CHAPTER TWO

Induction of New Technology

Weapons in West Asia, 1967-1973

It is war that shapes peace, and armament that shapes war.

- JFC Fuller, Armament and History (1945)

Section I: "War of Attrition"
and its Impact on Weapon Procurement

No War No Peace: 1967-1973

Defeat in the Six-Day War of 1967 intensified anti-West feelings among the Arabs. However, a ceasefire was accepted on the basis of the conditions included in the United Nations' Resolution 242 (see Appendix 'D') which called on Israel to withdraw from territories occupied during the 1967 war. This meant Israeli withdrawal from Sinai, the Gaza Strip, the West Bank, East Jerusalem, and the Golan Heights. But Israel, instead of withdrawing, began to fortify its defences along the east bank of the Canal for a permanent stay in the
area. The presence of Israeli troops on the east bank could not be watched without concern by the Egyptian President Gamal Abdul Nasser, who responded to the Israeli belligerence by launching a "'War of Attrition'" against the Israeli forces occupying Sinai. ¹

The "'War of Attrition'" intensified during 1969-1970 and before it ended in August 1970, both sides had suffered heavy casualties. During the period 1967-1970, 137 aircraft of the Arab air forces were shot down by Israeli forces. On the other hand, the Arabs claimed to have destroyed 250 Israeli aircraft. These claims may be excessive, but the number of aircraft lost by both sides was large enough to call for immediate replacement from the USA and the USSR. ²

"'The War of Attrition'" began soon after the cease-fire of 1967 war and ended only in August 1970 when a cease-fire was again accepted by Egypt and Israel under U.S. Secretary of State William Roger's peace plan. This long-drawn war was not a conventional war but a

low-intensity conflict in which several new types of weapons and strategies were tried out by both sides. According to Chaim Herzog, "the battlefield around the Suez Canal became a major proving ground for the military equipment of the two superpowers. In many ways—from the point of view of the development of military equipment and science—the War of Attrition was perhaps more significant than other struggles in which Israel was hitherto involved."³ (See Appendix 'E')

During most of 1967 and 1968, the Egyptian forces mounted attacks on the Israeli positions across the Suez Canal. These raids were carried out by guerrilla troops trained by the Egyptian forces. Artillery bombardment of Israeli positions on the east bank of the Canal was a regular feature of the Egyptian plan. In retaliation, Israeli forces bombed and raided Arab military installations, industrial complexes, and training camps for Arab guerrillas. At this stage air forces on both sides remained watchful but carried out limited number of sorties across the Canal against military targets.

A major reorganisation took place in the Egyptian

Army in 1968 when it formed a separate and an independent Air Defence Command with the sole responsibility to protect the Egyptian air space. This change in the organisation was based on the Soviet model and included 30 batteries of SA-2 surface-to-air missiles, more than 1,000 anti-aircraft guns and several squadrons of MiG-21 fighter interceptors. These air defence forces were deployed to protect military bases, airfields, centres of communications and other important places. 4

By late 1968, the Arab and Israeli air forces had the following strength: 5

**Egypt**

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>MiG-21</td>
<td>110</td>
</tr>
<tr>
<td>MiG-19</td>
<td>80</td>
</tr>
<tr>
<td>MiG-15, and MiG-17</td>
<td>120, 40</td>
</tr>
<tr>
<td>SU-7B</td>
<td>40</td>
</tr>
<tr>
<td>IL-28</td>
<td>40</td>
</tr>
<tr>
<td>TU-16</td>
<td>10</td>
</tr>
</tbody>
</table>

**Fighter Interceptors**

**All weather interceptors.**

**Fighter bombers**

**All weather fighter bombers**

**Light bombers**

**Medium Jet bomber**

4 Nordeen, n. 2, p. 126.

Syria

60 MiG-21 Fighter interceptors
70 MiG-15 and MiG-17 Fighter bombers
20 SU-7B All weather fighter bombers.

Israel

65 Mirage IIIC Fighter bomber/interceptors
15 Super-Mystere Fighter interceptors
48 A-4E Skyhawk Fighter bombers
35 Mystere IVA fighter bombers
15 Vautour light bombers
45 Ouragon fighter bombers

While the US Administration under President Johnson had agreed to supply 50 F-4E Phantom fighter bombers to the Israeli Air Force, these aircraft had still not been delivered.6

Escalation of the War of Attrition

In September 1968, the Egyptian forces began heavy bombardment of the Israeli positions on the east bank

6 Nordeen, n. 2, p. 127.
of the Canal to prevent movement of Israeli troops along the Canal. On the Egyptian side, there were more than three divisions of infantry and a large number of artillery pieces. On the other hand, Israeli forces along the Canal were few in numbers and their artillery was not capable of responding to the long-range artillery of Egypt. To relieve pressure on their troops, Israel mounted heli-borne commando raids well inside Egyptian territory against selected targets of strategic value. In these attacks Israeli commandos destroyed two bridges over the Nile as well as an electric transformer station. The Egyptians therefore, changed their strategy from an offensive one to one which remained mainly defensive for the next four months.

Meanwhile, the Israelis had greatly improved their fortifications on the east bank of the Canal by building concrete bunkers and watch towers with adequate communications between them. These forward defences were known as Bar-Lev Line, named after the Israeli Chief of Staff, General Bar-Lev.7

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With Israel consolidating its hold on the east bank of the Canal and the Egyptians massing infantry and artillery on the west bank, the situation was becoming critical and further escalation seemed imminent.

With a marked increase in shelling by the Egyptians of Israeli defence positions on the Bar-Lev Line on the east bank of the Canal, the Israeli forces adopted a different strategy which relied on the Air Force to conduct deep penetration raids inside the Egyptian territory. This was possible because of Israeli air superiority over the Sinai and over most of the Egyptian air space. The Israeli air raids deep inside Egypt were bad for the morale of Egyptian people and, therfore, to counter them, Egypt asked the Soviet Union to take over the responsibility for defending the Egyptian air space. To implement this decision the Soviet Union sent to Egypt surface-to-air missiles and fighter aircraft with Russian crews to operate them. During early 1970, these air defence forces manned by Soviet crews shot down several Israeli aircraft and some Soviet pilots were shot down by Israelis over the Sinai.8

The direct involvement of Soviet pilots and technicians in the War of Attrition brought about a substantive change in the political nature of the conflict and a fear of superpower confrontation in the region. To prevent the conflict from further escalation, US Secretary of State William Rogers brokered a new cease fire agreement in August 1970.

Super Power Involvement

The Soviet military intervention in Egypt was mainly to defend Egyptian air space and avoid a humiliating situation for its client arising out of complete air superiority achieved by the Israeli Air Force over the Canal Zone as well as over the rest of Egyptian territory. The deep penetration attacks had caused great damage to the morale of Egyptian population and the Government was in deep trouble for its inability to counter the Israeli air attacks. With the induction of Soviet SAM-3 missiles along with Russian crews to man them, the defensive measures on the Egyptian side were reinforced. But the United States viewed this Soviet intervention as causing a major change in the military balance in the region. The air defence missions flown by Soviet pilots were particularly worrying to the United States. It was only when the Soviet Union began to deploy
SAM-3 missiles in the Canal Zone to neutralise the Israeli air superiority over the Canal that concern was felt in Washington because the emerging situation could lead to superpower confrontation. On June 2, 1970, the United States warned the Soviet Union that it could not remain indifferent to induction of Soviet military personnel in the Canal combat zone.9

In Washington it was felt necessary to launch a new initiative to prevent further escalation and to avoid a confrontation between the two superpowers. Therefore, US Secretary of State William Rogers proposed a new cease-fire plan to be implemented immediately without any pre-conditions. This was accepted by the United Arab Republic and the Soviet Union without delay and subsequently by Israel, and came into effect on August 7, 1970.

Weapons Transfers During the War

The losses suffered by Egypt during the 1967 war had been made up by the Soviet Union by the second half of 1968. However, during the "War of Attrition" both sides suffered heavy losses of weapons particularly

of combat aircraft. The increased tension engendered by the Israeli air attacks caused both sides to procure new and more sophisticated weapons. Egypt obtained weapons from the Soviet Union mainly to improve its air defence system since it found itself virtually defenceless against Israeli air attacks. The fresh supplies included Su-7, and MiG-2I aircraft and SA-2 Missiles during 1969. Supply of Su-7 was made after the United States had agreed to supply F-4 Phantoms to Israel.¹⁰ Later in 1970 the Soviet Union supplied to Egypt SA-3 missiles which could be used against low flying aircraft. Alongwith the SA-3 missiles, the Soviet Union also provided Egypt with matching radar sets, electronic guidance equipment and computers. According to SIPRI, "Soviet troops were closely concerned with the operation of the missiles. In addition, the UAR received a number of MiG-2IJs, the radar equipped version, for night interception. An air defence system was first established along the Nile Valley. Israel then stopped its deep penetration raids against targets in this area in order to avoid confrontation with the Soviet Union."¹¹

¹¹ ibid, p. 526.
In the case of Israel, the United States, under a great deal of pressure from the Israeli Prime Minister, Golda Meir, agreed to supply 50 F-4 Phantoms and 25 additional A-4 Skyhawks for the Israeli Air Force. The United States also agreed to provide military assistance to the extent of $500 million. This aid package included 18 additional F-4 Phantoms, 18 additional A-4 Skyhawks, Shrike Air-to-surface missiles and Walleye glide bombs for use against SAMs, additional Hawk missile batteries for air defence, 180 tanks, including the M-60 main battle tanks, helicopters and other equipment. The new Phantoms which were supplied to Israel were fitted with special radar jamming devices known as 'the ear'.

Section 2: Arms Transfers

New Technology Arms Race

It was clear to Egypt and the rest of the Arabs that Israel would not withdraw from the Arab territories occupied during the 1967 Six-Day war as stipulated in the UN Resolution 242. Diplomatic efforts by the superpowers had failed to compel Israel to withdraw and

12 ibid, p. 534.
the only way to achieve the liberation of occupied Arab territory was by force of arms. This made it necessary for the Arabs to obtain sophisticated weapons from the Soviet Union to match those supplied to Israel by the United States and France. On the other hand, Israel's permanent sense of insecurity due to being surrounded by hostile Arab states with much larger populations, and its strategy of a pre-emptive war, required that it possessed the latest weapons in its armed forces. And because of the strong Jewish lobby in the United States, it was not too difficult for Israel to obtain high-performance weapon systems and aircraft.

This confrontationist situation which became critical during 1968-1970 "War of Attrition" engendered an arms race with particular emphasis on new technology air power weapons for offensive and defensive roles. These weapons included state-of-art supersonic aircraft fitted with the latest radar warning and guidance systems, electronic warfare equipment, guided air-to-air, air-to-surface, and surface-to-air missiles (SAMs) in large quantities.

Lessons From the Past

The scramble for sophisticated new technology air power weapons for offensive and defensive roles was a
result of the lessons learnt from the previous wars, particularly the Six-Day War of 1967. In this war the Israeli Air Force mounted a pre-emptive air strike on Egyptian airfields and during the first few hours on June 5 destroyed most of the Arab aircraft on the ground. After the war, Egypt and Syria built strong concrete shelter for aircraft, in order to prevent such damage in the future. In addition, the Soviet Union supplied the latest MiG-2IJs fitted with longer range radar for night-fighting, SA-2, and SA-3 surface-to-air missiles as well as a rolling umbrella of mobile SA-6 vehicle-mounted anti-aircraft missiles. Egypt and Syria also received mobile 23mm ZSU-23-4 radar equipped, rapid-firing anti-aircraft guns. 'The SA-6 was a technological surprise; its mobility permitted it to keep pace with the advancing armoured forces, and the SA-6 incorporated a continuous-wave, semi-actively guided Doppler technique against which existing US ECM jammers were impotent.'

Realising the significance of offensive air and air defence operations in the deserts of West Asia, President

Nasser, during his visit to Moscow in January 1970, requested the Soviet leadership to improve his air defence capability by new technology weapons. The new weapons supplied to Egypt had to be manned by Soviet personnel as the Egyptians had not been trained on them. After the arrival of these weapons in Egypt the strength of the Soviet military advisers increased from 3,000 to about 10,000. This brought about a marked improvement in the Egyptian air defence capability and in the summer of 1970 the Egyptian air defences shot down six Israeli planes.\textsuperscript{14}

According to Edward Luttwak and Dan Horowitz, the new technology arms race started when the Soviets supplied SAM-3 (Goa) missiles which were operated by Soviet advisers along with MiG-21J. This combination of advanced fighters and SAMs was first deployed in the interior of Egypt to defend population centres and other strategic targets. However, later it was moved forward to the Canal Zone for the air defence of the tactical area. Shortly before the cease-fire in August 1970, Russian pilots were for the first time engaged in air combat with the Israeli Air Force in which four Migs were shot down. Between

\textsuperscript{14} Mansfield, n. I, p. 349.
July 1967 and May 1973 the aircraft losses in the Israeli-Egyptian air battles were as follows:\(^{15}\)

<table>
<thead>
<tr>
<th></th>
<th>Air-to-air</th>
<th>Ground-to-air</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Israeli losses</td>
<td>2</td>
<td>25</td>
<td>27</td>
</tr>
<tr>
<td>Arab losses</td>
<td>125</td>
<td>37*</td>
<td>162</td>
</tr>
</tbody>
</table>

*(Of which 13 to Israeli Hawk missiles)*

The tactics of deploying SAM-2s and SAM-3s along with anti-aircraft cannons for the defence of the Canal Zone against Israeli air attacks started bearing results when in the summer of 1970 several Israeli aircraft were shot down by these weapons. These included the latest Phantoms and Skyhawks fitted with American counter-measure equipment. During three weeks in July 1970 Israel lost five frontline planes to Egyptian missiles and anti-aircraft guns. These heavy aircraft losses caused deep concern to the Israeli Air Force and the Israeli Government. However, to deter Soviet pilots flying air defence missions close to the Canal, the Israeli Air Force in a well-planned mission on July 30, in which four Israeli Phantoms were accompanied by four Mirages, shot down four Migs flown

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by Russian pilots without any losses to the Israeli force. 16

Moshe Dayan, the Israeli Defence Minister at the time, describes the impact of these air battles on the politics of the region as follows:

''In July, Israeli and Soviet planes clashed in the air. One of our patrols was flying when it came under attack from eight Soviet MiG-2Is flying in two formations. In the course of this dog-fight, we shot down five Soviet planes. All our planes returned to base. At the end of debriefing, I congratulated and thanked our pilots and told them that this engagement had far-reaching political significance.''

After these aerial engagements, a fresh initiative was launched to bring about a cease-fire as neither the United States nor the Soviet Union had any intention to support an escalation of the ''War of Attrition''. Roger's

peace initiative was the result of American and Soviet efforts to prevent any further escalation which may have dragged the Soviet Union into active combat and thus might have involved the United States also into upgrading its military support to Israel. As regards weapons of new technology, the United States had already supplied to Israel an ‘‘anti-missile package’’ consisting of airborne electronic systems for disrupting the detection and guidance radars of the missile system, ‘‘Shrike’’ air-to-ground missile that could home on to the radars of SAM missiles, and cluster bombs which could be used for destroying the missile sites.18

Before the cease-fire in August, therefore, the military balance in respect of high technology weapons on both sides of the cease-fire line was fairly well-matched. However, the major difference between the two sides was based on different air strategies being followed. While the Israeli air strategy was based on its offensive employment of Israeli air power, the Egyptian air strategy was mainly defensive in nature. This was clearly visible from the type of weapon systems

and the new technology available to each side. While Israel had concentrated mainly on obtaining longer-range offensive capable fighter aircraft like the Skyhawk and the Phantom with precision guided munitions and electronic warfare equipment, Egypt relied mainly on ground-based SAM-2s, SAM-3s and anti-aircraft guns. These weapons were integrated into a network of early warning radars and ground-controlled interception radar stations to guide interceptor fighters on to enemy aircraft. The two different strategies followed by the adversaries were designed to neutralise each other's advantage. This was to be achieved by constantly matching and upgrading the performance capabilities of the aircraft and weapon system by obtaining the state-of-the-art or latest technology weapons from the United States and the Soviet Union.

According to Frank Aker, the 'War of Attrition' started by Egypt to destroy the Bar-Lev Line east of the Canal by heavy artillery bombardment, was countered by Israel with air strikes deep inside Egyptian territory and along the Canal against strategic targets and artillery emplacements. Such combat measures and the counter measures they provoked determined to a great extent the weapons with which the 'Yom Kippur War' was fought. Military lessons gained from the experiences
in the 'War of Attrition' were used to request the superpowers for more advanced weaponry. Israel began to be supplied with Phantom jets and American electronic counter measure equipment to detect the locking of a SAM-2 radar on to an aircraft. Egypt then made a strong case for a more advanced fighter than the Mig and better air defence capability than that provided by SAM-2s. Strategic intelligence was provided to both sides by high altitude flights by SR-71 and MiG-25 and observation satellites of the United States and the Soviet Union.\(^{19}\)

Renowned Egyptian journalist, Mohamed Heikal also confirms the presence of four MiG.-25 high altitude reconnaissance aircraft in Egypt in May 1970. These were being flown by Russian pilots. According to him by June 1970 Soviet Union was actively engaged in the air defence of the Egyptian population against Israeli air raids. He criticises the Soviet Union for laying emphasis on quantity and not on quality. This was clearly demonstrated when in an air battle over Egypt, four Migs of the new version which had recently arrived and were flown by Russian pilots were shot down by Israeli Phantoms,

confirming that even the latest Migs were no match for the Phantoms.  

During a meeting at Moscow between President Sadat of Egypt and Leonid Brezhnev the problem of meeting the Israeli air threat was discussed. Because of the inability of the Egyptian Air Force to cope with Israeli air strikes and the US built electronic counter measure equipment, the Soviet Union agreed to send a large number of SAM-3 batteries with Russian crews who in turn would train Egyptian crews on the new SAMs. Later, when more of these missiles had been received and manned with Egyptian crews, they were deployed along the Canal thus forming a "missile barrier" against Israeli aircraft.

Henry Kissinger writing about this period in Israeli-Arab confrontation and the "'War of Attrition'", mentions the Israeli request for more aircraft of advanced technology. The request included 25 F-4 Phantoms and 100 A-4 Skyhawks. By then the Soviet Union had despatched

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the new SAM-3s which were manned and operated by 1,500 Soviet advisers. These were sent to defend the Egyptian air-space from deep-penetration raids by the Israeli Air Force. With the strengthening of air defence of the Egyptian air-space and without additional supplies of Phantoms and Skyhawks from the United States, Israel suspended air attacks against strategic targets inside Egypt. With the arrival of more SAM-3 batteries in Egypt the number of Soviet advisers had gone up to 10,000. In June 1970, there were 4-5 regiments of SAM-3s and five squadrons of the latest MiG-2Is flown by Soviet pilots according to a report of the Central Intelligence Agency. The creation of a new missile barrier in the Canal zone had vastly enhanced Egypt's capability for a war of attrition as well as created a secure base from which an offensive across the Canal could be launched into the Sinai. In this situation of escalating tension a cease-fire was brought into force on August 7, 1970 under the Roger Initiative.  

Golda Meir described the 'War of Attrition', which began in March 1968 and continued with increasing ferocity 

22 Henry Kissinger, The White House Years (New Delhi, 1979), pp. 564-585.
till August 1970, as the strategy Egypt adopted to force the Israeli defences away from the east bank of the Canal. Israeli strategy to counter this was to mount deep penetration air raids into the Egyptian heartland hitting targets of military and strategic value. Egyptian answer to these raids was installation of SAM-3 missiles supplied by the Soviet Union and manned by Soviet advisers all along the Canal Zone. In response to this change in military balance in favour of Egypt, Golda Meir went to Washington with a "shopping list" which included 25 Phantoms and 80 Skyhawks.\textsuperscript{23}

SAM-3s were inducted in the Soviet armed forces in 1964. They had a high-altitude kill capability with a 'slant range' of 33 miles and a top ceiling of 40,000 feet. It was fitted with the latest radar and electronic equipment which was less prone to jamming as compared to SAM-2. The launcher of SAM-3 was fully mobile with a two-stage solid fuel missile 18 feet long. To counter the threat posed by the Soviet SAMs in Egypt to Israeli aircraft, the United States sent to Israel about 100 of the latest Electronic Counter-Measure (ECM) pods. These

\textsuperscript{23} Golda Meir, \textit{My Life} (London, 1975), pp. 319-324.
contained a greater range of frequencies and extra sensors.²⁴

The F-4 Phantoms supplied to Israel by the United States in 1969-70 were fitted with these special electronic warfare equipment externally to the aircraft. Pods containing radar warning receivers were fitted to A-4 Skyhawk fighters and included new jammers which could totally blank off missile search, guidance and control radars. These jammers as well as several other types of electronic warfare systems were fitted on some modified Boeing B-47 Stratocruisers, exclusively tasked for electronic warfare role. These aircraft flew at high altitudes away from the front line, to closely monitor Egyptian air activity and jam Egyptian radars whenever necessary for the safety of Israeli air missions. Subsequently, the United States supplied to Israel one of the most secret and sophisticated electronic warfare system at that time which was known as 'deception jammer'. This system, when in operation, could give a false image on the enemy radar regarding the direction, distance, and the speed of the target thus totally misguiding the

²⁴ O’Ballance, n.7, pp. II0, 123.
enemy radar and missile. In such a situation if a missile is heading towards a target, the deception jammer would show the missile radar a different position of the target from its actual position. 25

These deception jammers are so small in size that they can be easily fitted inside fighter type of aircraft or carried externally in under-wing pods. From the point of view of technology, the production of deception jammers needs the most sophisticated technological capability and also extremely advanced technology which is available only with a few Western countries.

According to some estimates, during the 'War of Attrition' the Egyptians lost about 105 aircraft while the Israeli losses were only seven. This favourable air balance towards Israel was attributed mainly to the electronic warfare equipment carried in Israeli aircraft which saved the lives of many Israeli pilots during duels between missiles and aircraft. 26

25 Mario de Arcangelis, Electronic Warfare: From the Battle of Tsushima to the Falklands and Lebanon Conflict (Poole, Dorset, 1985), pp. 185-187.
26 ibid, p. 189.
One of the most important military lessons of the 'War of Attrition' was that without achieving air supremacy or command of the air over the Canal Zone, the Bar-Lev Line of defences on the east bank of the Canal could not be held. In this task the Israel Air Force had to play its part. The second lesson was that Israel did not have electronic counter-measure systems of advanced design to neutralise the radars of the advanced Soviet SAMs. Therefore, in the duels between the missiles and the aircraft, the missiles were likely to be the winners.27

Section 3: Type, Quantity and Performance of New Technology Weapons

Main suppliers and recipients

During the 'WAR of Attrition' and the subsequent war of October 1973, Israel was supplied with new technology weapons. The United States supplied 96 per cent of major weapons costing about US $ 6,000m. during the period 1971-1975. During the same period the Soviet Union supplied Egypt 96 per cent of its major weapons valued at US $ 7,000m. and the Soviet supplies of major

27 Korn, n. 16, pp. 275-276.
weapons to Syria accounted for 100 per cent of Syrian imports costing about US $6,500 m.\textsuperscript{28}

The value of imports of major weapons by Egypt, Israel and Syria during the period 1967-1973 is given in the chart on page 92. Value of imports of major weapons by Egypt, Israel, and Syria during 1951-1985 are shown in the Chart on pages 93 and 94. Value of imports for the period 1970-73, from the 'War of attrition' to the war of October 1973 is given below in US $ m. at constant 1985 prices.\textsuperscript{29}

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>2,205</td>
<td>2,581</td>
<td>2,105</td>
<td>2,056</td>
</tr>
<tr>
<td>Israel</td>
<td>1,431</td>
<td>666</td>
<td>1,031</td>
<td>2,561</td>
</tr>
<tr>
<td>Syria</td>
<td>370</td>
<td>640</td>
<td>515</td>
<td>2,984</td>
</tr>
</tbody>
</table>

Because of the predominant role played by air power in West Asia conflicts, major portion of imports were of fighter aircraft, missiles, and electronic warfare equipment. A comparative assessment of the induction of


\textsuperscript{29} ibid, pp. 332-334.
VALUE OF IMPORTS OF MAJOR WEAPON BY EGYPT, ISRAEL AND SYRIA 1967-73
US $ m AT CONSTANT 1985 PRICES

A - EGYPT
B - ISRAEL
C - SYRIA

SOURCE: MICHAEL BROZOSKA AND THOMAS OHLSON ARMS TRANSFERS TO THE THIRD WORLD 1971-85 (SIPRI) OXFORD.
(OXFORD UNIVERSITY PRESS 1987) PP. 332 - 334
VALUE OF IMPORTS OF MAJOR WEAPONS BY EGYPT, ISRAEL AND SYRIA 1951 - 1970
(U.S. $m at constant 1985 prices)

A EGYPT
B ISRAEL
C SYRIA

VALUE OF IMPORTS OF MAJOR WEAPON BY EGYPT, ISRAEL AND SYRIA 1971 - 85

A - EGYPT
B - ISRAEL
C - SYRIA

SCALE - VERTICAL 1" = 500
HORIZONTAL 1" = 1 YEAR

new technology weapons by Egypt and Israel during the period 1962-1973 is given below:30

Aircraft and Missiles

<table>
<thead>
<tr>
<th>Year</th>
<th>Egypt</th>
<th>Israel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962</td>
<td>MiG-21 fighter</td>
<td>Mirage IIIC Fighter</td>
</tr>
<tr>
<td></td>
<td>AA-2 Atoll Missile</td>
<td>Nord AS-30 Missile</td>
</tr>
<tr>
<td>1963</td>
<td>Guideline missile (SA-2) Hawk missile</td>
<td></td>
</tr>
<tr>
<td>1966</td>
<td></td>
<td>Matra R-530 missile</td>
</tr>
<tr>
<td>1967</td>
<td>Su-7 fighter</td>
<td>A-4 Skyhawk fighter bomber</td>
</tr>
<tr>
<td>1968</td>
<td>Frog-3 missile</td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td>AS-5 Kelt (for Tu-16)</td>
<td>F-4 Phantom fighter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bullpup missile</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sparrow missile</td>
</tr>
<tr>
<td>1970</td>
<td>SA-3 Goa)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MiG-21 J (MF)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SU-20</td>
<td></td>
</tr>
</tbody>
</table>

1971  TU-16  RF-4E Phantom (Recce)
      Shrike missile
      Sidewinder missile
      MIM-23B Hawk SAM

1972  A-4N Skyhawk-2

1973  SA-6 (Gainful)
      SA-7 (Grail)
      ZSU-23-4 (Shilka)

Type and Quantity of Weapons

During the period 1969-1973, Egypt and Israel had received from the Soviet Union and the United States the following major weapons relating to offensive and defensive air operations.

<table>
<thead>
<tr>
<th></th>
<th>Egypt</th>
<th>Israel</th>
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</thead>
<tbody>
<tr>
<td>Aircraft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MiG-21MF</td>
<td>150</td>
<td>A-4 Skyhawk 154</td>
</tr>
<tr>
<td>Su-7</td>
<td>140</td>
<td>F-4 Phantom 184</td>
</tr>
<tr>
<td>Tu-16</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Su-20</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Missiles</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air-to-air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA-2</td>
<td>1,910</td>
<td>AIM-7c Sparrow 1388</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AIM-9D Sidewinder 2366</td>
</tr>
</tbody>
</table>
Air-to-surface

AS-5 Kelt 25 AGM-12B Bullpup 5550
AGM-45A Shrike 600
AGM-65a Maverick 200

Surface-to-air

SA-2 850 MIM-23B 200
SA-3 1400 Hawk 100
SA-6 550 MIM-72 A
SA-7 2400 Chaparral 312

Anti-aircraft Artillery

ZSU-23-4 (Shilka) 150

Details of deliveries of new technology weapons year-wise are given in Appendix F1-F3.31

A careful analysis of the type of weapons inducted into the Egyptian and Israeli Air Forces and the role for which the weapons were designed shows that while Egypt had concentrated on building a defensive system because of its experience during the June 1967 War, Israel had continued to acquire greater offensive capability.

31 Brzoska and Ohlson, n.28, pp. 168-172, 196-198.
The reason for a preponderance of air power and counter air power weapons in the list of arms transfers from the United States to Israel and from the Soviet Union to Egypt and Syria was that all sides, had learnt the essential lesson that air power played a decisive role in these operations and without gaining and maintaining air superiority over the zone of battle it was difficult to achieve victory in the ground war. This lesson from the two previous wars was too clear to be ignored. During a conference in Moscow on June 30, 1970, Nasser told Brezhnev that, "We are being subjected to intensive air raids by the US built Israeli Phantoms, employing the most sophisticated US electronic equipment. The objective of these air raids over Egyptian territory is to prevent the Egyptian Army from completing its offensive preparation to liberate our land. From the military point of view, the war is essentially an air war."32

Brezhnev agreed with Nasser and said, "We agree with you that the war between Egypt and Israel is basically an air war" and promised to send the new SAM-3 missiles along with Soviet crews to maintain and

32 Riad, n. 21, pp. 139, 148.
operate them till the Egyptian troops had been trained on them.\textsuperscript{33}

Nasser, during his meetings with Brezhnev in Moscow, also emphasised the important role of electronic warfare in the ongoing war of attrition between Egypt and Israel. Commenting on this aspect he said:

"The main problem here is that the US supplies Israel with the most sophisticated electronic equipment. Israel has received specially equipped planes that can pinpoint missile bases and jam their radars, so that they can be bombarded. The problem with our Air Force is that the MiG can remain airborne for only 20 minutes, while the Mirage can stay up for an hour, and the Phantom even longer. Therefore, it would be wrong to say that a hundred Mirages and phantoms could be confronted with a hundred MiGs."

Nasser explained this aspect of warfare highlighting the importance and role of electronic warfare, and saying that unless we received similar electronic devices, our air defence system would remain weak.\textsuperscript{34}

\textsuperscript{33} ibid, p. 147.\textsuperscript{34} ibid, p. 140.
The contents of the discussions during the meetings between Nasser and Brezhnev at Moscow and between Golda Meir and Nixon in Washington clearly show the importance being given by both sides to weapons of air power. Golda Meir had also requested Nixon for 25 Phantoms and 100 Skyhawks when she met him in early 1970.35

Characteristics and Performance of New Technology Weapons

The new technology air power weapons obtained by the Arabs and Israel during the period 1967-1973 could broadly be grouped under the following categories:

1. **Aircraft**: fighters, bombers and reconnaissance.
2. **Missiles**: Surface-to-air, air-to-air, and air-to-surface.
3. **Radars and Electronic Warfare Equipment**.

**Combat Aircraft**

The main types of aircraft used by the two sides during the October 1973 War were MiG-2IJ, MiG-25, and Su-7 by the Arabs and A-4E Skyhawks and F-4E Phantoms

35 Meir, n. 23, p. 324.
by the Israeli Air Force. In addition, Egypt had some Tu-16 and Su-20 bombers and Israel had some B-47E Stratocruiser transport aircraft modified for electronic surveillance role and some C-130E Hercules transports.  

MiG-2IJ with the Egyptian Air Force in large numbers (210) was single-seat, multi-role fighter. It could fly at double the speed of sound at Mach 2.1. The first versions of the MiG-2I were day fighters only of limited range, with comparatively light armament and limited avionics. The latest version of the aircraft with the Egyptian Air Force before the October 1973 War, MiG-2I PF known also by the NATO code-name as 'Fishbed J', had a much greater range. It could carry almost double the weapon load and had an all weather capability and could carry out night interception when guided by ground control air defence radars. The aircraft was capable of carrying out air combat missions as well as ground attack role. For air combat role it carried either four K-13As advanced Atoll air-to-air missiles or two K-13As and two external fuel tanks for greater range. For the ground attack mission its typical load was: four UV-16-57 rocket packs; two 500 kg and two 250 kg bombs; or four

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S-24 240mm air-to-surface guided missiles.  

The other significant addition to the inventory of the Egyptian Air Force was the supply of 80 Su-7B ground attack fighters by the Soviet Union before the October 1973 War. It was single-seat ground attack fighter, supersonic at Mach 1.6. In addition to a 30mm NR-30 cannon with 70 rounds of ammunition fitted in each wing root leading edge, the aircraft could carry two 750kg and two 500kg bombs under wing and a pair of external fuel tanks under the fuselage.

In the inventory of the Israeli Air Force the two main types of aircraft which made up 90 per cent of its strength were the F-4E Phantoms (95) and the A-4E/H Skyhawks (160). Israel also had six RF-4E Phantoms modified for reconnaissance role. In addition, the Israeli Air Force possessed electronic warfare capability in two C-130E and eight B-47E. Two B-47Es could be used for aerial in-flight refueling.

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38 ibid, p. 509.
Mcdonnell Douglas F-4E Phantom was a two-seat, twin-engined all weather fighter, capable of performing multiple roles such as air superiority, close air support, and air interdiction missions. It had a maximum speed of more than Mach 2, and a combat radius of almost 1,000 miles. Its armament load in the air-to-air role could be six Sparrow III, or four Sparrow III and four Sidewinder air-to-air missiles. It had a provision for carrying alternative loads of up to about 16,000 Ibs (7,250kg) of nuclear or conventional bombs and missiles. Typical loads included 18x750Ib bombs, 15x680Ib mines, 11x150 US gallons napalm bombs, four Bullpup air-to-surface missiles or 15 packs of air-to-surface rockets. The aircraft was also fitted with highly sophisticated electronics giving it the capability of navigation, target acquisition and attack in all weather conditions.40

RF-4C/E was a multi sensor reconnaissance version of F-4E. Israel had six such aircraft. Three basic reconnaissance systems fitted to these aircraft were: side-looking radar to record high-definition pictures of the terrain on each side of the flight path on film;

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John Taylor, n. 37, pp. 384, 385.
infra-red detector to locate enemy forces under cover or at night by detecting exhaust gases and other heat sources; forward and side-looking cameras, including panoramic model with moving-lens elements for horizon-to-horizon pictures. All these systems could be operated from the rear cockpit by the second crew member.41

The aircraft which Israel possessed in largest numbers before the October 1973 War was A-4E/H Skyhawk, a single-seat, single-engined, light attack aircraft. It was originally designed to provide the US Navy with a simple low-cost light-weight attack and ground support aircraft, an outcome of the experience gained during the Korean war. It had sophisticated avionics including electronic counter measures. Its armament comprised several hundred variations of military loads, carried externally on one underfuselage rack, capacity 3,500 Ibs; two inward underwing racks capacity 2,250 Ibs each; and two outboard underwing racks capacity 2,250 Ibs each; and two outboard underwing racks capacity each 1,000 Ibs. Weapons that could be deployed included nuclear or HE bombs, air-to-surface and air-to-air rockets, Sidewinder infra-red missiles, Bullpup air-to-surface missiles, ground attack

41 ibid, p. 385.
gunpods, torpedoes, and electronic counter-measure equipment. It also had two 20mm mk 12 cannons in wingroots as standard fitting, each with 200 rounds of ammunition. DEFA 30mm cannon was available as optional on international versions with 150 rounds of ammunition per gun. It was a subsonic aircraft with a maximum level speed of about 600 mph and a combat radius of about 700 miles. 

High Altitude All-Weather Reconnaissance Aircraft

High altitude reconnaissance cover was provided to Egypt by MiG-25 based in Egypt and flown by Soviet pilots. The United States used SR-71 aircraft to gather high altitude intelligence for Israel.

The Russian Mikoyan MiG-25 had two main versions, codenamed by NATO as Foxbat A and Foxbat B. Foxbat A was an interceptor for high altitude interception fitted with air interception radar in the nose of the aircraft, while Foxbat B was the reconnaissance version fitted with cameras in the nose section. It was a twin-engined high altitude, all-weather interceptor and reconnaissance

aircraft. In early 1973, Dr Robert Seamans, US Secretary of the Air Force described the MiG-25 as 'probably the best interceptor in production in the world today' and added, 'This Mach 3 aircraft performs both interceptor and reconnaissance roles, can operate at 80,000 ft and has highly capable avionics and missile systems.'

The first operational use of the aircraft was reported to be by the Soviet Air Force units based in Egypt in the spring of 1971. During 1971 and 1972, from Cairo West airfield, MiG-25s flew high altitude reconnaissance missions along the Israeli coastline and down the full length of Israeli occupied Sinai Peninsula. The Israeli Air Force sent up F-4 Phantom interceptors but they were unable to make contact with the Soviet MiG-25s. The performance of the MiG-25s was reported to be as follows: maximum level speed at height Mach 3.2; service ceiling 80,000 ft; normal combat radius 1,130 km.

The American Lockheed SR-71 was a two seat, strategic photographic and electronic reconnaissance aircraft. It was reported to have flown operational missions of

43 ibid, pp. 501-502.
surveillance of the Suez Canal region in 1971. The United States flew surveillance operational missions in the Middle East during and after the October 1973 Arab-Israeli War. Operational equipment in SR-71 was classified, but reported to include provision for a wide variety of advanced observation equipment ranging from simple battlefield surveillance systems to multiple sensor high-performance systems for interdiction reconnaissance and strategic systems capable of surveying 60,000 sq miles in one hour from an altitude of 80,000 ft. Performance was reported to be as follows: maximum level speed at 78,740 ft 3320 km/h (more than Mach 3); operational ceiling above 80,000 ft; operational radius 1,930 km; range at Mach 3.0 at 78,740 ft 4,800 km (without in flight refuelling).44

An analysis of the performance and characteristics of the combat aircraft of Egypt and Israel just before October 1973 War indicates that the majority of aircraft were fast supersonic fighters capable of achieving Mach 2 performance with all-weather and night-fighting capability. They were fitted with state-of-the-art avionics for navigation to the target area, target acquisition and attack systems. Armament load included guided

44 ibid, pp. 367-369.
air-to-air, air-to-ground missiles and rockets. They had multi-role capability and could be employed for air combat or ground attack and air support. They could also carry out air reconnaissance and had electronic warfare capability. From the range figures and type of weapons which could be carried it is clear that while Israel could undertake offensive missions deep inside Egypt, the Egyptian Air Force could be used mainly for air defence and close air support.

Guided Missiles: The New Technology Weapons

The October 1973 Arab-Israeli War was the first conflict in which precision guided missiles based on new technologies were used in large numbers and with great impact on the conduct and the outcome of the air and ground battles. The air-to-air missiles, the air-to-surface missiles, and in particular, the surface-to-air missiles (SAMs) used by Egypt against the Israeli Air Force over the Canal Zone caused very high attrition of the Israeli aircraft. The performance and other operational characteristics of different types of missiles possessed by Egypt and Israel are described below.

The only air-to-air missile with Egypt was the Soviet supplied AA-2 Atoll of which it had 1910 for use on
MiG-21 aircraft. Its Soviet designation was K-13A. It was an infra-red homing missile like the American AIM-9B Sidewinder with similar weight and dimensions. Egypt also had the so-called advanced Atoll which was guided by semi-active radar. This model was 30cm longer than the IR guided versions, the extra length consisting of an extended nose section which was pressurised to house the radar receiver and antenna package. The missile had solid propellant and conventional warhead.

For air attacks against hard targets on the ground, Egypt had acquired 25 AS-5 Kelt air-to-surface missiles which could be carried on and fired from Tu-16 'Badger' bombers with the Egyptian Air Force. The dimensions of the missile were: length 8.59 meters, and wingspan 4.3 meters. The propulsion to the missile was provided by a single-stage liquid-fuelled rocket motor. Its range was 160km. Guidance was provided to the missile during the early stage by autopilot and during the terminal phase by active radar homing.

45 Brzoska and Ohlson, n. 28, pp 171-172.
47 ibid, p. 178.
The most significant guided weapons which made the October 1973 War stand out as the war of new technology weapons were the several types of surface-to-air missiles (SAMs) which Egypt had obtained from the Soviet Union. These were (qty in brackets): SA-2 Guideline (850); SA-3 Goa (1400); SA-6 Gainful (550); and SA-7 Grail (2400). Their performance details are as follows:

SA-2 designated by NATO as ‘‘Guideline’’ was a medium range surface-to-air missile for anti-aircraft role. It was the first anti-aircraft missile deployed in the Soviet Union and believed to have shot down the U-2 spy plane flown by Gary Powers over the Soviet Union.

The dimensions and the weight of the missile were: length 10.7 meters; missile diameter, booster 70cm, second stage 50 cm; launch weight about 2300 kg. The missile was propelled by a solid propellant booster with liquid propellant sustainer. Guidance and control of the missile was by radio command which controlled the moveable tail surfaces. It had a warhead weighing 130 kg of high explosive fitted with proximity fuze. Its slant range.

48 Brzoska and Ohlson, n. 28, pp. 171-172.
was 40-50 km, speed 3.5 Mach, and a ceiling of 18,000 meters.

During the confrontation between Egypt and Israel, it was initially observed that the Israelis with their ECM devices could deflect the SA-2 missiles off the target aircraft. However, with improvement in the missiles and in their terminal guidance radars, the Israelis were not able to counter the missiles till they received improved ECM pods from the USA which were later used to successfully jam the missile radars used for tracking and guidance. 49

SA-3 designated with the code-name 'Goa' by NATO, was a surface-to-air anti-aircraft guided missile with a short range and for defence against low flying aircraft. The missile dimensions and weight were: length 6.7 meters; missile diameter, booster 60 cm, second stage 25-45 cm; launch weight 636 kg. It was propelled by a two-stage solid propellent and carried a high explosive warhead with proximity fuze. It had a range of 25 km, speed of more than Mach 2, and a ceiling of over 13,000 meters. It was totally mobile and effective against fast flying

49 Ronald T. Pretty, n. 46 p. 97.
aircraft at low levels.50

The most advanced version of SAM in the Egyptian air defence inventory was SA-6 designated in NATO code-name as 'Gainful'. This missile was unknown to the Western intelligence community till its employment in October 1973 War in West Asia. In that war the missile system was used extensively and in the early stages of the war it achieved a number of kills of Israeli aircraft over the tactical area of the Canal Zone.

SA-6 system was fully mobile and mounted on two separate tracked vehicles, on one the missile launcher, and on the second the fire control radar system. The fire control radar was highly sophisticated and effective. The various elements of the radar system were: a primary search and acquisition radar; a target tracking and illuminating radar, a command link with secondary radar response for missile tracking; and a missile borne semi-active homing system. Some of the tracking functions could be carried out optically in case of electronic jamming of the radar system.

50 ibid, p. 98.
The guidance to the missile was provided by ground command and semi-active homing and aerodynamic control. The missile was propelled by an integrated rocket ramjet engine and carried a high explosive warhead of 80 kg with proximity, impact and command fuzes. The dimensions and the weight of the missile were: length 6.2 meters; diameter 33.5 cm; tailspan 124 cm; launch weight about 550 kg. It had a range at high altitude of about 18 km and at low altitude of about 30 km with a minimum engagement range of about 4 km. Its speed was Mach 2.8 and it had a ceiling of 18,000 meters.\textsuperscript{51}

Another Soviet missile which Egypt had acquired in large numbers was SA-7, a man-portable anti-aircraft missile which proved highly effective against low-flying aircraft and helicopters during the October 1973 Arab-Israeli War. It was widely known as ‘‘Strella’’ and its NATO code-name was ‘‘Grail’’. The length of the missile was 1.29 meters and its weight was about 9.2 kg. Its range was reported to be about 9 to 10 km. It had a simple optical sighting and tracking system. The infra-red seeker was activated after the operator had acquired the target. There was an indicator light which came on

\textsuperscript{51} ibid, p. 99.
to indicate that the target had been acquired and then the operator fired the missile.\textsuperscript{52}

For a time, flares fired from the target aircraft were found to be an effective counter measure and the missile was deflected from the target and homed on to the flare but later models of SA-7 are reported to have filters to counter the use of flare by the target by better discrimination. An improved MK 2 version of SA-7 had a boosted propellant charge to increase the range and speed of the missile.

Egypt had acquired from the Soviet Union another very potent anti-aircraft weapon system against low flying targets. This was 23mm ZSU-23-4 SP gun system widely known as 'Schilka'. It was extensively used in October 1973 War by Egypt and Syria and proved to be most effective of all the low-level anti-aircraft systems which had been employed. The guns could be used both against ground and air targets and could be laid and fired while on the move. The main characteristics of the system were as follows: Weight 14 tons; length 6.3m; width 2.95m; height 2.25m; road speed 44kph; range 260 km; weapons

\textsuperscript{52} ibid, p, 134.
4x23mm automatic guns; rate of fire 3400 rds/min; ammunition load 2000 rds; elevation 4 to 85 degrees; effective AA range 2000/2500 m; effective ground range 2000 m. The ZSU-23-4 vehicle was operated by a crew of four: Commander; search and surveillance radar operator; range finder and gunner; and the driver, the first three being housed in the turret.53

Israel's missile inventory before October 1973 War also contained several types of air-to-air, air-to-ground, and surface-to-air missiles, mostly obtained from the United States. In addition, it had acquired some Matra R 530 air-to-air missiles from France and had in its inventory indigenously produced Shafrir air-to-air missile. The US supplied air-to-air missile included (qty in brackets): AIM-9D Sidewinder (2336); and AIM-7C Sparrow (1338). In the air-to-ground category there were: AGM-12B Bullpup (760); AGM 45A Shrike (600); and AGM-65A Maverick (200). The two SAM systems were; MIM-23B Hawk (100); and MIM-72A Chaparral (312).54

Matra R-530 was an all-weather, all-aspect air-to-

53 ibid, p. 127.
54 Brzoska and Ohlson, n. 28, pp. 196-198.
air missile system which could be supplied with either semi-active radar homing or infra-red guidance heads. Its dimensions and weight were: length 328 cm; diameter 26 cm; wingspan 110 cm; and weight 195 kg. It was propelled by a two-stage solid propellant and at a maximum speed of Mach 3 had a range of 18 km and carried a warhead of 27 kg high explosive.\textsuperscript{55}

The indigenously produced Shafrir was an air-to-air infra-red homing missile for use against high performance aircraft at heights upto 18,000 meters. It was relatively small with a length of only 260 cm, diameter of 16 cm and a weight of 93 kg and carried a warhead of 11 kg.\textsuperscript{56}

Shafrir had been launched in air-to-air combat with a high kill ratio of about 75 per cent on several occasions, and according to Israeli official sources more than 200 kills were recorded to Shafrir during the October 1973 Arab Israeli War.\textsuperscript{57}

\textsuperscript{55} Ronald T. Pretty, n. 46, p. 198.
\textsuperscript{56} ibid, p. 196.
\textsuperscript{57} ibid
The most well-known of the American air-to-air missiles in the Israeli Air Force inventory was the AIM-9D 'Sidewinder'. It was a short/medium range air-to-air infra-red homing missile for pursuit engagements. Its principal dimensions were: length 284 cm; diameter 12.7 cm; fin span 60.9 cm; weight 75 kg. Its performance was: speed Mach 2; sea level range 1,100 meters; and a ceiling of over 15,000 meters. It was propelled by Rocketdyne solid-propellent motor and contained a high explosive warhead. The AIM-9D has a higher thrust motor which increases the range to 18 km and weight to 84 kg.58

The other American air-to-air missile Israel had was the AIM-7 'Sparrow'. This was a radar homing missile with all-weather and all altitude operational capability. It could be used also against shipping targets from aircraft and ships. The main dimensions of the missile were: length 12 ft; diameter 8"; wingspan 3ft and 4 inches and weight 500 lbs. It had a solid propellant motor and guided by a semi-active Doppler radar homing

AGM-12 'Bullpup' air-to-surface tactical missile with Israel was for attacking surface targets on land or sea. It was guided by radio command link from the launching aircraft, with optical tracking to target, aided by flares attached to the missile. Its main dimensions were as follows: length 3.2 meters; diameter 30.5 cm; wing span 95.25 cm; launch weight 258 kg.60

The Israeli Air Force also had an anti-radiation missile designated AGM-45A 'Shrike' which was used to destroy ground based defensive radar installations. Its main characteristics and dimensions were as follows: length 304.8 cm; diameter 20 cm; wing span 91.4 cm; weight 177 kg. The missile was powered by a solid propellant rocket motor with a range of 12-16 km at a speed of Mach 2 and carried a warhead of 66 kg high explosive fragmentation. It could be used from a specially modified

60 Ronald Pretty, n. 58, o. 142.
F-4A Phantom ‘‘Wild Weasel’’ aircraft fitted with radar homing and warning equipment.  

The AGM-65 ‘‘Maverick’’ air-to-surface missile system was a precision guided tactical missile in the 225 kg class for use against hard targets such as armoured vehicles, field fortifications, gun positions, concrete communication centres, and aircraft shelters.

The main dimensions and performance details of the missile were as follows: length 2.49 meters; diameter 30.50 cm; wing span 72 cm; weight 210 kg. It was propelled by a two-stage, solid fuel rocket motor and guided by TV (A/B models) laser (E model) infra-red (D/F models) guidance systems.

The basic warhead was a 57 kg charge designed for penetration through heavy armour and reinforced concrete. It was precision guided by a miniature TV homing system in the nose section of the missile. According to US sources more than 1800 missiles had been launched in test, training, and combat, of which 85 per cent had been direct hits.  

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61 Ronald Pretty; n. 46 p 183.
62 ibid, p. 184
Israel had two surface-to-air missile systems in its inventory; MIM-23B 'Hawk' and MIM-72A 'Chaparral'. The Hawk was an operational missile system providing air defence against low and medium system to discriminate against ground clutter and to achieve effective interception of the lowest flying target. The missile was capable of intercepting targets flying at supersonic speeds in ECM environments. The system was mobile, helicopter transportable and designed for use in rough battle conditions. Its main features were as follows: length 5.03 meters; diameter 0.36 meter; weight 627.3 kg. It was powered by a two-stage single chamber solid-propellent motor, carried a high explosive blast fragmentation warhead at supersonic speeds guided by semi-active homing with proportional navigation. It had an engagement envelope from an altitude of 30 meters to 16 km and range upto 40 km.63

The other SAM system with Israel was MIM-72A 'Chaparral' which was a surface-to-air infra-red heat-seeking missile system which had been designed as a low altitude air defence weapon. The main dimensions and performance details were as follows: length 2.91 m;

63 ibid, p. 108
diameter 13 cm; span 64 cm; launch weight 84 kg. The missile was guided by infra-red homing after optical aiming and propelled by solid propellant rocket motor. It carried a high explosive warhead at supersonic speeds.\textsuperscript{64}

From a comparative analysis of the different types of missiles possessed by Egypt and Israel it is evident that as in the case of combat aircraft, so in the case of missiles, Egypt had a defensive strategy while Israel had an offensive strategy. Egypt had a large variety of SAM missile systems for defence against Israeli aircraft, while Israel had a larger number and variety of offensive weapons of air-to-air and air-to-surface type.

Electronic Warfare Equipment

Electronic warfare came of age during the October 1973 Arab-Israeli conflict. The war in the so-called 'fourth dimension' ie in the electro-magnetic spectrum was a major development in 1973, and produced a technological shock to the Israelis and the world by Egypt's dense and overlapping deployment of anti-aircraft weapon systems against Israel's superior air force.

\textsuperscript{64} Ronald Pretty, n. 58, p. 83
SA-2, SA-3, SA-6 SAMs, and ZSU-23-4 AA gun system, highly mobile and working on different radar frequency bands, particularly the SA-6 which homed on continuous wave (CW) energy reflected from the target, were able to take a heavy toll of Israeli aircraft which flew in the missile defended zone over the Canal. Under this missile umbrella, and free from interference from the Israeli Air Force, the Egyptian ground forces crossed the Canal and were able to establish a narrow and secure belt on the East bank of the Suez Canal. On the other hand, Israel had to change its tactics and reduce its aircraft losses, and simultaneously obtain advanced electronic warfare equipment from the United States to counter the threat posed by the Egyptian SAMs. The lessons of the October 1973 War made it absolutely clear to defence analysts and planners that in the modern battlefield if victory had to be won, it was essential to control and exploit an enemy forces' utilisation of the electro-magnetic spectrum.

Before dealing with the details of electronic warfare equipment employed during the October 1973 War by both sides, it would perhaps be useful to briefly describe the main features of electronic warfare (EW). There are three basic levels of EW; Electronic Support Measures
(ESM); Electronic Counter Measures (ECM); and Electronic Counter Counter Measures (ECCM). They could be defined as follows:

**Electronic Support Measures (ESM).** These are actions taken to search for, detect, intercept and locate, record and otherwise analyse radiated electro-magnetic energy for the purpose of exploiting such emissions in support of military operations.

**Electronic Counter Measure (ECM).** Actions taken to prevent or reduce enemy's effective use of electro-magnetic spectrum.

**Electronic Counter Counter Measures (ECCM).** Actions taken to ensure the friendly use of the electro-magnetic spectrum despite hostile forces' use of EW techniques.\(^{65}\)

The above concepts need various types of electronic equipment to translate these ideas into practical application. Radars are needed to detect and track targets; radio command links to guide the missiles to

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targets; attackers use of ECM equipment to avoid detection and prevent tracking and also to interfere with the defenders missile radar; defender would employ ECCM equipment and techniques to counteract the attackers attempt and the defender would also employ ECM to oppose those attackers electronic systems that are necessary for the performance of the attack.66

Electronic Counter Measures are of two types: active, and passive. Active measures include 'noise jamming' and deception jamming' while passive measures include chaff (''window'' of the Second World War), flares and decoy, radar absorbent materials, as well as certain design feature in targets such as aircraft that would reduce the effective radar cross section. Recently, the last measure has been designated as 'stealth technology.'67

Ground Radar Systems

These systems are ground-based and deployed along with various anti-aircraft weapons supplied to Egypt by the Soviet Union.

66 RONALD PRETTY, N, 58, P, 302.
67 ibid, p. 308-309.
Flat Face Target Acquisition Radar. Flat Face is the NATO code-name of a radar known in Russia as the P-15. It is a vehicle mounted acquisition radar that is used in conjunction with the Low Blow missile control radar and the Goa surface-to-air missile (SA-3). This radar operates in the UHF band and was reported to be operational in Egypt and Vietnam.  

Gun Dish Fire Control Radar

This is a broad band radar used for fire control on the ZSU-23-4 self-propelled (SP) gun system. The radar is designed to counter low-level aircraft threat and therefore it has a very short reaction time. As an ECCM measure the radar operates over a wide band of frequencies from X band to the lower K band frequencies.  

Low Blow Tracking and Missile Control Radar

Low Blow is the NATO code-name for radars used with SA-3 Goa surface-to-air missiles. It is an X-band radar and was operational with Goa missiles.

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68 ibid, p. 593.
69 ibid.
70 ibid, p. 595.
Spoon Rest Early Warning Radar

This radar is known in Russia as the P-12. It is used in conjunction with SA-2 Guideline surface-to-air missile. It works on VHF frequencies of 147.1 MHz band and has a range of about 275 km. It is a heavy radar and mobile in two vehicles, one carries the generator and the other the radar cabin and the antenna. It was reported to be operational in Vietnam and also in Egypt from where Israelis claimed to have captured one set.\textsuperscript{71}

Straight Flush Fire Control Radar

This radar is used with SA-6 Gainful surface-to-air missile system and functions as command guidance system. It is reported to carry out the following functions in the missile system: limited search; low-altitude detection and acquisition; target tracking and illumination; missile radar command guidance; and secondary radar missile tracking. These functions are performed on different frequencies. Radars of this type were used with Gainful missiles in the October 1973 Arab-Israeli War.\textsuperscript{72}

\textsuperscript{71} ibid.
\textsuperscript{72} ibid, p. 595-596.
ALE-40 Chaff Dispenser

The ALE-40 is a chaff dispensing equipment for radar counter measure and it can be mounted on aircraft external stores pylons without preventing their use for carrying other Weapons. Each container can have 30 cartridge ejected chaff packages which can be expelled rearward from the packages. A complete set comprises four launcher containers and these in case of F-4 Phantom aircraft are carried on the inboard wing pylons.73

ALE-39 ECM Dispenser

This equipment can be used on all tactical combat aircraft and is capable of dispensing both chaff and flares. The ALE-39 allows the pilot to select from the cockpit, during flight, between chaff cartridge or the flare against the IR missile defence. The system is capable of dispensing three different types of payloads; chaff for radar decoys; flares for IR decoys; and electronic jammers for search, guidance, and fire control radars. The system can dispense all three types of payloads in both manual and automatic modes either independently or simultaneously. These functions can be

73 ibid, p. 681.
initiated either by the pilot, or by the electronic warfare officer, or in the case of chaff, by the aircraft radar warning receiver system. This equipment could be mounted in A-4 and F-4 aircraft with the Israeli Air Force and was reported to be the most advanced system in the US inventory in 1972.\textsuperscript{74}

**ALO-119 ECM Pod**

This was a dual mode jammer pod developed for the USAF to provide "full capability" protection for attacking aircraft with a complement of counter measures against all known anti-aircraft threats particularly against surface-to-air missiles. It was designed primarily for use on F-4 Phantom aircraft and was supplied to the Israeli Air Force. It was also used in Vietnam in 1972.\textsuperscript{75}

**ALO-100 ECM Equipment**

This is a Deception Electronic Counter Measure equipment (DECM), mounted internally on aircraft like the F-4 Phantom. It is a jammer on multiple band, with repeater type track breaking function and operates in

\textsuperscript{74} ibid, p. 682.

\textsuperscript{75} ibid, p. 684.
conjunction with the aircraft radar warning receiver system. No official details were available in 1975 but it was already in production in 1972. It is reported that the system responds to detection of radar signal associated with a known type of Soviet Surface-to-air missile system by a high-power, broad-band jamming in the same radar band, or in the DECM mode by repeating the threat's radar signals after a delay to deceive the system and break track.76

The above brief description of electronic warfare equipment which was in operational service during 1973 with the Soviet Union and the United States does not contain the details of the technology used in the design of the equipment. Only the functional aspects have been given as known at that time. It is also not certain whether all the equipment described above were in the inventory of the Egyptian and Israeli air forces. The ground-based air defence and missile fire control radars supplied by the Soviet Union along with SAM systems were with Egypt. However, the position about ECM equipment with Israel can only be estimated.

76 ibid.
Electronic Warfare Role

Most of the electronic warfare equipment fitted on the Soviet supplied anti-aircraft weapon systems with Egypt was ground-based, and functioned in conjunction with those weapons to detect, identify, and attack enemy aircraft. The electronic counter measure equipment supplied by the United States to Israel before and during the October 1973 War was designed to be carried on aircraft and used to jam the Egyptian radars or deflect the missiles which were fired at the Israeli aircraft. The electronic warfare equipment was used by Egypt and Israel to complement their defensive and offensive strategies respectively and played a crucial role in the success of air operations. It also showed clearly the impact of new technology on air power operations.

Unmanned Air Vehicles (UAV)

These radio-controlled small size aircraft earlier known as remotely piloted vehicles (RPV) have been used to perform three distinct functions. These are: aerial reconnaissance; electronic warfare; and demolition. Their weight is between 200 to 10,000 Ib, and since they are relatively small in size, it is difficult to detect and destroy them. Another major advantage is that they are
cheap and easy to operate from small and mobile ground stations where they can be easily serviced, launched and recovered.

Their tasks include visual and electronic surveillance of activity in the tactical area, target acquisition, radio relay, electronic jamming and suppression or decoying of missiles. For this purpose they carry photographic or television cameras and/or various kinds of electronic sensors. They can transmit all information gathered during the flight directly and instantly to ground stations or airborne command posts like the AWACS. Their guidance is manual or optical by radio from a ground or air control post through on-board television or by pre-flight programming. 77

The UAVs were used in large numbers during Vietnam War where between 1969 and 1975 about 3,435 missions were flown by the US operated UAVs. They were also used extensively during the October 1973 Arab Israeli War as well as in the Lebanon in the 1980s to jam enemy radars.

They are reported to have provided vital information during UN-Iraq War of 1991.

One of the UAVs used by Israel during early 1973 was the Teledyne Ryan Model 1241 which was a multi-mission UAV designed to perform surveillance, reconnaissance, and ECM roles. About a dozen of these had been supplied to Israel in 1971. They were later used for high altitude photographic reconnaissance overflights over Egyptian airspace and possibly over other Arab territory. There were other press reports suggesting that Israel had used Firebee I type of drone to deliver Israeli built air-to-ground missiles to attack Egyptian missile sites. Teledyne Ryan had a programme and command guidance system and it was air launched from a Hercules DC-130 AorE mother plane which also performed the functions of command, tracking, and data relay aircraft. 78

Military Space Vehicles

Military satellites in space have several functions. Some of the important ones are: communications; surveillance; weather forecasting; navigation; and use as

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ibid, p. 552.
missile platforms. During Arab-Israeli War of October 1973, Egyptians were kept informed of the extent of the Israeli penetration across the Suez Canal by Soviet surveillance satellites. American satellites performed a similar function for Israel. Appendix G gives the details of the Soviet and American satellite launches during 1972-73. In 1982, the United States diverted orbiting satellites to help British forces in the Falklands War. On many other occasions space satellite vehicles have proved to be immensely useful in providing intelligence, but their deterrence value is far greater since they help to reduce the possibility of military surprise. Satellites equipped with electronic sensors and cameras keep a constant watch for signs of unusual threatening developments in various hot-spots of the world. 79

Section 4: Military Balance Before the War of October 1973

Strength of Arab and Israeli Forces

The details of army, navy, and air force units along with their major equipment is tabulated and given at Appendix H.

79 ibid, pp. 316-317.
The combined strength of Egyptian and Syrian armed forces was 430,000 against the Israeli strength of 300,000 on total mobilisation. The strength of the Egyptian and Syrian armies was 380,000 against the Israeli Army strength of 275,000 on mobilisation. The Israeli Army was fully mobilised in about 72 hours. Before mobilisation, the strength of Israeli Army was just about one-third amounting to less than 100,000. In the form of main armour, Egypt had about 2,000 tanks, Syria about 1,200, a total of 3,200 with the Arabs, while Israel had about 1,800 tanks of all types. Egypt and Syria combined had about 1,200 pieces of field artillery against Israel whose artillery strength was 500. Egyptian Army was also equipped with several types of anti-aircraft weapons in good numbers. These included ZSU-23-4 AA guns, ZSU-57-2 AA guns and SA-7 man-portable surface-to-air missiles. The reserves on the Arab side (Egypt and Syria) amounted to 700,000 against Israeli reserves of 180,000.\(^{80}\)

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\(^{80}\) Military Balance, n. 36, pp.31,32,33,36.
According to Edgar O’Ballance, a well-known analyst of Arab-Israeli Wars, ‘‘The basic field formation of Israeli Army was the brigade, or a regimental command team, which varied in size from about 3,000 to 4,500 men, depending upon its type. The Israelis normally mobilised up to fifteen brigades at a time, usually a mixture of armoured, mechanised and infantry, and including three artillery brigades. These were employed either on garrison duty on the Golan and Suez Canal fronts, on standby alert, in a training role, or absorbing reservists for annual training. On mobilisation this number could be increased to thirty-two or thirty-four brigades, and, in fact, by the end of the October War about forty brigades had been identified, some of which had been hastily formed to replace others depleted by casualties. These brigades were grouped together for operational needs into a ‘‘task force’’ (Ugdad) which was virtually a division. About ten shadow divisions were designated on paper, to be activated only in an emergency; and regular and reserve officers, whose normal jobs would be temporarily suspended during hostilities, were ‘‘nominated to command them.’’81

On the other hand, Egypt and Syria had about 15 divisions of which four were armoured, three mechanised infantry and eight infantry. A significant difference between the two armies was that the Arabs, particularly the Egyptians had a mass of integrated anti-aircraft weapons with the ground forces to form a missile and gun umbrella for use against Israeli attacking aircraft, the Israeli Army had no such cover. 82

The strength of personnel in the Egyptian Navy was about 15,000 while Syria had about 2,000 making a combined Arab strength of 17,000 naval officers and sailors. On the other hand, the mobilised strength of the Israeli Navy was only 5,000. The naval inventory of Egypt included 12 submarines, 5-8 destroyers and about 50-60 fast attack boats. There were about 25 fast attack boats with Syria. Israel had 51 fast attack boats and two submarines. 83

From the above figures it would be evident that Egypt and Syria combined had three to one advantage over Israel at sea.

There were about 33,000 air force personnel in the

82 Military Balance, n. 36, pp. 31,32,33,36.
83 Frank Aker, n. 19, pp. 160, 162, 164.
combined strength of Egypt and Syria; Egypt had 23,000 and Syria had 10,000 while Israeli Air Force had a personnel strength of 20,000 on mobilisation.84 The Egyptian Air Force had a total of about 620 combat aircraft which included 550 fighters, 48 bombers, 70 transports, and 82 helicopters. Out of a total of about 326 combat aircraft with Syria, it had 275 fighters, 16 transports and 36 helicopters. The total combat inventory of the Israeli Air Force was about 488 aircraft of which 352 were fighters, 8 bombers, 66 transports, and 50 helicopters. The total Israeli strength of combat aircraft was just about half of the combined strength of Egypt and Syria; 488 as against 946.

An analysis of the main types of fighter combat aircraft and their performance shows that of the 550 fighters in Egypt's inventory, more than 390 were the MiG-21 short range interceptors and Su-7 short range close support aircraft. On the Israeli side, 352 fighters mainly comprised F-4E Phantoms, A-4E/H Skyhawks, Mirage IIIB/C, and also some Mystere IV. Most of these aircraft with the Israeli Air Force were multi-role fighters with much

84 *Military Balance*, n. 36, pp. 31,32,33,36.
longer ranges and carrying capacity for air-to-air and air-to-surface guided weapons and a vast array of electronic warfare equipment. The Egyptian capability, therefore, was mainly defensive, against the Israeli Air Force which could mount combat missions deep inside Egyptian territory. (See Appendix J1-J3)

To counter the Israeli Air Force threat Egypt had formed a separate Air Defence Command which had 90 batteries of SA-2 Guideline surface-to-air missiles (SAMs), 78 batteries of SA-3 Goa SAMs, and 40 batteries of SA-6 Gainful SAMs. In addition, the Air Defence Command had several squadrons of MiG-21 fighter interceptors integrated with it. The majority of SAM sites, which were supported by radar controlled ZSU-23-4 anti-aircraft guns were located in the Suez Canal Zone, near Aswan Dam and around other strategic locations.

What was of particular interest about the Israeli Army was that it had a peacetime strength of only 11,500 with 83,000 conscripts. On mobilisation which took 72

85 Frank Aker, n. 19, p. 162
86 O'Ballance, n. 81, p. 17.
hours the army strength would come up to 275,000, that is, a threefold increase. In case of the Israeli Navy and Air Force, seventy-five per cent of the force comprised regular personnel even in peacetime. So while the Army took 72 hours in which to mobilise and proceed to their operational locations, the Navy and the Air Force were in a position to undertake operational missions at short notice.

Surrounded as Israel was with large armies of Egypt and Syria, it could not maintain a balance by increasing its own army's strength due to a small population of just three million. Its answer was a regular force of just 25 per cent which could be increased four times in 72 hours. During the period of mobilisation, Israel relied on its air force to interdict advancing enemy ground forces and stop their advance till Israeli troops arrived after mobilisation. The Israeli Air Force, therefore, played a very crucial role during the first few days of the war. Israel was confident that its air force would be able to stem any enemy advance on the ground till Israeli ground forces arrived on the scene.

Israeli confidence in the air force was based on the experiences and the lessons of air power employment
during the Suez War of 1956 and the Six-day War of 1967. During the Suez War, the British and French planes, in a pre-emptive strike, had destroyed most of the Egyptian Air Force, and under cover of these planes, British and French paratroopers had been air dropped over Port Said and on the banks of the Suez Canal within a few days, overcoming all resistance. Similarly, during the Six-Day War of June 1967, a pre-emptive strike by the Israeli Air Force on major air bases of the Egyptian Air Force, once again destroyed most of the Egyptian combat aircraft on the ground on the first day of the war and enabled Israel to achieve total air superiority under which the ground forces advanced on all fronts with complete immunity from the enemy's air forces and occupied the whole of Sinai, the West bank, and the Golan Heights without much resistance from the Arab ground forces which were being harassed by the Israeli Air Force. During the June 1967 War, the Syrian Air Force and the Jordanian Air Force were also decimated by a pre-emptive air strike by the Israeli Air Force.87

In view of the confirmed capability of the Israeli

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Air Force to achieve air superiority over the Arab air forces, the grand strategy of Israel was to use its air force for a pre-emptive strike against the Arab air forces and then after gaining air superiority advance with armour, infantry, and artillery to defeat the Arabs who had lost air cover. For this strategy to be effective, Israel had always obtained from the Western sources, and mainly from the United States, the state-of-the-art and new technology weapons and aircraft along with sophisticated electronic warfare equipment either carried in external pods or fitted integrally to the aircraft.

The Egyptian and Syrian strategy for the conduct of the October 1973 Arab-Israeli War was the use of densely deployed anti-aircraft weapons to counter Israeli air threat. These weapons included the latest surface-to-air missiles of Soviet origin as well as multi-barrel rapid firing AA guns which were fitted with the most sophisticated search, detection, ranging, fire control, and missile guidance radars along with electronic warfare equipment.

Before the October 1973 Arab-Israeli War, the balance of military forces in the region was in favour of the Arabs, who had almost three times the strength of Israel
except in aircraft which was only 2:1. (See Appendix K.) In this situation of overall inferiority in strength, Israel relied on its air force to counter the large scale Arab threat on the ground. On the other hand, the Arabs equipped themselves to the teeth with SAMs and other anti-aircraft artillery to counter the Israeli Air Force. The next round of October 1973, was the first war in which guided missiles, precision guided weapons (PGMs), and electronic warfare equipment were used in large numbers causing technological surprises to both sides. These new technology weapons played a dominant role in a war for the first time.