



# **Electronics overview: Joint Strike Fighter (JSF) & Future Combat Systems (FCS)**

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# JSF and FCS commonalities

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- Both are new starts with evolving requirements
- Both seek to make broad use of commercial-off-the-shelf components
- Both are loaded with embedded electronics, optoelectronics, and computers



# Joint Strike Fighter

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- Multi-service supersonic stealth fighter-bomber
- Will replace AV-8B, A-10, F-16, and F/A-18, U.K. Sea Harrier
- Three variants: conventional takeoff and landing; short-takeoff and vertical-landing; and aircraft carrier-based
- Lockheed Martin is prime contractor, with key partners Northrop Grumman and BAE Systems
- Deployment set for 2012



# JSF funding picture

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- Almost all U.S. Air Force and Navy research money
- Combined 2004 and 2005 spending: \$8.4 billion
- 2006 request: \$5 billion-plus
- Quadrennial Defense Review (QDR) could produce cuts



# JSF Avionics snapshot

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- **Distributed avionics:** display-management computers, integrated core processing, and flight subsystems
- **IEEE 1394** FireWire network links core processor and display processors
- **Fibre Channel** links core processor modules and sensor subsystems



# JSF sensors

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- **AN/APG-81 radar** – Northrop Grumman Electronic Systems Division, Baltimore
- **Distributed Aperture System (DAS)** – Northrop Grumman Electronic Systems Division, Baltimore



# JSF data processing

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- **JSF Integrated Core Processor** – Lockheed Martin Tactical Systems in Eagan, Minn.
- **Integrated Backpanel Assembly** – Kitron AS of Arendal, Norway
- **Portable memory, installed mass memory, onboard file server** – Smiths Aerospace Electronic Systems in Germantown, Md.



# Communications and electronic warfare

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- **Electronic warfare suite** – BAE Information and Electronic Warfare Systems, Nashua, N.H.
- **Communications/navigation/IFF (CNI) system** – Northrop Grumman Radio Systems in San Diego (former TRW).



# JSF command and control

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- **Electro-optical targeting system (EOTS)** – Lockheed Martin Missiles and Fire Control in Orlando, Fla., with BAE Systems
- **Vehicle management system** – BAE Systems Aerospace Controls in Johnson City, N.Y.



# JSF command and control

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- **Multifunction display system (MFDS)** – Kaiser Electro-Optics Inc., a Rockwell Collins company in Carlsbad, Calif.
- **Helmet-mounted display system (HMDS)** – Vision Systems International (VSI), a joint venture of Kaiser Electro-Optics Inc., and EFW Inc. in Fort Worth, Texas



# JSF conclusions

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- **Funding** is there – for now
- **Opportunities** for technology insertion
- **Competition** with F/A-22
- **Hedging bets** with upgrades to F/A-18, A-10, and F-16 aircraft
- **Unmanned combat aircraft**; will these obsolete manned fighters?



# Future Combat Systems

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- Multi-mission, network-centric collective of several separate combat systems
- Primary data link is the Warfighter Information Network-Tactical, or WIN-T, backbone
- Boeing Integrated Defense Systems in St. Louis is the FCS lead system integrator
- Science Applications International Corp. (SAIC) in San Diego is a major Boeing partner
- First FCS unit to be fielded in 2008



# FCS components

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- 15 manned ground vehicles
- Three unmanned ground vehicles
- Four unmanned aerial vehicles
- The WIN-T network
- The soldier



# Manned ground vehicles

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- Fighting vehicles: tanks, artillery, mortar, and missile shooters
- Command-and-control vehicles: communications, UAV control, and reconnaissance
- Support vehicles for re-supply, medical, mine hunting, and bridge building



# Unmanned ground vehicles

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- Armed Robotic Vehicle – a 5-to-6-ton vehicle on a common chassis for reconnaissance and assault
- Multifunction Utility/Logistics Equipment Vehicle, or MULE, as heavy as one ton, for resupply and logistics
- Soldier Unmanned Ground Vehicle (SUGV), 30 pounds, for reconnaissance, surveillance, and assault



# Unmanned aerial vehicles

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- High Altitude/Long Endurance (HALE) – 2,200 pounds, 24-hour endurance
- Tactical Unmanned Air Vehicle (TUAV) – 600 pounds, 5-hour endurance
- Small unmanned aerial vehicle (SUAV) – 300 pounds, 6-hour endurance
- Organic Air Vehicle (OAV) – 20 pounds, 15-minute endurance



# Integrated Computer System

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- Common computing environment for the FCS family of systems
- Controls the FCS network of sensors, ground vehicles, and unmanned aircraft
- Designers are General Dynamics Advanced Information Systems and Rockwell Collins



# System of Systems Common Operating Environment

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- Runs on COTS-based Integrated Computer System
- Supports simultaneously running mission-critical applications
- Integrates separate software packages, independently of their locations
- Uses Joint Tactical Architecture-Army-compliant operating environment
- Industry briefings May 26 in Long Beach



# WIN-T

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- Supports voice, video, and data applications
- Links FCS ground vehicles, aircraft, satellites, and computers, from maneuver battalion to theater rear areas
- Will set Army communications standards and protocols



## WIN-T status

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- WIN-T systems integrator to be selected in 2006
- Competing: General Dynamics C4 Systems in Taunton, Mass., and Lockheed Martin Corp. in Gaithersburg, Md.
- WIN-T is to be fielded in 2008



# Keeping up with FCS

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- Regularly visit Boeing FCS Website at [www.boeing.com/fcs](http://www.boeing.com/fcs)
- For information on the SOSCOE industry day, contact Carolyn Eubanks by phone at 714-372-6771, or by e-mail at carolyn.eubanks@boeing.com.



# FCS conclusions

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- **Funding** for FCS is there, for now
- **Contracts** still to be let; broad opportunities for embedded electronics and computers
- **Criticism** for being too big and ill-defined
- **Big target** for budget cutters on Capitol Hill
  - remember Comanche and Crusader



# Questions, comments

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- John Keller

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