was being disingenuous when he famously said in 1932 'it is as well for the man in the street to realise that there is no power on earth that can protect him from being bombed. Whatever people may tell him, the bomber will always get through.'⁶⁰ It would have been more accurate to say some bombers would always get through. However the statement was intended to energise aerial disarmament negotiations at Geneva. Baldwin was also reflecting the official Air Staff view, explaining the impracticality of total air defence, given the area of space that needed defending. Hence, according to RAF doctrine the best defence was offence. Baldwin subsequently pledged if disarmament failed he would 'see to it that in air strength and air power this country shall no longer be in a position inferior to any country within striking distance of our shores.'⁶¹ In restating the pledge originally made in 1923, Baldwin was reflecting the particular grip fear of the bomber and London's vulnerability had on Britain.⁶² According to one historian 'belief in the Luftwaffe's potency was probably the single most important determinant of appeasement in the 1930s'.⁶³ Air parity with Germany dominated defence debate though estimates of German air strength and its threat to Britain were often exaggerated.⁶⁴

Rearmament, Expansion, Reorientation, Radar and Fighters, 1934-1935

In 1934, political imperatives, as a result of the changing international situation coupled with public fear of the bomber, led directly to the expansion and reorientation of air defence. The Government formed the Defence Requirements Sub-Committee (DRC), when, in October 1933, Germany walked out of the Geneva Disarmament Conference and the League of Nations,⁶⁵ and after Japanese aggression had already led to the suspension of the Ten-Year Rule in 1932.⁶⁶ The DRC's first report in February 1934, strongly influenced by Robert Vansittart and Warren Fisher, its Foreign Office and Treasury Officials, recommended a balanced programme of rearmament remedying the deficiencies in all three Services but also identified German air power as the most serious long-term threat.⁶⁷ The metropolitan air force's forty-two squadrons included twenty-eight bomber and thirteen fighter squadrons. However, the true bomber strength, according to the historian Jones, was much less: with only six day and five night bomber squadrons classed as first-line.⁶⁸

Vansittart and Fisher advocated a further twenty-five squadrons to strengthen the air defences of the South East and Midlands,⁶⁹ though surprisingly the Chiefs of Staff resisted, warning of the 'limited power of expansion of the Royal Air Force working under normal peace conditions'

and the 'great reluctance' of the Air Ministry to accept 'emergency conditions' of expansion.⁷⁰ Furthermore, in agreeing the knock-out blow was the most serious threat, Sir Edward Ellington, by many accounts the least impressive CAS between the wars, wanted to strengthen his bomber force, believing the fighter defence to be adequate:

I want to be quite clear that I will not agree to any increase of forces allocated to the Defence at the expense of the offense until 52 Squadrons are completed. The offensive portion has been already unduly weakened by the inclusion of so high a proportion of non-regular squadrons. As a line to cover London and as far as the Wash from the direction of Germany is a considerably shorter one than the original lay-out, and as the German menace for some years must be considerably less potentially than the French, I do not see that there is any necessity for increasing the number of fighter squadrons over the 17 allowed in the original scheme.⁷¹

Chamberlain's Intervention

Yet the Cabinet, at Neville Chamberlain's bidding as chancellor, overruled both DRC and Air Ministry recommendations.⁷² He argued that Japan could be appeased and therefore risk could be taken in equipping the Fleet to operate in the Far East, there was no need for an Army expeditionary force to support the French, but Britain should be protected by 'an Air Force based in this country of a size and efficiency calculated to inspire respect in the mind of a possible enemy'.⁷³ To this end, Chamberlain radically changed the report, reducing its cost by thirty per cent, the funds allotted to the Navy by sixty per cent, the Army by fifty per cent, and increasing the RAF's by almost 100 per cent.⁷⁴ The Cabinet's subsequent interim report on air defence allowed Baldwin to 'satisfy the semi-panic conditions which existed now about the Air'.⁷⁵ Known as Expansion Scheme A, it would expand the metropolitan RAF by thirty-three squadrons to seventy-five squadrons by 1940, and retain the proportion of bombers (forty-one squadrons) to fighters (twenty-eight squadrons - nineteen zone, six interceptor and three for the Field Force - at below two-to-one).⁷⁶ Contrary to Baldwin's earlier assertion of the impracticality of air defence and the Air Staff's bomber preference, the government marginally increased the proportion of fighters in an expanded RAF to reflect, as Baldwin told the Commons, Britain's new frontier on the Rhine, address public anxiety, and maintain affordable deterrence without continental commitment.⁷⁷ But this was done at the cost of a Navy that could protect British and Empire interests in the Far East and an Army that could support France.

Facing the German Threat

Chamberlain's report also directed work to adapt the air defence scheme to face the German threat. Air Marshal Sir Robert Brooke-Popham was appointed to chair a joint Air Ministry and War Office committee.⁷⁸ A former AOC Fighting Area, as AOC-in-C ADGB in 1933 he had recommended a review of the ten-year old scheme and proposed using combat air patrols or basing the faster interceptors in the Aircraft Fighting Zone to address the inability of Observer Corps' early warning to cope with the increasing speed of day-bombers.⁷⁹ He had already held

a conference to consider the problem of air defence from first principles. Its wide and active participation, including two future AOCs-in-C Bomber Command – Edgar Ludlow-Hewitt then Deputy CAS and Arthur Harris, the Deputy Director of Plans – speaks of a service able to deploy its air defence expertise free from bomber dogma.

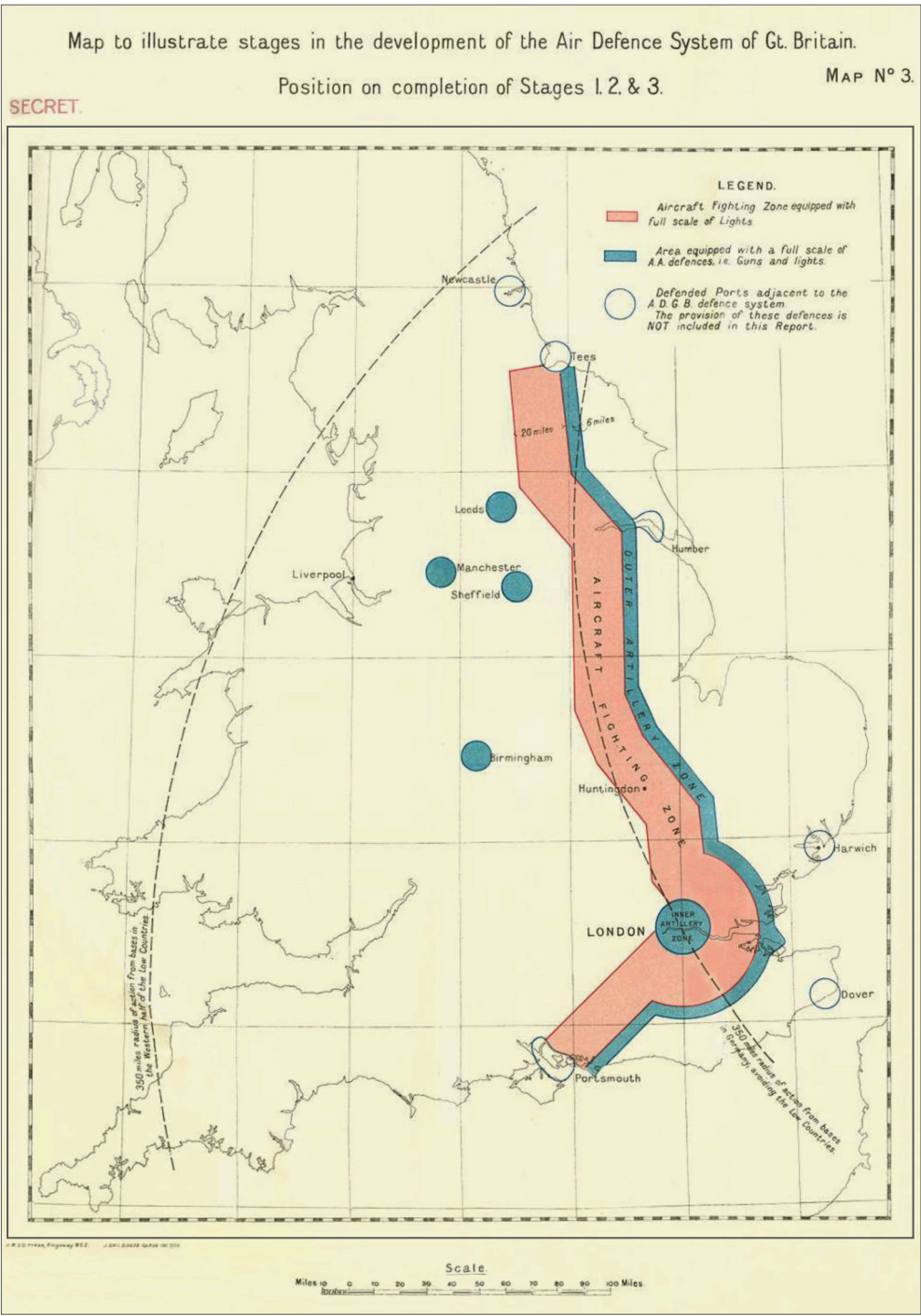
The conference concluded the Air Fighting Zone should be widened to allow more time for zone fighters to engage fast day bombers. However the zone could only be pushed forward if the enemy was detected before crossing the coast. This could not be guaranteed as trials of acoustic mirrors – 200-foot long sound detectors – had only limited success in the 1933 air defence exercise. Therefore the only solution was to reduce reaction times and also allow fighters to pursue enemy bombers into the Inner Artillery Zone to extend engagement times. Faster enemy night bombers also meant extending the searchlight illuminated zone.⁸⁰

Brooke-Popham's Report

Brooke-Popham's Committee assumed war with Germany, alliance with France, and German aircraft either overflying or based in the Low Countries. Greater London was the primary target, but other important industrial areas in the Midlands and north of England would need protection. Also it would be 'necessary to provide visible protective measures for the maintenance of public morale'.⁸¹ Meanwhile forces allocated to air defence were to be the 'minimum compatible with an adequate degree of protection'. In January 1935 the Committee's interim report recommended a continuous defended zone from Portsmouth, around London, to the Tees shown at Map 3 (Next page). This consisted of an Outer Artillery Zone of guns and searchlights six-miles deep, and an Aircraft Fighting Zone twenty-miles deep – increased from fifteen miles - with searchlights to illuminate enemy night bombers. London was defended by an Inner Artillery Zone with a twenty-mile diameter with other cities protected by anti-aircraft guns and lights.⁸² The Cabinet's main concern was cost, particularly of the ground defences, an increased Observer Corps and low-level air defence guns for airfield defence, agreeing to completion of the first stage by 1940 only.⁸³

Scientific Input

Brooke-Popham's Committee provides evidence of the RAF's ongoing scientific support to improve air defence. According to A. P. Rowe, assistant to the Air Ministry's Director of Research, his review of Air Ministry's files following a visit to an acoustic mirror in October 1934 with Dowding, then Air Member for Supply and Research, found there had been no co-operation with scientists to solve the problem of early warning. He recommended the formation of a scientific committee to consider air defence, subsequently known as the Tizard committee after its chairman. But Henry Tizard, aware of the need to improve detection, had already visited Brooke-Popham's headquarters in October 1934 and discussed possible 'electrical' methods of early warning.⁸⁴ Furthermore, Churchill's scientific advisor, Professor Lindemann had also advocated a Committee of Imperial Defence (CID) science sub-committee in August 1934, reminding Brooke-Popham in November of the scientific advice he had provided on anti-aircraft defences in 1928 and also of the Air Ministry's ability to



Map 3 – Reorientation of Air Defence System 1934.⁸⁵

stifle good ideas.⁸⁶ Tizard's new committee met first on 28 January 1935, three days before Brooke-Popham's interim report recommended using science to improve warning. The Tizard committee's second meeting on 21 February, which considered Watson-Watt's paper proposing radio detection, was held at Brooke-Popham's headquarters, five days before the first demonstration of radar at Daventry. The evidence, therefore, is that use of scientists to develop fighter defences during the reorientation of air defence was an evolution rather than an innovation, albeit with greater urgency and effect.

Aircraft Development

Meanwhile the development of fighters designed for use within the integrated air defence system continued. The characteristics of the zone and interceptor fighters merged as advances such as wing-flaps broke the link between maximum speed and landing speed, and radios became lighter. This and the need for increased fire-power to take on bomber formations resulted in operational requirements in 1934 for the RAF's last biplane fighter, the four-gun Gloucester Gladiator, and in 1935 for the eight-gun monoplane Hurricane and Spitfire.⁸⁷ It also produced the requirement for the less-successful Defiant: its four-gun turret designed to out-gun bomber formations. Operational requirements and aircraft into-service dates were integral to the Cabinet's RAF expansion scheme decisions.⁸⁸ Furthermore, the achievements of the British aircraft industry, out producing Germany by 1940, was not purely the work of a few brilliant engineers like the Spitfire's designer R. J. Mitchell but the result of consistent and methodical plans proposed in the 1920s and implemented during rearmament.⁸⁹

Fighter Command, 1936-40

The evolutionary development in fighter defence after the formation of Fighter Command in 1936 continued apace. Chamberlain, appointed Prime Minister in 1937, became increasingly concerned that air parity was unaffordable. The solution in Sir Thomas Inskip's review of late 1937, as the newly created Minister for the Co-ordination of Defence, was to prioritise fighters to protect Britain's economy from a German knock-out blow and to build heavy bombers later.⁹⁰ This represented the high water mark of Treasury-led defence policy and British attempts to avoid a continental commitment to deploy an expeditionary force in support of France. While Smith calls Inskip's review 'the single most important document produced on defence matters in the 1930s' he thought it a gamble 'justified neither by the contemporary state of readiness of Fighter Command, nor by estimates of German strength and strike capacity'.⁹¹ But Churchill, who sat on the CID's Air Defence Committee, though he was not in the government, recognised Britain led the world in air defence: later noting 'it was operational efficiency rather than novelty of equipment that was the British achievement'.⁹²

Under Dowding's leadership the further adaptation of fighter defence continued as a joint scientist and airman effort. Many developments pre-dated Dowding's appointment as AOC-inC Fighter Command in 1936 or even as Air Member for Supply and Research in 1930. For example, work on short-wave radio direction finding – later 'Pip-Squeak' – started in 1928.

Later, Dr B. G. Dickens at RAF Biggin Hill used operational research to take the radar filtered plot and convert it into an interception course for fighters, but it was the Station Commander, Wing Commander E. O. Grenfell who came up with the 'by-eye' method still in use today.⁹³ In 1937 Mr E. J. C. Dixon, whose seminal operational research enabled the exploitation of radar information, worked with Warrant Officer R. M. Woodley, who had been responsible for the Fighting Area operations room since at least 1931, to develop procedures.⁹⁴

The Munich Crisis probably occurred at the worst time for RAF expansion following, as it did, unsuccessful air defence exercises and at a time when Ludlow-Hewitt, as AOC-in-C Bomber Command, was realising the reality of his limited bomber capability.⁹⁵ But after Munich it was decided to expand Fighter Command to fifty-squadrons and the summer 1939 exercises demonstrated Fighter Command's readiness for war, notwithstanding the February 1939 decision to send fighters with expeditionary force to France. Furthermore, Fighter Command struggled to replicate the Luftwaffe's expertise in air fighting tactics. Despite forming an Air Fighting Committee and an Air Fighting Development Establishment to develop tactics, restrictive tactical formations designed for two-gun fighters were retained until the Battle of Britain.⁹⁶

Conclusions

The evidence presented in this article is that the RAF continuously developed air defence between the wars because strategic air defence was a political priority and because air defence expertise was institutionalised within the RAF. As the 1943 RAF narrative notes: 'Fighter Command, in short, was the fortunate legatee of ten-years' experience of air defence. The pity was that its inheritance was so much the smaller as a result of ten years economy'.⁹⁷ The RAF had been formed as a strategic air force and while successive Chiefs of the Air Staff favoured strategic bombing, there was much air defence expertise and advocacy within the service. Whereas strategic bombing was largely unproven and its impact exaggerated, air defence was based on lessons from the First World War, and increasingly on science, operational research and operational evaluation. While Smith thinks Steel's move from AOC-in-C ADGB to Bomber Command rather than Fighter Command in 1936 is evidence of bomber bias, Steel had co-designed the 1922 air defence scheme and advocated a higher fighter ratio than other air marshals in 1923.⁹⁸ Furthermore, Brooke-Popham may have been an advocate of bomber doctrine as the first commandant of the RAF Staff College but he was also the first AOC Fighting Area and as AOC-in-C ADGB led the reorientation work and advocated a scientific solution to the problem of warning of attack. Yet this cross-fertilization of leadership between the RAF's fighter and bomber capabilities highlights the need for further research to explain the differences in effectiveness and apparently different cultures within Fighter and Bomber Commands.

The development of fighter defence also supports a counter-revisionist view of appeasement and Edgerton's notion of Britain's way in warfare as the 'Air Forceism' phase of liberal militarism. Six of Cato's fifteen *Guilty Men* took decisions to improve air defence during the period –

Neville Chamberlain, MacDonald, Baldwin, Hoare, Inskip and Kingsley Wood. They helped ensure that from 1925 onward British fighter defence could counter the threat it faced. Political recognition of the fear of the bomber and the need for air defence had led to the formation of the RAF and the 1923 decision to match any air striking force within range. Another factor was economic: investing in the RAF bomber deterrent was seen as a cost effective response to German rearmament until it became too expensive at which stage fighters were prioritised. Chamberlain, in particular, saw investing in air defence as a means of protecting the economy for a long war.

The flaw in Chamberlain's strategy was of course Britain's failure to support France in 1940. That Fighter Command had to fight the Battle of Britain after the fall of France and the Low Countries in 1940 was evidence that maritime and continental strategies were interconnected and not separate choices.⁹⁹ The allied defeat in France was unforeseen, had turned on a few key events and the RAF suffered proportionally greater losses in France than in the Battle of Britain.¹⁰⁰ But a more capable expeditionary force and air component would have reduced the risk of French defeat. The *Guilty Men* had built-up the RAF whereas the French air force was no longer the force whose threat had secured the RAF's independence in 1923.¹⁰¹

Notes

¹ john.alexander@cantab.net. I would like to thank the participants of Transformation and Innovation in the British Military Conference at the University of Birmingham on 11 April 2011 for the comments received on the draft paper and also Dr Trevor Hopper for his supervision of my Open University MA in History dissertation from which the article is drawn. Any errors are my own.

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The Battle of Britain: A Not So Narrow Margin

By Wing Commander John Shields

What General Weygand called the Battle of France is over. I expect that the Battle of Britain is about to begin.....Upon it depends our own British life, and the long continuity of our institutions and our Empire..... Let us therefore brace ourselves to our duties, and so bear ourselves that, if the British Empire and the Commonwealth last for a thousand years, men will say, "this was their finest hour".¹

Winston Churchill's speech to parliament on 18 June 1940 made clear that the United Kingdom faced a struggle to survive in the face of an apparently omnipotent Germany. The options open to the British government were to either fight on, against apparently impossible odds, or to attempt to seek terms with Hitler. Few were under any illusion that the latter option would risk the imposition of crushing terms and conditions which hindered Britain's freedom of action and guaranteed Nazi domination of Europe.

The Germans, buoyed by their military success across Europe, had to decide on how to deal with the British, but it appeared that they had the advantage. Hitler, puzzled by the refusal of the British to accept their hopeless position, issued instructions for the development of a plan to invade Britain, Operation Sea Lion. Although there is some debate as to whether or not he in fact intended to launch such an operation (perhaps hoping that Britain would belatedly heed his 'appeal to reason'), the desired outcome was clear – a quiescent Britain, removed from the war and leaving Germany free to turn its attention against the Soviet Union. The campaign to knock Britain out of the war was to be dominated, at least at the start, by the *Luftwaffe*, which was to gain control of the air to enable further operations. This had implications – to be in a position to defeat the British and to be prepared to attack the USSR, it was necessary for the *Luftwaffe* to avoid heavy attrition. While this had proven a relatively straightforward task in early 1940 (even if the extent of German losses in Norway, France and the Low Countries are not always appreciated), this was far from the case when it came to facing Britain with a well-organised Fighter Command at the heart of a modern air defence system.

The hypothesis of this article is that while the Battle of Britain had the potential to be 'a close run thing' and has often been portrayed as such, it was not. It was lost by the *Luftwaffe* as a result of a series of errors which can be traced back to the development of the Third Reich's air arm, through to the faulty execution of the campaign. The paper addresses four key areas: first, the preparation for the Battle undertaken by the RAF. Second, the way in which the *Luftwaffe's* early successes influenced its thinking and approach to operations is considered. Next, the efficacy of the German attempt at a strategic air campaign is examined, before the article concludes with an analysis of the ability of both sides to sustain operations. As part of this, the battle is seen through the lens of Philip Sabin's 'Force Gradient' model. Before beginning this examination, though, it is necessary to establish the parameters of the Battle in terms of its duration. German and British definitions have long varied – the Air Ministry set the dates as being between 10 July and 31 October 1940, while German commentators – if they accept that there was a distinct 'Battle of Britain' at all – place the dates between mid-August 1940 and the commencement of Operation Barbarossa against the USSR on 22 June 1941. For convenience,

this paper makes use of the British official dates to bound its contentions, but recognises that there are alternative interpretations which have equal validity in terms of framing consideration of the duration of the Battle.

In the aftermath of the First World War, air power thought expanded greatly. There was a considerable amount of unanimity amongst theorists and visionaries with regard to the effect that air attack might have in a future war. It was held that bombing of targets in the enemy homeland – be that the morale of civilians or ‘vital centres’ which underpinned the enemy’s war-making potential, and this idea became widely accepted within Britain. Stanley Baldwin’s oft-cited remarks about the bomber always getting through were a reasonable representation of popular and political opinion. This did not mean that the RAF was idle in attempting to counter the threat from enemy air attack, even if it was not immediately obvious in years immediately following 1918 which nation would provide that threat. The culmination of the RAF’s efforts was the ‘Dowding System’ with which it fought the Battle of Britain in 1940, but it is important to stress that this was the end of a long-running evolutionary process, supported by revolutionary technological development in the form of Radio Direction Finding (RDF, later radar).

The threat to British airspace had been appreciated since before the First World War.² Concerns that the development of powered flight would leave Britain vulnerable to attack had been proven correct during the war, with attacks by both airships and aircraft between December 1914 and early 1918. This had led to the development of a defensive system around the nation’s capital, namely the London Air Defence Area (LADA). This was founded in 1916, but came into its own when LADA’s command passed to Major General EB Ashmore. Ashmore took the basic LADA construct and developed a basic networked system which formed the basis for the future air defence of the United Kingdom. It was necessarily limited in scope, and represented perhaps the most that could be done to defend London at that time with the available technology – but it was the genesis for the system which led to Dowding’s successful prosecution of the Battle of Britain. The development of LADA occurred alongside the deliberations which led to the creation of the Royal Air Force, driven by the investigations into air defence headed by General Jan Smuts. Smuts issued two reports on air power, concluding that having control of the air might become as important a factor in the defence of the British empire as being able to control the sea.

The question of how to control the air was one which exercised Air Staff thinking during the inter-war period. Sir Hugh Trenchard firmly believed that the best form of defence lay in attacking the enemy, rather than waiting in a defensive posture for enemy air attack to come. This led to the logical conclusion that the battle for control of the air, and thus the first line of national defence ‘lay over an enemy’s airfields and aircraft factories.’³ Trenchard, as Chief of the Air Staff, wished to shape his force so that fighter aircraft were retained as little more than a sop to public opinion, arguing that staying on the defensive was rather akin to staying on the defensive during a football match – the team which failed to attack simply could not

hope to win.⁴ This opinion enabled Trenchard to argue that the RAF could meet the principle enunciated by the Salisbury Committee that Britain should maintain 'a Home Defence Force of sufficient strength adequately to protect us against an attack by the strongest air force within striking distance of this country' through the provision of a force of 52 squadrons, dominated by bombers rather than defensive fighters.⁵

It is important to note, though, that Trenchard's views were not those of the Air Staff as a whole. Much to his frustration, the notion that a defensive fighter force was a necessity did not die out; many senior RAF officers, while respecting Trenchard's opinion, could not agree that defence against the bomber was impossible. As John Ferris has shown, the result of this was that the RAF spent a great deal of time, physical and intellectual effort and money during the inter-war period building upon the principles which had served the nation well during the last year and a half of the First World War.⁶ The development of radio direction finding helped to revolutionise the potential of air defence, and proved to be a critical element within the refreshed integrated air defence network which was in place when the Second World War broke out.

At the heart of this network was RAF Fighter Command, led by Air Chief Marshal Sir Hugh Dowding. Dowding was an articulate proponent of an alternative perspective to the 'bomber will always get through' school of thought, and believed that the deterrent effect presented to an opponent by possession of an effective fighter force should not be ignored.⁷ While the Air Staff may not have all shared this view, the provision of effective fighter aircraft was a key concern, leading to a number of Air Staff targets and requirements for the most modern fighters that could be obtained; this culminated with the procurement of the Hawker Hurricane and Supermarine Spitfire, the two types which were the mainstay of the Battle of Britain. Despite the importance of these aircraft, the biggest advantage Dowding had lay in the series of Chain Home radar stations sited along the British coast, allowing the detection of incoming enemy raids. While the Germans had developed radar in parallel with the British, they had not linked it to a centralised command and control system. With its integrated air defence system (IADS) Fighter Command was able to concentrate its efforts in time and space, rather than squander its assets on nugatory standing patrols.⁸ As a result, the RAF could efficiently apportion its limited resources in a timely fashion. The importance of this was such that it was the Chain Home system and its capabilities which formed Fighter Command's centre of gravity. Even in the later stages of the Battle of Britain, German commanders did not understand the efficiency of the RAF's warning system.⁹ The robust layered defence system which Dowding had nurtured and then led during the Battle inflicted the first notable defeat upon Germany during the war.

The British also benefitted from unity of command, unlike their German counterparts. Dowding's calls for the cessation of providing fighters to France, supported by the Chief of the Air Staff, Sir Cyril Newall, proved to be a decisive step in ensuring victory. While the decision was controversial, particularly in terms of Britain apparently refusing to support its

key ally, there is little doubt that Fighter Command's strength would have been whittled away as the Battle of France headed towards its conclusion, and to no obvious result. The Command might have been weakened to the point of failure. It must be understood that possession of sufficient assets to enable the exploitation of the British IADS was a critical component for success; while there may have been a popular sentiment since the war that the Battle of Britain was the result of daring, pluck and innovation, it is equally clear that it was hardly an improvised victory, but the result of long-standing plans to counter an enemy air campaign against the country.

This is not to say that the IADS was without flaws. The rapid expansion of the RAF to keep pace with the emerging German threat meant that many aspects of the Service were struggling to adapt. Fighter Command was dominated by Hurricane and Spitfire squadrons, but there were still obsolete types such as the Blenheim and Defiant in service during the Battle. The Defiant only equipped two squadrons, but the heavy losses it sustained meant that the type was swiftly withdrawn from the fray and ultimately re-roled as an improvised – and fairly effective – night fighter. The Blenheim, as a twin-engined derivative of a light bomber, could only be used for night fighting and long-range operations, often in support of Coastal Command, where it was unlikely to encounter German fighters. Furthermore, the difference of opinion between Air Vice-Marshal Keith Park and Trafford Leigh-Mallory, the Air Officers Commanding of 11 and 12 Groups respectively, did not contribute to the unity of effort within Fighter Command. It also, on occasion, caused confusion and missed opportunities to intercept enemy aircraft. Finally, the Chain Home system could only look 'out', that is over the sea. Once aircraft had crossed the coast, plotting their progress depended upon the Royal Observer Corps (ROC). While the ROC was extremely efficient and effective in daylight, the lack of an 'inward' looking radar system for control of defending fighters was to become a notable problem when the Germans moved over to night raiding. Despite this, Britain's air defence system was at the cutting edge of technology, and represented a world-leading capability.¹⁰ Rapid expansion, introduction of new aircraft, sensors and command and control systems were coupled with decisive leadership to create and preserve an effective IADS which presented the *Luftwaffe* with a formidable challenge. General Adolf Galland believed 'we could do no other than knock frontally against the outstandingly well-organised and resolute direct defence of the British Isles.'¹¹ Dowding had developed a system which was greater than the sum of its parts, and well-deserved the praise from Winston Churchill for his foresight: 'an example of genius in the art of war.'¹² In 1940, Fighter Command was given the opportunity to fight almost precisely the battle it had planned. It was, therefore, ready for the challenge, but what about its opponent?

The Luftwaffe's Initial Successes

James Corum notes that 'much of the *Luftwaffe's* success from 1939-1942, and some of its failures, can be traced to lessons that were learned, or not learned, during the Spanish Civil War.'¹³ In this campaign, many Germans were blooded in the art of air warfare, including key protagonists in the Battle of Britain such as the fighter pilots Werner Mölders and Adolf Galland.

Also, many of the aircraft which would see action in the Battle of Britain, such as the Me109 and He111 were used operationally for the first time in Spain. As a result of their experiences there, the Germans' air power thinking would become enshrined and many of their lessons would be incorporated into the Battle of Britain. For example, German fighter tactics were first-rate. The fluid and efficient German *Schwarm* fighter formation used during the Battle is still used by air forces today.¹⁴ In contrast, RAF fighter tactics were rigid and ridiculed by their opponents who called the RAF fighter formations *idiotenreihen* or 'rows of idiots'.¹⁵ However, many RAF pilots, such as Squadron Leader 'Sailor' Malan, quickly adapted their tactics to mirror those used by the Germans.¹⁶ As a result, the Luftwaffe's tactical advantage over its opposition reduced as the Battle progressed.

Although the Germans held the initial advantage in the tactical arena, their strategic prowess is questionable. Some commentators would refute this point by hinting that the *Condor Legion's* prosecution of strategic bombing against the Spanish town of Guernica highlights a Douhetian mindset in the early days of the *Luftwaffe*.¹⁷ However, others would suggest that the death of Major General Wever in 1936, Germany's own 'Douhet' and Chief of Staff, saw the collapse of the *Luftwaffe* as a strategic air arm and see them wedded to an all-arms capability.¹⁸ This is a little misleading, since the picture was rather more complex. There is clear evidence that the *Luftwaffe* did not abandon the notion of using long range bombers to achieve a strategic effect, but that procurement policies, driven by a desire for numbers, led to the production of fighters and medium bombers rather than the aircraft types necessary to sustain a bombing offensive.¹⁹

The image of a tactically-focussed air force was, though, reinforced by events: 'Poland was visible proof to the *Luftwaffe* of the success of *Blitzkrieg* and the overwhelming superiority of its air arm. To Goering all propaganda claims were vindicated, but in fact the *Luftwaffe*, although executing a highly effective attack, learned nothing.'²⁰ From this, historians such as Wood and Dempster reinforce the notion that the *Luftwaffe* was in essence a tactical entity suggesting that, 'the Germans regarded aircraft mainly as a sophisticated form of long-range artillery which must be subordinated to the land armies and used tactically to clear a path for the fast moving armoured spearheads and motorised infantry.'²¹ As the *Luftwaffe* entered the Battle, its successes at a tactical and operational level, coupled with the lack of development of a strategic arm left it with a tactically successful but arguably strategically naïve mindset, hoping to deliver a rapid victory over Britain just as it had against Poland, Norway and France.

Although the *Blitzkrieg* was highly successful, it came at a great cost to the *Luftwaffe*. Macksey suggests that following Dunkirk, and with a wounded Britain in retreat, the Germans were presented with an ideal opportunity to push home their advantage.²² However, this fails to grasp the scale of damage inflicted on the *Luftwaffe* up to that point; the *Luftwaffe* lost 2,888 aircraft with a further 1,562 damaged during its *Blitzkrieg* campaigns.²³ Material losses were, of course, accompanied by casualties amongst the aircrew. This point was not lost on *Reichsmarschall* Goering, who thought such a high risk proposal to take advantage of the

chaos in the UK by launching an invasion was 'nonsense'.²⁴ Thus, while at face value it may seem that waiting to attack Britain represented a missed opportunity, any attempt to execute the campaign earlier would have been folly; both sides required an operational pause to allow the recuperation of men and regeneration of force strength. The additional benefit of the operational pause was that it allowed Germany to assess the British willingness to fight and create an effective air campaign strategy. The *Luftwaffe* had proven itself as a ruthlessly efficient tactical entity but it had yet to be blooded as a strategic air arm. Due to the physical constraints of the English Channel, the *Luftwaffe* would be divorced from its traditional method of warfighting and forced into conducting what was, in effect, an independent strategic air campaign during the Battle of Britain. However, could it deliver higher command's intent?

The Luftwaffe's Strategic Failure

After the Battle of France, there was disagreement amongst the German leadership about what to do next. Some, such as General Felmy, commanding *Luftflotte 2*, concluded that a strategic air offensive against Britain could not be launched before 1942 due to the lack of suitable bombers.²⁵ However, most senior *Luftwaffe* staff were in favour of a campaign against Britain and the need to achieve control of the air prior to any operation. At the forefront of this argument was Goering:

*'Until the enemy air force has been broken, the over-riding principle behind air operations is to attack the enemy's flying units at every favourable opportunity, by day and by night, on the ground and in the air, without regard to any other tasks.'*²⁶

Other influential German figures, such as Galland, inferred that Germany should conduct operations against Britain's lines of communication and slowly starve the nation into defeat.²⁷ However, Germany could not afford a long drawn out campaign, particularly when Hitler's focus was drawn further east and a future campaign against Russia. In order to deliver a short and effective campaign, the identification and successful prosecution of the enemy's centre of gravity is required. However, despite German doctrine embracing Clausewitz's concepts, they failed to identify and target the British Centre of Gravity.²⁸ The *Luftwaffe* instead chose to employ kinetic effect across the full spectrum of targets rather than against the enemy's critical vulnerabilities. Put simply, the German leadership demonstrated their lack of understanding of the potential strategic effect of air power by failing to take advantage of their numerical supremacy. Furthermore, in breach of one of the principle tenets of warfare, they failed to concentrate their force on the enemy's operational centre of gravity – Fighter Command.

By destroying Fighter Command, the Germans would have created freedom of manoeuvre over Britain and allow their forces to conduct follow on operations at will. Analysis would suggest that Fighter Command's strength came from its ability to detect raids early and deploy sufficient fighters to counter the emerging threat. As Bungay suggests, the primary objective of the *Luftwaffe* should have been to focus upon Fighter Command, destroying its early warning and command and control systems, followed by its aircraft and pilots.²⁹

Instead, the *Luftwaffe* wasted 33% of its effort on non-Fighter Command targets with only 40% of effort put against the key Sector stations, which controlled the Fighter Command assets, and the bulk of these attacks did not begin until the end of August 1940.³⁰ These apportionment figures dovetail with Goering's intent which was based on geography rather than the enemy's 'weaknesses': 'for the first five days the *Luftwaffe* would aim at targets within 150-100 kilometres radius south of London, then for the next 3 days assault within a radius of 100-50 kilometres, then for the final five days attack targets within a 50 kilometre radius extending right round the British capital.'³¹ As shown in Figure 1, Goering's strategy encompassed all the key Fighter Command targets but, critically, did not attack them in priority order. The Germans might have prosecuted a far more effective plan based on neutralising enemy strengths rather than slowly destroying generic targets based on geography. Moreover, successful implementation of any strategic targeting plan is predicated on the availability of effective intelligence – and here, the *Luftwaffe* intelligence staffs displayed an inability to deliver the required product.

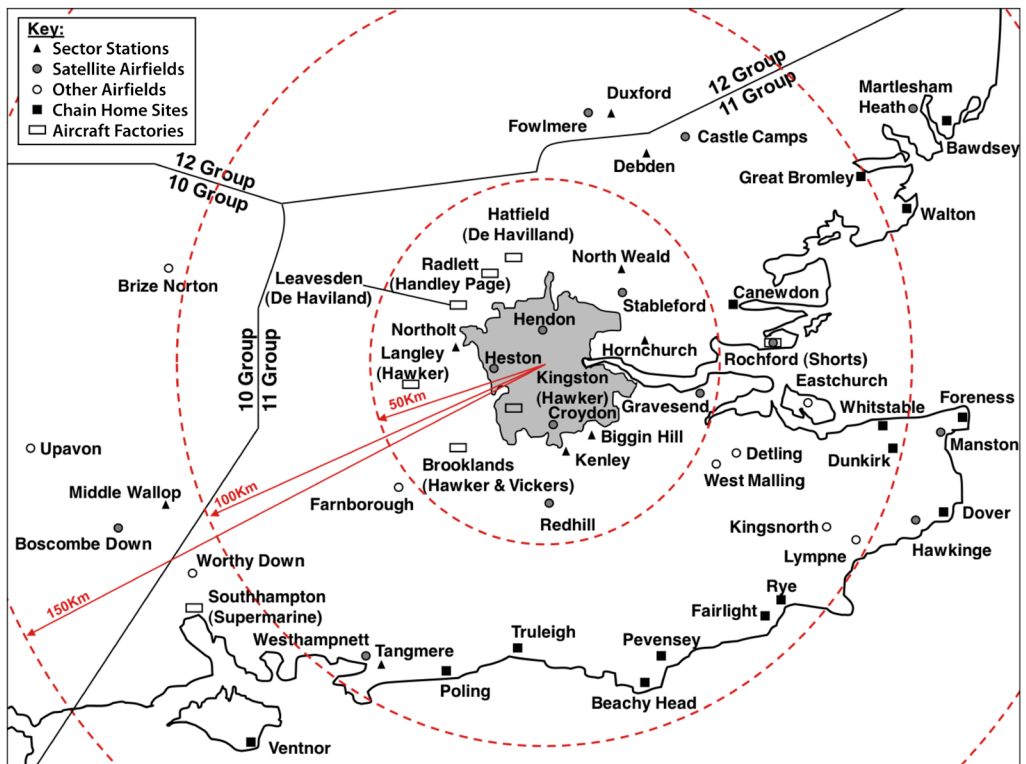


Figure 1: The Air Power-Related Targets during the Battle of Britain.

Wood and Dempster suggest that while Germany possessed the world's most powerful air force in 1940, the 'intelligence system was disorganised and inefficient.'³² Central to this theory is *Studie Blau* (Study Blue) written by *Oberst* Joseph 'Beppo' Schmid, which became the basic reference on which attacks on Britain were planned.³³ Schmid consistently and grossly

underestimated the number of British fighters, their capabilities, and production numbers as well as making no mention of the critical contribution radar made to Fighter Command.³⁴ Ultimately, Schmid's failings were widespread and fundamental.³⁵ These intelligence errors, which ran throughout the Battle, led the *Luftwaffe* into poor decision-making.

With incoherent strategy and fundamentally flawed intelligence it is not surprising that the *Luftwaffe* meandered its way through the Battle of Britain. As its planners dithered on the strategy to take against Britain, the *Luftwaffe* took needless losses that were contrary to the needs of a short and sharp campaign in order to preserve forces for the follow on campaigns. Although the Germans did not recognise this phase as part of the Battle of Britain, which they termed *kanalkampf* or Channel Fight, Gooderson's analysis shows that during the period 10 July – 7 August 1940, 70% of the *Luftwaffe's* effort was directed against coastal targets; shipping, port facilities and naval bases.³⁶ The *Luftwaffe* lost a significant number of assets during this phase without real tangible gain, nor did it obtain any insights to the centrality of Britain's use of radar that would have ultimately assisted their efforts to achieve control of the air over southern England. This phase can be assessed as an early example of the *Luftwaffe* failing to grasp the ways and resource limitations in achieving their desired end state.

Hitler's intent for the main assault, codenamed *Adlerangriff*, or 'Eagle Attack' was clear – to rapidly overwhelm and dominate the RAF.³⁷ However, the *Luftflotte* commanders' interpretation of this guidance led to an eclectic target set being developed which included harbours, shipping, dockyards and warships.³⁸ The *Luftwaffe* suffered from 'requirement creep' where an uninformed leadership curtailed a potentially campaign-winning effect from developing. Although *Luftwaffe* raids on radar sites and airfields took place, ineffective bomb damage assessment meant that the Germans wrongly concluded that the targets they had attacked were permanently out of action.³⁹ However, the reality was somewhat different. Manston, which was not one of the vital Sector stations, was the only Fighter Command airfield to be put permanently out of action.⁴⁰ Also, through the use of mobile transmitters, the Chain Home radar capability remained effective throughout the battle.⁴¹ Even with all the flaws in the plan, it was perhaps inevitable that the weight of effort meant that at times the Germans would enjoy some success. For example, in late August 1940, the *Luftwaffe's* success was gained not so much by the damage it caused to British aerodromes, but by the slow attrition which bled Fighter Command of experienced pilots, a point examined below.⁴²

The trigger point for the start of the last phase of the Battle of Britain between 6 September and 31 October 1940, marked the start of the *Luftwaffe* bombing campaign against London. This saw another breach of the principle tenets of warfare - the preservation and maintenance of the aim. There are several theories as to why Hitler elected to change his tactics. Many suggest that Hitler demanded revenge for the punitive RAF strikes against Berlin.⁴³ Others contend that the *Luftwaffe* command believed it was destroying the RAF at a rate 3 times greater than it was, thus placing them on the verge of victory.⁴⁴ Goering and Kesselring, Commanding *Luftflotte 1*, wanted to entice the RAF into the air for a great air battle over

London that would finally destroy Fighter Command.⁴⁵ In some respects, the exact reason for the switch from an offensive counter air campaign to one which sought strategic effect does not matter – the results were telling. In addition to allowing the harassed Fighter Command to recuperate German bombers would become increasingly vulnerable over London as the *Luftwaffe's* Me109 fighter was limited to ten minutes fighting time over London, with concomitant effects upon the preservation of German strength for future operations.⁴⁶

The War of Attrition

A number of analysts suggest that the Battle of Britain was, in essence, attritional. In terms of equipment, Maier agrees with the *Luftwaffe's* desire to eliminate the aircraft industry as it would make it impossible for the RAF to replace its losses.⁴⁷ To return to Bungay's point, the *Luftwaffe* failed to prioritise correctly, and should have been targeting Fighter Command's warning and control systems and then its assets, leaving the aircraft industry as a much lower priority, even if it was a valid target set.⁴⁸ Furthermore, Gooderson's analysis suggests that the number of aircraft allocated to Fighter Command, despite operational and training losses, remained consistent throughout the period of the Battle.⁴⁹ This would suggest that the RAF was able to replenish its front line with sufficient assets highlighting the importance of the aircraft industry, including its shadow factories, to the outcome of the Battle. Gooderson also shows that the *Luftwaffe* attacks against the aircraft industry were ineffective. The *Luftwaffe's* failings stem from the lack of reach of the Me109 fighters to escort their bombers to the shadow factories in the Midlands, the lack of precision bombing and the prosecution of non-Fighter Command related production facilities. Further proof of poor *Luftwaffe* intelligence comes from the inaccurate reporting of fighter production figures which suggested that only 280 RAF fighters per month could be built.⁵⁰ Despite *Luftwaffe* attacks, British fighter production was in fact fairly consistent throughout the period of the Battle, varying between 467 and 496 fighters per month.⁵¹ In comparison, the German aircraft industry was being out-produced by 47% during 1940.⁵² When considering the war of attrition in terms of equipment, there is little doubt that the RAF won.⁵³

However, as Wood and Dempster note, the main challenge for the RAF was the shortage of fighter pilots: 'This, and not aircraft, could have lost the RAF the Battle of Britain.'⁵⁴ The rapid expansion of Fighter Command had been limited by its inability to man the equipment. In particular, fighter pilot manning vexed many leaders, both prior to and during the battle.⁵⁵ The shortage of fighter pilots was exacerbated by the loss of 300 Fighter Command pilots during the Battle of France and it was still 130 pilots short of its establishment at the beginning of August.⁵⁶ This deficit increased to 181 pilots at the end of August when the *Luftwaffe* was conducting more efficient Offensive Counter Air campaigns against the key Sector airfields.⁵⁷ Moreover, during August 1940, RAF casualties outstripped the training output - the training system delivered 260 inexperienced pilots but there were 300 casualties.⁵⁸ As a result Fighter Command was haemorrhaging the quantity and quality of pilots it had in the early stages of the Battle. In order to stem this flow, Fighter Command seconded pilots from the Fleet Air Arm, Army Cooperation squadrons as well as those from foreign and commonwealth nations,

including squadrons formed from pilots who had escaped German-occupied Europe. By the end of the battle, Fighter Command had more aircraft and pilots than it had at the start of the campaign but it was still undermanned and it had lost many experienced operators.⁵⁹ Even here, though, we must be careful – since the position articulated by Wood and Dempster is challenged by the work of Richard Overy. Overy notes that the number of pilots between June and August, with a constant supply of between 1400 and 1500 pilots in August and September. The shortfall, although notable, was never more than 10 per cent.⁶⁰ The *Luftwaffe*, in contrast, was a third short of its established strength of fighter pilots, and only able to cope with this shortage by virtue of a lower overall loss rate amongst its fighter forces.⁶¹ The Germans had an opportunity to inflict a fatal blow against Fighter Command within their grasp – but through poor leadership, strategy and intelligence the opportunity to win the Battle passed.

The Force Gradient Model

For all the efforts put into the Battle by the *Luftwaffe*, they achieved very little of strategic worth.⁶² As the numerically superior attacking force, the Germans held the advantage as they could dictate timing, scale and tempo of operations but they failed to push it home. This is worth considering through the lens of Philip Sabin's Force Gradient Model, as seen in Figure 2, since it appears to offer a number of useful pointers as to the challenge that the *Luftwaffe* faced even without misdirected targeting and confused leadership.

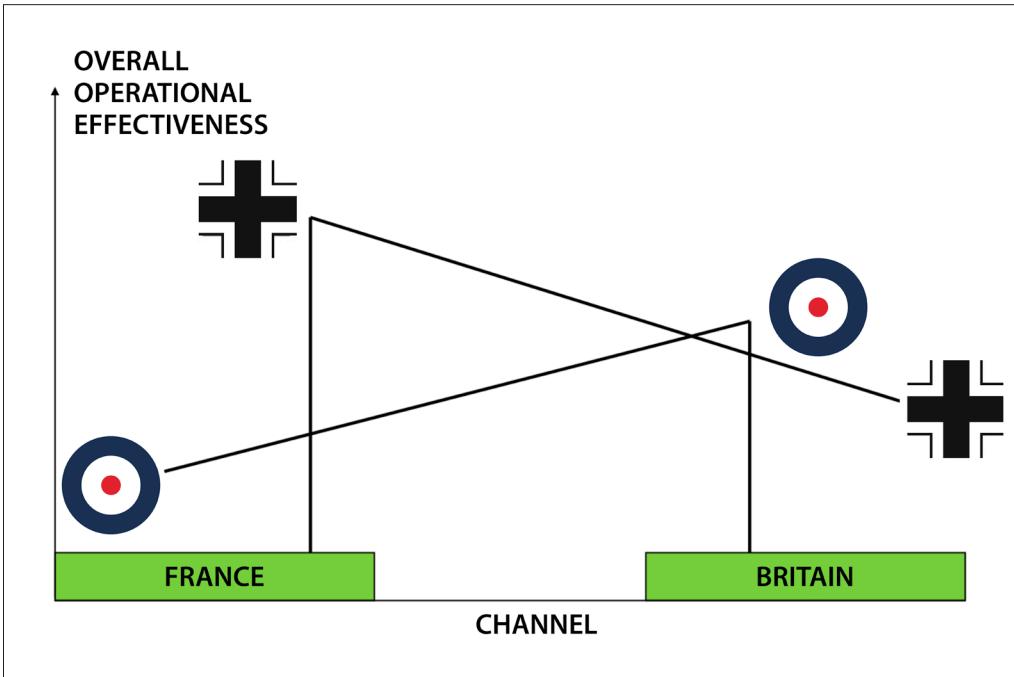


Figure 2: Force Gradients.

Over France, the *Luftwaffe* had the upper hand as it outnumbered its opponents. Although Bomber Command damaged 10-13% of the German invasion fleet, their operations suffered heavy losses as they were: limited in number, unescorted and vulnerable.⁶³ Conversely, when forced to operate over the English Channel, although the *Luftwaffe's* effectiveness diminished with range, it retained its advantage due to AVM Park constraining his squadrons to overland operations in order to preserve pilot numbers and concentrate his force.⁶⁴ Once the Germans were above Britain the picture is very different. The *Luftwaffe* faced a world-leading system specifically designed to counter the very threat which confronted them. Contrary to Galland's belief that, 'it is indisputable that Germany had air superiority', the statistics tell a different story.⁶⁵ During the Battle the Germans only achieved a kill ratio of 1:1.8.⁶⁶ Moreover, this kill ratio was significantly less than the 5:1 kill ratio *Generalmajor* Osterkamp, Commanding *Jagdgeschwader 51*, advocated as being necessary to ensure that the *Luftwaffe* might conduct air operations following the Battle.⁶⁷ The need to retain military capability is important in enduring campaigns, and the Germans clearly had aspirations for further military campaigns, this was not the case for the RAF.⁶⁸ Not so for the RAF in 1940, it was a fight for national survival. Therefore, the RAF could, and nearly had to, deplete Fighter Command to achieve its desired end state. Also, the RAF's ability to retain its advantage over southern England can also be attributed to the *Luftwaffe's* eclectic targeting policy. Ultimately, the RAF managed to maintain a competitive advantage over the *Luftwaffe* above the vital ground - London. Therefore, the Force Gradient Model' neatly demonstrates that Britain had a critical geographical advantage over its opponent.⁶⁹

Conclusion

Bungay's view that, 'the winners make fewer mistakes than the losers' is certainly true for the Battle of Britain.⁷⁰ The battle had the potential to be a close contest but was not. A series of critical decisions made by each side shaped the eventual outcome.

Although the Germans had the numerically superior forces, they were doomed to failure from the outset as they had insufficient resources to defeat Fighter Command and then subsequently support an invasion of Britain or Russia, and certainly not both. Fighter Command knew exactly what was needed to protect Britain and, through many years of effort during the inter-war years - much of it still unappreciated in popular history - delivered a world-leading integrated air defence system. In contrast, the *Luftwaffe* had turned into an effective tactical air force that had been highly successful during the *Blitzkrieg* campaigns, but it found it difficult to adapt to the strategic and independent air campaign. The RAF benefited from unity of command whereas the German orders were ambiguous and open to interpretation. As a result of poor leadership and intelligence, the prosecution of a varied target set meant that the Germans lacked concentration of force and wasted valuable assets on non-essential targets. The same cannot be said of Fighter Command, which had developed into an efficient machine capable of delivering the required effects at the right time and at the right place. Although it originally lacked the tactical acumen of its nemesis, the RAF quickly adapted its tactics and procedures to become more proficient and effective.

Galland's suggestion that, 'he who wants to protect everything, protects nothing' can, by substituting 'attack' for 'protect' offer some insight into the issues associated with the *Luftwaffe's* campaign during the Battle of Britain.⁷¹ The *Luftwaffe* failed to grasp the essential elements that were delivering Fighter Command's strengths and as a result failed to prosecute those critical components. Although the Chain Home radar sites were attacked, the *Luftwaffe* failed to blind the RAF by removing the key element that allowed the RAF to inflict the first defeat on Germany during the war. Moreover, by failing to preserve and maintain the aim by switching its attacks to London and away from the enemy's critical vulnerabilities, the *Luftwaffe* only highlighted further their flawed strategic mindset and poor intelligence. With Fighter Command pilot numbers at their nadir at the start of the London bombing campaign, it can be seen that the Battle of Britain had the potential to be a close run thing. However, Germany's failure to implement the principles of war meant that, along with a resolute defence by Fighter Command, a 'home win' was actually in many ways a foregone conclusion in what was undoubtedly Britain's 'finest hour'.

Notes

¹ *Parliamentary Debates* (Hansard), 18 June 1940, Column 60

² Richard Hough and Denis Richards, *Battle of Britain*, (Barnsley: Pen and Sword, 2007) p.6

³ Derek Wood and Derek Dempster, *The Narrow Margin*. (Barnsley: Pen and Sword, 2003), p.24

⁴ Sir Charles Webster and Noble Frankland, *The Strategic Air Offensive Against Germany, Volume IV*, 'Notes of a Meeting in CAS's Room, 19 July 1923', p.66.

⁵ Hough and Richards, *Battle of Britain*, p.21

⁶ John Ferris, 'Fighter Defence Before Fighter Command: The Rise of Strategic Air Defence in Great Britain, 1917-1934', in *The Journal of Military History*, Volume 63:4 (1999), pp.845-84.

⁷ Stephen Bungay, *The Most Dangerous Enemy* (London: Aurum Press, 2000), p.59.

⁸ David L Preston, 'The Key to Victory: Fighter Command and the Tactical Air Reserves During the Battle of Britain', *Air Power History*, Volume 41:4 (1994), p.26

⁹ Hough and Richards, *Battle of Britain*, p.90.

¹⁰ Williamson Murray, 'How did 'The Few' win?', *Quarterly Journal of Military History*, Volume 2:4 (1990), p.12.

¹¹ Bungay, *Most Dangerous Enemy*, p.69.

¹² *Ibid*, p.220.

¹³ James S Corum, 'The Luftwaffe & Lessons Learned in the Spanish Civil War' in Sebastian Cox and Peter Gray (eds.) *Air Power History – Turning Points From Kitty Hawk to Kosovo* (London: Frank Cass, 2002), p.66.

¹⁴ Hough and Richards, *The Battle of Britain*, p.313.

¹⁵ Bungay, *The Most Dangerous Enemy*, p.260.

¹⁶ *Ibid*, 261.

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The Vital Pre-Requisite: The Battle of Britain and the Enduring Importance of Control of the Air

By Air Commodore Al Gillespie

Air superiority, underpinned by an effective air command and control system, was fundamental to victory in the Battle of Britain. The Royal Air Force and Dowding's Fighter Command denied Goering's Luftwaffe the control of the air deemed the vital pre-requisite for an invasion of southern England in 1940. This paper examines the genesis of the doctrine and capabilities that created the conditions for success, the strategic significance of the British victory and how the challenges associated with achieving air superiority have evolved since 1940. It considers how air superiority remains relevant in the contemporary and future operating environments and if the UK has the resolve to deliver against the aspirations cited in current doctrine.

In June 1940, Britain found herself standing alone against a German war machine that had brushed aside European resistance with alarming and unexpected ease. On 16 July 1940, Hitler issued Directive 16, authorising Operation 'SEALION' – plans for an amphibious assault against England, somewhere between Ramsgate and the Isle of Wight. The directive was clear that invasion was a last resort and would only be possible if air superiority could be established over southern England and safe passage secured for the crossing.¹ While the fact that this appeared to ignore the role of the Royal Navy in opposing any attempted assault appears to be a major oversight, it is significant that the need for control of the air featured most prominently in Hitler's planning.

Three days later, Hitler offered unconditional peace to Britain.² Although many of the preparations to defend against a German invasion were incomplete, Britons perceived Hitler's intent to invade as absolute and any assurances meaningless. Despite a peace lobby in the British cabinet, Hitler's increasingly triumphalist arrogance sealed a formal British rejection of the peace offer on 22 July 1940.³ This was nearly a fortnight after the opening rounds of what we now know as the Battle of Britain, which officially spans the period 10 July to 31 October 1940, although by 17 September, Hitler had decided to postpone SEALION indefinitely.⁴ The British victory was a decisive point in history that dramatically changed the outcome of the Second World War. Although the traditional historical view which sees the Battle as being exclusively between the Luftwaffe and RAF Fighter Command overlooks the part played by Bomber and Coastal Commands and the Royal Navy, the struggle for control of the air was the most important aspect of this critical struggle, and lies at the core of this article. How was it, though, that the RAF was able to fight the Battle to such effect? And what does the Battle tell us today about control of the air, a concept which some respected popular commentators seemed to think had become little more than a post-Cold War irrelevance used only to justify the procurement of expensive fighter aircraft?⁵

To address these questions, this article reviews the air power theories and doctrine that predated the Battle of Britain and which were the essential underpinnings of the British defensive effort. It contends that the fundamentals of an integrated air defence system (IADS) were in place across southern England as early as 1918, and that this construct, equipped with the emerging technology of the day and consistently updated and refined during the interwar period, contributed to success against the Luftwaffe. It then goes on to examine the strategic significance of the victory, and considers briefly a number of other examples to illustrate the validity of the view that control of the air remains a critical air power role. Finally, it offers a short consideration of the challenges of delivering control of the air in the contemporary and future operating environments, and the risks and opportunities facing the United Kingdom in this respect.

The Beginning

"The aeroplane is not a defence against the aeroplane... as a weapon of attack, [it] cannot be too highly estimated."

Brigadier General Hugh Trenchard, 22 September 1916⁶

Between 1909 and 1914 airships and aircraft were transformed from exciting experimental curiosities into 'embryonic instruments of modern warfare'⁷ By 1914, most European states had a fledgling air service. Britain, France and Italy focused on reconnaissance, while the French also pursued the development of bomber aircraft to attack German industrial centres. A period of rapid evolution in the opening months of the war culminated with the arrival of the Fokker *Eindekker* - a relatively mediocre aircraft, but one fitted with a fixed, forward-firing machine gun able to fire through the propeller blades, delivering a new capability – the true single-seat fighter aircraft. Previous types had either been forced to employ a 'pusher' design with the engine behind the pilot, leaving the nose clear for a machine gun, or had used weapons mounted above the top plane – drum-fed and limited in ammunition capacity, and difficult to reload swiftly, if at all, during the heat of battle. The *Eindekker* may not have had scintillating performance, but revolutionised the control of the air battle. By the end of 1915, it was clear that to be effective, a fighter aircraft needed to possess a good turn of speed and fixed, forward-firing weapons.⁸ Rapid aircraft development resulted in a dynamic arms race that saw technological advantage pass frequently from one side to the other. A fascination with technology was to become a defining feature of air power (and airmen) that endures today.

While the Germans continued to configure defensively and concentrated their forces to seek limited control of the air over sections of the front, usually their own lines. The British and French, on the other hand, preferred offensive action. The land battles of 1916 on the Western Front were accompanied by the first true large scale battles for control of the air. As Trenchard noted, when the French air service had responded to complaints from ground troops at Verdun and ceased offensive action to provide visible cover over their own lines, the Germans had seized the initiative, but 'once the offensive policy was resumed, the enemy at once ceased to make hostile raids.'⁹ At the Battle of the Somme, Trenchard's policy of a "relentless and incessant offensive" resulted in the majority of air combat occurring over enemy lines with the enemy over-committed to Defensive Counter Air (DCA) operations and unable to go on the offensive.¹⁰

Trenchard's preference for offensive action is further explained as follows:

"...owing to the unlimited space in the air, the difficulty one machine has in seeing another... it is impossible for aeroplanes...however numerous their formations, to prevent hostile aircraft from crossing the line..."¹¹

Trenchard had concluded that DCA operations to protect friendly forces would be impossible. In a world without radio telegraphy (R/T) or radar, even if the location of enemy aircraft could be determined, there was no practicable means of concentrating defensive forces to intercept them. Control of the air depended largely on the visual acquisition of enemy aircraft, and the experiences at Verdun and the Somme shaped Trenchard and air force thinking for decades. Trenchard remained unconvinced about the value of defensive fighter aircraft for anything other than the protection of civilian morale in a home defence context, even though

technological advances in both detection and air command and control (C2) made strategic air defence a possibility.¹²

While the *Luftstreitkräfte* fought a largely defensive war over the Western front, the Germans also undertook a strategic air offensive against England, utilising both Army and Navy airships.¹³ It is in the analysis of the British response that we see the green shoots of a strategic AD system emerge. This was to be the London Air Defence Area (LADA), initially under the command of Admiral Sir Percy Scott (the result of the Admiralty having responsibility for the air defence of the UK between 1914 and 1916). During 1916, the airship threat was largely defeated, but a new challenge arose from raids by aircraft, most notably the infamous Gothas, from 1917. To reinvigorate the air defences in the light of this new threat, Major General Edward Ashmore was appointed to command LADA. Ashmore had commissioned into the Royal Artillery, but had joined the Royal Flying Corps (RFC) Special Reserve early in 1914; by 1917, he had commanded two RFC Brigades in France. His combination of extensive gunnery and flying experience made him an ideal man for the task of coordinating the air defence of London.

Ashmore placed a highly centralised system of command, control, communications and intelligence (C3I) at LADA's heart.¹⁴ A combination of highly-effective intercept of enemy R/T, an army of observers and a reliable operational intelligence feed provided Ashmore's LADA system with a primitive but accurate Recognised Air Picture (RAP):

*He could follow the course of all aircraft flying over the country as the counters crept across the map. The system worked very rapidly. ... as a rule not more than half a minute [from detection to display]. ...*¹⁵

Most importantly, by the end of 1918, Ashmore had the potential, through R/T, to vector his limited fighter force to intercept enemy raids, at day or night. Strategic air defence had become a realistic possibility.

The Inter-War Period

"To my mind in an air war. ... R/T will cause all enemy's attacks to be closely followed and aircraft of the defence concentrated to meet them."

Air Commodore J.A. Chamier¹⁶

As RAF senior officers debated the theory and practice of strategic air warfare, Chamier's prescient view was drowned-out by Trenchard's conviction that offensive air action, in the form of bombing, could win a war.¹⁷ This was accompanied by a reinforced belief that air defence remained an impracticality. Stanley Baldwin's declaration that "the bomber will always get through... the only defence is in offence..." and its wide acceptance amongst the British public is testament to how long the strategic bombing narrative dominated thinking in the United Kingdom.¹⁸

Concern across Whitehall in 1922-23 that France might use its air power superiority to blackmail Britain spawned the construction of a strategic warfare-focussed Home Defence Air Force (HDAF) of 52 squadrons.¹⁹ As the HDAF grew, the Air Ministry established Fighting Area Headquarters (FAHQ) to control all fighters and ground forces. This was the first time a HQ had been established with complete responsibility for strategic AD and it established the foundations of RAF Fighter Command (FC).²⁰ Between 1924 and 1934, FAHQ re-established the LADA and began systematic improvement to keep pace with technology. A highly-effective operational intelligence system provided, as it had done during the First World War, early warning that allowed fighters to be in the air by the time enemy bombers cleared 'The Channel Gap' and crossed the coast. The Chain Home (CH) radar system filled that gap, providing early warning and a more accurate and timely RAP that the FAHQ system was preadapted to absorb and exploit, using its existing C3I infrastructure. The further prioritisation of air defence as the growing threat from Germany became clearer led to a reorganisation of the RAF into functional commands. Air defence was placed in the hands of Fighter Command, led by Air Chief Marshal Sir Hugh Dowding. As the former Air Member for Supply and Research (1930-35) and then Air Member for Research and Development (1935-36), he was perhaps the ideal choice to lead the new command which would make use of much of the technology which began its development under his watchful eye in these two posts.²¹

The Czechoslovakia crisis of September 1938 sparked an Air Ministry-led inquest into the state of the RAF. The resultant enhancements to the strategic communications linking C2 nodes and radar stations were essential to the requirements of 1940.²² A final expansion scheme ('M') was put in place to bring Fighter Command up to a total strength of 50 squadrons by April 1941. By September 1939, 35 were available for home defence with over 80% equipped with Spitfires or Hurricanes. Beaverbrook's Ministry for Aircraft Production worked miracles and by June 1940 was producing 446 fighter aircraft per month. Technological enquiry and development went hand-in-hand with this upsurge in production. Of these advancements, the most significant of 1939 was 'Pipsqueak'. This enabled direction-finding and geolocation of friendly formations to Fighter Command operations rooms allowing fighter controllers to vector fighters much more accurately towards the enemy. This ground-controlled intercept technique was to be the Air C² bedrock of the command's operations during the Battle of Britain.²³ By July 1940 Dowding had at his disposal a cutting-edge, centrally-controlled IADS which fused multiple data streams, disseminated the RAP widely and effected C2 of fighter aircraft to force-multiply firepower where and when it was most needed.

The Battle of Britain

"Thank God we're alone now."

Sir Hugh Dowding, June 1940²⁴

When Dowding expressed his relief that the Battle of France would no longer be a drain on his precious fighter resource, he must have been thinking of the 450 Spitfires and Hurricanes destroyed and the associated deficit of more than 360 pilots.²⁵ The Luftwaffe had also taken heavy losses of 1,300 aircraft, about one-third of its total strength, but remained a competent and potent threat.

The War Cabinet agreed with the Chiefs of Staff that “the crux of the whole problem is the air defence of this country” and that the ability to defend against invasion would depend on the extent to which the Royal Navy could operate in the face of heavy air attack.²⁶ The Admiralty was understandably unwilling to commit capital ships south of the Forth until German air power had been weakened but retained a significant maritime advantage over a *Kriegsmarine*, much weakened by the Norwegian Campaign. The RN had also accumulated over eight hundred light vessels in south-eastern ports and “...German invasion craft were certain to suffer very heavy losses if the small fast English warships got in amongst them”.²⁷ With the Home Fleet intact, if the RAF could prevent the Luftwaffe from achieving air superiority across the English Channel and southern England, the risk to an invasion force would be intolerable to Hitler.²⁸ Churchill “...rested upon the conclusion that...we would beat the German Air Force. And if this were true our naval power...would destroy all enemies who set their course towards us.”²⁹

The British arguably had the strategic advantage. The RAF needed to deny the Luftwaffe control of the air to maintain the RN's credibility as a deterrent to invasion, and was appropriately configured, along functional lines, to do so. With the Observer Corps and anti-aircraft artillery (AAA) fully integrated into his C3I-enabled AD system, Dowding had the capability needed to do so. The Germans were organised differently into *Luftflotte* containing a mixed force of fighters, heavy-bombers and dive-bombers. This had worked well in supporting the Blitzkrieg that preceded the fall of France but it was suboptimal in delivering an OCA or strategic bombing campaign beyond the useful range of Luftwaffe fighters.

The period 11 July to 11 August 1940, often referred to as ‘The Battle of the Channel’, was dominated by regular ‘shoot-and-scoot’ attacks by German bombers protected by large fighter escort formations. Although Dowding had the RAP to respond to the Luftwaffe attacks, he refused to be drawn into an attritional battle where the Germans enjoyed range and endurance parity. This gave Fighter Command additional time to refine its Air C2 system and exercise squadrons that would very soon be called upon to scramble against German raids. Hitler became frustrated at the apparent reluctance of the RAF to fight, and on 1 August 1940 issued Directive No.17 “to establish the necessary conditions for the final conquest of England...[and] overpower the English air force.”³⁰ Goering's follow-on *Adlerangriff* (Eagle Attack) directive reiterated the extant objectives of establishing air supremacy and destroying the Royal Navy in advance of an invasion which, it was assessed, had to take place by 15 September 1940, before tidal conditions and weather became increasing limitations on the ability of an invasion force to set sail.

Adlertag, set for the 13 August 1940, marked the beginning of a month that nearly brought Fighter Command to its knees. Shaping attacks began against the Chain Home radar system but the lattice masts were difficult to destroy and mobile radar systems provided redundancy. They also had the unfortunate effect (for the Germans) of convincing Goering that the pre-war view that British radar sites were for experimentation rather than part of an integrated system was correct; the radar sites seemed of little importance, since the attacks appeared not to have had any effect on the RAF's defensive efforts.³¹ The *Adlerangriff*-related attacks on Fighter Command airfields that followed mark the decisive period during the Battle of Britain. The Luftwaffe committed 2,277 combat aircraft (963 fighters) against approximately 1,000 operational RAF fighters. Although between 12 August and 6 September 1940 there were 53 attacks on airfields, mostly in the south-east of England, it was very difficult to close a 'grass strip' airfield for more than a few days. RAF aircraft also moved further inland, where the airfields were protected by fighter aircraft from 10 Group (southwest England) and 12 Group (Midlands).³² On 15 August 1940, 'Luftflotte 5' launched the only attack across the North Sea from Norway. Notoriously poor German intelligence had incorrectly assessed that northern Britain had been depleted of fighters and the now highly-effective British C3I system, limited fighter escort and inadequate defensive armament on its bombers dealt the Luftwaffe a heavy blow.³³

As Goering began to worry about the unexpected resilience of the RAF, he intensified airfield attacks. Although the Luftwaffe seriously weakened Fighter Command's defences, it did not cause a major withdrawal of fighter units from southern England.³⁴ At this stage of the battle, the Luftwaffe were losing four aircraft for every three they shot down, but losing aircrew at seven times the rate of the RAF.³⁵ By the end of August, exacerbated by a tendency to make extravagant claims about kills and double counting, German intelligence convinced Goering that the RAF had less than 100 fighter aircraft remaining; the truth was closer to 700 operational with more than 250 in reserve.³⁶

In early September, perhaps born of the belief that the RAF was on its knees or as a reprisal for Bomber Command's attack on Berlin 25/26 August, Goering ordered the commencement of systematic attacks against London.³⁷ Hitler was convinced that with the RAF mortally wounded, a strategic bombing campaign would more rapidly bring Britain to its knees. The respite could not have come too soon for Dowding. The time-distance calculus gave the RAF more time to respond, further diminished the effectiveness of German escort fighters and brought relatively-unscathed No.12 Group aircraft directly into the fight. The period 7-15 September 1940 was a tipping point; during that week the Luftwaffe lost 298 aircraft. On 15 September more than 200 German bombers with escorts attacked in the now-predictable three waves. With no feints evident and an accurate RAP relayed to Dowding, the raids were met by over 300 aircraft. Although 158 bombers reached London, visibility and disruption by RAF fighters affected accuracy. The 25% loss rate endured by the Luftwaffe was unsustainable. On 17 September 1940, Operation SEALION was postponed indefinitely.³⁸

It might be said that the Luftwaffe never fully recovered from the experiences of 1940. The US Eighth Air Force's counter-air campaign (as part of Operation POINTBLANK) in February/March 1944 dealt the decisive blow.³⁹ The offensive action by the USAAF inflicted enormous attrition on an air force which, by 1944, was running out of pilots and which had been forced to call upon its national aero-industry to abandon production of all aircraft other than fighters. It was not enough. Despite a last-ditch attempt (Operation *Bodenplatte*), to win air superiority in January 1945, the Luftwaffe ceased to be an effective fighting force in northwest Europe months before D-Day, its ability to gain anything more than occasional localised, temporally-limited control of the air long gone.

If the Second World War demonstrated the importance of control of the air (and space precludes a detailed analysis of the relevance of the concept in the war against Japan), events in the post-war world validated the lessons drawn from the Second World War. The first main test came in the clash between United Nations forces and those of North Korea and the People's Republic of China. The growth of so-called 'brush-fire' or 'proxy' wars appeared to offer similar lessons, if not on the same scale. The classic illustration of the importance of control of the air in this sort of conflict lies in the experiences of the United States in Vietnam, and it is to the Korean and Vietnamese examples that we now turn.

Korea / Vietnam

The surprise North Korean invasion of the South on 25 June 1950 appeared, at first, to be on the verge of stunning, rapid success. Seoul fell to North Korean (DPRK) forces at the end of June, and within a month they occupied half of South Korea's (the RoK's) west coast. Stratemeyer (Commanding General Far East Air Forces (FEAF)) clearly defined control of the air as a priority precondition that would enable the FEAF to provide Close Air Support (CAS) to UN land forces.⁴⁰ His premise applied equally, of course, to US Marine Corps assets and to the aircraft operating from American and British aircraft carriers. The DPRK's air force was quickly destroyed, both in air-to-air combat and on the ground, its airfields rendered unserviceable. Although ground-based air defences (GBAD) were an ever-more potent threat, UN aircraft were able to exercise air supremacy over the entire peninsula and safeguard UN land forces against air attack.⁴¹ Having come close to being pushed off the peninsula, UN forces regrouped and won a decisive air-land battle at Pusan where Air Superiority, CAS and Air Mobility combined with UN reinforcement to force communist forces back. Coupled with General Douglas MacArthur's simultaneous amphibious assault at Inchon, 150 miles to the rear, severed enemy supply lines and by late October 1950 UN forces were approaching the border with China. This provoked a Chinese response, changing the dynamics of both the war as a whole and the contest for control of the air.

On 1 November 1950, UN forces attacked the Chinese for the first time, coincident with the appearance of technically-superior People's Liberation Army Air Force (PLAAF) MiG-15 fighters. Political constraints meant that the MiGs could operate from Manchuria unmolested and, ably supported by ground-based radars, they were able to regain air superiority over the

northwest corner of the peninsula ('MiG-alley') as they pushed UN forces back towards the 38th parallel. Both sides developed an IADS but here US and Soviet doctrine (which inspired the North Korean and the Chinese approaches) diverged rapidly. The USAF provided information to their pilots and allowed them significant autonomy (mission command) while Soviet doctrine placed a tight ground-controlled rein on fighter pilots. Near-parity led to mass dogfights with neither side able to provide the enduring control of the air necessary to support offensive ground manoeuvre.⁴² As the mid-1951 stalemate settled around the 38th parallel, it mirrored the situation in the air above with the Chinese reluctant to venture south beyond ground-based radar coverage. This, of course, ceded control of the air elsewhere to the UN forces, enabling the provision of effective air support for the remainder of the campaign. It is, perhaps, worth noting the repetition of a further lesson from the Second World War – namely that technologically inferior aircraft are often outclassed; sometimes pilot skill may offset technological superiority, but the risk of taking on advanced fighter opposition flown by pilots of at least comparable skill was all-too clear from the experiences of the USAF's F-80 Shooting Star squadrons and the Royal Australian Air Force Meteor squadron. Overall, the experiences of Korea validated those from 1940 and beyond: control of the air proved a critical enabler. It was not, though, an end in itself, since the possession of control of the air did not enable UN forces to break the stalemate that emerged after their retreat to the 38th Parallel.

An examination of control of the air in Vietnam highlights similar lessons. It also represents the point at which the increasing dominance of Surface-to-Air Missile (SAM) systems within an IADS can be seen. This gave ever-increasing importance to electronic warfare (EW), a factor first seen in the 'beam bending' conducted by the RAF in a bid to prevent German bombers from finding their targets during the Blitz, and then in the significant EW efforts of Bomber Command's 100 Group during the Allied air offensive.⁴³

Prior to April 1965, despite the existence of North Vietnamese (NV) AAA there was no obvious challenge to US air superiority. On 4 April 1965, this changed. North Vietnamese MiG-17s, under the C2 of NV ground-based controllers, avoided USAF fighter escorts and engaged an incoming strike package, inflicting several losses on the strike package. In an illustration of the importance of effective C2, it subsequently transpired that at least two North Vietnamese losses were as a result of 'friendly fire' by their AAA, rather than to US fighters as had been first presumed.⁴⁴ In response to this, the US deployed EB-66 EW aircraft to deny the RAP to the North Vietnamese and withdrew the ageing F-100 aircraft from the fighter role, replacing it with the F-4C Phantom. The latter was equipped with air-to-air radar and radar guided missiles that theoretically handed the technological advantage back to the US. Again, though, technology was not the sole answer. Restrictive rules of engagement; problems with missile reliability; sub-optimal tactics and determined opponents who appeared to learn lessons from the engagements meant that the technical superiority of the American aircraft was not exploited to the full.⁴⁵ The key to countering the MiG-17 threat was a more timely, accurate, dissemination of the RAP to the F-4C escorts, especially when they were operating beyond

friendly ground-based radar coverage. The arrival of EC-121 Airborne Early Warning (AEW) aircraft provided exactly that and addressed many of the challenges faced by the Luftwaffe in 1940 and the NKAF in 1950. Such was the force-multiplying effect that the NVAF withdrew – temporarily – from the fight within weeks.⁴⁶

On 24 July 1965, the North Vietnamese shot down a US aircraft with a Soviet-built SA-2 missile. Prior to this event, US aircrews had operated with impunity above a low-tech AAA threat; the situation had just changed irrevocably and it initially drove the US to much more hazardous low-level attacks in the vicinity of Hanoi where the IADS was concentrated. Ultimately, the North Vietnamese IADS would incorporate around 200 SA-2 launchers moving randomly between myriad prepared sites⁴⁷ and the US moved towards using the F-100 and F-105 to suppress enemy air defences in the so-called 'Wild Weasel' role. This required the development of emitter locator systems and anti-radiation missiles such as the AGM-45 Shrike and AGM-78 Standard ARM. The lesson of the air offensive in Europe between 1942 and 1945, namely that EW was a key part of maintaining control of the air was validated once more. The threat of the North Vietnamese IADS was never fully conquered by the USAF, demanding complex Composite Air Operations (COMAO) to fight hard for air superiority in North Vietnam on a daily basis.

The failure of US air forces to dominate the skies over North Vietnam prompted much investigation during the war itself. The US Navy and USAF identified similar reasons for their disappointment, and similar solutions. Much improved training, led by the Navy's famed Fighter Weapons School ('Top Gun'), in tactics and weapons employment, coupled with technological advances in air-to-air missile capabilities (such as 'dogfight' versions of the radar-guided AIM-7 Sparrow and more sophisticated versions of the Infra-Red homing AIM-9 Sidewinder) helped to redress the balance, but this was arguably a case of 'too little, too late'. It must, though, be noted that the perceived failure of US air forces to gain air supremacy, or even air superiority over North Vietnam often conceals a critical point – namely that the North Vietnamese air force did not fight for control of the air over South Vietnam. Once again, the control of the air battle – even if the results were felt to be disappointing by many Americans, practitioner and analyst alike – served as a critical enabler for other operations. No American transport aircraft were intercepted and shot down on their way in to the South by enemy fighters; the CAS sorties generated in South Vietnam did not have to fight their way into the target area, or to worry about enemy fighters attacking them on their weapons run. AAA presented the most serious threat to American aircraft operating above the 17th Parallel and the Demilitarized Zone, and although this inflicted large numbers of casualties, there can be little doubt that the air campaign over the North facilitated operations in support of the counter-insurgency operations. We can, perhaps, see here some resonance with recent times, when aircraft have operated in a relatively permissive environment – the difference being that in Vietnam, nobody questioned the relevance or need for fighters to gain control of the air.

There is little question that the experience of Vietnam scarred the United States – politically, militarily and socially. It saw significant rethinking of doctrine, a reconsideration of training

and professional military education, and a revitalisation of thinking about control of the air. While it was accepted that the F-4 Phantom II, the mainstay of both the USAF and the USN, was a magnificent aircraft which had achieved a great deal, the development of two new fighters, the McDonnell Douglas F-15 Eagle for the USAF and the Grumman F-14 Tomcat for the USN pointed to a willingness to learn the tactical lessons presented by the Vietnam experience (the first F-14 squadrons were ready in time to cover the evacuation from Saigon in 1975, although they saw no action).

Validation of the new types came in a number of limited engagements. The Israeli Air Force (IAF) used its F-15s effectively in a number of air combats during the late 1970s, while the US Navy's F-14s engaged Libyan aircraft over the Gulf of Sidra in 1981. The following year saw the reaffirmation of the importance of control of the air over Lebanon, where the IAF with its new F-15s in the vanguard, destroyed over 80 Syrian aircraft without reply. Thousands of miles away, in the South Atlantic, Britain experienced its first UK-only battle for control of the air since the Second World War – and it was again a critical enabler for operations.

While these actions sustained the notion that control of the air was fundamental to success, perhaps the most spectacular modern illustration of the concept came in 1991 with Operation DESERT STORM.

Desert Storm, 1991

"As I report to you, air attacks are under way against military targets in Iraq...I've told the American people...that this will not be another Vietnam."

George H W Bush, 16 January 1991

Operation DESERT STORM, the US-led operation to expel Iraqi forces from Kuwait lasted from 16 January to 28 February 1991. Coalition ground forces were engaged in combat operations for only the last 100 hours.⁴⁸ The experiences in Vietnam and the overwhelming technological advantage delivered by 20 years of investment in AEW, Suppression of Enemy Air Defences (SEAD), EW, Signals Intelligence (SIGINT), stealth and precision strike crushed the Iraqi Air Force (IZAF) and severely weakened Iraqi ground forces. The Vietnam-born concept of a COMAO to enhance friendly force situational awareness and deny the same to the enemy while achieving air superiority *en route* to conducting a precision strike was an art form that the US had perfected through exercises such as RED FLAG. Coalition fighter aircraft outperformed the ageing IZAF opponents in all respects and the advent of tactical data links (Link 16) and encrypted identification friend or foe (IFF) provided widely-distributed real-time RAP and Air C2 information. E-3 Airborne Warning and Control System (AWACS) aircraft transmitted the same information via encrypted, jam-resistant radios. Conversely, IZAF pilots were denied the RAP and Air C2 from their ground controllers by heavy Allied jamming. Without Air C2, they were relegated to relying on visual acquisition and were bound to suffer a swift defeat.

The Iraqi French-supplied 'KARI' IADS was at the heart of a competent layered defence containing Soviet and French SAM systems. Much of the static portion was disabled by Tomahawk Land Attack Missiles and Precision-Guided Munitions dropped by F-117A stealth fighters. In receipt of over 500 High-speed Anti-Radiation Missiles (HARMs) within the first day, Iraqi operators soon elected to maintain radar silence.⁴⁹ IZAF airfields were also targeted although RAF Tornados suffered significant losses as they employed runway denial weapons from low-level. Such was the psychological effect of coalition air power on the IZAF, they only flew 100 air-to-air sorties during the first 3 days and then ceased to operate. Iraqi commanders admitted within 7 days that "the enemy has achieved air superiority...the Iraqi Air Force has lost the ability to move between bases."⁵⁰

Although the KARI system was rendered inoperable, it was almost impossible to completely destroy the layered IADS; the residual SAM systems operating independently continued to influence Coalition tactics throughout the Air Campaign. In Kosovo, only 10 years later, the USAF brought a similarly complex level of COMAO to bear against the Serbian Air Force. Although NATO air power achieved overwhelming air supremacy, Milosevic conserved his SAMs by firing 2-3 missiles per day, often unguided to avoid being targeted by a HARM. Although Allied losses were limited, Serbian asymmetric tactics were sufficient to drive the Allies above 15,000 feet and reduce their effectiveness in targeting the Serbian Army.⁵¹

Kosovo, though, may be said to mark something of a turning point in the way in which control of the air has been considered in the United Kingdom. Since the Falklands campaign, British fighters have not been called upon to engage in air-to-air combat; suggestions that the character of war had changed have abounded, and as alluded to above, a number of prominent commentators and opinion-formers have expressed serious doubts about the validity of the concept of control of the air. This, of course, is to miss the point, not least since control of the air, as discussed, is about much more than air to air combat. This is why UK air power doctrine remains constant in stressing the importance of control of the air, and it is appropriate to end with an examination of the British approach to the concept within the contemporary environment.

The Contemporary Environment

UK Doctrine defines Control of the air as "freedom, over a given time, to use a volume of airspace for our own purposes while, if necessary, denying or constraining its use by an opponent." It also recognises Control of the air as the most important of the four air power roles because it protects political (strategic) and military (operational) freedom of action from attack.⁵² The doctrine cites frequent historical and contemporary examples, many discussed above, which validate the thesis that Control of the air is a vital prerequisite for operations across all domains. It also acknowledges the importance of the AEW mission as an enabling force multiplier and, although Air C2 is not defined as an air power role or mission, it is appropriately recognised as "essential to delivering air power."⁵³ Sir Hugh Dowding would not disagree.

Control of the air and Air C2 are, therefore, appropriately to the fore and remain relevant to contemporary doctrine and operations. The perceived absence of an existential threat to the UK and the Afghanistan/Iraq meme that exists within the British military may restrict the extent to which doctrine is underpinned by the capabilities necessary to survive in a future operating environment in which “the proliferation of A2AD⁵⁴ capabilities will enable a wider range of potential adversaries to...deny our access to...operational areas” using increasingly prolific and sophisticated capabilities such as ballistic missiles and increasingly-effective and longer-range AD systems.⁵⁵

This trend is already evident and the UK is struggling to keep pace. In Syria, as Coalition operations are ongoing against Islamic State, the highly-competent Syria IADS that made military planners think twice about airstrikes in 2013 continues to influence Coalition behaviour. The probable shoot-down of a USAF Predator drone on 17 March 2015 is a timely reminder. To render the IADS ineffective would take weeks of offensive military action and total destruction would be almost impossible to achieve. As NATO looks to its Eastern flank, towards the Baltic States, the airspace above is similarly challenged by Vladimir Putin. His Kaliningrad-based, state-of-the-art SAM systems have employment ranges of up to 180 miles and the layered, integrated nature presents an almost insurmountable challenge to all but the most advanced, low-observable aircraft or cruise missiles. Of most concern, this airspace is strongly contested without a need for even the hint of a NATO Article V-style border incursion.

Conclusion

Had the RAF failed to recognise the importance of home defence during the 1920s, the United Kingdom might well have lost the Battle of Britain, with the nation being forced to sue for peace or facing the threat of an invasion. Hypotheses postulating that the Royal Navy would have smashed any invasion attempt are persuasive – but the key point, of course, is that the Battle of Britain was not lost, which is why the British response to an invasion remains hypothetical. The roots of this success lay in the interwar period, with a recognition of the key factors within any contest for control of the air. Even with this prescience, the RAF achieved fighter force parity with the Luftwaffe only just in time but it was the force-multiplying effect of Dowding’s C3I/AD system, centrally controlled from the Bentley Priory Operations room, which demonstrated the importance of maintaining the technological edge that tipped the balance back in favour of the RAF. Victory was a direct result of the country’s single-minded preparedness to defend itself and maintain sufficient Control of the air to deter a German invasion. There can be little doubt, therefore, about the immediate strategic significance. In what followed, the availability of the British Isles to allied forces ensured that Hitler would continue to be harassed from the northwest as he expanded to the east. Britain also provided a mounting base essential to achieving victory in the Battle of the Atlantic and enabling the Allied air offensive. The latter enabled Allied air forces to achieve a level of air superiority that had eluded Hitler in 1940 and was an essential prerequisite to the D-Day landings which would ultimately lead to Allied victory in Europe.

A brief analysis of operations prior to and since the Battle of Britain supports the thesis that air power is a vital prerequisite for operations across all domains. The articulation of this enduring requirement does not adequately reflect the technical advances that have been (and remain) necessary to maintain superiority in the air. Korea was, arguably, the last time that aircrew prowess in aircraft-on-aircraft dogfights was the sole, decisive determinant, and the difficulty in projecting Air C2 and Control of the air forward was often a limiting factor in the ability to project force on the ground.

In Vietnam, the arrival of radar-guided SAMs, without the persistence limitations of aircraft, challenged air superiority and AEW aircraft enabled a long-range RAP and the concomitant projection of air superiority. Electronic warfare, which became a reality in the Second World War expanded massively in scope, becoming an integral part of control of the air. COMAOs, capable of operating in the increasingly contested environment, became a norm that endured to dominate the post-Cold War doctrine employed in the first Gulf War. Such was the coalition's technological advantage that ground forces enjoyed air supremacy from the moment they crossed the line of departure. Although air supremacy was achieved as quickly in Kosovo, the Serbs were able to challenge it with asymmetric use of relatively inexpensive SAM systems.

Although control of the air remains as doctrinally relevant today as it was during the Battle of Britain, the technical complexity associated with achieving it continues to grow at an alarming rate. Real-time Air C2 and an accurate RAP remain doctrinally-recognised as fundamental but, as predicted in Future Operating Environment 2035, the technological gap between western military technology and that of potential state or non-state adversaries is closing. Although the US continues to invest in maintaining the technological edge, the UK and the majority of NATO members have no answer to the A2AD effects associated with an increasingly-prevalent ballistic missile threat (Iran, North Korea) and Russian-built IADS (Kaliningrad, Syria). After 25 years without an existential threat to the UK, as Russian aircraft continue to penetrate our airspace, we are poorly configured to defend our territorial boundaries against anything other than an isolated incident. The realities of post-Cold War disinvestment are reminiscent of the 1930s and risk generating an inadvertent capability gap in the counter-air and Air C2 capabilities that remain fundamental to the defence of the UK and its overseas dependent territories as well as the collective defence of NATO. While control of the air therefore remains fundamentally relevant to British doctrine, the UK risks responding to this doctrine based on the experiences of the last 25 years rather than the requirements of the next. It is a picture with which Sir Hugh Dowding and his colleagues from 75 years ago might have been all-too familiar.

Notes

¹ Richard Overy, *The Battle of Britain* (London: Penguin Group, 2004), 19. Citing "Führer Conferences on Naval Affairs", 1939-1945.

² See, for example, Peter Fleming, *Operation Sea Lion: Hitler's Plot to Invade England* (1957: London: IB Tauris, 2011), pp.77-78

³ See Robert Mnookin, *Bargaining with the Devil: When to Negotiate and When to Fight* (New York: Simon and Schuster, 2010), pp.83-105. For a counter to the traditional view of a vacillating, 'peace at any price' lobby led by Lord Halifax, see Andrew Roberts, *The Holy Fox: The Life of Lord Halifax* (London: Phoenix Giant, 2004), pp. 195-257.

⁴ Amongst numerous sources, see Christina JM Goulter, 'The Battle of Britain: The Air Perspective', *RUSI Analysis* (20 October 2006), <https://www.rusi.org/analysis/commentary/ref:C4538E034F182D/#.VbfP0PkYNFI> (accessed 22 July 2015).

⁵ See Simon Jenkins, 'Defence budget? I prefer to Call it Showing Off', *The Guardian* 10 September 2010 <http://www.theguardian.com/commentisfree/2010/sep/07/defence-budget-expensive-showing-off> (accessed 22 July 2015); the same author's 'If the MOD can't name the enemy, it shouldn't buy the weapons' *The Guardian*, 16 January 2014 <http://www.theguardian.com/commentisfree/2014/jan/16/mod-cant-name-enemy-shouldnt-buy-weapons-threat-cold-war-defence> (accessed 22 July 2015) and Sir Max Hastings's interestingly-titled 'Britain's armed forces are beset by bureaucracy and big willy syndrome', *The Guardian* 2 August 2007, <http://www.theguardian.com/commentisfree/2007/aug/02/comment.politics> (accessed 22 July 2015)

⁶ "Future Policy in the Air' (September 22, 1916), *RAF Air Power Review*, Spring 2013, pp.119-122.

⁷ John Olsen, *A History of Air Warfare* (Washington DC: Potomac Books, 2010), 1.

⁸ *Ibid.*, 15.

⁹ Trenchard, "Future Policy in the Air."

¹⁰ *Ibid.*

¹¹ *Ibid.*

¹² Sir Charles Webster and Noble Frankland, *The Strategic Air Offensive Against Germany: Volume IV Appendices and Annexes* (London: HMSO, 1961), 'Minutes of a conference held in the room of the Chief of the Air Staff, 19 July, 1923', pp.62-70, especially p.66. John Ferris, 'Fighter Defence before Fighter Command: The Rise of Strategic Air Defence in Great Britain, 1917-1934', *Journal of Military History* 63:4 (1999), pp.845-44.

¹³ Olsen, *A History of Air Warfare*, 21.

¹⁴ John Ferris, 'Airbandit: C3I and Strategic Air Defence During the First Battle of Britain, 1915-18, in Michael Dockrill and David French, *Strategy and Intelligence – British Policy during the First World War* (London: The Hambledon Press, 1996), p.24.

¹⁵ E.B. Ashmore, *Air Defence* (London: Longmans, 1929), p.93.

¹⁶ Ferris, 'Fighter Defence Before Fighter Command', p. 859.

¹⁷ Ferris, 'Airbandit', p.63.

¹⁸ *Parliamentary Debates (Hansard)* 10 November 1932, Column 632. *The Times* (11 November 1932) reported on the speech with the bye-line 'Aerial Warfare – A Fear for the Future', and the speech is sometimes referred to as 'A Fear for the Future' speech in online sources.

¹⁹ John Ferris, 'The theory of a 'French air menace', Anglo-French relations and the British home defence air force programmes of 1921–25', *Journal of Strategic Studies* Volume 10:1 (1987), pp. 62-83; Hines H Hall III, 'British air defense and Anglo-French relations, 1921–1924', *Journal of Strategic Studies* Volume 4: 3 (1981) pp.271-284.

²⁰ Ferris, 'Fighter Defence Before Fighter Command', p. 859.

²¹ Vincent Orange, 'Dowding, Hugh Caswall Tremenheere, first Baron Dowding (1882–1970)', *Oxford Dictionary of National Biography*, Oxford University Press, 2004; online edn, May 2008 <http://www.oxforddnb.com/view/article/32884>, accessed 20 July 2015

²² Richard Hough & Denis Richards, *The Battle of Britain* (Sevenoaks: Hodder and Stoughton, 1989), 58–59.

²³ *Ibid.*, 63–64.

²⁴ Michael Glover, *Invasion Scare* (London: Redwood Press, 1990), 51.

²⁵ Hough, *The Battle of Britain*, 100.

²⁶ The National Archives, CAB 66/7/48 'War Cabinet Chiefs of Staff Committee, "British Strategy in a Certain Uncertainty," (May 25, 1940): 6,8. I am grateful to Dr David Jordan for providing a copy of this document.

²⁷ Friedrich-Karl von Plehwe, "Operation Sealion 1940," *RUSI Journal* (March 1973), p. 51. See also John Terraine, *The Right of the Line: The Royal Air Force in the European War 1939–1945* (Sevenoaks: Hodder & Stoughton, 1985), p. 173.

²⁸ Terraine, *Right of the Line*, p.171.

²⁹ Winston Churchill, *Their Finest Hour* (New York: Houghton Mifflin Company, 1949), 249.

³⁰ Hough and Richards, *Battle of Britain*, p.137.

³¹ Overy, *The Battle of Britain*, 71–73; Sami Puri, 'The role of intelligence in deciding the Battle of Britain', *Intelligence and National Security*, Volume 21:3, (2006), pp.416–439

³² *Ibid.*, 70.

³³ For an overview of German intelligence, see Puri, 'The Role of Intelligence'; Horst Boog, 'German Air Intelligence in the Second World War', *Intelligence and National Security*, Volume 5:2 (1990), pp.350–424; Sebastian Cox, 'A comparative analysis of RAF and Luftwaffe intelligence in the Battle of Britain, 1940', *Intelligence and National Security*, Volume 5:2 (1990) pp.425–443.

³⁴ John Ray, *The Battle of Britain: New Perspectives* (London: Weidenfeld Military, 1994), pp.80–82.

³⁵ Probert and Cox, *The Battle Re-Thought*, 27.

³⁶ Overy, *The Battle of Britain*, 72–73.

³⁷ *Ibid.*, 82.

³⁸ *Ibid.*, 86.

³⁹ Noble Frankland, *History at War: The Campaigns of an Historian* (London: Giles de la Mare, 1998) pp.70–73

⁴⁰ Olsen, *A History of Air Warfare*, 89.

⁴¹ *Ibid.*

⁴² *Ibid.*, 100.

⁴³ See Martin Streetly, *Confound and Destroy: 100 Group and the Bomber Support Campaign* (London: Macdonald and Janes, 1979); Martin Bowman and Tom Cushing, *Confounding the Reich: The Operational History of 100 (Bomber Support) Group* (Cambridge: Patrick Stephens Limited, 1996)

⁴⁴ See Istvan Toperczer, *MiG-17 and MiG-19 Units of the Vietnam War* (Oxford: Osprey Publishing, 2001) pp.30–31.

⁴⁵ Marshall L Michel, *Clashes: Air Combat Over North Vietnam, 1965–1975* (Annapolis: Naval Institute Press, 1997);

⁴⁶ Benjamin Cooling, *Case Studies in the Achievement of Air Superiority* (Honolulu: University Press of the Pacific, 1994), 528.

⁴⁷ Olsen, *A History of Air Warfare*, 113.

⁴⁸ *Ibid.*, 177.

⁴⁹ *Ibid.*, 184.

⁵⁰ Kevin Woods, *The Mother of all Battles* (Michigan: Naval Institute Press, 2008), 190.

⁵¹ For a full account, see, for example, Anthony Cordesman, *The Lessons and Non-Lessons of the Air and Missile Campaign in Kosovo* (Praeger, 2001); Stephen Hosmer, *Why Milosevic Decided to Settle When He Did* (Santa Monica: RAND, 2001).

⁵² MOD, *Joint Doctrine Publication 0-30 – UK Air and Space Doctrine* (Shrivenham: DCDC, 2012), 3-3.

⁵³ *Ibid.*, 3-30.

⁵⁴ Anti-Access and Area-Denial (A2AD).

⁵⁵ MOD, *Strategic Trends Programme: Future Operating Environment 2035* (Shrivenham: DCDC, 2014), 15-16.

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Book Review

Churchill and His Airmen: Relationships, Intrigue and Policy Making 1914-1945

By Vincent Orange

Reviewed by Sebastian Cox

The Royal Air Force owes Professor Vincent Orange a notable debt of gratitude for his remarkable series of biographies of senior RAF Commanders of the Second World War. His biographies of Keith Park, "Mary" Coningham, Hugh Dowding, Arthur Tedder and John Slessor have advanced our knowledge and understanding of these important figures in RAF history. Sadly, Professor Orange died before this, his last work, was published. He had been suffering ill-health for some time before he died, and perhaps this explains why, regrettably, this book is not amongst his best.

Professor Orange had always been fascinated by Churchill and had considered writing a straight biographical study, but decided to combine his interest in the great man with his wider interest in the RAF and many of its leading figures. Unfortunately, this approach did not work as well as might be expected in that it has led to a book which is "neither fish nor fowl". It contains many interesting insights into Churchill and his fluctuating attitudes to air power and his interaction with many of the leading airmen of the RAF but it lacks a consistent theme, unless it be that of "great men" and their influence on history. It is precisely in employing this seductive, but ultimately simplistic, narrative that the author goes astray.

He begins with Churchill at the Admiralty as the First World War approaches. Churchill's fascination with technology, gadgets great and small, is well known and he undoubtedly drove the development of naval aviation forward in those early years. However, in trying to follow the many vicissitudes of Churchill's post-Gallipoli career through to 1918 the author ends up writing short pieces with headings such as "Trenchard's Constant Offensive", "Still No Air Ministry", "Haig, Tiverton, Smuts, Ashmore", some with only tenuous links to Churchill himself. This approach breaks up the flow of the narrative and introduces characters who enter and disappear from the scene with the bewildering speed of extras in a film. This may in part explain why the book too often degenerates into superficial analysis. For example, when looking at Trenchard's offensive policy the author criticises him for "persuading himself" that his inferior aircraft and poorly trained crews "were destroying large numbers of German aircraft and undermining German morale, which... they were not...". He states that the RFC's concentration on aerial combat was at the expense of the "more positive" contribution of attempting to locate batteries, taking photographs of troop movements and offering close support. This is a common criticism which signally fails to appreciate two seminal issues. Firstly, that the RFC had little choice but to engage in offensive action if the British Army was doing the same, which it was, for example, during the infamous 'Bloody April' in 1917. And more fundamentally, that Trenchard's principal aim was not to destroy German aircraft *per se*, but rather to keep them away from the large numbers of British aircraft constantly engaged in the very activities which the author rather bizarrely appears to think they neglected, but in fact did not. To locate batteries, and photograph troop movements required penetration behind the lines and hence the conduct of 'inner' and 'outer' air battles. Trenchard on occasion pushed this too hard, but his fundamental reasoning was sound enough – it is called the air superiority battle. It is difficult to see how any other commander could successfully have adopted a policy much different in the circumstances.

Moving through the thirties and into the Second World War, the same trends appear. Certain individuals, notably Dowding, Park, Tedder and Coningham, all subjects of previous biographies by the author, are lavished with praise, much of it undoubtedly merited. Others come in for more criticism, again some merited. However, the author's views on RAF doctrine and policy are excessively simplistic. For him, any failures in policy and weaknesses exposed when War comes are down to distortions due to excessive adherence to Trenchardian views on strategic bombing. This supposedly results in a failure to provide for close air support forces for the Army, or maritime air support for the Navy. Air defence is only provided because of the vision of Dowding, Park and a few like-minded persons apparently struggling against the prevailing views. This is compared unfavourably with the *Luftwaffe's* supposed adherence to "close support". But there were many senior RAF officers other than Dowding and Park who espoused the need for some element of air defence, and Trenchard bowed to their opinion in his 1923 expansion scheme. The RAF did much thinking on the subject before Dowding became involved.

Come the 1930s what the author ignores is the Government's extreme reluctance to postulate any large scale commitment to land warfare on the Continent and its extreme anxiety to deter war – a policy which continued until a last minute *volte face* in March 1939 expands the putative BEF from 4 Divisions to 32! No large continental army, and a desire to deter equals strategic bombers and fighter defence of the UK, which is what the RAF built, though the latter ultimately took precedence. There were, in fact, more chapters on co-operative warfare than on strategic bombing in the main RAF Doctrine manual of the pre-war era.

Much criticism is also levelled at the bomber aircraft with which the RAF entered the War for which there is some justification, though they were not noticeably inferior to their German counterparts, but no blame is attached to Dowding although he was, in the early 1930s, precisely the officer responsible for issuing all of the specifications to which these aircraft were built.

The author also consistently conflates operational level air warfare in support of Armies, which is principally what the *Luftwaffe* was designed for, with close air support, which is a different thing. The two are complementary, not synonymous, and the RAF actually become experts at supporting the Army in the Middle East principally, though not exclusively, through the former not the latter. What this depends on is firstly air superiority, secondly proper organisation, and thirdly and crucially good inter-service communications, both personal and technical. Orange gives Tedder and Coningham nearly all the credit, whereas Sir Arthur Longmore and others laid much of the foundations, particularly organisationally, on which they were able to build. The exploration of Longmore's relationship with Churchill is largely limited to the former's demise at the hands of the latter.

In its analysis of the war years the book again tends to view events through the lens of these same airmen. Other important critically important figures including Harris and Portal

do feature, but the narrative tends to revolve around Tedder and his views and influence. More space should surely have been given to Portal, and arguably Harris, and their direct relationships with Churchill, not just when those relationships brought them into contact with Tedder.

This review has highlighted the many weaknesses in the book, especially the tendency to analyse decision-making and personality almost devoid of context and wider influences. It is therefore only fair to say that it contains much of value and interest as well, notably in its assessments of Churchill himself, where it gives a balanced and thoughtful assessment of the great man's strengths and weaknesses. It should therefore be read with an awareness that it tends to give a partial (in every sense) view.

Book Review

The Battle of Britain: Five Months that Changed History, May - October 1940

By James Holland

Reviewed by Dr David Jordan

James Holland's contribution to the historiography of the Battle of Britain differs from many previous works in that it is not simply an account of the air fighting over Britain during the summer months of 1940, bounded by the somewhat arbitrary official dates laid down for the battle, largely in order to set a defined period of time to allow the award of the Battle of Britain clasp for campaign medals.

Holland instead presents an account which, perhaps more than any other to date, seeks to place the battle in the wider context of events in 1940, and without the near-exclusive concentration upon the enormous efforts of Fighter Command in countering the German attack on the United Kingdom. The work of RAF Bomber and Coastal Commands, all too-often ignored by historians, are considered as is the part played by the Royal Navy. Holland gives short shrift to some of the more egregious attempts at revisionism of recent years (usually carried out through the vehicle of the internet, but with the occasional unfortunate escape into print) which seek to claim that the Battle was won by the existence of the Royal Navy. Although some of Britain's most capable maritime historians – most obviously Andrew Gordon – dismiss such a black and white approach and have brought more nuanced consideration to the part played by the naval and air forces, it may well be that the publicity for Holland's book, aided by a BBC television programme, will be the source of a more reasoned consideration of the role of maritime power without the crass attempts by some historians to denigrate the importance of the air force contribution to the Battle.

James Holland places the role of the other components into a reasoned context, pointing out the significance of the naval contribution to the defence of the United Kingdom in a joint context – one which was, in fact, recognised by the Chiefs of Staff in May 1940, in a document *'British Strategy in the Case of a Certain Eventuality'*, in which the importance of the RAF and RN standing firm against German efforts was held to be essential to Britain's ability to continue the war. Holland also gives due consideration of the British Army, which would, of course, have had to have faced any German landing which managed to get ashore, and manages to highlight the important point that despite the disaster of the French campaign, Britain was not quite in the state where the Walmington-on-Sea Home Guard platoon of 'Dad's Army' fame would have been the first line of defence against an attempt at establishing a lodgement.

As such, Holland offers one of the few attempts to take a more holistic view of the Battle of Britain. Readers expecting an overview of the Battle which concentrates upon air fighting and accounts of derring-do on both sides are likely to be a little disappointed, not least since the first 250 or so pages deal with events prior to what is commonly accepted as being the period of the Battle of Britain, and, indeed, preceding the speech by Winston Churchill on 18 June 1940 in which he gave popular currency to the term 'the Battle of Britain' by stating that '...the Battle of France is over. The Battle of Britain is about to begin'. This contextualisation is important to both the narrative and the analysis, however, and is thus far from misplaced.

Following the successful approach of his previous works on military history, Holland draws upon the personal recollections of a number of participants in the Battle to add colour to his tale, and does so to good effect, never allowing individual recollection of events to dominate. The overall effect, therefore is to prevent a fully rounded account of the events which led to the Battle of Britain and the successful efforts of the nation as a whole, with the Royal Air Force in the vanguard, to thwart the German effort to force Britain to seek peace. Holland provides a welcome addition to the historiography, perhaps opening a new 'front' in the consideration of the Battle in which the role of Fighter Command is given the credit which is rightly its due, but as part of a broader joint national effort to ensure that Britain was not defeated in 1940, thus leaving the consequences of such a defeat for the future direction of British, European and World history to entertaining counter-factual historical works.

Book Review

When Britain Saved the West: The Story of 1940

By Robin Prior

Reviewed by Dr David Jordan

Robin Prior is a familiar name to many military historians, but mainly for his work on the First World War. His studies of the Gallipoli campaign, the generalship of Sir Henry Rawlinson and the Battles of the Somme and Passchendaele (the last three co-authored with Trevor Wilson), place him amongst the front rank of historians of the 1914-18 period. All the books are well researched and thought-provoking, often inspiring further debate and scrutiny. Any reader familiar with Prior's canon of work will, therefore, have a certain level of expectation about this venture into the Second World War – and is unlikely to be disappointed by his latest efforts.

Prior sets forward a hypothesis that the historiography of the war, and particularly 1940, is incomplete in its analysis of how important it was for the future of 'the West' that Britain remained fighting in 1940. Prior notes that there have been some excellent books dealing with 1940, but only from one aspect, while those attempting a broader sweep are either dated (he cites Lawrence Thompson's *1940 - The year of Legend*), or not up to the job (it is clear that Clive Ponting's *1940: Myth and Reality* left Professor Prior distinctly unimpressed). To do this, he examines those events which might have ended Britain's role in the war – the ineffectual nature of Neville Chamberlain's government; the near-destruction of the British Expeditionary Force and its salvation; the Battle of Britain and then, finally, the Blitz against British cities. Prior is very clear that had any of these events, or a combination thereof, brought about a British capitulation or at least forced Britain into a negative peace deal with Hitler, it might have tipped the West into oblivion.

Prior helpfully defines what he means by 'the West', preferring not to employ the term in the rather generic way many commentators do, assuming that their readership instinctively knows what 'the West' is. He helpfully explains why Hitler's Germany could not be considered part of the West in 1940 because of its rejection of core values such as freedom from fear and persecution which underpin western norms, even if the nations believing in those freedoms are often far from perfect themselves.

This carefully laid definition of terms sets the scene for Prior's overall approach. He takes us through the well-meaning but confused and slightly vacillatory approach of the Chamberlain government – both helped and hindered by the boundless energy and enthusiasm of Winston Churchill as First Lord of the Admiralty – and the doubts within parliament about it. He notes the existence of five separate groups of Conservative MPs concerned at Chamberlain's leadership, and a careful examination of the parliamentary debate ('The Conduct of the War', 9-10 May 1940) which led to Chamberlain's resignation is particularly interesting for the manner in which it deconstructs the Prime Minister's woeful performance in the debate, and Prior highlights the incongruity of his announcing that Churchill was to be given the power to direct the Chiefs of Staff – effectively placing the Prime Minister in a subordinate role to the First Lord of the Admiralty when it came to the conduct of the war. It may be that Prior perhaps overplays the dire hand which Chamberlain and his supporters managed to deal themselves on the first day of the debate, but he tells the story precisely

and with wit (including a slightly barbed pondering of whether Churchill was taking notes when Arthur Greenwood, referring to the Norwegian campaign, observed that 'masterful evacuations' do not win wars).

With Chamberlain's fall bringing about a more robust and aggressive approach to the war as a result of Churchill's appointment, Prior sets about the notion that Churchill's position was weak. While not all historians will agree with his interpretation of how strong Churchill's political capital was upon his appointment – he was anxious to solicit the support of his predecessor, careful in his treatment of 'Chamberlainites', particularly those who were subject to some vicious assaults in the media, and conscious of the fact that he was leader of his country but not his party – Prior makes his case well. We are then taken through the disaster of the Fall of France and the 'miracle' of the evacuation at Dunkirk. Prior considers whether the threat of an invasion of Britain was a giant bluff, and concludes that it was not; he concludes that the idea that Operation Sea Lion was nothing more than an attempt to coerce Britain into accepting terms was a 'myth' (p.165), in no small part generated by historians who believe that Hitler had no desire to conquer the United Kingdom.

Prior regards this as 'nonsense', stating that 'Hitler hated the British' (p.166), but it would be useful were this point to be explored further. Gerwin Strobl's *This Germanic Isle* (Cambridge UP, 2007) demonstrates the complex and confused manner in which the Germans, including Hitler, regarded the British Empire. Hitler may not have liked the British, but he certainly admired the British Empire as a construct (and the 'ruthlessness' which had gone into its creation), and was concerned as to what – or more precisely who would fill the vacuum were London to fall under German occupation, with the concern that the diminution of British power might enhance the influence and strength of Japan, the United States and possibly even the Soviet Union, all to the detriment of Germany's future global position. While Prior is surely right to regard the threat of invasion as being more than just an enormous bluff, it may be that Hitler's degree of enthusiasm at the prospect was lower than a reader might assume from Prior's view. This is not a criticism of Prior's view – simply a demonstration of how readily well-founded scholarship, expressed with conviction, can provoke debate, a point which some contributions to the historiography of both World Wars appear to have ignored in a quest for coverage and notoriety over the years.

Whether an invasion attempt would have succeeded remains a moot point, but the book brings out some important points which deserve consideration. Prior notes (p.174) that Admiral Drax, the commander of Nore Command, was worried about the risks posed by a lack of control of the air; he feared that the anti-invasion forces would be extremely vulnerable to air attack. This is, of course, echoed in the Chief of Staffs' view as expressed in the memorandum *British Strategy in a Certain Eventuality*, and highlights the critical point that while historians today might regard the air threat to the Royal Navy's surface forces as being almost negligible, this was not how it was seen at the time by the majority of the senior commanders and thus the War Cabinet. It is in this context that we need to see the Battle

of Britain, and Prior conducts yet more succinct, incisive analysis of the Battle, offering some thought-provoking conclusions. He wonders whether or not the idea that the Battle was not 'The Few versus the many', something which has gained currency over recent years, might not have gone too far. He suggests that the idea that Britain often had more serviceable fighters and more pilots available during the Battle is an oversimplification, and skilfully leads us to his view that 'German aircraft had to be destroyed. Most of them were destroyed by just a handful of men' (p.238). While at first sight this will not be news to anyone who has read the work of (say) Christopher Shores and Clive Williams which demonstrates that a small proportion of pilots (from whichever nation is being studied) destroyed a percentage of enemy aircraft far higher than might be expected, Prior demonstrates that experienced pilots were under considerable pressure throughout the Battle – and that the idea of 'The Few' remains reasonable. The Battle dealt with, Prior then looks at the Blitz and the attempts to draw the United States into the war in detail, offering salient analysis of these two critical areas, albeit with the obvious caveat that both lasted into 1941.

Overall, this is an impressive and interesting book. For those unfamiliar with the events of 1940 and their effects upon and within Britain, it is an excellent starting point, while even for those who have spent many years considering the events of 1940, it provides food for thought and potentially the basis for vigorous debate. It offers a lively, provocative counter to the tone of some recent historiography which has suggested that Britain did not, really, save anything other than itself in 1940. Prior is clear – Britain, through its actions in 1940, did indeed 'save the West' and that without the sacrifices endured then, the world would have been a much darker place. Some might consider this an old-fashioned, self-regarding British view (thus failing to note that the author is Australian), but Prior is a powerful advocate who deserves consideration.

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