NEXT AIR-TO-AIR MISSILE
LETTING COMBAT RESULTS SHAPED THE
TOTAL KNOWN

MIDDLE EAST 1982

FALKLANDS 1982

MIDDLE EAST 1973

PAKISTAN 1971

MIDDLE EAST 1967

SOUTHEAST ASIA 1971-1973

SOUTHEAST ASIA 1955-1958

FORMOSA STRAITS 1958

MISSILES

KILLS WITH

MISSILES IN WAR

THE COMBAT EXPERIENCE: USE OF AIR-TO-AIR MISSILES IN WAR
**Missile Beam Shots**

<table>
<thead>
<tr>
<th></th>
<th>0.4%</th>
<th>1%</th>
<th>15%</th>
<th>17%</th>
<th>81%</th>
<th>77</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Middle East 1982</strong></td>
<td>261</td>
<td>98%</td>
<td>41%</td>
<td>59%</td>
<td>73</td>
<td>73</td>
</tr>
<tr>
<td><strong>Southeast Asia 1971-1973</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Southeast Asia 1965-1968</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Kills**

<table>
<thead>
<tr>
<th>Guns</th>
<th>Radar and Front</th>
<th>Radar and Front</th>
<th>IR+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The combat experience: First insights into actual missile firing conditions*
2,000 FT

WITHIN 5 MNI

BEYOND FRONT (5600)

REAR ATTEMPTS (5600)

TOTAL ATTEMPTS PRESENTED IN COMBAT

THE COMBAT EXPERIENCE: FIRING ATTEMPTS PRESENTED IN COMBAT
<table>
<thead>
<tr>
<th>Region</th>
<th>Radar Missle Launches</th>
<th>Front ($\pm 60^\circ$)</th>
<th>Beyond 5 NMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southeast Asia 1955-1968</td>
<td>321</td>
<td>16%</td>
<td>10%</td>
</tr>
<tr>
<td>Southeast Asia 1965-1973</td>
<td>597</td>
<td>17%</td>
<td>10%</td>
</tr>
<tr>
<td>Middle East 1973</td>
<td>12</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>Middle East 1982</td>
<td>23</td>
<td>22%</td>
<td>9%</td>
</tr>
</tbody>
</table>
## The Combat Experience: Tactical Situation Presented in Combat

<table>
<thead>
<tr>
<th>Region</th>
<th>KILLS</th>
<th>Initial Contact by Radar or Other Avionics</th>
<th>Initial Contact by Radar Alone</th>
<th>Initial Contact from Front (+600) Lookdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southeast Asia 1952-1958</td>
<td>117</td>
<td>44-80%</td>
<td>74%</td>
<td></td>
</tr>
<tr>
<td>Southeast Asia 1971-1973</td>
<td>73</td>
<td>60-80%</td>
<td>14%</td>
<td>73%</td>
</tr>
<tr>
<td>Middle East 1973</td>
<td>261</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle East 1982</td>
<td>77</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Kills/Attempts*

AIM-7 2/28

AIM-9 11/27

Gun 2/7
THE COMBAT EXPERIENCE
MISSILE LETHALITY OVER TIME

(CLASSIFIED)
0 There were almost no head-on, BVR shots

0 Many of the rear shots were fired from above the target (i.e., shootdown)

0 Maneuvered hard to counter the attack

0 A smaller but still significant number of targets were aware and

0 Most targets were unaware and fired upon from the rear

Some observations from combat experience
FLARES AND/OR SIMPLEX ECM

- Robustness Against Maneuvering
- Breakaway To Less Than 1 Sec From Descent To 0
- Less Than 9 (Including Launchers)
- 4 AIM-9 (Including Launchers) Weight And Drag Of 4 AIM-7 And Carry Up To 10 F-4/F-15 Within Fire
- Less Than 5 Secs From Descent To High Rate Of Lock-on And Launch From Doppler And IR Ground Clutter
- Must Discriminate Crowding Targets
- Must Not Suffer Centroid Effect
- If Available Radiar ID Longer E.C. 30 To 40 NM. Head On
- The Tail Assuming Visual ID
- 3 NM Range +/- 60 Degrees Of Passive Guidance

IMPLEMENTATION

- Expect Intelligent Countermeasures
- Effective Against Multiple Unaware Targets
- Effective Against Multiple Unaware Targets
- While Firing
- Short Window Of Vulnerability
- Carry Large Number Of Missiles To Be
- Exploring Firing Opportunities
- And Forming Targets
- Retain High Pk For Lockdown
- Deteriorate By Positive ID Requirements
- Ability To Kill From Ranges And Aspects
- Retain Surprise
- Effective Against Multiple Unaware Targets

IMPLEMENTATION OF COMBAT EXPERIENCE FOR AIR-TO-AIR MISSILES
CHANGE THIS?
WHAT NEW INVENTION WILL

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

REQUIREMENT TO POSITIVELY IDENTIFY THE TARGET
THE MOST DOMINANT ASPECT OF MISSILE AIR COMBAT TO DATE HAS BEEN THE
DATA PRESENTED HERELN
OWN RATING BASED ON
Note: Reader do his/her

- Simple ECM
- FLARES
- MANEUVERING
  - Intelligent Countermeasures
  - Short Window of Vulnerability
  - Large Weapon Loadout
  - Flight Opportunities
  - Lookdown or Formation Targets
  - Ability to Kill Beyond 3 NMI
  - Ability to Kill Within 3 NMI
  - Retain Surprise

EFFECTIVENESS COMPARISONS

AIM-7  AIM-9 AMRAAM