Course Outline

1. Overview – what are “Human Factors?”
2. Human Factors to Consider
3. Managing Human Factors
What Are “Human Factors?”
While not a new concept, “Human Factors” was introduced in AS9110 Rev A (2009), and so many organizations were introduced to it for the first time.

AS9110 requires that:
- Training on Human Factors be conducted
- Analysis of data pertaining to “human factors events” be performed
- Consider Human Factors in corrective and preventive action activities (CARs)
Origins

- The idea of considering “human factors” came from World War II, because there became a need to manage how people operate complex systems and equipment, both safely and accurately.

- After the war, US industries built upon the ideas to ensure a safe workplace and to reduce errors in manufacturing.
AS9110 defines “Human Factors” as:

The study of how humans behave physically and psychologically in relation to particular environments, products or services and the potential effect on safety. Recognition that personnel performing tasks are affected by physical fitness, physiological characteristics, personality, stress, fatigue, distraction, communication and attitude in order to ensure a safe interface between the personnel and all other environmental elements such as other personnel, equipment, facilities, procedures and data.
Definition (in normal English)

- This means:
  - Considering how people have to interact
    - With tools and equipment
    - With their work areas
    - With each other
Definition (in normal English)

This means:

- Thinking about managing things that can affect your staff’s:
  - Physical abilities
  - Mental state (awareness, exhaustion, etc.)
  - Comprehension (ability to understand instructions)
  - Safety of tasks (as done by people)
  - Safety of product (as used by people)
The intent of managing Human Factors in aerospace is to ensure work is done accurately in order to:

- Ensure the quality of the product or service
- Ensure the efficiency of the process
- Ensure the safety of the employee
- Ensure the safety of users of the product or the public
Myth: HF = HR Function

- Human Factors is not solely a function of Human Resources (HR), or any one department.
- Instead, management of Human Factors is cross-functional, across many departments, including management, HR, safety, engineering, production, service, stores, etc.
Benefits

- Methods are designed around people, not the other way around.
- Safety improvements (for workers and users of product)
- Training improvements
- Process improvements – human error reduced
Human Factors to Consider
Keeping Human Factors in Mind

- We must consider Human Factors during the following activities:
  - Work planning
  - Facility and equipment design and planning
  - Maintenance, repair and inspection
  - Product design
  - General management
Physical Human Factors

- Physical Fatigue
- Ergonomics
  - Will the work result in injury?
- Physical Ability
  - Can employees physically “fit” in the work area?
  - Can the work be done safely?
Mental Human Factors

- Mental Fatigue
- Comprehension
  - Can instructions be understood?
  - Are they presented in the clearest way?
- Distraction
- Interruption
Things that derail HF

- “Common sense”
- “Operator error”
- Management / engineers assuming their audience has equivalent technical skill
- Conducting MORE training to compensate for over-complicated instructions or design
- Tasks designed purely to maximize speed (speed ≠ efficiency)
Part Three

Managing Human Factors
Work Planning

- **MENTAL**: Are instructions written in a manner that can be clearly understood by all intended users?
- **MENTAL**: Are there alternative ways to provide instruction – other than documents – which may be easier to understand by the intended users? (For example: signs, illustrations, photos, flowcharts, physical samples, etc.)
Work Planning

- **MENTAL**: Is the wording used too technical for the reader?
- **MENTAL**: Are instructions presented in the language used by the reader?
- **MENTAL / PHYSICAL**: Are schedules too aggressive – will they automatically result in rushed work, stressed employees, fatigue, etc.?
MENTAL / PHYSICAL: Do the instructions and schedules attempt to minimize concurrent tasks? For example, is there adequate time allowed for one task to be completed before another is begun?

PHYSICAL: Do instructions call out when multiple employees must be utilized for a single task (i.e., heavy lifting, task coordination, “spotters,” etc.)
Facility / Equipment Planning

- PHYSICAL: Consider physical limitations of the human body, and specifically of the workers employed by the company.
- PHYSICAL: Safety considerations (confined workspaces, overhead dangers, etc.).
- PHYSICAL/MENTAL: Are flooring, temperature, sound levels and lighting sufficient for the work to be done?
Facility / Equipment Planning

- **PHYSICAL**: Floor layout – is it efficient
  - Are work areas separated by large unused areas, requiring more walking and carrying of items over large distances?

- **PHYSICAL**: Can the equipment be easily used by the operators?
  - Consider physical design of the tooling or equipment.
Facility / Equipment Planning

- PHYSICAL: Are all facility safety requirements met, per OSHA and other regulations?
- PHYSICAL / MENTAL: Do instructions for maintenance, repair and instruction consider the safe usage and performance of the aircraft component or final product?
Facility / Equipment Planning

- **MENTAL**: Does the work area minimize distractions?
  - Minimize noises such as radios, PA’s, etc.
  - Disallow walk through by non-authorized personnel.

- **GENERAL**: Consider the relationship between HF and FOD reduction!
Maintenance, Repair & Inspection

- **PHYSICAL**: Are the proper tools readily available for use?
- **MENTAL**: Do operators understand complex regulations or instructions?
- **MENTAL**: Are forms – which may be necessary to record work results – designed in a way that makes them easy to use and understand, to ensure they are filled out accurately?
Maintenance, Repair & Inspection

- **PHYSICAL**: Can the work be performed without risk of injury, whether major or minor?
- **GENERAL**: Do work and inspection steps ensure that the component, system or product will operate safely?
PHYSICAL / MENTAL: Is the staff trained, and staff provided, to assist each other as needed?

- Providing a “second set of eyes” on critical steps
- Helping during heavy lifting
- Double-checking work
Product Design

- **PHYSICAL**: Consider safe use of the product, including safe integration with related systems?

- **PHYSICAL**: Consider compliance with all safety requirements for the product?
Product Design

- **PHYSICAL**: Consider safe handling by staff during manufacturing, assembly, inspection, maintenance or repair?
- **PHYSICAL**: Consider simplification of design aspects to make handling and use easier?
- **MENTAL**: Consider simplification of design documentation to ensure technician comprehension at their level of training.
Top management must ensure that work is scheduled and conducted in a way that minimizes:

- Concurrent tasks
  - Don’t design rushing and anxiety into the process
Other General Considerations

- Avoid Concurrent tasks
  - Consider that multitasking leads to less efficiency for each individual task
  - Pause occasionally for review of work to date
- Manage Deferred tasks (“I’ll do it later”)
  - Create “reminder” methods so that when a task must be deferred, it is communicated and staff are formally reminded.
    - Alarm, notes, signage, status logs
Other General Considerations

- Limit Interruptions
  - Provide environment that reduces opportunity for interruption
  - Train management that their role does not include right to interrupt work for non-essential communication
Other General Considerations

- When a nonconformity (whether product or process) is discovered, the root cause analysis shall consider the human factors that led to the problem.
When determining a corrective or preventive action response to an existing or possible nonconformity, consideration of human factors shall be given to ensure an effective and comprehensive action plan.
Other General Considerations

- As part of Management Review, an analysis of any incidents related to human factors shall be reviewed.
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