

# Human Factors Focus Group

## *A Review of Activities*

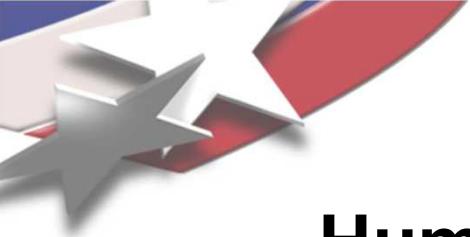
JOWOG 44  
September 2007



# Topics

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- Active Participants
- Progress Summary
- Top Ten List(s)
- Discussion



# Human Factors - Active Participants

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- UK
  - Andy Bardsley (AWE)
  - Joyce Lindsay (AWE)
  - Anna Ponting (AWE)
  - Richard Tait (AWE)
- US
  - Nathan Brannon (SNL)
  - Caren Wenner (SNL)
  - Courtney Dornburg (SNL)
  - Walt Gilmore (LANL)
  - Dan Pond (LANL)
  - Tom Bennett (LLNL)



# Progress Summary

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- **Information Exchange**
  - UK parallels to NNSA/NA-121.1
  - Joint Services Publication (JSP) 538
- **Risk Assessment Methodologies (Bardsley)**
- **Expert Elicitation (Gilmore)**
- **Cart Speed Study**
- **Pantex Barrier Development**
- **Business Development**
- **Top Ten List**



## “Top Ten” List

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- **Why?**
  - **Myriad of topics we could address, but what matters?**
  - **Leverage experience**
  - **Shifting programmatic demands**
  - **Proactive**
    - Staged for providing value added service
- **When and How?**
- **Types**
  - **Current and anticipated**
  - **Push/pull**



# Comparing Top *Current* Tasks

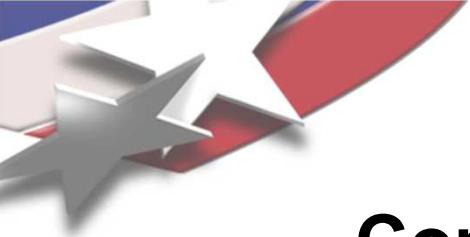
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## UK

1. Human Factors Integration with Investment Schemes
2. Human Error Assessment and Quantification of Manual Handling Tasks
3. Human Factors Assessment for Safety Cases
4. Control Room Design
5. HF Design Guide
6. Assessment of Decommissioning Activities
7. Occupational Psychology
8. Maintaining and Developing Company Documentation

## US

1. Task Analysis
2. Software Usability
3. Procedure Design
4. Human Factors Courses
5. Control Room Assessments
6. Process Assessments
7. Readiness Reviews
8. Administrative Control Design
9. Worker Training Assessment
10. Business Strategy



# Comparing Top *Anticipated* Tasks

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## UK

1. Worker Training Design
2. Human Factors Integration with Investment Schemes
3. Design of Operating Instructions
4. Human Performance Data
5. Business Strategy
6. Maintaining HF Documentation
7. Human Factors Courses
8. Alarm Design
9. Engineering Substantiation

## US

1. Cognitive Factors in Nuclear Weapons Operations
2. Work Hours/Fatigue
3. Biomechanical Modeling of Physical Performance in Nuclear Explosive Operations
4. Supporting Readiness Assessments
5. Supporting Adaptive Processes
6. Visual Inspection



# Findings

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- Semantics...
- UK investing in Human Factors methods and resources to support customers.
- UK's anticipated tasks have closer links to current work.
- Training found to be a topic of particular interest

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# Backups



# A Definition of Human Factors

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A discipline that discovers and applies information about human behavior, abilities, limitations and other characteristics to the **design of tools, machines, systems, tasks, jobs, and environments** for productive, safe, comfortable and effective human use.

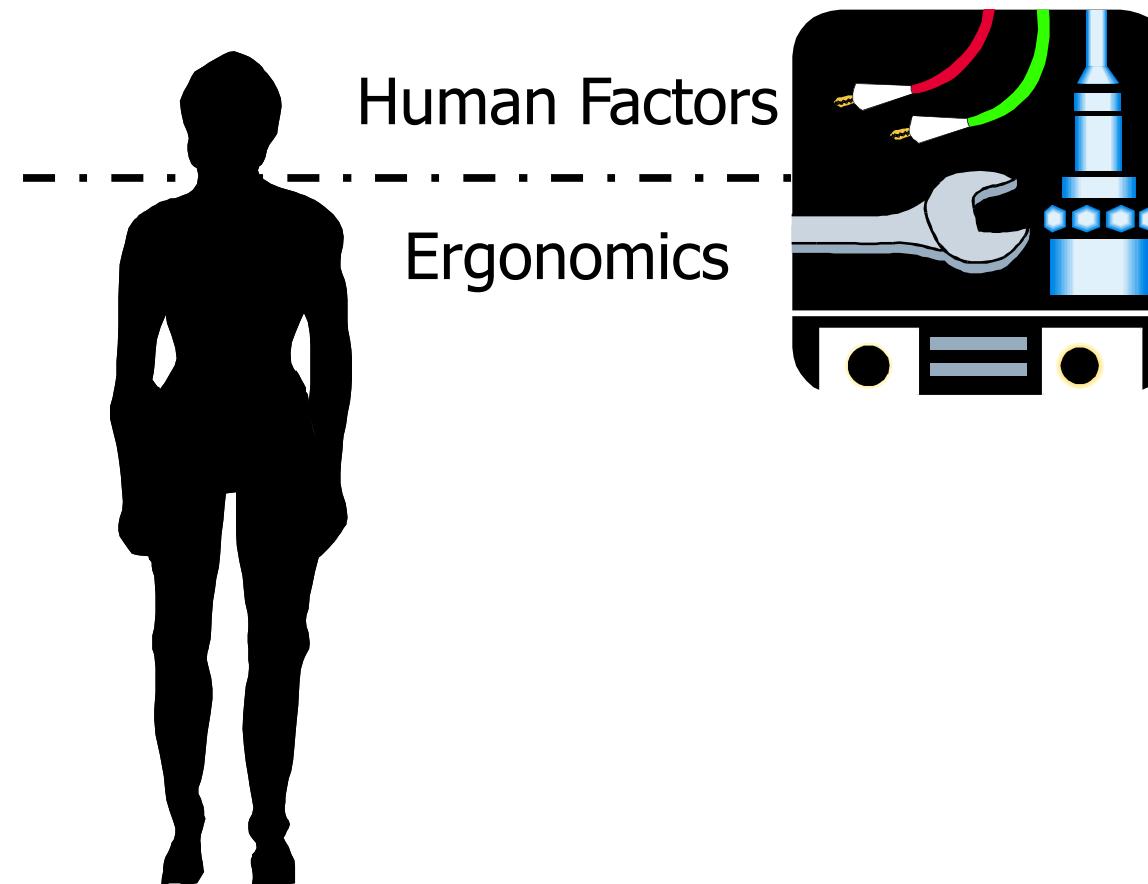
(Chapanis, 1985)

Environmental Psychology      Systems Engineering  
Perception      Biomechanics      Cognitive Psychology      Instructional Design  
Anthropometrics      Physiological Psychology      Occupational Medicine  
Industrial Hygiene      Industrial Engineering  
Anthropology      Anatomy and Physiology      Organization Psychology  
Human Reliability Analysis      Ergonomics      Social Psychology  
Learning      Acoustics      Human-Computer Interaction



# Human Factors vs. Ergonomics

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# Goals of Human Factors in Design/Analysis

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- Ensures that the system is “adapted” to the human, rather than forcing the human to adapt to the system
- Allows the human to perform in the best manner of which he/she is capable, rather than hindering performance
- Ensures that the human is not subjected to extreme physical or mental stress or workload
- Provides personal satisfaction for the user

# Humans in Engineered Systems

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Systems are engineered with the intent that through the interaction of inter-related processes, they will operate in certain ways

- There is **no escaping human involvement** in engineered systems
- Humans are:
  - the **most complex** system component
  - the **least understood** system component
  - the system component **most vulnerable** to failure
- Humans present a **remarkably diverse** set of failure modes

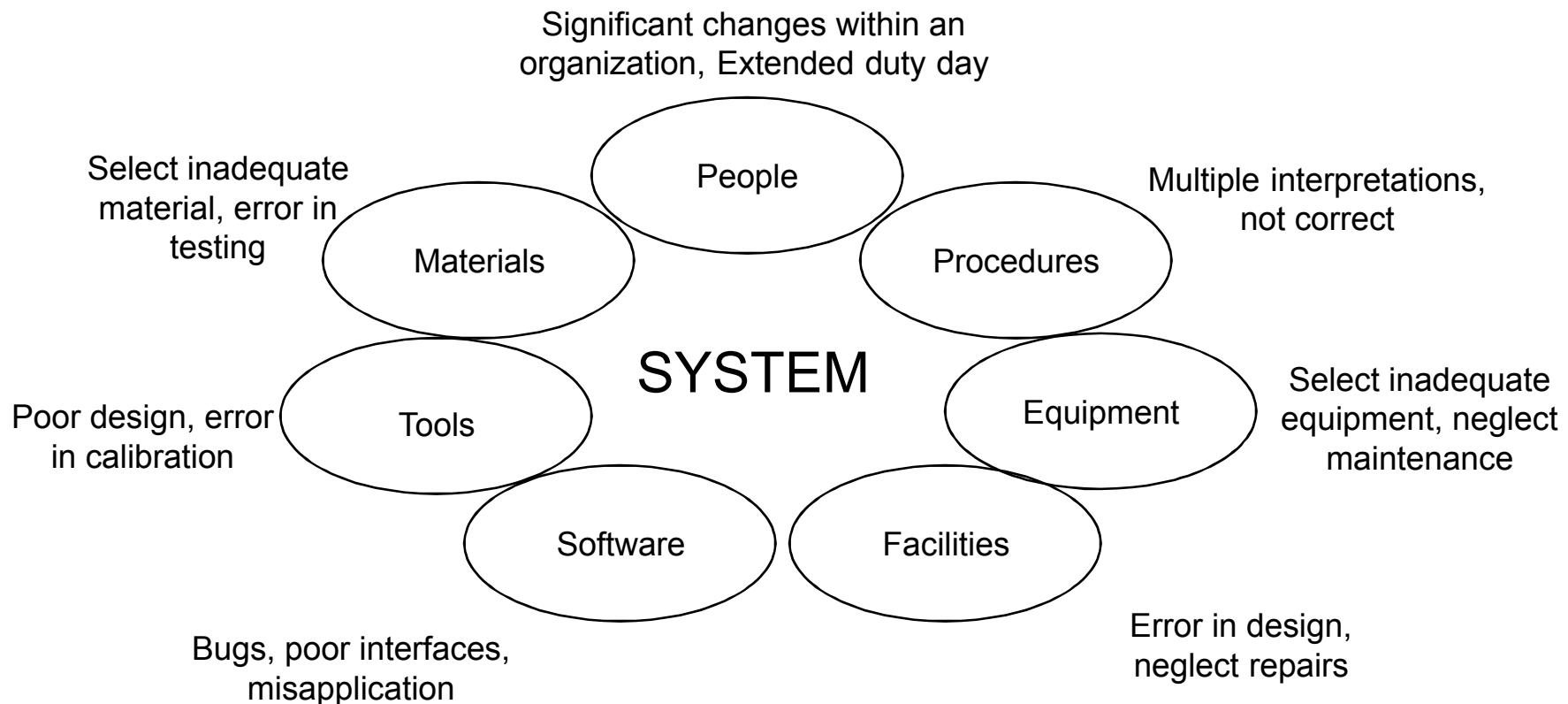


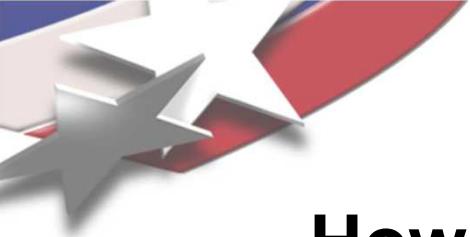


# Roles of Humans in Systems

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Human involvement at any point may introduce variability to the system





# How can Human Factors contribute?

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- Human Reliability Analysis
- Human Error Prevention
- Human Error Analysis
- Task Analysis
- Vulnerability Analysis
- Hardware Design
- Physical Workspace Design
- Software Design
- Cognitive Modeling
- Empirical Evaluation of Human Performance



# A Different Way of Looking at Human Error

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- Human Error is inevitable
- Little can be done to prevent human error
- Assumed causes of carelessness, poor attitudes, inattention
- Assumed cures of training, punishment
- Man is a reliable system under certain defined conditions
  - Performance can be predicted
- Human error increases with system complexity and ambiguity
- Many causes of human error are in external systems, and can be managed



# Procedures are Tools!

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- A procedure is a tool, a means to an end and not the end in itself.
  - Should provide specific “How To” information
- How can procedures fail?
  - They may not cover all situations
  - If not written clearly, they can cause errors
  - They can be technically incorrect



# Why are procedures important?

Review of ORPS data was restricted to NW operations at Pantex from 1991-2003, and all incidents resulting from procedure problems (N=526 out of 1434) were identified

