F-35 Lightning II

John Baranowski, Director, Air Systems Logistics F-35 JPO

8 November 2006
F-35 Family Of Aircraft
One Program – Three Variants
Meeting Service and International Needs

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

Short Take-Off and Vertical Landing (STOVL)
- Probe and Drogue Refueling (Basket)
- Lift Fan
- Roll Posts

Carrier Variant (CV)
- Larger Wing and Horizontal Tail Area
- Probe and Drogue Refueling (Basket)
- Centerline Gun Pod with 25mm Gun
- Strengthened Landing Gear and Tailhook
- Wingfold and Ailerons Added
- 3-Bearing Swivel Nozzle

The F-35 Family of Aircraft offers three variants to meet different service and international needs: Conventional Take-Off and Landing (CTOL), Short Take-Off and Vertical Landing (STOVL), and Carrier Variant (CV). Each variant has unique features tailored to their specific requirements.
F-35 Engine Interchangeability

- Physically and Functionally Interchangeable
- Any Aircraft Able to Use Any Engine
- Common JSF Autonomic Logistics System Interfaces

CTOL

PRATT & WHITNEY F135

STOVL

GE ROLLS-ROYCE F136

CV

COOPETITION

JSF Engines - - Common Core for Aircraft Variants, Competition in Production
Service & International Needs

- **USAF:** Multi-role (primary air-to-ground) fighter to replace F-16 & A-10 & to complement F/A-22
- **USMC:** Multi-role, short takeoff, vertical landing strike fighter to replace AV-8B & F/A-18C/D
- **USN:** Multi-role strike fighter to complement the F/A-18E/F
- **UK (RN and RAF):** Supersonic replacement for Sea Harrier and GR-7
F-35 Autonomic Logistics System

Highly Supportable Aircraft
- Smart / Reliable Design
- Prognostics and Health Management
- Remove and Replace (R/R) Maintenance
- On Condition Maintenance

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

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

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

Autonomic Logistics Provides Order Of Magnitude O&S Savings
JSF Training
Virtual – Constructive - Live

Pilot Entry Criteria
• T-38
• T-45
• Fighter Qualified

Maintainers Entry Criteria
• A School
• Tech School
• Previously Qualified Tech

Electronic Classrooms

Operational and Deployed
• Pilot Mission Rehearsal
• Maintainer Task Rehearsal
• Distributed Mission Training

Web Based on Demand CBT
• Continuation Training
• Embedded Training

Deployed/On-Demand Training
• Deployable Mission Rehearsal Trainer
• Distributed Learning
• Full Access to All JSF Courseware

Training Infrastructure System
Distributed Management
Records, Courseware, Software, Tech Data, Configurations

ALIS Connectivity
Feedback
Autonomic Logistics Information System

ALIS consists of the system, application and network infrastructures required to provide global integrated and autonomic support

- Single, Secure Information Environment
- Distributed Network Based on Web Technologies
- Capabilities Integrate Broad Range of Domains
  - Operations
  - Maintenance
  - Supply Chain
  - Customer Support Services
  - Training
  - Tech Data
  - External Interfaces

Functionality Focused on Enhancing Operations and Support
- Decision Support
- Autonomic Process Integration

“Provide All Information To Support Operations and Maintenance at Any Basing Location”
Prognostics Health Management

**Air Vehicle PHM**
- Enhanced diagnostics / BIT
- Corroboration
- Correlation
- Information Fusion
- Health Management Reports

**Unit Level Maintenance**

**Fleet Mngt Activities**

**Autonomic Logistics Information System**
- Decision Support
- Autonomic Process
- Integration

**Off Board PHM**
- Prognosis Models
- Life Usage Algorithms
- Failure Resolution Algorithms
- Diagnostic Tools

**Suppliers and OEMs**

**Customer Support**
F-35 MID 917 Approach

• Part 1: Conduct Business Case Analysis (BCA) to validate that PBL is most beneficial approach for F-35
  • BCA process conducted Dec 04-Mar 05
    – Two support concepts documented for evaluation
      ➢ Organic based Alternative Concept Description (ACD) – F-35 JPO
      ➢ F-35 Autonomic System based ACD – Lockheed Martin
    – Integrated quantitative and qualitative analyses completed
    – **PBL validated as best sustainment process for F-35**
  • Part 2: Develop a PBL Road Map phased approach for the JSF which integrates MID 917 process initiatives
    – Will be an evolving PBL concept
    – Identify obstacles and potential mitigation strategies
    – Demonstrate F-35 ability to implement initiative in the following areas
      ➢ Overall PBL performance
      ➢ Contracting
      ➢ Programming & Budgeting
      ➢ Finance
**Actual Performance against PBA**

- No actual performance against PBA yet
- LRIP I contract performance begins early 2007 (Deliveries 2009)
- Full PBL expected to begin after last U.S. IOC (2013)

<table>
<thead>
<tr>
<th>Cost Plus</th>
<th>Fixed Price</th>
</tr>
</thead>
</table>

| LRIP I RFP | LRIP IV RFP | FRP |

- PBA Metrics
  - Start Collecting
  - Start Tracking
  - Evaluate & Perform to

- "Refined" set of PBA Metrics
  - Collecting
  - Tracking
  - Evaluate & Perform to

- "Final" set of PBA Metrics
  - ($/FH) contract
  - Long term contracts…

Decision Point
- Review Metrics
- Review calculations
- Evaluate costs

Decision Points
- Review Metrics
- Review calculations
- Evaluate costs
Interim Contractor Support (ICS)
Non-Recurring Depot Costs

Legacy ICS Approach... Financially Motivates ASC/PSC/OEMs to Defer Additional Depot Capability to ICS Contract... Results in Duplicate Cost for Organic Stand-Up and Excess Capacity
JSF Approach: Leverage SDD Contract…Right Size Capacity

JSF Approach Breaks Interim Contractor Support (ICS) Paradigm… Financially Motivates ASC/PSC/OEMs to Maximize SDD Developed Capability

FOR OFFICIAL USE ONLY /REL TO USA, AUS MOD, CAN DND, DNK MOD, GBR MOD, ITA MOD, NLD MOD, NOR MOD and TUR MND
# F-35 SDD Program Schedule
(With PB-06 US and Apr 05 UK Quantities)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Air System Program Events</td>
<td>AS PDR</td>
<td>AS CDR 1</td>
<td>AS CDR 2</td>
<td>AS CDR 3</td>
<td>CTOL FF</td>
<td>STOVL FF</td>
<td>CTOL (Opt)</td>
<td>CV FF</td>
<td>Blk 1 DT&amp;E</td>
<td>Blk 2 DT&amp;E</td>
<td>Blk 3 DT&amp;E</td>
<td>IOC USMC</td>
<td>IOC USAF</td>
</tr>
<tr>
<td>Mission &amp; Vehicle Systems</td>
<td>Block 0</td>
<td>Block 0.5</td>
<td>Block 1</td>
<td>Block 2</td>
<td>Block 3</td>
<td>CDR</td>
<td>FETT</td>
<td>IFR</td>
<td>FFR</td>
<td>ISR</td>
<td>OCR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propulsion F135 F136</td>
<td>Pre-SDD</td>
<td>Transition</td>
<td>CDR</td>
<td>FETT</td>
<td>PDR</td>
<td>CDR</td>
<td>FETT</td>
<td>SDD</td>
<td>IFR</td>
<td>ISR</td>
<td>OCR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autonomic Logistics Development</td>
<td>CTOL Trng Sys PDR</td>
<td>Pilot PDR</td>
<td>Mx PDR</td>
<td>Mx CDR</td>
<td>Blk 1 RFT</td>
<td>Blk 2 RFT</td>
<td>Blk 3 RFT</td>
<td>Development and Qualification</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Rate Initial Production (LRIP) (US and UK Qtys)</td>
<td>LRIP I (5)</td>
<td>Long Lead</td>
<td>Full Funding</td>
<td>CTOL - 5</td>
<td>CTOL - 8</td>
<td>CTOL - 10</td>
<td>CTOL - 15</td>
<td>CTOL - 20</td>
<td>CTOL - 20</td>
<td>CTOL - 20</td>
<td>CTOL - 31</td>
<td>CTOL - 65</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRIP II (18)</td>
<td>LL</td>
<td>FF</td>
<td>STOVL - 10</td>
<td>CV - 12</td>
<td>UK - 2</td>
<td>STOVL - 20</td>
<td>CV - 16</td>
<td>UK - 3</td>
<td>STOVL - 20</td>
<td>CV - 10</td>
<td>DoN - 43</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRIP III (49)</td>
<td>LL</td>
<td>FF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRIP IV (60)</td>
<td>LL</td>
<td>FF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRIP V (73)</td>
<td>LL</td>
<td>FF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRIP VI (110)</td>
<td>LL</td>
<td>FF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRIP VII (143)</td>
<td>LL</td>
<td>FF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>