

MISSILES AND AIRCRAFT (Part I)

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Foreword

Many sources maintain that the role played by air power in the 1973 Yom Kippur War was important. Other interpretations state that control of air space over the battlefield areas, (either by aircraft or anti-aircraft defences), was vital.

Yet another standpoint is that newer, sophisticated equipment obtained by the Israelis towards the end of the war caused the outcome of the conflict to change decisively in their favour. Observers have also mentioned that the Arab preoccupation with the control of the air by means of a 'missile umbrella' greatly influenced their ground operations.

Analogous arguments concerning the role of the tank, versus anti-tank devices, have been described in previous *Pointers*. It would appear that the Yom Kippur War has resulted in new interpretations of old lessons, rather than radically new lessons. Even a subject as modern as Electronic Counter Measures will be seen to be very similar in basic aim to those practised by British Bomber Command during the last War. The technology and design philosophy to implement these aims has, however, changed radically.

A comparison of the Yom Kippur War with earlier historical events may cause Henry Ford's contentious statement to spring to mind: 'History is bunk'. But then, to analyse the Yom Kippur War in isolation would also be 'bunk'.

To obtain a thorough evaluation of the subject, it has been deemed necessary to approach it from the viewpoint of comparative history. Thus, the first article on 'Aircraft and Missiles deals with selected aspects of the developments of air power as from the First World War.

In his article on the origin and development of military aviation in *Militaria*, Colonel H.J. Botha says: 'Douhet's philosophy, and indeed the whole idea of strategic bombing would now be absolutely dead if it were not for nuclear weapons'.¹

Strategic bombing is not discussed, for the Yom Kippur War saw aircraft used mostly in a tactical role. For several reasons, dependence upon strategic bombing had been ruled out by the Israeli Air Force.²

A more specific analysis of the use of aircraft and missiles in the Yom Kippur War *per se*, with emphasis on the technical aspects will be given in the next article.

Introduction

*This is good sport but for the Army
the aeroplane is worthless.*³

So said General Foch while watching an early aircraft demonstration. Few people would now agree with him, least of all the Israelis.

Although the 1973 Arab-Israeli war ended almost five years ago, many doctrinal issues concerning the use of aircraft and missiles are still clouded. Small wonder — there are so many contradictory interpretations of the statistics that emerged from the war.

On the one hand, Major-General A.H. Farrar-Hockley states that Israeli tactics nearly caused them to lose the war,⁴ while Corddry maintains that

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1. *Militaria* 2/1, 1970 (H.J. Botha: Histories oorsig van die ontstaan en ontwikkeling van die militêre lugvaart en die selfstandige lugmagte), p 9.
2. C. Messenger: *The Blitzkrieg Story*, (New York, 1976) p 224.
3. B.H. Liddell Hart: *History of the First World War*, (London, 1970) p 457.
4. E. Monroe and A.H. Farrar-Hockley: *The Arab-Israel War October 1973, Background and events*. (In *Adelphi Papers* no III), p 31.

the surface-to-air missile is a far from decisive weapon in its present stage of development.⁵ Other aspects are the conflicting interpretations possible of Israeli Air Force losses. What is significant: that Israeli aircraft were initially prohibited to go nearer than 15 miles to the Canal, and that Israeli aircraft losses were more than double that of 1967 — or that the loss rate 'decreased from four aircraft lost in 100 sorties in 1967 to one per 100 sorties in 1973?'⁶

Some sources maintain that, from Yom Kippur statistics, the use of aircraft and tanks in *Blitzkrieg*-style tactics is finished. Others, equally convinced, produce totally different conclusions from the same statistics.

It would seem that a review of the history of the use of airpower in this century is essential to clarify what issues regarding air power were actually at stake in the Yom Kippur War.

The First World War

*The very eagerness with which the armies had eventually embraced aircraft as immediate auxiliaries — for reconnaissance, artillery observation, and the protection of these duties — limited the supply of aircraft for roles of indirect co-operation, and curtailed their exploitation of the bombing weapon.*⁷

— Liddell Hart.

No doubt by the end of the war, Marshal Foch had changed his opinion of the use of aircraft in war. From initial use in reconnaissance, artillery spotting and limited bombing, the Royal Air Force was, at the close of the war, on the point of being used as a strategic bombing weapon.

The German 'Circus' concept ensured that, despite being outnumbered three to one by total Allied air strength, concentration of aircraft in Circuses enabled the Germans to attain local air superiority where needed. Naturally, this was only for a certain period of the War.⁸

Aircraft were also used with considerable effect in the First World War to stem the German advance of 1918, and also to harass retreating Bulgarian, Turkish and Austrian columns.⁹

Between the Wars

One of the many who must have watched aircraft from the trenches was the then Captain Basil Liddell Hart. Appalled by what he regarded as a senseless way of waging war, he developed a new doctrine, in which the use of air power figured prominently.

He envisaged the use of aircraft to 'jump over the army which shields the enemy government, industry and people, and so strike direct and immediately at the seat of the opposing will and policy'.¹⁰

The Spanish Civil War saw a new use of air power. The Ju-57's of the *Luftwaffe Condor Legion* were used to ferry 15 000 Moroccan troops to Spain. Here, for the first time, aircraft were used in large scale ground-support actions.¹¹ An incident which achieved great publicity was the bombing of Guernica. Messenger maintains that the publicity accorded the bombing of Guernica forced the significance of tactical air operations in Spain into the background.¹²

Yet, although German aerial tactics were being evolved for all to see, the world was still unprepared for the *Blitzkrieg*. *Blitzkrieg* involves the use of aircraft co-ordinated with the ground forces, as inhabitants of Rotterdam and Warsaw later discovered to their cost.

The Second World War

*Whoever thinks that one can win a war with mighty aviation alone is deeply mistaken. If we look back into history we see what an important role artillery has played in all wars.*¹³

— Stalin.

5. National Defence, vol 58, no 324, May-June 1974, (C.W. Corddry: *The Yom Kippur War, 1973 — Lessons new and old*), p 508.
6. Army Journal, no 324, May 1976 (J.V. Viksne: *The Yom Kippur War in retrospect Part 2 — Technology*) p 32.
7. B.H. Liddell Hart: *op. cit.*, p 461.
8. *Ibid.*, p 459.
9. *Ibid.*, p 460.
10. B.H. Liddell Hart: *Paris or the Future of War* (London, 1972).
11. J.W.R. Taylor: *A history of Aerial warfare*, (London, 1974), p 144.
12. C. Messenger: *op. cit.*, p 103.
13. *Ibid.*, p 122.

While Stalin's opinions on the use of aircraft hardly dominate current military thought, it is nonetheless interesting to contrast the above quote with Morony's opinion of the consequences of the Yom Kippur War.

Morony, writing in *The Journal of the Royal Artillery*, argues that with the possibility of an effective air defence, close air support for ground forces may be denied them. Thus, ground forces are forced to rely upon their own indirect fire weapons – artillery included.¹⁴ The use of air power in the Second World War is such a vast subject that only certain aspects are highlighted. They are: The Battle of Britain, air power against Rommel's marine supply lines, and the Battle of Kursk. In addition, electronic counter-measures in support of bomber command are mentioned.

The Battle of Britain

The Battle of Britain is so well known that an attempt to cover it all would be superficial in the extreme. One important aspect was the use of radar.

In *The Strategic Bomber Offensive against Germany*, Richards emphasizes the importance of radar, saying it is 'common knowledge that the Battle of Britain could not have been won without radar early warning and the accompanying radio control of fighter command.'¹⁵

The initial German strategy was to wear down Royal Air Force fighter command. Without air superiority, the German Invasion – Operation *Sea Lion* – could not hope to succeed. The Germans were actually starting to succeed in their objective, when Hitler, enraged by British bomber attacks on Berlin, ordered the full weight of the Luftwaffe to be turned against London.

Radar had been of great importance in ensuring that many streams of German bombers were met before they reached the coastline. Another important aspect of using radar was that aircraft were wasted in standing patrols.

The Germans utilized a radio guidance beam. By means of headphones, German bombers could ensure that they were on course, when they had to release their bombs. Due to British electronic countermeasures, and the fear of German bomber pilots that British aircraft were 'riding the beam' in wait of them, this navigational aid soon decreased in efficiency.

Two further interesting developments were the development of gunlaying radar, and radar-controlled interception of enemy fighters. Ground controlled radar gave accurate height readings, thus permitting the target to be engaged 'unseen'. Ground Controlled Interception (GCI) radar, guided night fighters close enough to the enemy for them to use their own¹⁶ airborne radar for the final interception. In the Yom Kippur War of 1973, the Soviet-made *ZSU-23-4* mobile machine cannon, responsible for shooting down many Israeli aircraft, utilized radar. The *SAM-6* surface-to-air missile used in the same conflict first used tracking by ground control until its launching, whereafter it homed on its target, using semi-active radar.¹⁷

Air Power against Rommel's Marine Supply Lines

*The whole secret of the art of war lies in the ability to become master of the lines of communication.*¹⁸

– Napoleon.

This theatre of the war saw a concerted attack on Axis shipping, with the aim of imposing a stranglehold on supplies to Rommel. The Allies were not the only ones to use air power against marine supply lines. Germans operating from Greece and Libya against Allied shipping resulted in increased Allied dependence on Malta. But the combined use of Allied submarine and aircraft continued to weaken the German supply position. Writing in an official History of the Royal Air Force in the Second World War, Richards puts the total amount of Axis shipping sunk at 'between one third and one half of Axis sailings to North Africa.'¹⁹

14. *Journal of the Royal Artillery*, vol 102, no 1, March 1975, (T.O. Morony: Artillery support in the Yom Kippur War) p 11 – 13.

15. C. Webster and N. Frankland: *The strategic air offensive against Germany 1939 – 1945, Annexes and Appendices*, (London, 1961).

16. Purnell's History of the Second World War, vol 1 (D. Richards: The Battle of Britain) P 234.

17. 'Some reports have spoken of terminal infra-red homing, but the missile airframe shows no obvious windows behind which such a device could be mounted. A series of dark panels around the body (just forward of the air intake) could however be such windows rather than proximity fuze antennas, as has been suggested in earlier analyses of the weapon' *Flight International*, vol 3 no 3557, 14 May 1977 (D. Richardson: World Missiles Directory) p 1345.

19. D. Richards and H. St G. Saunders: *Royal Air Force 1939 – 1945, vol 2, The Fight Avails*, (London, 1954) p 170.

While the use of air power alone did not drive Rommel from North Africa, the importance of the use of air power against communications is evident.

In later wars, (eg Korea and Vietnam), air power was again used with varying degrees of success in an attempt to destroy communications and supply lines. Here though, supply lines that were attacked were overland ones.

The Battle of Kursk

Victory at Kursk will be a beacon for the whole world.

— Hitler.

The Battle of Kursk did prove a beacon for the whole world, but not in the way Hitler had intended. However, although this conflict (which saw one of the world's largest tank battles), took place almost thirty-five years ago, there are still lessons to be learned from it.

Due to good intelligence, the Soviets were aware of the German plan to attack the Kursk salient — *Operation Citadel*. They attempted a pre-emptive air-strike on German aircraft, just before the attack was due to start. Unfortunately, the Soviet aircraft were detected by German radar, and intercepted.²⁰

How did the Israelis manage to achieve in 1967 what the Russians failed to do in 1943? According to the *Luftwaffe War Diaries*, German radio monitors detected a major increase in Russian aircraft radio exchanges, followed by radar indications of several hundred aircraft approaching.

It must be remembered that the Israeli air strikes in 1967 were far better planned, and that they involved good timing. Israeli aircraft flew too low for radar detection. The attack was also timed to catch Egyptian aircraft on the ground, and their officers on the way to work!

In his article: *Air Power at Kursk: The Confrontation of Aircraft and Tanks — A Lesson for Today?* Captain Lonnie O'Ratley (United States Air Force) states: 'Based on the historical example of the successful air attacks against Soviet armour in the Battle of Kursk in July 1943, there is proof that aircraft without the support of ground forces can effectively neutralise enemy armoured formations'.²¹

This statement is based on the 'Meyer Model', when Captain Bruno Meyer of the Luftwaffe used a co-ordinated attack by Henschel HS 129 B-2 anti-

tank aircraft to destroy a Russian tank brigade — without ground support. He used four 'Staffeln' to ensure a constant attack. One 'Staffel' was attacking the tanks, another returning to base for fuel and ammunition, another taking on fuel and ammunition, while the final Staffel was en route to the battlefield to relieve the first.²²

Compare this to tactics used by the Israeli Air Force to destroy the Egyptian Air Force on the ground on 5 June 1967. Due to the incredible turn-around time of seven and a half minutes, the Israelis managed to do eight sorties a day, when the Egyptians expected them to manage two. Small wonder, a hysterical Nasser maintained that British and American aircraft were being used against him.²³

Lessons that emerge from Kursk are:

- 1 The vulnerability of armour to aircraft, when used without means of protection from aerial attack.
- 2 The efficient use of aircraft possible, when used with ground control.

Captain O'Ratley comes to the conclusion that the use at Kursk of 'tank-busting' aircraft is historical justification for the use of the Fairchild *Republic A-10* 'tank-busters' in Europe.

The Fairchild *Republic A-10* is by all accounts a well-designed, formidable piece of aeronautical engineering. But did the Battle of Kursk prove conclusively that tanks are vulnerable to aircraft in all circumstances?

The Ju-87 'Stuka', adapted for 'tank-busting' by the Germans, might have been very efficient against tanks²⁴ but how efficient would the Stuka have been in attacking tanks while trying to fight off fighters attacking it? Consider the vulnerability of the conventional Stuka to fighter attack.

20. Purnell's History of the Second World War, vol 4, (G.A. Koltunov: Kursk: The clash of armour) p 1376.

21. Rusi, vol 122, no 2, June 1977 (L.O. Ratley: Air Power at Kursk: The confrontation of aircraft and tanks — A lesson for today?) pp 26–27.

22. F. Ziegler (ed): *The Luftwaffe War Diaries*, (London, 1966) p 295.

23. An Cosantoir, vol 28, no 4 April 1968 (B.H. Liddell Hart: Strategy of a war), p 117.

24. F.W. von Mellenthin: *Panzer battles: a study of the employment of armour in the Second World War*, (New York 1956) p 273.

It is interesting to note that Major General von Mellenthin, involved in the German planning for *Operation Citadel*, while mentioning the successful use of aircraft against tanks at Kursk, goes on to say: 'No air force, however powerful, will be able to stop the Russian masses. The Western World's most crying need is for infantry, determined to do or die, and ready to stem the Russian onslaught with anti-tank weapons. The West also needs strong armoured and mechanized formations to counterattack and hurl back the Russian invader'.²⁵

It is also significant to remember that Arab-crewed Russian tanks invading the Sinai, in the Yom Kippur War were stopped by Israeli armour, not the Israeli Air Force.

Radio Counter-measures in support of Bomber Command

However difficult the situation, however hopeless it may seem at first our efforts must not tire.

— *Albert Speer.*

In the Battle of Britain, German bomber pilots were confronted with British fighter pilots aided by radar. Later in the war the roles were reversed. It was now British Bomber Command pilots who had to penetrate German air defences utilizing radar — Würzburg and Freya types.

The Germans had one of the biggest, most comprehensive air defence systems ever known. One of the important aspects was the use of radar-guided night fighters.

Bomber Command was initially reluctant to initiate an electronic counter-measures campaign, for fear of having the same methods being used by the Germans to disrupt British air defences.

The aspects of the night-fighter operation that were selected as being vulnerable to electronic counter-measures are interesting, as several current electronic counter-measures techniques have the same aims. As given by Richards, they are:

- 1 Jamming of the radio-telephone link between fighter and ground controller.
- 2 Jamming or interfering with early warning and tracking apparatus.
- 3 Producing false impressions upon radar search apparatus.
- 4 Fitting bombers with warning apparatus to notify crews they were under radar surveillance.
- 5 Equipping fighters to home on radar emissions from German night fighters.²⁶

Compare these ideas with these more modern concepts:

- 1 The use by Israeli pilots in the 1970 War of Attrition of Electronic Counter Measurer jammers to jam the ground-relayed radar guidance of *SAM-2* missiles.²⁷
- 2 The use of *EB-66* aircraft in Vietnam to jam radar stations.²⁸
3. The concept of fitting Luneberg lenses to remotely piloted vehicles, to produce an enlarged radar echo, imitating a much larger *aircraft*.²⁹
- 4 The use of equipment in current aircraft to warn of detection by enemy radar.³⁰
- 5 The use of antiradiation missiles to home on radar emissions of ground based *SAM* guidance radars.³¹

It is interesting to note that the 'concrete dibber' bomb applied by the Israelis in the 1967 war against Arab aircraft runways had a precedent in the Second World War. The American navy had developed a rocket-braked bomb that allowed it to fall straight down onto the target, and not over-

25. *Ibid.*, p 366.

26. D. Richards and H. St. G. Saunders: *op cit.*, p 20.

27. E. O' Ballance: *The electronic war in the Middle East 1968-70*, (London, 1974) p 123.

28. USAF South east Asia Monograph Series, vol 1, 1976 (A.J.C. Lavalle led): *The tale of two bridges, and the Battle for the Skies over North Vietnam* p 25.

29. 'One of the instructive lessons learned from the 1973 Middle East war, is that, in the heat of battle, defenses are inclined to shoot at anything that moves. An Israeli target drone sent across the Suez drew the fire of 32 surface-to-air missiles and still returned. World Missiles Directory) p 1345.

For this reason, the United States Air Force, is less inclined than it had been to invest in designing the tactical expendable decoy system vehicle to stimulate a strike aircraft's signature. The tactical expendable decoy system vehicles will carry radar and infrared augmentation devices, such as Luneberg lenses to concentrate and return radar signals' *Aviation Week and Space Technology*, vol 102, no 4, 27 January 1975, (Delivery gains speed expendable use) p 127.

30. Usually, enemy radar associated with anti-aircraft artillery or surface-to-air missile sites — the 'SAM song', heard by American pilots over Vietnam, warning of 'lock-on', by enemy radar.

31. Shrike antiradiation missiles used by the Americans in Vietnam. These missiles homed on enemy radar sites, and were effective, even if only forcing the enemy to switch off his tracking radar.

During the Yom Kippur War, one of the reasons for the initial effectiveness of the *SAM-6* missile was the inability of the Israelis to adopt appropriate electronic counter-measures.

shoot it. The last submarine to be sunk in the war, on 30 April 1945, was sunk in the Bay of Biscay by one of these weapons.³² The Israeli problem in 1967 was that high speed low-flying aircraft dropping bombs on Arab runways could be affected by their own bombs.

There is much that can still be learned about current military questions from a study of the Second World War. Towards the end of the war, many sophisticated, remotely-controlled missiles had started to appear.

Consider the sinking of the Italian battleship *Roma* with a German radio-controlled glider-bomb in 1943,³³ and the use by Israelis of the Walleye glide bomb. In April 1945, an American radar-guided air-to-surface missile sunk a Japanese destroyer 20 miles from its launch point.³⁴ In the October 1973 war, the Egyptians launched *Kelt AS-5* missiles at various Israeli targets, hitting two radar sites and a supply depot.³⁵

Further information on missiles will be given in the next article.

1948—49 Arab Israeli War of Independence

He who comes to kill thee, thou proceed to kill him.
— Old Israeli saying.³⁶

When the State of Israel was proclaimed on 14 May 1948, the nation found itself threatened on all sides by Arab armies, superior in numbers and equipment. Commenting on one of the operations making up the War of Independence, Yigael Yadin states:

'The only lessons they, (the Egyptians), had learned from 'Operation Ten Plagues' was that the Israeli specialized in night attack and that the Israeli Air Force had now become a weapon to be considered'.³⁷ Allon adds that the psychological value of the few Spitfires, Dakotas and Czech Messerschmitts possessed by the Israelis was at least as great as their military value.³⁸

The Korean War

It is quite evident to anybody that is acquainted with war that determined ground troops cannot be stopped alone by air.

— General Douglas MacArthur.³⁹

On 25 June 1950, North Korean forces invaded South Korea. The 'land of the morning calm' was not to regain peace for several years. The resulting Korean War saw extensive use of air power.

Since the North Korean supply sources were in Communist China, it was politically impossible to attack them. Thus, the supplies flowing to North Korean troops had to be 'interdicted'. Strategic bombing, as used in the Second World War, had little meaning as North Korea hadn't much infrastructure. What few targets there were, were destroyed very early in the war,⁴⁰ by *B-29 Superfortresses*.

The Korean War saw the introduction of a new jet aircraft — the *MiG-15*, but although the Communists sometimes managed to achieve local air superiority, general air superiority remained firmly in the hands of United Nations forces. One important factor here was superior United Nations force pilot training. Consider the erratic performance of North Korean pilots when under attack.⁴¹

Significantly, the Israelis have always attached great importance to well-trained pilots.

After standard rail links and bridges had been bombed, alternative North Korean supply routes were evolved, based on manpower. This was far more difficult to stop. A similar phenomenon occurred later in Vietnam.⁴²

32 Purnell's History of the Second World War, vol 6, 1974, (B.J. Ford: The Rocket Space), p 2617.

33 D. Richards and H. St G. Saunders: *op. cit.*, p 335.

34 B.J. Ford: *op. cit.*, p 2617

35 J.V. Viksne: *op. cit.*, p 22

36 B.H. Liddell Hart, *Strategy: The indirect approach*, p 400.

37 Y. Yadin: Appendix no 2 (In B.H. Liddell Hart: *Strategy: the Indirect approach*) p 407.

38 Y. Allon: The making of Israeli army (In M. Howard (ed): *The theory and practice of war*(London, 196b) p 655.

39 R.F. Fultrell, L.S. Moseley (et.al.): *The United States Air Force in Korea 1951—53*, (New York, 1961) p 655.

40 Rusi, vol 97 no 2, May 1952 (P.G. Wykeham Barnes: The war in Korea with special references to the difficulties of using our air power), p 155

41 R.F. Fultrell, L.S. Moseley, (et.al.): *op. cit.*, p 652. 'When the Communist (trainee) pilots could be brought under attack, they were apt to display utter confusion.'

42 A.J.C. Laval: *op. cit.*, p 40

Ground support use of fighter aircraft was useful in breaking up communist human wave assaults.⁴³

But, as mentioned in *The USAF in Korea*: 'There was much to be learned from the experiences of combat, but nearly every lesson of the Korean conflict had to be qualified by the fact that the Korean War had been a peculiar war, which was unlike wars in the past and was not necessarily typical of the future'.⁴⁴

The Israelis would have done well to heed this. Their sweeping success in the Six Day War of 1967 caused them to become blind to future developments.

'Because the military assessment was that, without air superiority, the Arabs lacked the ability to go to war, therefore the Arabs' rational political intention must be to avoid war — whatever Arab politicians might say to the contrary'.⁴⁵

The 1956 Arab-Israeli war did not see the development of radically new ideas or the use of air power. This, however, was evident in the Six Day War of 1967.

The Six Day War

*There were those who thought that Israel's Blitzkrieg had won her ten years' peace, but in fact her strategic position, never brilliant, was only marginally improved, since air power was the key to the situation.*⁴⁶

— Brigadier P. Young

At 07h45 Israeli local time, the Israeli Air Force struck. Down below, Egyptian pilots were breakfasting, and the early morning mist was clearing. The aircraft were in neatly parked rows. Field Marshal Ahmer was expected for a tour of inspection.⁴⁷ Suddenly, scores of Israeli aircraft appeared on Egyptian radar screens. Egyptian air crews scrambled, hastily warming up their engines, only to be caught on the ground by Israeli Mirages and Mysteres.⁴⁸

In an orgy of destruction, Israeli aircraft destroyed the bulk of the Egyptian Air Force on the ground in three hours. Although the Voice of Israel initially kept quiet about the spectacular success of its Air Force,⁴⁹ the extent of the Israeli victory could not be covered up for long.

In Sinai, the Israeli army had succeeded in breaking through Egyptian forces and taking the passes commanding passage to the canal. A merciless combined assault of armour, and aircraft dropping napalm, turned the Egyptian defeat in Sinai into a rout.

In describing the Six Day War, Sir B.H. Liddell Hart says: 'What struck me most in their latest campaign, compared with the second in 1956, was the significant development of the Israeli plan and operations in combining the strategical offensive with the tactical defensive — in getting round the back of the Egyptians in Sinai after the opening penetrations and by blocking their lines of retreat, forcing them to attack in trying to escape.⁵⁰ The Israeli Air Force became the 'anvil for the hammer of the ground forces.'⁵¹

On the West Bank, the Israelis had succeeded in taking Jerusalem, and depriving Jordan of some of its richest territory. Again, the Israeli Air Force was used to largely destroy the Jordanian Air Force on the ground. Ground support missions greatly aided the army.⁵²

In Syria, a combined air and ground assault resulted in the formidable-looking Syrian static defences being pierced. Here, Israeli Air Force ground support missions proved useful in achieving breakthroughs in the Syrian *Sword and Shield* Russian-modelled defences. The *Sword* lost its flexibility, resulting in an all *Shield* defence,⁵³ which was pierced. The Israelis were jubilant at their victory. Some spokesmen considered that it would take the Arabs a generation to train armed forces of equal calibre.

43. R.F. Fultrell, L.S. Moseley, (et.al.): *op. cit.*, p 662

44. *Ibid.*, p 644.

45. The Insight Team: *The Yom Kippur War*, (London, 1975) p 96.

46. P. Young: *The Israeli Campaign 1967*, (London, 1967) p 185

47. E. O'Ballance: *The Third Arab-Israeli War*, (London, 1972) p 63.

48. *Ibid.*, p 65

49. *Ibid.*, p 68

50. An Cosantoir, vol 28, no 4, April 1968, (B.H. Liddell Hart: *op. cit.*,) pp 118, 119.

51. E. Luttwak and D. Horowitz: *The Israeli Army*, (London, 1975) p 250

52. E.O' Ballance: *op. cit.*, p 220

53. E. Luttwak and D. Horowitz: *op. cit.*, p 274.

But, on the other side of the Suez canal, Egyptian planners were already planning a 'second round'. From the very outset, they realized they would have to include Israeli air superiority into their planning. How many Israelis had realized that the very magnitude of the defeat of the Arab armies had resulted in a situation from which no negotiated peace was possible.⁵⁴

An important question is how would the Israelis have fared if they had not been able to use their all-powerful air force effectively. Young says further: 'The Germans from 1943 to 1945, as well as the Viet Cong, have both shown that it is possible to operate without effective air cover, but neither was faced with the problem of doing so in a desert devoid of cover.'⁵⁵ Would Israeli ground forces in Sinai have managed to defeat an army 'almost four times as large as Rommel's was on the eve of El Alamein, and in forty-eight hours instead of six months?'⁵⁶

Had the gaining of the Sinai peninsula really improved Israel's strategic position? Flying time from Cairo to Tel Aviv was still only about 25 minutes, compared with the flying time from El Arish, in Sinai, to Tel Aviv of about 4½ minutes.⁵⁷ Israel had now fallen into a strategy of deterrence.

After the Six Day War

*Now the war is over the trouble begins.*⁵⁸

— Moshe Dayan.

In the period 1968–70, during the period of so-called *War of Attrition*, the Egyptians were plagued by deep level Israeli Air Force raids, hitting targets as diverse as Cairo Airport and Egyptian radar stations. Instead of weakening Nasser, the revolution caused by civilian casualties in these raids caused more people to rally round the government.⁵⁹ Consider the similar effect of Allied bombing raids on German civilians in The Second World War.

The SAM-2 missile, used in the 1967 War, had proved ineffective against the low-flying Israeli aircraft. Eventually newer SAM-3 missiles were obtained from Soviet Russia (designed to be effective against low-flying aircraft), together with some ZSU-23/4 mobile anti-aircraft machine cannon.⁶⁰ Many people maintained after the Six Day War the Egyptian armed forces were a subject for ridicule. A closer examination of Egyptian performance might have revealed an unexpected

degree of resistance of Egyptians in static defence positions, even in hopeless circumstances. Consider the sterling performance of Egyptians, (and it must be presumed, Russians), in repairing radar stations when the Israeli Air Force was furiously opposing the establishment of a SAM 'missile box'.⁶¹ There were also sit-down strikes by Egyptian pilots when forbidden to take to the air.⁶²

Just before the close of the *War of Attrition*, Israeli aircraft casualties had started to increase. But the cease fire, on 7 August 1970, arrived too soon for an objective assessment of the efficiency of surface-to-air missiles to be made.

Just after the cease fire, the Egyptians seized the opportunity to move their missiles up to the Suez Canal, intending to establish a zone of 'no-man's land' for Israeli aircraft.

At the same time as the 1967 war was raging, a less dramatic war was being waged in a remote South East Asian country — South Vietnam. Here, American pilots discovered to their cost that they did not enjoy freedom to move around North Vietnamese airspace at will. The presence of SAM-2 high altitude surface-to-air missiles forced many American aircraft to fly lower.

According to *The Tale of Two Brigades and the Battle for the Skies over North Vietnam*, this decreased the efficiency of many American aircraft: 'Flying too low meant AAA (Anti-Aircraft Artillery) reaction; flying at medium altitudes meant SAM reaction — the MiG became a problem at all altitudes. This evolution continued throughout the war.'⁶³

54. P. Young: *op. cit.*, p 183

55. *Ibid.*, p 168

56. E. Luttwak and D. Horowitz: *op. cit.*, p 250

57. E. O'Ballance: *op. cit.*, p 54

58. E. O'Ballance: *The electronic war in the Middel East 1968–70*, (London, 1974) p 15

59. *Ibid.*, p 109

60. *Ibid.*, p 129

61. *Ibid.*, p 133

62. *Ibid.*, p 134

63. A.J.C. Lavalley: *op. cit.*, p 122

Compare this with the efficiency of the combined Egyptian air defences operating over the Suez Canal during the Yom Kippur War. To fly too high meant risk of *SAM-2* missiles. Flying lower entailed risking *SAM-6*'s. Aircraft that flew very low came within range of the lethal *ZSU-23-4* mobile machine cannon, and the less effective *SAM-7* man-portable missile.

One of the methods evolved to attack *SAM-6* launch vehicles was a Stuka-like near vertical dive. This may have been effective against

SAM-6 launch vehicles, but this very dive brought the aircraft within range of the *ZSU-23-4* mobile anti-aircraft guns.

In closing, a remark by Brigadier Peter Young. 'Once again David had defeated Goliath. But this time Goliath, though battered, was still alive'⁶⁴

64. P. Young: *op. cit.*, p 187