

Miniature Air Launched Decoy (MALD[®]) & Future Concepts

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Operations Symposium & Exhibition

10/20/2010

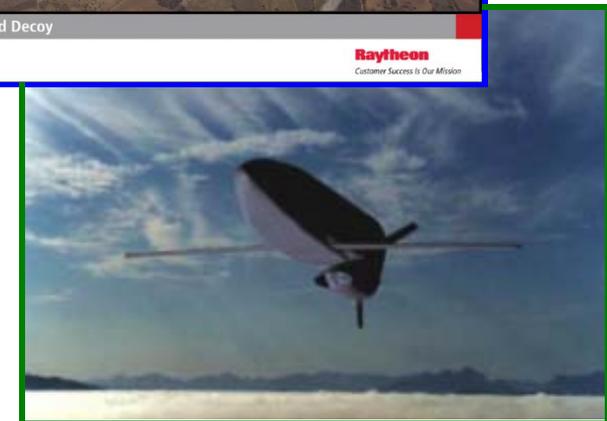


Raytheon Missile Systems

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DSER 163378



Miniature Air Launched Decoy

- Low-Cost, Air-Launched Programmable Craft
- Duplicates the Combat Flight Profiles Signatures of U.S. and Allied Aircraft
- Deceives Air Defense Systems that Pose a Threat to U.S. and Allied Pilots
- Modular Flexible System Capable of Delivering a Spectrum of Effects



- Modularity—Same Production Line
- Affordable—Swiss Army Knife Design
- Flexibility—Spectrum of Effects



MALD®



MALD®-V



USAF Programs
USAF Study

Raytheon Growth Initiatives

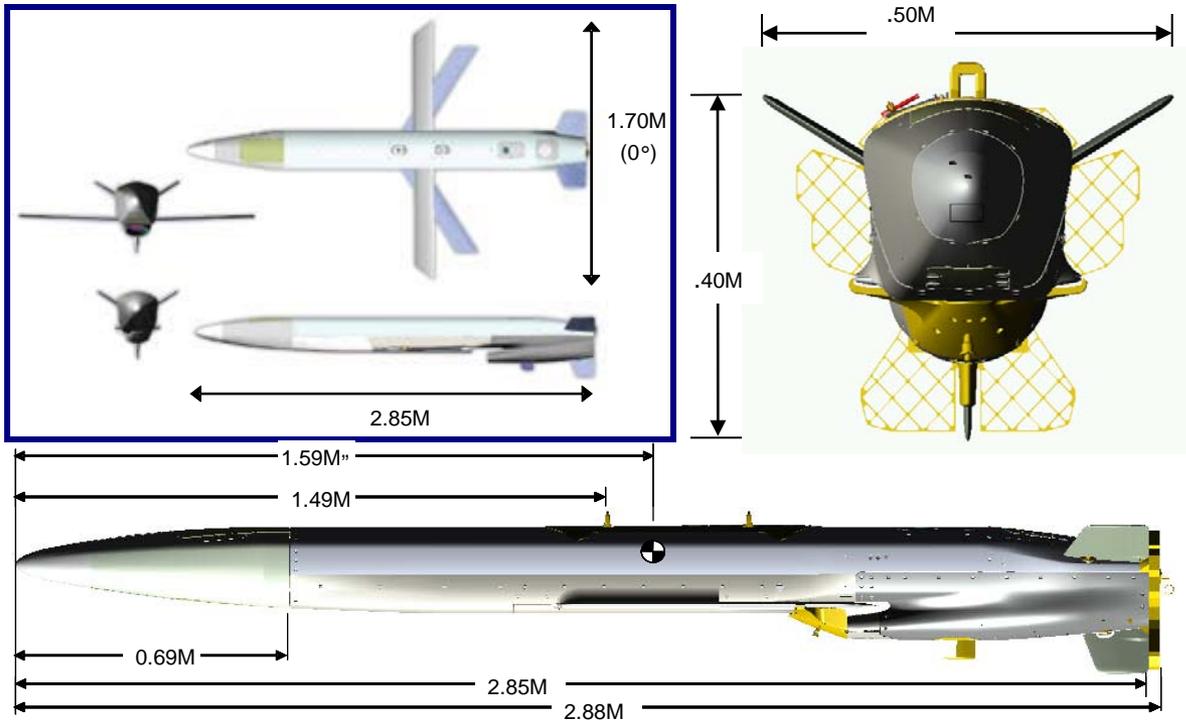


Two MALD® s in Same Hole!

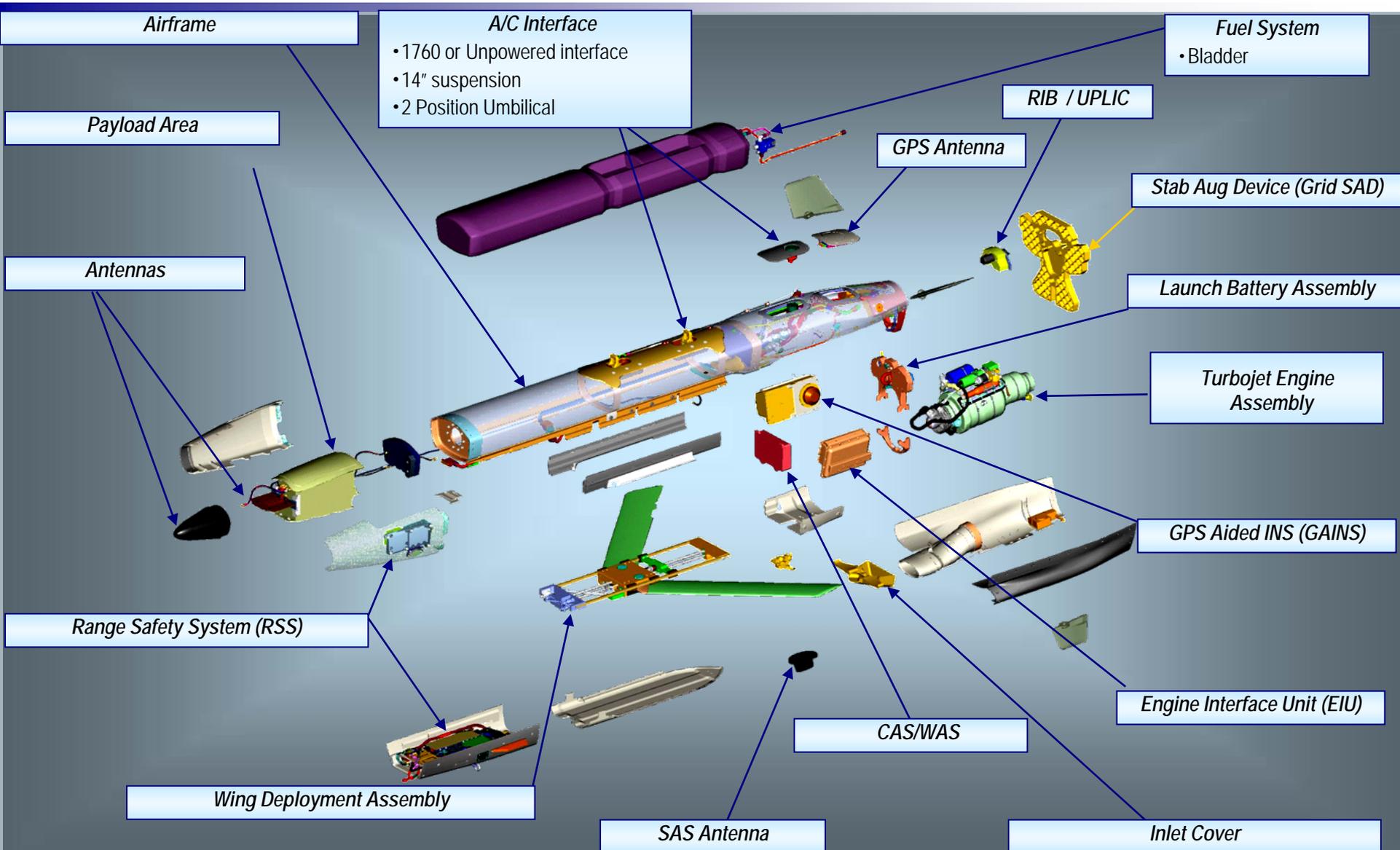


“MALD®... Spectrum of Effects”

MALD® Vehicle B-52 and F-16 Threshold A/C



MALD® Air Vehicle Overview



- **Specifications**

- System Weight: ~ 280 Pounds
- Payload Weight ~ 40 Pounds
- Payload Power ~ 1 KVA

- **Flexible Aircraft Interface**

- 1760 Interface or Unpowered
- 14 Inch (35.56 cm) Suspension Lugs
- Pull Lanyard

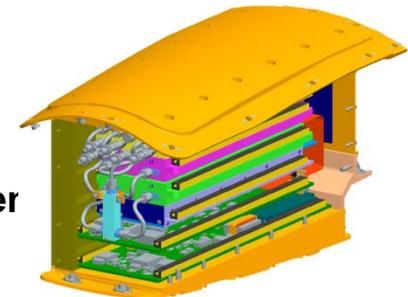
- **GPS-Aided Inertial Navigation Systems (GAINS)**

- Precise Preprogrammed Navigation

- **Signature Augmentation System (SAS)**

- Contains Various Active Radar Enhancers with a Range of Frequencies
- Simulates Range of Relative Aircraft Sizes

- **Missions Preprogrammed Prior to Launch**



- **Operating Altitudes:**

- T/O to 35K' MSL
- Launched 6K' AGL to 25K' MSL
- Post Launch 2K' AGL to 35K' MSL

- **Rate of Climb:**

- 1500 fpm @ 25K' MSL
- 4000 fpm @ 3K' MSL

- **Launch:**

- Envelope 1G (± 0.5 G) Level flight
- 6K' AGL to 25K' MSL
- 220K to 450KCAS, NTE 0.90M

- **Jettison:**

- No Restriction to Aircraft Jettison Envelopes (T=O)
 - Certified F-16 and B-52

- **Turn Maneuverability:**

- Represent Aircraft Turn Maneuvers of 2Gs @
2K' MSL to 19K' MSL

- **Temperature:**

- +71 °Centigrade (°C) to -46 °C
- 0.35M to 0.9M @ 3K' MSL

- **Materiel Reliability:**

- .93

- **Service Life:**

- 60 Days Cum if Sheltered
- 30 Days Not Sheltered

- **Shelf Minimum**

- 15 Year Shelf Life in Container

- **Storage Reliability:**

- 0.95, Allowed Degrade to 0.80 Over 15 yrs

- **Carriage Life:**

- Minimum of 60 hours

- **Built-in-Test (BIT) Reprogramming:**

- Not to Exceed 5 min

- **Near Perfect DT, Delivering to USAF Now...Completing IOT&E**
 - Over 300 MALD[®]'s on Contract...Working Fourth Production Contract Now
- **MALD[®]-J in EMD, 4th Production Contract Postures for J IOT&E**
 - FRP Decision & Release Policy Follows...MALD[®] Aerial Target Ready Now
- Recognized by *Aviation Week* for Program Excellence in 2009



MALD®... Family of Multi-Role Missiles

- Modularity—Same Production Line
- Affordable—Swiss Army Knife Design
- Flexibility—Spectrum of Effects



MALD®

MALD®-J

MALD®-J Inc II

MALD®-W

MALD®-V

MALD®-A

MALD®-TL



Raytheon
Growth Initiatives



“MALD®... Delivering a Spectrum of Effects”

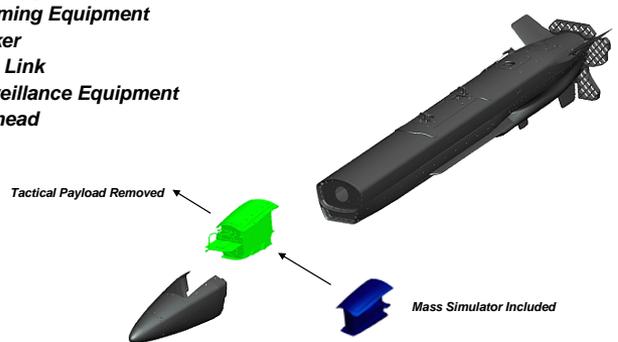
- **MALD® Less the Payload--Use Indigenous Payload or as Aerial Target**
 - Maximizes Scarce R&D Dollars for Payload Development
 - Reduces Development Risks Using a *Proven Solution*
 - Compresses Development Schedules
 - Easily Integrated/Employed From Multiple Aircraft
- **International Interest Increasing...**



MALD-VTM “Truck” **Raytheon**
Missile Systems

Payload Area

- User Integrates Own Payload
 - Jamming Equipment
 - Seeker
 - Data Link
 - Surveillance Equipment
 - Warhead



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Affordable Miniature Aerial Target (AMAT) **Raytheon**
Missile Systems

- Maximize Aerial Engagement Opportunities Within Budgets
- Can Replicate the Size of Multiple Different Aircraft for Beyond Visual Range Training Engagements
- Easily Launched from Military, Non-Military Aircraft, or Container Launched




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- Maximize Aerial Engagement Opportunities Within Budgets
 - Replicate Multiple Different Aircraft for BVR Training
 - Use to Deplete Shelf-Life Expired Air-to-Air Radar and/or IR Missiles
- Easily Launched from Military or Non-Military Aircraft



- **Fit Checks Accomplished**

- F-18
- Harrier

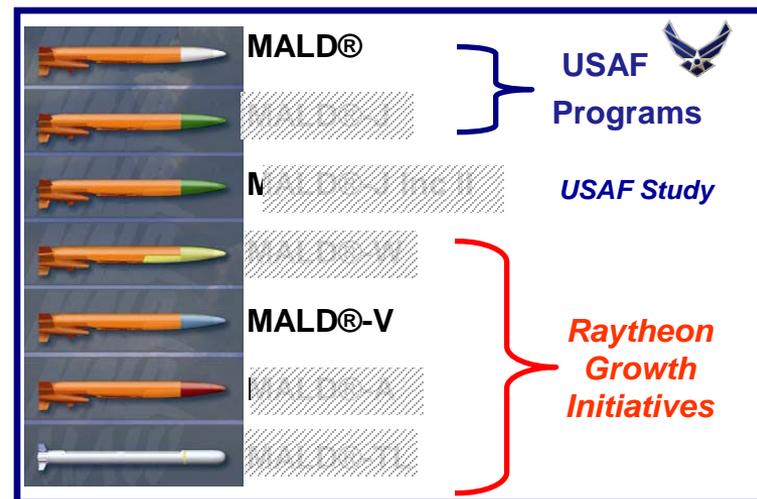
- **Preliminary Studies**

- JSF
 - Initial Discussions with Lockheed Held 12-09
 - A MALDTM fit into Weapons Bay Planned
 - Fit Check with JSF Launch Rack Planned
- Eurofighter
 - Fit Check Planned



Why MALD®?

- Only Sub-300 Pound, Low Cost System With an Extended Range
- In Production
- Flexible Aircraft Interface
 - Flight Certified on F-16, Low Entry Costs
 - 1760 Interface or Unpowered (Pull Lanyard)
 - 14 Inch (35.56 cm) Suspension Lugs
 - Transferable to Other Aircraft
- Spectrum of Effects
 - Reduces Logistics Foot Print
 - Multiple Systems Leverage from Single Design
- “Truck” Accommodates Different Avionics & Communication Goals
- Unprecedented Flight Test Box Score
- Award Winning R&D Team



MALD® ... A Low-Cost Aerial Target Alternative



Back Ups

Raytheon
Missile Systems

- ✓ **Increases Survivability in Defense of Airspace**
 - Entice the Enemy to Expend Resources on Decoys
 - Creates an Advantage in the Air to Air Arena
- ✓ **Force Multiplier for Gaining Air Superiority**
 - Makes You Appear to Have More Aircraft
 - Responsive, Persistent, Cost-effective
- ✓ **Stimulate Integrated Air Defense Systems (IADS)**
 - Deceive/Confuse IADS Commanders
 - Forces Difficult Engagements Using Scarce Resources
- ✓ **Reduce Reliance on Manned Aircraft for SEAD**
 - Persistent, Flexible, Expendable, and Affordable
- ✓ **Simple, Modular, Cost-Efficient**
 - Versatile Airframe
 - Interoperable



Increases Survivability...

- Continuous Operation

- 18 Hours

- Navigation System – Dynamics

- Angular Displacements, Rates, Accelerations
- Linear Acceleration and Velocities

- Navigation – Horizontal

- <30M With GPS
- <2NM After 5 min Without GPS

- Navigation Systems – Vertical

- <30 m GPS
- <1000 ft After 5 Min Without GPS

- Time of Arrival Control

- +/- 20 Seconds at Waypoint

- GPS Acquisition Performance

- Cold Start – 60 Seconds
- Warm Start – 15 Seconds
- Hot Start – 5 Seconds

- Waypoint Capacity

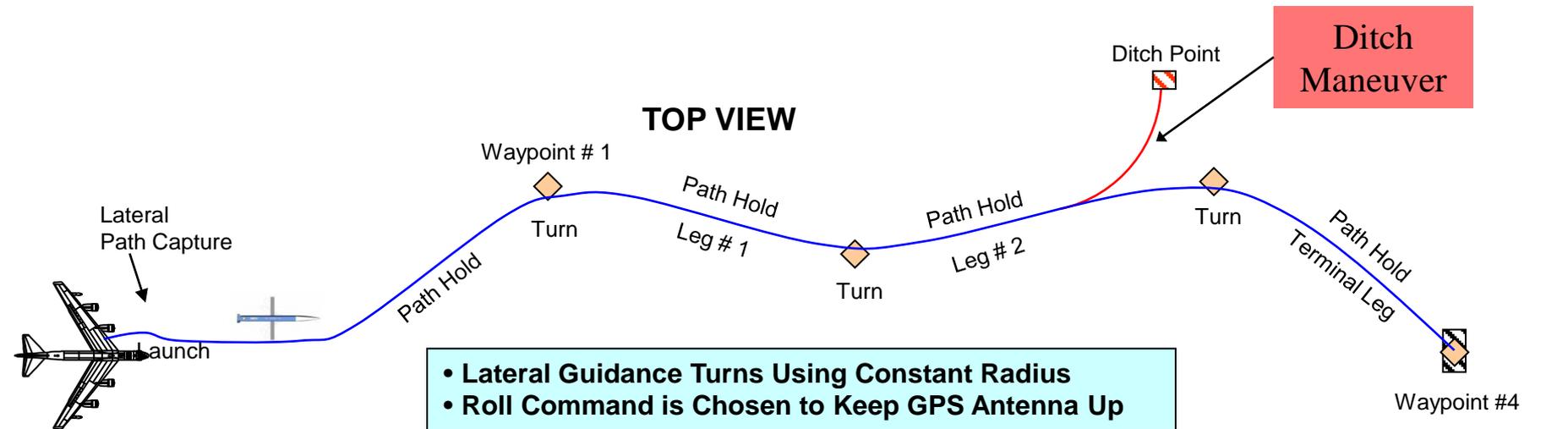
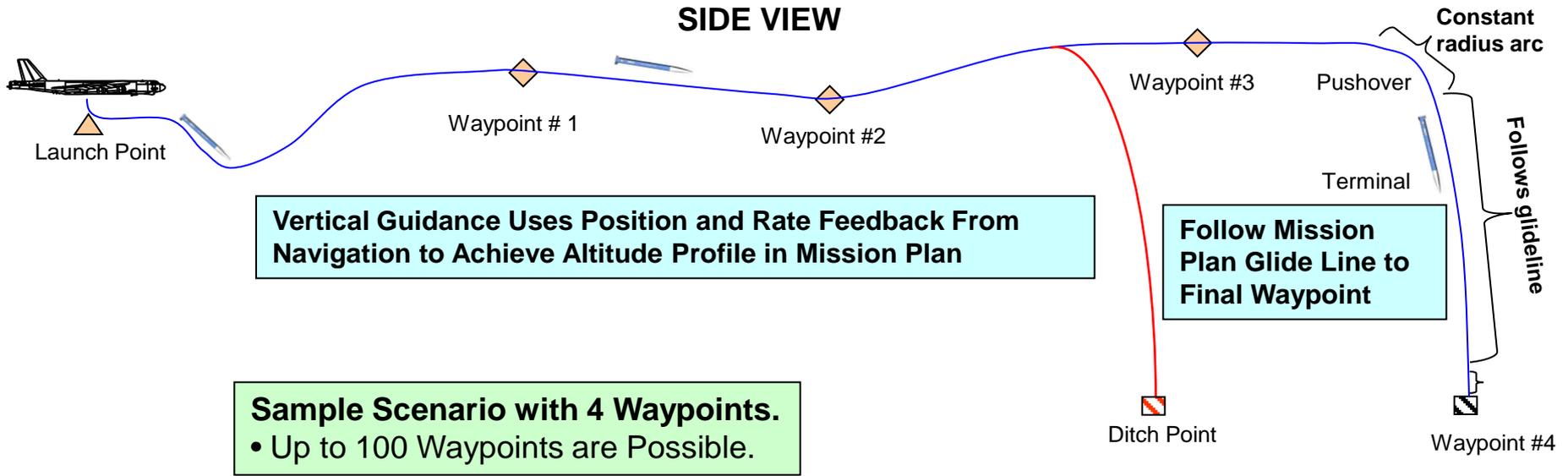
- 100 Waypoints

- Growth Potential/Activities

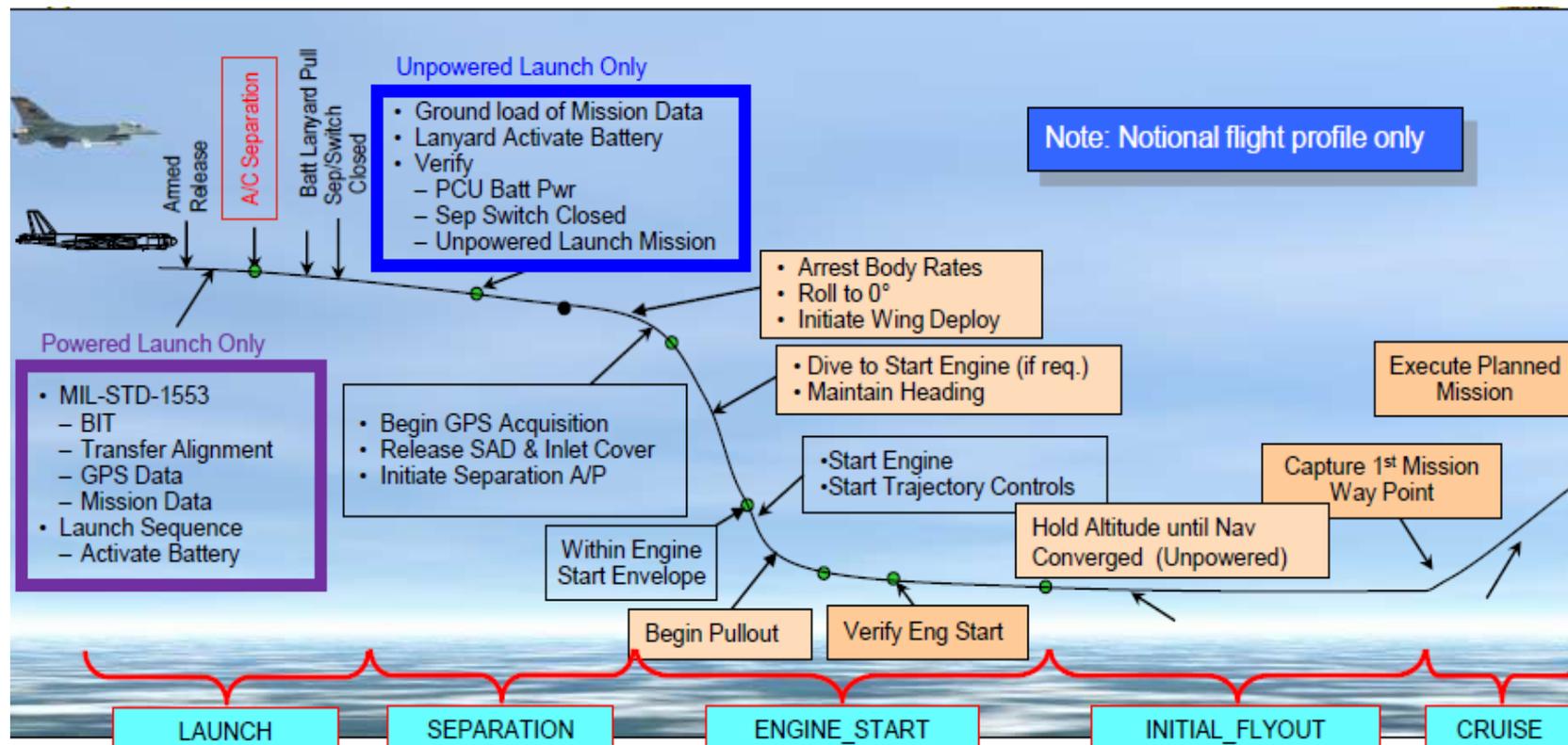
- Anti-Jam
- Thermal Conditioning
- Data Link Interface

- GPS

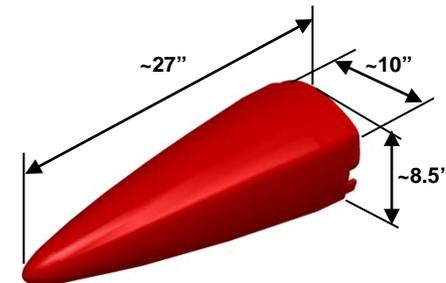
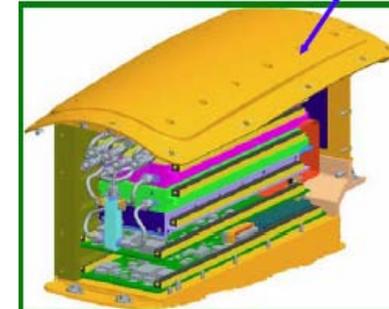
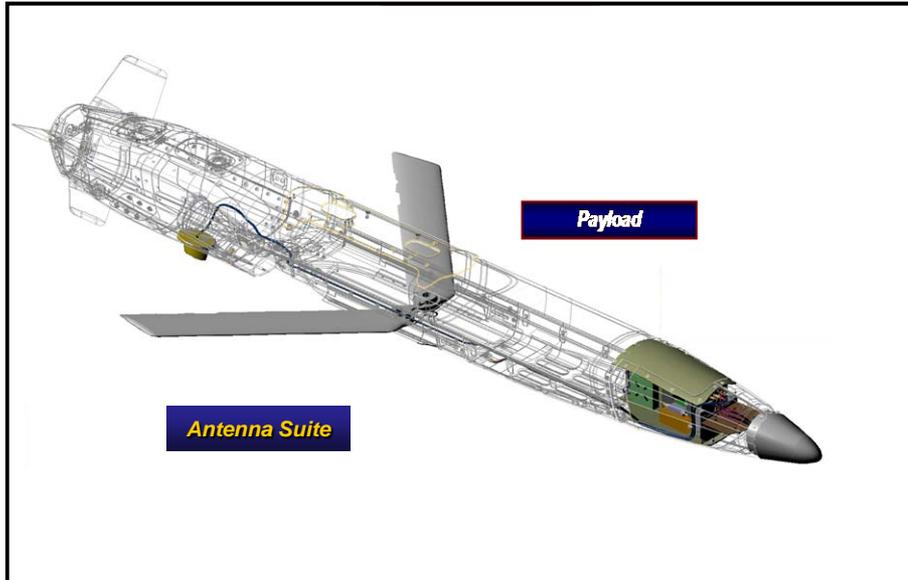
- L1 and L2
- SAASM Compliant



Launch - Separation - Transition to Cruise



MALD[®] Payload System



Power Requirements:
Voltage: +28 VDC Nominal, 19.4 VDC Minimum, and 33.0 Maximum
Standby Power: 28 Watts Maximum
In-rush Current: Peak Amplitude No Greater Than 25 Amps and Duration Less Than 1 Millisecond

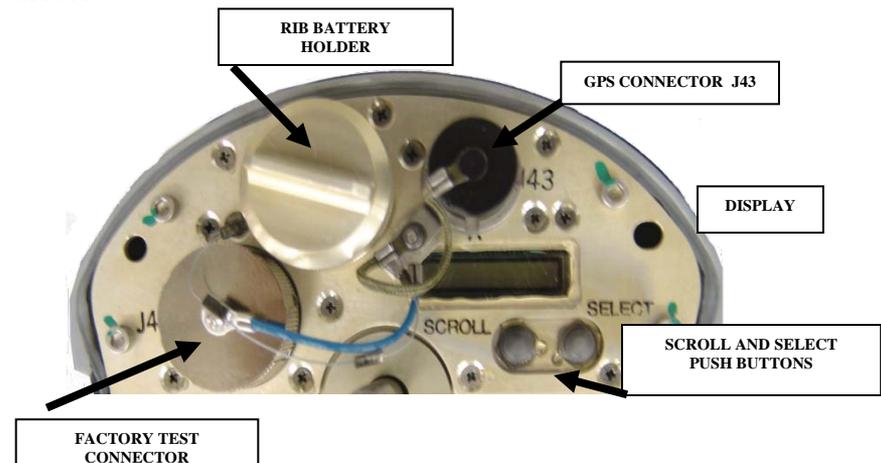
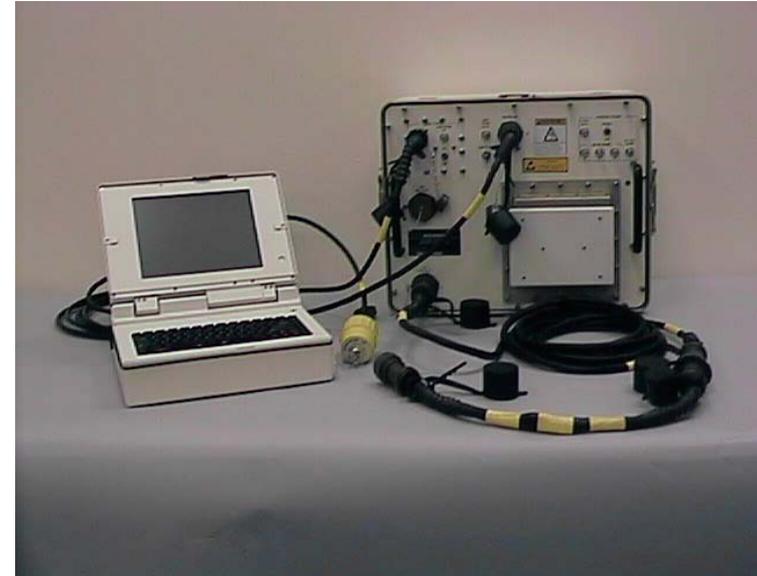
- Flexible Aircraft Interface
 - Compatible with an MIL-8591 14 Inch Suspension Lugs
 - **Un powered Interface**
 - No Umbilical
 - Lanyard Squibbed Battery
 - Smart Data Interface (1760)



- Mission Planning
 - JMPS Compatible

- Un powered Interface
 - Missions Loaded via RIB on the Ground with CMBRE*
 - Maximum of 8 Missions
 - Ground Crew or Pilots Selects Mission Prior to Take Off
 - Cannot Be Changed Once Aircraft Takes Off

- Smart Data Interface (1760)
 - Mission Data Loaded onto Aircraft – Multiple Missions
 - Pilot Loads a Single Mission onto MALD[™] Prior to Launch
 - Mission Can be Changed Prior to Launch



* Common Munitions Bit/Re Programming Equipment