



60<sup>TH</sup>  
ANNIVERSARY  
USAF  
1947 - 2007

# Defense Advanced Research Project Agency



60<sup>TH</sup>  
ANNIVERSARY  
USAF  
1947 - 2007

**Microsystems Technology (MTO)**

**Young Faculty Award (YFA) Workshop**

**Colonel Victor Lofton, USAF  
Air Force Operational Liaison / Special Assistant**

# America's Air Force



Headquarters United States Air Force



U.S. AIR FORCE

## ■ 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**
- **Next Techno-Surprise?**

## ■ Summary



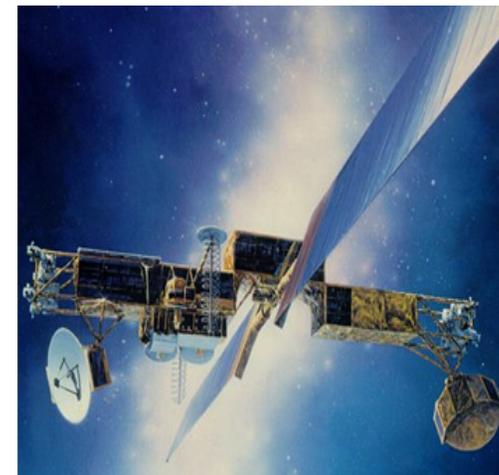
U.S. AIR FORCE

## 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



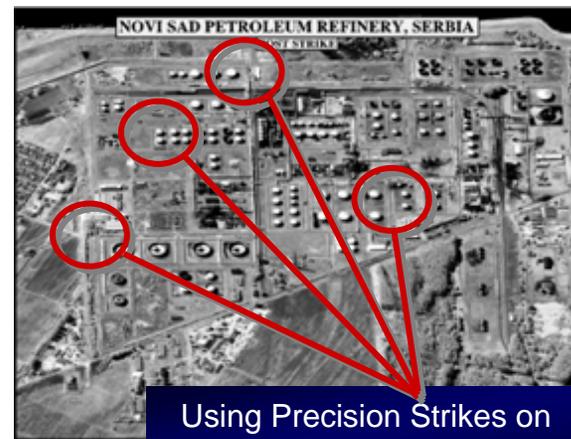
**GBU-27**



**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!**



U.S. AIR FORCE

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

## ■ Summary



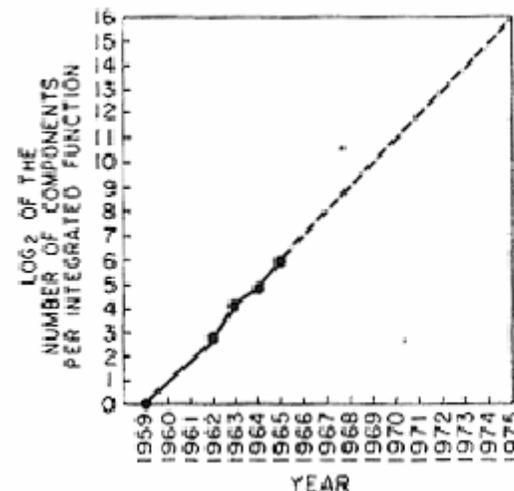
U.S. AIR FORCE

## 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.





U.S. AIR FORCE

## ■ 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**

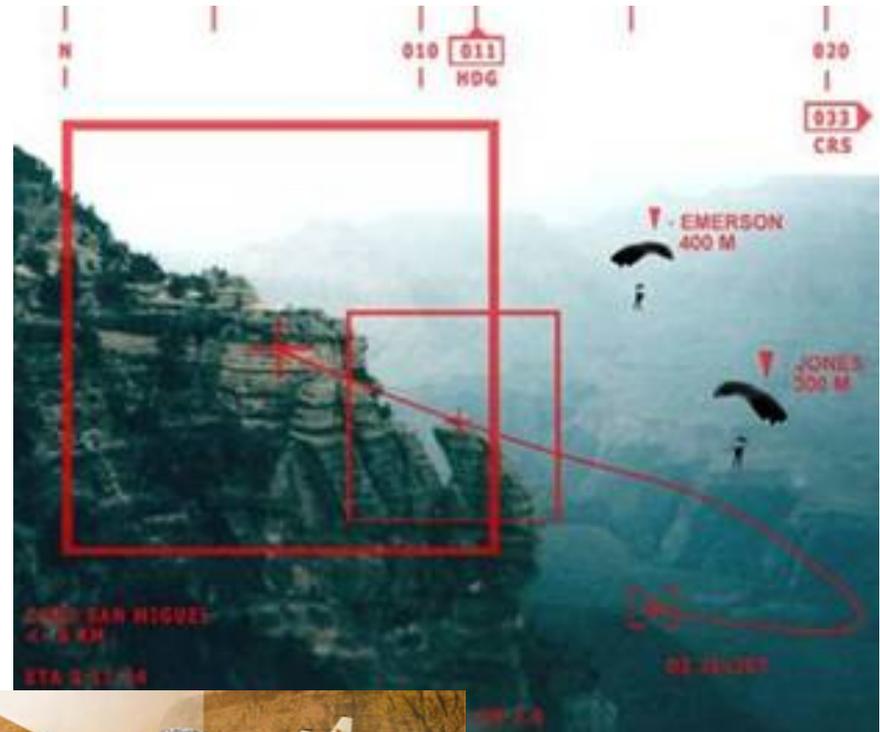
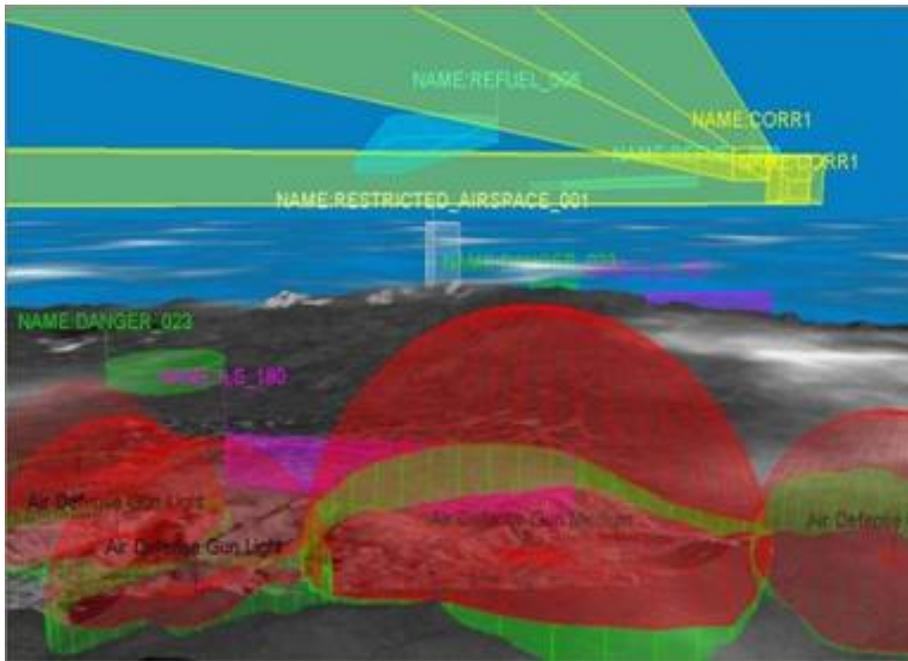
## ■ Future

- **Offense: Directed Energy Weapons (DEW) & Cyberspace**
- **Defense: DEW Again? (Cyberspace?) & Asymmetric Warfare**
- **Next Techno-Surprise: Techno-Doctrine vs. Techno-Strategy**

## ■ Summary



# The Future Is... The Joint Warfighting Team





# Future JOINT INITIATIVES:



- **UPDATE SURVIVAL EQUIPMENT**
- **BODY ARMOR**
- **PERFORMANCE MAINTENANCE IN COMBAT**
- **MASS DATA MANAGEMENT**



U.S. AIR FORCE

## Offense:

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



## Defense:

DEW protection and what about Cyber-warfare? Who will be the “bad guys” and what will they do? What will be the next variation of Asymmetric Warfare?

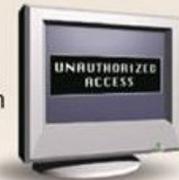
Next Techno-Surprise: (Let’s tip the scales in our favor.) Technology-vs-Military Doctrine is a two-way street. Strategic technological intelligence capability

### DISRUPTIVE

Those seeking to usurp U.S. power and influence by acquiring breakthrough capabilities, such as:

- Sensors
- Biotechnology
- Miniaturization on the molecular level
- Cyber-operations
- Space
- Directed-energy and other emerging fields

**Likelihood:** low, but time works against U.S.  
**Vulnerability:** unknown; strategic surprise puts U.S. security at risk



DEFENSE NEWS GRAPHIC BY CHRIS BROZ



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.”*



U.S. AIR FORCE

## **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, open communications with joint warfighters, and strategic technological intelligence.**

*- Remember, the enemy gets a vote.*



U.S. AIR FORCE

**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.”*



U.S. AIR FORCE



**Colonel Victor "Raven" Lofton**  
**Special Assistant**  
**DARPA/DIRO**  
[Victor.lofton@arpa.mil](mailto:Victor.lofton@arpa.mil)  
703.696.6619  
[www.darpa.mil](http://www.darpa.mil)  
[www.airman.af.mil](http://www.airman.af.mil)



U.S. AIR FORCE



A bald eagle with a white head and yellow beak is perched on a globe. The globe shows the Americas. The eagle's wings are spread, and it is holding a small American flag. The background is dark with a red sun-like glow behind the globe.

# Defense Advanced Research Projects Agency *MTO Technology Forum*

Colonel Victor "Raven" Lofton  
Special Assistant  
DARPA/DIRO  
[Victor.lofton@darpa.mil](mailto:Victor.lofton@darpa.mil)  
703.696.6619