Overview

- JSF Program Update
- JSF “Family” of Aircraft
- JSF Operations
- Integrated Avionics Suite
  - Surface Target ID
  - AESA Radar
  - EOTS
  - DAS
- Range Criteria
- Summary
JSF “101”

- USAF, USN, USMC, and several other countries will be fielding JSF
  - Single seat, multi-role fighter
- Three Variants
  - USAF Conventional Take Off and Landing (CTOL)
  - USMC Short Take Off/Vertical Land (STOVL)
  - USN Carrier Variant (CV)
- USAF purchase is for 1763 aircraft
  - 1-for-1 replacement for A-10/F-16
- JSF will enter USAF inventory ~2010
  - IOC ~2013
JSF Family of Aircraft

**CTOL**
- Span (ft): 35
- Length (ft): 50.5
- Wing Area (ft²): 460

**STOVL**
- Span (ft): 35
- Length (ft): 50.5
- Wing Area (ft²): 460

**CV**
- Span (ft): 43
- Length (ft): 50.8
- Wing Area (ft²): 620

**vs. Legacy:**
- 2.5x Range
- 1.4x Fuel/Payload Capacity

**Gun Fairing**

**F-16**
- Weight Empty (lb): 26,664
- Internal Fuel (lb): 18,307

**AV-8B**
- Weight Empty (lb): 29,695
- Internal Fuel (lb): 13,400

**F/A-18C**
- Weight Empty (lb): 29,996
- Internal Fuel (lb): 19,145

Folded Span 31.1 ft
AA-1 in Flight Test

Status
• 19 flights to date (six in January)
• Plan is 6 flights a month
• Next flight scheduled late Nov 07

Objectives
• Risk reduction/confirmation
• Basic envelope expansion
• Systems integration

• First Flight was 15 Dec 2006
JSF Operations

• JSF will be F-18/F-16-like
  • 60/40 mix – not built for the “phone booth”
  • Sensor Management/Integration intensive

• Active Electronically Scanned Array (AESA) Radar much more capable than legacy
  • Tactics require larger amounts of airspace to train realistically
  • Legacy fighters are also being upgraded with AESA

• “Normal” operating altitudes will be in FL300-FL400
  • Does not preclude low/medium altitude training requirements

• “Embedded Training” will change range requirements
  • Strafe only, occasional LGB/J-Series weapons delivery
  • Will require very high fidelity targets for Combat ID
**Weapons Carriage Capability**

<table>
<thead>
<tr>
<th>Station</th>
<th>11</th>
<th>10</th>
<th>9</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
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<tr>
<td>Weight</td>
<td>300</td>
<td>2,500</td>
<td>5,000</td>
<td>2,500</td>
<td>350</td>
<td>1,000</td>
<td>350</td>
<td>2,500</td>
<td>5,000</td>
<td>2,500</td>
<td>300</td>
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</table>

- **1000# STOVL**
- **1000# STOVL**
- **1000# STOVL**
- **1000# STOVL**

* Growth option for CTOL
APG-81 Radar Advanced Electronically Scanned Array Interleaved Search & Track

Air-to-Air Target Engagement

Air-to-Air Target Detection/Track

Ground Moving Target Detection

Synthetic Aperture RADAR

Electronic Attack/High Gain ESM

Sea Surface Detection

Lockheed Martin Aeronautics Company
Targets at NAS Patuxent River

Legacy Capability

JSF Capability

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.
Long Range SAR Imaging
BIG SAR With Auto Target Cueing (ATC)
Automatic Target Cueing

Candidate targets
Military targets recognized
Non military targets discarded

Aberdeen, MD
Active Electronically Scanned Array (AESA) Radar

Allows Zoom In/Out Without Additional Radiation Time

GMTI Mode

- Superimposed on SAR Map
- Capable at Stand Off Ranges

Down-Sampled Image Initially Displayed To Locate Cues With Context

Potential Target Located

High-Resolution SAR for Identification

Target Cues Provided to Pilot

JSF1101049
JSF Program Overview
Advanced Internal Electro-Optical Targeting System (EOTS)

- Internally Mounted
- Long Range, High Resolution
- NAVFLIR, Targeting FLIR, IRST Functions
- Digital Continuous Zoom
Distributed Aperture System (DAS)

- 360 degree FOV
- Internally Mounted
- AAA Firing Detection
- Threat Aircraft Detection
- Missile Launch Detection
- Track Wingman
- NAVFLIR Functions
- Integrated With HMD
### Criteria

- Criteria used to determine base suitability on
  - Level I are fixed (can’t change)
  - Level II require MILCON to fix/change
  - Level III are business case to be evaluated during Site Surveys

- Air Staff / AETC / ACC / USN / USMC / UK input
- Educated subjective assessments are required

<table>
<thead>
<tr>
<th>LEVEL 1 CRITERIA</th>
<th>LEVEL 2 CRITERIA</th>
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</thead>
<tbody>
<tr>
<td>RANGE/AIRSPACE</td>
<td>RUNWAY</td>
</tr>
<tr>
<td>Distance to training areas</td>
<td>Number</td>
</tr>
<tr>
<td>AG Range Capacity</td>
<td>Width</td>
</tr>
<tr>
<td>Range Size AG</td>
<td>Length</td>
</tr>
<tr>
<td>A-G Range Altitude</td>
<td>Instrument Approaches</td>
</tr>
<tr>
<td>Range Capabilities</td>
<td>STOVL Ops</td>
</tr>
<tr>
<td>Range Capacity AA</td>
<td>RAMP SPACE/Flight Line</td>
</tr>
<tr>
<td>Range Size AA</td>
<td>Parking</td>
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<tr>
<td>A-A Range Altitude</td>
<td>Arm/Dearm Pad</td>
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<tr>
<td>WEATHER</td>
<td>AUX FIELD</td>
</tr>
<tr>
<td>Main Base</td>
<td>Operational Availability</td>
</tr>
<tr>
<td>Range</td>
<td>Distance</td>
</tr>
<tr>
<td>Aux Field</td>
<td>Altitude</td>
</tr>
<tr>
<td>FIELD ELEVATION</td>
<td>CARRIER OPS</td>
</tr>
<tr>
<td>FLD ELEV</td>
<td>Distance</td>
</tr>
<tr>
<td>TEMPO</td>
<td>AIRSPACE PLUS</td>
</tr>
<tr>
<td>Flight Ops</td>
<td>Airspace Capabilities</td>
</tr>
<tr>
<td>CURRENT MISSION</td>
<td></td>
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<tr>
<td>Low Level Routes</td>
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<tr>
<td>SFO</td>
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<td>Air Refuel</td>
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<tr>
<td>ENVIRON</td>
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<td>Emissions</td>
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<tr>
<td>Noise</td>
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</table>
# Level I Criteria

<table>
<thead>
<tr>
<th>CRITERIA/BASE</th>
<th>GREEN</th>
<th>YELLOW</th>
<th>RED</th>
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</thead>
<tbody>
<tr>
<td><strong>RANGE/AIRSPACE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance to training areas</td>
<td>&lt; 120 nm (20 minutes)</td>
<td>&gt;120 - &lt; 150</td>
<td>&gt; 150 nm</td>
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<tr>
<td>AG Range Capacity</td>
<td>≥4 ranges available for simultaneous use</td>
<td>&lt; 4 ranges available for simultaneous use</td>
<td></td>
</tr>
<tr>
<td>Range Size AG</td>
<td>≥1600 sq mi (40 nm x 40 nm) collocated in/beside MOA</td>
<td>250 &lt; sq mi &lt; 1600, not collocated with a MOA</td>
<td>&lt; 250 sq mi (25 nm x 10 nm)</td>
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<tr>
<td>A-G Range Altitude</td>
<td>&gt; 30,000 ft</td>
<td>20,000 &lt; altitude &lt; 30,000</td>
<td>&lt; 20,000 ft</td>
</tr>
<tr>
<td>Range Capabilities</td>
<td>Full-Scale weapons/Impact scoring and Threat Emitters</td>
<td>Inert weapons and limited threat emitters</td>
<td>No inert capability and only limited threat emitters</td>
</tr>
<tr>
<td>Range Capacity AA</td>
<td>≥4 A-A ranges available for simultaneous use</td>
<td>&lt; 4 ranges available for simultaneous use</td>
<td></td>
</tr>
<tr>
<td>Range Size AA</td>
<td>≥ 3200 sq mi (80 nm x 3200) in MOA</td>
<td>1600 &lt; sq mi &lt; 3200</td>
<td>&lt; 1800 sq mi (30 nm x 60 nm)</td>
</tr>
<tr>
<td>A-A Range Altitude</td>
<td>Sfc floor to 50000</td>
<td>Surface floor to &gt; 25k block</td>
<td>&lt; 25k foot block; no areas to sfc</td>
</tr>
<tr>
<td><strong>WEATHER</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Base</td>
<td>≥ 3000 &amp; 3 mi</td>
<td>≥ 3000 &amp; 3 mi</td>
<td>≥ 3000 &amp; 3 mi</td>
</tr>
<tr>
<td>Range</td>
<td>≥ 300 days</td>
<td>≥ 200 days</td>
<td>&lt; 200 days</td>
</tr>
<tr>
<td>Aux Field</td>
<td>≥ 250 days</td>
<td>≥ 200 days</td>
<td>&lt; 200 days</td>
</tr>
<tr>
<td><strong>FIELD ELEVATION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLD ELEV</td>
<td>&lt;1000 ft MSL will sufficiently simulate conditions for carrier ops</td>
<td>&gt;1000’ - &lt;3000’ MSL</td>
<td>&gt;3000 MSL unacceptable</td>
</tr>
<tr>
<td><strong>TEMPO</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flight Ops</td>
<td>No restrictions to training production at home field, aux field or ranges</td>
<td>Unable to meet training production requirements</td>
<td></td>
</tr>
<tr>
<td><strong>CURRENT MISSION</strong></td>
<td>Compatible or can be moved</td>
<td>Mission can not be moved or operate with JSF</td>
<td></td>
</tr>
</tbody>
</table>
Summary

• Very capable sensor suite will require additional airspace to realistically train
  • Begin requesting additional airspace
    • Preferably 10K and up w/ 100x50 mile chunks
    • “J” Series weapons capability
  • Begin Environmental Impact Reports (post BRAC)
  • Priority is for Test then Training then Ops

• Range maintenance will shift from “disposable” targets to very high fidelity targets

• Future DE or Laser tgts?
Backup Slides