



F-35 Lightning II

Norway



January 15, 2008



Combat Aircraft Generations



Stealth Technology



High and Fast



Air-to-Ground Only – At Night



Capability



1st Gen

- 1st Jets



2nd Gen

- Supersonic
- 1st Radar



3rd Gen

- Multirole



4th Gen

- LO Treatments
- Advanced Avionics
- Guided Weapons

- Advanced Stealth Fighter Performance
- Integrated Sensor Fusion
- Net Enabled Ops
- Advanced Sustainment

- Air-to-Air
- Air-to-Surface
- ISR
- Basing Options
- Range and Persistence
- Sensor Flexibility

Counter Air, Strike and ISR Mission Capability

5th Gen

The F-35 Design Requirement



Go Deep Into a Double Digit SAM Environment . . .

Surface-to-Air Missiles

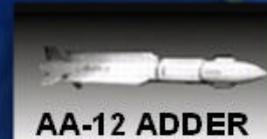


. . . Locate, Identify and Destroy Mobile / Moving Targets Through the Weather . . . While Outnumbered by Fourth Generation Fighters

Fighter Aircraft



Air-to-Air Missiles



From Any Base at Significantly Lower Cost Than Legacy Systems

Air Dominance Mission Area Requirements



5th Generation Fighters Uniquely Integrate:



F-22



F-35

- All Aspect Stealth
- Fighter Performance
- Total Situational Awareness
- Advanced Sustainment



Unmatched Counter Air, Strike, and ISR Mission Capability Increases The Effectiveness of Legacy Forces

F-35 Development Progress



Interoperability



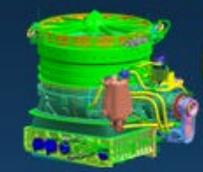
CV



CTOL



STOVL



**P&W F135
GE/RR F136**



3 Services



8 International Partners



2 Security Cooperation Participants



Global Sustainment



Domestic / International Suppliers



Autonomic Logistics



3 Flight Test Facilities



Integrated Training

Team JSF
 LOCKHEED MARTIN
 NORTHROP GRUMMAN
 BAE SYSTEMS
 GE Rolls - Royce
 Fighter Engine Team

Enable Coalition Air Forces



United Kingdom



\$1,800M



Italy



\$1,020M



The Netherlands



\$800M



Canada



\$150M



Turkey



\$175M



Australia



\$150M



Norway



\$125M



Denmark



\$125M



International Participation

- Contributed \$4.3B to SDD
- Supported Design and Development
- Partner Military Involved in Decisions
- Financial Benefits to Partners
- Opportunity for > 500 Aircraft Sales
- International Commitment to Production Nonrecurring and Sustainment Funding

Industrial Participation

- Significant Work in All Partner Nations
- "Best Value" vs. Traditional Offset
- Life of Program Participation if Best Value Maintained
- Global Sustainment Opportunities

Partners Preparing for 2008-2009 Procurement Decisions

Streamlining Logistics Support Worldwide



Domestic and UK



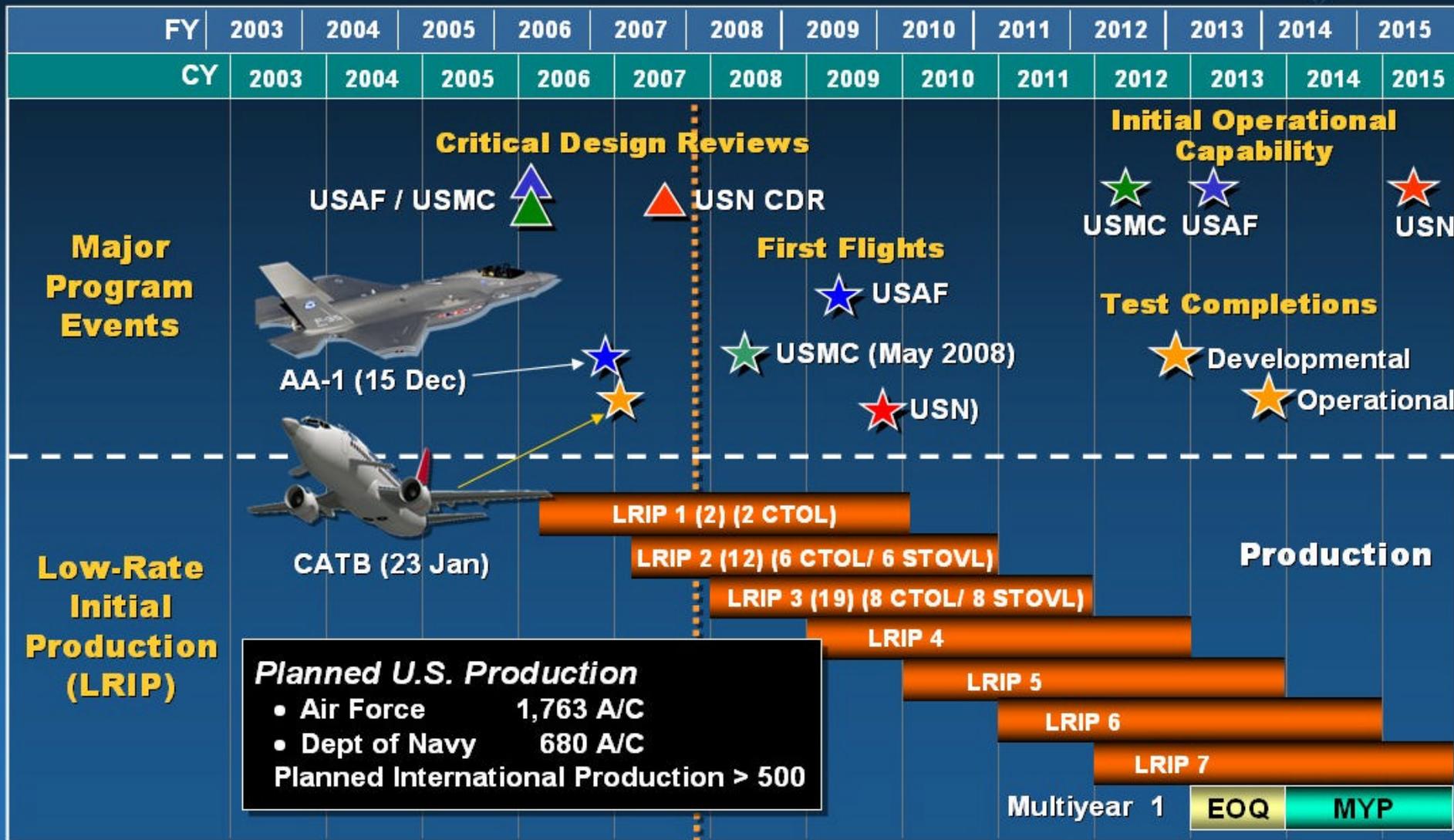
F-35 Joint Strike Fighter



International



Program Schedule





2007 Milestones

Jan Feb Mar Apr May June July Aug Sep Oct Nov Dec

✓ **LRIP #2 LL Proposal Submittal**



✓ **ALIS Ft Worth**



✓ **CV CDR**



✓ **1st STOVL Engine and Lift Delivery**



✓ **LRIP #2 FF Proposal Submittal**



✓ **CATB 1st Flight**



✓ **LRIP #1 Award**



✓ **Pilot Training CDR**



✓ **STOVL Power On**



✓ **STOVL Engine and Lift Fan Installation**



✓ **Partner MoU Signatures Complete**



✓ **BF1 Wing Completion**



✓ **CATB 1st Mission Systems Flight**



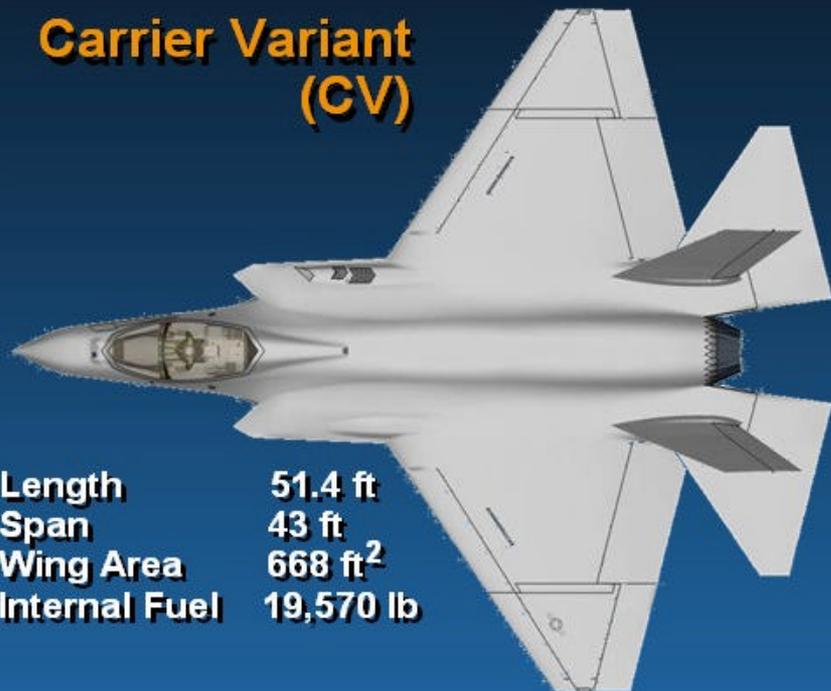
✓ **BF-1 Rollout**



Multi-Service Design



Carrier Variant (CV)

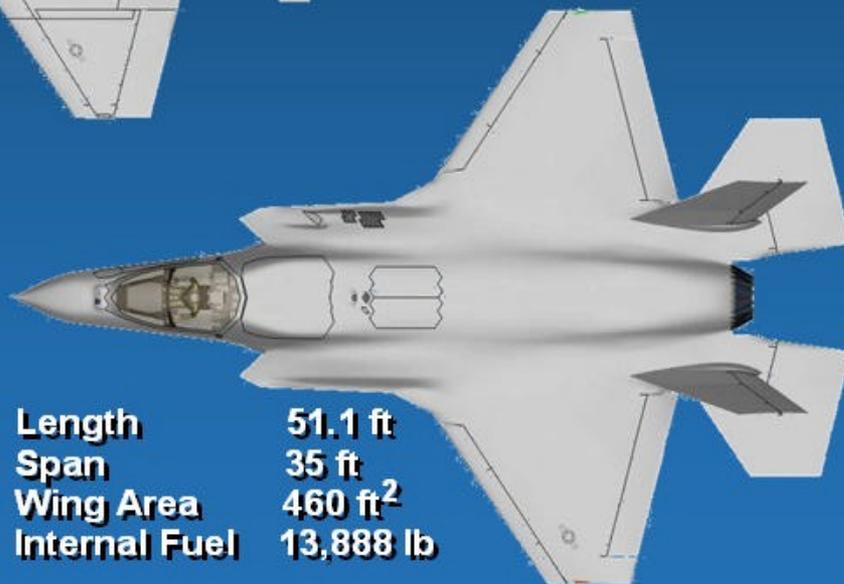


Length 51.4 ft
Span 43 ft
Wing Area 668 ft²
Internal Fuel 19,570 lb

Conventional Take-Off and Landing (CTOL)



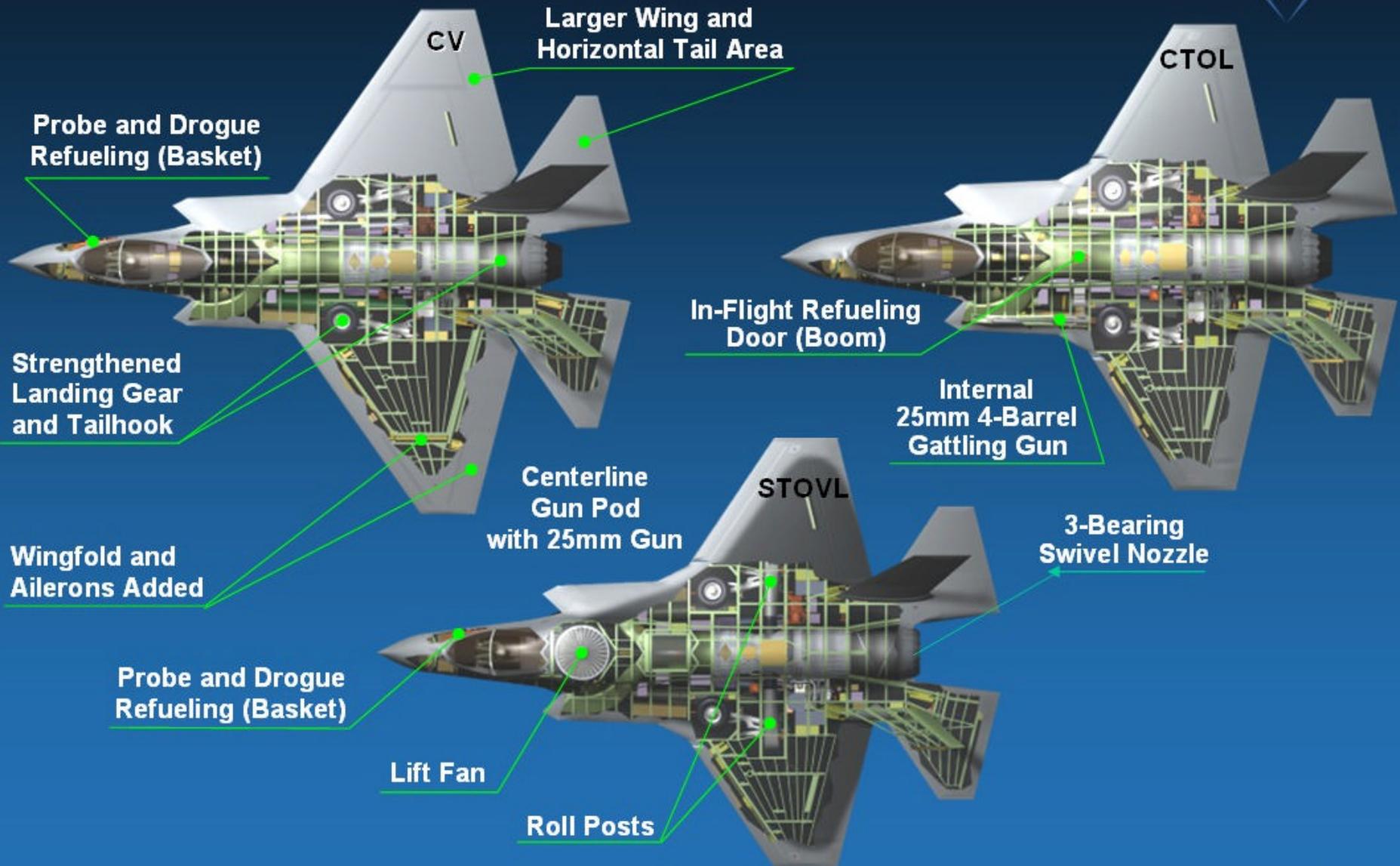
Length 51.1 ft
Span 35 ft
Wing Area 460 ft²
Internal Fuel 18,073 lb



Length 51.1 ft
Span 35 ft
Wing Area 460 ft²
Internal Fuel 13,888 lb

Short Take-Off and Vertical Landing (STOVL)

F-35 Multi-Service Design Commonality



CTOL Comparison (USAF)



F-16

Length	49.7 ft
Span	31 ft
Wing Area	300.2 ft ²
Internal Fuel	7,162 lb



F-35 CTOL

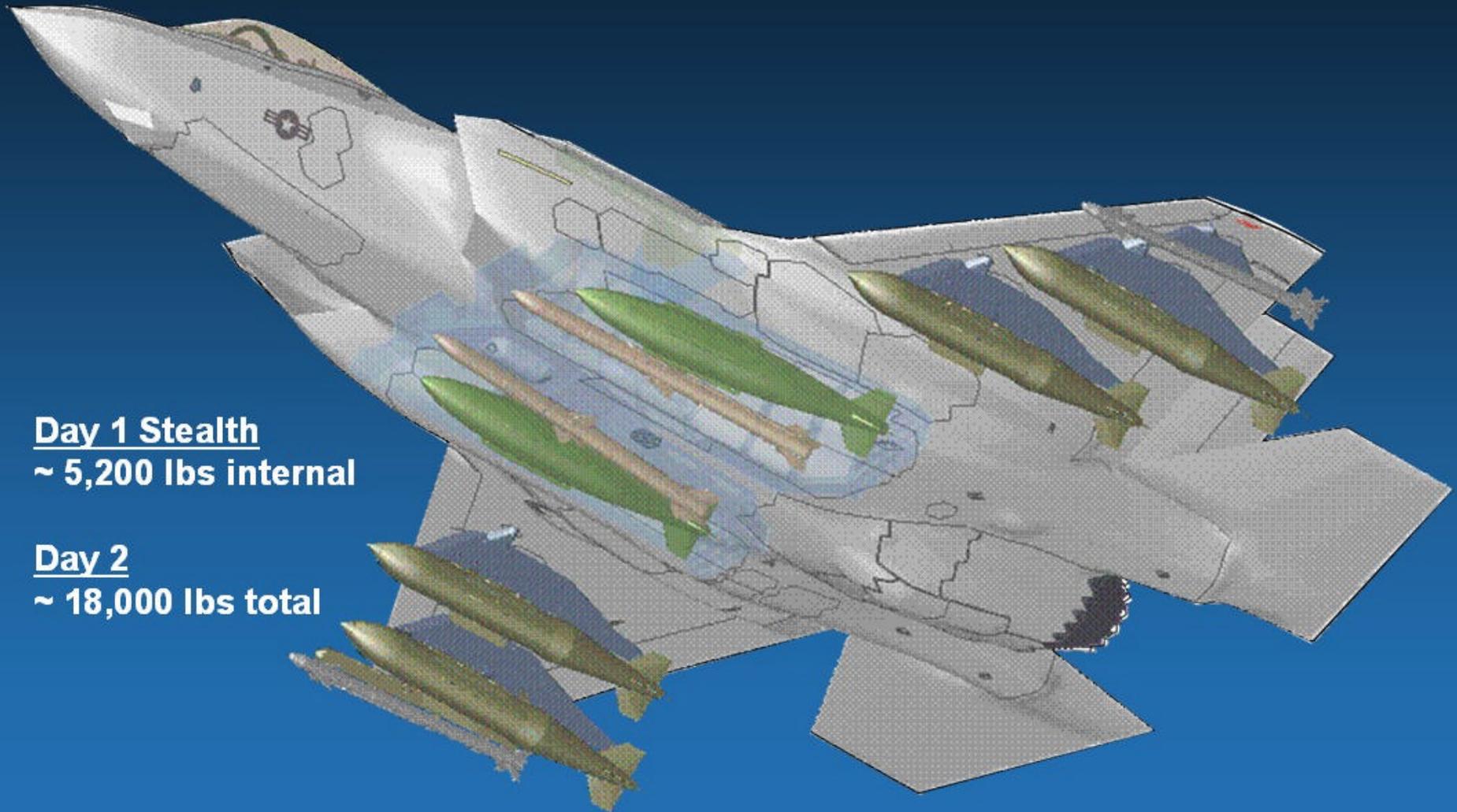
Length	51.4 ft
Span	35 ft
Wing Area	460 ft ²
Internal Fuel	18,483 lb



F-22

Length	62.1 ft
Span	44.5 ft
Wing Area	840 ft ²
Internal Fuel	18,448 lb

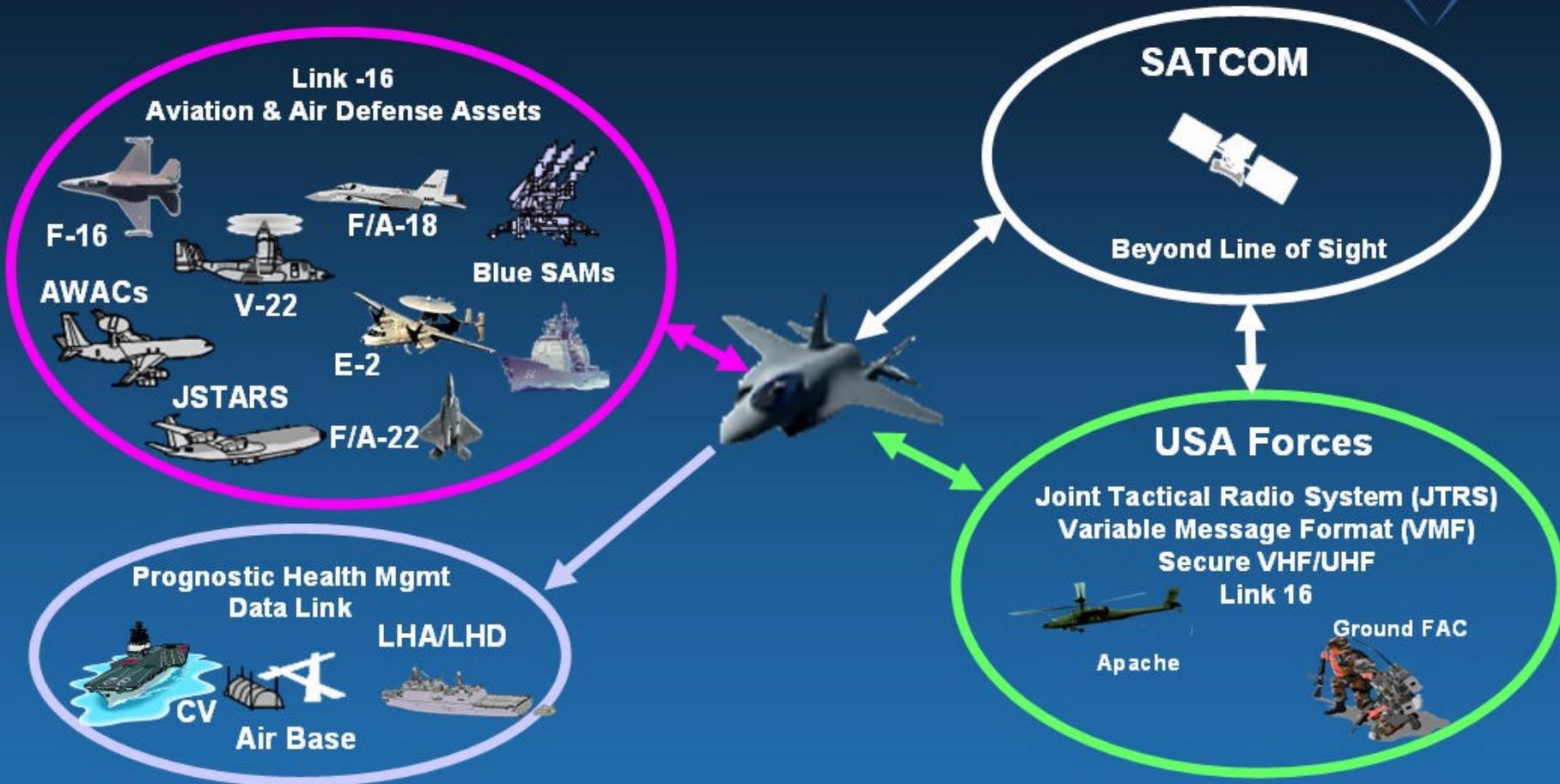
CTOL Loading



Day 1 Stealth
~ 5,200 lbs internal

Day 2
~ 18,000 lbs total

Voice and Data Link Interoperability



Over 120 Information Exchange Requirements to Ensure Interoperability Across US and Coalition Forces

Key Performance Parameters



	KPP	USMC	USAF	USN	UK
Joint	Radio Frequency Signature	Low Observable			
	Combat Radius	450 nm USMC Profile	590 nm USAF Profile	600 nm USN Profile	450 nm UK Profile
	Sortie Generation	4 <u>Surg</u> / 3 <u>Sust</u>	3 <u>Surg</u> / 2 <u>Sust</u>	3 <u>Surg</u> / 2 <u>Sust</u>	3 <u>Surg</u> / 2 <u>Sust</u>
	Logistics Footprint	<8 C-17 Equivalent Loads (20 PAA)	<8 C-17 Equivalent Loads (24 PAA)	<46,000 cu ft 243 ST	<21,000 cu ft 102 ST
	Mission Reliability	95%	93%	95%	95%
	Interoperability	Meet 100% of Critical, Top-Level Information Exchange Requirements Secure Voice and Data			
USMC UK	STOVL Mission Performance Short Take-Off Distance	550 ft	N/A	N/A	450 ft Ski-Jump
	STOVL Mission Performance Vertical Lift Bring Back	2 x 1k JDAM, 2 x Aim-120 With Reserve Fuel	N/A	N/A	2 x 1k JDAM, 2 x Aim-120 With Reserve Fuel
USN	Maximum Approach Speed	N/A	N/A	145 knots	N/A

JSF Autonomic Logistics System



Highly Supportable Aircraft

- Smart / Reliable Design
- Prognostics and Health Management
- Remove and Replace Maintenance
- On Condition Maintenance

Training System

- Integrated Training
- Embedded Pilot Training
- On Demand Maintenance Training
- Air Vehicle Software Reuse



Support System

- Sustaining Engineering
 - 24/7 Help Desk
- Electronic Joint-Service Tech Data
- Intelligent Maintenance Management
- Global Supply Chain Insight
- Support Equipment Management

Autonomic Logistics Information System

- Distributed Information System
- Enterprise Resource Solution
- Secure
- Scalable
- Deployable

Autonomic Logistics Provides Order Of Magnitude O&S Savings

....Plus Near Perfect Situational Awareness



Full Spherical Coverage by Distributed Aperture System (DAS)



Electro-Optical Targeting System (EOTS)

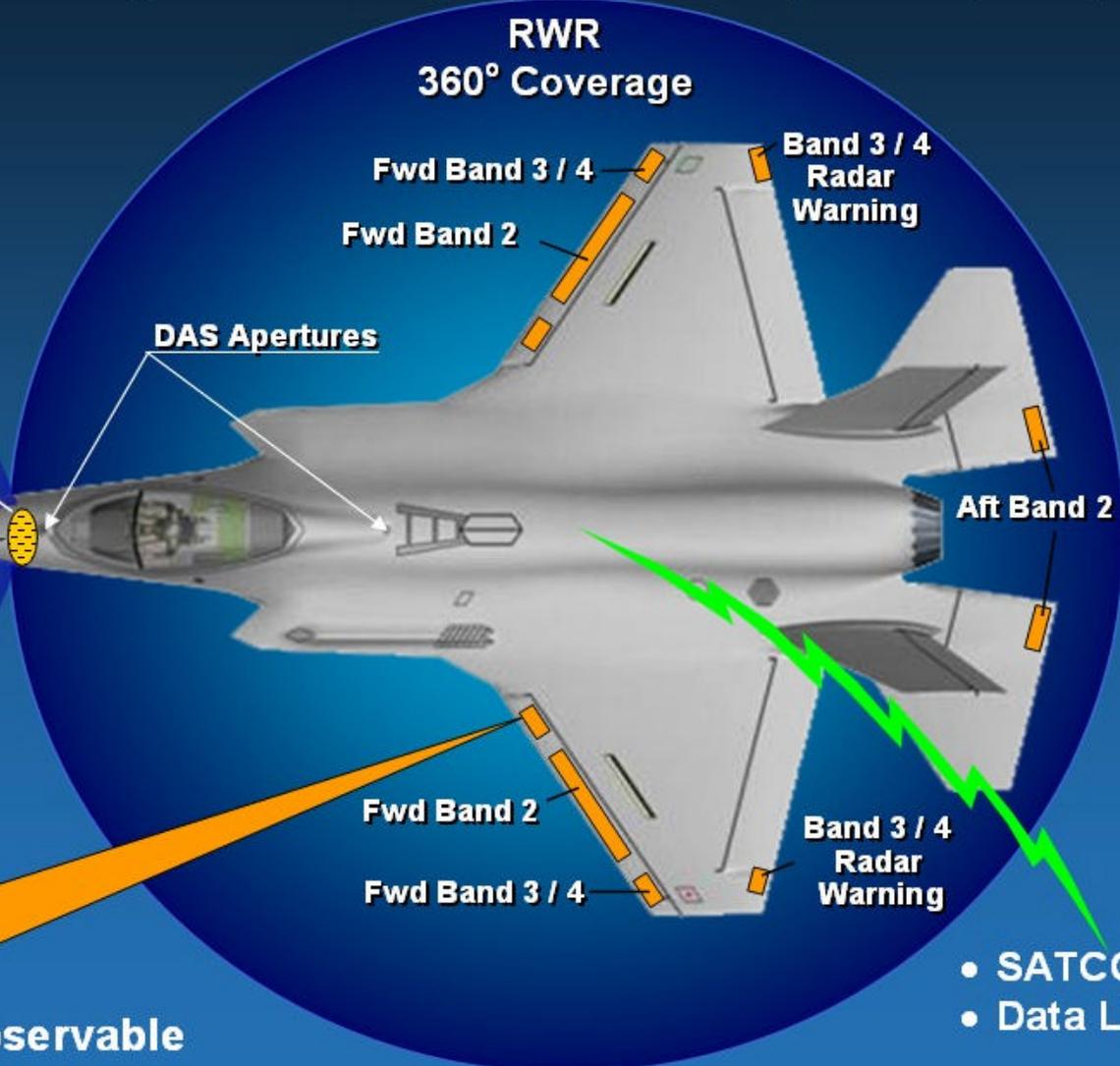
Active Electronically Scanned Array (AESA)

RADAR

Electronic Support Measures

Emitter Locating

All Aspect Stealth – Low Observable



- SATCOM
- Data Links

Fully Integrated Avionics



Exceptional Situational Awareness

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

Integrated Ground Test Labs In Place



Manned Tactical Simulators



Mission Systems Integration Lab



Prognostic Health Management Lab



Hydraulic System Integration



JSF Interoperability Lab



Vehicle Systems Integration Facility



Flight Control System Integration



Vehicle Systems Processor / Flight Control Systems Integration Facility

Autonomic Logistics Lab



Utilities and Subsystems Integration Facility



Air System Integration Facility

Electrical Power System Integration

Fuel System Simulator



Lab Integration – Unprecedented Collocation, Coordination and Capacity



Current Production Status



Forward Fuselages (LM)

- 8 in Assembly
- 4 Delivered



Center Fuselages (NGC)

- 13 in Assembly
- 5 Delivered



AFT Fuselages (BAE)

- 7 in Assembly
- 4 Delivered



Wing (LM)

- 7 in Assembly
- 4 Delivered



Major Assembly (LM)

- 4 in Major Mate
- 2 in Flight Ops

**All SDD and LRIP 1
Aircraft in Production**

2008 Milestones



Jan Feb Mar Apr May June July Aug Sep Oct Nov Dec



**LRIP #2
CTOL FF
Approved**

BF-1 FRR



**LRIP #3 FF
Proposal
Submitted**

**Sustainment
Readiness
Review-PAX**



**BF-1 Deploy
to PAX River**



**BF-1
Structural
Coupling
Tests Start**




**BF-1:
Hover Pit
Testing**



**BF-1 1st
Flight**




**AF-1
Power On**



**AF-1
Rollout**



**Maintenance
Training
CDR**



**BG-1
Transfer To
Test Lab**



**AA-1 Launch
to EAFB**



**LRIP #2
STOVL
FF
Approved**

**BF-3
Rollout**



**BF-4
Rollout**



**ALIS 1.0.2
Delivery**



**LRIP #3 LL
Approved**



**BF-2
Rollout**




**CF-1 Start
Major Mate**



**CATB 1st
Federated
Flt**



**AG-1
Static
Test Start**



Cooperative Avionics Test Bed - 737



First Full Fusion Flying Laboratory

Flight Test Underway



Objectives

- Mission Systems Risk Reduction/Confirmation
- Missions Systems Integration

Status

- 29 Flights To Date; 85.5 Flt Hrs
- Basic Airworthiness Proven
- Initial Mission Systems Installed
- First Mission Systems Flight on Dec 7, 2007



Objectives

- Risk Reduction/Confirmation
- Basic Envelope Expansion
- Systems Integration

Status

- 30 Flights To Date; 34.4 Flt Hrs
- 38,000 Feet, 0.8 Mach, 20 Degrees AoA
- Vehicle Systems Being Validated
- Reliability/Maintainability Evaluation

CATB

23 Jan '07



May '08

STOVL



2009

CTOL



2009

CV



International Parts Flying on 1st CTOL Aircraft



Life Support System
Honeywell Aerospace Yeovil - UK

Center Fuselage Metal Parts
Kalekalip - Turkey

Opening Doors
Fokker - Netherlands

Ejection Seat
Martin Baker - UK

Aft Fuselage &
Structural Components
BAE SYSTEMS - UK

Emergency UHF Radio
Selex - Italy

Weapons Bay Door
Drive/Utilities
Goodrich - UK

Composite Materials
Cytec Fiberite - UK

Noseboom
Assembly/EOTS Tray
TERMA - Denmark

Cockpit Panels
and Lighting
Selex - Italy

3-Bearing
Swivel Nozzle
Rolls Royce - UK

Throttle Quadrant
BAE - UK

CTOL Arresting Gear
STORK SP - Netherlands

F135 Low Pressure
Turbine Shaft
**Volvo Aero Norge -
Norway**

Pilot Flight Equipment
Beaufort - UK

Wiring Harnesses
Fokker ELMO -Netherlands

Wheels and Brakes
Dunlop - UK

Engine Removal and
Installation Trailer
Marand - Australia

Fuselage Remote Interface Units
Electrical Power System
GE Aviation - UK

Power Thermal Management System
Honeywell - Canada

All 8 International Partners Have Parts on 1st Flight Test Aircraft

What We Have Learned From AA-1 That Reduces Program Risk



Handling Qualities Development

- Excellent Handling qualities verify design goals.
- Initial Autopilot testing
- Mode – Speed Brake/ Air Refuel/ APC

F-135 Engine

- Engine Transients to AB
- Engine Response
- 'Control to Thrust Concept'



IPP

- Cross wind Start
- IPP screen
- ECS Temperature
- ECS Deicing
- EPU operation
- Temperature Control
- Defog pattern
- IPP operation

Electrical System

- ICC Operation
- Emergency Fill in
- 270 V Power to Flight controls

EHA

- Integration with electrical system – produced gear box changes / REGEN resistor .
- Hydraulic Reservoir Temperatures
- High altitude Electronics Unit Changes to improve component design.
- IBIT Mechanization



F-35 – An Unprecedented Value Proposition



- Unprecedented Capability – Restores Asymmetric Advantage
- Affordable Recapitalization – Worldwide
- True Security Cooperation – Enduring Relationships

Global Program



F-35 . . . Delivering the Promise