

F-35 INFORMATION FUSION

Thomas L. Frey, Jr.

Lockheed Martin Senior Fellow
F-35 Information Fusion Chief Scientist

Coauthors: J. Chris Aguilar, Kent R. Engebretson, David K. Faulk, and Layne G. Lenning



WHAT IS INFORMATION FUSION?

Fusion is a “...hardened ‘smart’ networking capability flying into a heavily defended airspace, **collecting information** about ever-changing defenses ... **finding and automatically prioritizing** multiple targets in the air and on the ground even as they change, securely **sharing that information** with other weapons systems ... all while going up to Mach 1.5+.”

Maj. Scott “Worm” Trageser and Capt. Mark “Quatro” Tappendorf of the Air Force Reserve 466th Fighter Squadron, 419th Fighter Wing, from Hill AFB, Utah

<https://theaviationist.com/2018/04/18/why-does-the-public-have-trouble-understanding-the-f-35-air-force-reserve-pilots-tell-us-the-f-35a-is-a-powerful-force-multiplier/#ETILIBa8pg4YfL44.99>

IN THE F-35,
THERE'S AN APP
FOR THAT (FUSION)

THE EVOLUTION OF FUSION TECHNOLOGY

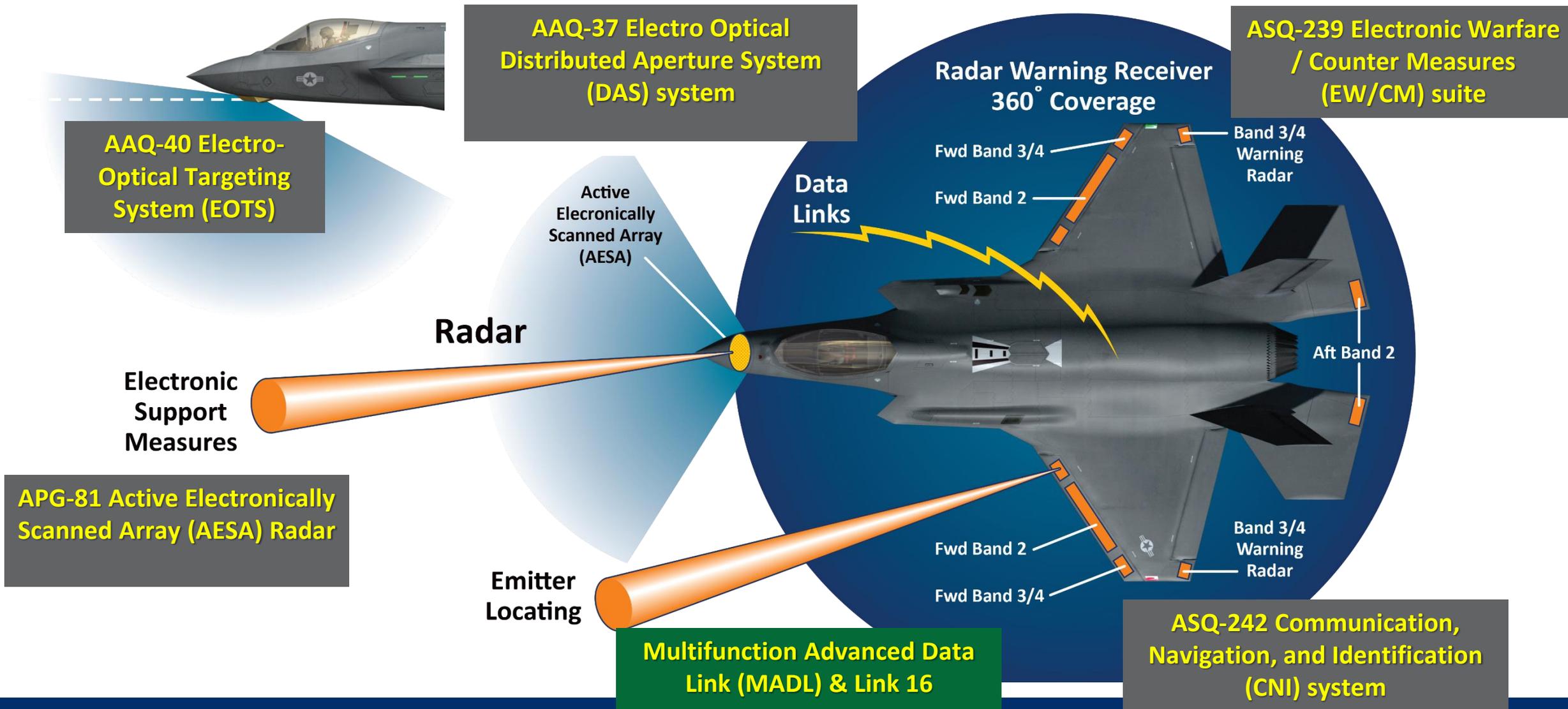


- Measurement-Based
- Autonomous Sensor Management
- Evidential-Based ID Algorithm
- Collaborative Sharing / Connected
- Fusion Agnostic Data Sharing

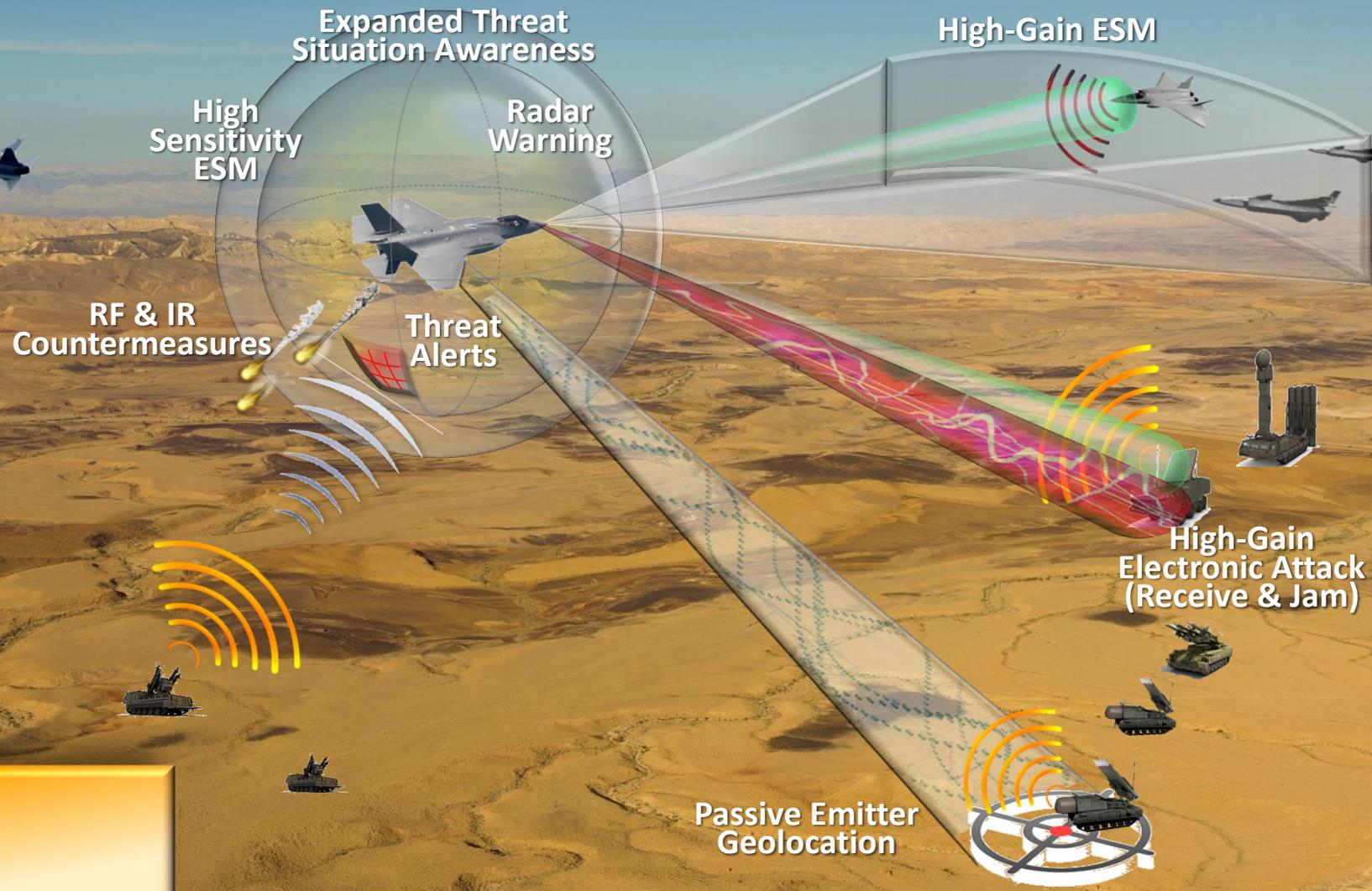


F-35 FUSION IS FULLY
CONNECTED TO THE
INFORMATION NETWORK

F-35 INTEGRATED AVIONICS SUITE – THE “EYES AND EARS”



AN/ASQ-239 ELECTRONIC WARFARE SYSTEM



- Fast Emitter Detection
- High Density/Complex Environments
- Emitter ID

AN/APG-81 RADAR

Air-to-Air

- Autonomous Search
- All Aspect Search
- Passive Search
- Cued Search
- Multi-target Track
- Air-to-Air Targeting
- Air Target Identification
- Sector Search
- Air Combat Maneuvering
- Passive Track

Navigation Support

- Weather

Air-to-Surface

- SAR
- Air-to-Ground Ranging
- Sea Search
- GMTI
- Big SAR
- GMTT
- Ship Target Track

Electronic Warfare

- ESM
- Electronic Attack
- Advanced Electronic Protection

- 3rd Generation Tactical AESA Radar
- Support of Multiple Interleaved Tasks

AN/AAQ-40 ELECTRO-OPTICAL TARGETING SYSTEM

Air-to-Air Targeting FLIR

- Infrared Video Imaging

Air-to-Surface Targeting FLIR

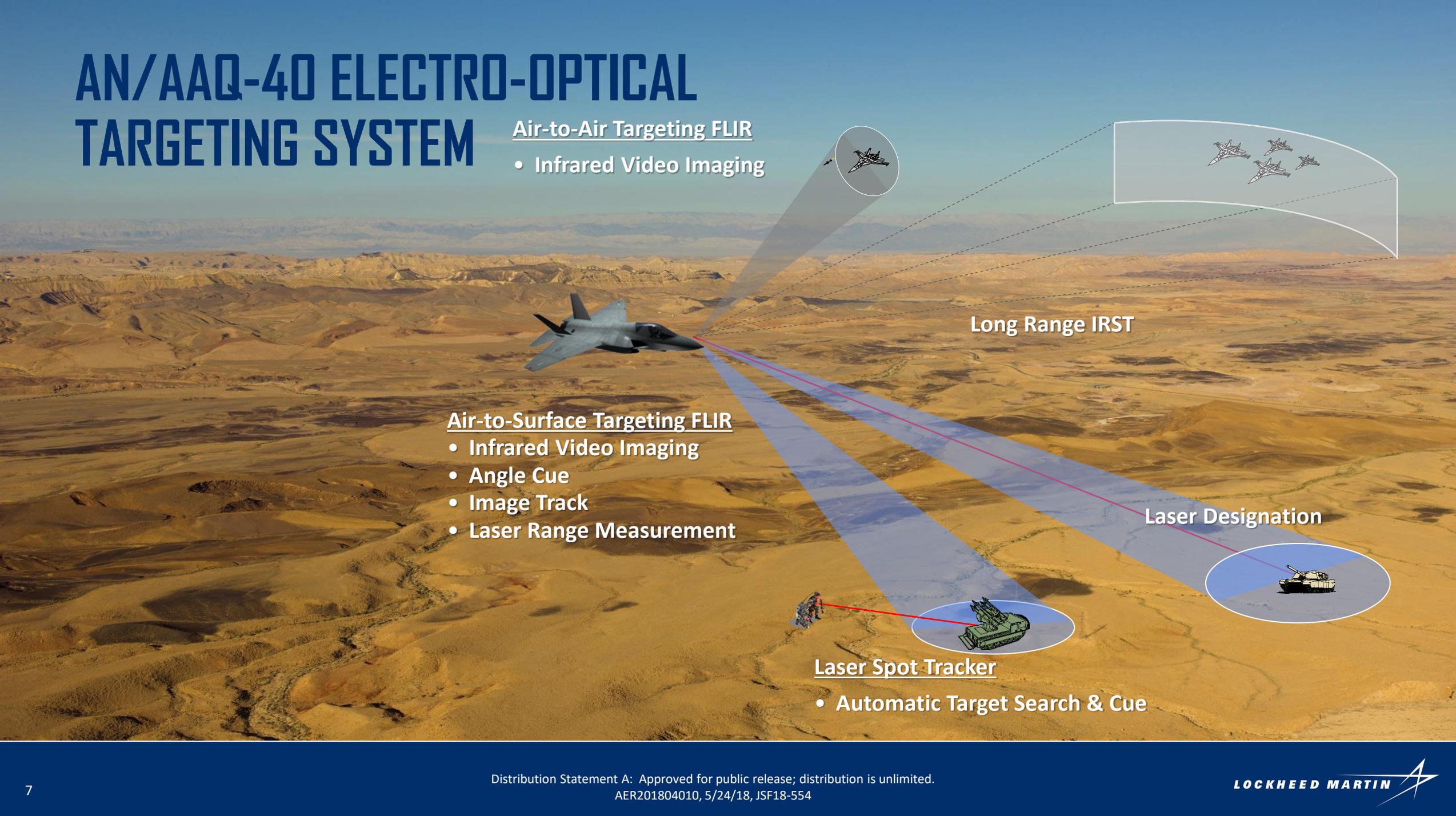
- Infrared Video Imaging
- Angle Cue
- Image Track
- Laser Range Measurement

Laser Spot Tracker

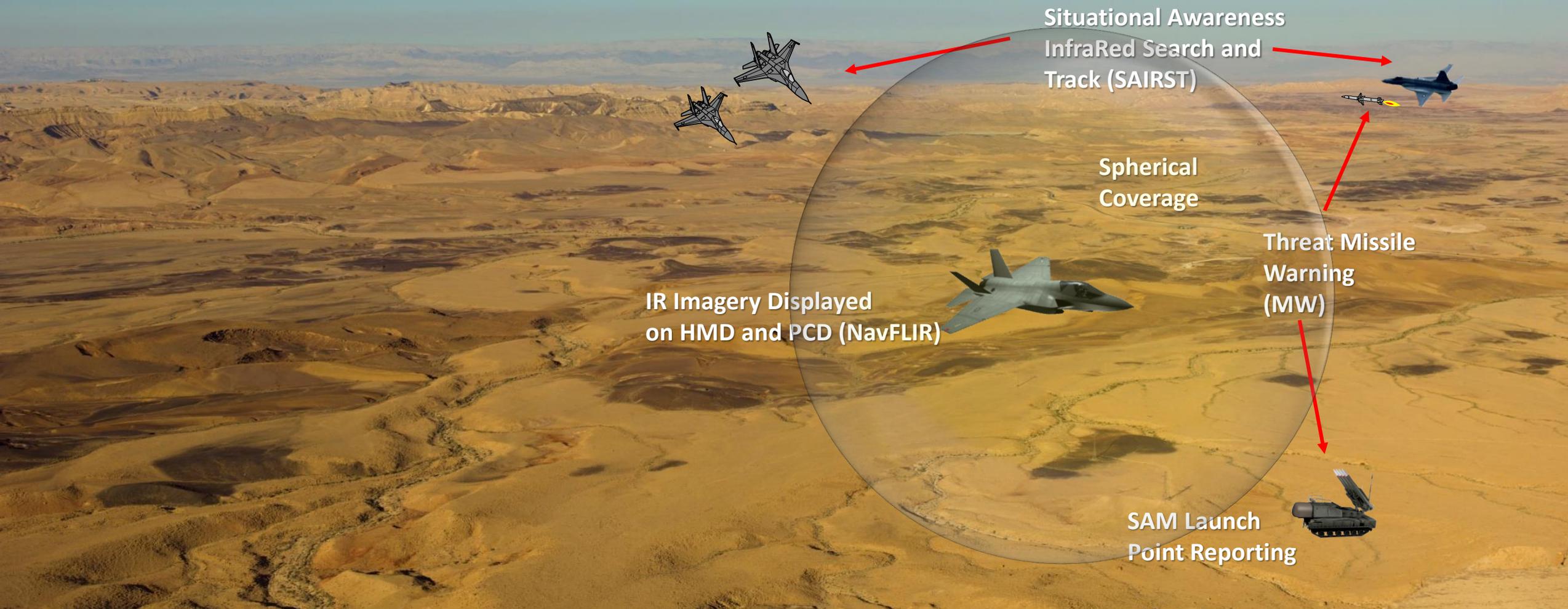
- Automatic Target Search & Cue

Long Range IRST

Laser Designation



AN/AAQ-37 ELECTRO-OPTICAL DISTRIBUTED APERTURE SYSTEM



AN/ASQ-242 COMMUNICATION NAVIGATION AND IDENTIFICATION SYSTEM

Training Systems

- P5 CTS
- Embedded Training

Data Link

Communications

- Link 16
- VMF
- MADL

Voice Communication

- UHF/VHF Voice (AM/FM)
- Secure Voice
- HAVEQUICK
- SINGARS

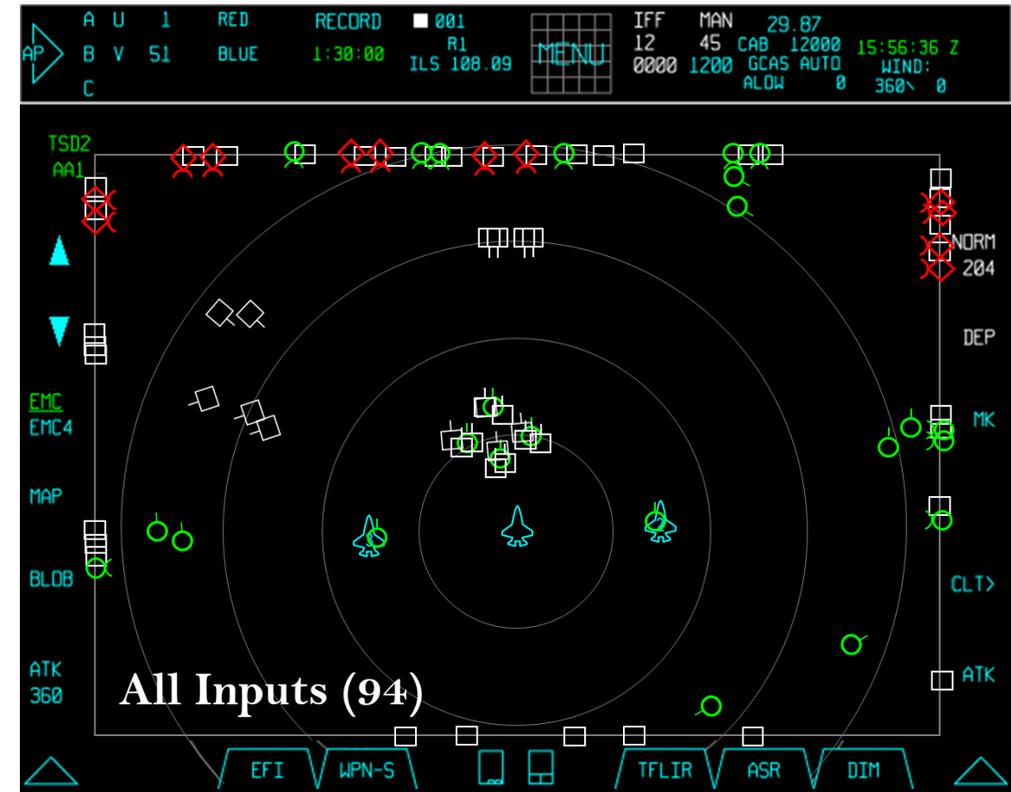
Navigation

- INS
- GPS
- Radar Altimeter
- ILS Marker Beacon
- ILS Glideslope
- ILS Localizer
- TACAN
- Carrier ILS
- JPALS

Identification

- Mark XII Transponder - Modes 1, 2, 3/A, C, 4, 5, S
- Mark XII Interrogator - Modes 1, 2, 3/A, C, 4, 5

INPUTS TO FUSION



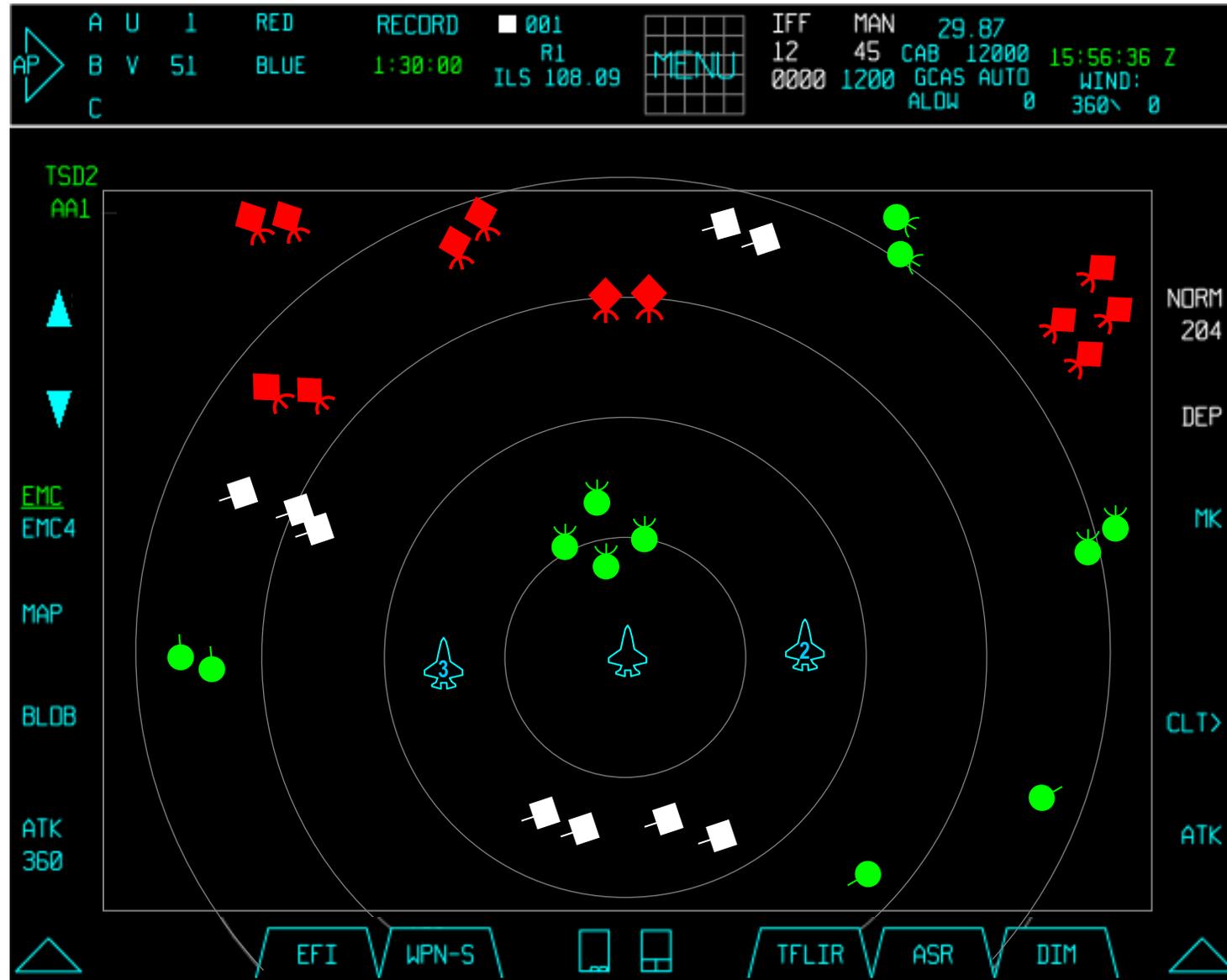
LEGACY TRACK BLENDING

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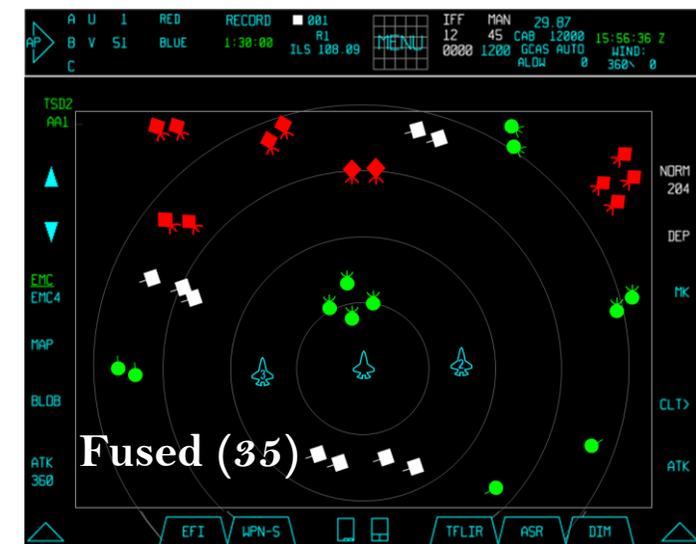
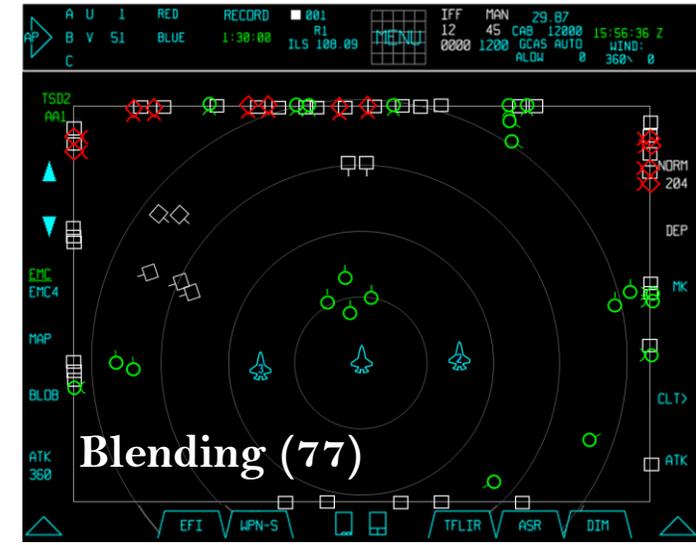


F-35 CLOSED LOOP FUSION

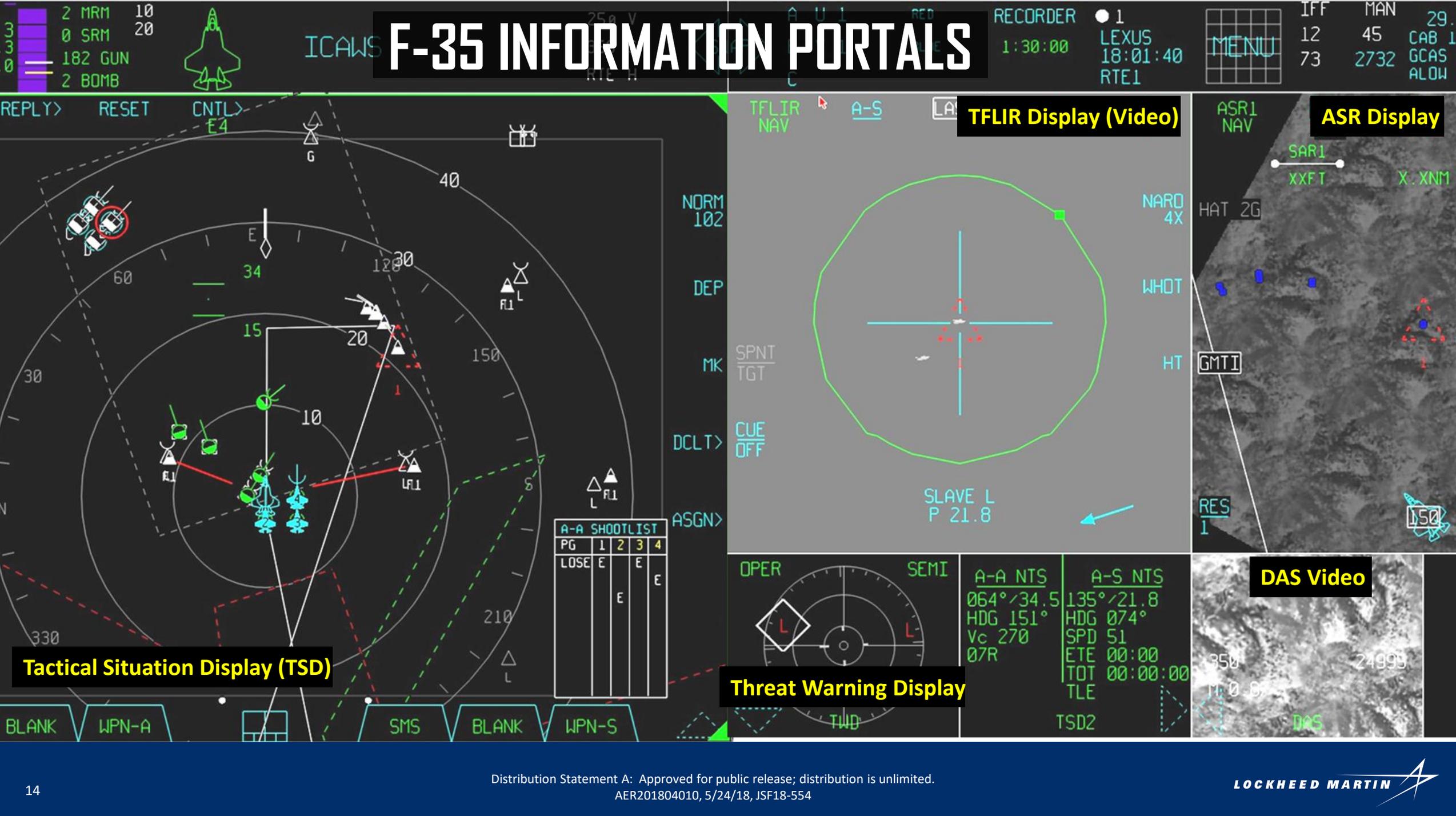
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ALL VIEWS



F-35 INFORMATION PORTALS



F-35 INFORMATION FUSION

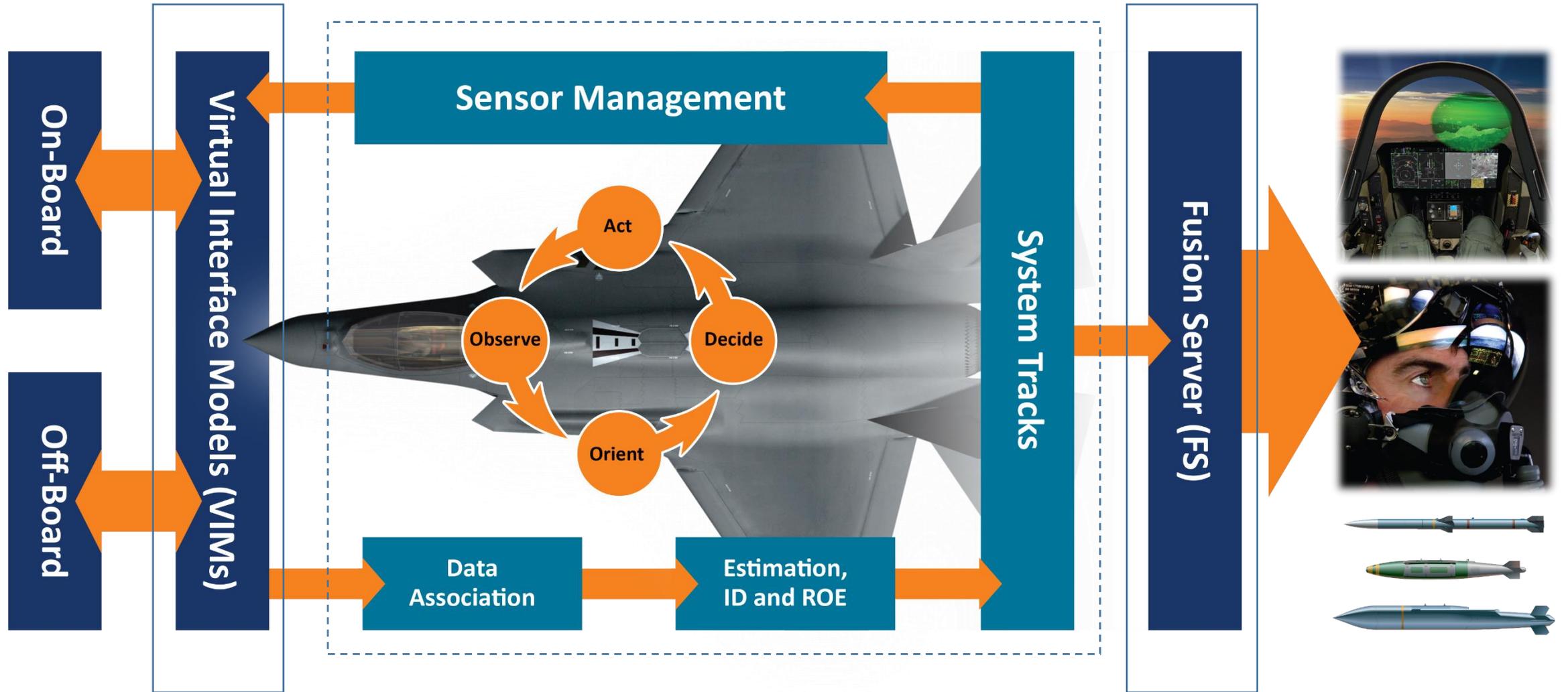
Information Fusion combines data to create an integrated view of the environment.

F-35 Information Fusion solution provides:

- Extensible Architecture
- Information Based Data Sharing Across Platforms
- Evidential-Based Identification Algorithm
- Autonomous Sensor Management
- Collaborative Sensing/Operations

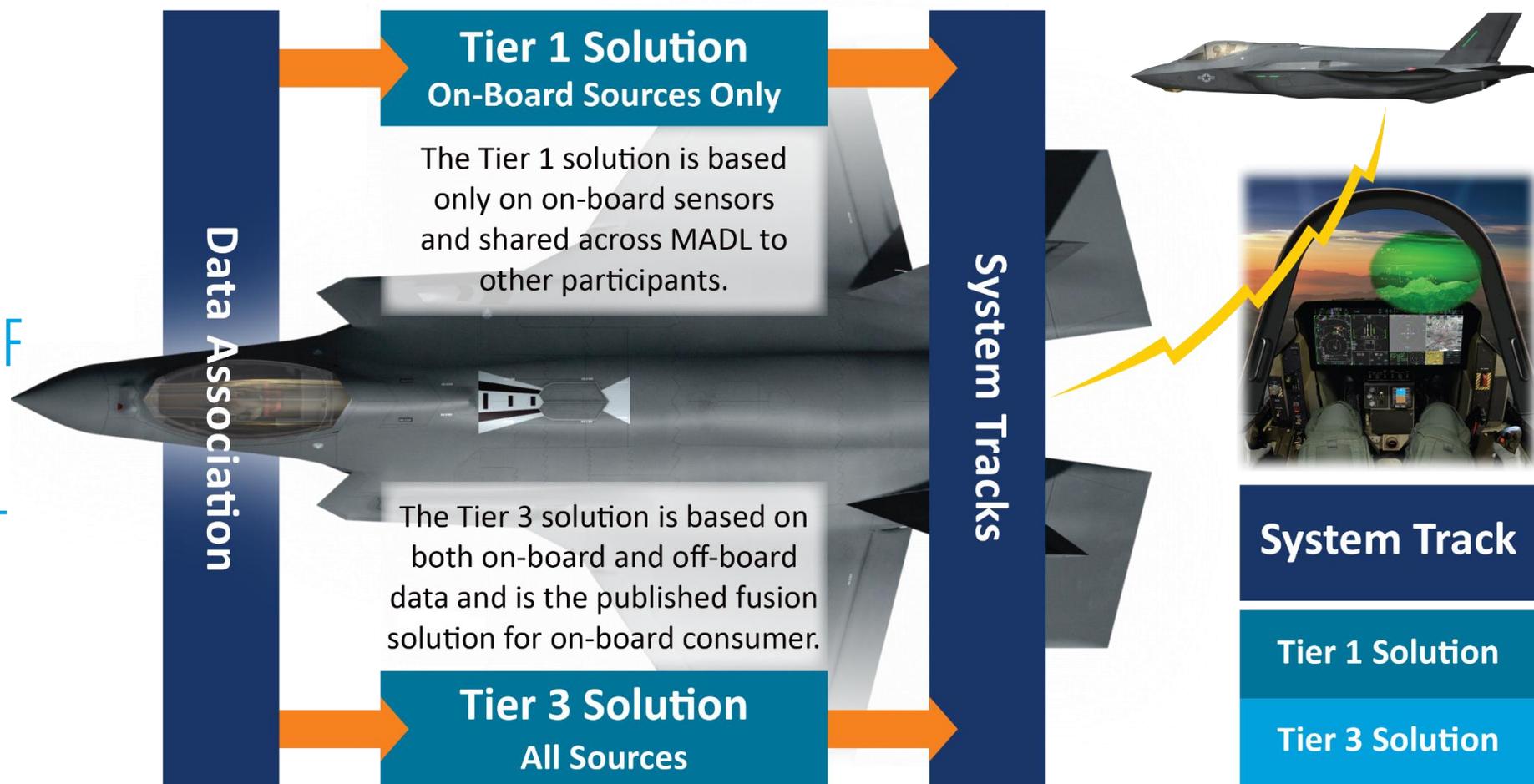
FUSION IS A CORE
ATTRIBUTE OF THE F-35,
DESIGNED INTO THE
MISSION SYSTEMS FROM
INITIAL CONCEPTION.

F-35 EXTENSIBLE ARCHITECTURE

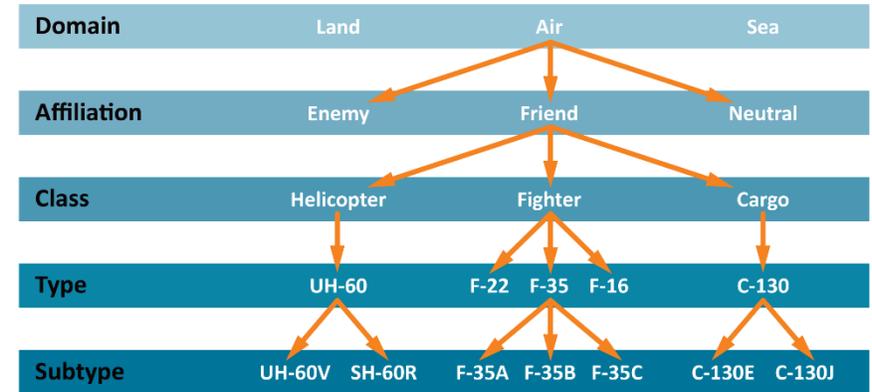
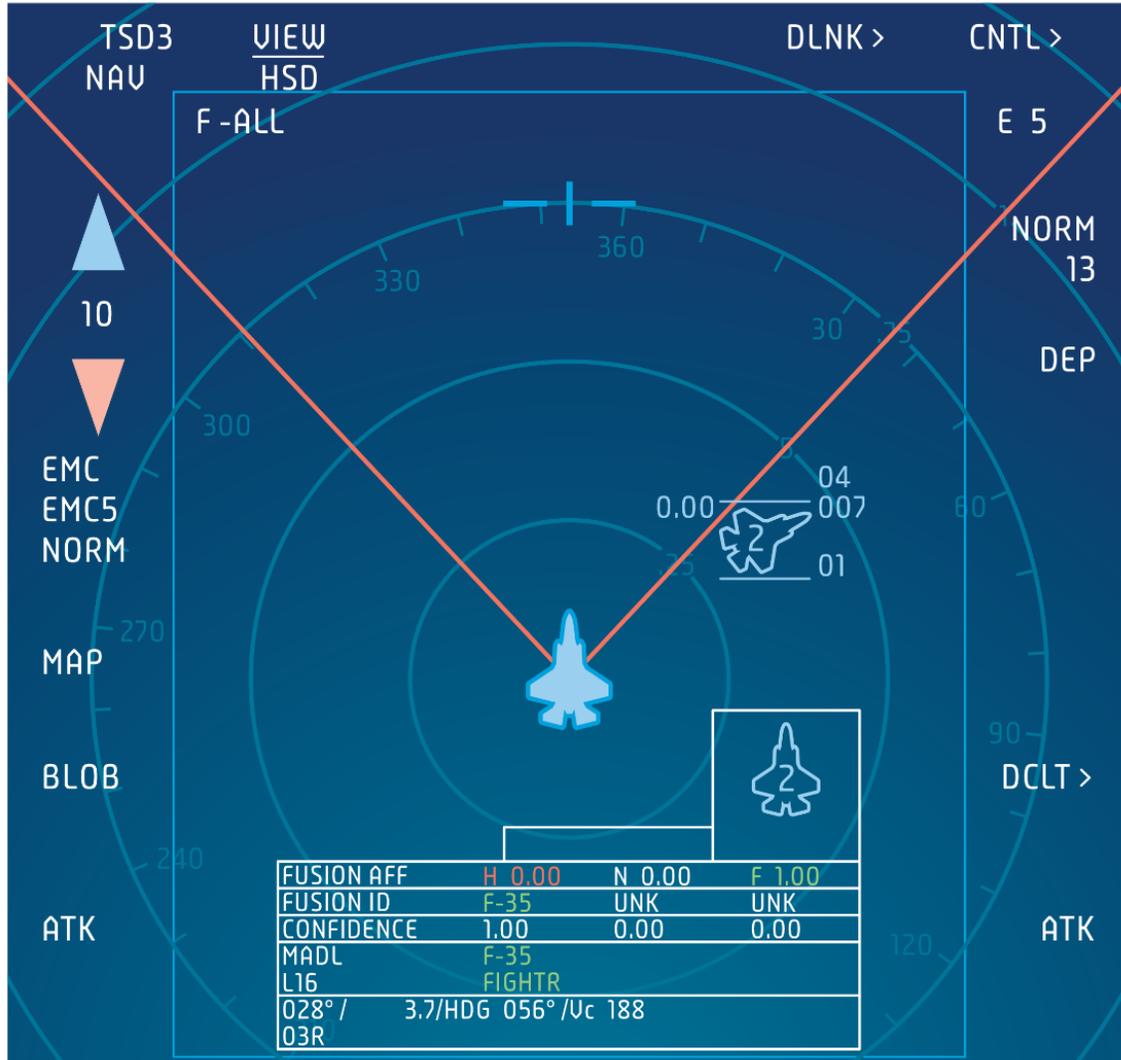


INFORMATION-BASED DATA SHARING ACROSS PLATFORMS

F-35 SHARES INDEPENDENT KINEMATIC TRACKS (TIER 1), SENSOR ID MEASUREMENTS, AND RF HISTORY WITH OTHER PLATFORMS OVER MADL TO SUPPORT OPTIMAL ESTIMATION TECHNIQUES.



EVIDENTIAL-BASED IDENTIFICATION



Dempster-Shafer Provides an Evidential Method to Estimate ID Confidence Without the Need for A Priori Environmental Statistics

AUTONOMOUS SENSOR MANAGEMENT

TRACKS ARE REFINED AUTONOMOUSLY
IN ORDER TO SUPPORT CRITICAL PILOT
DECISIONS (INFORMATION
BOUNDARIES) BASED ON PRIORITY

EACH INFORMATION BOUNDARY HAS AN
ASSOCIATED DATA CONTENT (KINEMATIC & ID)
AS WELL AS A DESIRED
ACCURACY/CONFIDENCE

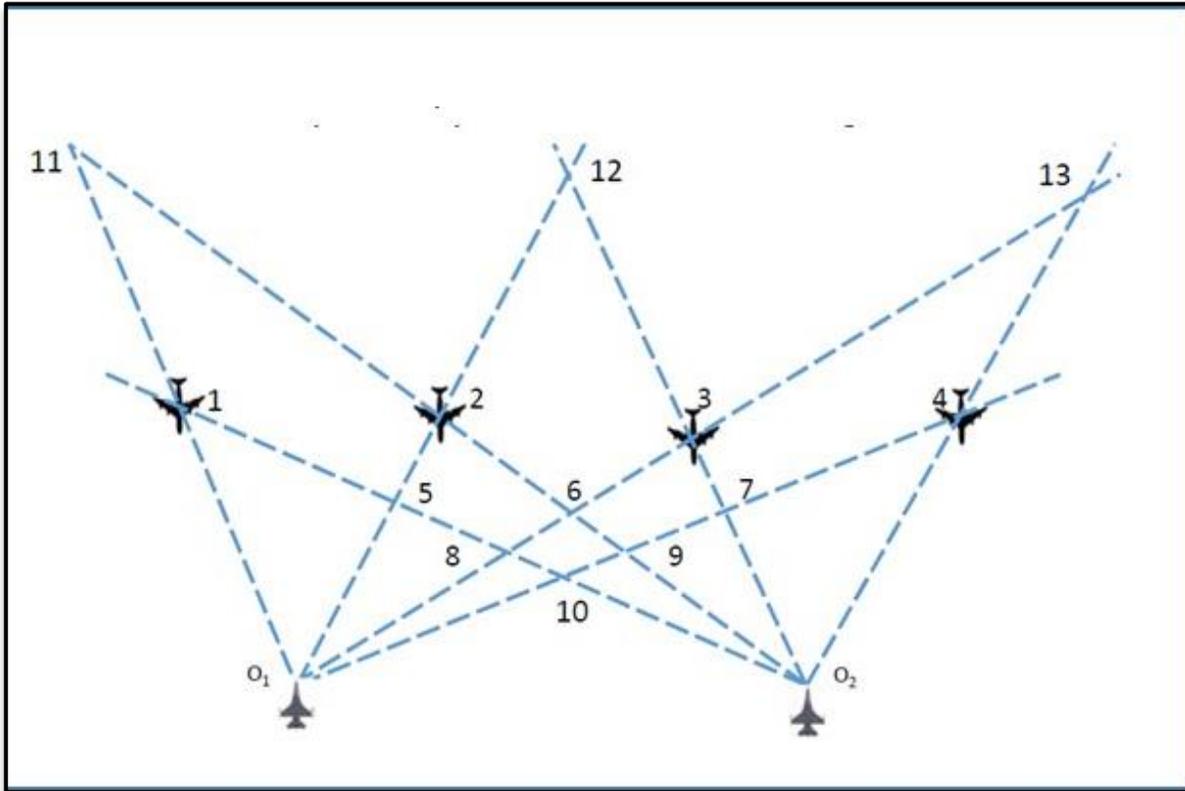
Situation Awareness

Tactical

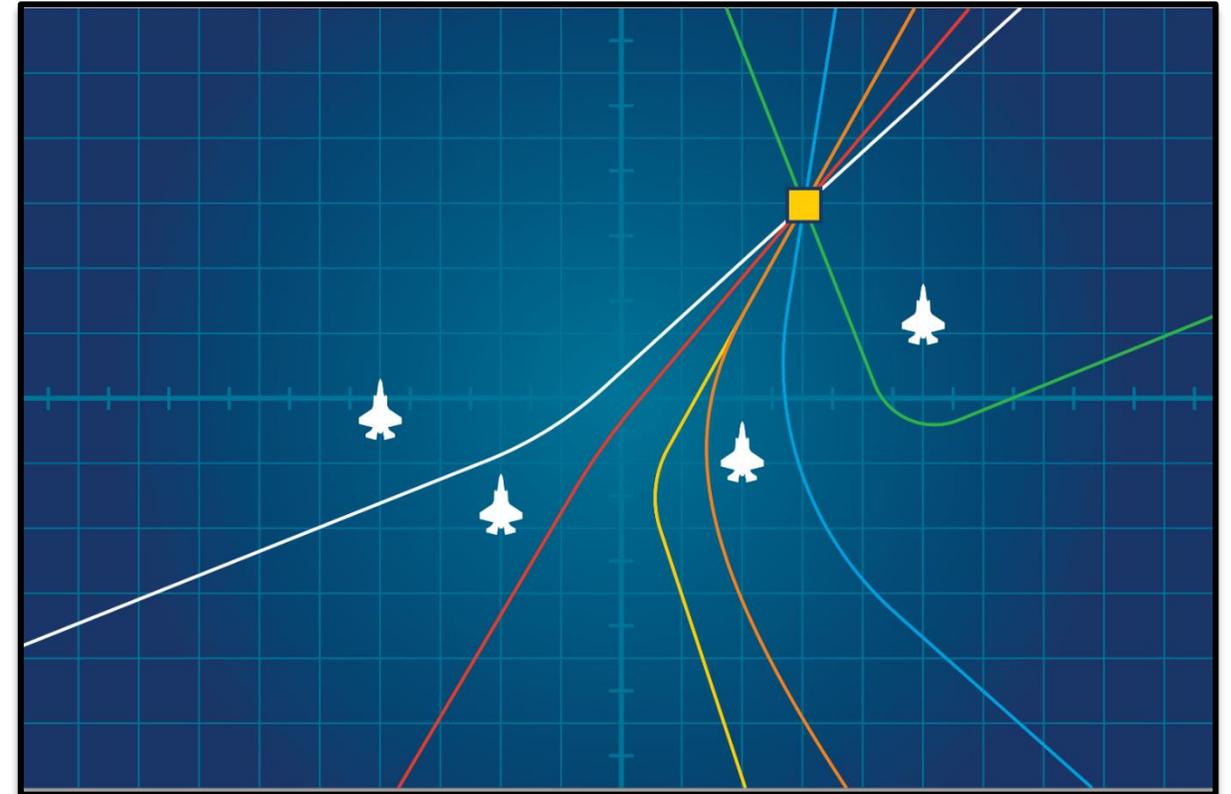


COLLABORATIVE SENSING

PASSIVE ANGLE/ANGLE RANGING



TIME DIFFERENCE OF ARRIVAL (TDOA) ALGORITHMS



SUMMARY

- F-35 Information Fusion provides unprecedented situation awareness to the pilot
- Extensible architecture enables future growth
- Combat ID provides evidential-based IDs and confidences
- Autonomous Sensor Management minimizes the reaction time of the system to changes in the environment
- Information-based data sharing leverages the spectral and spatial diversity of each F-35
- Collaborative sensing/operations supports improved clarity of objects in the environment

F-35 FUSION ALLOWS
THE PILOT TO RETURN
TO THE ROLE OF
TACTICIAN



LOCKHEED MARTIN

