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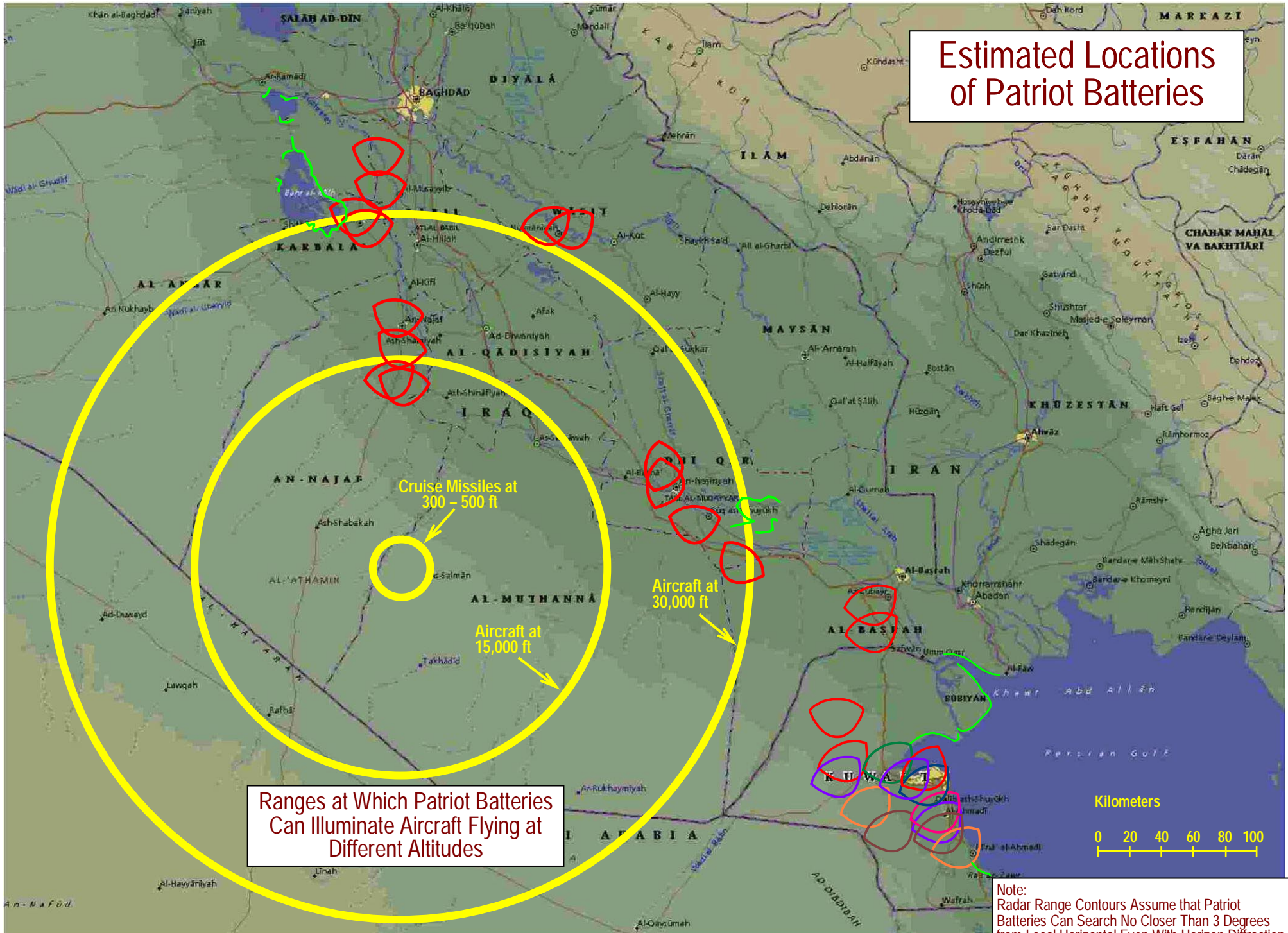
## Additional Information of Technical Relevance

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Small Nose Radius of Tactical Ballistic Missile Warhead is the Dominant Contribution to the Nose-On Radar Cross Section (RCS).  
For Nose Radii of 1 to 2 inches, the overall RCS will be less than 0.01 m<sup>2</sup>, or about a thousand or more times smaller than a typical aircraft.  
As a result, Patriot Units that do not have the benefit of cueing information will have very short acquisition ranges against short-range ballistic missiles.

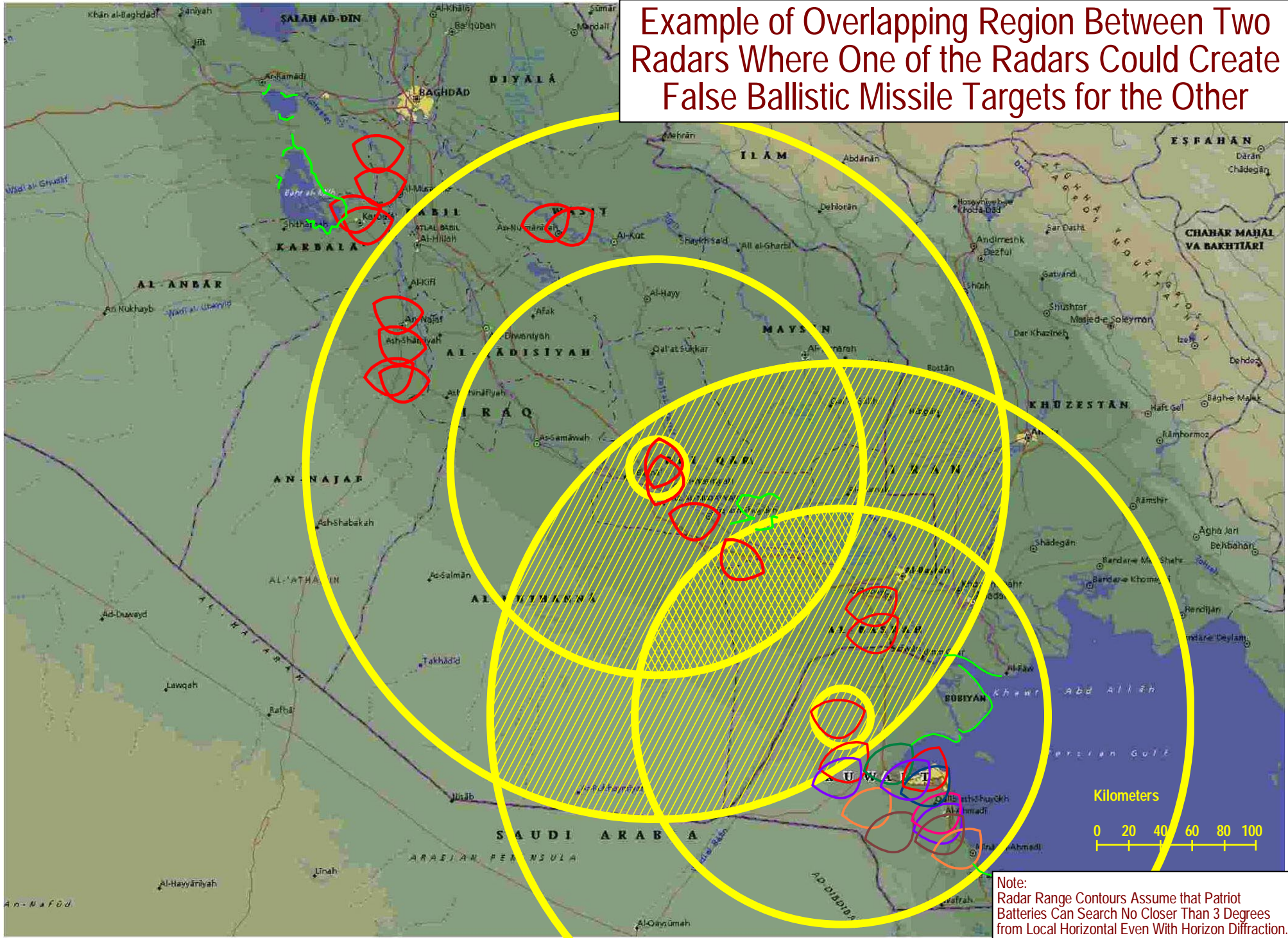
# Estimated Locations of Patriot Batteries



Ranges at Which Patriot Batteries Can Illuminate Aircraft Flying at Different Altitudes

Note: Radar Range Contours Assume that Patriot Batteries Can Search No Closer Than 3 Degrees from Local Horizontal Even With Horizon Diffraction.

# Example of Overlapping Region Between Two Radars Where One of the Radars Could Create False Ballistic Missile Targets for the Other



Note:  
Radar Range Contours Assume that Patriot Batteries Can Search No Closer Than 3 Degrees from Local Horizontal Even With Horizon Diffraction.

# Estimated Number of Patriot Radars Simultaneously Tracking Friendly Aircraft Over Iraq and Kuwait

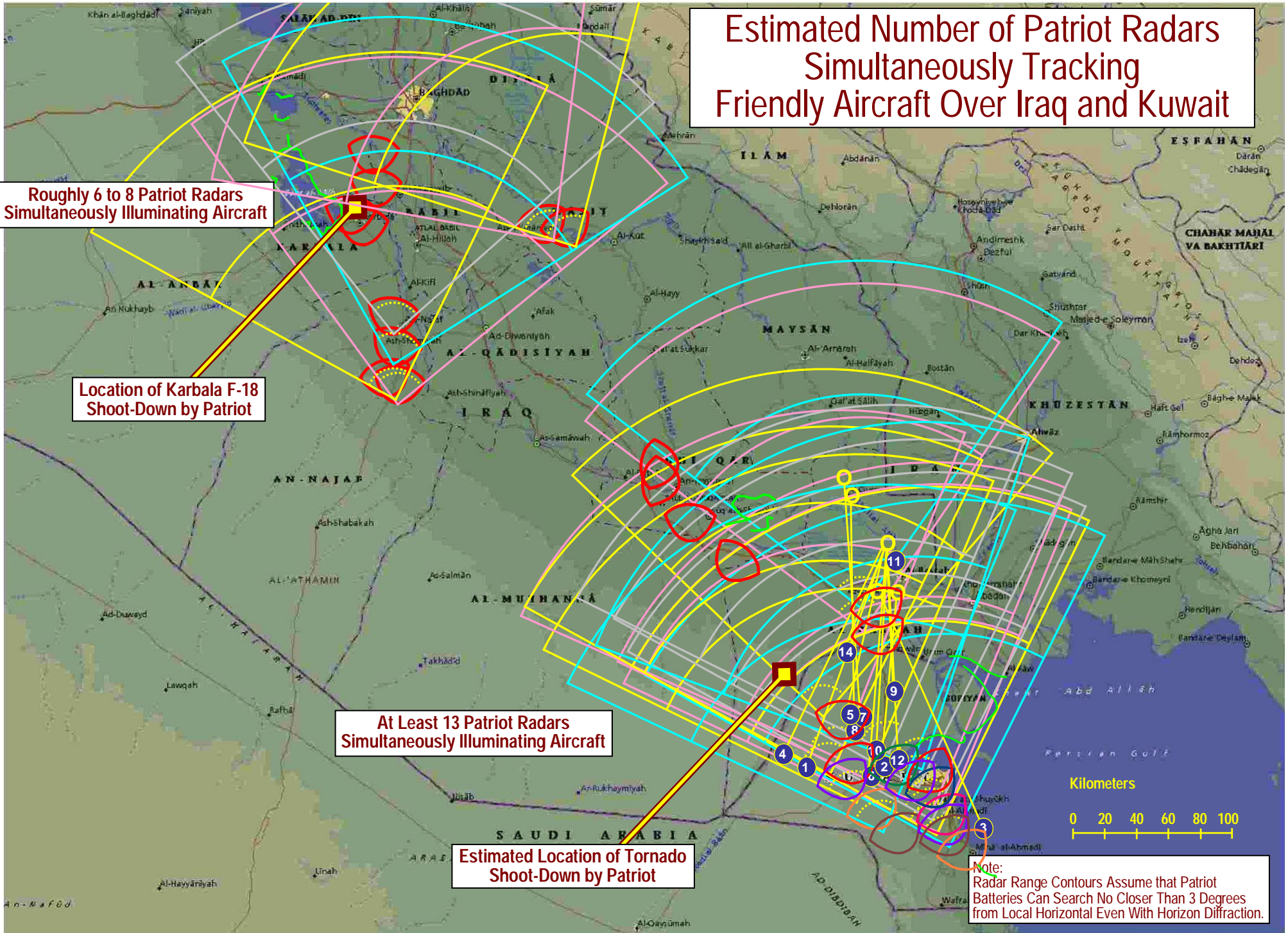
Roughly 6 to 8 Patriot Radars Simultaneously Illuminating Aircraft

Location of Karbala F-18 Shoot-Down by Patriot

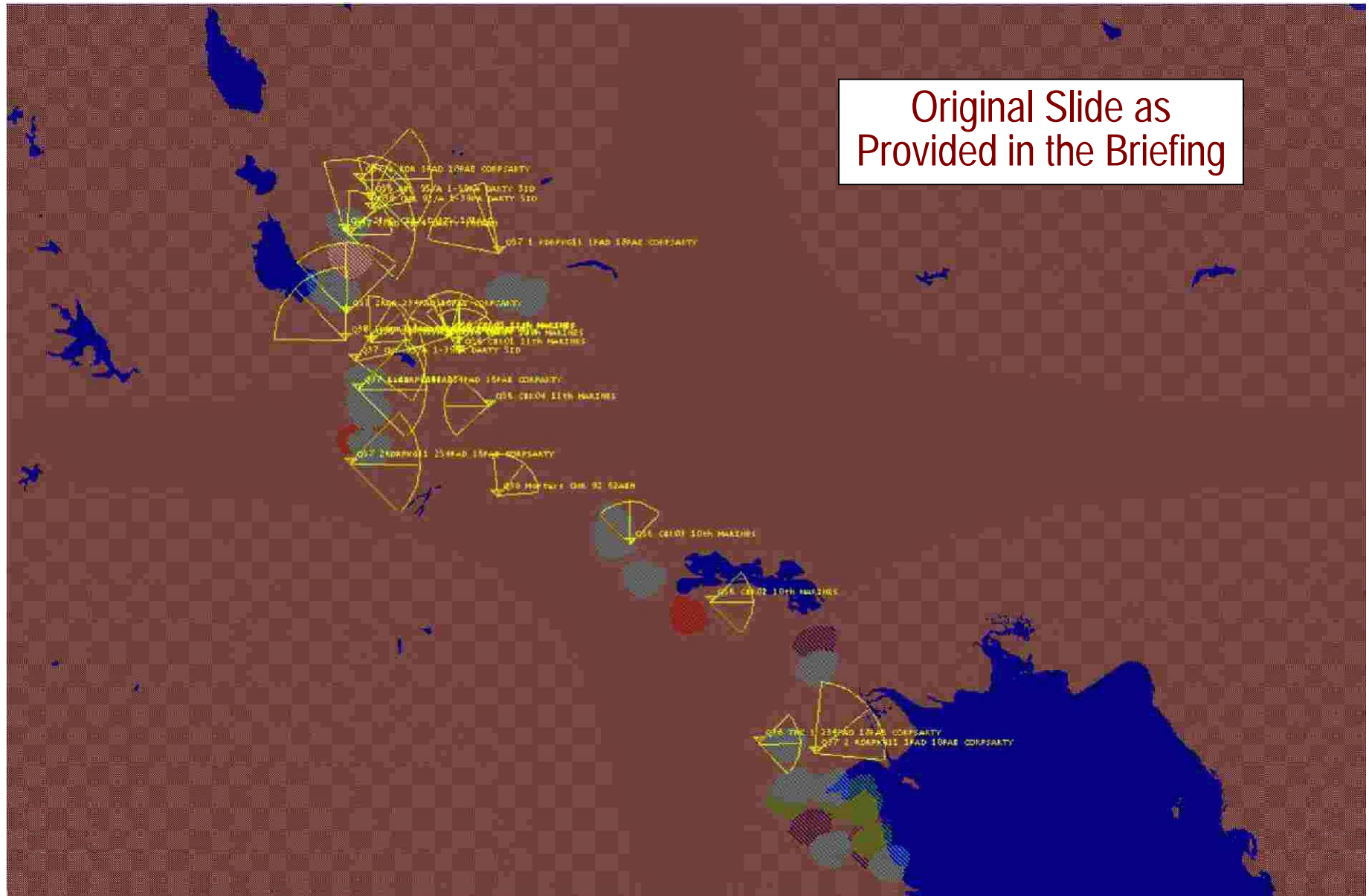
At Least 13 Patriot Radars Simultaneously Illuminating Aircraft

Estimated Location of Tornado Shoot-Down by Patriot

Note: Radar Range Contours Assume that Patriot Batteries Can Search No Closer Than 3 Degrees from Local Horizontal Even With Horizon Diffraction.

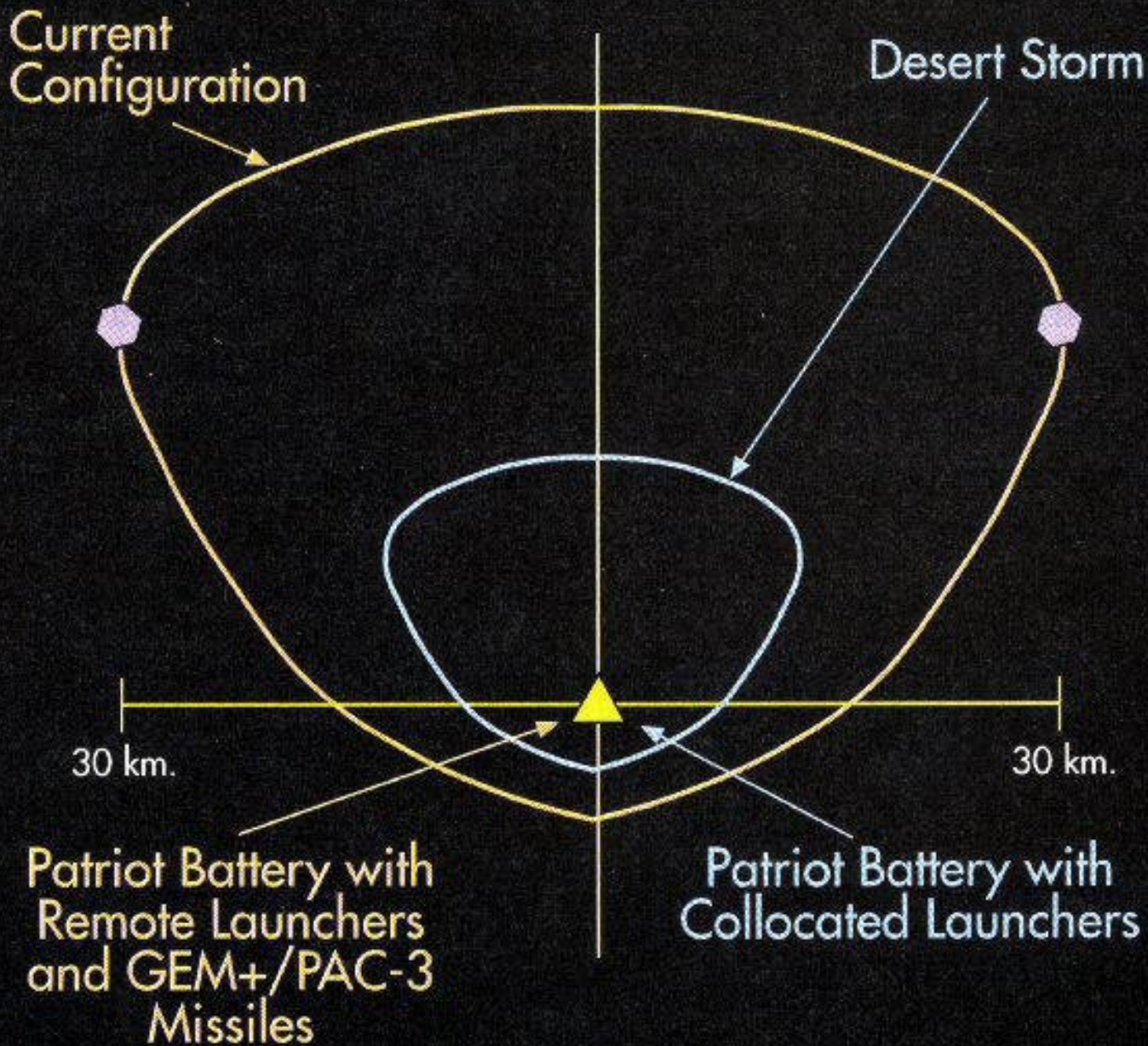


# Slide 50 from Briefing by the 32<sup>nd</sup> Army Air and Missile Defense Defense Command



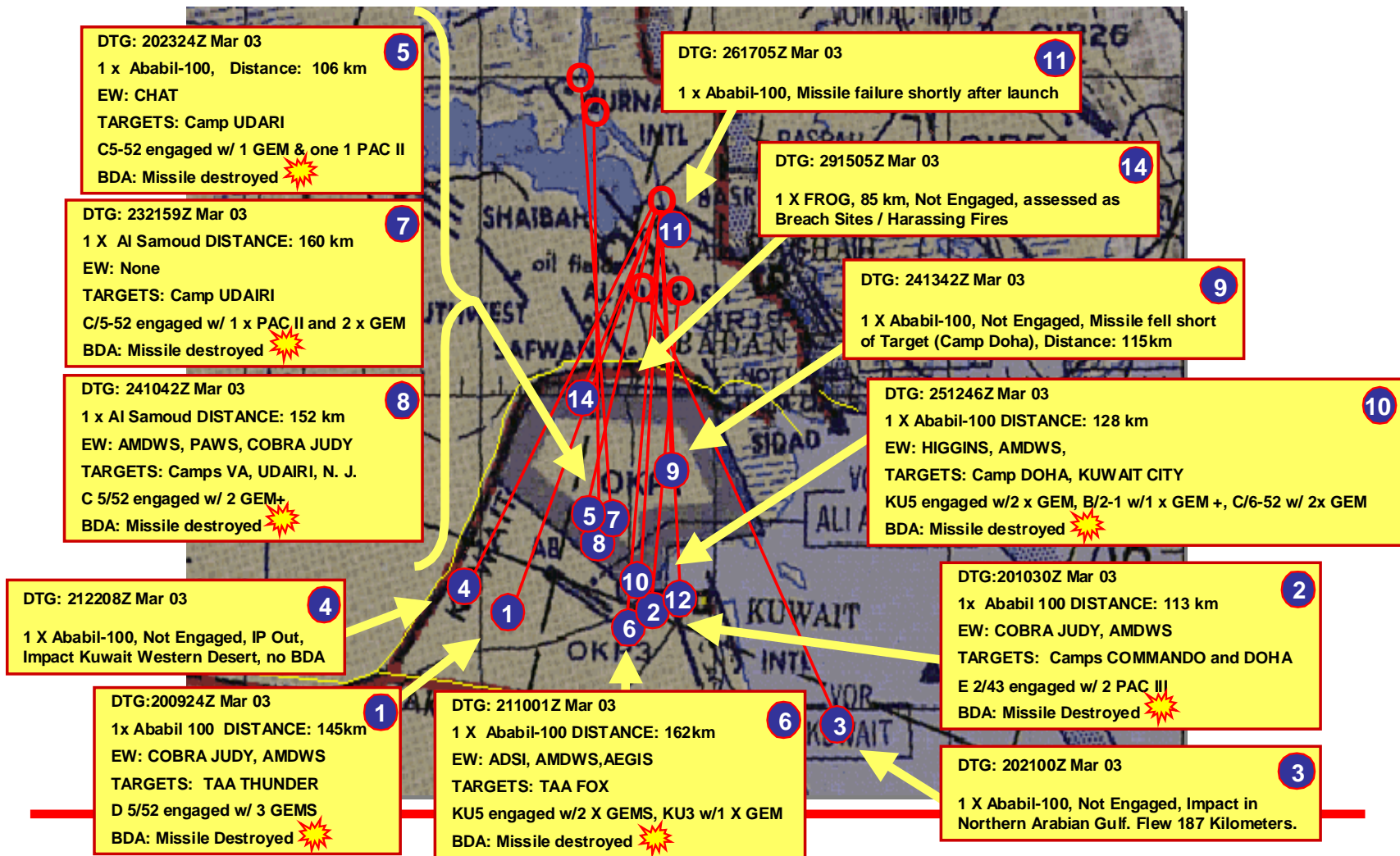


# Patriot Ballistic Missile Defense (1991 vs. 2003)

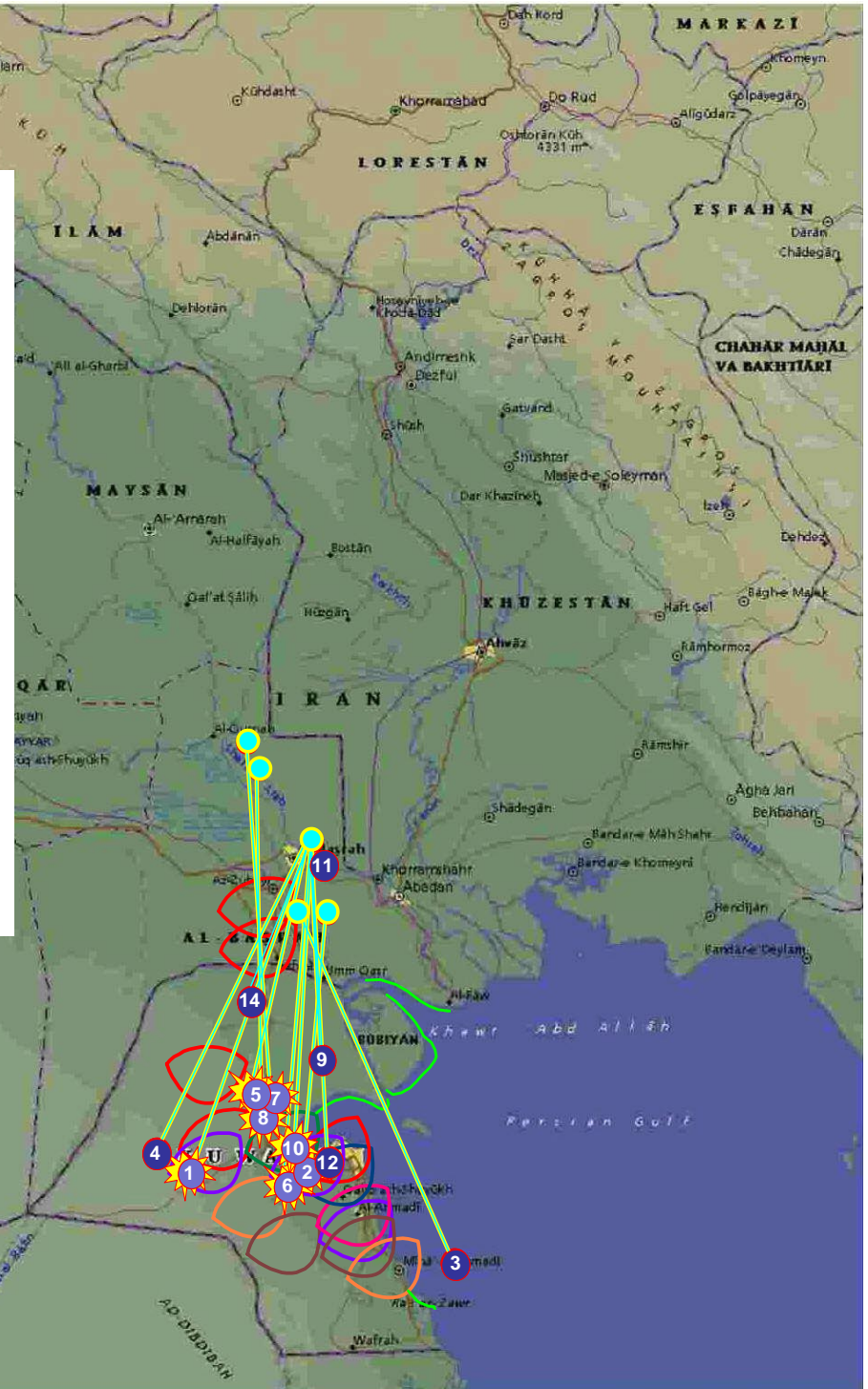
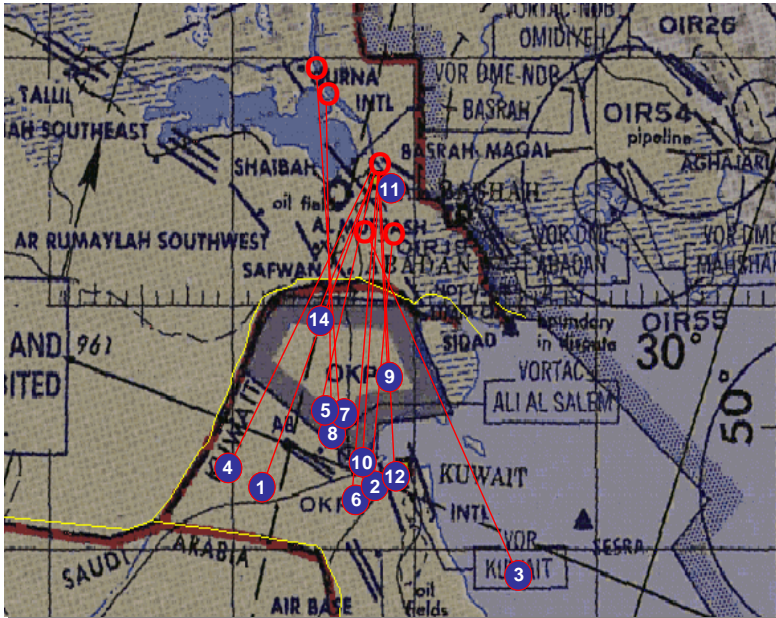




# Summary of Launches against Kuwait



## Summary of Launches against Kuwait





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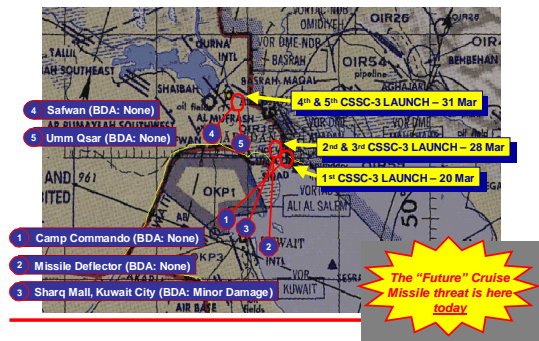
## Extracted Slides from the Army Air Defense Artillery Briefing

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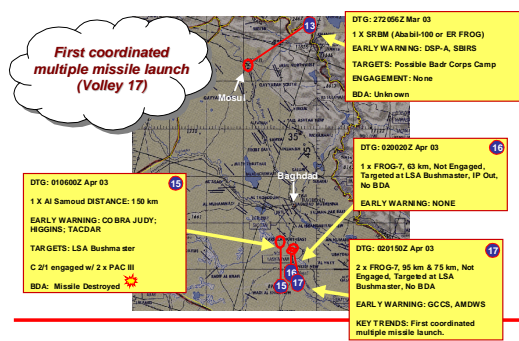


# Extracted Slides from the Army Air Defense Artillery Briefing (Page 2 of 3)

## Summary of CSSC-3 Launches



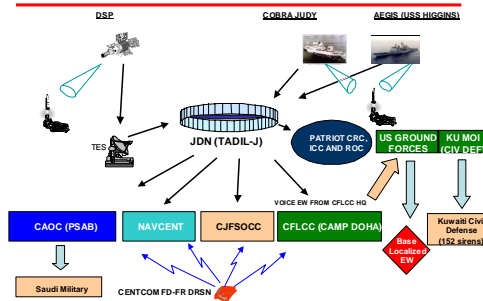
## Summary of Launches in Iraq



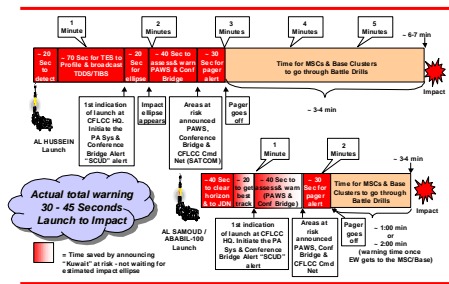
## What TAMD Forces Protected

VOLLEY	DTG	LOCATION	WHAT WAS THERE
1	200924ZMAR03	TAA Thunder	101st AAD Aviation Assets - 100+ Helos / 4,000 Soldiers
2	201030ZMAR03	Camp Commando Al Jahra	1 MEF / Marine Engineer Group HQ - 4,700 Marines / 100,000 Civilians
5	202324ZMAR03	Camp Udairi	11th AHR and Combat Support Hospital - 4,000 Soldiers
6	211001ZMAR03	TAA FOX Al Jahra	1st Forward Service Support Group - 4,500 Marines / 100,000 Civilians
7	232159ZMAR03	Camps NJ / NY / PA	101st AAD - 12,000 Soldiers
8	241042ZMAR03	Camps VA / NJ	V CORPS Main / 101st AAD - 8,000 Soldiers
10	251246ZMAR03	Camp Commando	1 MEF / Marine Engineer Group HQ - 4,700 Marines
12	270831ZMAR03	Camp Doha	Camp Doha / CFLCC HQ - 8,000
15	010600ZAPR03	LSA Bushma ster	11 AHR, 101st AAD Aviation Assets, V CORPS Log Assets / 10,000 Soldiers

## Early Warning



## Estimated Launch to Impact Timeline



## Final Thoughts

- Proven....
- You will fight as you train
  - Patriot is lethal
  - Non-contiguous battlefield exposes us all
  - There is no difference between SHORAD AND HIMAD.. but the equipment. The fundamental tasks to guarantee freedom of maneuver are the same
  - There is no difference between EAC and Corps Patriot; all must be trained under one standard
  - Basic fundamentals carry the fight; again

## LESSONS/OBSERVATIONS (-)

### Joint Deficiencies

- C4I Lacking - Internal and external voice & data capability -- Controlling Authority to shooter links
  - Voice over TADIL-J / Link 16
  - Voice to air borne controller
  - Theater Air Defense net
- Impacts of dense joint / coalition battlespace & EMI & Spurious tracks, IFF
  - Training, Doctrine, Material Solutions
- Space based warning not effective for SRBMs

## LESSONS/OBSERVATIONS (-)

### Systems Deficiencies

- SRBMs more challenging - non-contiguous battlefield requires 360° coverage
- Interoperability via Link 16 to Battery Level

### Operational Deficiencies

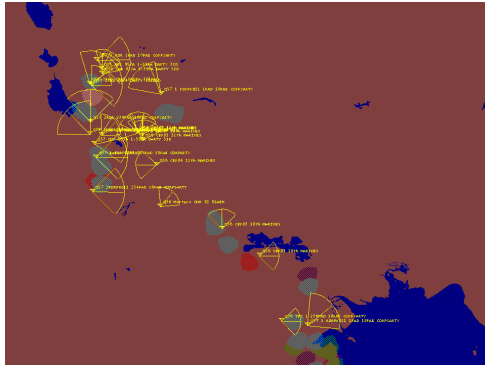
- Need revised Tactical SOP for Patriot Crews w/ focus on engagement operations
- EAD / EAC unit training to include CSS training
  - Operations on non-contiguous battlefield
  - Resourcing of CSS units
- PATRIOT organization
  - 4 Btry vs. 5 Btry battalion
  - PAC II in PAC III Task Force

Completed Action

## The "Way Ahead"

- OIF validated the inherently "Joint Nature" of Theater Missile Operations
- Joint Exercise/ Experiments enhance combat readiness (RS, UFL, IL, CJTFEX (JCJET))
- "CTC Like" training opportunity required for AMD forces
- C2 limitations pose greatest risk now and in the future
- Enhance capabilities to counter the evolving threat
- Theater-level air defense command required
  - Today- 32d AAMDC with Joint Responsibilities
  - Tomorrow- Standing Integrated Missile Defense JTF

# Extracted Slides from the Army Air Defense Artillery Briefing (Page 3 of 3)



## AMD LESSONS LEARNED (+)

### Joint Operations

- Joint (AEGIS) early warning and situational awareness w/ Link 16
- Role as DAADC w/ CFACC – Counter-TBM team (Attack Operations), AADP
- Role as TAAMDCOORD w/ CFLCC-Operations w/ V Corps, I MEF
- Operational Force Protection

### Combined Operations

- Integration of US & Coalition TMD operations: Jordan, Qatar, Bahrain, Turkey, Saudi Arabia, Kuwait, Israel, Dutch, UK
- C2 of Kuwait PATRIOT (46 ADA (KWTF) TACON to 11 BDE in Feb 03)
- Host nation early warning

### Performance

- PATRIOT lethality proven – 9 of 9- confirmed warhead kills 8 of 9
- OR Rate for the Patriot force >92% during combat operations
- Stance and flexibility – Playbook, Shortstop, EAC remissioning, Asymmetric defense
- Divisional ADA – Combined arms contribution, fight as a battalion, security missions, CMO

## ACHIEVING THE AMD “STANCE”

### TACTICAL

- PATRIOT IS A SECTORED WEAPON; DOES NOT PROVIDE 360 DEGREE COVERAGE
- NON-CONTIGUOUS BATTLEFIELD INCREASED REQUIRED FIRE UNITS; MULTIPLE PLS
- HEAVY TRUCKS STUCK ROUTINELY
- COMBINED ARMS INTEGRATION (DIVISIONAL) UP/PATRIOT
- ASYMMETRICAL THREAT – STINGER OVERMATCHED
- RESULT: EXPOSURE OF HIGH VALUE ASSETS TO TBM& AND CRUISE MISSILES

### OPERATIONAL

- 13<sup>TH</sup> AIRBORNE REGIMENT MOVED BY AIR TO BASHURE A FIELD, NORTH EAST IRAQ; C-130 ONLY AIR FLD
- IRAG LAUNCHED TWO FROGS TOWARD THEIR LOCATION
- CENTCOM REQUESTED PATRIOT SUPPORT
- DUE TO NON-CONTIGUOUS BATTLEFIELD PATRIOT COULD NOT MOVE OVER LAND TO DEFEND 17<sup>TH</sup> ASSETS TO TBM& AND CRUISE MISSILES
- PATRIOT REQUIRES C-17C-5
- RESULT: UNDEFENDED AND EXPOSED FORCES

### STRATEGIC

- 17 C5A AND 21 C17s TO MOVE 8 PATRIOT MINIMUM ENGAGEMENT PACKAGES TO IRDRAIN
- PATRIOT LAUNCHERS DO NOT FIT ON LOWER DECKS OF ALL SHIPS; MOSTLY WEATHERDECKS
- RESULT: LIMITED AIR FRAMES DEVOTED TO MOVE PATRIOT

Pursue AMD-Vision

OF VALIDATED THE REQUIREMENT FOR MEADS

## SITUATIONAL AWARENESS/UNDERSTANDING

VOICE	DATA
<ul style="list-style-type: none"> <li>• PATRIOT IN IRAQ COULD NOT TALK TO TACD IN KUWAIT</li> <li>• NO SATCOM</li> <li>• AWACS CANT TALK TO GROUND BASED UNITS</li> <li>• RESULT: NO VOICE LINK BETWEEN BATTALION HQS AND HIGHER AUTHORITY (ID AND ENGAGEMENT)</li> <li>• FIX: MTOE AND JOINT</li> <li>• ACTION: ADAS / 32<sup>ND</sup> AMDCD</li> </ul>	<ul style="list-style-type: none"> <li>• SHORTAGE OF HSDIO CARDS RESULTED IN PAC-2 UNITS NOT TRANSMITTING/RECEIVING DATA FROM ICC/TACD/CRC</li> <li>• PAC-2 AND PAC-3 INCOMPATIBILITY</li> <li>• RESULT: AUTONOMOUS UNITS</li> <li>• FIX: HSDIO CARDS FOR PAC-2 UNITS PATRIOT &amp; MEADS TRANSITION</li> <li>• ACTION: LTPO AND 50ND AMDCD</li> </ul>
JDN	ACO/SPINS
<ul style="list-style-type: none"> <li>• AWACS/CRC DID NOT ALLOW GROUND AND SEA BASED DATA TO BE DISPLAYED</li> <li>• RESULT: DIFFERENT AIR PICTURE AT DIFFERENT LEVELS OF COMMAND</li> <li>• 1ST TIME PATRIOT WAS AWARE OF INCOMING TBM&amp;S WHEN IT'S RADAR SAW IT</li> <li>• FIX: MAXIMIZES JOINT EFFORTS IN DEFINING THE JDN</li> <li>• ACTION: DOD</li> </ul>	<ul style="list-style-type: none"> <li>• OF SPINS WERE NOT TIMELY</li> <li>• UNITS NOT AGGRESSIVE IN RECEIVING ACO/SPINS</li> <li>• ACMS NOT USED TO ROUTE FRIENDLY AC</li> <li>• RESULT: UNITS OPERATING OFF DIFFERENT DATA</li> <li>• FIX: JOINT TRAINING</li> <li>• ACTION: ADAS/32<sup>ND</sup> AMDCD/IV ADA</li> </ul>

CHALLENGED AIRSPACE CONTROL

## RADAR RELIABILITY

TWT	COMPRESSOR/DEHYDRATION UNIT
<ul style="list-style-type: none"> <li>• MAX LIFE IS 10,000 HRS; NO TIMER ON TWT</li> <li>• RESULT: SOLDIER DOESN'T KNOW HOW MANY HOURS ON HS TWT</li> <li>• RECOMMENDATION: 1) ESTABLISH PROCEDURES TO TRACK TWT USE 2) ESTABLISH TWT WARN-UP CRITERIA</li> <li>• ACTION: LTPO</li> </ul>	<ul style="list-style-type: none"> <li>• CURRENTLY REQUIRES SOLDIER W/ STOPWATCH TO TIME ON AND OFF CYCLES FOR AN HOUR TO DETERMINE FCM/CMC</li> <li>• RESULT: PROCEDURE NOT PRACTICAL IN WAR</li> <li>• RECOMMENDATION: EITHER CHANGE WAVE GUIDE PRESURIZATION SYSTEM OR ADD THIS CHECK INTO BIT (TELLS OPERATOR IF COV &amp; OVERHEATING)</li> <li>• ACTION: LTPO</li> </ul>
CABLES ON THE FRONT-END	HIGH FAILURE RATES
<ul style="list-style-type: none"> <li>• CABLES NO DIAGNOSTICS</li> <li>• SOLDIER REPLACES ONE CABLE THAT APPEARS TO BE DEFECTIVE – A PROBLEM IS INTRODUCED THAT IS NOT DETECTABLE WITH DIAGNOSTICS</li> <li>• RECOMMENDATION: ESTABLISH LIFE EXPECTANCY ON CABLES; REPLACE ALL 3</li> <li>• ACTION: LTPO</li> </ul>	

OFF SHIP/AIRCRAFT READINES

## TRAINING

### AMD STANDARD BEAR

- SOLDIERS 100% RELIANT ON PATRIOT WEAPON SYSTEM
- NO STANDARD FOR TRAINING PROFICIENCY
- RECOGNITION OF TECHNICAL/TACTICAL COMPETENCE
- RESULT: ACROSS THE FORCE THERE ARE VARYING DEGREES OF STANDARDS
- FIX: 1) INITIATE MASTER GUNNER COURSE (1<sup>ST</sup> CLASS 2<sup>ND</sup> QTR FY04)
- 2) DEVELOP PUSH/PULL GUNNER MANUAL
- 3) DEVELOP AMD TOP GUN PROGRAM
- 4) TRAIN NEW POST-OFF TSP
- ACTION: ADAS / 32<sup>ND</sup> AMDCD

### OPERATOR TRAINING IN AN AMBIGUOUS ENVIRONMENT

- ON-LINE TRAINING MODE/TROOP PROFICIENCY TRAINER DOES NOT PRESENT OPERATOR WITH MISCLASSIFIED OR FALSE TRACKS
- COFT – INCAPABLE OF SCRIPTING SPURIOUS TRACKS
- FIX: UPDATE OTM/TTP/COFT SOFTWARE
- ACTION: LTPO / 32<sup>ND</sup> AMDCD

PROFESSIONALIZE THE FORCE

## TRAINING

### FRIENDLY PROTECT

- OPERATORS FOCUS SOLELY ON TBM&S; DID NOT WORK ID OF UNKNOWN/AIRCRAFT ON SCOPE
- LOST SITUATIONAL AWARENESS OF AIR TRACKS
- AUTONOMOUS OPERATIONS PROCEDURES NOT CLEAR
- RESULT: LOSS OF SITUATIONAL AWARENESS
- FIX: TRAIN SCOPE AWARENESS – ALL AIR PLATFORMS
- ACTION: ADAS/32<sup>ND</sup> AMDCD

### PATRIOT GENERAL KNOWLEDGE

- OPERATORS AT ALL LEVELS DIDN'T FULLY UNDERSTAND TABULAR ENTRY VALUES
- PROCEDURES NOT ESTABLISHED FOR HARMONIZING THE PATRIOT WEAPON/LAW METT/CTC
- RESULT: OPERATOR NOT ENABLING THE WEAPON SYSTEM
- FIX: RE-WRITE TSP; INCLUDE LINKAGE BETWEEN IPB/DOCTRINAL/SITUATIONAL TEMPLATE) TO TABULAR ENTRIES
- GROW EXPERTS IN THE FORCE
- ACTION: ADAS/32<sup>ND</sup> AMDCD

PROFESSIONALIZE THE FORCE

## BASIC FUNDAMENTALS

### SHOOT

- MUST SHOOT INDIVIDUAL AND CREW SERVED WEAPONS TWICE A YEAR
- CONVOY LFX A MUST
- RING MOUNT READINGS
- TIME DATE ACTION DRILLS - SPORTS
- WEAPONS MAINTENANCE
- MUZZLE AWARENESS

### MOVE

- CONVOY PROCEDURES
- MANEUVER / COMBINED ARMS
- VEHICLE RECOVERY OPERATIONS
- MTOE REVIEW - PLUGGERS; NVGs
- UP-ARMORED HMMV's
- FUTURE REQUIREMENTS

### COMMUNICATE

- RADIO MAINTENANCE
- FIELD EXPEDIENT ANTENNAS
- AIR/DIRM PHONES/SATCOM - MTOE
- MEDEVAC CALL FOR FREQ
- USAF "RENEWALS" PROHIBITS AMDWS, C2PC, CHAT
- AIRBORNE PLATFORMS; CANT TALK TO PATRIOT

### FIX – “CTC-LIKE EXPERIENCE”

- COMBINED ARMS/JOINT
- COE/NON-CONTIGUOUS
- TRAINED/COMPETENT OCS AND OPFOR; TBM&S, CMs UAVs, ASYMMETRIC THREATS
- LESSONS LEARNED; COMMUNITIES OF PRACTICE
- LEADER DEVELOPMENT – LEADER TRAINING PROGRAM
- UPDATE MTPs AND JOINT DOCTRINE
- LFX – DUST FACILITY/ CONVOY LFX

WARRIOR FOCUS