

# DIRECTED ENERGY BIOEFFECTS DIVISION



**Gordon T. Hengst, PhD**  
**Directed Energy Bioeffects Division**  
**Human Effectiveness Directorate**  
**Air Force Research Laboratory**



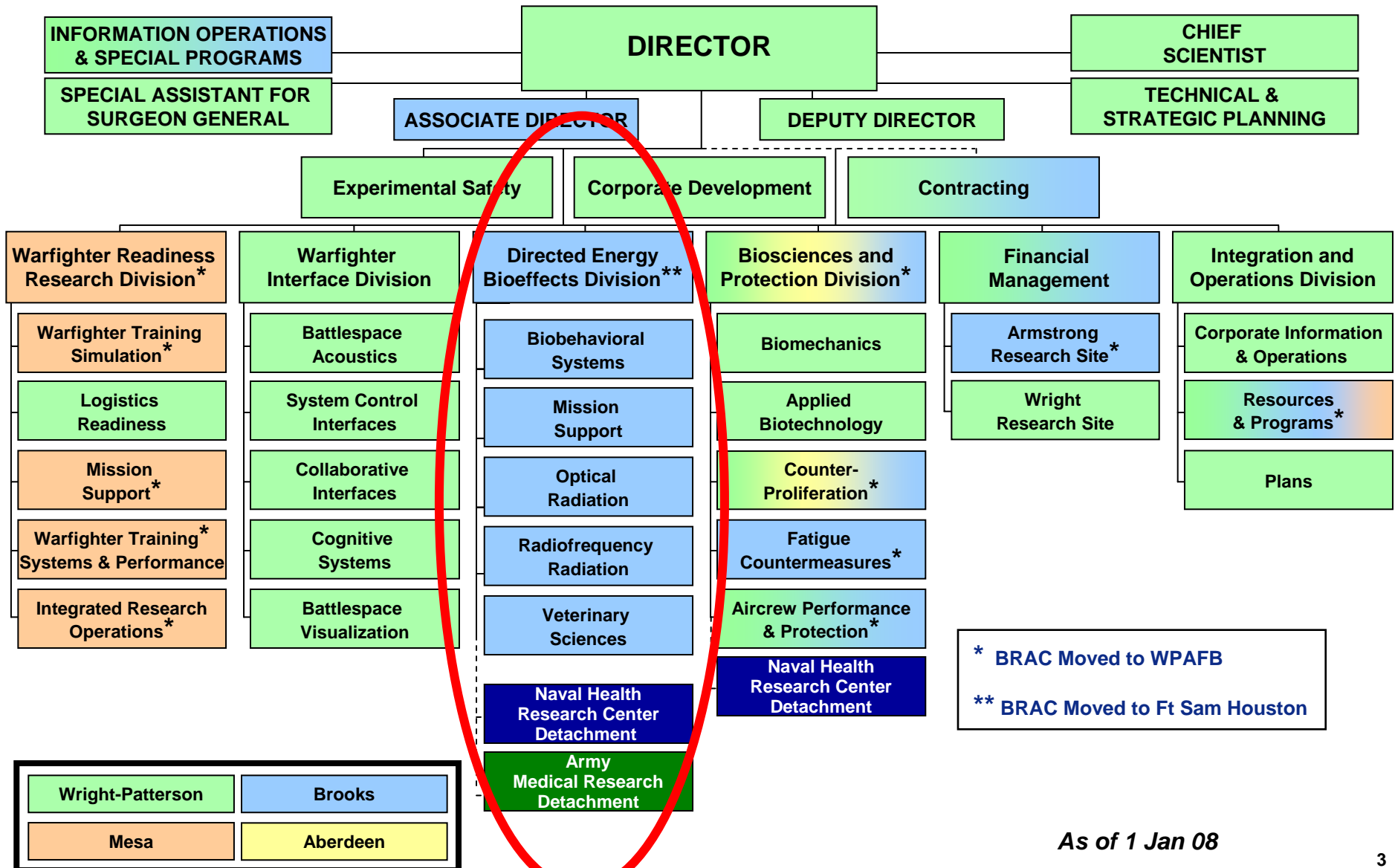
# Outline



- **Organization and Mission**
- **Enabling technology for DE Weapons Development**
- **Health and Safety Issues**
- **Diverse Set of People**
- **DoD Tri-Service Science and Technology**



# AFRL/RH Organization





# Directed Energy Bioeffects



## Mission

- Predict and mitigate the bioeffects of directed energy on personnel and mission performance
- Exploit the bioeffects of directed energy for non-lethal applications

## Vision

- Provide maximal safe exploitation of directed energy for national defense

## Scope

- Biomedical effects of laser and radio frequency radiation
  - mechanisms of action
  - health & safety guidelines and standards
  - personnel protection
  - Non-lethal applications

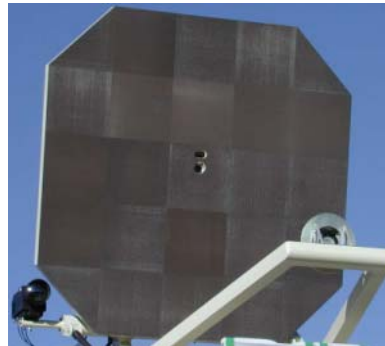
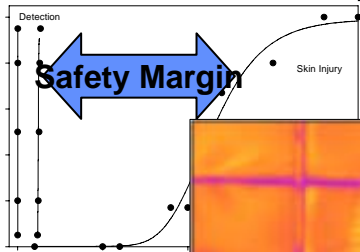




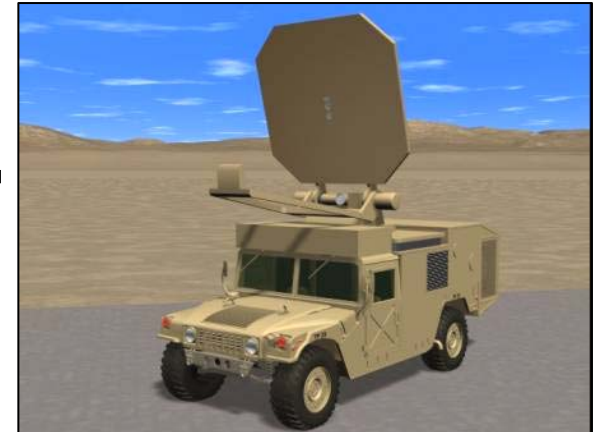
# Bioeffects: Critical Enabling Technology



## AFRL/RH + AFRL/RD



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## Other Collaborations

- AFRL/RX ...
- JNLWD, Navy, Army ...
- Boeing, Raytheon ...
- Univ of Texas, Trinity ...



# Warfighter Health and Safety



WORLD HEALTH ORGANIZATION COLLABORATING CENTER

- Broad Expertise, Advocacy, & Involvement in NLW Human Effects
- Reputation for Safety, Science, Service
- World Leaders in Laser and RFR Bioeffects
- Joint Service Cooperation



UNITED NATIONS



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия



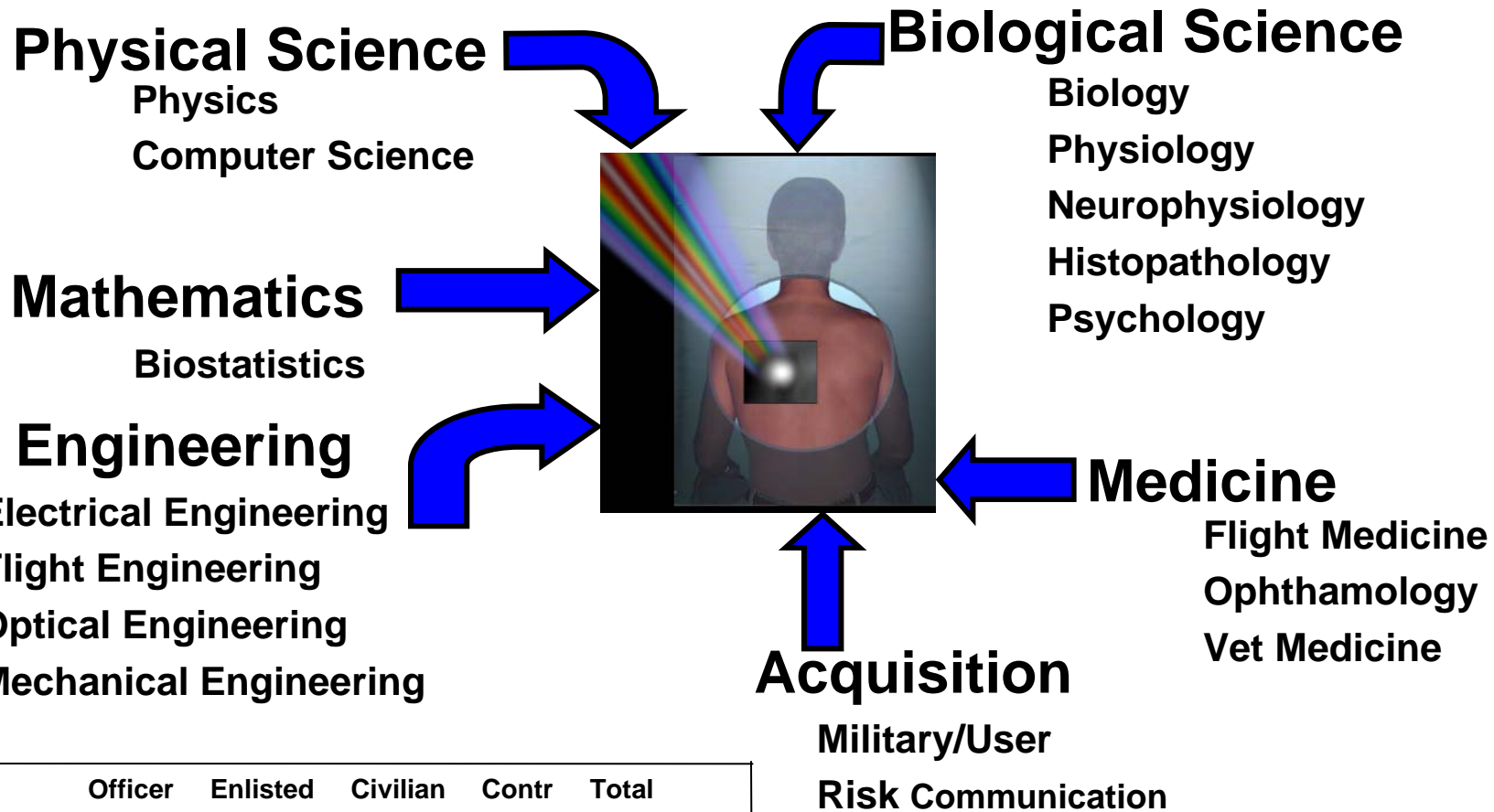
Research & Technology Organization  
Activities



# A Multi-disciplinary Team



Understanding the interaction between the human and directed energy



	Officer	Enlisted	Civilian	Contr	Total
Asgn	41	10	68	109	228



# Collocated Army, Navy, and Air Force Units at Brooks City-Base



Army Unit Detached from WRAIR; Navy Unit Detached from NHRC



## Research Focus

- Determine risks for wide range of military threats
- Conduct research at many levels (molecules, cells, rodents, primates, humans)

## Goal

- Reduce operating costs
- Eliminate duplication
  - Share facilities and equipment
  - Share access to special expertise
  - Maintain capability to address Service-unique requirements



# Growth Areas



## Directed Energy Bioeffects

- Weapon system enabler

## Biotechnology

- Detect and Neutralize Chemical/biological agents
- Detect exposure to Directed Energy
- Enhance development of personal protection

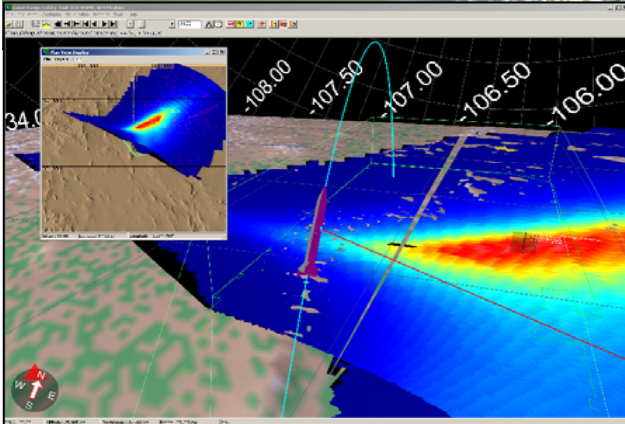
## Non-Lethal Technologies

- Sponsored by Joint Non-Lethal Weapons Directorate (JNLWD)
- Quantify Human Effects and Effectiveness





# Why does the AF care?



- **Directed Energy Weapons are the future**
- **Without an understanding of the bioeffects**
  - Politics won't permit use
  - Operators won't use
- **Research is needed**



# Directed Energy Bioeffects Summary



- **Transformational Technology: Directed energy systems and weapons will play an increasing role in future battlefields**
- **Bioeffects of directed energy is a critical component for the development of directed energy and non-lethal weapons**
- **Health and safety considerations will drive test, policy and ultimate application of all directed energy systems**

*Directed Energy Bioeffects research is an indispensable cog in the development of Directed Energy Weapons*



# Directed Energy Bioeffects

A US Air Force aircraft is shown in flight against a vibrant, multi-colored background of light. The aircraft is white with "U.S. AIR FORCE" written on its side. A bright, glowing light source in the upper right corner emits a beam of light that curves around the aircraft. The overall scene is ethereal and futuristic.

## Questions?

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