Technology Applications Program Office

“Deeds Not Words”

Program Overview

Special Operations Forces Industry Conference 2012

TAPO Charter

- Responsible for life-cycle program management of the Army Special Operations Aircraft (ARSOA) fleet

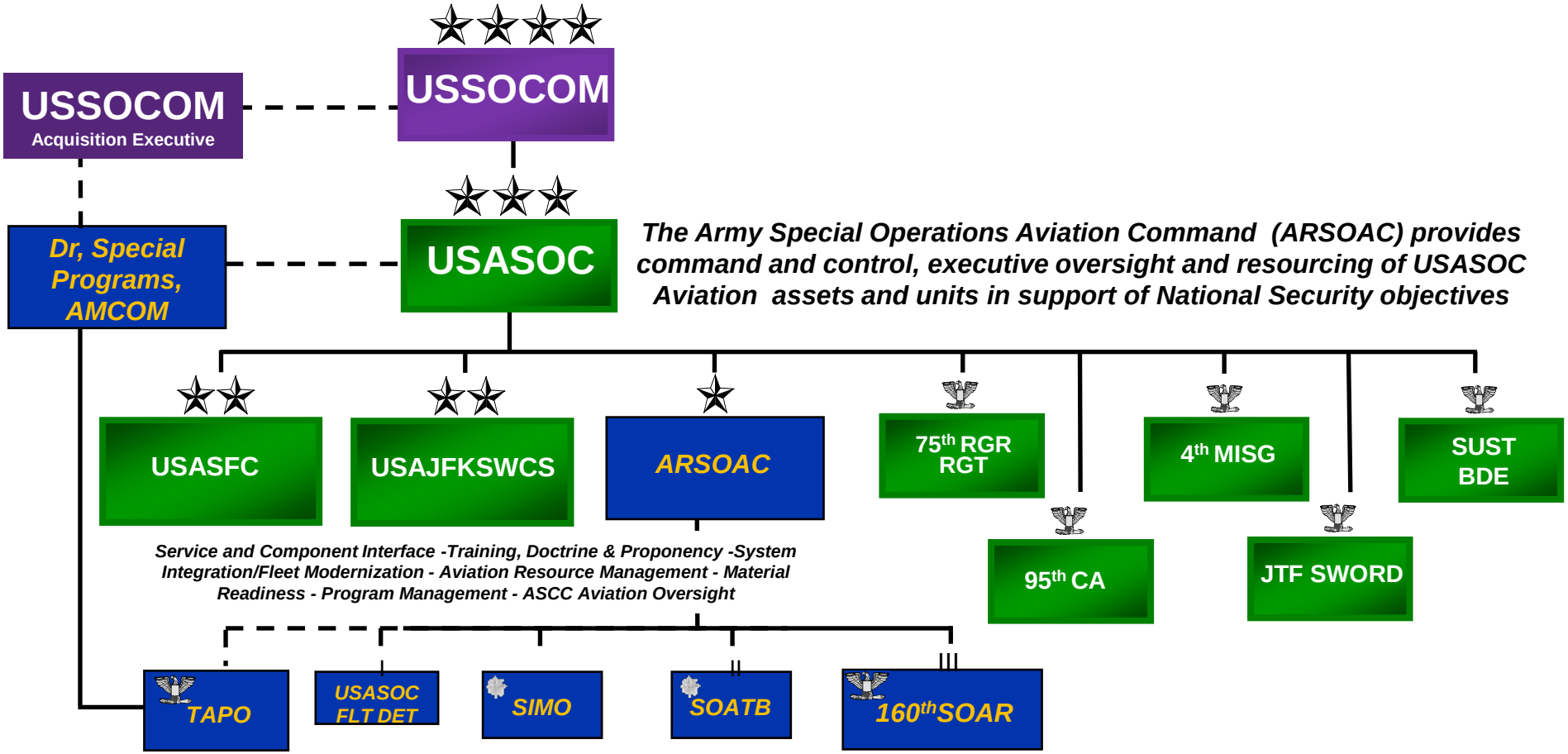
  A/MH-6M, MH-60L/K/M, MH-47G

  - Single customer focus: 160th SOAR(A)
  - Involved from Concept Refinement through Disposal
  - Provide continuous Sustainment and Modernization
  - Support growing rotorcraft fleet

- Manage the USSOCOM RW Aviation NVD and AASE Programs
  - Joint responsibility
  - Services Air Force Special Operations Command and Navy

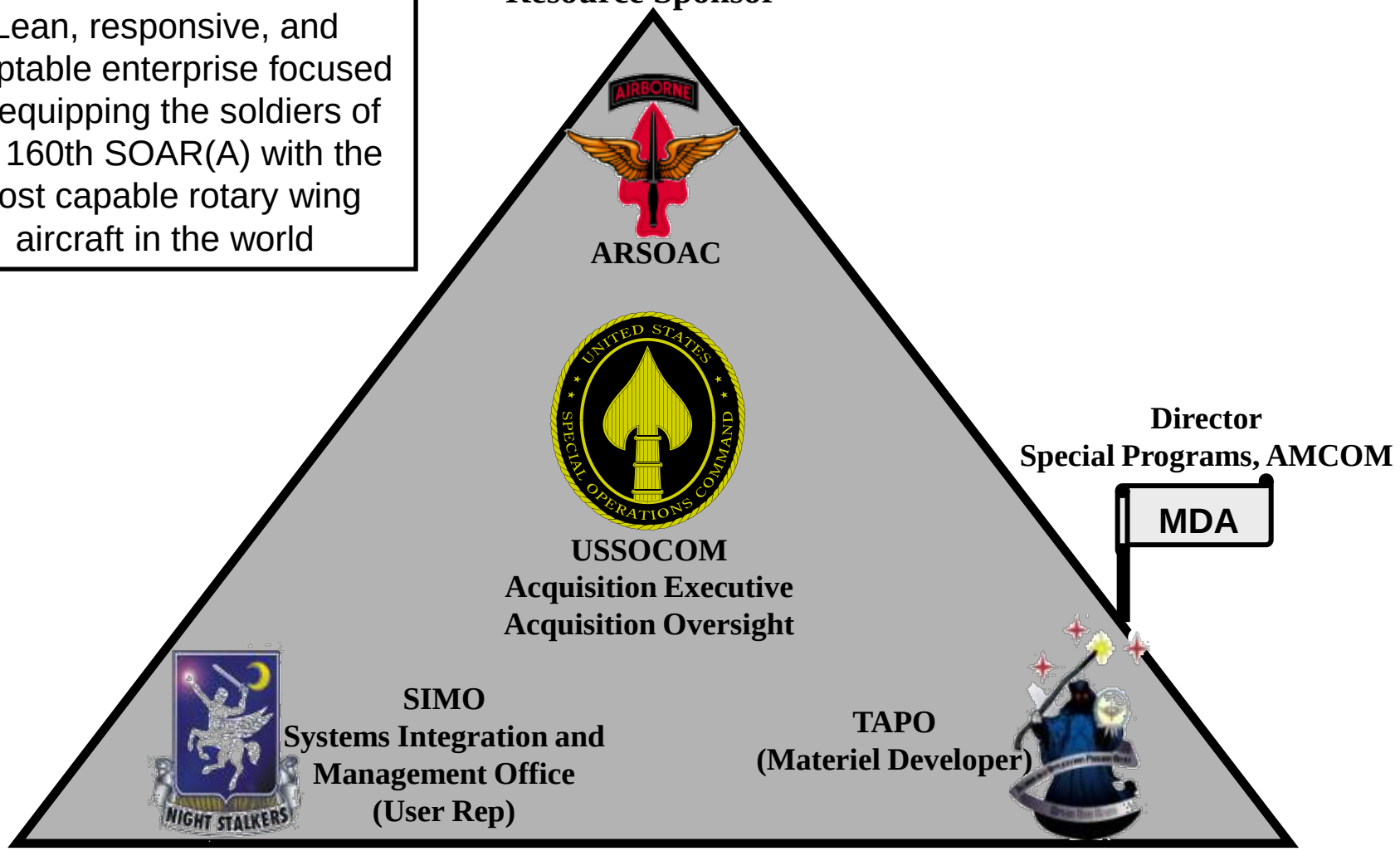
- Item Manager for all Special Operations Aviation (SOA) unique components and equipment

Army Special Operations Aviation Command



SOA Acquisition Team

Lean, responsive, and adaptable enterprise focused on equipping the soldiers of the 160th SOAR(A) with the most capable rotary wing aircraft in the world



Portfolio Overview

Platform Fielding / Upgrades

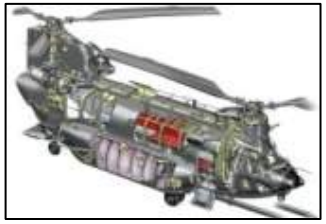
MH-60L
MH-60K
MH-60M

- Production / Fielding
- Resolving Tech Issues

MH-60M

MH-47G

- Reconstitution
- DAFCS Integration
- Electrical Upgrade
- "New Build" Machined



MH-47G

MH-6M

- Crashworthy Seat
- 3.0 Block Upgrade
- Rotor & Structure
- Cockpit & Avionics

MH-6M

Integrated Mission Systems

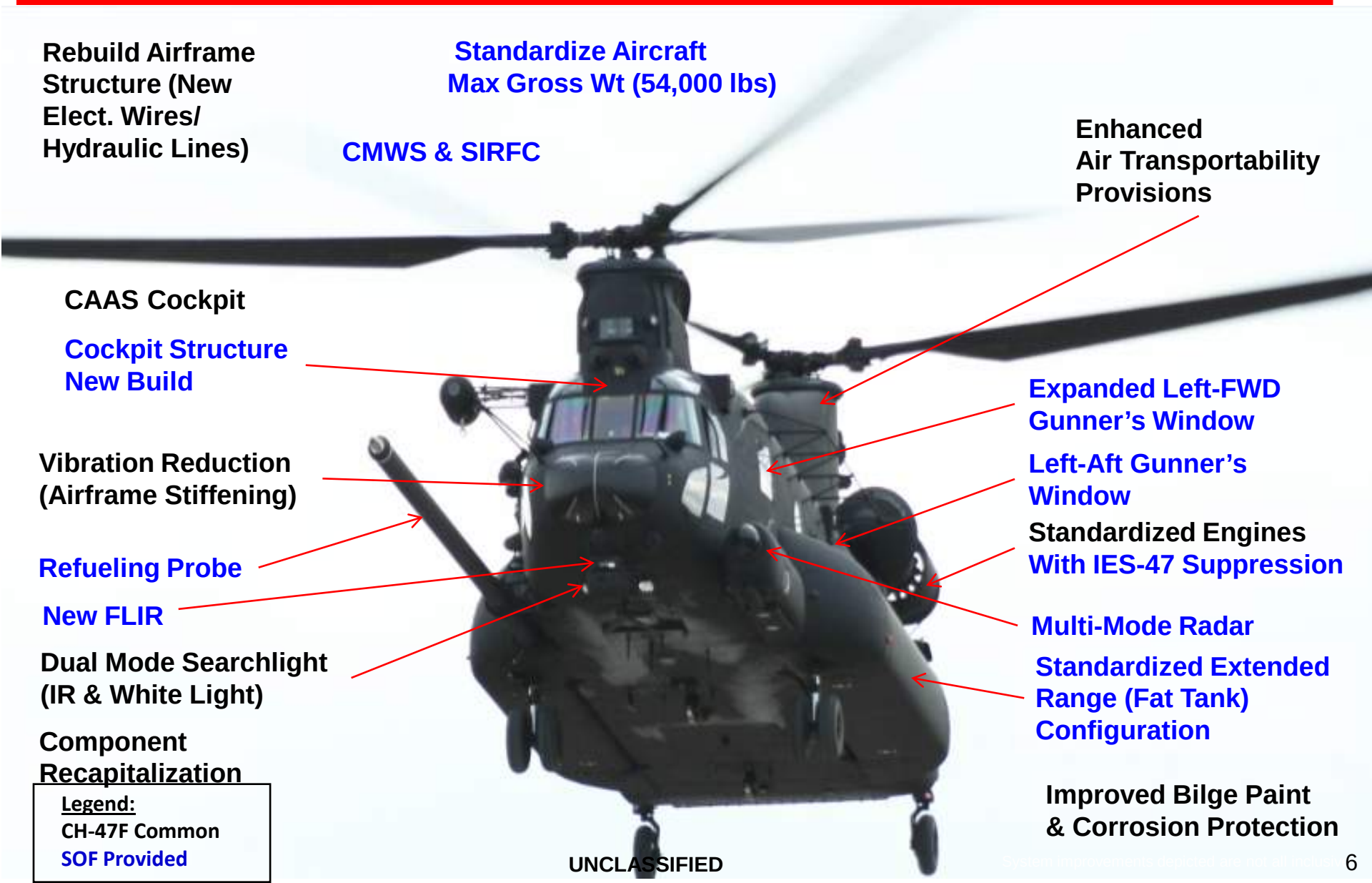
Aircraft Survivability

Avionics

Sensors and Weapons

- **Endstate: 3 RW Aircraft Configurations**
- **Common Mission Suite**
  - Common Avionics (CAAS)
  - Q2 FLIR System
  - Multi-Mode Radar
  - Advanced ASE (SIRFC / IR / HFIS)
  - Future DVE Integration

MH-47G



Rebuild Airframe Structure (New Elect. Wires/ Hydraulic Lines)

Standardize Aircraft Max Gross Wt (54,000 lbs)

CMWS & SIRFC

Enhanced Air Transportability Provisions

CAAS Cockpit

Cockpit Structure New Build

Vibration Reduction (Airframe Stiffening)

Refueling Probe

New FLIR

Dual Mode Searchlight (IR & White Light)

Component Recapitalization

Expanded Left-FWD Gunner's Window

Left-Aft Gunner's Window

Standardized Engines With IES-47 Suppression

Multi-Mode Radar

Standardized Extended Range (Fat Tank) Configuration

Improved Bilge Paint & Corrosion Protection

Legend:
CH-47F Common
SOF Provided

MH-47G

SLEP

- Remanufactures a combination of CH-47D and MH-47E airframes into MH-47G configuration
  - Production Complete
- Block Upgrade strategy to integrate SOF unique modifications
  - Includes Block 2.0-2.3
  - Block 2.2 includes accelerated integration of DAFCS
  - Block 2.3 includes:
    - Digital Intercom
    - 3rd/4th ARC-231
    - AC/DC Pwr Upgrades

New Build

- Completes NRE to integrate MH-47G SOF unique mods into a machined frame
  - Leverages CH-47F
  - Leverages Canadian H-47
- Common system configuration with latest fielded aircraft
- Produces 8 New Build aircraft
- Allows for future combat loss replacement

Reconstitution

Boeing
- Remanufacture fuselage
- Splices new nose (41 Section)

Summit Aviation
- Install hydraulic tubing
- Limited Over and Above repair
- Prep for shipping and storage

SOFSA
- Install Engines and Transmission/Dynamics
- Conduct 2.1/2.2 modifications
- Install SOF unique components
- Ground / flight test
- Unit acceptance

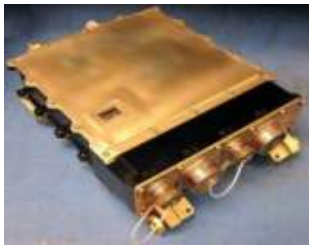
160th Delivery
- Rapid response to aircraft loss
- Aircraft equipped with latest modifications
- Cost savings to command
- Maximum flexibility

MH-47G Modernization Upgrades

Advanced Parallel Actuator System (APAS)

- Replaces existing Flight Control Pallets at STA 120 and 95
- Improved safety (i.e. Pilot situational awareness, Redundant systems, Improved control laws)
- Enable pilots to use maximum performance and increase productivity

Engine Control Unit (ECU)



- Increased Reliability and Maintainability
- Improved troubleshooting and upgrade capability
- Common with CH-47 fleet
- Currently fielding -02

Advanced Boresight (ABE)

- Enables more efficient alignment of aircraft sensors and nav systems
- Reduces O&M cost
- Common STTE with MH-60 fleet

Side Facing Gunner's Seat (SFGS)

- Integrates 4xMartin Baker MFOS Seats
- 8G,300# Occupant Crash Load (All Axis)
- Ballistic tolerant
- Decreases fatigue level of the aft crew member and mitigate associated safety and operational risks

Advanced Chinook Rotor Blade (ACRB)

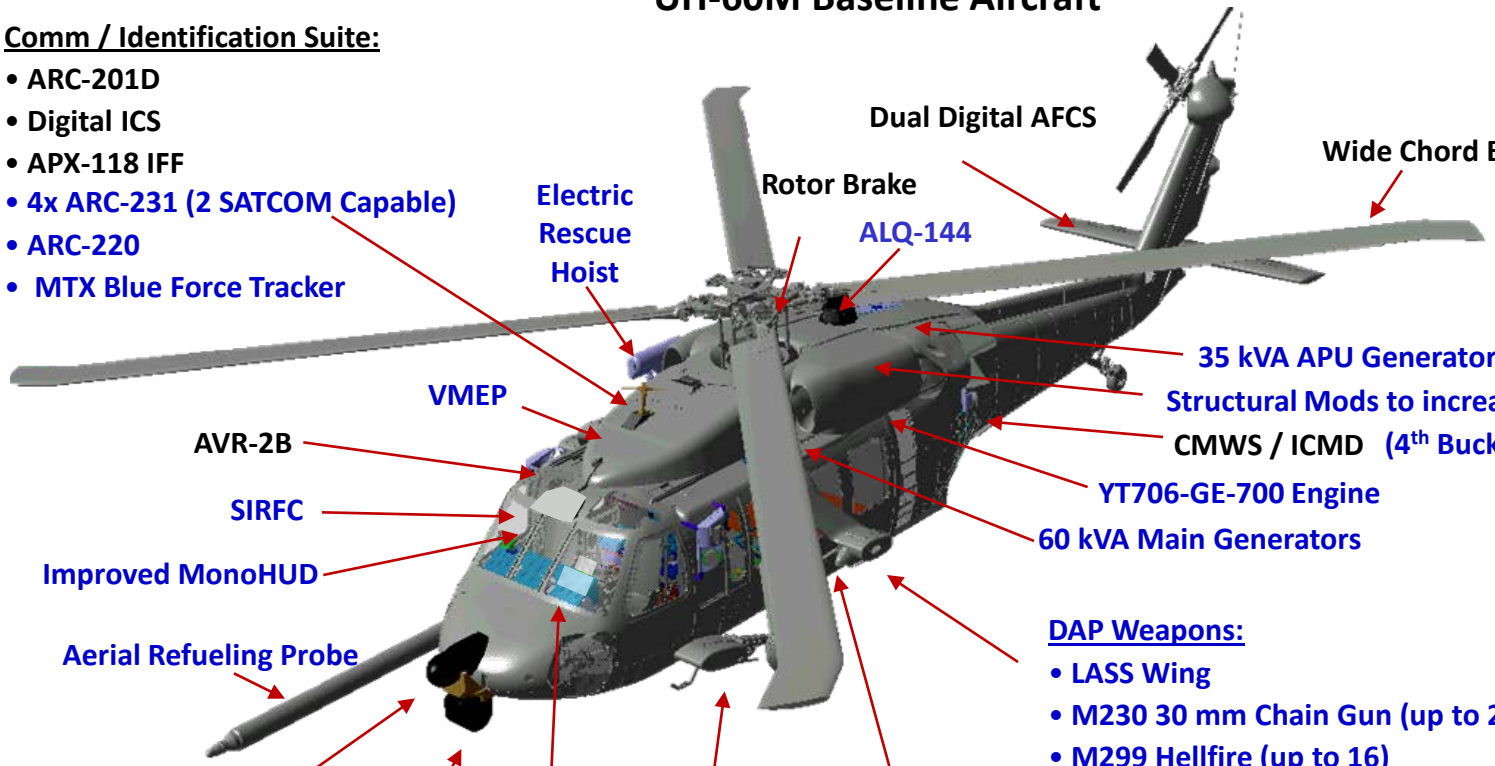
- Increase lift approx 2,000 lbs @ 4K/95F
- Manufacturing and repair improvements
- Rotor Hub is common to current blades
- Common with CH-47 Fleet
- Fielding begins FY16

Engine Inlet Filter

- T55 Engine Air Particle Separator (EAPS) does not meet SOAR needs (i.e. power impact, weight, maintenance)
- Exploring lightweight, low-drag, little-to-no power impact T55 engine inlet filtration system to limit the ingestion of sand, rock and dust
- Similar solutions exist (UH-60M)

MH-60M

UH-60M Baseline Aircraft



Comm / Identification Suite:
- ARC-201D
- Digital ICS
- APX-118 IFF
- 4x ARC-231 (2 SATCOM Capable)
- ARC-220
- MTX Blue Force Tracker

Electric Rescue Hoist

Dual Digital AFCS

Rotor Brake

ALQ-144

Wide Chord Blades

35 kVA APU Generator

Structural Mods to increase GW to 24,500lbs

CMWS / ICMD (4th Bucket)

YT706-GE-700 Engine

60 kVA Main Generators

VMEP

AVR-2B

SIRFC

Improved MonoHUD

Aerial Refueling Probe

APN-174B MMR

ZSQ-2 EOSS (FLIR)

CAAS Cockpit

Active Vibration Control

DAP Weapons:
- LASS Wing
- M230 30 mm Chain Gun (up to 2)
- M299 Hellfire (up to 16)
- M261 Rockets (up to 4 19-shot pods)
- M134 Miniguns (2)

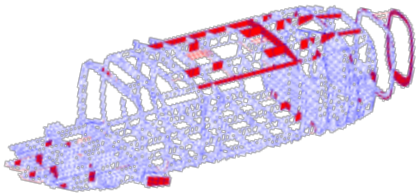
Fuel Management Suite:
- Internal 185/200 Gallon Auxiliary Tanks
- Fuel Dump

Legend:
UH-60M Common
SOF Provided

Integration Methodology

Sikorsky
A United Technologies Company

L3 communications
Platform Integration



Structural Design
- Increase GW to 24,500 lbs
- Structural enhancements to base airframe and dynamics analysis

GE

Propulsion
- Commercial Off the Shelf Engine
- FADEC Software Design

Honeywell
Raytheon
Rockwell Collins
ITT EXELIS

Mission Equipment
- Commonality with MH-47 Fleet
- Upgrades 60kVA Generators

United States Special Operations Command

Special Operations Forces Support Activity

LOCKHEED MARTIN

Integrated Design and Production
- Sub-structure and Mission Equipment
- Production of 72 MH-60M Aircraft

Test, Evaluation, and Airworthiness
- Government executed DT
- Airworthiness via AED, AMRDEC

AATD

AMRDEC

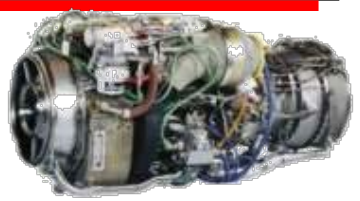
MH-60M Production and Fielding

SOFSA GOCO (LMCO) builds MH kit 1 year prior to install

TAPO procures 61 GFE components and provides to SOFSA Warehouse ISO Production and Provisioning

CAAS

Hoist



YT 706 Growth Engine

UH-60M

SOFSA GOCO (LMCO) Lexington, KY

Depopulate UH-60M unused components and return to UHPO

UH-60M "Baseline" Aircraft Deliveries

UH-60M LRIP	-	Fort Rucker
UH-60M New Production	-	Sikorsky Aircraft

13 month Modification

- GW increase to 24,500 lbs
- Growth Engine Integration
- SOF Mission Equipment

MH-60M

Field aircraft to 160th SOAR(A) FY11-FY15

MH-60L/K

Fly A/C to DeMod Facility and Harvest SOF components; A/C turn-in FY12-15

A/MH-6M

MELB Kit Items

UNCLASSIFIED

Integration Methodology

Aircraft / Shell Induction

Station 0

Station 1

Station 2

Station 3a

Station 3b

Station 4

Station 5

Flight Line Support

Ready for Delivery

Approx 12 months start-to-finish

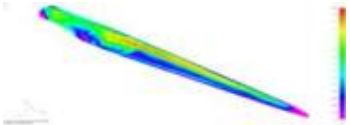
A/MH-6M Block 3.0 Upgrade

Purpose

1. Safely extend the usable life of the fleet and keep the aircraft in the fight until a replacement is available
2. Restore structural, performance, and safety margins for the aircrews
3. Provide an acceptable level of SA in the cockpit and accommodations for rapid integration of future capabilities

Main Rotor, Tail Rotor, FADEC

A main/tail rotor drive train and engine control replacement effort to reduce airframe loads and restore safety and performance margin (***Not*** *a Government sponsored rotor blade development program*).



Improved Rotor Systems

Dual Channel FADEC

Avionics Upgrades

An avionics upgrade to replace obsolescent components and provide basic SA (NDI/COTS) (***Not*** *a development program for state of the art mission processors, displays, or cockpit software*)

SRTV Rover 6 / Vortex

Legacy CMS Cockpit

Digmap Processor

CAAS Light (CASSL)

Airframe Upgrades

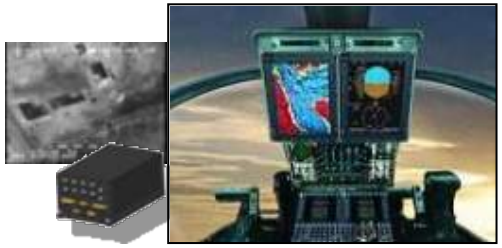
An airframe structural modification that address structural failures due to high intensity, high gross weight operations, and a decade of battle damage (***Not*** *a complete redesign of the basic airframe features*)

Mission Equipment (MH-47G/MH-60M)

Requirements	Programs	End State
Aircraft Survivability Equipment **Multi-Spectral Threat Detect and Defeat**	Radar (RF) Infra-Red (IR) Laser Small Arms/RPG Ballistic Protection	 **Integrated Advanced ASE**
Sensors and Weapons **Navigation** **Terrain Avoidance** **Targeting**	Electro-optic FLIR Multi-Mode Radar Degraded Visual Environment (DVE)	 **Common Sensor/ Weapons Suite**
Avionics and Software **Situational Awareness** **Digital Connectivity** **Airspace Management**	Common Avionics Networking Navigation	 **Common Cockpit**

Common Mission Suite – MH-60 and MH-47

Mission Equipment (A/MH-6)

Requirements	***Programs***	***End State***
Aircraft Survivability Equipment **Multi-Spectral Threat Detect and Defeat**	Ballistic Protection POM Issue for LIRCM	 **Light Weight ASE**
Sensors and Weapons **Navigation** **Terrain Avoidance** **Targeting**	FLIR Degraded Visual Environment (DVE)	 **AN-ZSQ-3 (V2) LRF/LD Capability**
Avionics and Software **Situational Awareness** **Digital Connectivity** **Airspace Management**	Common Avionics Networking Navigation	 **CAAS Light Cockpit**

.Common Mission Suite – Attack and Assault

Advanced Aircraft Survivability
(Roadmap – Past, Present and Future)

Radio Frequency Countermeasures (RFCM)

RWR APR-39 / APR-44

Pulse Jammer ALQ-136

CW Jammer ALQ-162

SIRFC

Laser Threat Detection

AN/AVR-2A Laser Detecting Set

AVR-2B/2X

Advanced Aircraft Survivability Equipment (AASE) Suite

CORE = SIRFC LRU-1

GOALS

- Integrated ASE
- Multi Spectral Sensor Fusion
- Threat Correlation
- Threat Geolocation
- Coordinated Countermeasures
- Networked EW

Infrared Countermeasures (IRCM)

CMWS

Missile Warning AAR-47

Dispenser ALE-47

CIRCM

IR Jammer ALQ-144

IRSS

- IES-47
- UES-60

HIRSS

ROSES

AIRCMM

Unguided Threat Protection

HFIS

MITAS/TBPS

AOBPS

Steel BPS

Legend

PAST

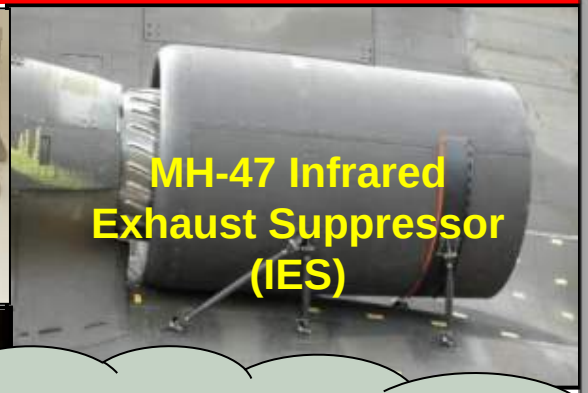
PRESENT

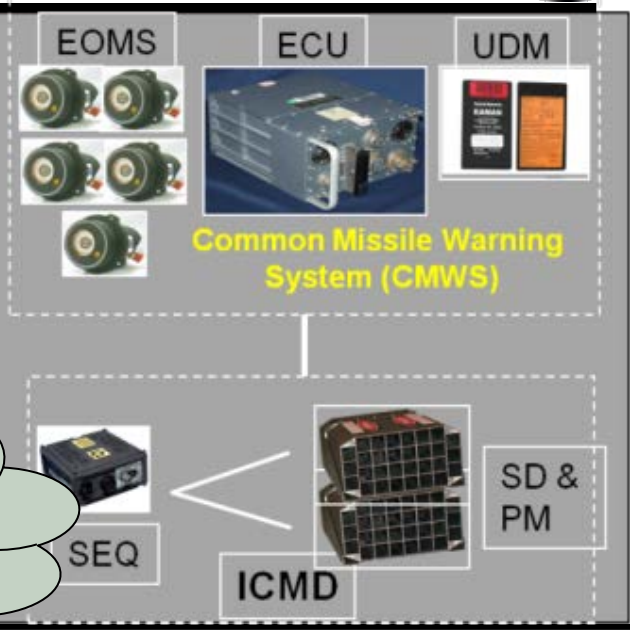
FUTURE

Unmet Reqts

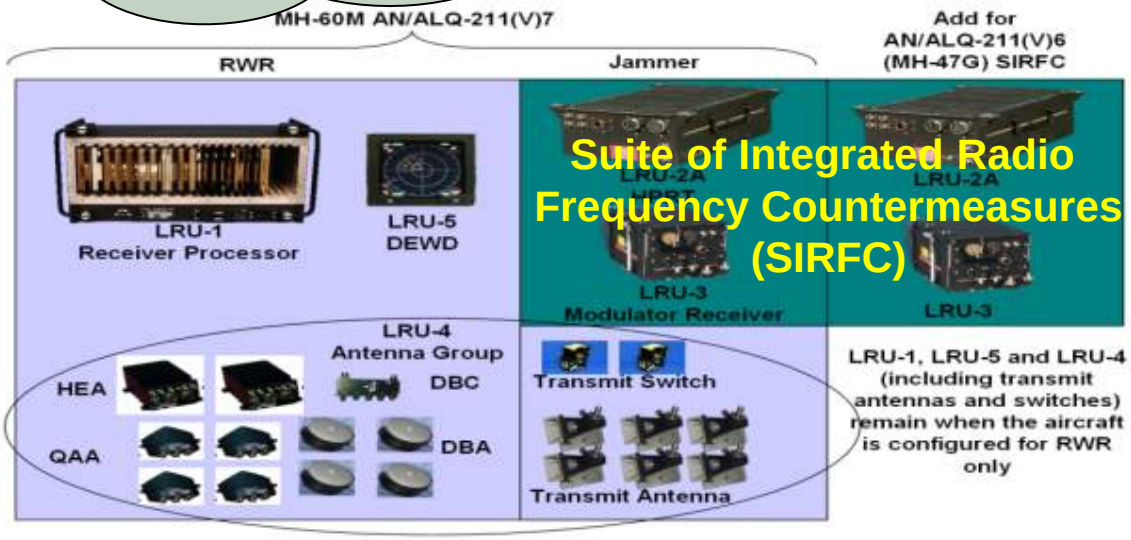
- A/MH-6 IRCM/HFI

Advanced Aircraft Survivability
(Present)



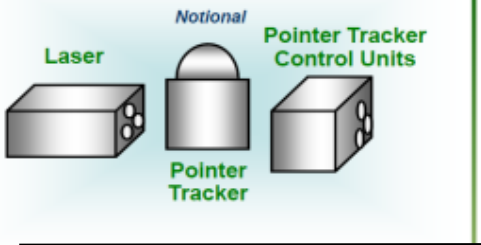


SEPARATE ASE SYSTEMS
(Laser / UV / IR / RF / BPS)



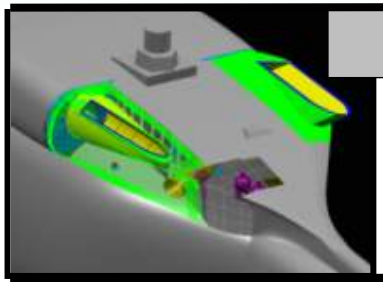
Advanced Aircraft Survivability (Future)

Common Infrared Countermeasures (CIRCM)

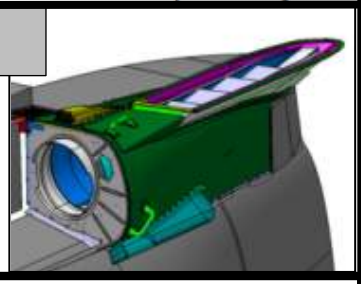


- **Same functionality as ATIRCM**
- **Multi-Service fleet-wide solution**
- **Improved reliability, reduced weight and cost**
- **The new configuration will include:**
  - IR Pointer Tracker(s)
  - Pointer Tracker Control Unit(s)
  - Laser(s)
  - CMWS normal 5-Sensor system configuration

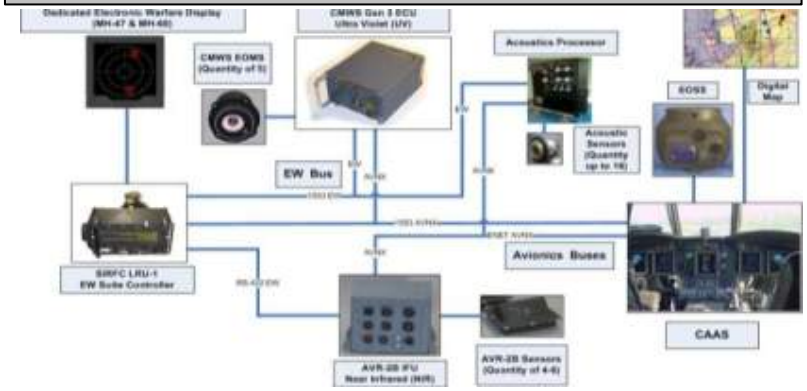
MH-60 IES



Replaces legacy HIRSS

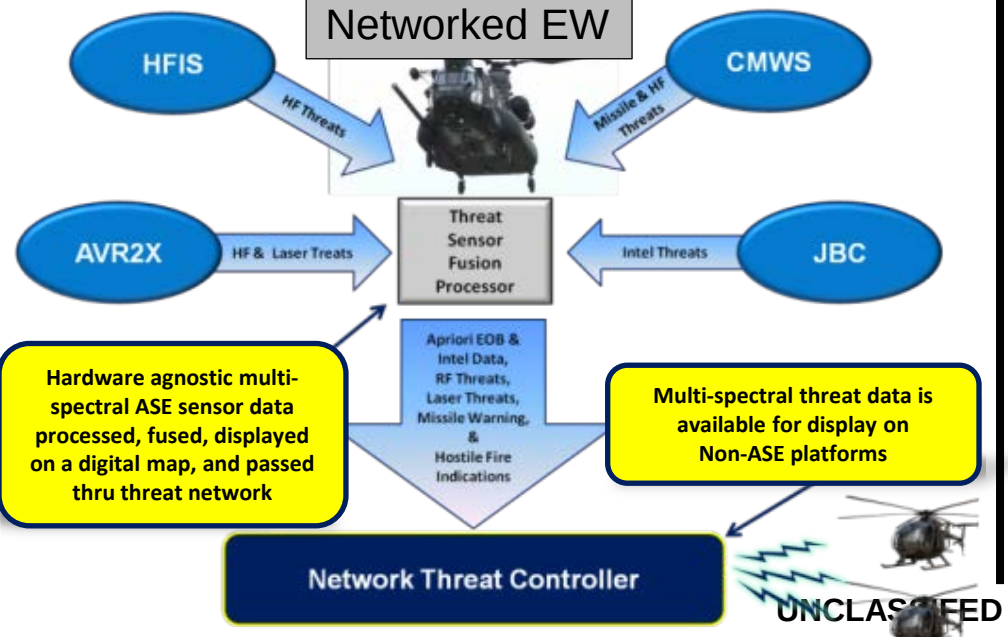


Hostile Fire Indicating System (HFIS)

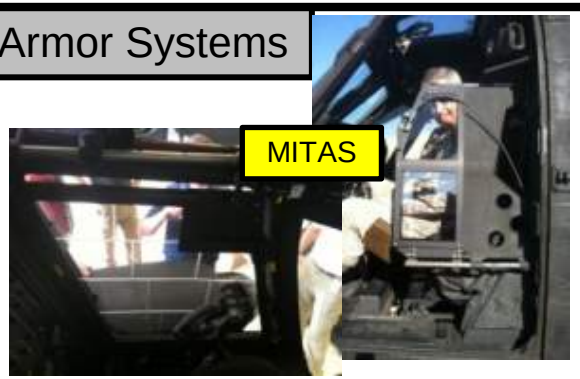


- Purpose: Detect/Classify/Alert of small caliber, AAA & RPG fires
- Goals: *Multi-Spectral (UV IR Acoustic)* - Integrated & Geolocated Threat Alerts through SIRFC LRU-1 to Dedicated Electronic Warfare Display (DEWD) for evasive/counter fire actions

Networked EW



Armor Systems



Purpose: (Pilot Protection) Replaces opaque armor with transparent armor
Two options: Multiple Impact Transparent Armor System (MITAS); Transparent Ballistic Protection System (TBPS)
Goals: Reduce weight without sacrificing ballistic protection; improve pilot FOV

Sensors Roadmap

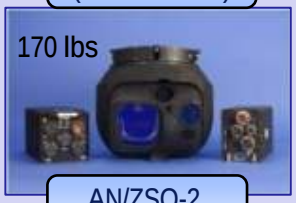
EO/IR Sensors Systems (1st Generation)

Q-16B, & Q-16D
151 & 182 lbs.

1st Gen Capabilities
- LWIR
- Laser Range Finder
- Laser Designator

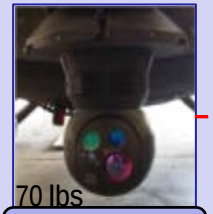
Current EO/IR Sensors Systems (2nd Generation)

AN/ZSQ-2
(V1 – Assault)



AN/ZSQ-2
(V2 – Attack)

2nd Gen Capabilities
- MWIR
- Day CCD
- I2 CCD
- Image Fusion
- Laser Pointer
- Laser Range Finder
- Laser Designator
- Laser spot tracker



AN/ZSQ-3
(V1 – Assault)

AN/ZSQ-3
(V2 – Attack)

TAPO
Partnering With Industry

Future EO/IR Sensors Systems (3rd Generation)

- Two color engine
  - LWIR/MWIR
  - MWIR/SWIR
- High Definition
- SWIR (see laser spot)
- LIDAR (see thru brownout/foliage)
- Distributed Aperture
- New System for LCR

Leverage S&T, Big Army, Other Service Efforts

Legacy Force » » » **Current Force** » » » **Future Force**

Bendix King 1400 Weather Radar

Primus 700 Weather Radar

- Weather Radar Only

AN/APQ-174B
Multi-Mode Radar

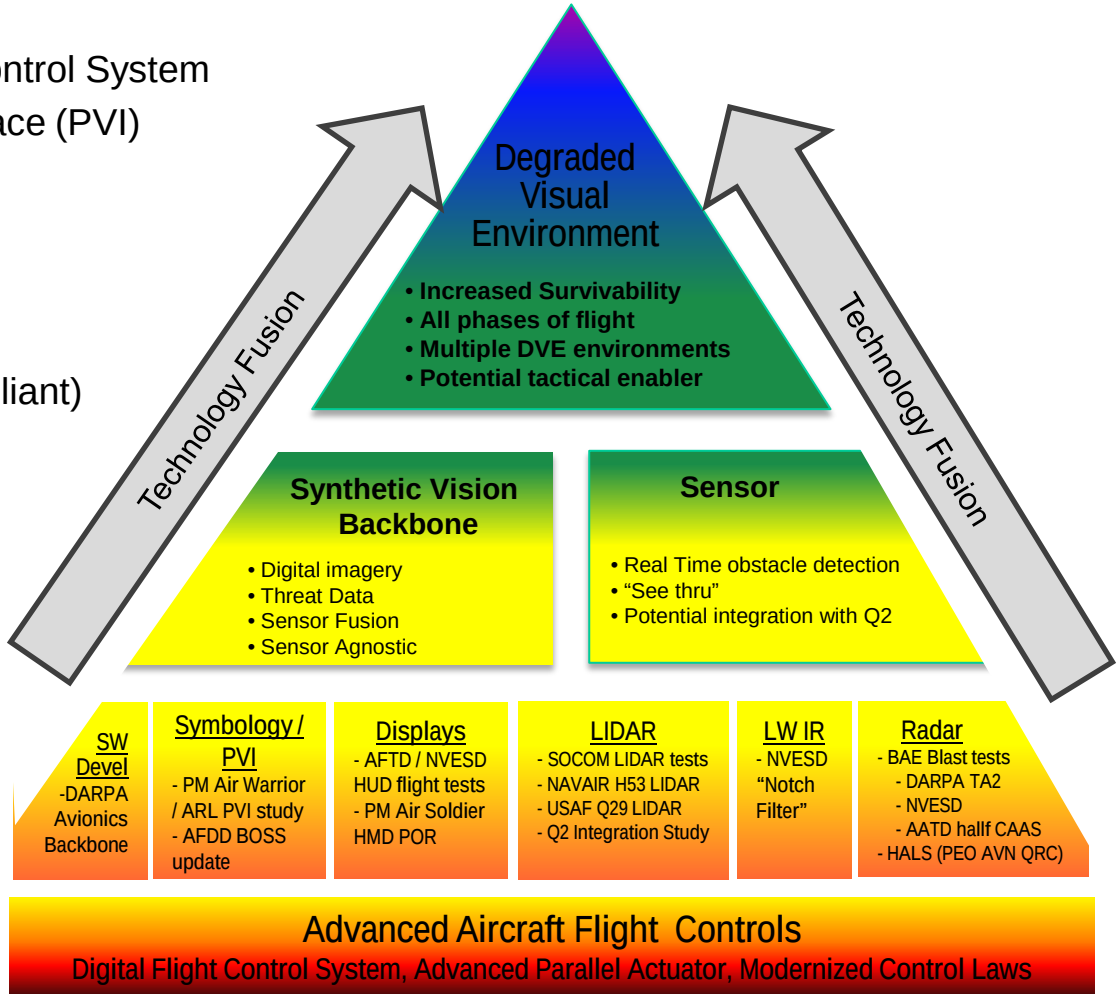
- Weather
- Terrain Following/Terrain Avoidance (TF/TA)

AN/APQ-187
Silent Knight Radar (SKR)

- Weather
- TF/TA
- LPI/LPD
- Wind Shear
- Turbulence
- Air to Air
- Maritime
- Single LRU
- 70 lbs. lighter
- Digital Radar
- Anti-Ice Radome
- Growth Capacity

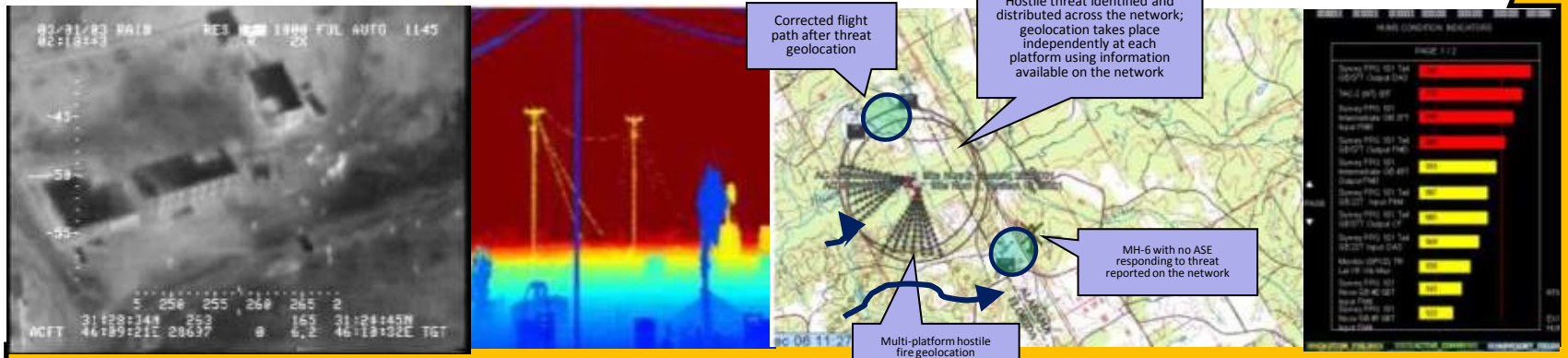
DVE Architecture

- DVE Building Blocks:
  - Foundation based Aircraft Flight Control System
  - Symbology and Pilot-Vehicle Interface (PVI)
  - Display
    - Heads Up
    - Helmet Mounted
    - Flat Panel
  - Software Architecture (FACE Compliant)
  - See-thru Sensor Integration
    - LIDAR/LADAR
    - 94GHZ Radar
    - LW IR
- Future Integration:
  - Dual Band Sensor
  - Network Controller
  - DARPA MFRF
  - Passive TF/TA
  - SKR SAR mode
  - Weather



Common Avionics Architecture System (CAAS)

- Identical Architecture for MH-47/60
  - Single Software / Hardware Configuration
  - Consolidated crew station working groups and integrated roadmap
  - Hardware commonality reduces logistics complexity and footprint
  - Training material, devices, methods shared between platforms
- Fusion center for all data / situational awareness
- Future Synthetic Vision Integration



Discussion / Questions