

LETTING COMBAT RESULTS SHAPE THE
NEXT AIR-TO-AIR MISSILE

THE COMBAT EXPERIENCE: USE OF AIR-TO-AIR MISSILES IN WAR

KILLS WITH
MISSILES

FORMOSA STRAITS 1958	4
SOUTHEAST ASIA 1965-1968	77
SOUTHEAST ASIA 1971-1973	62
MIDDLE EAST 1967	UNKNOWN
PAKISTAN 1971	UNKNOWN
MIDDLE EAST 1973	176
FALKLANDS 1982	17
MIDDLE EAST 1982	<u>59</u>
TOTAL KNOWN	407

THE COMBAT EXPERIENCE: FIRST INSIGHTS INTO ACTUAL MISSILE FIRING CONDITIONS

	TOTAL KILLS	IR+ *GUNS	RADAR	RADAR AND FRONT	RADAR AND FRONT AND BVRA
SOUTHEAST ASIA 1965-1968	117	78%	22%	5%B	0%
SOUTHEAST ASIA 1971-1973	73	59%	41%	7%	2.7%
MIDDLE EAST 1973	261	98%	2%	0.4%	0.4%
MIDDLE EAST 1982	77	81%	15%	1%	1%

AFIRED BEYOND 30,000 FT
B INCLUDES BEAM SHOTS

THE COMBAT EXPERIENCE: FIRING ATTEMPTS PRESENTED IN COMBAT

	TOTAL ATTEMPTS	REAR (±500)	FRONT (±600)	BEYOND 5 NMI	WITHIN 2,000 FT
SOUTHEAST ASIA 1953-1968	939	74%	12%	4%	25%
SOUTHEAST ASIA 1971-1973	549	80%	17%	5%	18%
MIDDLE EAST 1973	405	99%	1%	1%	
MIDDLE EAST 1982	121	95%	4%	4%	7%

THE COMBAT EXPERIENCE: RADAR MISSILE USAGE

	RADAR MISSILE LAUNCHES	FRONT (±500)	BEYOND 5 NMI
SOUTHEAST ASIA 1955-1968	321	16%	10%
SOUTHEAST ASIA 1965-1973	597	17%	10%
MIDDLE EAST 1973	12	20%	10%
MIDDLE EAST 1982	23	22%	9%

THE COMBAT EXPERIENCE: TACTICAL SITUATION PRESENTED IN COMBAT

	KILLS	TARGET UNAWARE	INITIAL CONTACT BY RADAR OR OTHER AVIONICS	INITIAL CONTACT BY RADAR ALONE	INITIAL CONTACT FROM FRONT (+500) LOOKDOWN
SOUTHEAST ASIA 1956-1968	117	44-80%	35%	14%	74%
SOUTHEAST ASIA 1971-1973	73	60-80%	35%	14%	73%
MIDDLE EAST 1973	261				
MIDDLE EAST 1982	77				
					(7/41/29)
					20%
					70%
					66%

*KILLS/ATTEMPTS

- AIM-7 2/28
- AIM-9 11/27
- GUN 2/7

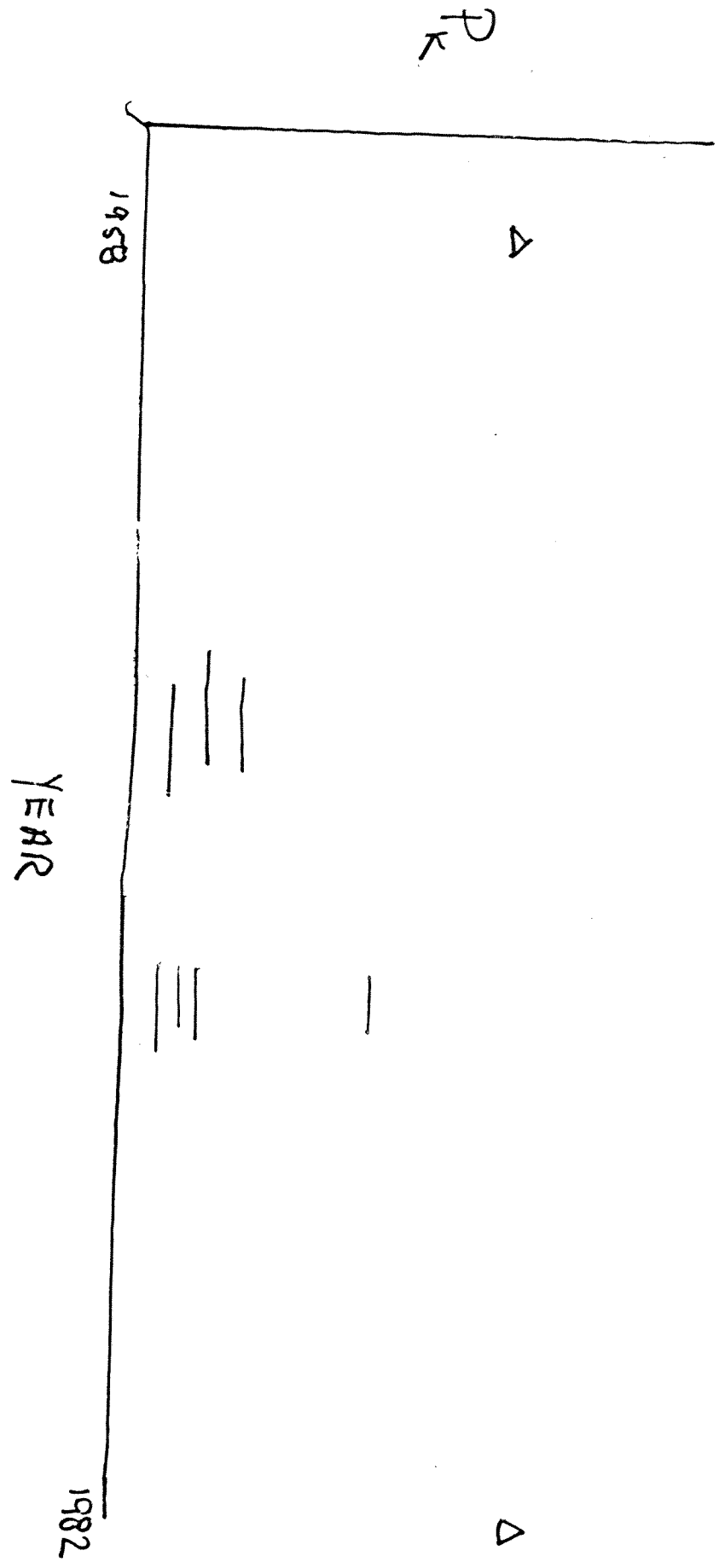
SHOTS

ASPECT AND RANGE

(CLASSIFIED)

**THE COMBAT EXPERIENCE
MISSILE LETHALITY OVER TIME**

(CLASSIFIED)



SOME OBSERVATIONS FROM COMBAT EXPERIENCE

- 0 MOST TARGETS WERE UNAWARE AND FIRED UPON FROM THE REAR
- 0 A SMALLER BUT STILL SIGNIFICANT NUMBER OF TARGETS WERE AWARE AND MANEUVERED HARD TO COUNTER THE ATTACK
- 0 MANY OF THE REAR SHOTS WERE FIRED FROM ABOVE THE TARGET (I.E., SHOOTDOWN)
- 0 THERE WERE ALMOST NO HEAD-ON, BVR SHOTS

IMPLICATIONS OF COMBAT EXPERIENCE FOR AIR-TO-AIR MISSILES

IMPLICATION

0 EFFECTIVENESS AGAINST UNAWARE TARGETS

- RETAIN SURPRISE
- ABILITY TO KILL FROM RANGES AND ASPECTS DICTATED BY POSITIVE ID REQUIREMENTS
- PASSIVE GUIDANCE
- 3 NM RANGE ±60 DEGREES OFF THE TAIL ASSUMING VISUAL ID
- LONGER (E.G., 30 TO 40 NM HEAD ON) IF RELIABLE RADAR ID
- MUST NOT SUFFER CENTROID EFFECT MUST DISCRIMINATE CRUISING TARGET FROM DOPPLER AND IR GROUND CLUTTER
- EXPLOIT FLEETING OPPORTUNITIES AGAINST MULTIPLE UNAWARE TARGETS
- HIGH RATE OF LOCK-ON AND LAUNCH (LESS THAN 5 SECS FROM DESIRE TO FIRE)
- PERMIT LARGE NUMBER OF MISSILES TO BE CARRIED WITHIN FIXED WEIGHT AND DRAG
- CARRY UP TO 16 F-4/F-15 WITHIN WEIGHT AND DRAG OF 4 AIM-7 AND 4 AIM-9 (INCLUDING LAUNCHERS)
- SHORT "WINDOWN OF VULNERABILITY" WHILE FIRING
- LESS THAN 7 SEC FROM DESIRE TO BREAKAWAY

0 EFFECTIVENESS AGAINST AWARE TARGETS

- EXPECT INTELLIGENT COUNTERMEASURES
- ROBUSTNESS AGAINST MANUEVERING, FLARES AND/OR SIMPLE ECM

THE MOST DOMINANT ASPECT OF MISSILE AIR COMBAT TO DATE HAS BEEN THE
REQUIREMENT TO POSITIVELY IDENTIFY THE TARGET

RESULTS IN DOGFIGHTS WITH ALMOST ALL SHOTS WITHIN VISUAL RANGE
AND FROM THE REAR HEMISPHERE

WHAT NEW INVENTION WILL
CHANGE THIS?

EFFECTIVENESS COMPARISONS

AIM-7 AIM-9 AMRAAM*

- 0 RETAIN SURPRISE
- 0 ABILITY TO KILL WITHIN 3 NMI
- 0 ABILITY TO KILL BEYOND 3 NMI
- 0 LOOKDOWN OR FORMATION TARGETS
- 0 FLEETING OPPORTUNITIES
- 0 LARGE WEAPON LOADOUT
- 0 SHORT WINDOW OF VULNERABILITY
- 0 INTELLIGENT COUNTERMEASURES
 - MANEUVERING
 - FLARES
 - SIMPLE ECM

NOTE: READER DO HIS/HER
OWN RATING BASED ON
DATA PRESENTED HEREIN

*ASSUMES MISSILE MEETS PERFORMANCE SPECIFICATION