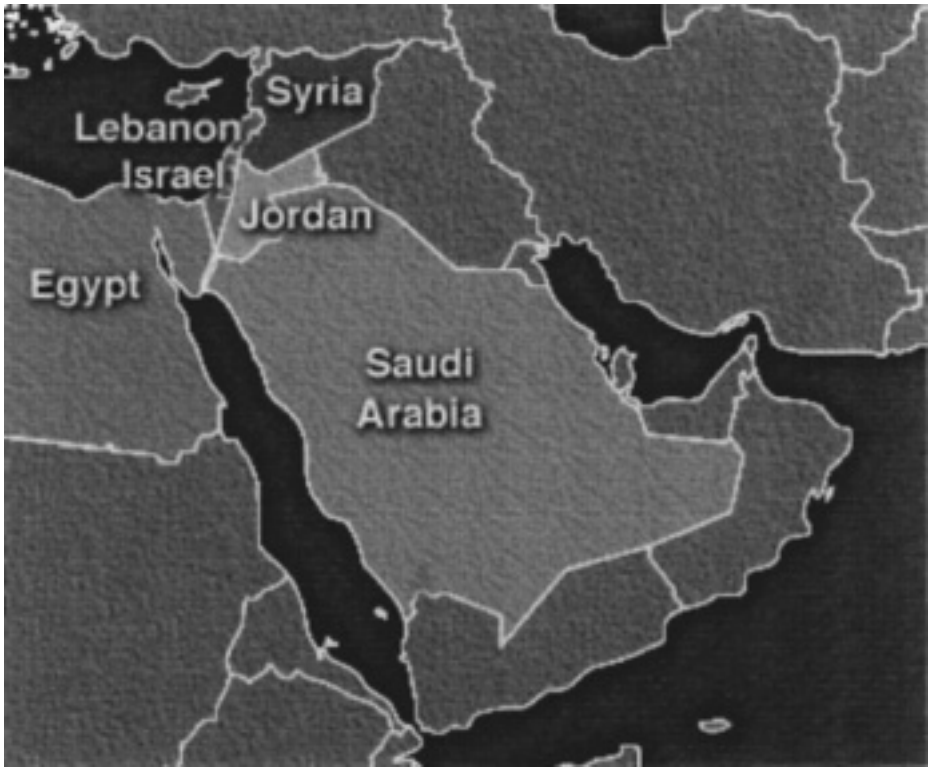
WARTIME SCENARIOS IN THE MIDDLE EAST: ISRAEL'S CHANCES FOR SURVIVAL



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1 Introduction

Since declaring independence in 1948, Israel has fought and won four declared defensive wars against all of the Arab countries on its borders (most of them backed by the military support of the other Arab countries in the region) and has survived almost daily terrorist attacks both from heavily-armed forces in Lebanon and Syria and from less well-funded Palestinian groups in the West Bank and Gaza Strip. While most of the rest of the world has confidence that the recent notion of a Middle East peace process will bring an end to hostilities in the region, in fact the opposing sides have been fighting this ongoing war since the foundation of Judaism, over 5000 years ago. One need be neither a participant in the Middle East conflagration nor a historian or scholar to see that the conflict is far from over. In 1996, Middle Eastern arms imports amounted to 15 billion dollars, a full 40% of the worldwide arms trade[1], and while that expenditure was merely the result of 1993 purchases, there does not appear to have been a major slowdown in Mideast arms sales since that time.[2] In fact, the major documentable trends in arms sales to the region have been the order of **more** sophisticated equipment, longer range missiles, more maneuverable aircraft, and heavier weapons. Grouped with ongoing terrorism (on all sides) against military and civilian targets; probable nuclear proliferation in Israel, Iran, and Iraq[3]; and the hatred any CNN watcher can see in the eyes of the region's populace, this continual bolstering of forces in the Middle East only makes the possibility of further Arab-Israeli war more likely. And as Israel

[1] International Institute for Strategic Studies, Military Balance 1997-98 ed., pg. 118

[2] Military Balance, pg. 119

[3] Shahram Chubin, "Does Iran Want Nuclear Weapons?", Survival Vol. 37 No. 1, pg. 93

maintains an operational policy not to be the aggressor in any war[4], one can safely assume that the next regional conflict will take place only when whichever Arab enemy feels it can wage successful war against the Jewish state. So, the question becomes: can Israel survive?

Towards an answer, this brief study presents aggregated data on the current force structures and intangible assets of the major Middle Eastern players; proceeds to consider several scenarios for Arab-Israeli confrontation, of increasing Arab strength (and thus, decreasing overall probability of occurrence); and attempts to determine, in a holistic manner[5], what the outcome of such wars would be in the near future.[6] The possible problems associated with Palestinian involvement in the given scenarios are presented as well, and non-conventional Israeli solutions are suggested.

2 Existing Force Structures

The military balance in the Middle East changes on almost a monthly basis as new weapons are built locally, years-old foreign orders arrive at their destinations, and new foreign orders are placed. The International Institute for Strategic Studies, based in London, publishes an annual report, entitled Military Balance, in an attempt to keep track of the military strengths of 169 countries, including all of the possible combatants in the Middle East and

[4]Yair Evron, Israel's Nuclear Dilemma, pg. 40

[5]This holistic manner involves assigning parameters for each country's weapon strengths, intelligence, training/ability, and technology, and matching up the resulting "equivalent" units of force on all sides to determine who has greater "effective" strength (see Chapter III). No attempts are made at plotting effective strategies for any country; variances in war-fighting ability are hypothesized numerically.

[6]All numerical force structure data comes from Military Balance, 1997-98 ed., but none of the assumptions made or conclusions drawn herein reflect the opinions or evaluations of the IISS authors. All units (including tons) are metric.

North Africa. While the IISS provides very detailed accounts of the force structures of the possible warring countries in the region — Egypt, Iran, Iraq, Israel, Jordan, Lebanon, Saudi Arabia, and Syria[7] — our study does not examine the suggested scenarios in enough depth to require such precise data.

As a result, the IISS data is aggregated into the categories below, with the corresponding raw data appearing in Tables I through VI. Any major characteristics, aside from the numerical "average data" listed, that are assumed to affect an equipment's battle performance are given here and defined rigorously in Chapter III.

Here and in Chapter III, "effectiveness" refers to the .ability of a weapon to hit a defenseless target, and the "survivability" of a target factors in its ability both to avoid being hit ("invulnerability") and to withstand a partial or direct hit ("durability"). All weapon launchers (i.e. MORs, MRLs, SUBs, and FGAs) have finite vulnerabilities, but only SSMs and ASMs (and not SAMs or AAMs) are assumed to be vulnerable once in flight; thus, a soldier firing an ATGW is assumed to be vulnerable to attack, but the weapon, once launched, can only be subverted by electronic countermeasures.

Also in this study, the term "equivalent" is frequently used to refer to a generic basis type of weapon. For instance, an equivalent ground/surface-attack weapon is defined to do the damage of a 100 mm caliber, unguided, high-explosive shell that has been "reasonably" well-aimed.[8] (Note that a reasonably well-aimed tank shell is assumed to be just as well-aimed

[7]Libya, a highly militant and well-armed state, is assumed not to take part in any of the scenarios in this study. Due to its distance from Israel, and the fact that three of its four submarines are currently inoperable, the country poses no significant land or sea threat at present.

[8]Most of the definitions in this Chapter take "equivalent" to have both quantitative AND qualitative meaning. The point of "well-aimed" is to present the assumption that all shots fired in this study come at

as a reasonably well-aimed artillery shell; this is a limitation in the study.) An equivalent air-attack weapon is harder to specify, so the notes below define the relative amounts of damage needed to kill the various air combat equipment in this study.[9] For organically controlled equipment, such as tanks, airplanes, and ships, an equivalent unit simply refers to the piece of equipment itself, assuming that the controller lacks intelligence (but has the will to survive). For instance, if a weapon below is assumed to do a certain amount of damage to an equivalent aircraft, the aircraft pilot is assumed to be aware of the missile's approach, and doing his best to avoid it, but without the aid of electronic countermeasures, etc. *To (hopefully) avoid some confusion, note in advance that most weapons will have final equivalent offensive and defensive values greater than one due to such factors as added guidance, intelligence of operator, higher caliber, and countermeasures.* These final values are brought about by the action of **multipliers** (some of which are given in Chapter II; they are fully explained in Chapter 111), some specific to certain weapons systems, others to certain weapon classes, and still others to a given country's entire armed forces. *Thus, ALL of the generic survivability and effectiveness parameters listed below provide only bases for further calculations.*[10]

least close to hitting their targets. In the case of an equivalent (reasonably well-driven) tank, the assumption is that only one in four of these nearby shots will actually hit. Assumptions such as this one are made for every unit in this chapter.

[9]Missiles are unique in their heavy reliance on guidance, and thus the term "equivalent" in the general descriptions of these weapons should be taken to mean generic, and will be refined for each country later.

[10]All assumptions made in this study were arbitrarily made based on the author's understanding of current weapons systems and on qualitative information gleaned from such sources as Military Balance, McGraw Hill Encyclopedia of Science and Technology, www.hughesmissiles.com, wvw.raytheon.com, www.defense1ink.mil (and its numerous links to the Army, Navy, Marines, and Air Force websites), etc.

Total Armed Forces Size[11] Includes both active soldiers and reserves. Note that this generalization is numerically disadvantageous to Israel, as Israeli reserve forces are much more rigorously trained and maintained than those of the neighboring Arab countries, and are thus more ready to join the active IDF (Israeli Defense Force) ranks than are their Arab counterparts.

2.1 Army

Includes the number of soldiers assigned to all of the various equipment below and a rough estimate on the number of infantry divisions (active and reserve together). Infantry units that are not tied to any particular equipment are not included as part of this study. The only Army weapons that fire at non-Army targets are surface-to-air missiles and air defense guns.

Main Battle Tanks (MBTs)[12] The total number of tanks and the speed (kph), armament (mm), and ammunition capacity (rounds) for each country's "average" tank are given. Tank armor is a factor in survivability, and two equivalent ground weapon hits are assumed necessary to kill one equivalent tank. Furthermore, an equivalent tank, defined to travel at

[11] The importance of footnote 5 enters here. Forces in this study are highly aggregated and averaged. In the end, one country's equivalent strength will be compared to another's, so it is assumed that all weapons and vehicles of war encounter each other head-on. Very little attention is paid to the "order of warfare", and the winners and losers are determined based solely upon the equivalent strengths of their forces.

[12] Armored Infantry Fighting Vehicles (AIFVs) and Armored Personnel Carriers (APCs), both with limited anti-same and anti-personnel firepower, are not considered in this study for the following reasons: troop transports are similar between countries, all of the combatants have thousands of them, and infantry movement is probably not one of the more crucial factors along the small fronts that Israel shares with its neighbors. In the end, this study seeks to contrast numbers of equivalent forces, and equipment and soldiers are assumed to be where they should be (subject to intelligence parameters).

45 kph, is hit by one in four equivalent weapons. Each MBT fires three times per ARTY launch.[13]

Artillery (ARTY), Towed (T) and Self-Propelled (SP)[14] Gives numbers and caliber ratings for each country's average towed artillery piece and average self-propelled artillery piece. Inaccuracy is a large factor in artillery effectiveness, but payload and blast radius are assumed to counter this effect. If hit by one equivalent major weapon, ARTY are destroyed. Because of mobility, it is assumed that an equivalent ARTY/SP is hit by only one in five equivalent weapons, while an equivalent ARTY/T is hit one in three times. The ARTY rate of fire is taken as the basis unit of rate for the entire study.

Multiple Rocket Launchers (MRLs) Gives the number of launchers and the average caliber for the accompanying rocket-propelled ammunition. All MRLs are ground-launched at ground targets. Inaccuracy decreases MRL effectiveness, but high rate of fire (assumed at 15 launches in the time taken for one ARTY launch) and large payload add back to effectiveness — the result being an effectiveness multiplier of 10.[15] If hit by one equivalent major weapon, equivalent MRLs are destroyed. Because of size, equivalent MRLs are assumed

[13]The definition of ALL units in this chapter (even sea and air units) includes a parameter for how many times the unit can fire during the time an artillery unit takes to fire. These ratios are only assumptions, but are crucial to the study, as stocks of ammunition do not play a role herein. This point is further explained prior to the presentation of the final equivalent military balance at the end of Chapter III.

[14]Armor, range, and ammunition/warhead information are either classified or not available for the majority of ARTY, MRLs, MORs, SSMs, ATGWs, SAMs, AAMs, and ASMs, but the specifications that were present in the Military Balance indicate little variation between the countries' average ARTY, MRLs, MORs, and SSMs. Such a wide variety of missile weaponry is present in the region that the overriding factors in air combat seem to be the plane specifications and pilot training, rather than the missiles in use.

[15]Multipliers are explained in Chapter III.

to be hit by one of every two equivalent weapons. (Some countries employ single Rocket Launchers instead of MRLs; 15 single rockets can be launched in the time one ARTY fires, and the same effectiveness parameter of 10 is used.)

Mortars (MORs) Gives the total number of launchers and the average caliber rating for compatible shells, differentiating between stationary and self-propelled types. All MORs are ground-launched at ground targets. Inaccuracy subtracts from MOR effectiveness, but high rate of fire (three launches per one equivalent ARTY launch) and large payload again contribute positively – resulting in an offensive equivalency multiplier of 2.5. If hit by one equivalent major weapon, MORs are destroyed. Through smallness and relative mobility, equivalent MORs are hit by one in every five equivalent weapons. In addition, some mortars are self-propelled and are hit by one in every ten equivalent weapons.

Surface-to-Surface Missiles (SSMs) Gives the number of missiles, not differentiating between types. Except for Iran's, all surface-to-surface missiles belonging to the Arab states are assumed to have adequate range and accuracy to hit equivalent targets in Israel.[16] Conversely, all of Israel's SSMs are assumed able to hit equivalent targets in any of the surrounding Arab states (other than Iran). However, Army SSMs can only be used to attack enemy ground forces (including ground-based SAM and ADG installations that are part of the enemy's Air Force).[17]

Ground SSM launchers are assumed invulnerable to all weapons; furthermore, only SAMs

[16] Military Balance. 1996-97 edition. See included missile range map at back of book.

[17] Only weapons systems are considered vulnerable. Ground "value targets" play no part in this study of force structures. As a result, the true power of SSMs cannot be harnessed in these battle scenarios.

and AAMs can intercept an SSM in the air. Ground SSMs are assumed to have a 1/2 probability of detonating near their target against countries with advanced SAM systems (Israel, Jordan, and Saudi Arabia), a 3/4 probability of the same against countries with normal SAM systems (Egypt, Iran, Iraq, Syria), and 100% probability of the same against Lebanon, which lacks SAMs altogether.

Finally, Army SSMs do the damage of 20 equivalent surface-attack weapons and are assumed to do that damage even if they do not hit directly (excepting electronic warfare countermeasures, to be added in later). Note: *All* missiles that have ammunition totals in this study are drawn down in a different manner from the other weapons systems (see footnote 35), and as such a missile, the SSM's rate of fire does not need to be specified.

Anti-Tank Guided Weapons (ATGW) Gives the number of weapons per country. All ATGWs are assumed to be single-launch, one-rocket weapons. ATGWs do the damage of one equivalent ground-attack weapon. Staying out of range of the enemy adversely affects ATGW effectiveness in this study, the result being that ATGWs have only a 3/4 chance of hitting to begin with. Once in flight, the weapon is vulnerable solely to electronic countermeasures. Like SSMs, ATGWs have ammunition totals and do not, therefore, have rates of fire defined here (see footnote 35). Advanced technologies (HOT, TOW)[18] are listed if present and increase the effectiveness of those weapons (from 0.75 to 1.00).

[18]HOT = High-subsonic Optically Teleguided weaponry. TOW = Tube-launched Optically-tracked Wireguided weaponry.

Air-Defense Guns (ADGs) An average caliber is presented for each country. A 25 mm caliber ADG is defined as the equivalent unit, and five equivalent weapon hits are assumed necessary to bring down an attacking aircraft. Air defense guns are used only to attack incoming planes and helicopters, not ASMs or SSMs. The chance of an equivalent ADG hitting an equivalent aircraft is assumed to be one in five per aircraft flyby. Thus, the effective use of ADGs in this study is more closely related to early warning and operator skill than to ammunition type and stock. One aircraft flyby is assumed to take the time of one ARTY launch, so an AD gun is assumed to fire as many shots as necessary to achieve its 20% hit percentage during the ARTY launch.

ADGs are also vulnerable to destruction, with one in three equivalent ground attacks hitting, and one hit destroying the unit.

Surface-to-Air Missiles (SAMs) Only the number of missiles per country is given. It is assumed that one missile hitting an enemy aircraft is enough to kill it and that an equivalent SAM intercepts an equivalent (i.e. dumb, countermeasureless) airplane one in two times. Even though many modern missiles actually need only to be within a certain "lethal" range to destroy an airplane, this study requires a hit. SAMs can only be avoided by pilot skill and countermeasures. Again, SAM drawdowns are calculated along with other missiles as the first step of combat; no rate of fire is defined. Note: The Israeli and Saudi militaries alone use the Stinger missile, the most advanced surface-to-air intercept missile to date.

2.2 Navy

Number of soldiers in the country's water-based attack fleet. Because of the less rigid nature of fighting postures possible on the open sea, this general study must take a highly aggregated approach to balancing naval warfare. First, because of the distance of the Persian Gulf from Israel, Iran, Iraq, and at least half of Saudi Arabia's forces are excluded from naval warfare in this study; their shipboard SSMs are also out-of-range. In addition, Lebanon and Jordan have such small naval forces that they are not perceived as a threat and are not included here.

Second, four naval vessel categories – submarines, principal surface combatants, surface missile craft, and surface anti-submarine craft – are specified below, each carrying a certain few types of weapons particular to their function. For ease of comprehension, the weapons systems per type of craft are aggregated.

Third, all surface ships can be hit by both torpedoes and surface attack weapons (Navy SSMs, USGWs, and Navy MRLs). To determine one absolute amount of damage that a given vessel can withstand, one equivalent torpedo's damage is defined to be four times as damaging as an equivalent surface-attack weapon. In addition, for purposes of calculation, half of the surface craft losses in a given fleet will be arbitrarily attributed to surface-attack weapons, and half to torpedoes.

Finally, mine warfare is not modeled. Naval troop transports, though possibly an important factor in a Mideast war, are also not modeled for the same reason that armored personnel carriers are not included in the Army section above.

Submarines (SUBs) Only Israel and Egypt have submarine warfare capabilities. Size of the fleet and average displacement, a measure of durability, per ship are included. An equivalent submarine displaces 2,000 tons of water and takes two equivalent torpedo hits to sink. Heavier submarines can withstand a proportionately larger amount of damage; however, the effective weapons range of a submarine dictates that it is always hit once per two equivalent torpedoes.

Torpedo Tubes (TTs) Gives the average number of torpedo tubes per submarine and their average caliber. One equivalent torpedo is unguided and has 400 mm caliber. 4 heavyweight torpedo (HWT) does twice the damage of an equivalent torpedo, and a lightweight torpedo (LWT) does half the damage. Both have the same hit percentage as the equivalent torpedo. Two torpedoes can be launched during one ARTY fire.

Underwater-to-Surface Guided Weapons (USGWs) Gives the number of submarines carrying USGWs. The one weapon type in the region is the Harpoon. Since only Israel and Egypt have submarines, USGWs are assumed to have the necessary range and accuracy to do damage to sea targets (only) on both sides, and can only be subverted by electronic countermeasures (not by AIMs). Only one USGW can be launched per ship during two ARTY firing rounds, and it does seven times the damage of an equivalent surface-attack weapon.

Notice that restricting USGWs to use only against sea targets is a marked deviation from reality. Added to this will be the limitation that sea-borne SSMs also must remain over the water. However, the error in these assumptions is canceled out by assuming that

air-to-surface missiles and land-based SSMs can only strike at ground targets, whereas in reality many ASMs and SSMs would be sent on naval missions.

Principal Surface Combatants (PSCs) The total number of ships is given. All PSCs in the region displace between 1,000 and 8,000 tons, and each equivalent PSC requires three equivalent torpedo hits to sink, with one of every two equivalent torpedoes hitting and one of every two surface-attack weapons hitting. Deck guns are not very common on Mideast surface craft and are not included here.

SAMs Gives the total number of surface-to-air missiles in the fleet plus allocation information. All deck-launched surface-to-air missiles have at least 10 km range. Navy SAM specifications are the same as Army SAM specifications.

Anti-Submarine Rocket Launchers (ASRLs) An ASW (anti-submarine warfare) rocket (unguided) does the same damage as an equivalent torpedo, but is assumed to hit an equivalent submarine only half as frequently. The total number of ASRLs is given, along with their allocation. To balance forces, all ASRLs of a fleet are assumed to fire twice during one ARTY launch.

(PSC) SSMs Deck-launched SSMs are similar to Army SSMs. Because of their short range and this study's assumption that land bases are invulnerable, all floating SSMs must be used against naval targets. The total number of SSMs in the PSC fleet is presented, coupled with allocation information. Shipboard SSMs inflict ten times the damage of an

equivalent surface-attack weapon.

Anti-Submarine Torpedo Tubes (ASTTs) An equivalent PSC-launched torpedo is identical to an equivalent SUB-launched torpedo. The total number of ASTTs in the fleet (with allocations) and the average bore size per ASTT are listed. ASTTs fire twice during one round of ARTY fire.

Surface Missile Craft (SMC) The total number of craft is given. An equivalent SMC displaces less than 1,000 tons and sinks after two equivalent torpedo hits. Because of its small size, however, only one of every three equivalent torpedoes and one of every three equivalent surface-attack weapons make contact.

(SMC) SSMs Deck-launched SSMs are vulnerable on SMC just as they are on PSCs, and are again as potent as other Navy SSMs. The total number of SSMs in the surface missile craft fleet is given.

Patrol Craft (PTRC) The total number of craft is presented. These smaller versions of PSCs displace less than 1,000 tons and require two equivalent torpedo hits to sink, with one out of three torpedoes hitting, and one out of three equivalent surface weapons hitting. PTRC carry ASRLs and ASTTs, as well as MRLs.

ASRLs PTRC-loaded ASRLs are the same as PSC-loaded ASRLs. The total number of launchers (allocated) is presented.

ASTTs PTRC-mounted ASTTs are identical to PSC-mounted ASTTs. The total number (allocated) and average size of the fleet's torpedo tubes are given.

2.3 Air Force

Number of soldiers in a country's air-based defense force. Just as naval forces have to be highly aggregated, so must air forces. No differentiation is made between types of fighter aircraft within the study; instead, average values are used.

Only Israel, Egypt, and Saudi Arabia have Airborne Early Warning systems, which factor largely in the intelligence parameters of Chapter III. Furthermore, only Egypt, Israel, and Syria (limited) have Electronic Warfare systems, which are of utmost importance in air defense and offense. Note that tactical transport helicopters are not included, for the same reasons as APCs, etc.

Finally, this study assumes that Iran, Iraq, and Saudi Arabia can only fight against Israel if another country that borders both Israel and that Arab country is also involved in the war. (This restriction is just for logistical reasons, though; therefore, Syria is taken as a suitable path of war between Israel and Iran.) Consequently, it can be assumed that all aircraft from warring Arab states are based within range of Israeli weapons.

Fighters (FTRs) Includes only non-ground-attack fighters. Planes in storage are assumed to become instantly available, as are training planes deemed combat-capable by the IISS. Listed are the number of fighters, average payload OR average number of AAMs[19], and

[19]For purposes of this study, an equivalent jet is assumed to carry either 4 missiles or 2,000 kg payload. Even though AAMs do not weigh 500 kg, this equivalency definition most accurately equates opposing country's forces.

cruising speed, along with the number of planes using advanced performance-enhancing equipment (such as electronic support and computerized weapon-aiming systems) and the number specifically using electronic countermeasures (ECM). An equivalent fighter jet is countermeasureless; cruises at 800 kph; and is brought down by one equivalent AIM hit. One out of two equivalent (i.e. tailpipe heat-seeking) AIMS will hit an equivalent aircraft. FTRs and FGAs (below) are assumed to be capable of "weapons dump", wherein all missiles are launched simultaneously at a target. Weapons dump thus takes only the time of one ARTY launch.

Ground-Attack Fighters (FGAs) Includes dual-purpose fighter/ground-attack aircraft. Fighting equivalencies are the same for FGAs and FTRs, but an equivalent FGA carries two air-to-surface missiles and two air-to-air missiles in its payload of 2,000 kg. Iraq and Syria are then at 3/4 offensive effectiveness. The same information is given for FGAs as for FTRs. Both FGAs and FTRs are assumed to fly one sortie per round, as mentioned in the Army ADG section.[20] Multipliers are given to planes flying with advanced air-to-ground missiles (see ASMs below).

Attack Helicopters (ATKHs) Gives only the number of helicopters per country. No distinctions are made between types of helicopters, but any technology presenting a tactical advantage (HOT, TOW) is listed and given an offensive multiplier of 1.25. All are assumed

[20]This is somewhat unreasonable, but it should be noted that it is also unreasonable to ARTY of a country will fire at the same time. Thus, in condensing the time taken by all assume that all ARTY to fire once, this study condenses the time taken by all other units in firing their weapons as well (or, in this case, by aircraft to conduct their sorties).

to carry one equivalent anti-tank weapon and to fire it twice per ARTY launch. Also, ATKHs are hit by one in two AIMs, and are killed with one hit.

Anti-Submarine Warfare Helicopters (ASWHs) Gives the number of helicopters devoted to ASW. Each is assumed to carry two equivalent underwater weapon launchers, each with half the chance an equivalent torpedo has of hitting a submarine. ASWHs are assumed killed just as frequently as ATKHs, and can fire two weapons for every ARTY launch.

Air-to-Surface Missiles (ASMs) All countries other than Jordan and Lebanon are assumed to pose equal ASM threats to ground forces. Advanced technology (TOW, HOT) and advanced missiles (Maverick, HARM) are listed if present, and result in offensive multipliers of 1.25 for the planes that carry them. The equivalent ASM does the damage of ten equivalent surface-attack weapons, and does damage to an equivalent target every time (i.e. whether it hits directly or not).[21]

Air-to-Air Missiles (AAMs) All countries other than Iraq and Syria (treated at 1/2 effectiveness) possess the AIM-9 Sidewinder missile, and are assumed to have equal AAM technology. Thus, since AAMs are the only studied form of mid-air combat, all equivalent aircraft have equal chances for victory (prior to the application of aircraft and country effectiveness parameters).

[21]The point of making this weapon do so much more damage than an equivalent ground-attack weapon is that, in the end, when force structures are directly compared, ASMs will be able to kill more target "value" than just one ground weapon, which reflects the true nature of an ASM payload. The same reasoning goes for SSMs' and USGWs' high damage value.

SAMs Air Force SAMs are identical to Army and Navy SAMs. Note: Only Israel, Iran, Saudi Arabia, and Jordan possess I-HAWK, an advanced radar-homing missile. Also, only Israel uses Patriot missiles, another advanced SAM system. Finally, the Saudi Air Force, like its Army, uses the Stinger missile, the most advanced SAM to date.

ADGs Identical to Army air defense guns, usually part of the inventory of a country's specialized Air Defense Command. The number and average caliber are listed. The same equivalencies apply to Air Force ADGs as to Army ADGs.

2.4 Tables I-VI

TABLE I[22] — ARMY FORCE STRUCTURES OF EGYPT, IRAN, IRAQ[23], & ISRAEL

	EGYPT	**IRAN**	**IRAQ**	**ISRAEL**
Total A.F.	704,000	868,000	1,037,500	605,000
Army	320,000; 9 inf divs	350,000; 8 inf divs	≈350,000; 14 inf divs	134,000; 10 inf divs
MBTs	3700: 46 kph, 107mm, 57 rds	1390: 49.5 kph, 108.5mm, 48 rds	1900: 53 kph, 111mm, 40 rds	4300: 46 kph, 107mm, 57 rds
ARTY	971 T: 125.5mm; 276 SP: 146mm	1995 T: 129mm; 289 SP: 155.5mm	ca.1,800 T: 128mm; 150 SP: 143mm	400 T: 149mm; 1150 SP:159mm
MRLs	296: 122mm	≈700: 124.5mm	≈150: 150mm	≈100: 188mm
MORs	2310 T: 113.5mm; 150 SP: 98.5mm	6500 T: 90mm; 0 SP	5000 T: 130mm; 0 SP	7740 T: 74.5mm; negligible SP
SSMs	21 (FROG, Scud)	out of range of Israel	≈27 (Scud)	≈30 (Lance, Jericho)
ATGWs	2660: 840 TOW	3000	3000: 1/5 HOT	≈1100: 200 TOW
ADGs	1677: 29mm	1700: 33mm	≈6000: 55mm	≈1200: 23.5mm
SAMs	2046	1500	3000	≈1400 (incl Stinger)

TABLE II — ARMY FORCE STRUCTURES OF JORDAN, LEBANON, SAUDI ARABIA, & SYRIA

	JORDAN	**LEBANON**	**SAUDI ARABIA**	**SYRIA**
Total A.F.	139,050	55,100	162,500	820,000
Army	90,000; 3 inf divs	53,300; 2 inf divs	70,000; perhaps 3 div	≈215,000; 4 inf divs
MBTs	1141: 44.5 kph, 106.5mm, 63 rds	315: 48 kph, 99mm, 45 rds	1055: 58 kph 109.5mm, 52 rds	4600: 53 kph 111.5mm, 41 rds
ARTY	115 T: 143.5mm; 370 SP: 164mm	203 T: 139mm; 0 SP	≈250 T: 136.5mm; 200 SP: 155mm	≈1630 T: 127.5mm; 450 SP: 125.5mm
MRLs	4800 RL: 102.5mm	perhaps 40: 122mm	60: 127mm	480: 116mm
MORs	670 T: 100.5mm; 130 SP: 81mm	280T: 99mm; 0 SP	400: 110.5mm; 0 SP	658 T: 117mm; 0 SP
SSMs	0	0	40 CSS-2	62 launchers
ATGWs	640: $\frac{1}{2}$ TOW	< 100: $\frac{1}{5}$ TOW	< 400: $\frac{1}{2}$ TOW, $\frac{1}{4}$ HOT	3390
ADGs	360: 27mm	< 50: 27.5mm	none under Army	2060: 37.5mm
SAMs	≈ 1000	0	< 1000 (incl Stinger)	4055

[22]Some values that were incalculable directly from the available literature are filled into Tables I-VI by rough extrapolation from the rest of that country's values (relative to its neighbors). All of the final values in this study are thus still reasonable approximations of the true military balance.

[23]As a result of the Gulf War, Iraqi infantry are at 50% effectiveness and only half of all Iraqi equipment is serviceable.

TABLE III — NAVAL FORCE STRUCTURES OF EGYPT[24], IRAN, IRAQ & ISRAEL[25]

	EGYPT	**IRAN**	**IRAQ**	**ISRAEL**
Navy	≈20,000	unusable vs. Israel	unusable vs. Israel	≈9000
SUBS	8: 1830 tons	–	–	4: 925 tons
TTs	8: 533mm	–	–	7.5: 541mm, 3 HWT
USGWs	4 SUBs equipped	–	–	all 4 SUBs equipped
PSCs	9 (1 > 8000 tons)	–	–	3: 1000 tons
SAMs	72: on 2 ships	–	–	192: on 3 ships
ASRLs	8: on 4 ships	–	–	0
SSMs	28: on 6 ships	–	–	48: on 3 ships
ASTTs	25: 402mm on 5 ships	–	–	18: 324mm on 3 ships
SMC	25	–	–	21
SSMs	72 missiles	–	–	194 missiles
PTRC	14	–	–	29
ASRLs	32: on 8 ships	–	–	0
ASTTs	8: 533mm on 2 ships	–	–	44: 324mm on 22 ships

TABLE IV — NAVAL FORCE STRUCTURES OF JORDAN, LEBANON. SAUDI ARABIA, & SYRIA

	JORDAN	**LEBANON**	**SAUDI ARABIA**	**SYRIA**
Navy	≈650	1000	≈13,500	≈9000
SUBS	0	0	0	3: all non-operational
TTs	0	0	0	0
USGWs	0	0	0	0
PSCs	0	0	8	4
SAMs	0	0	0	16: on 2 ships
ASRLs	0	0	0	8: on 2 ships
SSMs	0	0	64: on 8 ships	16: on 2 ships
ASTTs	0	0	48: 345.5mm (some LWT incl.) on 8 ships	10: 533mm on 2 ships
SMC	0	0	9	16
SSMs	0	0	36 missiles	56 missiles
PTRC	8	14	20: 17 light-armed	11: all light-armed
ASRLs	0	0	0	0
ASTTs	0	0	12: 533mm on 3 ships	0

[24]Egypt is assumed to split its naval forces equally between the Mediterranean and Red Seas.

[25]Israel is assumed to split its navy between its two territorial waters so that properly balanced proportions of its forces are facing its Mediterranean and Red Sea oppositions.

TABLE V — AIR FORCE STRUCTURES[26] OF EGYPT, IRAN, IRAQ & ISRAEL

	EGYPT	**IRAN**	**IRAQ**	**ISRAEL**
Air Force	30,000	30,000	35,000	32,000
FTRs	338: 4080 kg; 920 kph; 158 adv; 18 ECM	114: 6.5 AAMs; 947 kph; all adv; 30 ECM; 60 hi maneuverability	≈180: 5.5 AAMs; 937 kph; $\frac{2}{3}$ adv; $\frac{1}{3}$ ECM; $\frac{1}{6}$ hi maneuver	IAF uses all dual-purpose aircraft – see FGAs below
FGAs	135: 3725 kg; 839 kph; 29 adv; 29 ECM	150: 5240 kg; 902 kph; all adv; 90 ECM; 30 hi maneuverability	≈130: 3875 kg; 924 kph; $\frac{3}{5}$ adv; $\frac{1}{5}$ ECM; $\frac{2}{5}$ hi maneuver	662: 5800 kg; 889 kph; all adv; $\frac{2}{5}$ ECM
ATKHs	101: 44 with HOT	negligible number	≈120: few with HOT	130
ASWHs	33	9	0	1: provides OTHT
ASMs	Maverick, HOT, Armat (anti-radiation)	Maverick	no advanced missiles	Maverick, TOW
SAMs	664	≈300	none in Air Force	≈300 (advanced)
ADGs	≈2000: 54mm	none in Air Force	none in Air Force	none in Air Force

TABLE VI — AIR FORCE STRUCTURES OF JORDAN, LEBANON, SAUDI ARABIA & SYRIA

	JORDAN	**LEBANON**	**SAUDI ARABIA**	**SYRIA**
Air Force	13,400	800	18,000	40,000
FTRs	30: 4000 kg; 980 kph; all adv; 0 ECM	3: unknown specs, not advanced	139: 9715 kg; 975 kph; all adv; 0 ECM	310: 2,000 kg; 917 kph; $\frac{1}{3}$ adv and ECM; $\frac{1}{3}$ hi maneuver
FGAs	65: 3200 kg; 860 kph; 0 adv; 0 ECM	0	128: 4825 kg; 842 kph; 58 adv; 0 ECM	154: 4234 kg; 951 kph; $\frac{2}{5}$ adv and ECM; all hi maneuver
ATKHs	3: all with TOW	4	98	72
ASWHs	0	0	23	24
ASMs	TOW (small number)	no advanced missiles	Maverick, ALARM (anti-radiation)	HOT
SAMs	80 (advanced)	0	309 (advanced)	≈758
ADGs	0	none in Air Force	420: 33mm	none in Air Force

[26]OTHT = over-the-horizon targeting. This one capability gives the entire Israeli Navy an offensive multiplier of 1.25.

3 Multiplying Assets and Effectiveness Parameters

Although the numerical data shown above adequately demonstrate the huge military disparities that exist among the Middle Eastern countries, one of the goals of this study is to quantify some of the broad intangible and technological advantages that certain countries have over their neighbors that can both widen and shrink these force structure gaps. In other words, the strict military balance is not the final word: there are qualitative human and conceptual factors that must be included. Doing so, however, involves translating military concepts into numbers. To figure out how to make this translation, the final method of evaluating the battle scenarios must be fully explained here.

3.1 Offensive Equivalency

Starting with the numerical information above, all of the countries' equivalent forces are determined as follows. Each country's average units are given equivalency ratings for offense and defense. This is done straightforwardly by looking back at the above definitions for equivalent units. For example, Israel's average main battle tank carries a 107 mm gun with high-explosive rounds. The equivalent ground-attack unit was earlier defined as the damage done-by a 100 mm unguided, high-explosive shell. Thus, Israel's average MBT has an **offensive equivalency** of

$$\frac{107}{100} * 3(\text{the number of shots per ARTY fire}) = 3.21 \tag{1}$$

This value is the amount of equivalent damage that the average Israeli tank does with one shot.

3.2 Defensive Equivalency

Now, the tank also has a **defensive equivalency**. It was stipulated earlier that an equivalent MBT is killed by two equivalent ground-attack hits (that is its **durability**), and as there are no special heavily-armored tanks in this study, that particular equivalency remains constant. However, it was also stated that 1 in 4 ground-attack shots ("reasonably" well-aimed) will hit an equivalent tank traveling at 45 kph - (that is then its **vulnerability**). Again, the Israeli tank has the same durability as all others, but it travels at 46 kph. This is only a small improvement over the equivalent value, but it is finite, allowing the Israeli MBT to be hit only

$$\frac{45}{46} = .978 \tag{2}$$

times as often as an equivalent tank. As a result, one Israeli tank dies for every

$$\textit{(vulnerability } \textbf{\textit{multiplier}}\textit{)} * \textit{(equivalent vulnerability)} * \textit{(durability)} =$$

$$\frac{1}{.978} * 4 * 2 = 8.178 \tag{3}$$

equivalent enemy ground-attack weapons fired. That is, it would take 8 equivalent ground-attack weapons to kill one equivalent tank, but the Israeli tank is just a little bit faster, so it gets hit just a little bit less of the time, and requires 8.178 enemy **shots** to die. The same mathematical process – identifying those traits that change a weapon or vehicle's offensive and defensive abilities and then generating multipliers for both – can be applied to every weapon system defined in Section 2. However, this is only the **mechanical** equivalency step.

3.3 Country Effectiveness Parameters

Remaining are the aforementioned "country effectiveness parameters". This highly ambiguous subject is the key to determining an accurate answer to this study's question: can Israel survive? It is already evident that Israel has the ability to overcome forces far outnumbering it in both men and machines; she has unquestioningly prevailed in such circumstances before. But if we equate only mechanical equivalencies, how could Israel possibly win against even a limited multinational opposition? In order to factor in the major intangible and/or technological assets that have been and will continue to be so crucial to the outcome of war, the following country effectiveness parameters (**CEPs**) are defined. With them, the warfighting abilities of our eight nations can be fully estimated and experimented with.

3.3.1 Intelligence

This term signifies a country's ability to anticipate and observe enemy movements through the use of technology.[27] It does not refer to the ability to plot effective combat strategies or to fight "smartly". Intelligence factors will be directly multiplied by all of a country's units' **offensive equivalencies** and **defensive equivalencies**. Why should this be? Say that Egypt knows in advance of an Israeli air strike from over the Sinai Desert. Missiles will be at the ready, perhaps already in the air, when the first planes appear on RADAR. Any Egyptian interceptors sent up to ward off the IAF bombers will know where to be and at what to fire. Air defense guns will be churning away at the point where the flyers should

[27] One form of intelligence, the ability to detect submarines, is trivial in the context of this study, and all naval forces are assumed to be able to detect a submarine by the time it has launched one torpedo. This avoids the problem of ASRLs remaining idle during a round because they cannot see anything at which to fire.

be appearing over the horizon. As a rule, Egypt's air defenses will stand a proportionately better chance of hitting the approaching enemy. Furthermore, tanks, artillery, mortars, and infantry will know to scatter or find cover – in general, all Egyptian units will become harder to hit. Notice that similar multiplications are appropriate for a ground or naval assault or any combination of the three. All corresponding Egyptian forces can be made fully prepared for the approaching enemy as a result of intelligence information. (Of course, this study does not differentiate be tween attackers and victims in its head-on confrontation approach, but the ability to monitor an enemy's activities is still applicable and advantageous.)

While adding said advantages to a country's forces, intelligence nonetheless does not greatly improve the fighting ability of any particular unit. As a result, the intelligence multiplier will vary only from 1.00 (for countries without any form of early warning or reconnaissance) through 1.10 (for countries with reconnaissance aircraft alone) to 1.25 (for countries with extensive reconnaissance capabilities and airborne early warning systems). On this scale, the eight combatants are given the following intelligence factors:[28]

Egypt = 1.18	Iran = 1.10	Iraq = 1.05	Israel = 1.25
Jordan = 1.00	Lebanon = 1.00	Saudi Arabia = 1.18	Syria = 1.10

Israel receives extraordinarily high marks for its extensive fleet of RECCE jets and its 2 Boeing 747's utilizing the up-to-date Phalcon AEW system. Note that this multiplier is greater than one and therefore multiplies directly to increase both the damage points and the hit points of the forces with AEW.

[28]Derived from Military Balance, 1997-98 ed.'s listing of reconnaissance (RECCE) and AEW capabilities for each country. Unfortunately, our scaling system is crude, and there is no way of knowing whether the basis assumptions are accurate. For this reason, we minimize the scaling effects while still giving hefty advantages to those countries with extensive intelligence infrastructures.

3.3.2 Electronic Warfare

Two other important aspects of modern warfare are the ability to disable, without the use of conventional weapons, incoming guided weapons so that they do not hit their intended targets and the capability to "fire and forget" AAMs and ASMs. These invaluable weapon systems are known as electronic warfare (EW), and two different multipliers will be used to decrease the **vulnerability equivalencies** of friendly aircraft, on the one hand, and ALL friendly units on the other. Also, both multipliers will increase the **offensive equivalencies** of all friendly units FIRING guided weapons.

There are two distinct types of EW that are separately responsible for the two multiplicative effects above. The first is FTR/FGA-based electronic countermeasures (ECM). Each plane equipped with this technology has the ability, depending on the system in use, to project a false image of itself to, to obscure its electronic or heat signature from, or to cause a general malfunction in an incoming missile's seeking and/or guidance systems. The result is, in some cases, virtually invulnerable planes, but as this study is assuming a universal type of FGA/FTR-based EW, and in order to factor in plane cannon dogfighting, *every ECM-capable plane receives a vulnerability multiplier of 0.75*. Note, of course, that this is not a country multiplier and is instead incorporated directly into the calculations for individual aircraft.

The other type of EW is area-wide, based either on circling planes (aside from fighters) or on the ground. Such systems can project the same electronic interference as the above type, but over wider areas, encompassing perhaps large portions of a nation's armed forces.

ATGWs can be sent off course and not hit their targets. Guided surface-to-surface missiles, such as USGWs and deck-launched SSMs in naval fleets, can be thrown off target as well. Thus, the following defensive multipliers, ranging from 0.90 (for excellent systems, because obviously not all incoming weapons are affected by electronic interference, but the multiplier is best used in this study as an *overall* multiplier) to 1.00 (for no such systems), are defined.[29]

Egypt = 0.95	Iran = 1.00	Iraq = 1.00	Israel = 0.90
Jordan = 1.00	Lebanon = 1.00	Saudi Arabia = 1.00	Syria = 0.95

Israel again receives the highest marks for its EW infrastructure, which is composed of at least 36 autonomous systems.

Electronic warfare takes one additional form. Friendly guided weapons can be led along their path with the assistance of the EW systems in the surrounding airspace. For instance, an overflying Boeing 707-based system can "paint" an enemy aircraft with a laser or other such technology so that a friendly missile can find its way to the target easily, regardless of enemy countermeasures. This type of system can be part of a fighter jet's arsenal (and, once again, does not signify a country multiplier, but instead a multiplier for individual planes), giving directions only to that plane's AAMs and ASMs, and *resulting in an offensive multiplier of 1.50 for that plane*, and/or it can be part of an area-wide EW system, as above, with these country parameters (1.00 for nonexistent, 1.25 for area-covering):

Egypt = 1.15	Iran = 1.00	Iraq = 1.00	Israel = 1.25
Jordan = 1.00	Lebanon = 1.00	Saudi Arabia = 1.00	Syria = 1.15

Israel's systems, as before, are superior to those of the surrounding Arab countries. When considering both this type of EW and that directly above, it is again important to remember

[29]Derived from Military Balance, 1997-98 ed.'s listing of EW capabilities for all countries. The same caveats apply here as for the intelligence scaling (see previous footnote).

that the battles in this study will be taking place mainly in and above Israeli territory, where Israeli EW has maximum efficiency, and that of its opponents has minimum.

3.3.3 Training / Ability

The necessity for incorporating intangible assets as best as possible into this highly quantitative model is offset by the inability to do so. Such nonquantizable aspects of a fighting force as its desire to win or knowledge of home terrain, etc., are perhaps just as important as electronic countermeasures to the outcome of war, but within a model such aspects can only be experimented with, and not delineated. Fortunately, in the early 1990's the United States Army Concepts Analysis Agency completed a project to catalogue every major western land battle since the year 1600, the result being a spreadsheet over 1 megabyte in size, encompassing such minutiae as the weather conditions during each battle, what the opposing commanders' names were, and to what degree close air support assisted each side. More towards our goal, the researchers covered all of the Six Day War in 1967 and the Yom Kippur War in 1973, providing precise numbers of armored combat vehicles destroyed on all sides. From said data,[30] this study extrapolates the following overall warfighting parameter, called the **training/ability multiplier**, to function as a special **survivability multiplier** for Israel versus its seven enemies.

The method of extrapolation is to divide the percentage of Israeli armored units destroyed by the percentage of opponent armored units destroyed, and then average the resulting fractions over the 20 or so recorded battles for each enemy. This provides a measure of how

[30]The data, entitled "Table of Battles: 1600 to the Present", is in the public domain, and a copy of it can be obtained from Dr. Robert Helmbold of the USACAA.

survivable Israeli forces are relative to their opponents. However, the two Arab-Israeli wars in question give such data only for Israel versus Egypt, Jordan, Syria, and Iran. Consequently, to be fair towards the Arab countries that took no part in those wars, the weighted average of those four ratios, 1.514, will be used as the final multiplier. Thus, all Israeli armored organic forces (MBTs, FTRs, FGAs, ATKHs, and naval vessels) are defined to be 1.514 times as survivable as those of their enemies.[31]

3.4 The Equivalent Balance

Now that both the **mechanical equivalencies** and **country multipliers**[32] have been defined, the equivalent balance of the region remains to be determined by multiplying and dividing equivalencies and effectiveness parameters as exemplified above. The tables below contain the offensive and defensive equivalencies for the forces of all eight countries. Total offensive power is obtained by multiplying the number of average units by their offensive equivalency. Thus, from above, the Israeli MBT force has a total offensive power of

$$3.21 * 4,300 = 13,803 \quad \textbf{damage points}. \tag{4}$$

[31] While the USACAA data utilized herein covers only armored losses, the actual battles between Israel and its neighbors involved close air support, artillery, mortars, rockets, infantry, etc. (data for some of which is also included in the USACAA table); consequently, it is not at all far-fetched to form a general survivability multiplier based on the most numerous units, the armored units, in those historical confrontations. It is also conceivable that the same intangible qualities that go into the training, ability, and overall effectiveness of Israeli ground forces will also apply to Israeli air and sea forces, relative to the same enemies.

[32] Note that the cumulative effects of the various country multipliers can reduce the effectiveness of some enemy weapons enormously. Non-advanced, non-aided enemy ATGWs, for instance, fly into Israeli battlespace with a paltry .334 effectiveness parameter, both due to their own shortcomings and Israel's country multipliers.

The reader may be suddenly confused by the size of this number and by the fact that it no longer has any real units.[33] The notion of a damage point is introduced as an arbitrary basis unit for armies' offensive power. It should, in fact, be quite clear that since all country's offensive powers are multiplied in the same manner, this basis unit is as good as any other arbitrarily defined unit for estimating power. In the same manner, the **hit point** is introduced as the basis unit for defensive equivalencies, and the Israeli MBTs have a total defensive equivalency of

$$8.178 * 4,300 = 35,165 \quad \text{hit points.} \tag{5}$$

It is probably apparent that damage points and hit points no longer have any sure retraceable path back to real speed, armor, and bullets. Indeed, the "actual" force structures have been left behind, and the study is now concerned only with "points".

Now, one major limitation governing the realism of this study is the inability to incorporate amounts of ammunition. One reason for this is the limited availability of such information in the literature. If damage points are defined in terms of the standard damage a weapon does with one shot, and hit points are defined in terms of the number of total enemy shots required to kill a unit, how can the two be related without ammunition information? The answer is that since the aggregate forces of the opponents in this study will only be compared to each other, ammunition can be considered infinite. For example, in the end, when Israel's total land, air, and naval offensive and defensive powers will be

[33] One advantage of ending up with such enormous numbers is that errors in this study's assumptions, while having been multiplied (and thus made worse), will be somewhat lost among the other large numbers in the final analysis.

compared to those of an opponent, the key lies in determining which side can do enough damage to destroy the other side first. That is, Israel's defensive equivalency will be divided by the opponent's offensive power to determine how many "rounds" of firing need to be done before Israel's forces are completely destroyed.[34] The same will be done for the opponent's defensive rating and Israel's offensive power. If Israel's defenses take longer to wear down under enemy fire than do enemy defenses under Israeli fire, Israel wins. If the opposite is true, the opponent wins.

So, the second to last step in force evaluation is to multiply each weapon's offensive value by its rate of fire in relation to artillery. However, as noted in footnote 35 (and several times previously in Section 2), there are several missile weapons whose ammunition stock values are known and therefore draw down enemy defense scores in the first stage of any scenario. These include SSMs, ATGWs, and SAMs. Because these types of weapons are not subject to the round format of exchange, they have been given special effectiveness parameters in Section 2. Only after multiplication by these parameters and the appropriate country multipliers (above) are these weapons' scores subtracted from the defense structures of their target countries.

The final step for all of the normal drawdown weapons will be to multiply in the country parameters that have just been defined. **Training/ability** will be multiplied into a coun-

[34]One round is defined as the time an ARTY battery takes to fire one shell. The corresponding time taken for all other units to fire was given in Section 2. Note that most wars studied will thus take an unreasonably short time in terms of the number of ARTY shells fired, but this is merely a consequence of the head-on nature of confrontation assumed herein.

try's defensive equivalencies AFTER all units have been summed together. The same will be done with **intelligence**, which affects all units. Finally, the first **electronic warfare** multiplier will be used solely towards planes' defensive values, *before* adding them into the total; the second EW defensive multiplier will be used over all units *after* summing; and the third EW multiplier will be used towards friendly guided weapons' offensive parameters *before* summing.

To review, the steps in determining a weapon's equivalent effectiveness are: **first**, calculate its defensive parameter by determining the equivalent number of shots the enemy must fire before the weapon is killed — if appropriate, include multipliers specific to the weapon system (such as ECM or high maneuverability on airplanes); **second**, if it is an ammunition-defined weapon, include all country parameters so that the final value demonstrates its full effectiveness against the target country (defense scores do not apply to these weapons); and **third**, calculate its offensive parameter by determining the total amount of damage done per round of firing by all of those weapons belonging to a country — again, if appropriate, include multipliers specific to that weapon system (such as heavyweight torpedoes or advanced missiles/targeting). The country totals are then obtained by aggregating all of the weapons systems (as per footnote 35) and multiplying by countrywide effectiveness parameters where they apply.

With this chapter's notions of how the force structures will be calculated firmly in place,

the following aggregate equivalency data for the eight countries are presented. [35] (As a rule, simply because of the enormous amount of assumption that was necessary to come up with these final numbers, they may easily err by twenty percent in either direction. Moreover, this caveat should not be mistaken for a claim that these numbers represent *reality* accurate to 20%; the reader must remember that all of the assumptions in the preceding chapters are merely hypotheses generated by educated extrapolation from a minimal initial data base.)

[35] Offensive power is given in terms of damage points. Defensive power is given in terms of hit points. So that the proper match-ups can be made with the listed aggregate forces, the following definitions apply:

1. Army offensive power includes air-launched weapons used against enemy land targets (ASMs, ATKHs).
2. Air Force offensive power includes Army and Navy weapons launched against enemy air targets (SAMs, ADGs).
3. Navy offensive power includes Air Force weapons launched against submarines (ASWH torpedoes).
4. Army defensive scores include ground-based Air Force equipment (ADGs).

Since the missiles that DO have ammunition totals above cannot be divided up into the number used per round until AFTER the war is over and we know how many rounds there WERE, missiles' offensive equivalencies are instead subtracted from the enemy's defensive scores as the **first stage** in drawdown, AFTER the application of any country defense parameters on behalf of the target country:

1. Army SSMs and ATGWs are subtracted directly from the enemy's total land defense score.
2. Navy SSMs are directly subtracted from the enemy's sea defense score.
3. Air Force SAMs, Army SAMs, and Navy SAMs are subtracted directly from the enemy's air defense score.

Notice that while SAMs have already been spent prior to the first round of battle, fighters must still make their sorties as defined earlier such that plane-plane combat, ASM drops, and AD hits can be balanced.

3.5 Tables VII-XII

TABLE VII[36] — AGGREGATE[37] FORCE[38] EQUIVALENCIES[39] FOR EGYPT AND IRAN

	Egypt, Offense	Egypt, Defense	Iran, Offense	Iran, Defense
ARMY	31,000	70,000	41,500	79,000
NAVY	450	900	0	0
AIR FORCE	2,500	1,000	750	450

TABLE VIII — AGGREGATE FORCE EQUIVALENCIES FOR IRAQ AND ISRAEL[40]

	Iraq, Offense	Iraq, Defense	Israel, Offense	Israel, Defense
ARMY	30,000	70,000	50,500	128,000
NAVY	0	0	325	1,500
AIR FORCE	2,900	700	7,600	2,300

TABLE IX — AGGREGATE FORCE EQUIVALENCIES FOR JORDAN AND LEBANON

	Jordan, Offense	Jordan, Defense	Lebanon, Offense	Lebanon, Defense
ARMY	10,500	18,000	2,500	5,000
NAVY	0	0	0	0
AIR FORCE	150	100	> 0	> 0

TABLE X — AGGREGATE FORCE EQUIVALENCIES FOR SAUDI ARABIA AND SYRIA

	S. Arabia, Offense	S. Arabia, Defense	Syria, Offense	Syria, Defense
ARMY	10,500	19,000	30,000	67,000
NAVY	75	200	100	350
AIR FORCE	1,000	650	800	1,050

[36] All Army offensive values in Tables VII-X are rounded to the nearest 500 damage points; Army defensive values are to the nearest 1,000 hit points.

[37] Navy offensive values in Tables VII-X are rounded to the nearest 25 damage points; Navy defensive values are to the nearest 50 hit points.

[38] Air Force offensive and defensive values in Tables VII-X are rounded to the nearest 50 points.

[39] While the Army and Navy ratios between offensive and defensive forces appear reasonable at first glance, the Air Force ratios appear flawed. Upon further reflection, though, it is apparent that the amount of air firepower for any given Air Force is literally enormous. On the other hand, the planes that deliver such firepower are inherently easily destroyed, fragile objects. So, the final values still bear a correlation with reality.

[40] The air offense value for Israel is the average value against all opponents. Note that the extensive system of multipliers dealing with guided weapons can cause large disparities in a country's air force with respect to two different enemies. Fortunately, every country but Israel only HAS one enemy, namely Israel. Unfortunately, Israel has seven enemies. This is also the reason why tables XI and XII are necessary.

TABLE XI — SPECIAL DRAWDOWN EQUIVALENT OFFENSE FORCES (all except Israel)[41]

	Egypt	Iran	Iraq	Jordan	Lebanon	S. Arabia	Syria
All SAMs	750	400	625	225	0	375	1225
Naval SSMs	575	0	0	0	0	300	400
Army SSMs	125	0	150	0	0	225	350
Army ATGWs	1325	1100	1125	350	25	200	1425

TABLE XII — SPECIAL DRAWDOWN EQUIVALENT OFFENSE FORCES (Israel vs. others)[42]

versus: →	Egypt	Iran	Iraq	Jordan	Lebanon	S. Arabia	Syria
All SAMs	1850	2150	2300	2400	2400	2000	2050
Naval SSMs	3000	3250	3450	3650	3650	3000	3250
Army SSMs	600	700	700	750	750	600	700
Army ATGWs	1050	1250	1300	1350	1350	1100	1150

4 Wartime Scenarios

4.1 Limited Scenarios — One Enemy

With all of the above equivalency data firmly established, it is an easy task to determine the winners and losers in the various plausible Mideast wartime scenarios. Falling back once again on the long-standing Israeli policy never to begin a war with its Arab neighbors, this study assumes that the only plausible one-enemy wars are Israel vs. Egypt and Israel vs. Syria. It is obvious from the above data that none of Lebanon, Jordan, or Saudi Arabia stands a fighting chance of individual victory against Israel's forces. Remember also that Iran, Iraq, and Saudi Arabia are prohibited from fighting single-country wars against Israel because none of them shares a border with Israel. A conflict with Egypt, perhaps Israel's most feared enemy for its proximity and the possibility that it could win control of the Mediterranean and Red Seas, is deemed in the author's optimistic mind an improbable event because of the two countries' long standing peace accord and the good relations both

[41] Values are rounded to the nearest 25 damage points.
[42] Values are rounded to the nearest 50 damage points.

countries have with the world's most famous peacekeeper, the United States.

A conflict with Syria, however, is quite likely, relatively speaking. Syria and Israel are far from at peace; Syria is even a well-known sponsor of Lebanese terrorism against Israeli civilians. Syria has been involved in every major war against Israel so far, and still claims the Golan Heights of northeastern Israel as its own. With several reasons for wanting to wage war on Israel, Syria might also consider itself able to do so effectively. Let us briefly compare their equivalent forces.

Normal Forces	Israel, Offense	Israel, Defense	Syria, Offense	Syria, Defense	Special Drawdowns	Syria	Israel vs. Syria
ARMY	50,500	128,000	30,000	67,000	All SAMs	1225	2050
NAVY	325	1500	100	350	Naval SAMs	400	3250
AIR FORCE	7600	2300	800	1050	Army SSMs	350	700
					Army ATGWs	1425	1150

After taking into account the 20% error factor (as a bonus for Syria and a subtraction for Israel) mentioned earlier, Israel's Army stands at 40,500 points of offense and 101,000 points of (subtracted) defense. Syria's army fights with 36,000 offense and 79,000 subtracted defense. Thus, in the context of this study, Israel is able to destroy Syria's forces at least twice as fast as Syria would be capable of. A similar analysis of the two naval forces[43] — I: O=260; D=1200 vs. S: O=120; D=420 — favors Israel even more convincingly, at a 5:1 ratio of destruction. Finally, a comparison of the Air Forces also demonstrates the commanding superiority of Israel's advanced technology — a 9:1 ratio of relative destructive power.[44]

[43]The drawdown of naval SSMs has not even been included here, as Israel's SSM force alone would completely disable the Syrian surface fleet.

[44]Again, the drawdown of SAMs has not been included here, since Israel can repel the entire Syrian Air Force (in this model) simply with its SAMs.

The study is, therefore, conclusive regarding the only current plausible one-enemy wartime scenario: Israel can survive. (It would be an easy exercise for the reader to confirm that Israel can also defeat Egypt. The uncertainty of who would win the sea battle is more or less eliminated by the presence of such great firepower in Israel's naval SSMs.)

4.2 Expanded Scenarios — Multiple Enemies

Retaining the assumption that Egypt will remain neutral in any Middle East conflict except under the most dire circumstances, and that Lebanon understands it has nowhere near enough offensive power to fight Israel successfully, the three most plausible multiple enemy scenarios are against Iran and Syria; against Iraq and Jordan; and against Iraq, Jordan, and Syria.

Aside from Syria, Iran (as part of its holy war against Judaism) is the other well-known state sponsor of both Lebanese and Palestinian terrorism against the Israeli populace; in other words, Iran also hates Israel with a passion. Thus, this first scenario is highly likely. Let us examine the equivalent force structures:

Normal Forces	Israel, Offense	Israel, Defense	Irn/Syr, Offense	Irn/Syr, Defense	Special Drawdowns	Iran and Syria	Israel vs. Irn/Syria
ARMY	50,500	128,000	71,500	146,000	All SAMs	1625	2100
NAVY	325	1500	100	350	Naval SAMs	400	3250
AIR FORCE	7600	2300	1550	1500	Army SSMs	350	700
					Army ATGWs	2525	1200

It is immediately apparent that Israel is in a far different position from before. After the initial special weapons drawdown (and no adjustments for error), Israel's Army fights with 50,500 offense and 125,000 defense. After the same procedure, the combined enemy Army

forces sit at 71,500 offense and 344,000 defense, with Iran and Syria possessing a marked 1.6-to-1 advantage in destructive power over Israel. On the other hand, assuming that Israel utilizes all of its naval power, the Syrian fleet is easily obliterated without any damage to Israeli forces. Finally, even without factoring in SAM activity (which would leave Israel incredibly more powerful than the opposition), Israel retains an immense 7.5:1 effectiveness ratio against the opposition in the air. While Iran and Syria now pose a large land threat against Israel, the Israeli air forces that would remain even after use of SAMs could freely bombard key targets (military and government) in the opposing countries until those countries surrendered.

Note that while this last statement appears to be a contradiction, since ASM bombardments are included in the land force offensive values and not the remaining Air Force offensive value, the crude method of comparing final force structures utilized here is NOT a dynamic model. In other words, the presumed head-on nature of the confrontations does not at all take into account that offensive power decreases every round as units are destroyed. This shortcoming would not matter much due to the aggregate, imprecise nature of the overall model; however, in this case, where all opposition planes have been destroyed, and a vast number of now-invulnerable friendly aircraft remains, it must be noted that Israel now has the capability to completely repel the remaining opposition ground forces solely from the air. Therefore, in this scenario, it is still likely that Israel would survive, due to its tremendous air power.

The second multi-national scenario, pitting Iraq and Jordan against Israel, is more un-

likely. The one reason for including it is to measure Iraq's potential against Israel; unfortunately, no Mideast country is on good terms with Iraq at present. Therefore, Jordan is selected as the requisite border country because Syria is almost as unfriendly towards Iraq as it is towards Israel. Again, the composite equivalent force structures are compared:

Normal Forces	Israel, Offense	Israel, Defense	Iraq/Jor, Offense	Iraq/Jor, Defense	Special Drawdowns	Iraq and Jordan	Israel vs. Iraq/Jor
ARMY	50,500	128,000	40,500	88,000	All SAMs	850	2350
NAVY	325	1500	0	0	Naval SAMs	0	3550
AIR FORCE	7600	2300	3000	800	Army SSMs	150	750
					Army ATGWs	1475	1350

Giving Iraq and Jordan the benefit of the doubt, the 20% error factor is figured in once more, and after initial weapons drawdown, Israel's Army is left with an offensive force of 50,500 damage points and a defensive force of 101,000 hit points. The combined enemy Army ends up with 48,500 offensive points and 106,000 defensive. Interestingly, the two Armies have a 1-to-1 match-up between equivalent forces. Unfortunately for Israel, this particular opposition has no naval targets to be destroyed, and none of Israel's sea weapons are allowed to be redirected at land targets. Nonetheless, even when SAMs are not included in the model, Israel maintains the same air superiority it had in the two wars above, this time at a 3:1 ratio. Once again, we see that even though this ground war would probably end in a bloody stalemate, Israel's capability for power projection in the sky would assure Israeli victory.

The last Expanded Scenario considered here sends Israel into combat against its three closest enemies to the east — Jordan, Syria, and Iraq. Of course, for reasons stated above,

this scenario is highly unlikely. However, the only three-country enemy force of greater likelihood — Syria, Iran, and Jordan — differs very little from the Syria/Iran case considered earlier; Jordan, after all, poses only a small threat to Israel. So, let us examine Israel's chances here.

Normal Forces	Israel, Offense	Israel, Defense	Iq/Sy/Jn, Offense	Iq/Sy/Jn, Defense	Special Drawdowns	Iraq/Syria/ Jordan	Israel vs. Iq/Sy/Jn
ARMY	50,500	128,000	70,500	155,000	All SAMs	2075	2250
NAVY	325	1500	100	350	Naval SAMs	400	3450
AIR FORCE	7600	2300	3800	1850	Army SSMs	500	700
					Army ATGWs	2900	1250

Not giving the benefit of the doubt to anybody this time, initial special drawdowns leave Israeli Army forces at 50,500/125,000 (off/def). The three-country opposition Army sits at 70,500/153,000, and the ratio of destructive power rests in favor of the Arab nations, at 1.7-to-1. As in all three previous scenarios, the Israeli Navy maintains absolute control over the Mediterranean and Red Seas. Finally, the use of SAMs *is* a crucial point in this scenario. If they are used effectively by both sides, Israel's air forces could fall to only 225 points, signifying the destruction of over 90% of the Israeli Air Force. In reality, a balance such as the one in the table above would simply discourage Israeli sorties into enemy SAM-infested areas. Consequently, while more than a mere 10% of Israel's forces would survive in the real world, they would be highly ineffectual in aiding Israel's struggling ground forces. Thus, the study comes to the conclusion that if Iraq, Syria, and Jordan were on better terms, they could easily overwhelm Israel's forces and achieve the Arab League's stated goal of "driving the Jews into the Sea."

One relevant question is how Iraq, Syria, and Jordan can overpower Israel when Iran (with a better all-around military than Iraq), Syria, and Jordan cannot. The answer lies in examining air defense. Iraq has a much more extensive and powerful system of SAMs and air defense guns than any other country in the region. As we just saw, the key to Iraq, Syria, and Jordan defeating Israel is the absence of Israeli air power. Thus, even though the Iran/Syria force is able to soundly defeat the Israeli Army, Israel's Air Force survives in that scenario to repel the invaders. Not so against Iraq.

4.3 Theater-Wide Scenario — Arab Coalition

It should be obvious, then, that any Arab Coalition force (i.e. four or more countries) including Iraq could easily invade Israel and destroy its entire army. In fact, it is readily verifiable from this study's aggregated output that any coalition including Iran *or* Iraq stands a good chance of being able to do so.

Incorporating Iraq, however, is unlikely, and even though Iran would readily fight a war against Israel if it knew it could win, there is a more likely coalition force in the author's opinion. After all, the most likely Arab enemies to form a coalition are the ones closest to Israel — the ones on its borders, especially the ones that have warred against Israel before. Any circumstances that would cause Syria, Lebanon, Jordan, and Saudi Arabia to band together against Israel are assumed severe enough to provoke Egypt as well, and therefore this study lastly examines Israel vs. that 5-country coalition. The aggregate data follow:

Normal Forces	Israel, Offense	Israel, Defense	Coalition Offense	Coalition Defense	Special Drawdowns	Coalition	Israel vs. Coalition
ARMY	50,500	128,000	84,500	179,000	All SAMs	2575	2150
NAVY	325	1500	625	1450	Naval SAMs	1275	3300
AIR FORCE	7600	2300	4450	2800	Army SSMs	850	700
					Army ATGWs	5550	1200

After initial drawdowns, Israel's badly outnumbered Army stands with 50,500 damage points and 122,000 hit points. The Coalition Army presents 84,500 damage points and 177,000 hit points. However, even with Egypt's impressive naval fleet, the entire Coalition Navy is still easily wiped out under the onslaught of Israeli Navy SSMs. (Remember that in all of these scenarios, Israel has been using an Over-the-Horizon Targeting system, which has greatly multiplied the offensive effectiveness of its naval force.) The air battle, on the other hand, looks incredibly bleak for Israel. Assuming SAMs are used effectively on both sides, the Coalition does have the ability to destroy all of the IAF while still retaining over 20% of its Air Force to be used later in the war. Thus, with the Coalition Army's 2.4:1 advantage in forces over Israel's Army, it is more or less impossible for Israel to win this war. Again, one of the keys for the Arab Coalition is the ability to bring down all of Israel's flyers. The other major point, of course, is that putting five countries together against Israel simply presents too large of an attacking ground force for Israel to deal with. In such a small plot of land as Israel, the front lines in this scenario would be completely swollen, affording no maneuverability and incredibly high casualties on all sides before Israel's defeat.

5 Palestinians and Non-Conventional Possibilities

Regardless of the wartime scenario, the Palestinian population, augmented by the recent 35,000-strong armed Palestinian police force, could prove to be a major stumbling block in Israel's attempts to mobilize towards the front lines. After all, of all the populations in the Middle East, the Palestinians have the most hatred for their Israeli oppressors. It is almost guaranteed that an attacking Arab force would notify Palestinian authorities of the coming invasion, and ask for their help in sabotaging Israeli equipment, bases, weapons systems, etc. While the Palestinians obviously could not present a major armed threat to the IDF, they could block the entrances to bases, destroy roadways and runways, and generally bring the IDF mobilization to a standstill.

How might the IDF deal with this problem? This question raises a sensitive point that most Mideast commentators are loathe to put in an objective, truth-telling spotlight — that is, that there is no such thing as a Palestinian "civilian". Any *ABC News* viewer can infer that Palestinian youths are taught that Israel and the Jews are their enemies, and that throwing rocks at Israeli soldiers is a rite of passage. While throwing rocks at IDF troops seems reason enough (to this author) for retaliation with more than just rubber bullets, the possible massive "civilian" action that could be taken by the Palestinians against Israel during a war is without question reason enough for the IDF to treat every such "civilian" as an enemy soldier. In short, faced with the death of their nation, IDF soldiers could very well be instructed to massacre all Palestinians who make any attempt to hinder the progress of Israeli forces. An army is at its most vulnerable when in mobilization, and the IDF could

expect heavy losses if the Palestinians intervened. In such a situation, where every minute counts and every soldier's life matters, swift and deadly retaliation against the Palestinians would be not only called for, but necessary for the survival of the Israeli state.

6 Conclusions and Limitations

After several stages of estimation and assumption, the final equivalent force structures do a remarkable job of approximating reality. While the outcome of any war is uncertain to some extent, the damage point / hit point / multiplier system employed in this study allows for easy manipulation of the data to see that several different Mideast war scenarios play out the way an educated observer might expect. As one would think, the highly militarized Iran presents a potent force structure. Moreover, the study shows that Iraq, while a weakling now in comparison to the United States and other major powers, has rebuilt enough of its military since the Gulf War to pose a significant threat to any smaller nation in the region. Also, the study deals effectively with the question it was set to answer: the final equivalent force structures are easily compared to determine who in this hostile corner of the globe can and cannot defeat Israel. As evidenced in this model, the surrounding Arab countries will continue to pose a great risk to Israel's security and serve as a constant reminder to the dedicated soldiers of the IDF that Israel is only heartbeats away from annihilation. Whether this is "good" for the region in the long run is hard to say. Proponents of the Mideast peace process would rather have the entire region demilitarize, but they are deluding themselves to think that a few conferences and negotiations can settle religious disputes dating back thousands of years. Which is not to say that this author feels war is a better solution

than peace. Not at all. Rather, assured security for Israel is the goal that everyone from international diplomats to arms exporters should be seeking. Israel's policy to never start a war does not appear to be wavering in the slightest. Consequently, if no Arab nation or coalition could ever defeat Israel, there would be no possibility for war in the region. And therein lies the importance of studies such as these — assured survival can only be assured if the numbers say so.

Many of the limitations of this study have been pointed out along the way. They include: the limited availability of accurate numerical information regarding the weapons systems currently in use, the need to estimate killer-target scores based on educated guesses, the inability to adequately model the order of warfare between weapons, the inability to include ammunition stocks in the calculations and the consequent adoption of a rough system of measurement to determine equivalent force structures, and the attempts to quantize the qualitative aspects of war. As pointed out directly above, the study nevertheless produces output consistent with an educated observer's intuition regarding the true military balance in the Middle East.

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