Jerome G. Peppers—educator, logistician, historian, for whom one of the most prestigious awards given at the Air Force Institute of Technology is named—observed,

> Military history has long ignored logistics. No one wrote about and no one remembers the original logistician. He was probably a mean but smart Neanderthal (or earlier) warrior who spent some time thinking about conditions and began to stock stones, arrows, and spears in logical places for a coming battle. Chances are very good that he won the battle, but we will never know since history doesn't tell us. Many people study the strategy and tactics of great battles, but few study, and even fewer learn of, the logistics actions that contributed so greatly to the outcome of those battles.
>
> Lieutenant General Brehon Somervell in 1944 said, 'History has little to say of the great logisticians, for the prancing charger is longer remembered than the pack mule.' How true. Because logistics lacks *sex appeal,* it finds little coverage in military history or education. It certainly never approaches the dramatic and flowery coverage accorded strategy or tactics. And the published biography of the logistician is extremely rare.
>
> We must recognize that, for logisticians, the study of military logistics history is vitally important because of the nature of the problems faced by military leadership. The study of military logistics history will help the logistician and the student of logistics to more readily identify current problems, and it will suggest potential avenues of solution for those problems. Further and perhaps far more important, the study will help logisticians create more effective logistics systems for tomorrow.

logistics history

Historical Vignettes: Thinking About Strategy and Resources

This edition's Logistics History section features four vignettes written by Robin Higham: "Demand Versus Resources—a Short Historical Perspective," "Logistic Limitations and Grand Strategy—the Dilemma for Underdogs," "Royal Air Force Spares Forecasting in World War II," and "Pipeline Purdah and the Barbed-Wire Strand." Doctor Higham, Professor Emeritus of History at Kansas State University, has educated two generations of historians and is widely known among historians and logisticians alike.

In each of these vignettes presented, the reader will find some very interesting nuggets of truth. For example:

- The wave cycle of aeronautical history shows, on a financial basis, how wars are anticipated in peace. Demands cannot be matched to resources until an all-encompassing national grand strategy for peace and war has been put in place.
- While major powers such as Britain, France, Germany, Russia, Japan, and the United States have at their peaks had enough resources, including manpower, and indigenous manufacturing capacity, the same has not been and is not true for lesser powers. Thus the demand versus resources dilemma has and is much more important and compels the adoption of a viable national grand strategy.
- During World War II, The Royal Air Force found itself saddled with six problems which could not be solved overnight: a lack of standardization; a lack of experience in spares ordering for wartime; a lack of planning for the repair of aircraft; a deficiency in the knowledge of modern production and a lack of understanding of the technological revolution; low serviceability rates; and a shortage of fitters and riggers. It took the first 4 years of war to hammer out the balances and compromises necessary to run a fighting air force and make airpower effective.
- Wartime equilibrium refers to that short period at the peak between rearmamental instability and demobilizational instability when the war economy has been fully developed and crisis has been accepted as the norm. The other equilibrium is peacetime when money rather than time dominates.

Thinking About Strategy and Resources

Historical Vignettes

Demand Versus Resources—a Short Historical Perspective

History provides a vicarious education in examples not personally experienced. Since history repeats for those who do not read it and heed its lessons, it is essential that leaders, managers, policymakers, and budget drafters understand this.

Official historical sections around the world spend a part of each year shooting down ideas their chiefs have proposed because these have been tried in the past. Sometimes they have succeeded, often they have failed, while on other occasions new technology has enabled old concepts to reach reality.

Basic to the way in which ideas and inventions in peace and war are handled is the constant human factor.

As an example, the current concern over demand versus resources follows a precedent set in the Royal Air Force's 1936 *Secret Document 98* (SD98) *Calculations of Wastage and Consumption in War*. The instructions and tables had been worked out in the early 1930s, based in part on World War I experience, and were designed to enable commanders to anticipate their needs, including casualties to men and machines and the supplies of fuel and ammunition required. Air Chief Marshal Hugh Dowding of Fighter Command used *SD98* to prepare for the Battle of Britain.

SD98, however, overlooked wastage of personnel due to fatigue, especially in very intensive operations, which were not, by the way, expected to last more than a very few short weeks.

Dowding won the Battle of Britain for a number of reasons. An important one was that he refused to accept the French demand for most of Fighter Command, arguing correctly that the Air Council had ruled that he needed a minimum of 29 squadrons. Luckily, the Prime Minister reluctantly accepted Dowding's stand and Britain was saved later in the summer of 1940, by which time Dowding had increased his resources to 55 squadrons of 18 rather than 14 aircraft each and 24 rather than 18 pilots. In other words, he matched his resources to demand with the help of both the aircraft industry and of technology (notably the combination of radar with sector control worked out in the air exercises of the later 1930s and grafted onto the basic 1918 concept).

The wave cycle of aeronautical history (Figure 1) shows, on a financial basis, how wars are anticipated in peace. Demands cannot be matched to resources until an all-encompassing national grand strategy for peace and war has been put in place. To make it effective for the armed forces, roles and doctrine have to be agreed to and the consequent requirements in fiscal, industrial, manpower, and infrastructure have to be set in place.

In the examples which follow, the French were defeated in 1940 in spite of having won in 1918 because of memories of trench warfare, domestic democratic disturbances, to use a current phrase, and the national character impeded progress. The Egyptian Air Force suffered defeats at the hands of the Israelis in 1956 and 1967. Egypt's dictator,

The wave cycle of aeronautical history shows, on a financial basis, how wars are anticipated in peace. Demands cannot be matched to resources until an all-encompassing national grand strategy for peace and war has been put in place.

Vignette Acronyms

RAF - Royal Air Force
EAF - Egyptian Air Force
PAF - Pakistani Air Force
SD - Secret Document

One of the lessons from the Battle of France in 1940 was that German officers and even noncommissioned officers had been encouraged to use their own initiative, whereas the British and French high command could not think at blitz speed, while the latter's command system was so rigid that information forwarded up the phone system and the delayed, calculated response was hopelessly out of synch.

General Nasser, recognized the necessity to achieve, if not victory, at least a standoff, by combing the national resources for suitable manpower and concentrating resources on the air and armored forces to meet the demands of another Israeli thrust. Terrain, climate, and a perpetual threat made the Middle East a natural arena of war. But Egypt's resources of all sorts were limited while its own vulnerable targets were concentrated.

Pakistan, like Egypt a Muslim country, faced a more complex grand-strategic situation in an entirely different environment. In a political sense, Pakistan was India's Israel and so was targeted as an upstart after partition in 1947. Like Egypt, Pakistan had to rely upon outside suppliers both for aircraft and spares. Like Egypt, this made it vulnerable to embargoes and compelled Pakistani planners, like Israel's, to use air power as a first-strike rapier in conjunction with a blocking army advance.

In each of these cases, the opponent-enemy had its own plans. After their defeat in 1918, the Germans secretly developed in Russia what became the Luftwaffe doctrine and tactics together with a skeleton air staff in Germany. The new German air force did not intend to be *the air menace* the French and British feared and to which they reacted.

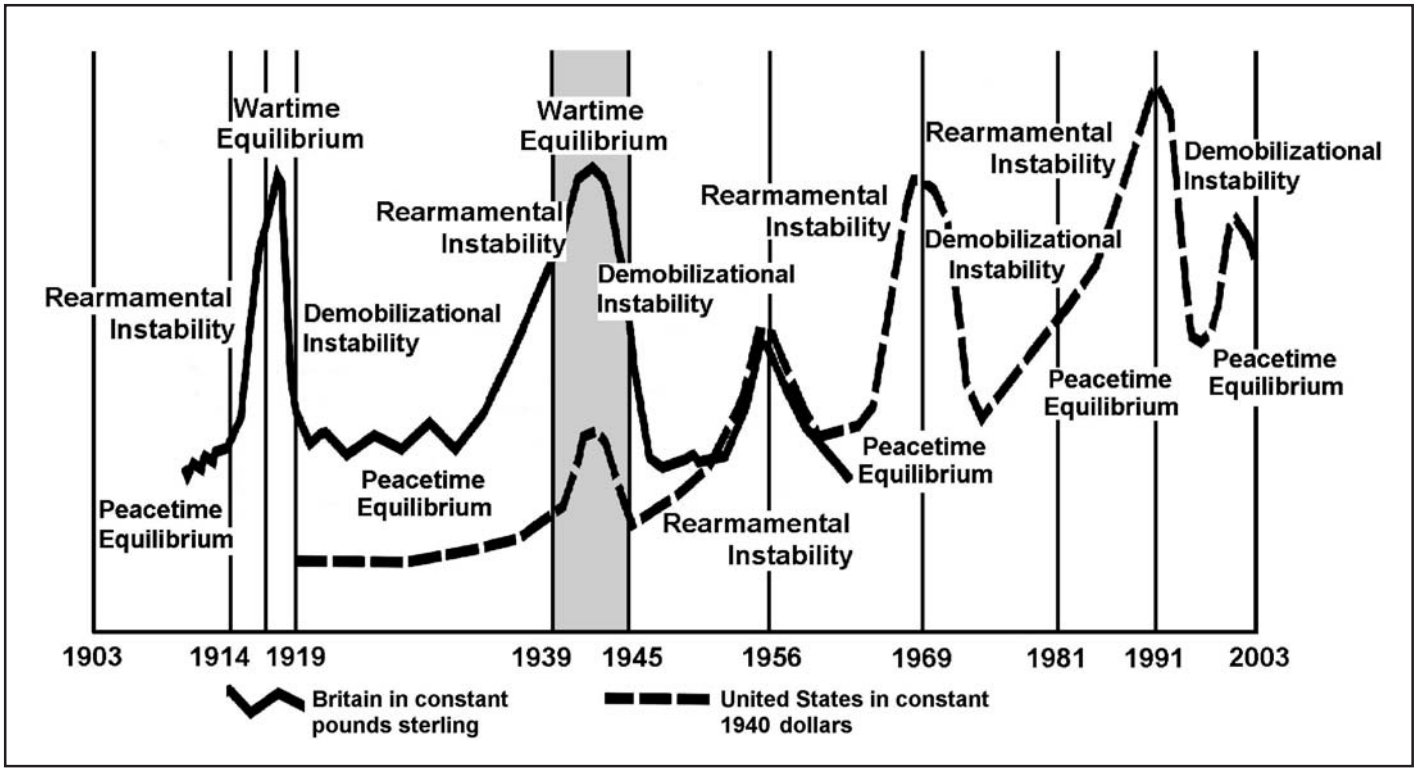

Figure 1. The Wave Cycle in the 20th Century

The Egyptian Air Force had to retrain after the disaster of 1967 from Soviet air defense, ideas based upon countering high-flying US Air Force B-52s, to a counter to the Israeli tactical low-level approach.

The Pakistan Air Force realized the Indian Air Force would, because of like equipment, operate in a manner similar to its own and so developed a first-strike approach to cripple them.

The *Armée de l'Air*, only created in 1933 as an independent arm, was mentally mired in a battle with its late Army parent that crippled the creation of doctrine. At the same time it faced three tasks—defense of the territories, grand-strategic attacks on enemy resources, and army cooperation (assault). This situation meant that there were four very different demands upon French resources—political, fiscal, industrial, and human.

France had neither the doctrine nor the strategy to meet blitzkrieg in 1940, let alone the resources. Wastage and consumption in May 1940 exhausted the French Air Force in a few days. In contrast, Pakistan has demonstrated how a superior enemy can be neutralized.

Money was not available because the Army dominated the defense structure and did not understand the complexities of aviation, while at the same time insistently demanding its own support aviation.

Thus owing to prewar decisions and conditions, the *Armée de l'Air* was short of credits until 1938, short of modern aircraft, and short of aircrew and mechanics.

Modern aircraft could not be produced for a variety of reasons, amongst others, lack of designs, shortage of reliable high-horsepower engines, time in which to test and develop both designs and engines during the technological revolution, properly scheduled delivery of essentials such as propellers and guns, and a paucity of personnel to test and deliver as well as to modify and maintain this equipment. When the *blitzkrieg* hit France, both the 40 percent shortage of mechanics and the absence of a trained reserve of pilots and other aircrew, meant a quick onset of fatigue so that efficiency dropped rapidly. Equally debilitating was the fact that French fighters were slower, heavier, less reliable, and not as easily replaceable as the Luftwaffe's Me-109 and Me-110. In short, the calamity of 1940 had many causes.

In sharp contrast has been the experience of the Egyptian and Pakistan air forces because they have not only survived wars, they have also had a determined higher direction.

In 1956, and more so in 1967, Israel showed that modern limited wars had to be short. Indeed, their similarity to the campaign of 1940 emphasized the same dilemma of demand versus resources. The high rates of wastage and consumption in intensive operations very quickly drained reserves. This was well demonstrated in the 1973 Arab-Israeli Ramadan (the Yom Kippur) War when both of the then superpowers, the Soviet Union and the United States, had to reprovision their clients.

In Egypt, General Nasser started after the Suez War of 1956 to reconstruct and reconfigure the Egyptian Air Force (EAF) with the help of massive Soviet resources. At the same time, he had to recognize the nature of his own population—half urban and concentrated on only four percent of the land, prone to await plans and orders from above, and generally lacking education and industrial skills. Nasser, therefore, concentrated his efforts at recruiting from the elite, educating them as airmen, and making their profession respectable among their peers. However, his Soviet instructors tended to reinforce the Egyptian lack of initiative by their massive welded-wing formations and high-altitude tactics.

After the 1967 defeat, Nasser forced the EAF to practice against low-level attacks, hardened his bases, and engaged in electronic warfare. By 1970, the combination of the EAF with Soviet flak defenses, formalized by Anwar Sadat after Nasser's death in September 1970, brought a stalemate.

In 1972, Sadat expelled the Soviets and allowed Hosni Mubarak to prepare plans for a limited war against Israel. Though the 1973 Ramadan War still led to defeat, both sides realized the futility of further hostilities. In the years that followed, Egypt's demands were satisfied with US resources putting the EAF on a par with the Israelis, which for a while led to a formal peace with Israel.

In the Indian subcontinent, geography and climate are very different. From Partition in 1947 to the independence of East Pakistan in 1971, Pakistan faced a multifront war with India, the Kashmir problem, and a threat from Afghanistan. Like the Egyptian

and Indian air forces, the Pakistani Air Force (PAF) had a British legacy and also lacked an indigenous aircraft industry. However, Pakistan had a fighting tradition and many skilled arms makers, as well as a dictatorship. And also like the Egyptians, Pakistan, and India too, faced an uncertain foreign supply of the sinews of war. Ultimately the fickleness of US foreign policy forced the PAF to develop its own spares industry.

Nevertheless, because of its underdog situation (by 1971 the PAF was only 22 percent the size of the Indian Air Force), Pakistan's grand strategy had to be a devastating first strike against the Indian Air Force.

The PAF has owed its successful survival to focused leadership, constant innovation and development, rigorous training, and persistent analysis of exercises and refinement of operations together with a willingness to change quickly. Not only did the PAF create an indigenous spares industry, and adapted foreign aircraft such as the US F-86, the Chinese F-6, and French Mirage-IIIs, but it also created the *Mobile Observer Units* and then withdrew them when they proved vulnerable to guerrillas. By this time the PAF had better radar and electronic defenses in place together with navigation aids to refine the accuracy of strikes.

Faced with heavy demands, the PAF made the most of its resources.

Conclusion

It should be noted that there are interesting parallels with past aeronautical history, as well as some what-ifs.

France failed to deter the Second World War in 1939-1940 because her armed forces were in no position to face down Hitler to make him reevaluate an attack. The *Armée de l'Air* lacked the wherewithal from the will or the political leadership and credits to personnel and competitive serviceable aircraft.

France had neither the doctrine nor the strategy to meet blitzkrieg in 1940, let alone the resources. Wastage and consumption in May 1940 exhausted the French Air Force in a few days. In contrast, Pakistan has demonstrated how a superior enemy can be neutralized.

The Egyptian Air Force has shown that the demands of defense have to be faced by analysis and focus on the appropriate resources while allowing an outsider to make up wastage and consumption.

Both the Egyptian and the Pakistan air forces created determined, flexible commands with fluid communications.

Logistic Limitations and Grand Strategy—the Dilemma for Underdogs

Logistic limitations have always existed given fiscal restraints and political perceptions of danger. Demand versus resources has been a constant tension. While major powers such as Britain, France, Germany, Russia, Japan and the United States have at their peaks had enough resources, including manpower, and indigenous manufacturing capacity, the same has not and is not true for lesser powers. Thus the demand versus resources dilemma has been and still is much more important and compels the adoption of a viable national grand strategy.

Such a policy is one that is not only continuous in peace and war, but also takes into account all necessities for the nation's life and survival.

Thus policymakers and executors have to consider not only the requirements for survival, prosperity, and welfare, but also the allocation and distribution of all resources, recognizing that demands have to be prioritized.

Students of war and of the military tend to forget that peace is the norm and war the exception. At the same time, it is vital to remember that wars were often won by the side whose peacetime policies and practices led to adequate sinews of war.

All of the above applies especially to the powers such as in the post-1945 era Israel, Egypt, and Pakistan. Interestingly, their air forces like most in Africa, India, Singapore, and others are legatees of the British Royal Air Force. Their histories have many worthwhile parallels with those of older air forces such as the French *Armée de'l Air* and the German *Luftwaffe*.

Israel, Egypt, and Pakistan have each been underdogs facing potentially superior enemies. With a *Sword of Damocles* hanging over their heads, they have been forced to concentrate upon realities. Like oriental martial-arts warriors, their best defense has been a focused offense. Moreover, because of the difficulties and uncertainties of resupply, they have been forced to plan to deter their opponents by concentrating on what the German General Staff called the *schwerpunkt*—that the enemy has been willing to make peace, in part because in the case of Egypt it, too, was exhausted. In the case of India, involvement in a long war was politically undesirable.

Both Israel in 1956 and 1967, and Pakistan in 1965 and 1971, saw that their only viable grand strategy was to attempt a lightning knockout blow against their opponent. Since they did not have the resources for a grand-strategic bomber force, enemy targets were limited, their own resources were in fighter-bombers, their pilots and support forces, the preemptive strikes had to be within the low-level range of these jet aircraft. So multiple strikes were planned for just after dawn and just before sunset on the opening day. Such intense activity drained spares pools to keep aircraft serviceable and fatigued ground crew.

One of the first lessons, therefore, was the need to double not only the pilots per aircraft, but also the ground crews on each squadron, as well as personnel on the stations and in the control rooms. The same had been found true of the antiaircraft defenders of England in the Battle of Britain. Logistically, this meant doubled consumption of rations, housing, and so forth.

Such preemptive strikes also required a high stock of readily available fuel, ammunition, bombs, and spares.

In both the Israeli and the Pakistan air forces, it was clearly understood that in wars, hopefully, lasting 6 days or less—the

The background to grand strategic decisionmaking is a very multifaceted matter whose timeline stretches back several years before war breaks out.

near limits of their logistics—that everyone had to be prepared to switch tactics the minute it became evident that current doctrine was ineffective or counter-productive.

Both the Israeli and the Pakistan air forces proved historical points by their opponents' unpreparedness. The Egyptians and the Indians were both early on vulnerable to attacks on their aircraft parked unprotected in the open and on their above-ground fuel dumps. However, these air forces learned to provide hardened shelters and underground fuel supplies. Thus after having been caught flat-footed in 1965, 24-hours after war began with their aircraft still parked wingtip-to-wingtip, by 1971 the Indian Air Force had its machines in hardened shelters, its fuel protected, and its airfields camouflaged and ringed by antiaircraft artillery and fighter patrols, but not low level radar. As a result, as in Egypt in 1967, the attackers used dibbler bombs to crater the runways—targets large enough to be seen and hit by fast-flying, low-level fighter-bombers. The latter became a favorite of lesser air forces—a heritage of Luftwaffe hit-and-run raids in the Battle of Britain and after, because the machines could quickly be switched from attack to self and air defense. This was both a tactical and a fiscal imperative.

For small air forces, the greatest possible flexibility is needed because accidents can have a serious effect. In 1971 two out of the three Pakistan Air Force Mirage III PRU aircraft were grounded on the first day by bird strikes. More recent development of pods has provided a solution to such a devastating loss.

While the aim of the majority of air forces, large or small, is to keep the peace, that of the smaller services, especially those adjacent to hostile neighbors, has been to deter any would-be aggressor. The difficulty rises as the range of aircraft increases so that the advantage of space swings to the physically greater power, the one with the larger area for dispersal of its assets, especially beyond radar range.

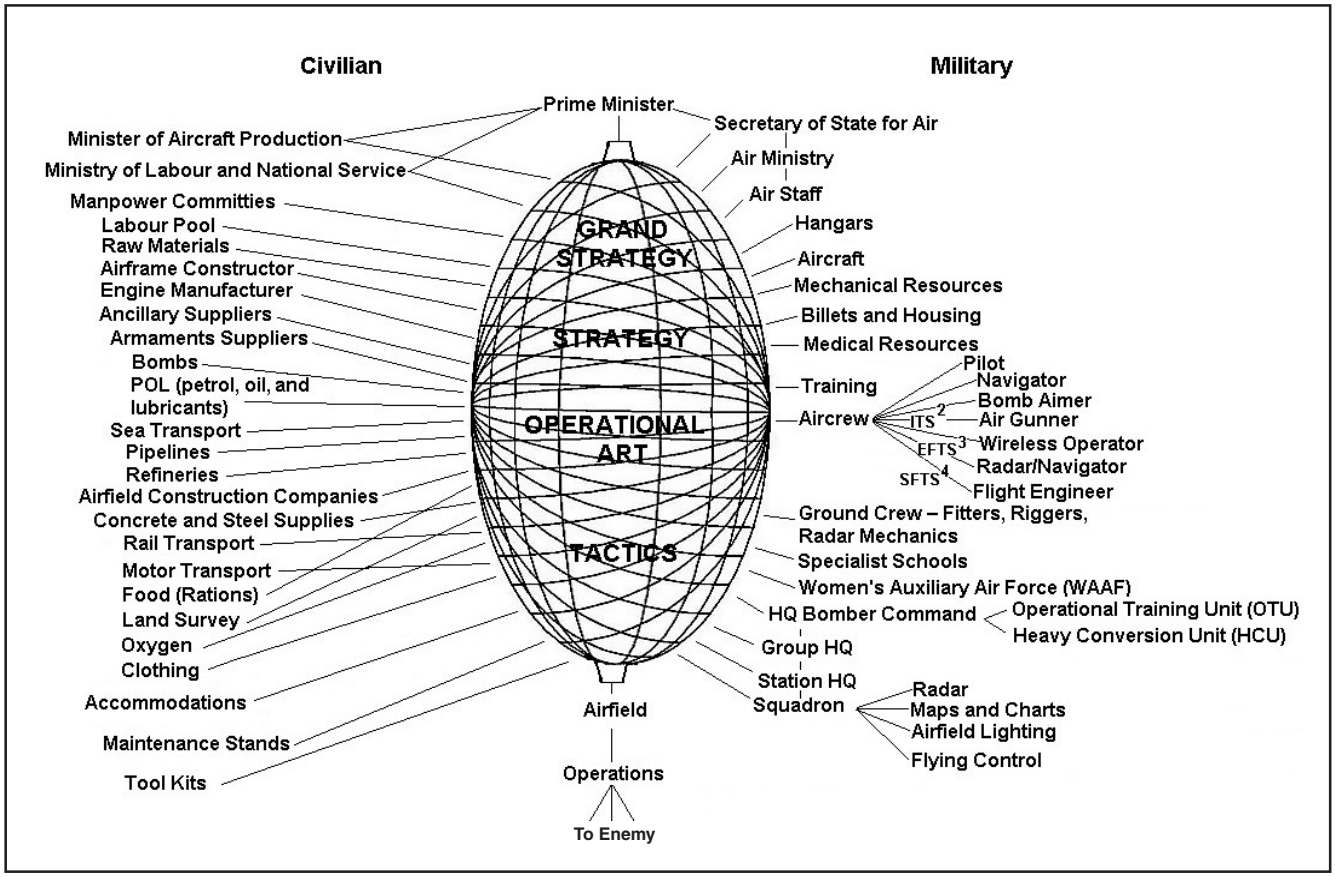

Figure 1. The Invisible Infrastructure—the Bamboo Basket

Under the circumstances, alliances are needed to be able to obtain shared satellite intelligence. It is also a requirement because even Israel is not self-sufficient. It is more so in the cases of Egypt and Pakistan. History has shown the necessity of reliable outside sources whether it is the late Soviet Union, the United States, Britain, France, or China. While, as in 1973, massive airlift is possible for a short vital period to replenish almost exhausted stocks, for other than aircraft refuelable enroute, sealift has to be the solution due to lack of rail connections. This means that a prime logistic requirement is freedom of the seas and accessible ports with either roll-on, roll-off piers or full-service docks. It also means that those ports and their alternates have to be protected, as do their storage and distribution systems. Man- and woman-power has to be deployable and available, with all that involves from unskilled stevedores to technically trained assemblers.

Thus it should become clear that the background to grand strategic decisionmaking as demonstrated by the accompanying diagram for air power in Britain in World War II (Figure 1) is a very multifaceted matter whose timeline stretches back several years before war breaks out. For lesser powers with limited resources this requires, then, national planning and execution of a constant in peace for success in war if that collapses.

Royal Air Force Spares Forecasting in World War II

Early investigations into the spares problems of the Royal Air Force (RAF) in World War II suggest that many hidden human failings delayed the impact of airpower until late into the war.

For example, in September 1939 when war broke out, the RAF had some 59 types of aircraft in the inventory or on order. Even though these aircraft contained standardized items for which tool kits were issued to mechanics, had standard blind-flying instrument panels in the cockpits, and standardized placement of instruments, much was missing and complicated by the revolutions taking place in aviation. New airframes, new engines, and new ancillary equipment were becoming available, but many items were nonstandard because they had not yet been proofed, approved, and ordered in quantity.

A second problem was how to order spares. It was envisaged almost exclusively on a peacetime basis. The trouble was, the spares system was geared to peacetime, where only one or two squadrons of a particular type aircraft were flown very few hours with gentle professional handling. From 1934 onward, however, the RAF was in rearmamental instability. Under a situation of rapid change, it was hard to know how to order spares when there was little experience with a certain aircraft type. Moreover, factories did not wish to produce spares, as they only got credit for complete aircraft.

The rule of thumb was that an aircraft type should be ordered with a 27-month package of spares for peacetime operations plus additional spares for 4 months of war. Due to bureaucratic lag, the spares were not ordered until after the manufacturing program had begun. Attempts were still going on three years after the war started to get factories to allocate ten percent of their floor space to the manufacture of spares or to allow outside subcontractors to do the work. When the initial approach was found incompatible with factory work loads, or as some said, with the fact that the factories simply were not interested in damaging their production record, the Ministry of Aircraft Production decided to cut the requirements to a 15-month peacetime and 4-month wartime stock of spares. But then it was pointed out that less than an 18-month supply would not allow enough experience upon which to base future orders for spares based upon actual consumption of individual items. To that dilemma was added an additional demand for new parts for repairs. In fact, by mid-war some 40 percent of the British operational aircraft available in the United Kingdom were rebuilds.

Part of the problem was that prewar discussions, until just before war broke out, did not cover the matter of repairs, but did contain the idea that within three months of the outbreak of war, factories would be running at full wartime capacity. Part of the reason for this naiveté came from a failure to study World War I. Though it was true staff work had begun as early as 1924 on a document which finally saw the light of day in 1933 as *Secret Document 78, Tables For Estimating Consumption and Wastage in War*, and in 1934 as *Secret Document 98*, also entitled *Tables For Estimating Consumption and Wastage in War*. These were not firmed up until 1936, and were then substantially gutted and reworked by 1941. However useful these tables were, they failed to deal with salvage and repair, or with the lessons of 1918, when there were very high casualties from operations, not all of which were lost over enemy lines.

Another difficulty was that the High Command was not only deficient in its knowledge of modern production and the time needed to assemble raw materials and trained manpower for that activity, but it was also wanting in an understanding of what the technological and other revolutions were all about. Not only did aircraft, for instance, require far more parts and a greater knowledge of how to assemble and repair them, but also complexity had a multiplier that affected all operations as well as manufacturing.

Few people understood what a modern industrial war would require five years before war broke out, in addition to four years after it was declared, before wartime equilibrium would be reached. The latter was a short stage when everything was up and running not only militarily, but also bureaucratically, industrially, and the like.

During the Battle of Britain in 1940, the Inspector General of the RAF toured the available airfields. He found that the lowest serviceability rates were at Training Command stations where only 59 percent of the allocated 150 Spitfires and Hurricanes were serviceable. Why was the rate so low at a time of crisis? Basically, because either the fitters and riggers did not have tool kits or spares were not available, or both. At Fighter Command the

serviceability rate was 75 percent. At Bomber Command the rate was 82 percent except in the No. 2 Group where the Blenheims and Hudsons were at 106 percent. This was because the aircraft were not being used in the Battle of Britain and the ground crews had time to bring even the spare aircraft up to available status.[1]

Availability also had to do with the system of recording aircraft states (status). At 1700 hours daily the equipment officer had to call into headquarters the squadron's state:

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- Aircraft currently available at dispersal.
- Aircraft which would be available by 0900 the next morning.
- Aircraft which would become available in 24 hours.
- Aircraft which could be repaired at the station in 34 days.
- Aircraft write-offs, meaning essentially that their repair was beyond local capability.

The aircraft write-offs were replaced from the local storage unit, but they dropped off the paper record. This explains why the graphs for aircraft in Fighter Command during the Battle of Britain show a steady decline of machines in the storage units, even though Spitfire and Hurricane production and losses were about equal.

Another way of looking at the matter of repairs was a study done by the Ministry of Aircraft Production. This study looked back on the war in terms of repaired aircraft as a percentage of total production. In May 1940, the figure stood at 13.5 percent of 1,298. By September it had risen to 37.6 percent of 1,906. In November 1940, of the 42.1 percent of repaired aircraft out of a total of 1,927 aircraft added to stocks, 300 were being repaired *in situ* (where they lay) and 512 were at works (returned to factories) for a total of 812, or more than all aircraft production in September 1939. By late 1942, the number of repaired aircraft available that month was the highest of the war, 53.9 percent of 3,179, or 1,714. The highest total number ever returned in one month was in June 1944, when 1,903 aircraft were added to production totals.[2]

What had made this possible was that, in addition to *in situ* teams, the RAF had managed to get its own repair and maintenance facilities. These facilities were originally envisaged as six (three civilian and three RAF), one million square-foot depots, with 10,000 men each.

Of course, the demands from expansion of the RAF put the RAF into competition with all the other technical services and industries for manpower. For the RAF, this was complicated by the prewar insistence that it took 7.5 years to train a fitter or rigger fully. Even when the frontline strength was pegged briefly at 750 aircraft, the RAF needed an intake of 1,000 fitters and riggers a year through Halton, the apprentice training establishment, but was only getting 200.

Summary

The RAF found itself saddled with six problems which could not be solved overnight:

- A lack of standardization
- A lack of experience in spares ordering for wartime
- A lack of planning for the repair of aircraft
- A deficiency in the knowledge of modern production and a lack of understanding of the technological revolution.
- Low serviceability rates
- A shortage of fitters and riggers

It took the first four years of war to hammer out the balances and compromises necessary to run a fighting air force and make airpower effective.

Notes

1. *Air Superiority*, Office of Air Force History, Washington DC: AFHSO/HO, 1995.
2. AVIA 46/228, Ministry of Air Production, *Aircraft–The Spares Problem–Narrative*, London.

Pipeline Purdah and the Barbed-Wire Strand

In Moslem countries purdah is seclusion from the public of female *assets*. *Pipeline purdah* is when assets such as new aircraft and spares or personnel are unavailable because they are in-transit.

For the British in the Second World War, this became a critical condition with the fall of France in June 1940. Until the Italians entered the war in that month and the Middle East became a theater of war, transit delays were only a matter of days between Britain and forces in France. But once the Italians closed the Mediterranean, the 6000 miles from the United Kingdom or the US to Egypt became a 3 to 6 month matter.

This was especially critical in the early years of the war before production and purchase of provisions had reached such wartime equilibrium levels that the pipeline was full and supplies flowed out the far end at about the same speed as they were pumped in.

Wartime equilibrium refers to that short period at the peak between rearmamental instability and demobilizational instability when the war economy has been fully developed and crisis has been accepted as the norm. The other equilibrium is peacetime when money rather than time dominates.

In the case here, pipeline purdah was critical since the Middle East had not been envisioned in prewar days as a theater of war. Thus, it was essentially garrisoned to a peacetime colonial level and was short of everything from men and supplies to the invisible infrastructure of air stores parks, workshops and airfields, not to mention repair and salvage facilities, fuel storage, etc.

Thus, at the time the Royal Air Force (RAF) was dispatched to Greece in November 1940, there was a critical shortage of aircraft. This became a highly acrimonious matter between headquarters in Cairo and the Cabinet in London, resulting in the end in the recall of the long-suffering Air Officer Commanding-in-Charge, Middle East. It was only at that critical juncture when Greece and Crete had fallen in April and May 1941 that someone in London saw fit to comment that, of the 1782 aircraft which had by that time been allotted to the Middle East, only 330 had actually arrived. This observer failed to note that even those in the theater, such as the 28 Wellington's of Nos. 37 and 38 Squadrons, had only flown 12 operational sorties in support of operations in Greece in 6 months in the Middle East. Moreover, all the Hurricanes dispatched across the desert route to Cairo from West Africa via Khartoum had to be stripped and inspected before they could be issued to operational squadrons. Without the necessary invisible infrastructure that existed in Britain, this was a time consuming process not really eliminated until after the establishment of a full-scale base in Egypt. Meanwhile, operations, as well as ferrying, caused wastage to exceed replacements, thus making the Royal Air Force Middle East at times almost impotent.

The Barbed-Wire Strand

Moreover, pipeline purdah was and is related to the barbed-wire strand. In this conception, all of the information, decisional analysis and the decisions themselves can be viewed as points along a strand of barbed wire; the segments between the barbs as periods of time; and the barbs themselves as events (both good and bad). Continuing with this conception, in the time between facts becoming evidence, management or command becoming aware of them and making a decision, the facts may have all changed. This is why it is critical that command be able to think and see the strand between the two ends and not just between two barbs, or only a single barb.

In the Middle East case it was also critical that London recognize that the Germans had interior lines and could switch assets from France to Sicily and the Balkans much faster than the British could. So for the British in Greece and the Middle East there was a need to equip the RAF with first-line machines and not with those cast off or not wanted at home. In other words, it would take prescience of mind to see that what mattered took account of both pipeline purdah and of the barbed-wire strand effects.

Robin Higham, Professor Emeritus of History at Kansas State University, is a frequent contributor to the Air Force Journal of Logistics.

notable quotes

Before World War II the Royal Air Force had in SD98 of 1936, developed tables for the wastage and consumption of an air force at war. If SD98 had been remembered, it would have provided very useful guidance. Just because a document is historic, the ideas and methods it contains should not be ignored. Otherwise planners and fighters are doomed to repeat the reinvention of the wheel!

—Robin Higham