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A HISTORY OF ATTACKS ON AIRBASES

By

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About the Author

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INTRODUCTION

The plane is a strange creature. In the air, refuelled, armed and piloted by a good flyer, it represents an incarnation of power and fighting ability that strikes fear into tanks and ships at sea...But the plane, so powerful in the air, is a despicable object on the ground. Not only is it harmless, it lacks the most minimal defensive capacity. It squats on the runway, clumsy and prostrate, at the mercy of any enemy. Not only is it vulnerable to air attack (which makes air-bases attractive targets in war), but even some humble mortar, correctly deployed, can tear it to pieces. It costs a fortune, it can decide the fate of a war, and yet, it's as helpless as a baby.¹

Ezer Weizmann
Chief of Staff, Israeli Air Force
1967 Arab-Israeli War

The aim of this paper is to highlight examples of attacks upon airbases by both air and land forces to demonstrate the effect that these attacks have had upon the conflicts in which they were a part. It will consider which attacks succeeded, which attacks failed, and why. Given the regularity by which attacks on airbases have been used to open military campaigns an understanding of this particular operation is important, even for air forces in peacetime.

Great care must be taken when detailing historical examples of military operations that the conclusions drawn and lessons learnt are relevant to the present. With the pace of development of weapons and tactics that has occurred in the last ten years it is difficult to draw direct parallels between historical examples and current operational scenarios. Dr Alan Stephens, in his paper *High Noon of Air Power*, cautions firmly against the misuse of historical analysis as a means of analysing the potential of air power and consequently its vulnerabilities.² However, if considered in the context of a rapidly and often fundamentally changing technological and doctrinal environment, some valid lessons may be drawn.

A broad range of historical examples will be considered – anti-airbase operations during World Wars I and II, the Korean War, operations during the Vietnam War, a selection of incidents during the various Arab/Israeli Wars, the Falkland Islands War and American attacks on Iraqi airfields during the 1991 Gulf War. Other conflicts and isolated airbase attacks are cited where they demonstrate unique features or provide additional insights on airbase attack.

THE EARLY DAYS – WORLD WAR I

Perhaps the first recorded attack on an airbase occurred during World War I when on 24 August 1914 an aircraft of the Royal Flying Corps observed and then attacked with a single bomb three German aircraft parked on an airfield near Lessines.³ Although no

¹ Halliday, J.M., *Tactical Dispersal of Fighter Aircraft: Risk, Uncertainty, and Policy Recommendations*, Rand Corporation, Santa Monica, 1987, p 10.

² Stephens, Alan, *High Noon of Air Power*, Air Power Studies Centre, Canberra, 1999, p 26.

³ Kreis, J.F., *Air Warfare and Airbase Air Defence*, Office of Air Force History, Washington DC, 1988, p 5.

damage was recorded the event was a foretaste of a new military operation – the air attack on the airbase; a military operation that would be repeated in virtually every single major conflict where aircraft were involved, from that point onwards.

Prior to World War II there was initially little attempt made to attack aircraft at their airbases. Two main reasons for this seem apparent. Firstly, military aircraft operations were still in their infancy and combat aircraft had yet to make a decisive impact on the results of wider land or sea campaigns. Secondly, airbases were usually any flat piece of unobstructed ground. They were rarely improved and base support facilities were often simple tents. ‘The aerodrome just by the village of Bethouart was occupied by a herd of cows, and that no-one took the least notice of them, each pilot taking off or landing in whatever direction seemed to be most suitable to avoid the animals.’⁴

However, when aircraft were based for any period of time they did draw enemy attacks. During 1917 the German Air Service aggressively began to expand their ground attack and interdiction operations to great effect. Despite improvements in control and coordination British pilots had great difficulty in effectively intercepting these attacks. In an effort to control them, the British Royal Flying Corps, in turn, attacked German airfields. Following this first large-scale attempt at airbase attacks several important countermeasures were taken by both sides. The policy of attacking airfields and concomitant airbase defence was refined by Major Harold Hartney, commander of the US 1st Pursuit Group. He believed that counter air operations could be used to force the enemy to relocate their airfields so far to the rear that they could no longer influence the tactical situation on the ground.⁵ He also pioneered ideas of fortifying hangers and maintenance facilities and their placement underground. He extensively protected his airbases with anti-aircraft guns and routinely used dummy and auxiliary airfields.

Active airbase defences were improved, with the use of anti-aircraft artillery, searchlights and machine guns. The Germans also used camouflage – painting the tops of their aircraft to hide them from aerial observation and by constructing dummy airfields near real ones.

AIRBASE ATTACKS DURING WORLD WAR II

Poland

From the opening moments of the European war the Luftwaffe actively pursued the destruction of their opponents’ air forces. Their doctrine was to include aggressive attacks against airfields as an integral part of the *Blitzkrieg* strategy.⁶

Perhaps one of the best examples of doctrinal and performance surprise occurred during these early attacks when aircraft were able to attack airbases almost unhindered by the anti-aircraft defences in place. During the inter-war years there had been great advances in aircraft design and tactics but little, if any, improvement in

⁴ Kennett, L., *The First Air War 1914-1918*, The Free Press, New York, 1991, p 136.

⁵ Kreis, *Air Warfare and Airbase Air Defence*, p 219.

⁶ *ibid.*, p 54.

anti-aircraft gun system technology. Guns were still aimed visually and could rarely hit moving targets and radar had generally not been deployed.

Accordingly, when German aircraft attacked nine of the twelve main Polish operating airbases on 1 September 1939 they were able to destroy those aircraft and facilities they could find. However, the Poles had undertaken a comprehensive program of dispersal and camouflage of their aircraft. Very few Polish aircraft were destroyed in the opening attacks. This enabled the Polish air force to continue operations for that month and put up a credible defence effort, destroying 126 German aircraft in air-to-air fighting during the campaign. Given the advances in attacking aircraft and the inability of extant defences to counter them, dispersal and camouflage alone may have temporarily saved the Polish air force.

The Netherlands, Belgium and Norway

Following the destruction of Poland the Luftwaffe turned its attention to the Netherlands and Belgium. These attacks saw the first large-scale use of air and glider borne troops. Bombers attacked Waalhaven airbase at dawn on 10 May 1940 from both medium and low altitudes. Despite suffering relatively high losses from the anti-aircraft defences these attacks paved the way for the paratroops who were able to capture the airbase. The heavy anti-aircraft defences of the Dutch accounted for 315 German aircraft, making the operation an expensive one for the Luftwaffe. Germany further used airborne forces to capture other airbases. Ju52 troop transport aircraft were used to land infantry at Ypenburg. Again heavy anti-aircraft gun defences made this an expensive operation.

When the Germans turned their attention to Belgium they had a far easier time. The Belgian Air Force was neither dispersed nor well defended on the ground. German air attacks on the morning of 10 May destroyed virtually all of the Belgian aircraft. Those that survived were flown to France, where they were of little use because of their age and obsolescence.

In Norway, Germany utilised airborne and aircraft inserted forces entirely to capture the heart of the country. Having failed to insert an invasion force by sea, a small force of paratroopers captured Oslo airport and the Luftwaffe began a massive operation of flying-in fuel, munitions, ground forces and combat aircraft. Later that day airborne forces were again used to capture Sola airfield and by evening 180 German aircraft had been flown into there. The next day the Germans captured other airfields. 'The speed with which the Germans had seized the airfields and then turned them into operational bases, capable of supporting significant air operations, was one of the nastiest surprises of the campaign.'⁷ Accordingly, given the difficulties experienced by the Germans in inserting forces into Norway using other means, the failure to defend its airfields adequately may have cost Norway the war.

⁷ Cooling, B.F., *Case Studies in the Achievement of Air Superiority*, Center for Air Force History, Washington DC, 1994, p 79.

German Air Attacks on France

The foremost aim of the Luftwaffe during the invasion of France was to ‘achieve air superiority over the battlefield by attacking Allied airbases and aircraft’.⁸ In this goal they were quite successful, and those allied aircraft that were not destroyed in the initial attacks were kept on the defensive throughout the entire campaign. For example, all 18 aircraft of No. 114 Squadron Royal Air Force were destroyed or rendered unserviceable during a Luftwaffe attack on Conde Vraux airfield.⁹ A similar fate awaited the bombers of No. 142 Squadron as they were destroyed in neatly parked unprotected rows preparing for a mission.¹⁰

Of those few French and British aircraft that could compete with the German fighters in the air, most continued to suffer heavy casualties whilst on the ground. A group of new Dewoitine 520 fighters that fought quite well in the air suffered over 50 per cent losses on the ground through German attacks on their airbases.¹¹

The Battle of Britain

The Battle of Britain is the name given to the August/September 1940 campaign whereby the Luftwaffe attempted to destroy the RAF in preparation for an amphibious invasion of the UK. The battle was a major strategic defeat for Germany in that the failure to subdue the RAF led them to cancel their plans for the invasion. This left England in the hands of the Allies and allowed the build-up of forces leading to the combined bomber offensive and the Normandy invasion.

Perhaps the earliest loss for the Germans during this campaign was the information war. Their preliminary intelligence estimates of the RAF, in particular the capability of its fighter defences, were highly inaccurate. These misled the Luftwaffe into believing they had a far greater superiority than they actually had. A July intelligence report prepared by the Luftwaffe Head of Intelligence, Colonel Joseph Schmid, denigrated the RAF ability to fight the Luftwaffe to the extent that combat between the two would allow the Luftwaffe to ‘achieve a decisive effect’ allowing further operations to be prosecuted against England.¹² Operational estimates forecast that four days of major air attacks on England would break Fighter Command. A further four weeks of operations would then eliminate the remainder of the RAF and allow the destruction by bombing of the factories that could replace the RAF aircraft.

The other major knowledge-edge loss by the Luftwaffe was its failure to realise the significance of the British radar system. Initially promising attacks by the Luftwaffe on radar installations during mid-August were questioned by Goering and ceased forthwith.¹³ Radar allowed the RAF to respond effectively to Luftwaffe raids and protect their own airbases and cities.

⁸ Cooling, *Case Studies in the Achievement of Air Superiority*, p 81.

⁹ *ibid.*, p 81.

¹⁰ Kreis, *Air Warfare and Airbase Air Defence*, p 71.

¹¹ Cooling, *Case Studies in the Achievement of Air Superiority*, p 84.

¹² *ibid.*, p 92.

¹³ Murray, W., *Luftwaffe*, George Allen and Unwin, London, 1985, p 52.

Early German planning for the Battle of Britain called for an aggressive offensive counter air campaign. The foremost task was to gain air superiority through attacks on the RAF. This was to be achieved by attacking their bases and aircraft production facilities and attacking RAF fighter aircraft wherever they could be found. In attacking the British airfields the Germans were quite successful, although ultimately not decisive, perhaps for the following reasons:

- a. the light bomb loads of the available German aircraft;
- b. the effectiveness of the British air defences;
- c. the number of small airfields and satellite strips employed by the RAF; and
- d. the simplicity of the British fields, usually being just sod runways and a few scattered buildings.

Attacks on RAF airfields began in earnest on 12 August. Mainly by daylight, attacking from both high and low level, virtually every major aerodrome was visited at least once in the first few days.¹⁴ Those airfields defended with a large number of guns were better able to weather the attacks and were often able to inflict heavy casualties on the attackers.

‘These attacks brought out the importance of having an abundance of anti-aircraft guns for airfield defence, for it is the guns which protect the aircraft during the vulnerable moments when they are approaching or leaving the ground.’¹⁵

Despite these strong defences many airfields were badly damaged. A combined low and medium level attack on Manston rendered the field ‘temporarily unusable’.¹⁶ However, events had conspired to ensure that Fighter Command’s airfield system was very resilient. Both the Hurricane and the Spitfire were grass-airfield machines and a very large number of airfields had been spread throughout the English countryside before the war.¹⁷ Following the initial raids Fighter Command instituted a widespread program of dispersal. This reduced RAF casualties on the ground, however, a lack of support equipment such as telephones and motor vehicles made operations in this decentralised manner very difficult.¹⁸

The Germans also dropped large numbers of empty parachutes, designed to convince the British population that spies were being deployed by this method. This was a psychological warfare technique designed to unsettle Allied military and civilian personnel alike.

24 August saw the concentration of Luftwaffe activity on the airfields of No. 11 Group, RAF. Raids were conducted both during day and at night with night-time raids

¹⁴ Pile, F., *Ack-Ack: Britain’s Defence Against Air Attack During the Second World War*, George Harrap & Co., London, 1949, p 137.

¹⁵ *ibid.*, p 136.

¹⁶ *ibid.*, p 137.

¹⁷ Cooling, *Case Studies in the Achievement of Air Superiority*, p 155.

¹⁸ *ibid.*, p 140.

being used to sap the will of the people. One of the largest airfields, Biggin Hill, was raided twice on the night of 29 August and four more times the following day.¹⁹ Despite the casualties being inflicted on the Germans, the situation was desperate for the RAF.

This counter air policy was proving to be very effective but the Germans began changing goals and plans too quickly and lost sight of the initial aim. British Bomber Command raids on Berlin between 25 August and 4 September infuriated Hitler and he ordered the Luftwaffe to concentrate their attacks on the British urban areas. By this stage of the campaign Luftwaffe losses during raids on RAF facilities had become untenable and the plans to invade England by sea, which had depended upon the neutralisation of RAF air power, were postponed indefinitely. The importance of the counter air campaign is illustrated in the following description of the final day of the Battle of Britain on 31 October 1940.

The great Battle fizzles out damply, the Germans having exhausted every tactical alternative after being deprived of their best chance of victory by the inept decision of their Supreme Command to attack London rather than continue with the direct offensive against Fighter Command and its ground installations.²⁰

British Ground Attacks on Axis Airbases – North Africa 1940-43

The battle for North Africa during 1940-43 was characterised by fluid frontlines, long distances in relatively featureless deserts and tenuous supply lines. During this period British forces proposed that a motorised unit be formed to conduct long range reconnaissance throughout the extensive rear areas and to raid vulnerable facilities such as airbases and supply dumps. General Wavell, Commander of Commonwealth Forces in the theatre, was attracted to this idea and authorised the formation of such a force to be called the Long Range Patrols (LRP). The strategic aim of the patrols was to help offset the numerical superiority of the mainly Italian Axis forces by forcing them to divert resources to provide expanded rear area security.

Initially operating from a base on the western edge of the Egyptian Sand Sea the LRP conducted its first raids against Italian airstrips north of Kufra during September 1940, destroying fuel dumps and pumping facilities.²¹ Further patrols during late 1940 destroyed the first Axis aircraft, an unguarded Savoia S.79 bomber.

Wavell was impressed with the results obtained by the modest resources allocated to LRP and at the end of 1940 increased their number to five independent patrols and renamed them the Long Range Desert Group (LRDG). During 1941 the LRDG continued operations raiding airbases, harassing Axis supply lines and providing much needed reconnaissance information.

Following on from the success of the LRDG, L Detachment of the Special Air Service (SAS) Regiment was formed in November 1941 with the primary purpose of raiding

¹⁹ Pile, *Ack-Ack: Britain's Defence Against Air Attack During the Second World War*, p 143.

²⁰ Hough, R., and Richards, D., *The Battle of Britain*, Norton & Company, New York, 1989, p 370.

²¹ Vick, A., *Snakes in the Eagle's Nest*, RAND Corporation, Santa Monica, 1995, p 68.

airfields.²² Combined SAS-LRDG raids continued throughout 1941 until the final successful African raid in September 1942. Utilising parachute insertion or long range desert vehicles to reach the vicinity of the target airfield they then would use either stealth to plant charges on aircraft during the night, or simply drive their vehicles onto the airstrip at high speed and use machine-gun fire to destroy aircraft. In total 367 Axis aircraft were destroyed by British Special Forces in North Africa and the Mediterranean during the period October 1940 to July 1943.²³

In countering the SAS-LRDG threat the Axis forces employed two main measures, one active and one passive. By sending out aircraft on the morning following a raid they were often able to find and severely damage the retreating raiding parties. They also improved the airfield passive defences, installing strong ground defences and instituting aggressive patrolling. These measures made the SAS-LRDG task more difficult and reduced Axis losses. One analysis proposed the use of further passive defence measures such as dispersing aircraft in revetments, the employment of minefields, dog patrols and selective lighting as being potentially the most successful measures which could have been used to minimise losses to these raids.²⁴ Attempting to capitalise on the ease with which SAS-LRDG parties were able to destroy Axis aircraft in North Africa, a similar Special Boat Squadron (SBS) group was assigned to raid Maleme airfield but was turned back ‘by impressive defences that included many machine gun posts, dogs, and searchlights’.²⁵

Malta

The seemingly unending contest between the Axis forces and British defenders in the sky over Malta illustrated the ability of airfields to recover following attack. Several times British air power and airbases at Malta were destroyed, but because of Hitler’s decision not to seize the island with land forces, defences were rebuilt, air operations restored and Malta remained a base for British air operations throughout the war.²⁶ During April 1942 an average of 170 bombers were raiding the island every day.²⁷ On 20 April a new batch of 47 Spitfires arrived at the island off the American carrier USS *Wasp*. The Luftwaffe tried desperately to destroy these new aircraft and within three days of their arrival dropped 985 tons of bombs on Takali airfield and 485 tons on Luqa. Both airfields were ruined and 30 of the new Spitfires destroyed.²⁸ Many more aircraft were damaged or destroyed on the ground during these and later raids.

Constant repairs to the airfields enabled them to remain operational. ‘The aerodromes were in such a frightful state that rollers had to be used continuously for twenty-four hours on end.’²⁹ However, the build up of defensive fighters, arrival of trained ground staff and improvements to the island’s early warning radar soon enabled unsustainable

²² *ibid.*, p 44.

²³ *ibid.*, p 57.

²⁴ *ibid.*, p 63.

²⁵ *ibid.*, p 49.

²⁶ Kreis, *Air Warfare and Airbase Air Defence*, p 344.

²⁷ Hamlin, J.F., *Military Aviation in Malta G.C. 1915-1993*, GMS Enterprises, Peterborough, 1994, p 24.

²⁸ *ibid.*, p 25.

²⁹ *ibid.*, p 26.

losses to be inflicted on the Luftwaffe. By the war's end 707 RAF aircraft had been destroyed at Malta, 160 of them on the ground.³⁰

Pearl Harbor – 7 December 1941

The attack by Japanese aircraft on US naval assets and airbases in Hawaii is highly significant because of the number of parallels that may be drawn between the conditions that existed then and those which could conceivably involve Australia in the future. The attack on Pearl Harbor is usually referred to as being a surprise attack, a 'bolt from the blue' that the Americans could not have predicted. This may not be correct, and the success of the Japanese raid demonstrated how important the accurate analysis and dissemination of intelligence is to avoiding highly destructive attacks on airbases. The potential vulnerability of the Hawaiian airfields to air attack had been identified as early as 1924, when the then Brigadier-General William Mitchell stated that Oahu formed 'an easy, compact and convenient object for air attack'.³¹

The attack on Pearl Harbor evolved from a long running political stalemate between the United States and Japan. The Americans were taking a steadfast stance and refusing to grant Japan concessions in the hope that it would deter the Japanese from war. American cultural myopia at the time allowed them to assume that this would not in fact provoke the Japanese, and that the Japanese would not be 'irrational' in attacking before negotiations had ceased. Accordingly, the Americans were not expecting war because they believed the political climate was not yet ripe for it. Yet, despite this, many general warnings had been provided to US forces in Hawaii previously, possibly producing a numbness that comes from long term exposure to warnings.

American intelligence sources also had a great deal of evidence that a surprise attack on Hawaii was imminent. Highly accurate reports from their ambassador in Tokyo and many classified message intercepts provided (in hindsight) a highly accurate picture of when and where the Japanese would strike.³² Due to poor US intelligence analysis and dissemination procedures these warnings were provided to Hawaii either too late or in too general terms to be of any great utility. In return, Washington did not have a full understanding of the situation in Hawaii and assumed that because of the previous warnings the fleet would have put to sea.³³

The US, believing Japanese military attention would be focused westward towards Russia and Manchuria, mainly implemented the warnings by instituting anti-sabotage measures. The aircraft warning systems in Hawaii were never fully activated, search aircraft were not activated around-the-clock and there was no recognised commander for these forms of operations.

Consequently, Japanese tactical surprise was virtually complete. Both Wheeler and Hickam fields were bombed and strafed. The aircraft at these fields were parked close together in rows; an anti-sabotage precaution rather than being dispersed in

³⁰ *ibid.*, p 34.

³¹ Bateson, C., *The War with Japan - A Concise History*, Ure Smith, Sydney, 1968, p 24.

³² Betts, R.K., *Surprise Attack*, The Brookings Institution, Washington DC, 1982, p 43.

³³ *ibid.*, p 44.

anticipation of air raids. 'The destruction of defending air power on the ground was almost total.'³⁴ At the Marine airbase at Ewa, 49 aircraft were shot up on the ground. Of the 231 Army aircraft on Oahu, 97 were destroyed and 88 severely damaged. Later that morning as American aircraft either arrived from carriers nearby or went in search of the Japanese fleet, many were shot down by the US anti-aircraft defences.

Pearl Harbor demonstrated several enduring lessons on airbase operability. Firstly, intelligence needs to be disseminated, timely, and acted upon. Secondly, it demonstrated the paradox that protective measures for one form of threat could make assets more vulnerable to a different threat. Thirdly, it demonstrated the degree of caution that should be applied when ground based anti-aircraft defences are placed near airfields.

The Solomons and Guadalcanal

The Pacific War was characterised by desperate naval battles and island hopping advances and retreats. Firstly, by Japanese forces vigorously expanding their empire, and then by the US and Allied forces driving them back again. Sea and air power played a significant part in this campaign and the unusual nature of the battle space provided a unique perspective on airbase operations. The limited number of carriers that could be deployed by both sides, and their potential vulnerability, meant that land based air power was essential to support combat operations. 'Not until Luzon in 1945 would the United States have enough carriers and the Japanese air force be weak enough, for these precious ships to remain in combat for more than a few days at a time.'³⁵

The limited number of potential airfield sites that could be established in the mountainous island theatre meant they were strongly fought for. 'The survival of American air power on Guadalcanal, in the final analysis, depended upon the survival of the airfield.'³⁶ During October and November 1942 the Japanese made their ultimate efforts to remove US forces from Guadalcanal. Approximately 90 US aircraft were operating from Henderson Field and were coming under constant attack from large numbers of Japanese aircraft based at Rabaul on the island of New Britain in New Guinea. Peaking in mid-October, Henderson came under heavy air attack combined with night bombardment from naval ships, including 14 inch shells from battleships. On the night of 13 October, 53 shells and bombs hit the runway, 13 of which were repaired by US engineers whilst their own planes were waiting to land. Confusion between the local US Army defence battalion and the fighter controllers resulted in some friendly aircraft being fired upon by their own anti-aircraft defences.³⁷

The constant defence and repair of Henderson enabled US land based air power to contribute to the broader campaign in the region, with eventual allied naval victories bringing an end to Japanese attempts to reinforce Guadalcanal.

³⁴ Campbell, C., *Air War Pacific*, Hamlyn, London, 1991, p 31.

³⁵ Cooling, *Case Studies in the Achievement of Air Superiority*, p 334.

³⁶ *ibid.*, p 334.

³⁷ Kries, *Air Warfare and Airbase Air Defence*, p 230.

As at Henderson, Allied operations in New Guinea were vulnerable to Japanese aircraft based at Rabaul. The Japanese had also established an airfield at Munda, the next large island up the Solomons chain from Guadalcanal. Extensive use of camouflage and concealment had prevented allied forces from discovering this base until it was ready for operations. Once it was discovered the Americans attacked it constantly. Fighters and bombers from Guadalcanal and heavy bombers from Australia attacked throughout the end of 1942 and early 1943. Japanese anti-aircraft defences were generally ineffective and the runways were constantly cratered and many aircraft were destroyed on the ground. The cratering was repaired hastily, but daily raids prevented the base from being effectively used as a fighter base. Logistical isolation was also beginning to affect Japanese airbase operability and the interdiction of Japanese transport shipping was beginning to have a severe impact on aircraft serviceability and sortie generation.³⁸

In summary, the Pacific campaign was a string of airbase operability battles. The side that could capture airbases and keep them operational most effectively would eventually carry the day. The Americans had demonstrated how tenacious defence and repair of an airbase could make a significant strategic difference.

The importance of recovery efforts to operation of an airbase and the base's continued use by a flying force was soon emphasised. After devastating raids during the Battle of Britain, the RAF restored several of its bases to operation only through the most exemplary efforts of leadership and diligence. Fighters could operate largely because of the repeated efforts of military and civilian crews who repaired bomb damage. Elsewhere, American and Japanese commanders in the Solomon Islands went to great lengths to repair bomb damage and keep airfields serviceable. The Americans succeeded at Guadalcanal; the Japanese lost at Munda and had to abandon their important airfield there.³⁹

The survivability of early airfields, when provided with dedicated and tenacious repair crews was again to be demonstrated later in the war during the American invasion of Iwo Jima.

Iwo Jima

The American pre-invasion bombardment of the Japanese held island of Iwo Jima is another good example of the ability of these early airfields to be recovered quickly following severe bombardment. An island of only seven kilometres long and four kilometres wide it was subjected to the heaviest air and naval bombardment yet seen during the war. In the ten weeks prior to 16 February 1945 the island was deluged by 6800 tons of bombs, 203 rounds of 16 inch, 6472 rounds of 8 inch and 15,251 rounds of 5 inch projectiles.⁴⁰ As heavy as this attack was it never kept the airfields inoperable for more than a few hours at a time.

³⁸ *ibid.*, p 257.

³⁹ *ibid.*, p 347.

⁴⁰ Bateson, *The War with Japan - A Concise History*, p 372.

Milne Bay

Milne Bay, located on the east coast of Papua New Guinea, was developed as an airstrip in June 1942. It allowed allied air power control over the eastern sea and land approaches to Port Moresby and placed allied aircraft within striking distance of Japanese airbases on the island of New Britain. Three airstrips were built at the site which was occupied by 75 and 76 Squadron Kittyhawks, a flight of 32 Squadron Hudsons, an Operational Base Unit, 7500 Australian Army troops organised in two brigades, and approximately 1340 American servicemen.⁴¹

Command and control of the forces at Milne Bay was always a difficult issue and is dealt with in detail in Dr John Mordike's paper on the battle presented at the 1996 RAAF History Conference. On several occasions it may have jeopardised the defence of the airbase. Before the initial attacks there was reluctance on the part of some American servicemen to prepare defensive works at the order of the Australian Commander. Accordingly, when the first Japanese air raids occurred they had no protective slit trenches to occupy and overcrowded the positions dug by Australians. This prevented the Australian troops from manning their weapons as planned and potentially affected the ability of the airbase to defend itself.⁴²

On 21 August 1942 the main Japanese landing force was sighted in Milne Bay and Major General Clowes assumed active command of all allied land and air forces in the area. A misplaced landing by the main Japanese force and the destruction of part of their invasion force at sea delayed the initial assault with the first attack on the airfields occurring on the morning of 27 August. Eight dive-bombers and 12 escorting Zeros raided the No. 1 strip in an offensive counter air operation. None of the bombs dropped actually struck the runway. Strafing by the Zeros set fire to a Liberator bomber that was parked on the strip, having crash-landed there earlier.⁴³

The next attack on the airfield occurred at 0300 hours on the morning of 31 August. Sentries heard noise in the vicinity of the strip and flares were fired. An advancing force of Japanese infantry was engaged with machine gun fire as they advanced in tight packed groups across the flat ground of the No. 3 strip. The attack was repeated twice more, each time the Japanese suffering heavy casualties because of the massed defensive fire and open ground. Eventually, the attackers withdrew.

The final attack on the Milne Bay airbase was on the final day of the battle after the Japanese ground forces had withdrawn. Nine enemy bombers attacked the No. 1 strip, causing little damage.

During the battles one of the most debilitating aspects of life at Milne Bay was sickness, particularly from diseases borne by mosquitos. At one point one-third of 76 Squadron personnel had been admitted to sick camp with the most prevalent disease

⁴¹ Mordike, J., 'Turning the Japanese Tide: Air Power at Milne Bay August-September 1942', in Stephens, Alan, (Ed), *The RAAF in the Southwest Pacific Area 1942-1945*, Air Power Studies Centre, Canberra, 1993, p 80.

⁴² *ibid.*, p 82.

⁴³ Gillison, D., *Royal Australian Air Force 1939-1945*, Australian War Memorial, Canberra, 1962, p 611.

being malaria.⁴⁴ This was due to the geography of the site, but also to lack of preparation. Mosquito nets, suitable clothing, mosquito repellent and medicine had either been supplied in insufficient quantities, or not at all.⁴⁵ Ignorance of environmental factors compromised the operability of the airbase.

Poltava

A good example of the vulnerability of aircraft parked undispersed and unprotected occurred at Poltava airbase in the Southern USSR on 21 June 1944. Poltava, like several other Russian airbases, was to be used by American B-17 bombers to enable them to attack German targets normally out of range from England or Italy. The aircraft would fly from their normal bases, bomb German targets and continue on to land at Russian bases. They would then refuel and rearm and reverse the process.

The second of these missions landed in Russia on the afternoon of 21 June 1944, the bombers landing at Poltava and Mirgorod, their escorting P-51 fighters at Piryatin. The Luftwaffe had shadowed the bombers and knew where they had landed, a photo reconnaissance mission confirming this. The 79 B-17s at Poltava were lined up in open un-revetted parking areas.

Luftwaffe bombers attacked after dusk that evening dropping 110 tons of mixed large high explosive and smaller fragmentation bombs.⁴⁶ Every B-17 at Poltava was damaged, 50 being completely destroyed and the other 29 requiring considerable repair. The Russian Air Force lost a further 26 aircraft. 'Blast shields and revetments were not common on the VVS's airstrips and were not built at Poltava. Had they been, the damage could have been reduced considerably.'⁴⁷ Also, no attempt had been made to camouflage the aircraft and their silver finishes made them an obvious target in the reflected light of the air dropped flares. None of the German bombers was shot down in the raid, the VVS lacking effective night-time AA or fighter control. 'The VVS lacked the doctrine, command structure, and the equipment to defend the base.'⁴⁸

Similar attacks on Mirgorod and Piryatin failed due to navigational errors by the Luftwaffe.

Of interest, during the fire fighting, rescue and subsequent repair and recovery operations following the attack unexploded ordnance posed a major hazard to personnel. At least 30 Russians were killed during the bomb disposal operations and many more injured, more than during the actual attack.⁴⁹

Meiktila, Burma

The allied airfield at Meiktila, Burma, is an interesting example due to the desperation and nature of its defence. In the last months of the war desperate Japanese ground

⁴⁴ Mordike, 'Turning the Japanese Tide: Air Power at Milne Bay August-September 1942', p 79.

⁴⁵ Wilson, D., *The Decisive Factor*, Banner Books, Melbourne, 1991, p 104.

⁴⁶ Kreis, *Air Warfare and Airbase Air Defence*, p 208.

⁴⁷ *ibid.*, p 211.

⁴⁸ *ibid.*, p 211.

⁴⁹ *ibid.*, p 208.

forces were attempting to seize this important airfield. Each night during March 1945 Japanese troops would assault the airbase. Each night, the RAF Regiment and other Commonwealth troops would pull the aircraft into a tight inner perimeter to defend them. Each morning, the airfield would be cleared of remaining Japanese forces and flight operations would resume.⁵⁰

The Allied defenders were able to use this method as the tightly parked aircraft were safe at night from air attack. During this campaign the Japanese air force had been reduced to virtual ineffectiveness and accurate tactical bombing at night was still an unknown.

World War II Conclusions

World War II was arguably the first major conflict in which air power proved decisive in the outcome of wider campaigns. The aircraft themselves matured into potent fighting machines with order of magnitude improvements in firepower, accuracy, range and reliability. Accordingly, the airbase took on a far greater relevance as a target, and airbase attacks were prosecuted with vigour in all theatres.

Defence of the airbase also matured. The principles of layered and mixed defence took over from one based solely on the use of active defences such as guns and airborne fighters. The vulnerability of airbases to ground and air attack was evident for the first time as bomber aircraft and penetration style Special Forces tactics were developed and improved. It quickly became apparent that airbases could be neutralised by attack. However, if the attention of the attacker was diverted elsewhere the integral ability of the airbase to recover would enable it to do so. A combination of active defences, passive defences and a recovery capability could ultimately keep the airfields operational whilst inflicting often unacceptable casualties on the attacker.

KOREA

Availability of Airstrips for UN Jet Aircraft

Unlike earlier propeller driven aircraft, which were operated quite successfully from unimproved dirt strips of moderate length, jet aircraft require long runways capable of withstanding high impact forces from high aircraft tyre pressures. The expanded requirement of modern tactical aircraft for quality pavement surfaces was first encountered during the initial USAF operations in the Korean War. The F-80 Shooting Star was fielded by the USAF as a superior machine to the propeller driven fighters it had replaced; however, it required longer, wider runways which were capable of withstanding the increased tyre pressures of the new jets.⁵¹

High speed jet aircraft with their smaller wheels increased tyre pressures from the World War II maximum of 80 psi to 200psi. They also landed at generally higher

⁵⁰ Shlapak, D.A., and Vick, A., *Check Six Begins on the Ground*, RAND Corporation, Santa Monica, 1995, p 28.

⁵¹ Bahm, P.C., and Polasek K.W., 'Tactical Aircraft and Airfield Recovery', *Airpower Journal*, Volume 5, Number 2, Summer 1991, p 43.

speeds and in some cases had greater all-up weights. Furthermore, their jet engines could be vulnerable to damage caused by ingesting foreign material lying on the movement surfaces. Construction of airfields to these new specifications required three times the construction effort of the typical airfields of World War II.⁵²

When the few airfields on the peninsula capable of handling these aircraft were overrun by the 1950 North Korean initial offensive, the F-80 squadrons were required to operate from airfields in Japan. This significant increase in staging range impacted upon the ability of these high performance aircraft to influence the war. Even in Japan, there were only four runways capable of supporting combat-loaded jet fighters.

Of the six airfields in South Korea earmarked for improvement to jet standard, the North Koreans captured three and one was subsequently assessed as being unable to be immediately improved.⁵³ This left US Engineers with two potential airbases – Pohang and Taegu. Although Perforated Steel Planking (PSP) matting strips were quickly laid at both fields, the short time frames allocated to the engineers and the unsuitable nature of the sub soil at both sites meant that ‘it became evident to General Partridge [Commander, US Fifth Air Force] that the only aircraft which he could base in Korea during the immediate future would be Mustang fighters’.⁵⁴ Accordingly, the UN forces were denied the land based air power which was theoretically available to them, by a combination of enemy action and the under-developed infrastructure of the region; an enduring lesson for future joint force commanders planning air operations in an under-developed region.

Basic environmental health problems also affected the ability of the UN air forces to operate. During the second half of 1950 the UN forces suffered from poor housing, poor field hygiene resulting in infection and disease, scarce potable water and frequent occurrences of spoilt or contaminated food.⁵⁵ Maintenance and other base facilities were also slow to be improved and this directly affected mission generation and operability rates.

UN Counter Air Operations against the North Korean Air Force

Early in the air war, the North Korean Air Force and its major airbases were quickly destroyed by UN air power. North Korean Yak piston engined fighters were all destroyed in the first few weeks.⁵⁶ In fact, UN air superiority was quickly established over the whole theatre and ‘the Reds came to appreciate the fact that they could not repair airfields and reconstitute an air force in an area dominated by United Nations Air Forces’.⁵⁷

⁵² Stewart, J.T., (Ed), *Airpower the Decisive Force in Korea*, D. Van Nostrand, Princeton, 1957, p 232.

⁵³ Futrell, R.F., *The United States Air Force in Korea*, Duell, Sloan and Pearce, New York, 1961, p 103.

⁵⁴ *ibid.*, p 104.

⁵⁵ Cooling, *Case Studies in the Achievement of Air Superiority*, p 457.

⁵⁶ Hastings, M., *The Korean War*, Michael Joseph Ltd, London, 1987, p 307.

⁵⁷ Futrell, *The United States Air Force in Korea*, p 636.

As a result, the majority of the North Korean and Chinese ‘volunteer’ aircraft operated from airbases within China itself. Located just north of the Yalu River these aircraft were able to mount ‘hit and run’ raids into North Korea throughout the area south of the Yalu known as ‘MiG Alley’. These were denied to the UN forces as targets by the political decision not to allow air strikes into Chinese territory. In early 1951 ‘there were 445 MiGs operating from the political sanctuary of airbases beyond the Yalu’.⁵⁸ ‘For two years F-86 pilots patrolling MiG Alley stared across the Yalu at four major Communist airfields, Tapao, Antung, Tatungkou and Takishan, where hundreds of gleaming MiG-15s presented a magnificent target – but on the other side of the river.’⁵⁹

However, this did not stop the North Koreans from trying to establish airbases within North Korea itself. During a routine reconnaissance mission of enemy air facilities on 25 September 1951 it was discovered that the North Koreans were well advanced in building a major airbase near Saamcham. Further investigation revealed it was merely a single component of a group of three fighter-capable fields all within 20 miles of each other. These bases posed a major threat to UN air operations in the region. If the airfields could be completed and utilised by MiG fighters they would extend ‘MiG Alley’ further south to Pyongyang. ‘If MiGs were dispersed within the revetments being built at the [airfields], rooting them out would be a bloody, costly business.’⁶⁰ Accordingly, the UN forces targeted the airfields immediately for day and night time B-29 attacks.

Before the near-truce of June 1953 the North Koreans devoted considerable effort to repairing airfields that had, since 1951, been rendered unusable by heavy damage. Since the movement into theatre of additional forces was to be prohibited during the truce, their intention was to repair the airfields and then in the last hours before the truce was signed, fly in as many aircraft as possible. Understanding the communist plan, the UN forces undertook the Joint Airfield Neutralisation Program (JANP) which aimed to keep unserviceable 35 critical North Korean airfields. The objective was to keep runway surfaces shorter than the 3000 feet required to land a MiG-15. By 23 June all but one of the targeted airfields had been neutralised despite bad weather delaying the operation.

Airbases are not only vulnerable to the direct effects of the guns and bombs of attacking aircraft. Unique regional or local features can complicate the vulnerability assessment of an airbase. One series of attacks during the JANP illustrated this concept with attempts by UN forces to destroy two of the airfields by flooding them with water. The water was to be released by attacking nearby irrigation dams at Toksang and Kusong. However, the North Koreans were able to gradually release water from the dams as damage was done, thus preventing the catastrophic release of water required to flood the airbases. This attack methodology illustrated the concept that airbases should never be viewed as island bastions and their defence/vulnerability assessment should always encompass their surroundings.

⁵⁸ Hastings, *The Korean War*, p 310.

⁵⁹ Stewart, *Airpower the Decisive Force in Korea*, p 41.

⁶⁰ Futrell, *The United States Air Force in Korea*, p 376.

Following the failure of the truce negotiations, UN air forces were directed to continue attacks on North Korean airbases ensuring that each could be fully neutralised in four to five days, if the need arose. As the winter weather set in throughout July 1953, only Bomber Command could continue regular operations against the North Korean airbases. Discovering through photo-reconnaissance that the North Koreans were quickly able to repair damage done by 100lb bombs, the Bomber Command B-29s shifted to using heavier 500lb bombs. The logic being that 'the heavier bombs would penetrate deeper into soggy earth and explode a crater which the Reds would find hard to repair'.⁶¹

Unfortunately, when clearer weather permitted more aerial photo reconnaissance to be undertaken it was found that the North Koreans had made considerable progress in repairing critical airfields. The concrete strip at Namsi and up to five other airfields had all been repaired. Forty-three MiGs had been flown into Uji and were parked in revetments, whilst 21 other aircraft were parked in the dispersal areas at Sinuiju.

Following news on 19 July that an armistice may again be imminent UN aircraft launched another wave of attacks on North Korean airfields. Both fighter and bomber aircraft attacked the aircraft operating surfaces and parked aircraft, destroying many of them. By 27 July it was clear that all the North Korean airfields were again closed to jet aircraft. Sabre fighter-bomber strikes were used against the MiGs in revetments at Uji with no less than 21 being destroyed. This perhaps demonstrated that revetments, although providing some degree of protection, could not protect parked aircraft indefinitely against a determined attack by a well armed foe with air superiority. However (as was also to be demonstrated in Vietnam), keeping the enemy airbases closed required repeated strikes and frequent photo-reconnaissance.

Following the armistice on 27 July it was revealed that during the inclement weather in early July the communists had flown approximately 200 aircraft into Uji and towed most of these planes up the hard surfaced highway between Uji and Sinuiju.⁶² Although many were damaged, these aircraft were parked in dispersal points in the fields and hills surrounding the highway where they survived as an initial North Korean air order of battle going into the armistice.

Korea Conclusions

Korea was the first major conflict fought with relatively high performance aircraft with unforgiving airfield support requirements. Accordingly, the ability to operate these aircraft from the limited number of suitable strips available to either side was crucial to their ability to influence the war. Had the North Koreans and Chinese continued to operate aircraft of World War II vintage they may have been able to build and utilise improvised strips. This could have significantly complicated the UN offensive counter air attempts, although potentially at the cost of rendering them near ineffective in the air.

Korea also demonstrated some new techniques and options that would be used in many subsequent conflicts where a lesser developed or equipped nation would be at

⁶¹ *ibid.*, p 638.

⁶² *ibid.*, p 640.

war with an advanced air power. The use of political sanctuaries contributed significantly to the communist ability to maintain an aircraft presence over the battlefield. The Koreans mastered the art of deception, with considerable effort being devoted to confusing UN attempts to ascertain how successful their campaign had been. They effectively employed dispersal, ensuring that despite heavy Allied bombing of all North Korean airbases actual aircraft losses on the ground were quite low.

Despite being fought with weapons and tactics similar or identical to those at the end of World War II Korea demonstrated the way ahead for airfield attack. Using modern aircraft airfields could be bombed into temporary uselessness when required. However, these airfields could also be repaired just as quickly. Airfields can be shut down but to keep them shut requires constant revisiting. The continuous counter air campaign of the Allies prevented the North Korean Air Force from having an impact on the ground war. Destruction of their airbases and the need to intercept the Allied bombers limited them to air-to-air operations only. In this way the two year long 'Battle of the Airfields' contributed significantly to the broader Korean Campaign.⁶³

THE ARAB-ISRAELI WARS

The Arab-Israeli series of wars began in 1948 and are effectively still continuing with current Israeli operations in Lebanon. These wars have been punctuated regularly with a broad spectrum of air operations, including a large number of attacks on airbases during Offensive Counter Air (OCA) operations.

The first such conflict was the Israeli War of Independence, which was fought during 1948. Air forces during this period, on both sides, were very limited and no accounts of significant attacks on enemy airbases can be found.

1956 – The Sinai Campaign/The Suez Affair

During 1956, Egypt, in a show of nationalism and strength against Britain and France, nationalised the Suez Canal, which had been previously controlled by its former colonial rulers. Combined with an Israeli move into the Sinai and the supposed threat both belligerents posed to commerce through the Suez Canal, this caused France and Britain to issue both sides with an ultimatum to withdraw. Egypt refused and the French and British began attacking Egypt by air on 31 October 1956.

By October 1956 the EAF had built up a sizeable air force including 80 MiG-15s, 45 Il-28s, 82 Meteors and Vampires and 200 other aircraft. Although Israel had also developed a sizeable air force, the 1956 air war was dominated by French and British aircraft and their attacks on Egypt.

The first attacks were night air strikes against Egyptian Air Force (EAF) airfields. Using high altitude bombing the accuracy was quite poor and many of the EAF aircraft survived, despite having no protective revetments. British and French fighter-bombers followed up these initial attacks with daytime raids on 1 and 2 November.

⁶³ Stewart, *Airpower the Decisive Force in Korea*, p 59.

'By morning of November 2 the EAF had largely been destroyed on the ground, never having struck inside Israel.'⁶⁴ British and French authorities were claiming that 105 EAF aircraft had been destroyed on the ground by noon on 1 November.⁶⁵ Of the remaining aircraft, only 20 Il-28 bombers did not flee to neutral countries. These were based at Luxor and were subsequently destroyed by a French F-84F strike on 4 November. The EAF airfields, despite many of them being of considerable size with redundant runways, were heavily bombed and in most cases closed.

An attack by Royal Navy aircraft on MiG-17s stationed at Almaza demonstrated the usefulness of camouflage. Of the MiGs stationed at the airfield, eight were placed under camouflage netting near some hangers and were missed in the first round of attacks. These aircraft were destroyed in later raids, but had they been moved following the first attack they would have survived. This demonstrated the short-term protection even the simplest deception measures can provide.

The attacks demonstrated the success that can be achieved against air forces on the ground. The combination of Anglo-French air superiority (which was never contested by the EAF) and a total lack of protection for parked aircraft ensured their destruction. Observing the success of these attacks, IAF planners would ensure that their own plans for pre-emptive strikes on Arab air power were well developed and kept current should the need arise.

The Anglo-French air operations had been launched from aircraft carriers in the Mediterranean Sea, airbases in Cyprus and Malta, and from IAF bases in Israel. The vulnerability of the coalition aircraft, particularly at Nicosia and Akrotiri in Cyprus, was noted, but little appears to have been done about it on the ground, despite photo reconnaissance sorties showing Egyptian bomber and fighter aircraft deployed to nearby Syrian airbases. General Sir Charles Knightley, Allied Commander-in-Chief, is quoted as saying 'The effect of even a couple of MiGs, flown perhaps by Russians, flying over Nicosia with a load of rockets' emphasising the vulnerability of the allied aircraft on the ground.⁶⁶ Photo-reconnaissance missions were continued, but aerial photos of the Cyprus fields show lines of British and French aircraft parked in the open with no attempt made to protect them. Ultimately, no Arab air attacks on these airfields were mounted. However, on 10 November EOKA terrorists infiltrated the Nicosia airbase and placed a 'time bomb' on a 1 Squadron Hunter fighter. This aircraft was damaged beyond repair.⁶⁷

During this campaign the Egyptian El Gamil airfield was the target for an airborne assault by paratroopers of the British 3rd Parachute Battalion. The airfield had been comprehensively blocked by sand-filled oil drums to prevent unauthorised aircraft from landing, however, these obstacles provided handy cover for the paratroops.⁶⁸ After a thorough pre-assault attack by carrier aircraft, 600 paratroops jumped into the airfield after dawn on 5 November, followed by heavy equipment including anti-tank

⁶⁴ Kreis, *Air Warfare and Airbase Air Defence*, p 302.

⁶⁵ Cooling, *Case Studies in the Achievement of Air Superiority*, p 572.

⁶⁶ Cull, B., *Wings over Suez*, Grub Street, London, 1996, p 237.

⁶⁷ *ibid.*, p 341.

⁶⁸ Barker, A.J., *Suez: The Seven Day War*, Faber and Faber, London, 1964, p 117.

guns. The airfield was cleared of all substantial opposition within thirty minutes and the airfield was clear to accept aircraft by midday.

At the end of this conflict, although Egypt had been militarily defeated, the UN ordered a British, French and Israeli withdrawal from the disputed territories. Egypt began rebuilding its armed forces and repairing its damaged facilities. Over 40 EAF aircraft which had been flown out of the country (mainly to Syria and Saudi Arabia) during the attacks returned.⁶⁹ This is an example of the effective use of political sanctuaries that would be also seen in Korea and Vietnam, although not so effectively in the Gulf War. The principle conclusion that can be drawn from this conflict is again that aircraft parked in the open can be destroyed easily with modest resources.

1967 – The Six Day War

During the early 1960s the Soviet Union supplied the Arab states bordering Israel with a large amount of military hardware and training support. The EAF had benefited the most from this patronage and had built up a substantial air force, consisting of approximately 450 planes and 25 bases.⁷⁰ April and May 1967 saw a deterioration in the already unfriendly diplomatic relationship between Israel and the Arab states. Provocative Egyptian troop movements and their closure of the Gulf of Aqaba to Israeli shipping on 22 May ensured that war would result. President Nasser of Egypt fully expected war would start no later than 5 June and was advised that in the event of an Israeli pre-emptive air strike Egypt would suffer only 10 per cent attrition.⁷¹

The Six Day War commenced on the morning of 6 June 1967 with Israeli Air Force strikes on EAF airbases. The Israelis had carefully studied the British and French attacks on Egypt during the earlier Suez campaign and had noted the unsuccessful use of medium altitude night bombing. So they determined to undertake their attacks during daylight and at low level.

Once again the EAF was totally unprepared for such an attack and no precautionary measures had been taken to defend airfields or protect aircraft. In the first wave of attacks 200 EAF aircraft were destroyed, with follow up sorties undertaken to strike at EAF bases in the west and south of the country.⁷² Three hundred Egyptian aircraft were destroyed on that first day. The effective destruction of the EAF was then exploited by the IAF who attained immediate air superiority and were able to prosecute vigorous close support and interdiction missions in support of Israeli ground forces. In total 451 Arab aircraft were destroyed in the first two days, of which only 58 were lost in aerial combat.⁷³ Several EAF aircraft which did manage to get airborne during the initial attacks and survive the ensuing air-to-air combat were destroyed after crashing whilst attempting to land on damaged runways.⁷⁴

⁶⁹ Cull, *Wings over Suez*, pp 356-358.

⁷⁰ Kries, *Air Warfare and Airbase Air Defence*, p 307.

⁷¹ *ibid.*, p 311.

⁷² Mason, R.A., 'Air Power as a National Instrument: The Arab Israeli Wars' in Stephens, Alan, (Ed), *The War in the Air 1914-1994*, Air Power Studies Centre, Canberra, 1994, p 187.

⁷³ Kries, *Air Warfare and Airbase Air Defence*, p 317.

⁷⁴ Cooling, *Case Studies in the Achievement of Air Superiority*, p 578.

Defence of the EAF bases was inadequate, and virtually all the EAF aircraft were lined up in neat rows. One step that had been taken by the Egyptians was the placement of many aircraft dummies on the airfields to confuse attacking pilots. These dummies generally failed because of their lack of realistic employment and advances in Israeli aerial photography techniques. The dummies were parked in unlikely locations and the ground under them did not bear the characteristic fuel and exhaust stains of a working jet tarmac.⁷⁵

This campaign was also the first in which dedicated runway attack munitions were used. A bomb was used that employed retro-rockets and a parachute to slow itself after a low-level high speed deployment. The parachute oriented the weapon so it faced the ground at a high impact angle and a rocket motor in the tail propelled the warhead through the runway surface. The warhead then detonated under the runway surface causing the maximum sized crater possible. Delay fusing was also utilised to prevent runway repair crews from approaching impact sites safely.⁷⁶ Despite this, most runways were repaired quickly by dedicated crews, although the initial aircraft losses on the ground could not be overcome.

Ultimately, doctrinal and performance surprise contributed greatly to the Arab defeat in this conflict. The Egyptians knew an attack was coming but failed to anticipate how destructive it would be. When the attacks started the Egyptian high command was isolated from its units and subordinates failed to take the initiative and respond accordingly.

1973 – The October War (The Ramadan or Yom Kippur War)

On 5 October 1973, following months of tension and skirmishing, Egyptian and Syrian aircraft attacked Israel as a prelude to a major ground offensive. One of the initial offensive actions by the IAF was to attack the forward EAF airfields from which they were mounting ground support attacks in support of the Suez Canal crossing.

However, the EAF had learnt the lessons of 1967 and dramatically improved the resilience of its airbases. Hundreds of concrete hangers had been built and additional runways added to provide redundancy.⁷⁷ Egypt had built over 1000 hardened aircraft shelters and complemented these with underground fuel storage and hardened command and control and anti-aircraft installations. During the war the IAF only managed to destroy a single Egyptian hardened aircraft shelter. These facilities gave excellent protection and could not be destroyed with the 500 lb unguided bombs or Maverick missiles available to the Israelis.

These improvements, combined with the lack of surprise and improved Egyptian anti-aircraft defences, reduced the success of the IAF attacks during 1973. Kotmiya airfield was shut down for two days following repeated attacks and Mansura airfield was closed for six days, seven MiG-21 aircraft also being destroyed on the ground.

⁷⁵ Kries, *Air Warfare and Airbase Air Defence*, p 316.

⁷⁶ Cooling, *Case Studies in the Achievement of Air Superiority*, p 578.

⁷⁷ Cohen, E., *Israel's Best Defence*, Airline Publishing Ltd, Shrewsbury, 1994, p 350.

The initial Egyptian attacks caused considerable damage to the IAF airbases. Bir Gifgafa airfield had five craters blown in its main runway, which took over four hours to repair. The control tower was also destroyed. Israeli aircraft landing at Ras Nasrani had to dodge craters and debris with the landing gear of one F-4 aircraft being damaged.⁷⁸

Arab-Israeli War Summary

The Arab-Israeli Wars were important in the history as they demonstrated a future use of aircraft - fast jets attacking at low level deploying a variety of specialist weapons using accurate aiming systems. Aircraft parked on airfields were shown to be even more vulnerable targets than they had been during World War II. The frantic building of hardened aircraft shelters in Europe on both sides of the Iron Curtain was a direct result of the Israeli successes during that campaign. Air forces which did not improve the defences and survivability of their airfields could not expect the aircraft based there to survive the first days of conflict.

VIETNAM

Vulnerability of US Airbases to North Vietnamese Air Attack

During the Vietnam conflict the US deployed a large number of aircraft into the theatre. Given the lack of offensive capability possessed by the North Vietnamese Air Force (NVNAF) the principle form of attack used against US targets was by land forces. The rapid growth of US air power in the region quickly stretched the capability of the limited number of suitable airbases to accommodate them. In 1965, one of the principal US airbases, Da Nang, would have presented the North Vietnamese a very tempting target. Large numbers of aircraft were parked together on unprotected hard stands, fuel tanks were exposed, the ordnance storage area was packed very much in excess of its safe limit, plus the normal collection of support facilities.⁷⁹ To defend this, the Americans emplaced Hawk missile batteries and interceptor aircraft. Although these defences would have taken a heavy toll of any North Vietnamese air attack, US planners remained concerned by the threat.⁸⁰ However, no NVNAF air attack on US airbases was ever attempted.

North Vietnamese Army and Viet Cong Ground Attacks on US Airbases

During the period 1964-73 Viet Cong (VC) and North Vietnamese Army (NVA) forces attacked USAF Main Operating Bases (MOBs) 475 times destroying 99 US and South Vietnamese aircraft and damaging a further 1170. More ground attacks on airbases were recorded during this conflict than in any other. Attacks against smaller bases and forward operating locations raised the total number of US and allied aircraft destroyed to 375.⁸¹

⁷⁸ Kries, *Air Warfare and Airbase Air Defence*, p 327.

⁷⁹ *ibid.*, p 279.

⁸⁰ *ibid.*, p 279.

⁸¹ Vick, *Snakes in the Eagle's Nest*, p 68.

At the beginning of the conflict airbase security and defence was notoriously lax. Most main operating bases were unfenced and very lightly defended. Local South Vietnamese security procedures and access control was similarly poor. This made these bases, which rapidly began to swell with large numbers of expensive advanced US aircraft, tempting targets. Given the strategic objective of the North Vietnamese to wear down the American support for the war through constant attrition and adversity, small-scale attacks on airbases were appropriate.

An early attack on Bien Hoa airbase demonstrated the destructive effect a small party with good infiltration skills and intelligence can have. Shortly after midnight on 1 November 1964 a small party infiltrated to within 400 metres of the base perimeter fence with six 81mm mortars. They fired 83 rounds onto the airfield, directing the fire at B-57 bombers parked wing-tip to wing-tip. Five B-57s were destroyed, eight received major damage and seven received light damage. An entire B-57 squadron was taken out of action and the attacking party was able to escape without any losses.

Attacks using standoff weapons such as rockets and mortars accounted for 96 per cent of ground attacks on main operating bases in Vietnam.⁸² Eventually, from 1968 onwards, the success rates for these attacks began to fall as more effective countermeasures were employed. Subsequently, following 1970, the success rates again climbed as the NVA and Viet Cong forces learnt from their mistakes and adopted better tactics. Figure 1 shows the percentage of ground attacks that actually succeeded in destroying or damaging aircraft.

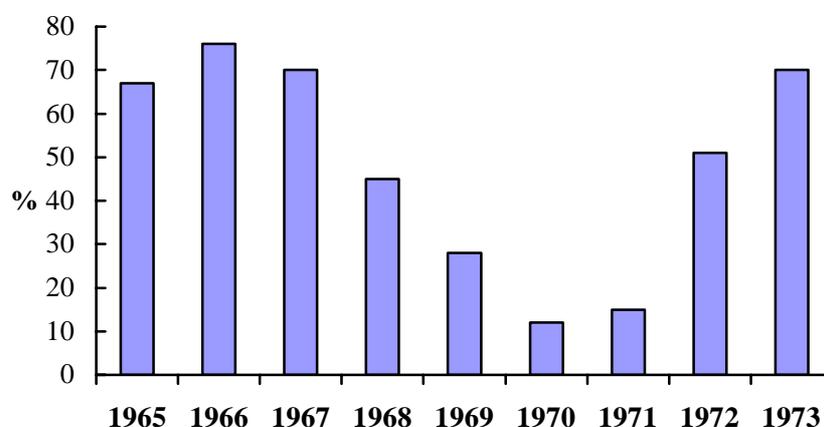


Figure 1 - Attack Success Rate against Main Operating Bases, 1965-1973⁸³

Ground Attacks on RAAF Aircraft During the Conflict

During the Australian involvement in Vietnam, RAAF aircraft came under fire on several occasions. During the 1968 Tet offensive a 35 Squadron Caribou came under mortar fire at Kontum, one round landing less than 70 metres from the aircraft. The following day at Ben Het the same aircraft was fired upon by a recoilless rifle. On 23

⁸² *ibid.*, p 71.

⁸³ *ibid.*, p 71.

April 1968 Australian and US aircraft at Vung Tau came under attack from enemy rocket and recoilless rifle fire. One of these rounds skimmed the roof of the RAAF working area and destroyed an American Caribou which was parked 60 metres from the nearest RAAF office block.⁸⁴ Standoff attacks against Vung Tau were repeated at irregular intervals with casualties (although no Australians) being caused each time.

During 1969 RAAF aircraft were again attacked with Caribou A4-208 being attacked by mortar fire at Katum. The aircraft was damaged by several near misses and both crew members were slightly wounded. The aircraft made an emergency evacuation and was able to land at Bien Hoa without further incident. Aircraft A4-191 was also attacked by mortar fire at the same base in May of that year.

During March 1970, Caribou A4-193 was unloading fuel drums at That Son when it came under 'an intensive and very accurate mortar attack from the hills overlooking the base'.⁸⁵ The aircraft received a direct hit and was set on fire. The crew abandoned the aircraft taking cover in a ditch before moving to a bunker. The barrage continued for three hours and began again early the next morning. Further hits destroyed the aircraft. The base itself was also substantially damaged with the fuel dump being destroyed.

Mortar fire was again targeted at a 35 Squadron Caribou whilst taxiing at Tra Vinh on 19 May. In this case the aircraft was able to quickly embark the waiting passengers and leave the airfield before being hit.

US Offensive Counter Air Operations Against the North Vietnamese Air Force

Prior to the Gulf of Tonkin incident, the NVNAF had no combat aircraft, possessing only training and transport aircraft. However, in August 1964, MiG-15 and MiG-17 aircraft began appearing on North Vietnamese airfields, having been supplied by China.

Between 1962 and 1964 the North Vietnamese, with Soviet and Chinese assistance, developed their air forces. Four airfields in North Vietnam were developed to handle combat jet aircraft; these were Phuc Yen, Gia Lam, Kep and Kien An. Nine other airfields were capable of handling propeller driven aircraft. Until mid-1965 the USAF assessed the aerial threat posed by the North Vietnamese Air Force as tolerable and it was not until late 1966 that they were considered as having had an 'appreciable success in harassing our aircraft'.⁸⁶ Some of the smaller NVNAF bases had been attacked and closed by American and South Vietnamese air attacks in 1965 but these had little effect on the primary threat – MiG jet fighters. Throughout the war Phuc Yen and Kep remained the primary bases for the NVNAF MiGs with the other bases used mainly for dispersal and to provide greater operating flexibility.

In March 1965 the US air forces commenced Operation *Rolling Thunder*. This program lasted over three years and consisted of a series of intermittent incremental attacks against North Vietnamese targets, including many NVNAF airbases. Despite

⁸⁴ Coulthard-Clark, C.D., *The RAAF in Vietnam*, Allen & Unwin, St Leonards, 1995, p 122.

⁸⁵ *ibid.*, p 124.

⁸⁶ Kreis, *Air Warfare and Airbase Air Defence*, p 279.

the weight of US firepower brought to bear during these attacks, they were assessed as being largely ineffective in preventing NVNAF air operations.

NVNAF aircraft were frequently evacuated to political sanctuaries in China or other dispersal areas. Because of the intermittent nature of the *Rolling Thunder* raids, any substantial damage that was inflicted on the airfields could be repaired during the lulls in bombing. The US forces during this period also lacked the ability to bomb effectively during periods of bad weather and cloud cover, which were frequent in the region.⁸⁷

The North Vietnamese used extensive passive defences to protect their airfields and parked aircraft. Some of the measures used included revetted parking apron located away from the airfields, buried fuel tanks, and extensive dispersal and camouflage on anti-air defences and support facilities. Many of the NVNAF's biggest bases were for large periods of the war off limits to American bombers due to their proximity to major population centres.

Beginning in April 1967 the Americans increased the pressure on the North Vietnamese government and increased the tempo of their bombing. OCA attacks on NVNAF airbases were increased and many of the restrictions placed on airbases in residential areas were removed. US anti-aircraft defence suppression weapons and techniques also improved. By the end of March 1968, virtually all of the NVNAF bases were bombed into disuse and virtually all the NVNAF aircraft were evacuated into China. It was at this stage that President Johnson called a temporary halt to bombing above the 19th parallel. The damaged airfields were then quickly repaired.

Following the North Vietnamese offensive of March 1972, a far wider ranging bombing campaign, Operation *Linebacker*, was authorised. Again the primary targets were the communist supply and transportation systems; however, far fewer targets were protected from attack by political decree. US forces had access to better weapons in the form of laser-guided bombs and better anti-radiation missiles and electronic countermeasures.

Four main bases in the North housed the NVNAF MiG-15, MiG-17 and MiG-21s: Phuc Yen, Yen Bai, Kep and Gia Lam. Kien An, Dong Suong, Hoa Loc and Bai Thuong served as dispersal sites. During April 1972 US aircraft attacked the NVNAF bases close to the coast and in the southern areas extensively. Laser guided unitary bombs were used against runways for the first time cratering those runways targeted.⁸⁸ The ease of access to these bases by USAF and USN aircraft kept them generally unserviceable to jet traffic.

During December 1972 the Linebacker II raids heavily targeted the NVNAF bases in the north. B-52s and F-111s were used in large-scale night attacks against all of the major bases. The F-111s were particularly effective in precision night low level bombing. However, despite the weight of firepower deployed, NVNAF operations were not shut down at any bases except Bac Mai and Yen Bai, which were only

⁸⁷ *ibid.*, p 286.

⁸⁸ *ibid.*, p 293.

closed for a single day. Despite this, the aerial bombardment did cause heavy damage and forced the North Vietnamese to once again remove the MiG fighters to China.

Unexploded Explosive Ordnance Encountered During Aircraft Battle Damage Repair

Aircraft returning from combat operations may have sustained damage and require repair upon return to the airbase. All ammunition and ordnance when fired can be expected to produce a percentage of hits that fail to detonate or function as designed, resulting in a piece of Unexploded Explosive Ordnance (UXO). Accordingly, it has been found that some projectiles and missiles fired at aircraft have struck the target, but failed to function. The aircraft may then return to the airbase with the UXO remaining lodged within the airframe.

Vietnam was the first conflict that featured the large-scale use of Surface-to-Air Missiles (SAM). In June 1966 a US F-105 Thunderchief was struck by an air-to-air missile that failed to explode and remained lodged in the rear section of the fuselage.⁸⁹ The aircraft was able to land safely and the dangerous cargo was removed and made safe. The unstable nature of unexploded munitions can endanger the crew tasked to repair or service returning aircraft.

Vietnam Summary

US attacks against the NVNAF were rarely fully effective. Usually the most that was achieved was the destruction of supporting facilities and stores and the forced evacuation of aircraft out of the theatre. The principle reasons for this included:

- a. The considerable rough field capability of the MiG aircraft and their modest airstrip requirements.
- b. The political limitations placed on US bomb targeting.
- c. The thick and effective anti-aircraft defences of North Vietnam.
- d. The large pool of labour available to repair bomb damage.
- e. The proximity of sanctuary in China for fleeing NVNAF aircraft.
- f. The extensive use of underground facilities and widely dispersed off-base aircraft parking.

VC and NVA attacks on US and South Vietnamese airbases achieved mixed results. In terms of actual damage done, the results were quite modest. Ground attacks are credited with destroying 99 US and South Vietnamese aircraft and damaging a further 1170.⁹⁰ As a comparison, only 92 US aircraft were lost in air-to-air action during the conflict and substantially more to ground based fire.⁹¹ However, consistent with North

⁸⁹ USAF, *Air War Vietnam*, Arms and Armour Press, London, 1978, p 16.

⁹⁰ Vick, *Snakes in the Eagle's Nest*, p 68.

⁹¹ USAF, *Air War Vietnam*, p 290.

Vietnam's strategic aims, the ground attacks kept constant pressure on the US forces, inflicted casualties and ensured that American service personnel and equipment were not safe, no matter where they were in the theatre.

Vietnam demonstrated the potential danger posed to heavily defended airfields by standoff attacks. Despite base defences being able to generally prevent penetration attacks, standoff attacks using mortar or rocket fire were often successful, with only the limited accuracy of these attacks preventing greater damage. This demonstrated the need for hardening of airbase facilities and aircraft parking to thwart these kinds of weapons; and friendly patrolling and control of the standoff weapons footprint outside the base perimeter.

ENTEBBE – JULY 1976

On 27 June 1976 German and Palestinian terrorists hijacked an Air France 707 aircraft and directed that it be flown to Entebbe airport in Uganda. Following the release of the non-Jewish passengers from the aircraft, the Israeli Defence Force decided to undertake a long range rescue mission. A group of Israeli commandos were flown to Entebbe in four C-130 transports using two 707s as support. They landed at Entebbe airport at approximately 2300 hours on 3 July and using a variety of deception techniques were able to kill the terrorists and rescue the hostages. Several Ugandan air force MiG-17 aircraft were also disabled before the rescue team left.

Entebbe is significant in that it represents a daring and imaginative operation to attack an airbase. During the operation the Israeli forces secured the airfield and had the objective been to seize it, more forces could then have easily been flown in. The use of transport aircraft to land assault forces was pioneered by the Germans in World War II and continues to be a threat to all airbases, particularly during low level contingencies with restrictive rules of engagement and potential confusion over security responsibilities.

THE FALKLANDS WAR

The Falkland Islands, located in the southern Atlantic Ocean, were British sovereign territory when occupied by Argentine forces in April 1982. Responding quickly the British despatched a task force to recapture the islands. Following an intensive battle involving air, land and sea forces the islands were recaptured, with Argentine forces surrendering in June 1982.

There was only one major airfield on the Falklands Islands, located near the capital Port Stanley. It alone possessed an airstrip that could conceivably be improved for use by jet combat aircraft. Scattered around the islands however were many other grass strips which were suitable for use by Argentine ground attack aircraft and C-130 transports.

During this war there were several notable attacks on airbases – three attacks by a lone Vulcan bomber on the airfield at Port Stanley, many attacks by RAF and RN

Harriers against Stanley and other minor airfields and the attack by an SAS force on Argentine aircraft parked on Pebble Island.

Vulcan Attacks on Port Stanley Airfield

At 0423 hours on the morning of 1 May 1982 a lone RAF Vulcan bomber of 101 Squadron attacked Port Stanley airfield. Callsign 'Black Buck 1' the bomber, which made 17 air-to-air refuelling operations during the mission, approached at low level before pulling up to 10,000 feet and releasing 21 1000lb Mk83 bombs three miles from the coast.⁹² One bomb struck the runway at Port Stanley, one struck the runway edge and the others landed beyond it. Some damage was done to the airfield facilities.

Bomb damage assessment was performed by photo reconnaissance Harriers and showed that despite the single sizeable crater the strip was still available to Hercules and Pucara aircraft.⁹³ The runway at Stanley had never been long enough to support jet combat aircraft; however, the extension of the runway using temporary steel matting (PSP) was feasible. This was never attempted by the Argentinians and the damage done in the Vulcan raid potentially made this task more difficult.

The single Vulcan bomber raid was repeated at 0430 hours on the morning of 4 May, with no bombs this time striking the airstrip. All 21 of 'Black Buck 2's' 1000lb bombs fell to the west of the runway threshold.

A third Vulcan strike mission was flown against Stanley airfield on the night of 11 June. This mission again used unguided bombs and was aimed at airfield facilities rather than the aircraft operating surfaces themselves. The results of this raid, although not specified in detail, were assessed as being 'successful'.⁹⁴

Ground Attacks Against Aircraft on Pebble Island

Before the main British landings at San Carlos there was concern over the impact that Argentine ground attack aircraft may have on the beachhead once established.⁹⁵ A substantial number of these aircraft were believed to be based on a small airstrip on Pebble Island, just north of the main island of West Falkland. The waterlogged condition of the grass airfield had prevented aircraft departures from the strip for several days. On the night of 14 May a small detachment of British SAS troops, with a Naval Gunfire Support (NGS) team, attacked these aircraft using a combination of demolition charges and NGS. Argentine defence of the aircraft was almost non-existent with the garrison sheltering from the cold night winds in a group of sheds nearly a kilometre from the airfield.

The Argentine defenders finally responded to the SAS incursion but only after the British had begun to withdraw. After stopping a feeble enemy counter attack, the high level of mobility provided by Royal Navy Sea King helicopters enabled the raiding

⁹² Burden R.A., Draper M.I., Rough D.A., Smith C.R., and Wilton, D.L., *Falklands The Air War*, Arms and Armour Press, London, 1986, p 363.

⁹³ Eddy, P., Linklater, M., and Gillman, P., *The Falklands War*, Andre Deutsch, 1982, p 155.

⁹⁴ Burden et al., *Falklands The Air War*, p 367.

⁹⁵ Hastings, M., and Jenkins S., *The Battle for the Falklands*, Michael Joseph Ltd, London, 1983, p 186.

party to withdraw without further contact with the enemy. Interestingly, static defence of the aircraft had not been totally ignored as the Argentinians were able to detonate an emplaced explosive charge, which had been pre-positioned on the airfield perimeter, as the exfiltrating SAS party passed by it. No casualties were caused to the British force. Eleven Pucara, Mentor and Skyvan aircraft were destroyed in the raid, a significant blow to the ability of the Argentine forces to threaten British ground forces and helicopters.

Falklands Conclusions

The Falklands War was important in that it was a modern conflict employing reasonably advanced weapons. However, unlike the Gulf War of 1991, the scale of forces involved was far more representative of what may be seen in more typical regional conflicts. Relatively modest numbers of aircraft and other forces operated in a region of large distances and hostile climate and terrain. The ability of the Royal Navy carrier based aircraft to defend the amphibious operation and support the ground forces was crucial to British victory. Had they not been available the British would have been unlikely to contest the Argentine occupation.

Perhaps the principle limitation of the Argentine Air Force's ability to attack the British force was the distance they had to fly from combat aircraft capable airfields on the Argentine mainland. They were always operating at the edge of their endurance which reduced their flexibility in employment and their ability to conduct sustained strikes. Had the airfield at Port Stanley been modified and used to operate combat jet aircraft as a priority after the Argentine landing, the outcome of the conflict may have been very different. Following the war the RAF operated F-4 Phantom jets for several years from Port Stanley before moving to a newly constructed airfield at Mount Pleasant.

The use of the Vulcan bombers to attack the Port Stanley airfield demonstrates firstly the vulnerability of the airbase, but also the limited utility of 'half-hearted' attacks. (Noting the aim of that attack was perhaps more political than to simply close Stanley airfield.) Had the Argentine forces possessed even the most modest runway repair capability they probably could have repaired Stanley very quickly and resumed whatever operations they had conducted from there.

GRENADA – OPERATION *URGENT FURY* – OCTOBER 1983

During October 1983 US forces headed a Caribbean coalition to capture the island of Grenada, which had been taken over in a Marxist coup. Both principal initial assaults on the island were on and through the island's two main airfields.

One of the initial objectives of the assault was the airstrip at Point Salines. The airfield was defended by local and Cuban troops and anti-aircraft guns. Large oil drums blocked the runways. Five hundred and fifty Rangers made a low altitude parachute drop over Point Salines and quickly secured the airfield. They cleared the runways, which allowed reinforcements to be flown in and landed directly at the field. Eventually over 5000 US troops would be landed there.

The other major airfield on the island was located near the town of Grenville. US Marines took this in a heliborne assault, simultaneously with the airborne assault on Point Salines.

Urgent Fury demonstrated the pre-eminent importance of airfields as potential insertion points for assaulting troops. Although the weight of US forces made defence of the airfield practically impossible, had it been better defended (both actively and passively) it may have made the operation considerably more difficult.

LIBYA - OPERATION *EL DORADO CANYON* - APRIL 1986

US President Reagan decided on 7 April 1986 to use air strikes on military targets in and around Tripoli to demonstrate American resolve following alleged Libyan sponsorship of terrorism. Two of the targets chosen for the 14 April night raid were airbases – the Benina military airfield and the military portion of the Tripoli international airport. Benina airfield housed MiG-23 interceptors and Tripoli was home to Libya's fleet of Il-76 transport aircraft.

The Libyans were unprepared for the attacks and none of the aircraft parked at these two locations was dispersed or afforded any form of protection. Runway lighting at the military airports was still illuminated during the attack.⁹⁶ F-111 aircraft attacked the transport aircraft parked at Tripoli airport, using laser-guided bombs, and caused very heavy losses. Three Ilyushin Il-76 transports, a Boeing 727 and a Fiat G.222 were all destroyed, with a further three Ilyushin Il-76 damaged.⁹⁷

US Navy A-6 bombers attacked the Benina airfield using unguided unitary and cluster bombs. Damage at both airfields was heavy – two transport aircraft destroyed and 12 damaged, two helicopters destroyed and 10 to 15 damaged, and as many as 14 MiG-23s destroyed.⁹⁸ The runways were also heavily cratered. The strict rules of engagement imposed upon the attackers to reduce collateral damage reduced the damage that was achieved.

Tripoli Conclusions

This raid demonstrated that modest numbers of attacking aircraft operating at long range from their land bases could now inflict considerable damage on unprepared airbases. Aircraft parked in rows on unprotected hardstands are still as vulnerable as they have always been. It represented an evolution of the tactics demonstrated during the Arab-Israeli wars. It also demonstrated that airbases could now be effectively attacked at night and precision guided weapons were further increasing the vulnerability of airbase features.

⁹⁶ Drew, D.M., 'Air Power in Peripheral Conflict: From the Past, the Future?' in Stephens, A. (ed), *The War in the Air 1914-1994*, Air Power Studies Centre, Canberra, 1994, p 259.

⁹⁷ Boyne, W.J., 'El Dorado Canyon', *Air Force Magazine*, March 1999, p 61.

⁹⁸ Drew, 'Air Power in Peripheral Conflict: From the Past, the Future?', p 260.

PANAMA – OPERATION *JUST CAUSE* – DECEMBER 1989

During December 1989 US forces undertook an invasion of the Central American nation of Panama to capture a dictator, Manuel Noriega, and restore a democratically elected government to power. Significant during this operation were a number of assaults upon airbases.

Many of the primary targets on the first day of operations were airfields. Parachute assaults were used to capture Tocuman, Rio Hato and Torrijos airfields. The capture of these airfields was vital for the insertion and resupply of US forces in the theatre. 'The reliance on air lines of communication was total.'⁹⁹

One of the most important of these operations was conducted by US Navy Special Forces to deny the use of Paitilla Airfield and to destroy Noriega's personal aircraft. Commencing at 0100 hours on 20 December 1989, Task Force White (Golf Platoon, SEAL Team Four)¹⁰⁰ conducted an over-the-beach assault on Patilla airfield.¹⁰¹

One source states that the deployment of a few armoured cars at Paitilla airport was the principal reason for the high casualty count amongst the assaulting special forces.¹⁰² Special forces, by necessity of their requirement to deploy by unusual means, will normally be lightly equipped, and accordingly have little organic capability to deal with armoured vehicles. Four SEALs were killed in this operation, and a further nine wounded.¹⁰³ The plan preferred by the SEALs to deny Noriega use of the airport was to position sniper teams in buildings overlooking the airport. Anti-materiel sniper rifles would then be used to disable any aircraft attempting movement. This option was ruled out due to the potential for collateral damage to civilians outside the airfield.¹⁰⁴ Of note, is how easily this preferred plan might have effectively denied the airfield.

THE 1991 GULF WAR

The Gulf War is notable in that it represents the most recent large-scale conflict that pitted regular armed forces against one another in a theatre wide series of operations. The Iraqi airbase network was one of the strongest points of the Iraqi military machine, the base hardening making Iraq's airfields 'the strongest component of its air force'.¹⁰⁵ Acknowledging this strength, commensurately strong coalition forces were allocated to its suppression.

Despite the weight of air power devoted to the task of attacking Iraqi airfields 'the fact that many of Iraq's frontline fighters were able to escape to Iran clearly indicates that

⁹⁹ Jackson, J.T., in US Army War College, *Case Study – Operation Just Cause Panama 1989*, p 91.

¹⁰⁰ Kelly, O., *Brave Men Dark Waters – The Untold Story of the Navy SEALs*, Pocket Books, New York, 1993, p 1.

¹⁰¹ US Army War College, *Case Study – Operation Just Cause Panama 1989*, p 10.

¹⁰² *ibid.*, pp 39-40.

¹⁰³ Kelly, *Brave Men Dark Waters – The Untold Story of the Navy SEALs*, p 2.

¹⁰⁴ *ibid.*, p 255.

¹⁰⁵ Centner, C.M., 'Ignorance is Risk', *Airpower Journal*, Volume 6, Number 4, p 27.

many runways remained accessible and useable, despite the coalition's best efforts'.¹⁰⁶ Of the 16 primary Iraqi Air Force bases and 28 dispersal airbases targeted only nine were placed irreparably out of action.¹⁰⁷ These figures attest to the operability of these airbases; however, these results must be considered in the context of the goals of the coalition offensive counter air campaign. 'We never had any intention to render all of the airfields inoperable,' General Schwarzkopf explained, 'our intention is to render the [Iraqi] *Air Force* [emphasis in original] ineffective'.¹⁰⁸

During the second week of the air war, fully 60 per cent of F-111F and 26 per cent of the F-117 sorties attacked airfield targets, mostly aircraft shelters. During the third week, F-111F aircraft conducted more than 200 strikes against airfield targets (representing 18 per cent of their strikes for that week).¹⁰⁹ B-52G strategic bombers were used to attack airfield targets using low altitude high-speed attacks. They attacked runways with unguided unitary bombs and laid fields of area denial sub-munitions.¹¹⁰ In the two weeks 1300 sorties were flown against Iraqi airfields.¹¹¹

Each major Iraqi airfield possessed trained runway repair teams, specialised equipment and stockpiles of material to use during repairs. At no stage was it apparent that the coalition attacked these airbase repair assets as part of their airfield attack strategy.¹¹² Accordingly, where meaningful damage was inflicted it was usually repaired quickly. Craters were painted on operational runways to make them appear damaged and real craters were papered over to attract further wasted attacks.¹¹³

1991 Gulf War Conclusions

In summary, the Gulf War pitted one of the world's most resilient airbase systems against perhaps the strongest air campaign ever conducted. 'Fully one-third of the US tactical air forces went to *Desert Storm*, including 90 per cent of the F-111s, F-117s and F-15E strike aircraft. Over half of the tankers and command and control aircraft deployed, and almost half of the reconnaissance and electronic warfare aircraft.'¹¹⁴ It demonstrated the finite, yet very tangible benefits that airbase operability features provide. Had the Iraqi airbase network not possessed such a suite of operability features it may have been neutralised far more easily than it was. Because of the highly resilient nature of the Iraqi airbase network the aim of the coalition offensive counter air attacks was to 'disrupt operations and to reduce sortie rates, rather than to close the airfields altogether which, given their size, was beyond the capability of the resources available'.¹¹⁵ The dispersed and hardened bases, combined with an active deception and repair capability, ensured that despite the coalition's weight of

¹⁰⁶ *ibid.*, p 32.

¹⁰⁷ Canan, J.W., 'Airpower Opens the Fight', *Air Force Magazine*, Vol 74, No 3, March 1991, p 18.

¹⁰⁸ *ibid.*, p 18.

¹⁰⁹ Murray, W., *Air War in the Persian Gulf*, Nautical and Aviation Publishing, Baltimore, 1996, p 185.

¹¹⁰ Coyne J.P., *Airpower in the Gulf*, Aerospace Education Foundation, Arlington, 1992, p 50.

¹¹¹ Canan, 'Airpower Opens the Fight', p 18.

¹¹² Centner, 'Ignorance is Risk', p 29.

¹¹³ Asia-Pacific Defence Reporter – Random Intelligence, Volume XVII, Number 9, March 1991, p 23.

¹¹⁴ Story, W.C., *Third World Traps and Pitfalls – Ballistic Missiles, Cruise Missiles, and Land Based Airpower*, Air University Press, Maxwell AFB, 1995, p 41.

¹¹⁵ Hine, P., 'Air Operations in the Gulf War' in Stephens, Alan, (Ed), *The War in the Air 1914-1994*, Air Power Studies Centre, Canberra, 1994, p 310.

precision fire power, Iraqi aircraft were potentially available for combat tasking (had it been desired) right up until the end of the war.

SERBIA – OPERATION *ALLIED FORCE* – MAY/JUNE 1999

The most recent international conflict in which airbases have been attacked was NATO operations against Serbia from April to June of 1999. Military and infrastructure targets in Serbia were attacked by NATO aircraft to drive Serbian forces out of the disputed province of Kosovo.

During this campaign many Yugoslavian Air Force bases and dual-use airports were attacked, principally as part of a comprehensive defence suppression campaign. NATO reconnaissance imagery shows damage to airfields at Sjenica, Obvra, Batajnica, Ponikve, Nis, Sombor, Podgorica and Pristina. In most cases the runway pavements have been primary targets attacked either by massed sticks of bombs or precision strikes at critical junction points. Aircraft parking, fuel and airfield facilities have also been targeted in some instances.

Allied Force also saw the first wide spread use of satellite or Global Positioning System (GPS) guided munitions. GPS-guided US Joint Direct Attack Munitions (JDAM) were used to cut runways and destroy airfield facilities on many airbases. One report states that JDAMs deployed from USAF B-2A bombers were used to interdict Obvra Airport. A single B-2A sortie hit two runways with three bombs on each one, spread evenly along their length.¹¹⁶ The principal advantage of GPS guided munitions is that they can be used to precisely attack small fixed targets in all weathers, overcoming a major deficiency of laser guided bombs.

NATO reconnaissance imagery also shows a diversity of methods used by Serbian forces to counter the air attacks, and also reveals instances where little has been attempted to ameliorate or repair damage. Aerial photographs of commercial transport aircraft parked at Belgrade Airfield reveal a fighter aircraft parked under the tail of one of the larger transports.¹¹⁷ Low angle sunlight has formed long shadows from both aircraft revealing the presence of the hidden fighter. Post strike images of Ponikve airfield show bomb damage across the main runway. A path has been cleared through the resulting debris, but no attempt to repair the bomb damage is apparent.¹¹⁸ Although, given the overwhelming firepower deployed by the NATO airforces and their demonstrated reconnaissance and restrike capability, any repair attempts would have been unlikely to be worthwhile anyway. The US Air Force's senior officer in Europe, General John Jumper was quoted as saying 'one of the myths that was dispelled in this conflict was that you can't close airfields [with bombing]. We closed almost all the airfields so there was no air activity off of them'.¹¹⁹ Given the number of airfields which historically have been closed by bombing, this conception should

¹¹⁶ Seigle, G., 'B-2A Spirit is No Prima Donna on the Ground', *Jane's Defence Weekly*, 7 July 1999, <http://defweb.cbr.defence.gov.au/jrl/janes/jdw99/jdw02394.htm> accessed 2 September 1999.

¹¹⁷ <http://www.nato.int/pictures/1999/990419/b990419c.jpg> accessed 20 August 1999.

¹¹⁸ <http://www.nato.int/pictures/1999/990419/b990530i.jpg> accessed 20 August 1999.

¹¹⁹ Fulghum, D.A., 'Kosovo Conflict Spurred New Airborne Technology Use', *Aviation Week and Space Technology*, 23 August 1999, p 30.

certainly have been only a myth long before *Allied Force*. The quote highlights the effectiveness of the new generation of air-to-surface weapons.

Despite the increased accuracy of the new weapon systems considerable quantities of unexploded ordnance were left after the campaign. Much of this ordnance was left in Kosovo to be cleared by NATO Explosive Ordnance Disposal teams. Another example was a 2000 lb unexploded bomb found at Pristina Airport. This bomb was destroyed in place by Russian troops using a 'controlled explosion' over a month after the cessation of the air campaign.¹²⁰

Allied Force also saw the first offensive use of computer or information warfare to attack air defence systems.¹²¹ Used in support of air attacks, US computer experts were able to introduce false radar images onto air defence systems to protect attacking aircraft. Less sophisticated brute force methods such as the overloading of systems with extraneous data were also employed as had been undertaken in the 1991 Gulf War.

CONCLUSIONS

The defence of the airbase can be seen as an attempt to make the best of a bad situation. Airbases are attractive targets, combining high strategic and monetary value with a large number of vulnerabilities. In few other fields of military endeavour would one be expected to defend at all costs such a seemingly indefensible target.

In many of the examples provided in this paper, the airbase targets seemed to be indefensible. Where the attacker possessed air superiority and precision weapons, and the defender only earthbound anti-aircraft weapons, all the airbase resiliency features in the world did not prevent severe asset losses. However, where the attacker had only a finite capability, the implementation of protective measures on the ground made a significant difference - 'since 1940 airbases have been difficult to defend, but they have also proven to be very hard to destroy'.¹²²

The study of previous military undertakings and attempts to draw lessons from them is often stymied by the inconsistencies and conflicting results that are found. Also, as previously stated, care must be taken in ensuring that lessons drawn are still valid as 'one era's truisms can be another's falsehoods'.¹²³ The study of attacks against airbases shows that some simple conclusions can be readily drawn and that despite considerable changes in technology some basic truths can be seen over the last 80 years. The most consistent lessons learnt from this study of past airbase attacks are:

- a. The extreme vulnerability of aircraft and essential facilities unless protected by an operability plan and appropriate passive defences.

¹²⁰ NATO briefing, <http://www.nato.int/kosovo/press/1999/k990811a.htm> accessed 13 September 1999.

¹²¹ Fulghum, D.A., 'Yugoslavia Successfully Attacked by Computers', *Aviation Week and Space Technology*, 23 August 1999, p 31.

¹²² Kreis, *Air Warfare and Airbase Air Defence*, p 352.

¹²³ Stephens, Alan, *High Noon of Air Power*, Air Power Studies Centre, Canberra, 1999, p 26.

- b. The vulnerability of airbase operations to ground attack and the extent to which an aggressive and well managed ground defence capability can offset this threat.
- c. The importance and potential effectiveness of a comprehensive airfield recovery capability.
- d. Aircraft parked in the open undispersed are sitting ducks and will be destroyed quickly and cheaply. Dispersal and protection from near misses is normally the most cost-effective solution to protect parked aircraft.

In almost every example presented in this paper, describing both air and ground attack against airbases, aircraft parked in the open without protection were easily destroyed or damaged. Israeli attacks on Egyptian aircraft in 1967 demonstrated that this was not only feasible, but could be done with considerable economy. Placing aircraft in protected positions such as revetments and Hardened Aircraft Shelters (HAS) has always provided them with a degree of protection and made the attackers' task of destroying them commensurately harder. Although, in later conflicts hardened aircraft parking was also shown to be vulnerable, they were still more difficult to destroy than unprotected aircraft. The soft nature and necessarily light construction of aircraft makes them vulnerable to serious damage from relatively light overpressures or small impacts.

The development of a family of precision guided penetration weapons has ensured that all parked aircraft may be vulnerable, regardless of the physical protection afforded them. Accordingly, the construction of expensive HAS may no longer be economically justifiable, except in unusual cases. However, there are large gains to be made by protecting aircraft from the effects of near misses, ground fired weapons, area weapons and other non-precision attacks. The combination of limited physical protection with an effective dispersal plan, can minimise the damage caused by a limited number of attack weapons and may provide the most cost-effective protection for parked aircraft. It is also effective against ground attack, protecting against these weapons and complicating the task of penetrating 'sapper' style attacks. The construction of dispersed and hardened aircraft parking following the 1967 Arab-Israeli War and during the Vietnam War was undertaken in response to these diverse requirements.

A determined special or irregular forces unit can employ stand-off weapons or penetrate inadequate ground defences to destroy aircraft. Well designed and aggressively employed ground defence in depth can prevent these attacks.

Airbases must be adequately defended against ground attack. Where defences are inadequate ground resources will be tasked to attack the assets at the airbase. In many campaigns the available ground attack air assets are usually in high demand with more targets available than aircraft to attack them. Accordingly, where it is feasible to use ground forces to attack an enemy facility they may be employed. This was well demonstrated during SAS-LRDG operations in North Africa during World War II and by the North Vietnamese and VC during the Vietnam War.

Some USAF bases in Vietnam were excellent examples of fortress airbases incorporating well established perimeter defences and mobile defenders with heavy firepower. Against these defences penetrating style attacks were largely unsuccessful. Although generally impossible to quantify, the deterrent effect of these defences was probably of even greater usefulness. Potential attackers were forced to use stand-off tactics that generally had lower accuracy, and accordingly were potentially less effective.

Airfields are easy to attack and easy to damage, however, keeping them closed requires repeated and continual attacks. A strong airfield recovery capability, including the ability to neutralise unexploded explosive ordnance is essential.

Historical examples have shown that unless active defences are particularly strong it is relatively easy to damage airfield surfaces and facilities. In many cases this was shown to be capable of stopping airbase operations. However, it was also demonstrated that this damage could normally be repaired quite quickly and repeated attacks were required to keep airbases inoperable. The possession of even a rudimentary repair and recovery capability enabled operations to be recommenced quite quickly.

This phenomena was again demonstrated during the 1991 Gulf War, when well developed resiliency features and an effective runway repair capability enabled many Iraqi airbases to be kept operational, despite the weight of coalition firepower thrown at them.

It has been demonstrated that the presence of UXO following an attack can greatly hinder the recovery process. Airbases must have an appropriate capability to deal with this threat. Poltrava is an early example of the disruption and casualties that UXO can inflict upon recovery operations. There is a wide variety of advanced and effective pavement and facility repair options presently available that can quickly repair the damage caused by air base attack. The use of area denial munitions (particularly if a variety of different forms is used simultaneously) has the potential to greatly increase the time required to restore a base's operational capability, and inflict substantial casualties whilst doing so.