EMBRY-RIDDLE
Aeronautical University.
FLORIDA | ARIZONA | WORLDWIDE

COMBINING ARFF & MAINTENANCE INTO EFFECTIVE CONFINED SPACE RESCUE TEAM: THE HUMAN FACTORS CHALLENGES

JOHN KEITH WILSON

PERCEPTIONS OF MAINTENANCE

OVERVIEW

- Defining a confined space (CS)
- Aircraft maintenance work in a confined space
- Factors that contribute to a rescue operation
- Confined Space Rescue Plan Components
- The Rescue Team – Human Factors Challenges
- Mitigation Strategies
- Conclusion/Questions

WHY SHOULD I CARE?

- Mission change
- Worker safety
- Increase operational effectiveness
- Prevent damage
- Improve existing training programs
- Promote a collaborative environment

DEFINITION OF CS

- **Defined by OSHA as a space that:**
  - Is large enough for entry
  - Not designed to be continually occupied
  - Has a limited opening for entry/exit

TYPES OF CS

- **Permit required**
  - Hazardous atmosphere
  - Potential for engulfment
  - Potential to trap or asphyxia
  - Any other recognized hazard
- **Non-permit required**
  - Contains none of the above

OTHER DEFINITIONS

- **Immediately Dangerous to Life or Health (IDLH)**
  - Poses an immediate or delayed threat to life
  - Interfere with ability to escape
  - Cause irreversible adverse health effects

Note: Entry into IDLH is prohibited

OTHER DEFINITIONS

- **Hazardous Atmosphere**
  - Caused by:
    - >10% LFL
    - Oxygen level <19.5% or > 23.5%
  - Leads to
    - Employee to risk of death
    - Incapacitation
    - Inability for self rescue

ENTERING AIRCRAFT FUEL TANK

ENTERING AIRCRAFT FUEL TANK

- **Permit required confined space**
  - Requires
    - Entry Supervisor
    - Entrant
    - Attendant
    - Equipment monitor
    - Rescue plan

ENTERING AIRCRAFT FUEL TANK

- **Permit required confined space**
  - Requires
    - PPE
    - Atmosphere monitoring
    - Grounding/bonding
    - Communication plan
    - Lights intrinsically safe or NFPA 70 Class 1, Division 1

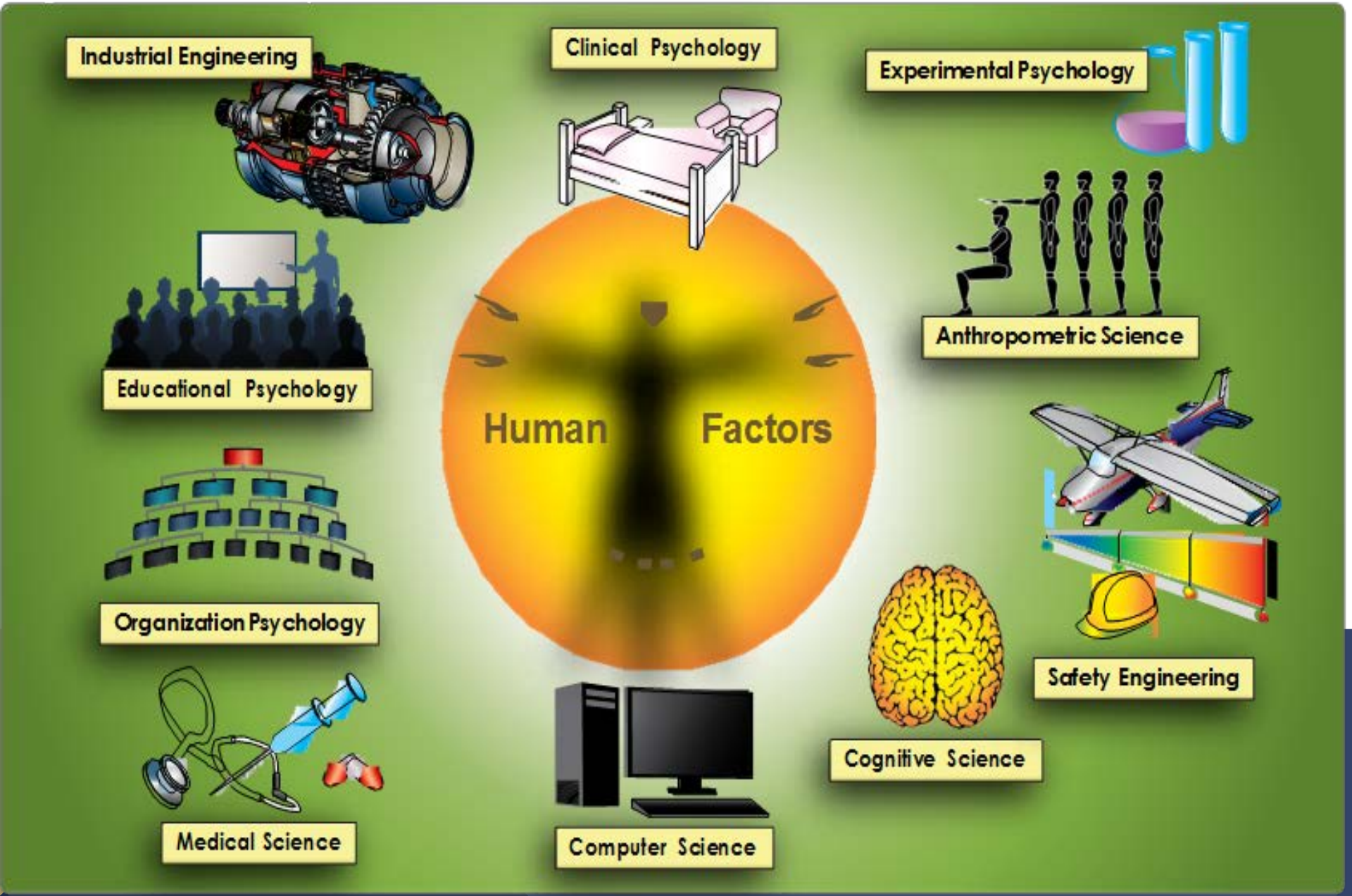
CS RESCUE PLAN

- Requires annual performance
- Coordination
- Timely reaction
- Hazard identification
- Knowledge of confined space types/configuration
- Evaluation

FACTORS LEADING TO A RESCUE

- Failed/non-use of PPE
- Human error
- Medical emergency
- External event
- Equipment malfunction

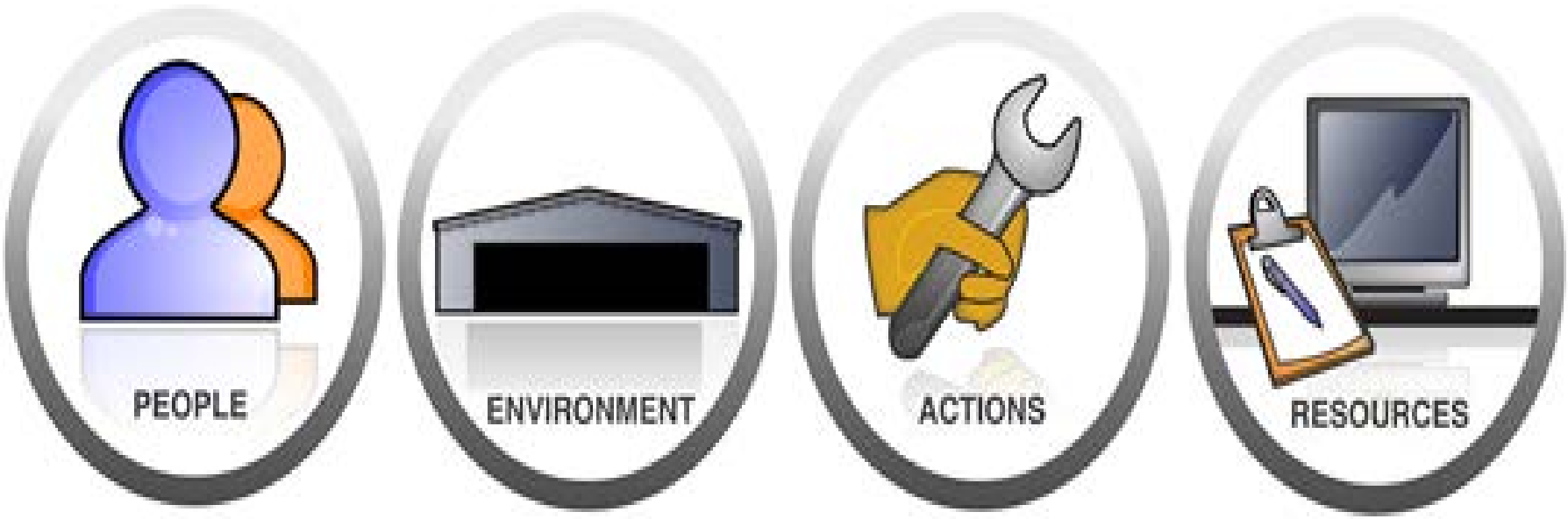
HUMAN FACTORS



HUMAN FACTORS

- **Human capabilities**
- **Related to**
  - Design for human use
  - Development of ease of use
  - Application of systems
  - Humans & their environment
  - Goal is identify factors that affect performance

PEAR MODEL



CS RESCUE HUMAN FACTORS CHALLENGES

- ARFF/Maintenance team dynamics
- Generational differences
- Personnel challenges
- Emotions
- All hinder communication

CS RESCUE HUMAN FACTORS CHALLENGES

- Fuel vapors
- Lack of oxygen
- Aircraft configuration
- Static electricity
- Assuming command

ENVIRONMENT

Physical

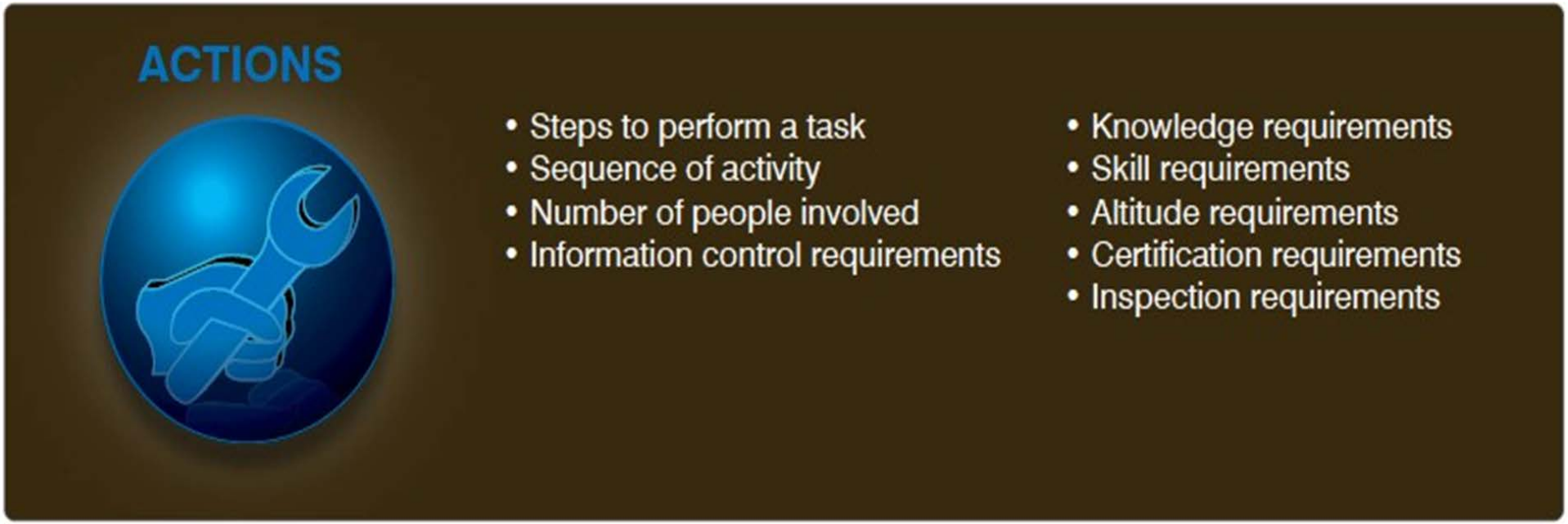
- Weather
- Location inside/outside
- Workspace
- Shift
- Lighting
- Sound level
- Safety

Organizational

- Personnel
- Supervision
- Labor-management relations
- Pressures
- Crew structure
- Size of company
- Profitability
- Morale
- Corporate culture

CS RESCUE HUMAN FACTORS CHALLENGES

- Confined space entry qualified
- Understanding fuel tank entry procedures
- Rescue or recovery effort
- PPE on hand/serviceable
- Securing the area



CS RESCUE HUMAN FACTORS CHALLENGES

- Integrating with maintenance
- Written guidance establishing control/procedures
- Training conducted/current
- Task understanding
- Equipment readiness

RESOURCES

- Procedures/work cards
- Technical manuals
- Other people
- Test equipment
- Tools
- Computers/software
- Paperwork/signoffs

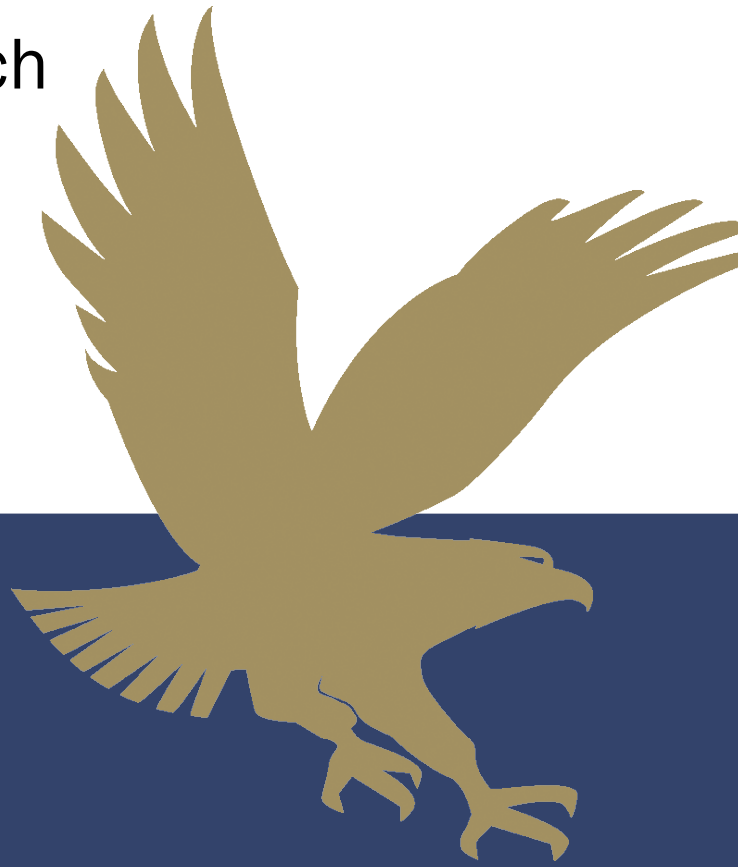
- Ground Handling equipment
- Work stands and lifts
- Fixtures
- Materials
- Task lighting
- Training
- Quality systems

MITIGATION STRATEGIES

- Table top exercises involving all agencies
- Film annual extraction exercises
- Visit maintenance shops/witness operations
- Invite maintenance to ARFF training

MITIGATION STRATEGIES

- Incorporate human factors into annual training
- Promote realism in training scenarios
- Participate in continuing research opportunities



BOTTOM LINE

- A real-world rescue is not the time to second guess one another
- Effective training and collaboration can help ensure a successful rescue
- Lack of communication between agencies can lead to fatal consequences
- The hazards are real, they must be treated as such

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Professor John Keith Wilson

ERAU-Worldwide
Assistant Professor/Chair
BS/AS Maintenance
College of Aeronautics

Email: wilsoj15@erau.edu
Phone: 940-550-5373

Questions?