Logistics and Airpower—A Failure in Doctrine?

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To an external observer, it must seem axiomatic that the delivery of airpower is entirely dependent on adequate logistics and infrastructure arrangements derived from and, in turn, sustained by the nation's technological and industrial base. In this regard, the individual weapons platform (and its crew) embodies the collective investment of both industry and the Services over a considerable period of time. As and when the first Eurofighter engages in combat, it will do so on the back of not only the single most expensive procurement programme in the history of the United Kingdom (UK) but also a comprehensive support and training programme across the aircraft's entire operational life that represents an equally large national investment.[1] The scale of this undertaking, as well as the evident difficulty in divorcing the air weapons from such complex support arrangements, is as much a defining characteristic of airpower as are *height, speed, reach, ubiquity, flexibility, responsiveness,* and *concentration*.

This all-embracing view of what comprises airpower is by no means novel. Many years ago, Sir John Slessor wrote that airpower ". . . is a compound of air forces and all those things on which air forces directly or indirectly depend, such as a flourishing industry and Civil Aviation, a good meteorological service, secure fuel supplies and so on."[2] The Royal Air force (RAF) doctrinal document AP 3000, in addressing the same question, consciously rejects the wider perspective in favour of what it terms a *purely military concept of airpower*.[3] When one reads on, it becomes clear this is not so much a more cautious appreciation as it is a narrow definition that focuses almost exclusively on the nature of air vehicles. This seems a debatable strategy, even given the seminal role of the manned aircraft in the creation of the RAF. It is the equivalent of the army describing its doctrine in terms of the tank or the navy, the surface ship.

The blurring of the distinction between aircraft and airpower permeates the remainder of AP 3000 but is particularly noticeable in the debate about airpower's relative strengths and weaknesses. AP 3000 explains that the characteristics of airpower can be divided into primary strengths (*height, reach,* and *speed*), secondary strengths (*flexibility, ubiquity, responsiveness,* and *concentration*), limitations (*impermanence, payload,* and *fragility*), and other considerations (such as cost and dependence on bases). According to Sir John Slessor, the simplest definition of airpower is ". . . the use of the air to enforce the national will." Even if we substitute AP 3000's more pedantic description ". . . the ability to use platforms operating in or passing through the air for military purposes . . . ," it is difficult to understand how *height, reach,* and *speed* are contributory characteristics. They are, in fact, terms that help describe the lack of friction potentially available when operating in the air compared to the sea or land. In themselves, they do not and cannot define airpower and, equally, should not be thought of as strengths or, indeed, weaknesses. *Fragility* and *impermanence* may be regarded as the other side of the coin in that there is a reciprocal relationship between friction and fragility. To exploit the air, we need to develop and support, often at great distances, a level of technology significantly greater than that needed to operate at sea or on land in an environment that is intrinsically more hostile. Crudely put, reduced friction has been gained at the price of greater fragility. In fact, this is a truism across the entire operating spectrum of land, sea, air, and indeed, space.

The secondary strengths of *flexibility, ubiquity, responsiveness,* and *concentration* are in reality enablers—good practices for air forces in the delivery of airpower. This was certainly how Sir John Slessor saw them, sensibly adding mobility for good measure.[4] As far as the limitations are concerned and putting *fragility* to one side, it is possible to argue that *impermanence* is as much a strength as a weakness seeking discrete and proportionate military action. This is why airpower is used so often as the weapon of choice by the United Nations and the North Atlantic Treaty Organization to achieve their policing and coercive aims. As to other considerations, the limitations represented by cost or *dependency* on bases seems to be about as relevant to the debate as recording the tank's vulnerability to attack helicopters in a discussion on the nature of land doctrine or stressing the high cost of nuclear submarines when examining maritime power.

In sum, AP 3000 takes an extremely narrow and confused approach to the question of what airpower is, while at times, the argument can appear defensive and self-serving. In the process, the opportunity is lost to focus on the enablers that permit air forces to deliver airpower. The result is a distorted emphasis on the weapon rather than the environment with little attention to the wider constituent components, particularly logistics. Why this has come about is not particularly important, although it could be that it derives partly from a belief the manned aircraft is in itself the embodiment of airpower (rather than the final link in a complex chain of processes) and partly from a historic aversion to any suggestion that the support area has a warfighting role. What is important, however, is the fact that warfighters have inflicted on themselves a definition of airpower that is largely divorced from reality.

So what is reality? The truth is that air forces, by their very nature, consume vast resources. It was Britain's wealth, industrial capacity, and technological development that enabled airpower to be exercised so effectively on the battlefield of the First World War. Without a ready supply or aircraft and trained aircrews and the infrastructure to support both, the RAF would have been stillborn. A vast and complex organisation was created at home and overseas to allow the air war to be prosecuted, in effect, linking industry to the front line. This was not a simple one-way pipeline but a series of complex, interrelated processes encompassing repair, overhaul, modification,

testing, development, and training that saw materiel and manpower move continuously between the home base and the front line in response to technological advances and operational circumstances.

This picture of immense national collective effort, harnessed by the purpose of delivering airpower, is as true today as it was in 1918. If one looks simply at the human resources required to support aircraft in the field over the last 80 years, a familiar pattern emerges. The RAF deployed 54,000 people to France in 1918 and more than 87,000 to support the 2d Tactical Air Force in France and Belgium in 1944. The following graphs indicate how these operations compared with the Gulf War (including the US Air Force).

Interestingly, the number of direct maintenance personnel appears to have remained much the same, at about 10 to 20 per airframe. The higher support total in 1944 reflects the large numbers involved in airfield construction and the demands of a highly mobile campaign. Even allowing for errors of interpretation and the differing scale of individual campaigns, it is clear that airpower is and always has been a maintenance intensive business.

This is equally true of supply. The RAF not only was the world's largest air force in 1918 but also possessed the largest range of stores ever managed by a single organisation. The total number of different items held in stock was in the region of 100,000. Simply organising the purchase and handling of this stock, in the vast quantities required to support the front line, was an achievement in itself.[5] In the intervening years, the challenge has become even greater as aircraft have inexorably grown in complexity. By 1945, the RAF was struggling with more than 800,000 separate line items, and at the time of the Gulf War, it was probably well over 1 million. Provisioning and storing this immense range of spares would be difficult enough without a high rate of modification action (even before the Tornado entered squadron service, more than 5,000 modifications had been approved, and the total is now probably closer to 15,000) and the overriding concern for airworthiness. In short, it is a task very different in scale and intensity to the management of the 25,000 different food items found in the average supermarket,[6] and incidentally, the 410,000

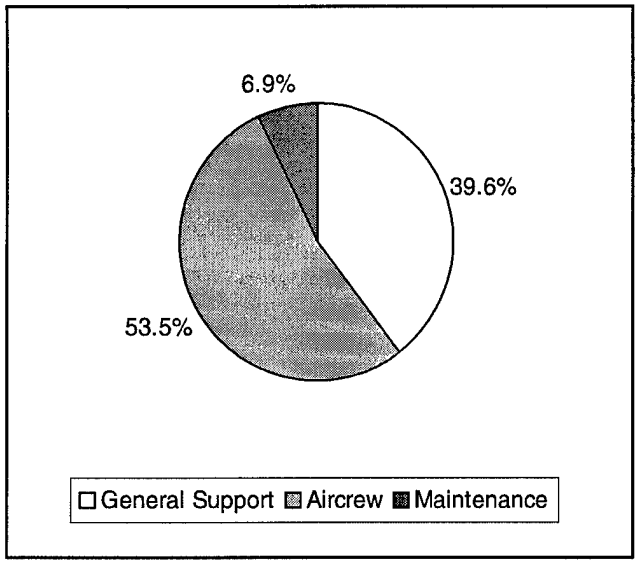

Figure 1. RAF—France 1918

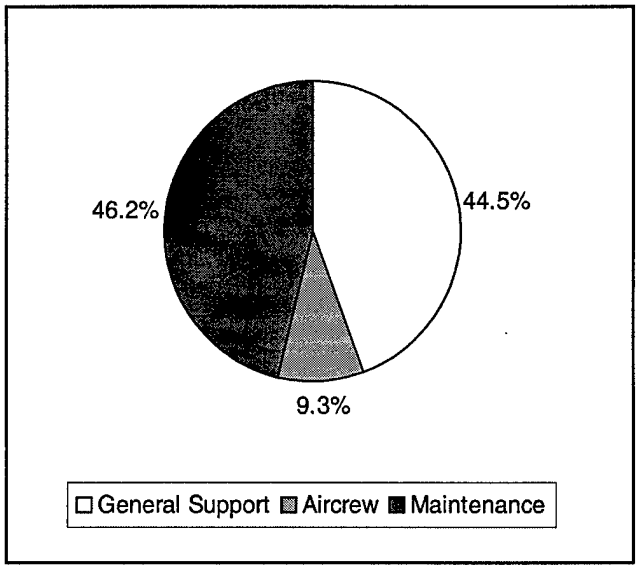

Figure 2. RAF—France 1944

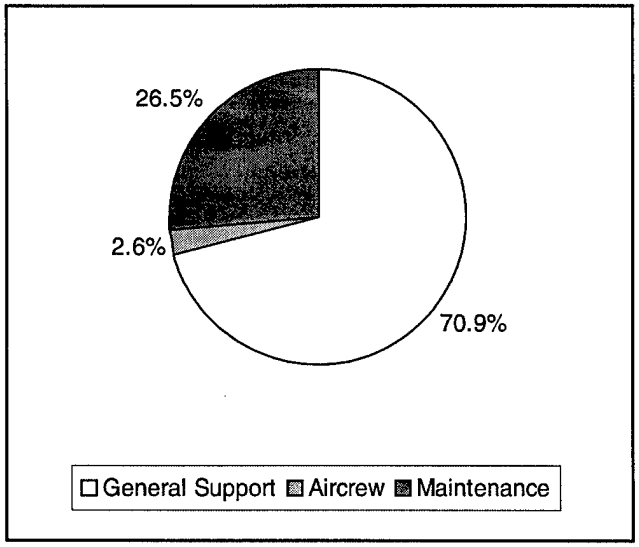

Figure 3. RAF—Gulf 1991

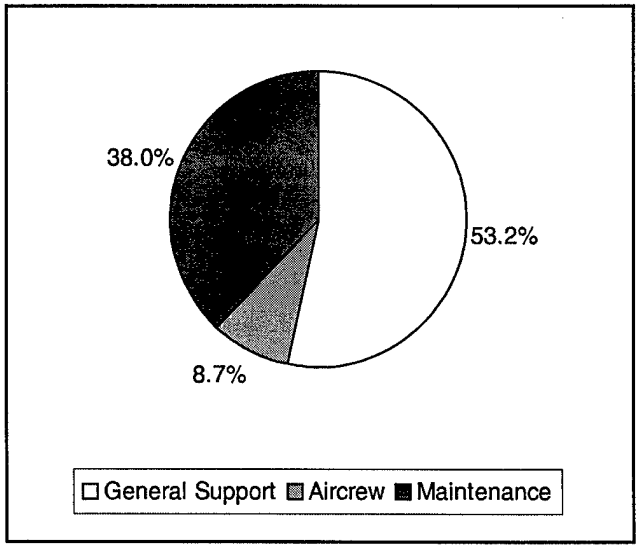

Figure 4. USAF—1991

separate items held by Boeing to support the world's largest commercial aircraft fleet.[7]

Evidence for the broader interpretation of what constitutes airpower can be found by turning the question around and looking at the composition of an air force's center of gravity. Colonel John Warden, USAF, writing in 1988, argued that the enemy's vulnerability lies in the equipment chain, from manufacturing to employment, and other similarly interdependent systems such as fuel or pilot training. He noted that logistics (in this context, supply) might well constitute the real centre of gravity but also added that other targets (or enablers)—such as airfields, personnel, and command and control—might be suitable for attacks aimed at destroying an enemy's airpower.[8] This echoes Sir Basil Liddell Hart's assessment in 1934, when he noted that the large ground organisation of a modern air force was its Achilles' heel.[9] Interestingly, this was written before rearmament saw RAF expenditures reach some 35 to 36 percent of total defence spending (much of it on infrastructure) and an expansion programme that demanded the lion's share of the available manpower. By 1942, 750,000 personnel were allocated to the RAF and the Ministry of Aircraft Production alone, as great as the navy, the shipbuilding industry, the army, and the Ministry of Supply put together.[10]

A central characteristic of airpower—a thread that has run through the RAF's entire existence—is the provision of a sophisticated and comprehensive logistics system. This is not to suggest that repair and overhaul are somehow more important than any other activity undertaken by air forces. The fundamental point is that we should see airpower as the sum of a series of complex processes stretching over time and across organisations, including flying training stations, repair depots, and industry. In its current form AP 3000 fails to provide this understanding and, in so doing, presents a flawed picture of airpower.

Why should this be a cause for concern? First, by focusing on the weapon system, we deny ourselves a balanced view of what comprises airpower. When difficult resourcing decisions have to be made, people are inclined temperamentally to favour platform numbers at the expense of enablers, such as combat support, training, and logistics. If the latter is not recognised as proper constituents of airpower, the continuity of experience that provides valuable lessons for support requirements cannot be exploited. Appearing to argue that fixed bases and complex logistics support arrangements weaken airpower is confusing and creates the impression the logistics tail is something to be embarrassed about. The idea has been fostered, at least in the minds of external observers, that logistics and airpower are separate entities somehow enmeshed by inefficiency and outdated ways of doing business. As a result, there seems to have been a wider willingness to embrace efficiencies in the support area in the belief the risk is self-contained. That this is not the case has been amply demonstrated over recent years as the hollowing out of logistics has rapidly bitten in the form of falling front-line availability. The effective delivery of airpower is evidently not about teeth or tail; rather it depends upon how we managed the continuum that links the industrial base with the front line.

There is further danger, arising from this doctrinal confusion, in the softening of the distinction between operational and business logistics.[11] If the former can be separated from what comprises airpower, then it is a relatively easy step to conclude that the commercial world provides a template for how we should organise our support arrangements. This has particular implications for our ability to maintain the capacity for surge. Once resilience is perceived purely in terms of the overhead involved (because logistics processes are not an integral part of how we deliver airpower), it will inevitably fall victim to the pressure to cut costs.

Not surprisingly, business has little experience of reverse logistics (the flow of materiel back to depots for repair, modification, and reissue) and even less of attrition. All the evidence to date indicates that the ability to cope with surge is equally questionable, witness the well-publicised problems confronting Boeing. Having adopted a streamlined production process, optimised on the principle of *just in time*, the company discovered that it faced immense difficulties in attempting to double its commercial production rate to meet an unplanned and sudden increase in demand.[12] It was only by halting the production line and, incidentally, recording its first loss in 50 years that the situation was recovered. Not all the contributory problems were production related, but material and parts shortages played a significant role in exacerbating the situation. As one senior executive put it, ". . . we did not have the resiliency to absorb a series of things that happened to us, none of which was individually big." A similar but less well-known incident occurred when a 29,000-ton forging press producing aero engine components in Houston broke down. This single failure threatened to disrupt not only engine production at three separate manufacturers but also final assembly at Boeing and Airbus. Offloading work to competing companies was complicated because of dies and proprietary processes. Self-evidently, optimisation of the supply chain not only reduces the ability to respond to short notice requirements but also creates a greater vulnerability to *shock*. It is these very dangers that a military logistics system should be designed to counter.

Turning for a moment to a specific issue, it is fair to say the present ambivalence regarding the place of logistics in delivering airpower has made the argument for the retention of third line (depot-level) maintenance facilities more complicated than it should have been. With a clear commitment in doctrine to the principle of managing the logistics chain as an entity—from industry through the depots and on to the front line—there is a risk in seeing what should be a holistic process reduced to a collection of suboptimised and ill-focused activities. Aside from the obvious damage this would inflict on an organisation built around the efficacy of its logistics system, such an outcome would also deny the opportunity to develop the many potential synergies that exist across the support chain. All the evidence indicates there is considerable scope for innovative partnership arrangements between air forces and industry—*smart support* for want of a better phrase—once the role of in-house facilities and the wider place of logistics in airpower doctrine has been clarified.[13]

If technology lies at the heart of war, then the support chain lies at the heart of an air force. The processes and interdependencies that comprise this continuum can only be managed effectively in a holistic manner. Indeed, the Integrated Logistics Support concept, pioneered by the USAF and RAF, is based on this very principle. However, we need to move beyond optimising logistics support to developing a strategy that embraces the entire process, from industry to the flying squadrons, seeking to develop synergies and reduce vulnerabilities. To do this successfully will require the development of appropriate mechanisms and suitable metrics—the latter focusing on not only readiness and availability but also sustainability and resilience. Finally, we must examine how our airpower doctrine relates to the other Services and environmental doctrines and, in the case of logistics, with the integrated approach implicit in the decision to form the CDL organisation.

None of this is to argue that the RAF's logistics system can avoid change or that there is no scope for improvement. Business practices do have a place in the defence environment. The budgetary pressures that demand more effective ways of supporting the front

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line cannot be escaped. On the other hand, unless there is a proper understanding of how collective efforts contribute to the use of the air to enforce national will, there is a risk of weakening this very ability in the name of greater efficiency. The aim should be at creating a robust and coherent airpower doctrine that transcends both aircraft and air forces.

Notes

1. The British share of Eurofighter development and production costs is reportedly in excess of £15B. However, the life-cycle costs will certainly match, if not exceed, this sum. (*Daily Telegraph*, 5 September 1998.)
2. Air Chief Marshal Sir John Slessor, *The Past Development of Air Power*, RUSI, 1986.
3. AP 3000, *Air Power Doctrine*, 13-17.
4. Sir John Slessor, *The Great Deterrent*, London: Cassel & Co., 1957, 259.
5. Beyond the immense increase in the output of airframes and engines, huge numbers of spares were provisioned. In November 1918 alone, the output of turnbuckles and bolts was 1.2 million and 10.5 million respectively.
6. On a typical day, some 3,500 lorries head for TESCO's 22 depots. (*The Times*, 5 November 1996 and 3 November 1997.)
7. Boeing's Spare Parts Distribution Center has more than 410,000 different part numbers in a total inventory of more than 20 million items. (*Overhaul & Maintenance*, July/August 1966, 48-49.)
8. Colonel John A. Warden, *The Air Campaign*, Pergamon-Brassey's, Washington, 1989, 34-38.
9. Sir Basil Liddell Hart, *Thoughts on War*, London: Faber & Faber, 1944, 54.
10. John Terrane, *The Right of the Line*, London: Hodder & Stoughton, 1985, 602-603.
11. *Logistics Spectrum*, Spring 1985, includes a thoughtful article on the difference between military and business logistics and, while agreeing that there has been some convergence, concludes that the disciplines retain unique objectives and characteristics.
12. Boeing, which was building ten 737s in early 1997, was producing 21 a month by early 1998 and was scheduled to be producing 24 every 30 days by the end of the year (*Aviation Week*, 16 March 1998.)
13. The US Air Force has pioneered a similar approach under the Lean Logistics label.

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