ADVANCED SUPER HORNET

Outpacing threats in a 2030+ A2/AD environment ... affordably!

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Evolution of the Super Hornet

Advanced Super Hornet

Adv. Capability Insertion

- Enhanced Survivability
- Conformal Fuel Tanks
- Enclosed Weapons Pod
- Enhanced Engine
- Next Generation Cockpit
- Internal IRST
- Missile / Laser Warning

Block II

Mission Systems Insertion

- Advanced pilot vehicle interface
- Advanced computing systems
- Joint Helmet Mounted Cueing System
- AESA radar
- MIDS
- ATFLIR
- IDECM Blk IV
- IRST
- Advanced Networking & Fusion

Block I

New Air Vehicle Design

- Lethality
- Survivability
- Range
- Bring back
- Payload



Investing Today - Reducing Risk & Ensuring Readiness

Advanced Super Hornet

Adv. Capability Insertion

- Longer Range
- Low Observability
- Significant Acceleration Increase
- Enhanced Situational Awareness







Significant Industry Funded Initiatives







AESA Radar Upgrades



Advanced Super Hornet Prototype Demonstration Pillars

Low Cost /Low Risk Fleet Insertion

- Designed for rapid retrofit and forward fit
- Demonstrate CFT maintenance concepts
- Provide risk reduction for production articles



Increased Range & Endurance

- Validate CFT & EWP drag for cruise/loiter
- Assess flying qualities
- Increased bring-back
- Growler compatible design

Reduced Signature

- Validate RCS w/In-flight measurements
- Modular 1st/2nd day capabilities
- Ship maintainable

Designed to Operate in the 2030+ A2/AD Environment

Advanced Super Hornet Prototype Test Configuration

Conformal Fuel Tanks (CFTs)

<u>Prototype</u>: Designed to validate aerodynamic and signature performance with partial CFT fuel load; 1500 lbs.

Production: 870 lbs. empty – will hold 3500 lbs. of useable fuel; adding 260 NM of combat range



Signature Reduction

Production-ready signature enhancements enable capability against advanced threats

Enclosed Weapons Pod (EWP)

Prototype: Designed to validate aerodynamic and signature performance; 2050 lbs.

Production: 900 lbs. empty – will hold ~2500 lbs. of weapons for low signature missions

On-Aircraft Flight Demonstration is Ultimate Proof of Viability

Advanced Super Hornet Prototype Flights

- Commenced flying on 5 August 2013
- 15 flights to-date; 25 hrs.
- 9 additional flights planned; 14 hrs.
- Flights in STL operating areas and Pax River NAS air-space





10 Months from Concept to Flight

Conformal Fuel Tanks

Prototype CFTs

- Outer mold-line shaping derived from wind-tunnel and signature testing
- Prototype CFTs designed & manufactured by Northrop Grumman



Production CFTs

- Holds 3500 lbs. of useable fuel
- Requires internal fuel system "plumbing" changes that can be retro- fitted onto existing aircraft or forward-fitted onto new aircraft
- Provides additional space for added weaponry or electronic equipment
- Enhances selected missions where very low-signature is necessary

Enhances Super Hornet & Growler Mission Capability and Flexibility

"Napkin to First Flight" in 10 months





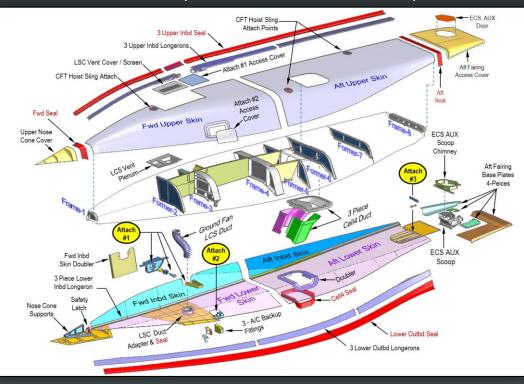
Northrop Grumman Invested Company Funds to Develop the CFTs

CFT Structural Arrangement

- ~207 parts per tank
- Composite upper skins
- Metal lower skins and floors
- Fastened construction



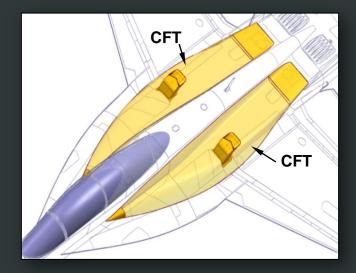
CFT System General Concept



CFT Specifications

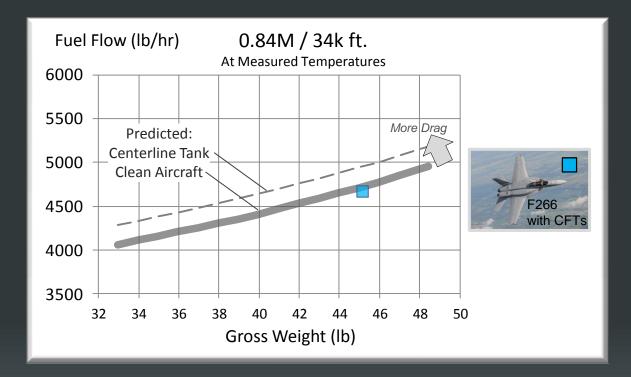
Prototype

- CFT weight will simulate a production CFT at low fuel state
- Designed to carry 3500 lbs of fuel
- Production shape representative
 - Demonstrate flying qualities
 - Considers maintainability



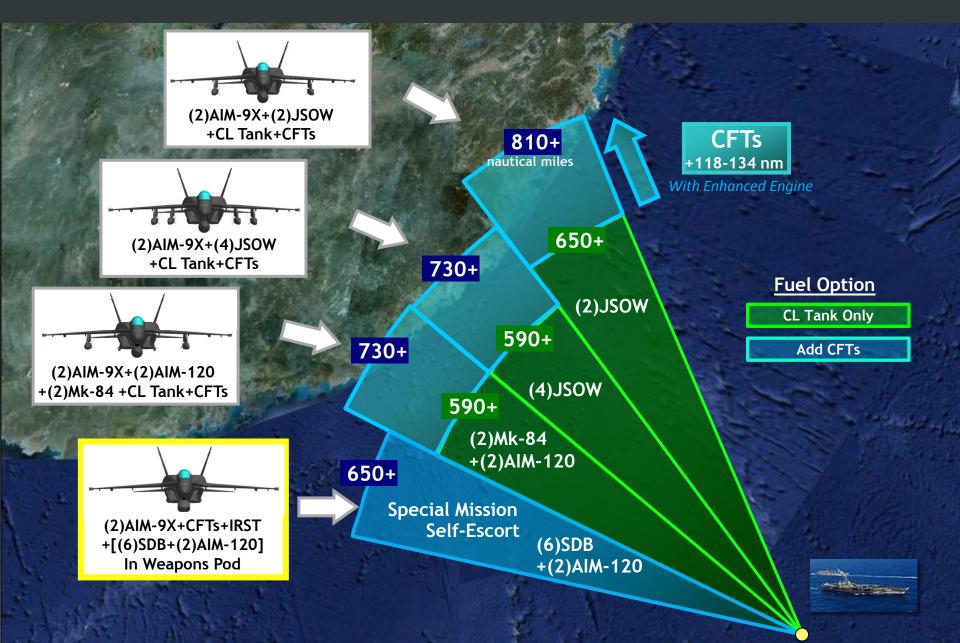


Fuel Burn Rate w/CFTs Confirm Zero/Negative Drag Impact



- F264 clean aircraft flown side-by-side with F266 w/CFTs on 6 August 2013
- Fuel burn rate (drag) demonstrated to be same or better with CFTs
- Extracted drag data consistent with wind tunnel predictions

Enclosed Weapons Pod + CFTs Enables a Day 1 Super Hornet Option



EA-18G Growler with CFTs and Next Generation Jammer (NGJ)



Add CFTs, Remove External Tanks

- Same mission performance with 3,000 lbs. less fuel
- 600+ lbs reduced landing weight
- Reduces fuel required for bring-back by 400 lbs.
- Un-obscured field-of-regard for jamming

Enhanced Capability at Lower Cost

Enclosed Weapons Pod (EWP)

Prototype EWP

• 2050 lbs. – designed to validate aerodynamic and signature performance

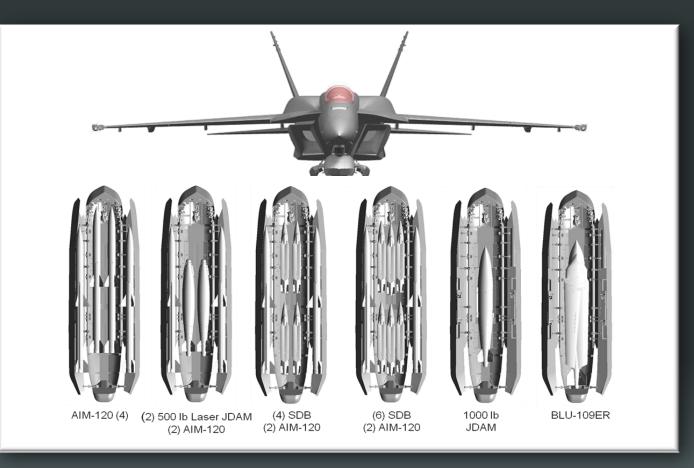


Production EWP

• 900 lbs. – will hold ~2500 lbs of weapons

Optimized for Day 1, Low Signature Missions

Enclosed Weapons Pod (EWP) Operational Flexibility



- Provides modular 1st day low signature weapons carriage
- Supports a broad array of DoD air-to-air and air-to-surface weapons
- Provides full envelope maneuvering capability
- Can be carried on centerline and inboard wing stations
- Used to support specialized avionics and sensors

Validating More Than 50% Improvement Over Current LO Signature

- Signature enhancements
 - Designed to counter 2030 + threats
- CFTs and EWP designed for low signature missions



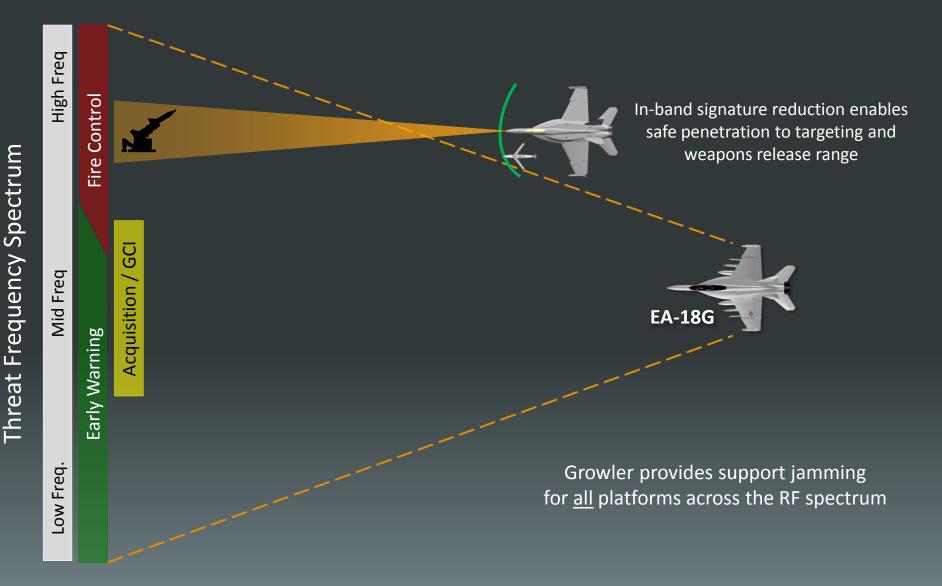
- All procedures and materials enable rapid transition to production
- Signature design equally suitable for forward-fit and retro-fit
- Signature validated in both Boeing's near-field test facility and the Navy's Atlantic Test Range

Near-Field Testing Validating Signature Design Prior to Flight

Near-Field Range Testing

- 100 Hrs of testing & diagnostics
- Clean and CFT configurations
- Multi-band
- Tested GE prototype advanced engine inlet devices

How much stealth is needed for the 2030+ A2AD Environment?



Total Survivability Solution to Counter Emerging Threats

Affordable Innovation

- Maintainability and ground support features
 - Designed to be supportable at the Organizational level
 - Uses existing maintenance procedures and maintainer training
- Advanced Super Hornet features are retrofit-able or available for incorporation onto new aircraft
 - Retrofit of CFTs and additional signature enhancements require minimal down time



Delivering Next-generation Capabilities in a Cost-effective Manner

What's Next?

2014 Flight Demonstration Multi-Ship/Multi-Spectral Fusion Demonstration

Common battle-space Depiction in all aircraft Radar IRST ATDL IRST - Infra-Red Search & Track ATDL - Advanced Tactical Data Link

Common Operating Picture Enables Extended Range Air-to-Air Engagements

Evolutionary Approach, Revolutionary Results



Outpacing Future Threats Affordably and Reliably