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

- Large Capacity Internal Fuel Tanks
- Curved Diverterless Inlets, “Buried” Engine
- Low Observable Seams, RAM Seals
- Weapons Carried Internally
- Reduced Signature Nozzle
- Aircraft Shaping and Edge Alignment
- Low-Emission Radar and Avionics
- EOTS / IRST
- Embedded / Internal Antennas and Sensors
- DAS Apertures

Fundamental 5TH Gen Design Features Can Not Be Retrofitted

<table>
<thead>
<tr>
<th>Mode</th>
<th>Weight</th>
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<tr>
<td>CTOL</td>
<td>18,500 lbs</td>
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<tr>
<td>STOVL</td>
<td>14,000 lbs</td>
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<td>CV</td>
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The Solution – A Quantum Leap In 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)**
- Probe and Drogue Refueling (Basket)
- Strengthened Landing Gear and Tailhook
- Wingfold and Ailerons Added

**Conventional Take-Off and Landing (CTOL)**
- In-Flight Refueling Door (Boom)
- Internal 25mm 4-Barrel Gatling Gun
- 3-Bearing Swivel Nozzle

**Short Take-Off and Vertical Landing (STOVL)**
- Lift Fan
- Roll Posts

**Larger Wing and Horizontal Tail Area**
- Centerline Gun Pod with 25mm Gun

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Public Release JSF 10-205 4/14/10
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

Intelligence, Surveillance, Reconnaissance

Electronic Attack

Air-to-Surface

Carrier

Short Takeoff

Conventional

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
A Quantum Leap in Capability

Unprecedented Effectiveness…and Value
F-35 Weapon Carriage Overview

“Putting the Strike in the Lightning II”
Weapon Integration Overview

**Internal Weapon Bays**
- Combined A-G and A-A
  - 1000 lb on STOVL
  - Internal Adapters

**Weapon Bay Integration**

**Weapon Supplier and Data Management**

**Stores Management Systems**
- MIL-STD-1760 Class 1
  - Internal (CTOL)
  - Missionized (STOVL/CV)

**Stores Certification Process Management**

**CMS Hardware I/O Structure (No OFP)**
- Armament Carriage Systems

**GAU-22/A 25mm Gun**
- Internal (CTOL)
- Missionized (STOVL/CV)

**6 External Hardpoints Fwd of MLG**
- Air-to-Air and Air-to-Ground Pylons
- Advanced Rail Launchers and AME

**Stores**
- All Versions
- (CTOL) Mil-STD-1760 Class 1
- & CV)

**Safing From Outside Cockpit**

**Stability**

**Weapon Integration Overview**

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

**GAU-22/A 25mm Gun**
- Internal (CTOL)
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- Air-to-Air and Air-to-Ground Pylons
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**Stores**
- All Versions
- (CTOL) Mil-STD-1760 Class 1
- & CV)
### F-35 Weapons Stations

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#### Capacity

- **CTOL/CV**
  - 300
  - 2,500
  - 5,000
  - 2,500
  - 350
  - 1,000
  - 350
  - 2,500
  - 5,000
  - 2,500
  - 300

- **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
**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

- 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

Spiral Development Process

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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

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Low-Rate Initial Production & Multiyear Procurement

- Planned Production
  - Air Force: 1,763 CTOL
  - Dept of Navy: 680 CV/STOVL
  - Partners: 800-1500

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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