Human Factors Integration Standards Seminar

Asset Standards Authority
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ASA

Introduction to the Asset Standards Authority
Seminar agenda

• ASA HF team – who we are?
• Objectives of Human Factors for the ASA
• What is Human Factors
• AEO Requirements
• HF examples
• The ASA HF Standards
• Exercise
• Q & A
Who we are?

The ASA SQER Human Factors team are:

- Gareth Hughes *(Manager HF)*
- Airdrie Long *(Snr HF Specialist)*
- Stuart Hughes *(HF Specialist)*
Objective of HF for the ASA

- The Asset Standards Authority’s objective is to ensure that the delivered asset is both operable and maintainable as well as being safe to operate and maintain and provide required overall system performance.
What is Human Factors?

• It is the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system and the profession, that applies:
  – theory,
  – principles,
  – data,
  – and methods

to design in order to optimise human well-being and system performance.
What does this mean in practice?

- Overall system performance improves when human capabilities and limitations have been addressed in the design
HF in the Asset Lifecycle

Plan: Concept, Specify, Procurement, Design, Build, Integrate
Acquire: Accept
Operate / Maintain: Operate, Maintain, Evolve
Dispose

Stakeholder Management
Risk Based Management
Value Realisation
HF in the Asset Lifecycle

• If you don’t design right…

  operating and maintaining costs
  – $$$
  – Time
  – Fatigue & frustration
  – Errors & violations
  – Complex procedures
  – More staff
  – More incidents
  – Retrofit (100 x $$$ at design and less than optimal solution)
Aircraft Wheel Spacer

Damage caused by missing spacer

Just for one major airline the spacer missed during maintenance resulted in multi million dollar losses every year!
8.11 Human Factors Integration

The Authorised Engineering Organisation shall manage all human factors relevant to the scope of authorised engineering services and disciplines provided to deliver the asset.
Future AEO Requirements

• The Authorised Engineering Organisation shall manage all human factors relevant to their authorised engineering services. This management process should be aligned with the requirements of the Human Factors Integration – General Requirements T MU HF 00001 ST.

• Human factors integration tasks shall be carried out by a competent resource. The competency requirements of the resource shall be determined by the needs of the specific project.

Source: AEO Assessment Checklist, Version 2 – To be published
ASA HF Standards

• T MU HF 00001 ST
  Human Factors Integration – General Requirements
• T MU HF 00001 GU
  AEO Guide to Human Factors Integration
• T HR HF 00001 ST
  Human Factors Integration – Rolling Stock

Published 22nd August 2014.

All projects by AEOs need to comply with these standards.
Asset might be operable but has maintenance been considered?
Fuel Gauge Example

ATR - 42

ATR - 72
• Gauge uses algorithm to calculate fuel quantity
• Gauge was installed into the incorrect plane
• Wrong fuel quantity reading shown

Plane ran out of fuel and ditched into the sea causing 16 deaths
Fuel Gauges

Benefits
- Lower manufacturing costs
  - single production line
  - fewer manufacturer staff needed
  - common sub-assembly parts
- Displays the same way for pilots (end users)

Costs
- Multiple loss of life
- Financial and reputational
Optimising benefits/costs

- Large cost (deaths) avoided by minimising the potential for the wrong part to be fitted e.g. provide a different electrical connector
- Majority of manufacturing benefits retained with small increase in manufacturing and through life costs

→ this is considered a “win-win” situation
"To Err is Human"
... a basic human trait

Some mitigation for error designed in
Human Factors seeks to optimise the interactions between humans and other system elements to benefit overall system performance.

Source: T MU HF 00001 GU AEO Guide to Human Factors Integration Version 2.0
Our example

Lifts 1, 2, 3, Lift 4, Lift 5

Where would you find similar examples in rail?
The ASA HF Standards
Approach

• Ensure that AEOs consider Human Factors early within design process not just a review and retrofit process.
• Provide functional requirements not prescription
• Not exhaustive but useful and usable focusing on process – HFI with some key topics for transport projects
• Applicable to all projects – scalable
• Develop a short usable standard

• Additionally include information, assistance and guidance to increase awareness and value of HF for bid managers and project managers.
HF Process

Communication and Consultation

Establish the Context
HF Issue Identification
HF Analysis
HF Assessment
Solution Adoption and Testing

Monitoring and Review

Source: T MU HF 00001 GU AEO Guide to Human Factors Integration Version 2.0
Points of note

- HFI is integral to the engineering/design process
- “Stakeholder” is not the same as “end users”
- End users need to be consulted
- End users need current and relevant experience
- Business requirements are not the same as HF/User requirements
Practical Considerations

- SiD – include efficient + effective Asset
- COTS – context and assurance
- Like-for-like
- Customer Experience
  “Placing the customer at the centre of everything we do”
Scalability

• Larger projects can result in specific documents:
  – Concept of Operations
  – User requirements
  – HF Integration Plan
  – HF Issues Register
  – Lessons Learned

Always need to consider these aspects but smaller projects may incorporate these into the engineering plans etc.
ASA General Requirements

- HFI process

- A list of some generic topics pertinent to transport projects (*not just heavy rail*).
HF topics in ASA Standard

- Design requirements
- Anthropometric data
- Controls and displays
- Information content
- Audibility and intelligibility of messages
- Alarms and alerts
- Workspace and task design
- Seating
- Glare and reflections
- Customers and the public specific

(This is a non exhaustive list)
Design requirements

Include:

• Human variability, capabilities, limitations
• Using relevant and valid data
• Normal, degraded, maintenance, cleaning and emergency situations
• Human error
• ‘easy way is correct way’ - violations
• Foreseeable mis-use
• Workload and distraction
• Overall environment – climate, acoustic, visual, vibration
• Design review with end users and stakeholders
• Impact of design decisions on operations and training
Contents of ASA Guide

- Information for bid and project managers:
  - Defining HF within asset life cycle
  - What is HFI
  - Goals of HFI in asset life cycle
  - Why include HF
- HFI process – more detail about how could implement the requirements of the Standard
- Common HF topics
- Common HF analyses terms
ASA HF Rolling Stock Standard

- Additional HFI requirements for both:
  - procurement of new rolling stock
  - alterations to existing rolling stock

- Includes:
  - Driver compartment and cab design
  - Crew workstations, controls and displays
  - Passenger and crew comfort and safety
  - Simulators and emulators
  - Other users that interact with the rolling stock asset
Any questions?

Or alternatively like your toaster

“Do you want a bit more!”