



**Defense Advanced
Research Projects Agency
MTO
*Youth Faculty Award***

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America's Air Force



Headquarters United States Air Force



MTO & The Air Force: A Partnership for Victory

■ Past

- **Space: Space rated vehicles & MIL-Spec Hardware**
- **Weapons: Seekers, Sensors, Guidance & Control Systems**
- **Aircraft: Radars, Sensors, & Flight Controls**

■ Present

- **Information Age: Moore's Law & Cost**
- **Foundry: People and Machines - a Diverse Work Force**
- **Transformation: Mass Data Challenges & Machine Intelligence**

■ Future

- **Offense: Directed Energy Weapons (DEW) & Cyberspace**
- **Defense: DEW Again? (Cyberspace?) & Asymmetric Warfare**
- **Future Challenges**

■ Summary



In the Past

Space:

Air Forces exploited the air, space, and cyberspace with Space rated vehicles and MIL-Spec hardware

Weapons:

Airmen precisely destroyed targets with weapons guided by ultra-high speed, miniature electronics and ultra-sensitive seekers/sensors



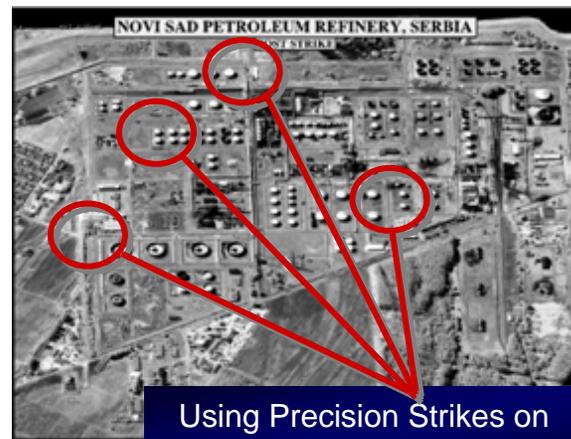
GBU-27



GBU-31

Aircraft:

Avoided detection by enemy radars and sensor while locating and destroying heavily defended enemy centers of gravity



Using Precision Strikes on Key Nodes

Refinery shut down!



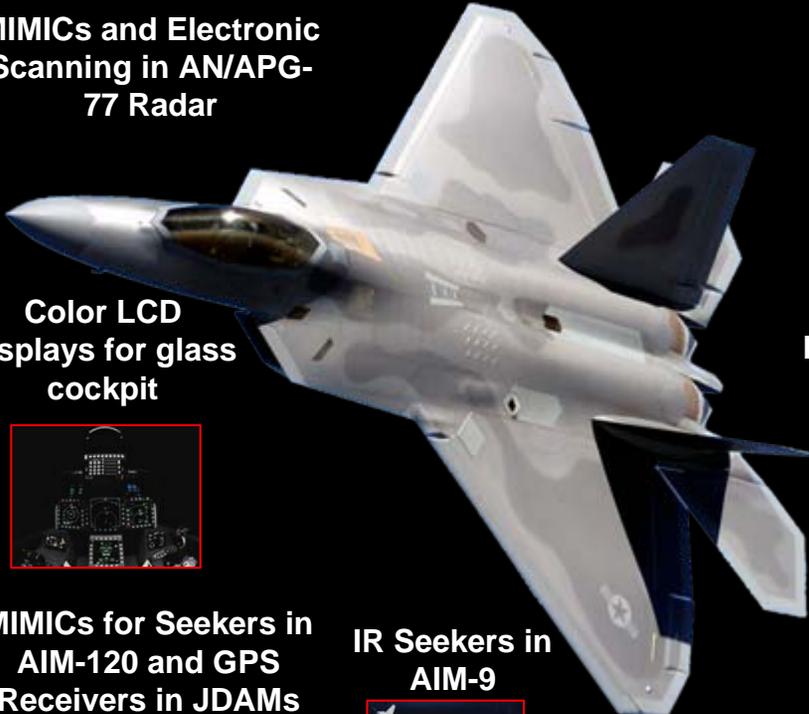
MTO Technologies' Impact on Air Force Systems

F-22A Raptor

High-speed Common Integrated Processor Technology for Integrated Avionics, Air Data Computers, and Weapons Management



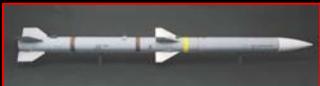
MIMICs and Electronic Scanning in AN/APG-77 Radar



Color LCD displays for glass cockpit



MIMICs for Seekers in AIM-120 and GPS Receivers in JDAMs



IR Seekers in AIM-9



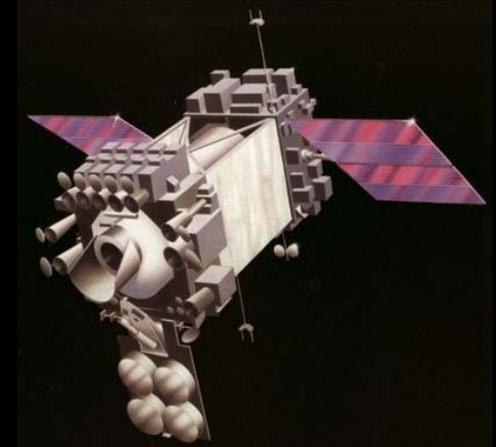
MIMICs EW Defensive Systems

Inter/Intra-Flight Data Link to link F-22A platforms together



Cooled IR Threat Warning Detectors

MSX Spacecraft



- MIMICs for X-band and S-band Communications
- RF Sensor Electronics
- Mass Spectrometers
- UV - Imagers
- Visible Imagers
- SPIRIT III LWIR Detectors



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- **Next Techno-Surprise: Techno-Doctrine vs. Techno-Strategy**

■ Summary



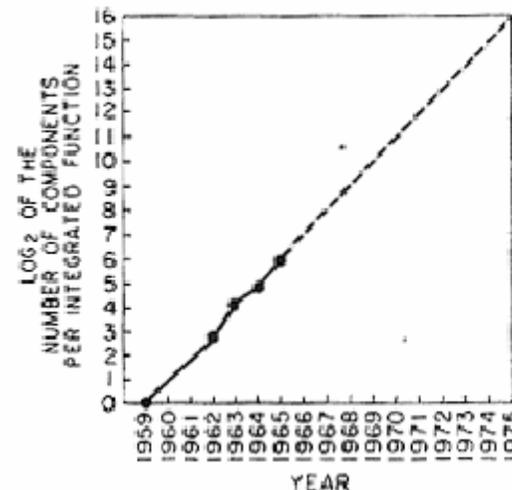
In the Present

Information Age:

Moore's law continues to describe the density of semiconductor logic... but for how much longer and at what "cost?"

Foundry:

America needs to maintain our lead in technology. America must have a robust, diverse force of scientists & engineers...coupled with the machinery of a flexible, combat-ready industry.



April of 1965, Electronics magazine
Gordon Moore

Transformation:

The massive amounts of data from Network Centric Warfare demands we develop new methods of information management. Machine Intelligence and Logical Computing results in a competition to develop R2D2 for the USAF.





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Airmen Need Your Help

Offense:

Airmen envision fighting with
Directed Energy Weapon (DEW) systems
How will we fight in Cyberspace?

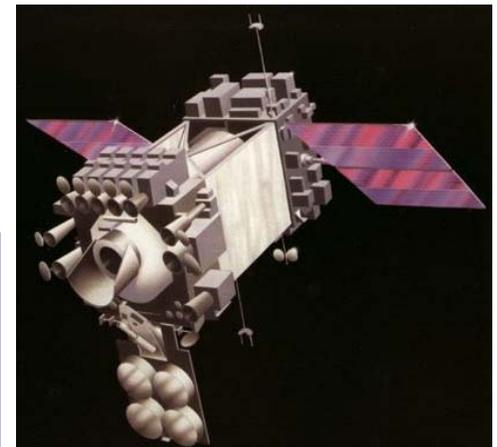


Defense:

Protection from DEW
What about Cyber-warfare?
What will be the next variation of
Asymmetric Warfare?

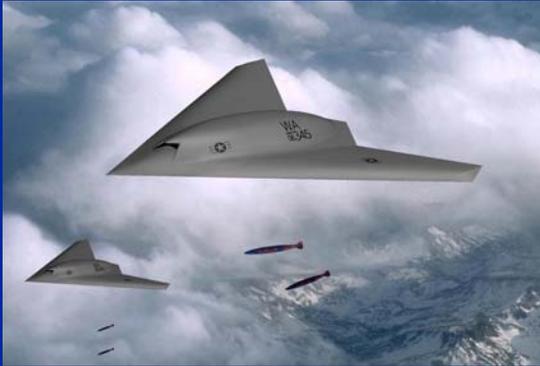


Next Techno-Surprise: (Let's tip the scales in our favor.)
Technology-vs-Military Doctrine is a two-way street
Strategic technological intelligence capability



Air Force Mission Statement:

"The mission of the United States Air Force is to deliver sovereign options for the defense of the United States of America and its global interests—to fly and fight in Air, Space, and Cyberspace."

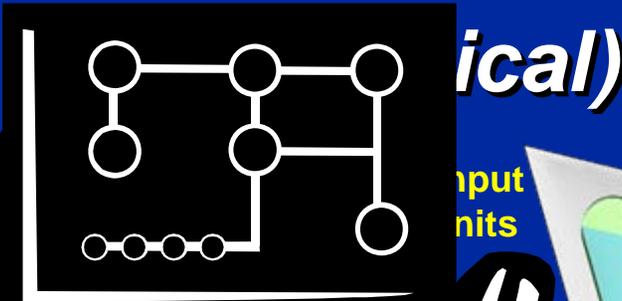


SECAF Wants.... Future Aircraft Avionics



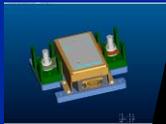
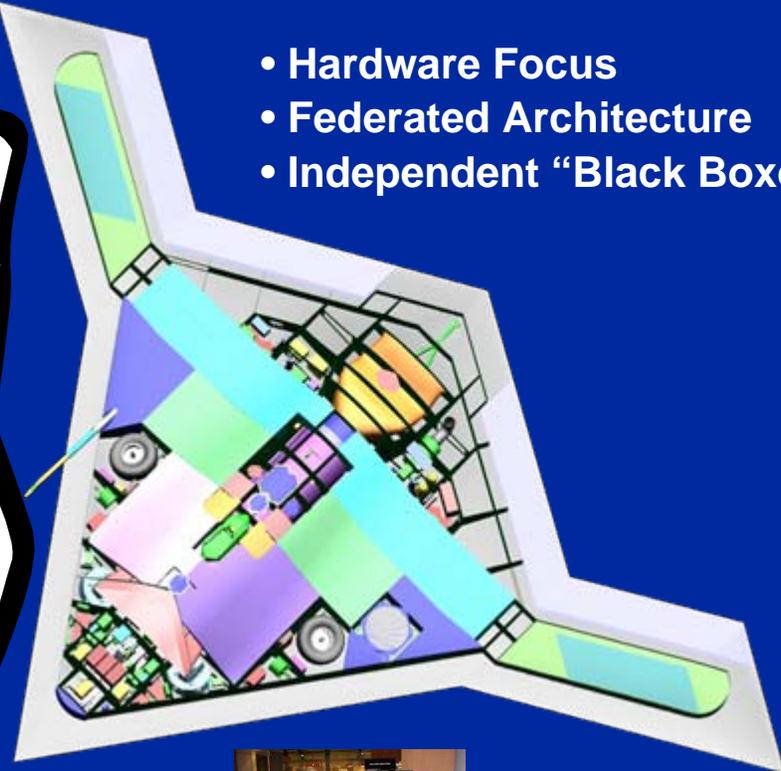
- ***Cheap***
- ***Microchip Size***
- ***Low Power***
- ***Redundant***
- ***Reliable***

Our Motivation -- Avionics



Input
Units

- Hardware Focus
- Federated Architecture
- Independent "Black Boxes"



CSA



Voltage Converter

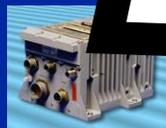


Emergency GCU



3 VMCs

Non-Linear
Inverter



3 INS/GPS



Special
Comms



ARC-210s



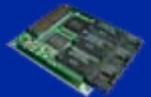
SatCom
Terminal



Radar



Electrical Power
Distribution Unit



Network
Daughter
Board



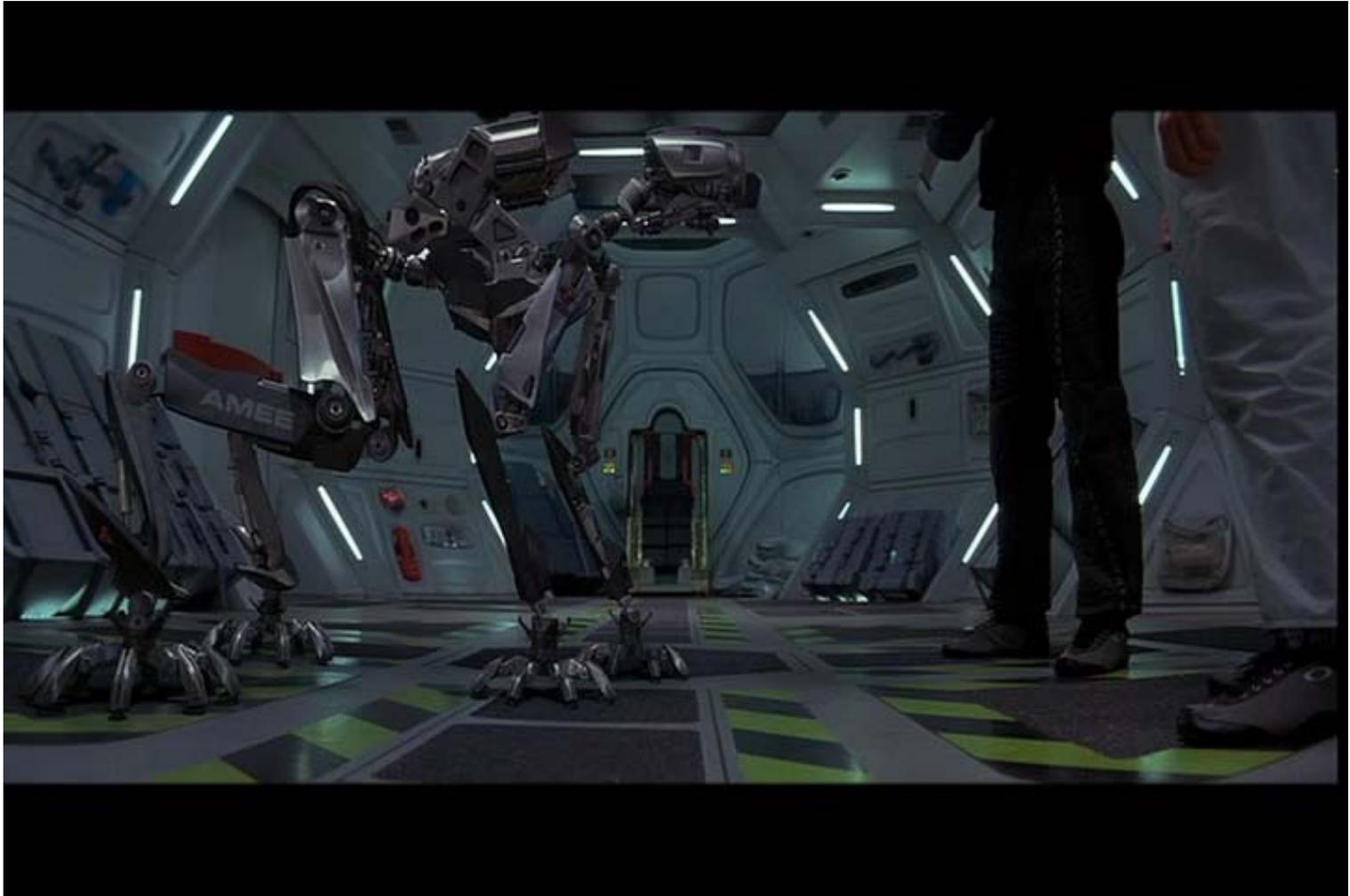
Survival Map





Scouting Robot

Autonomous Mapping Evaluation and Evastion (AMEE)





Summary

A. Past, Present, and Future Challenges

1. *Past Challenges* and success speak for themselves!
2. *Present Challenges* are maintaining the foundry and transforming for future success.
3. *Future Challenges* such as mass data management, “operationalizing” AI, DEW, and strategic technological intelligence are knowns. What are the unknowns?

B. “Takeaways”

1. *Focus* on creating a robust, diverse, science and engineering force, opening two-way communications with joint warfighters, and getting strategic technological intelligence to keep us ahead.

- *Remember, the enemy always gets a vote.*



Thank you Team MTO!

**Thank you for your role in making
America's Air Force
the most dominate
air, space, and cyberspace
force
in the history of warfare and
for making the United States the best
Joint Warfighting Team in the world.**

"Now, go do that voodoo that you do so well."



QUESTIONS???

**AIRMAN WEBSITE:
www.airman.af.mil**



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Your Air Force

Heritage video

