

F-35 Weapon System Overview



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JSF SDD Program Overview



Interoperability



Global Sustainment

Domestic / International Suppliers



Autonomic Logistics



3 Flight Test Facilities



Integrated Training



CV



CTOL



STOVL



P&W F135 GE/RR F136

3 Services



8 International Partners



2 Security Cooperation Participants



CATB



Team JSF

LOCKHEED MARTIN
NORTHROP GRUMMAN

BAE SYSTEMS

GE
GE Rolls - Royce
Fighter Engine Team

Rolls Royce

Mar 10 2



F-35 5th Gen Multi-Role Fighter



- Stealthy, Supersonic, Multirole, STOVL
- Joint and Coalition Interoperability
- F-16 / F/A-18 Speeds and Performance
- Advanced Avionics and Data Links
- Advanced Countermeasures
- Increased Endurance / Range With Internal Fuel and Weapons
- Smaller Logistic Footprint...Requiring Less Support and Airlift



Lethal Survivable Supportable Affordable



VLO Stealth Must Be Designed-In



CTOL	18,500 lbs
STOVL	14,000 lbs
CV	20,000 lbs



Fundamental 5TH Gen Design Features Can Not Be Retrofitted



The Solution – A Quantum Leap In Capability



Capability

5th Generation
Fighters
(Circa 2005)

Net-Enabled Ops

Integrated Sensor Fusion

Advanced Stealth With
Fighter Performance



4th Generation
Fighters
(Circa 1975)

Multi-Mode Sensors

Precision Weapons

Energy Maneuverability



Time

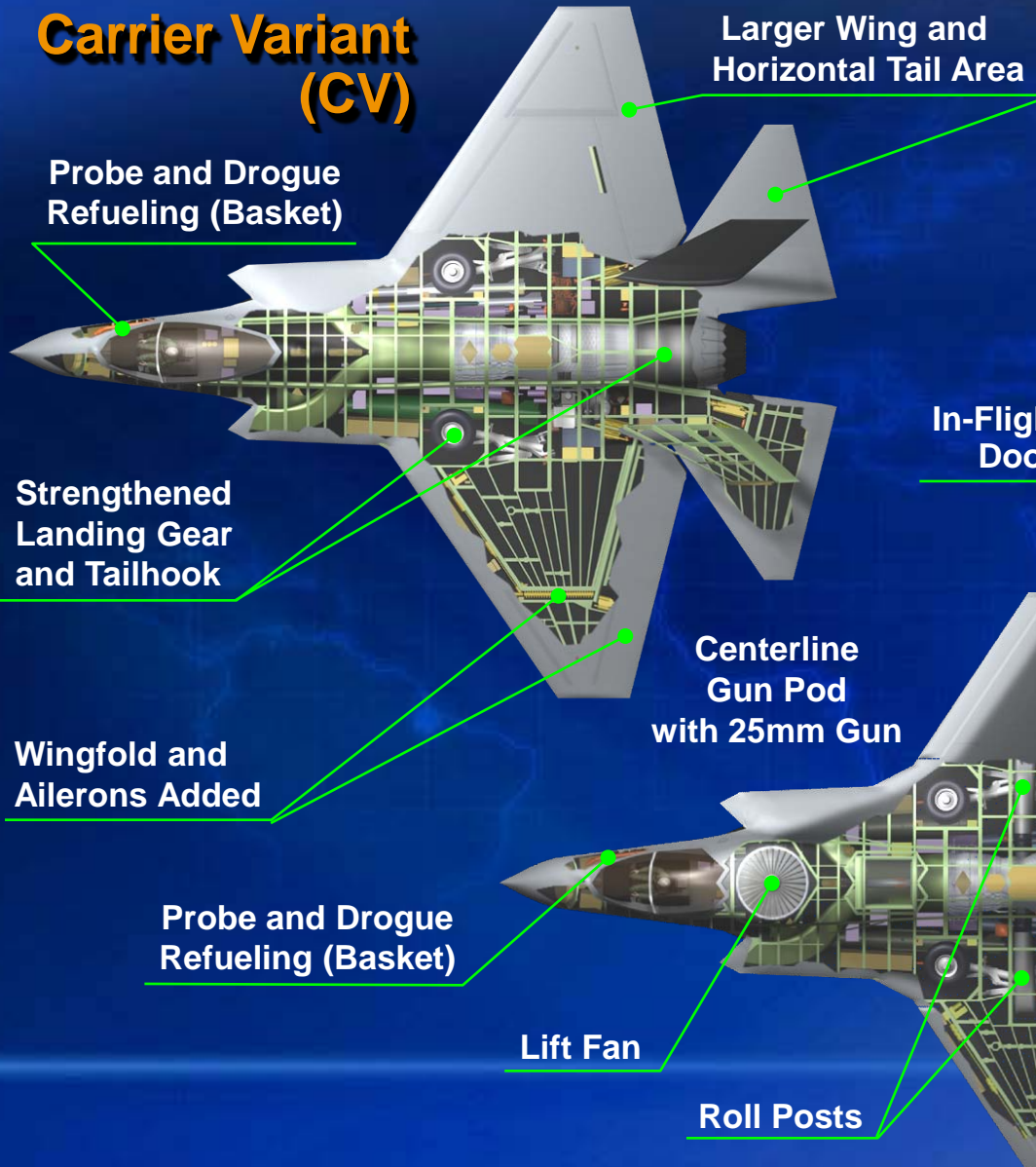
F-35 Is the Future



Lockheed Martin Multi-Service Design



Carrier Variant (CV)



Larger Wing and Horizontal Tail Area

Probe and Drogue Refueling (Basket)

Strengthened Landing Gear and Tailhook

Wingfold and Ailerons Added

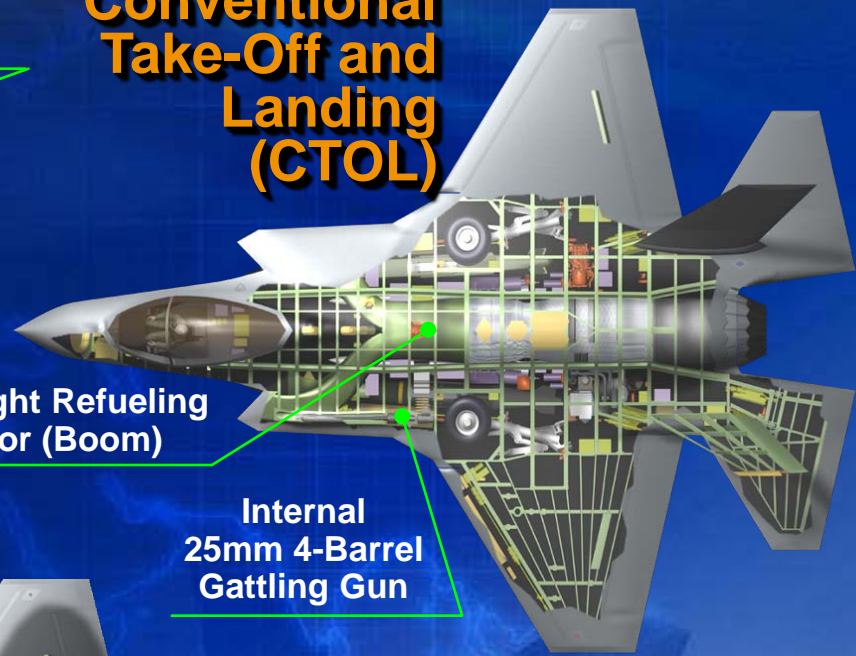
Probe and Drogue Refueling (Basket)

Lift Fan

Roll Posts

Centerline Gun Pod with 25mm Gun

Conventional Take-Off and Landing (CTOL)

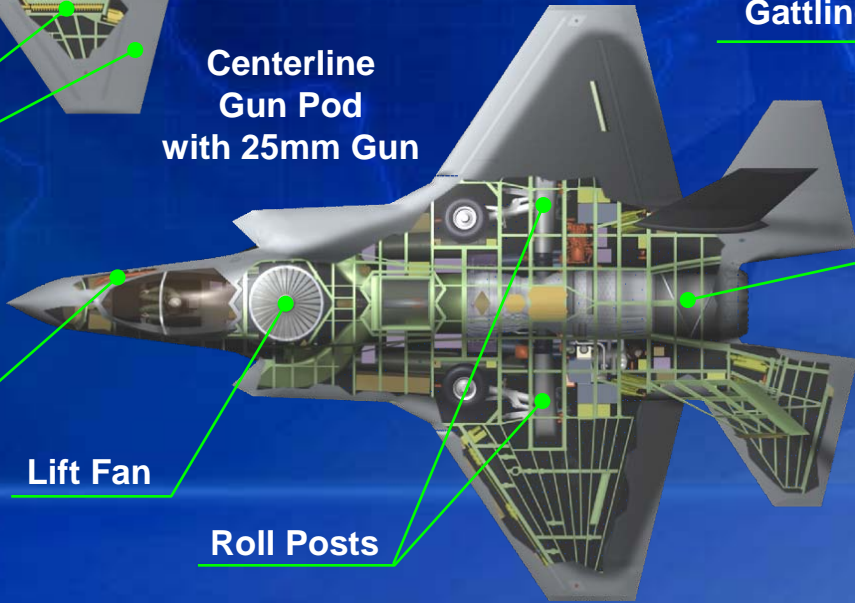


In-Flight Refueling Door (Boom)

Internal 25mm 4-Barrel Gattling Gun

3-Bearing Swivel Nozzle

Short Take-Off and Vertical Landing (STOVL)





CTOL Comparison (USAF)



F-16

Length	49.7 ft
Span	31 ft
Wing Area	300.2 ft²
Internal Fuel	7,162 lb



F-35 CTOL

Length	51.4 ft
Span	35 ft
Wing Area	460 ft²
Internal Fuel	18,483 lb



F-22

Length	62.1 ft
Span	44.5 ft
Wing Area	840 ft²
Internal Fuel	18,448 lb

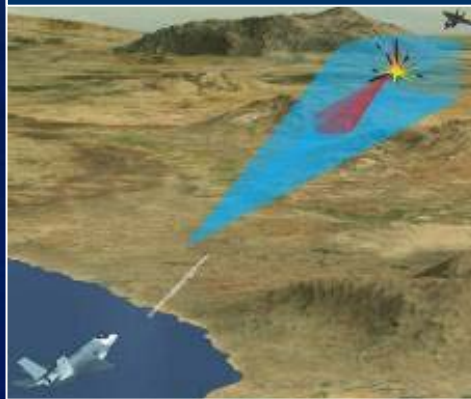


Multi-Mission Capability



- **Very Low Observable Stealth**
- **Fighter Performance**
- **Integrated Sensor Fusion**
- **Net-Enabled Operations**
- **Peace Keeping Capabilities**
- **Advanced Sustainment**

Air-to-Air



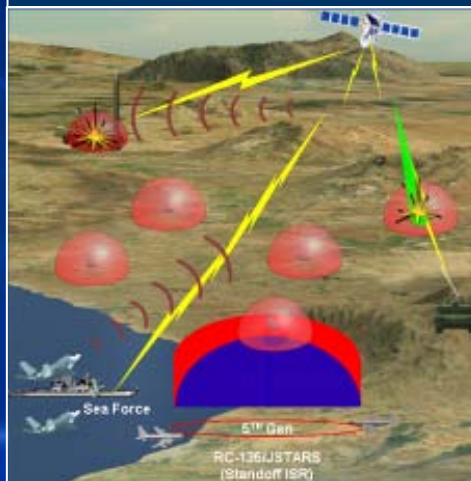
Carrier



Air-to-Surface



Intelligence, Surveillance, Reconnaissance



Electronic Attack



Command & Control



F-35 Redefines Multi-Role Aircraft

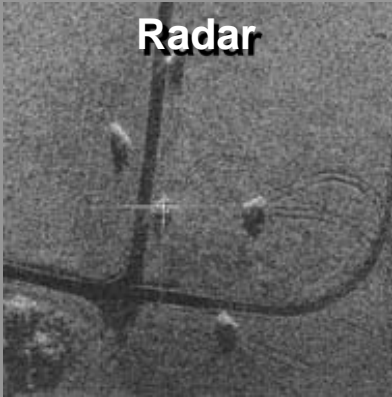


Total Situational Awareness

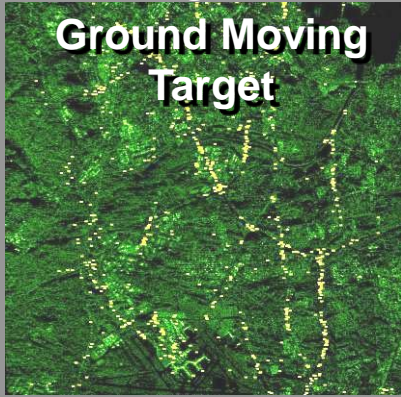


Data Links / Interrogators / EW Suite ... Multi-Spectral Sensors

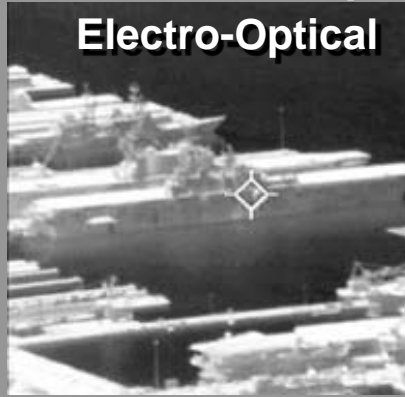
Radar



Ground Moving Target



Electro-Optical



Missile Warning



Fused Tactical Information Managed & Displayed To The Pilot



Day



Night



Mar 10-9



A Quantum Leap in Capability



Air-to-Air



Relative Loss
Exchange Ratio



Better

Air-to-Ground



Relative
Kills

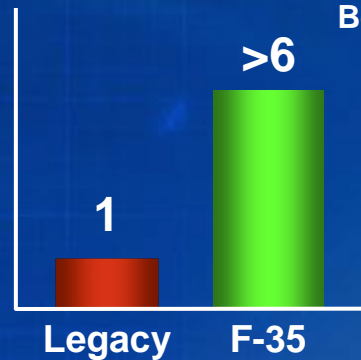


Better

ISR



Relative
Detections & ID

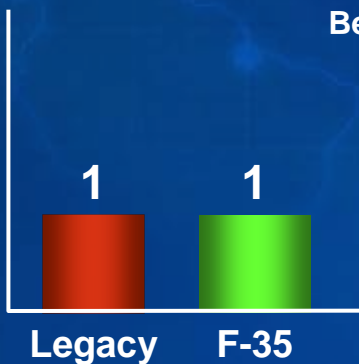


Better

Acquisition Cost



Relative
Acquisition Cost

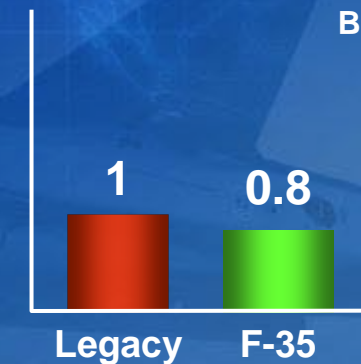


Better

O&S Cost



Normalized
O&S
Cost



Better

Unprecedented Effectiveness...and Value

F-35 Weapon Carriage Overview



“Putting the Strike in the Lightning II”



Weapons Carriage Requirements



CTOL Internal Gun

Store Fully Certified During SDD

EXTERNAL WEAPONS

INTERNAL

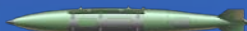
EXTERNAL WEAPONS



426 -Gallon Wing Tank



Stormshadow



GBU-38 JDAM 500-lb (MK-82 Warhead)



AGM-158 JASSM



MXU-648/CNU-88 Baggage Pod



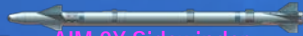
AGM-154A/C JSOW Glide Bomb



AIM-120B/C AMRAAM



GBU-31 JDAM 2,000-lb (MK-84 Warhead)



AIM-9X Sidewinder



GBU-32 JDAM 1,000-lb (MK-83/BLU-110 Warhead)



BDU-57/58/60 Laser-Guided Training Round



GBU-31 JDAM 2,000-lb (BLU-109 Warhead)



Brimstone/Joint Common Missile



Missionized Gun

MK-76/MK-58/BDU-48



GBU-32 JDAM 1,000-lb (MK-83/BLU-110 Warhead)



GBU-12 Paveway II 500-lb LGB (MK-82 Warhead)



GBU-31 JDAM 2,000-lb (MK-84 Warhead)



AGM-154A/C JSOW Glide Bomb



GBU-38 JDAM 500-lb (MK-82 Warhead)



Brimstone/Joint Common Missile



GBU-31 JDAM 2,000-lb (BLU-109 Warhead)



AIM-120C AMRAAM

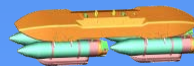


AIM-132 ASRAAM

Weapons Currently Under Development



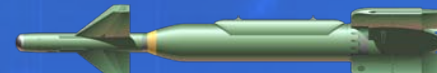
UK 500# PGB



Phase I SDB



GBU-10 Paveway II 2,000-lb LGB (MK-84 Warhead)



GBU-24A/B Paveway III 2,000-lb LGB (MK-84 / BLU-109 Warhead)



GBU-16 Paveway II 1,000-lb LGB (MK-83 Warhead)



MK-83 BLU-110 LDGP 1,000-lb LDGP



MK-83 BSU-85 HDGP



MK-84 2,000-lb LD/HDGP



MK-84 BSU-50 Ballute 2,000-lb HDGP



GBU-12 Paveway II 500-lb LGB (MK-82 Warhead)



MK-82 500-lb LD & HD



CBU-99/100 Rockeye II Cluster Munition



AIM-132 ASRAAM



Weapon Integration Overview

Internal Weapon Bays

- Combined A-G and A-A
- 1000 lb on STOVL
- Internal Adapters

Weapon Bay Integration

SMS Hardware I/O Structure (No OFP)

Armament Carriage Systems

Stores

Weapon Supplier and Data Management

Stability

Stores Management Systems

MIL-Inter Stati

- T
- 8 Independent '1553 Channels

Safing From Outside Cockpit

6 External Hardpoints Fwd of MLG

Air-to-Air and Air-to-Ground Pylons
Advanced Rail Launchers and AME

GAU-22/A 25mm Gun

- Internal (CTOL)
- Missionized (STOVL/CV)

Cer

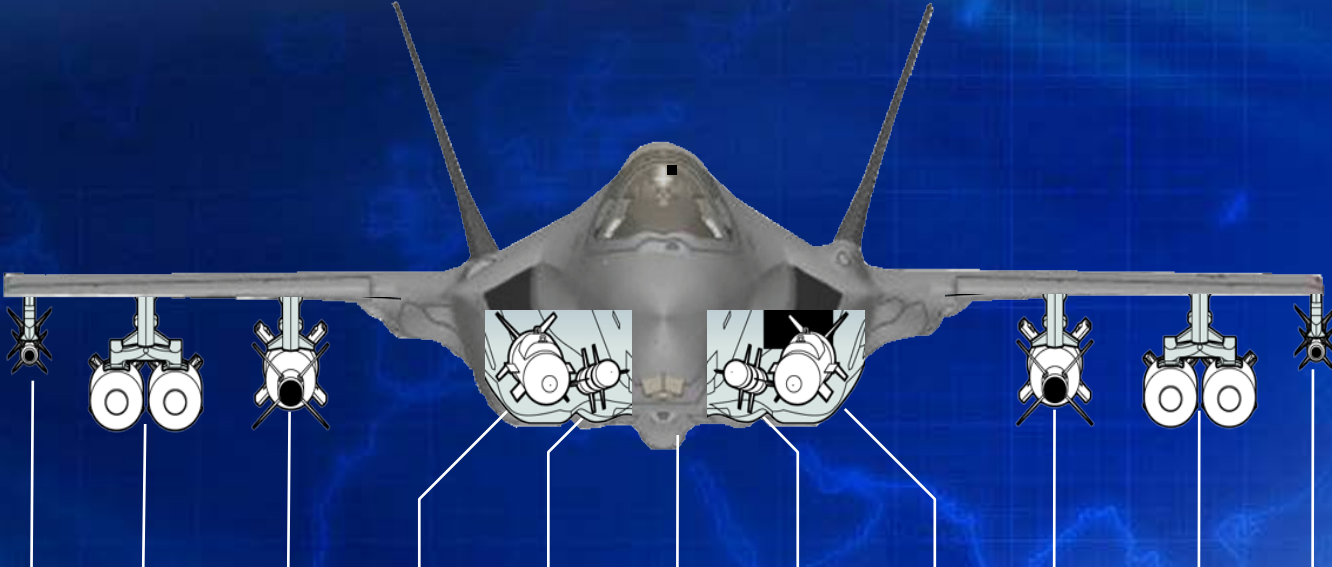
Stores Certification Process Management

All Versions

(OVL) Mil-STD-1760 Class 1
(L & CV)



F-35 Weapons Stations

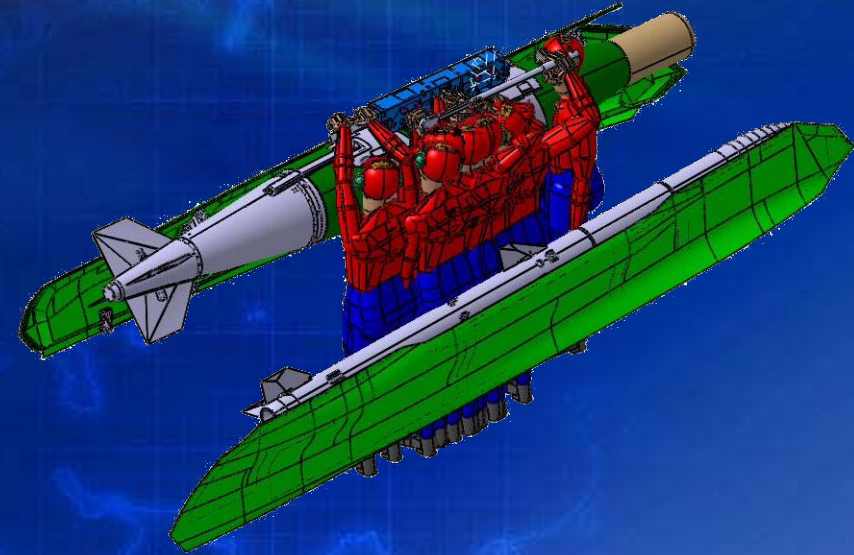


Station	11	10	9	8	7	6	5	4	3	2	1
Store	A/A	A/A, A/S	A/A, A/S	A/A, A/S	A/A	Gun	A/A	A/A, A/S	A/A, A/S	A/A, A/S	A/A
Capacity CTOL/CV	300	2,500	5,000	2,500	350	1,000	350	2,500	5,000	2,500	300
Capacity STOVL	300	1,500	5,000	1,500	350	1,000	350	1,500	5,000	1,500	300

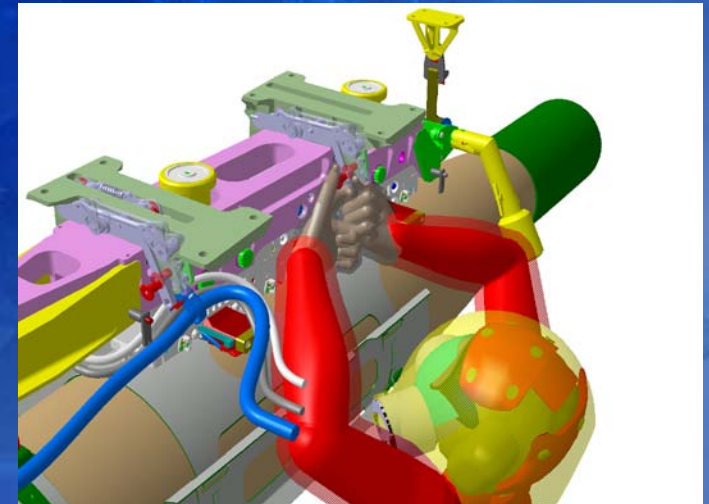
Over 18K lbs Of Payload Capability



Weapon Bay Stay-Out Volumes Definition



- **Weapon Stay-Out Volumes Defined to Protect Internal Bay Volume**
 - Includes All Required Weapons Plus Static, Fall and Maintainer Access Clearances
- **Incorporates Internal Bay Design Lessons Learned**
 - Additional Clearance for Access and Flow-Field Effects





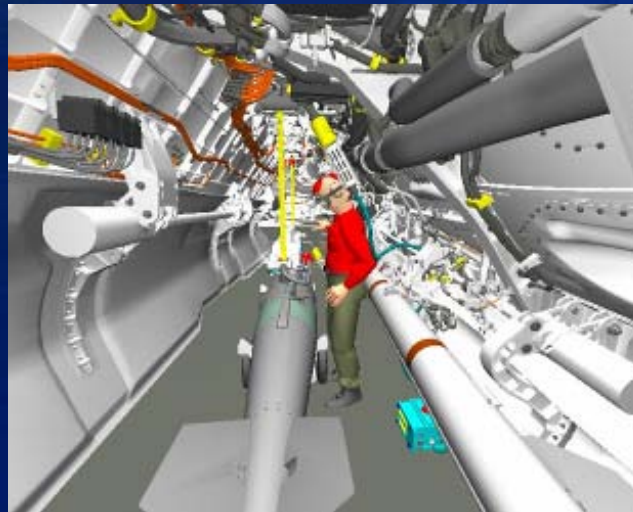
Weapon Loading Validation



Real Time Motion Capture

Real-Time Immersive Simulation

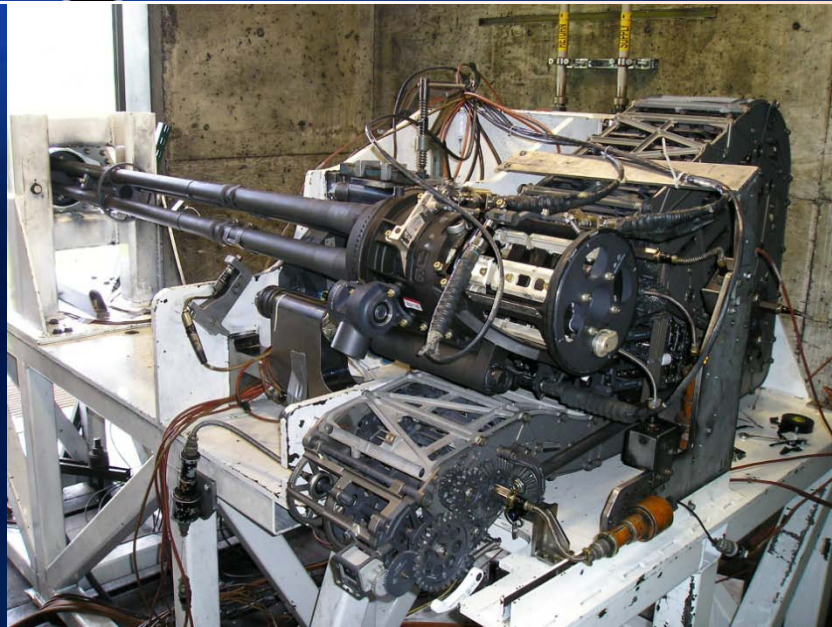
Aircraft Load



Ship – Air Integration Lab Utilized To Substantiate Loading Prior to First Load



F-35 Gun System Development



- **General Dynamics GAU-22/A Gun System**
 - 3,000 SPM Four Barrel Derivative of GAU-12
 - Currently Qualified with PGU-20/U API and PGU-23 TP Ammunition
- **Primary Mission A/G with A/A Fallout Capability**
- **Internal Installation for CTOL**
 - 181 Rounds Linear Linkless Feed System
 - Over 50,000 Rounds Fired in Development and Qualification
 - Qualification Completed in 2008
- **Missionized Pod for STOVL and CV**
 - 220 Rounds Helical Feed System
 - Currently in 36,000 Round Qualification Test Program



JSF Capability Upgrades Through Spiral Block Plan



Block 0.1 – First Flight and Envelope Expansion

Basic functions to get the Aircraft Flying

Block 0.5 – Initial MS Architecture & Sensor Infrastructure

Mission systems infrastructure Build supporting sensor and architecture development

Block 1 – Initial Warfighting Capability

Support for the AI mission (limited target set) allowing meaningful operational test

Block 2 – Multi-Mission Support

Added support for CAS with expanded target set (sensor detection and weapon prosecution)

Block 3 – Enhanced Warfighting

Follow-on build to incorporate advanced decision aids, threshold weapons, and limited objective functionality

Spiral Development Process

Supports 7 Flight Performance Aircraft

Initial MS Tactical Sensors Integration “Avionics FF(A3)” Initial Weapons Testing

Bulk of MS Hardware on Board

Primarily Software Updates with Added Weapons



F-35 - Designed for Future Weapon Growth



- **Internal Weapon Bay Design Provides Physical Volume for Future Weapons**
 - *Future Weapon Designs Should Use F-35 as Design Driver!*
- **External Station Spacing and Capacity Sized for Larger External Stores**
- **All S&RE and AME Designed for MIL-STD-8591 Mechanical Interfaces**
- **MIL-STD-1760 Class 1 Interface Provided at All Store Stations**
- **Modular Software Architecture to Minimize Integration Impacts**



Program Schedule





The Moving Line



LRIP Aircraft Now on Moving Line

In Ground Testing



BF-3 During Structural Coupling Test - Aug. 13 – 17, 2009



In Flight Testing







In Flight Testing



STOVL at USN Test Facility

