

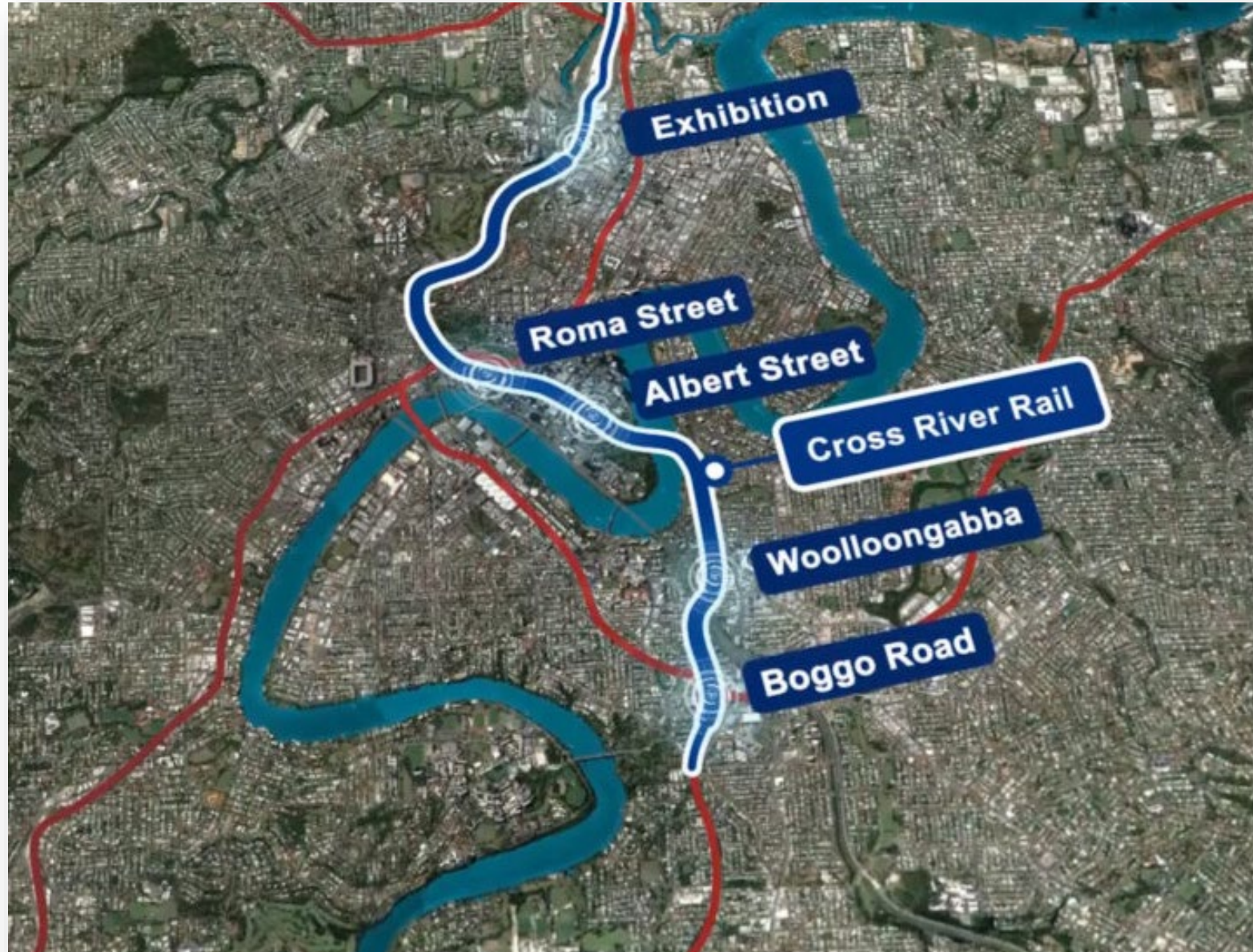
# Human-centred design in the introduction of in-cab signalling

**ANTONY WHITMORE, HUMAN FACTORS INTEGRATION MANAGER  
BRYONY OUTERIDGE, PRINCIPAL HUMAN FACTORS ADVISOR  
Queensland Rail**

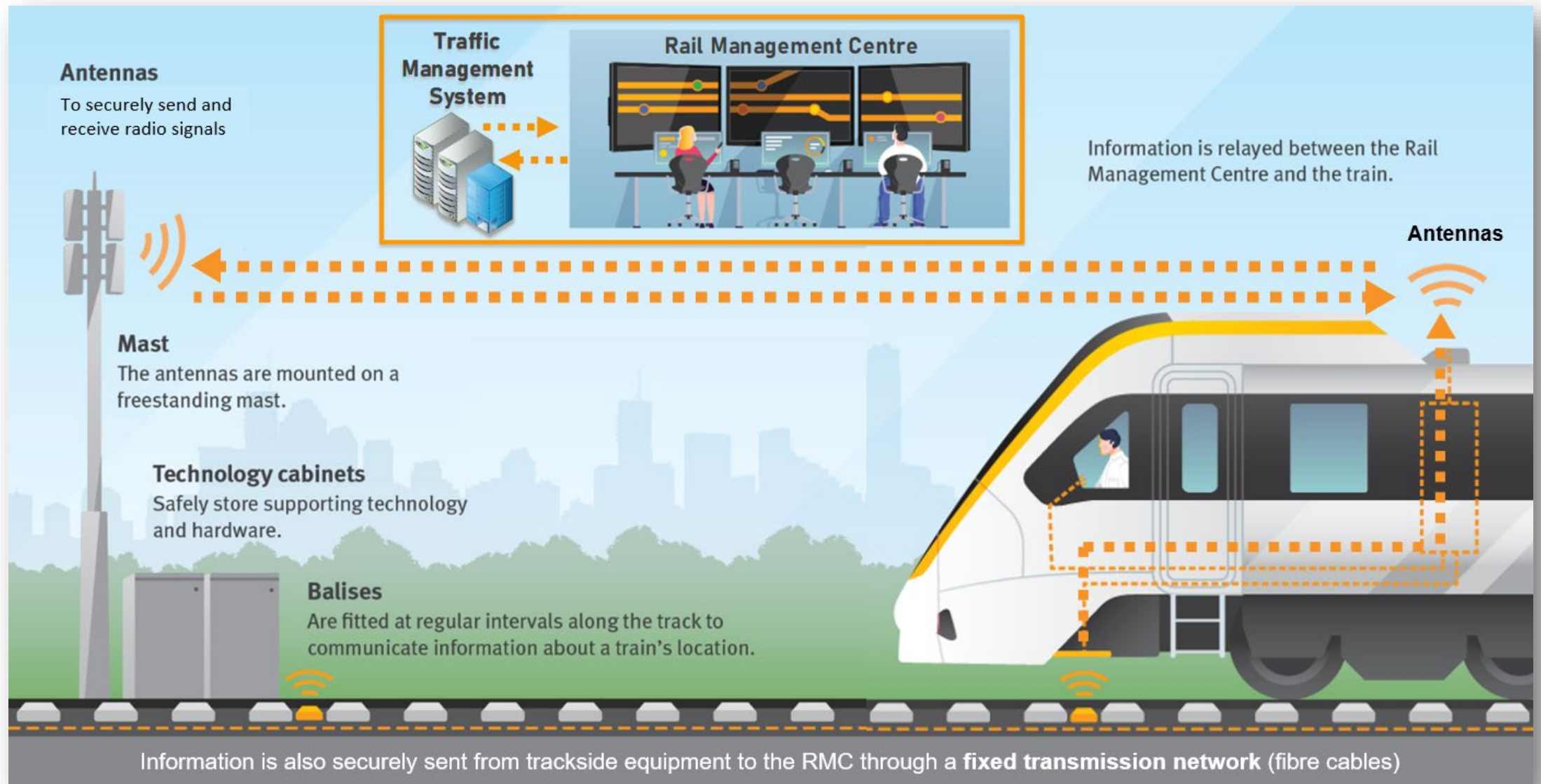




# Network expansion and new river crossing



# ETCS Level 2 - A seamless, safe system



# HUMAN PERFORMANCE & NEW TECHNOLOGY

- Recognise that technology nearly always changes, rather than replaces, the role of people in a system.
- Design technology such that operators can maintain awareness of both the state of the system and the context in which it operates.
- Ensure those who support the system understand what it is doing and why.
- Recognise that new systems can sometimes increase the levels of task difficulty and workload imposed on operators.
- Design is critical to supporting and optimizing performance



***“Design the  
human into the  
process.”***

Dr. Alonso Vera  
NASA

# HUMAN PERFORMANCE & NEW TECHNOLOGY

Air France flight 447,  
1 June 2009

## Cockpit Voice Recorder:

- We still have the engines! What the hell is happening? I don't understand what's happening
- *Damn it, I don't have control of the plane, I don't have control of the plane at all!*
- What the hell are you doing?
- *We've totally lost control of the plane. We don't understand at all... We've tried everything*
- What do you think? What do you think? What should we do?
- *Well, I don't know!*



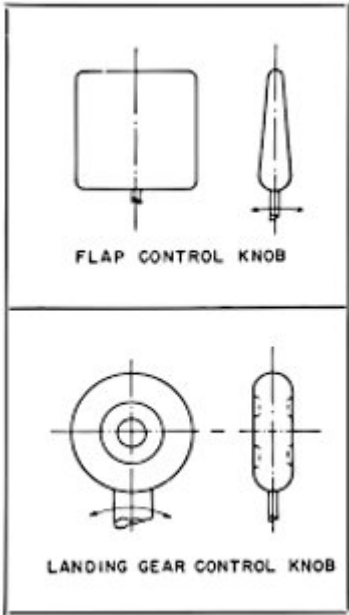
# HUMAN PERFORMANCE & NEW TECHNOLOGY



# HUMAN PERFORMANCE & NEW TECHNOLOGY



The landing gear lever (Photo by Charlie Page/The Points Guy)





# HUMAN PERFORMANCE & ETCS



# HUMAN PERFORMANCE & ETCS

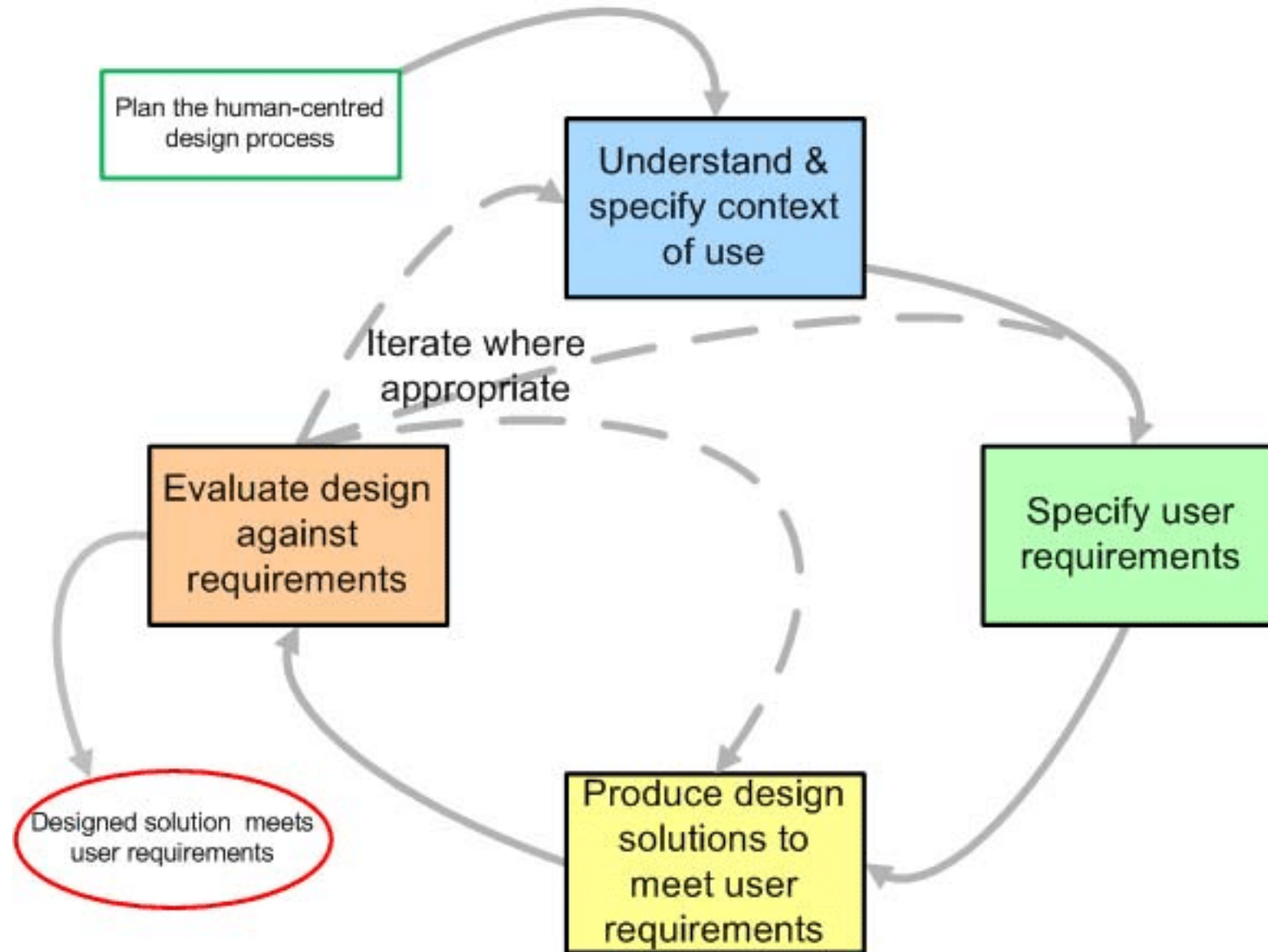
Confirmed: Human error caused horror train crash



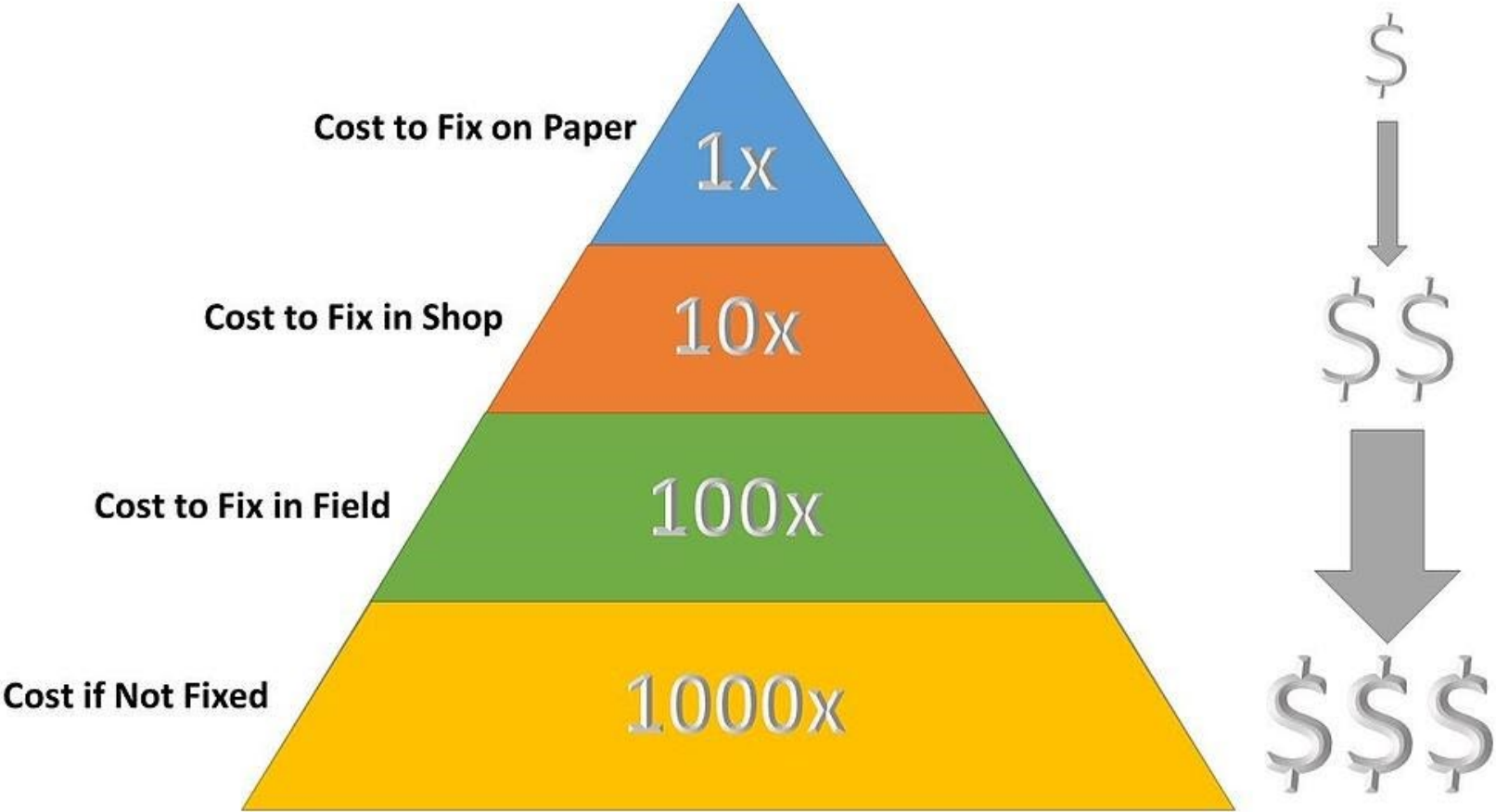
File photo: Oscar Corral/AFP

Investigators have confirmed that driver error was fully responsible for a tragic train crash near the Spanish city of Santiago de Compostela in July 2013 in which 79 people died.

# HUMAN-CENTRED DESIGN PROCESS



# WHY HUMAN CENTRED DESIGN?

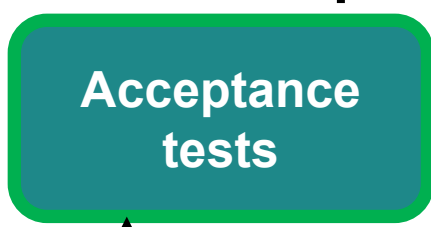


1. Bid/  
Tender  
Stage



Validation

Validation

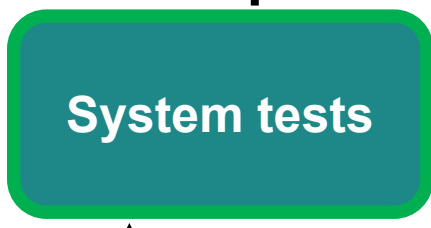


5. Post-  
commissioning

2. Design



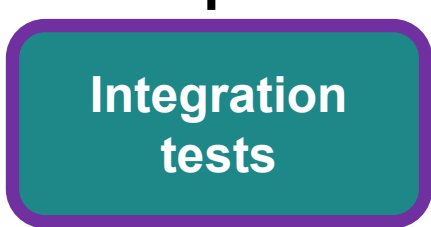
Verification



4. Pre-  
commissioning



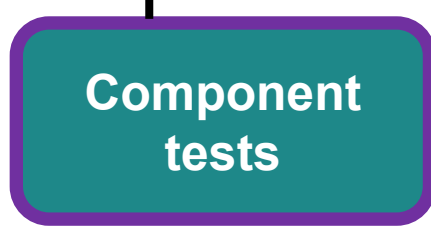
Verification



**HUMAN  
FACTORS  
IN DESIGN**



→



3. Construction /  
Installation Stage

# TRAIN CAB DESIGN

## Purpose

- Review new in-cab equipment including the Driver Machine Interface

## Considerations:

- Existing cab layout
- Physical size of drivers
- Posture and access to controls
- External driver sightlines
- Location of controls
- Glare and reflection

## End users:

- Design mock-ups
- Queensland Rail Cab Committee
- In-cab assessments



Current IMU160/SMU260 driver's cab desk layout

# TRAIN CAB DESIGN

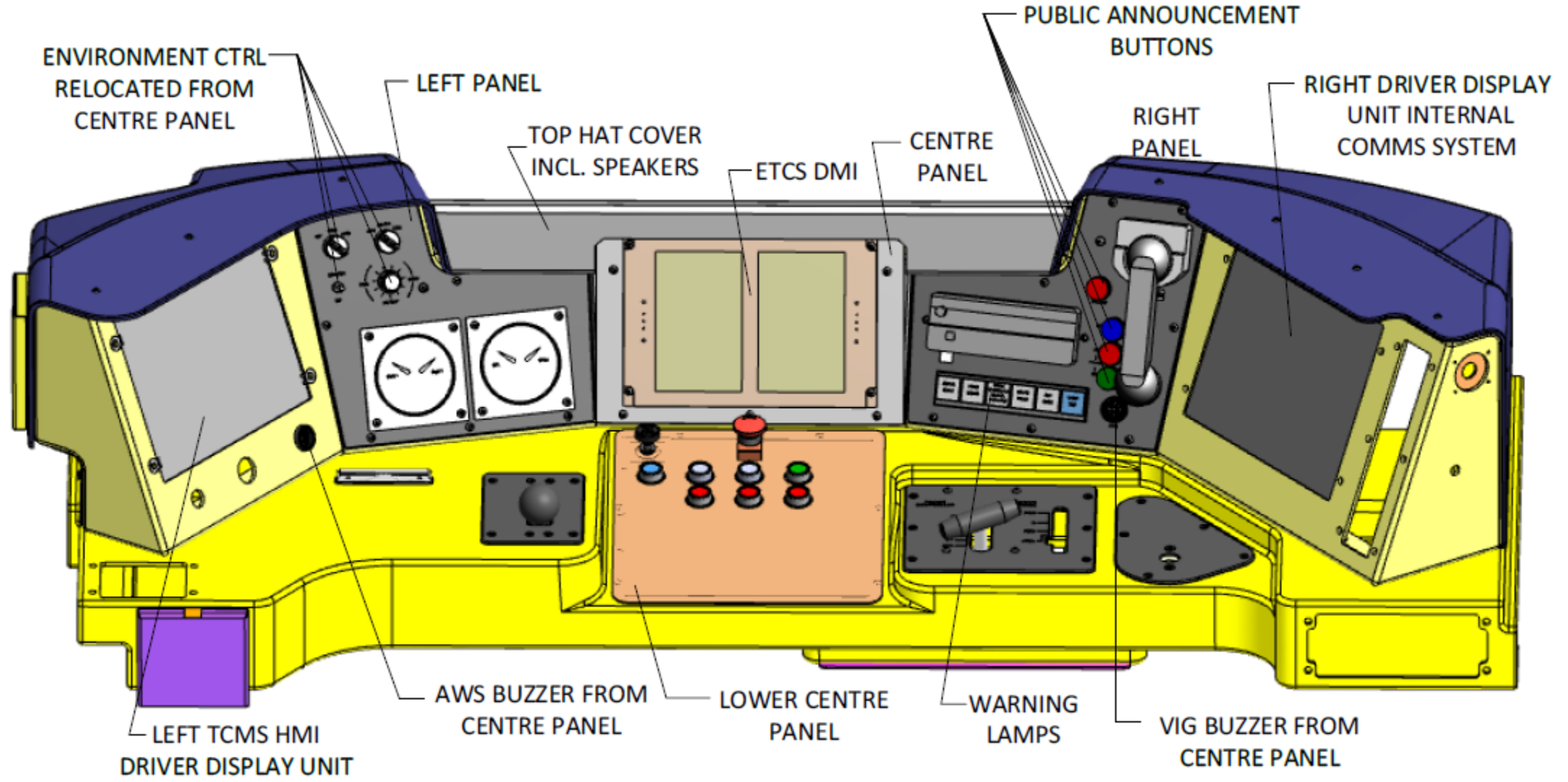


# TRAIN CAB DESIGN





# TRAIN CAB DESIGN

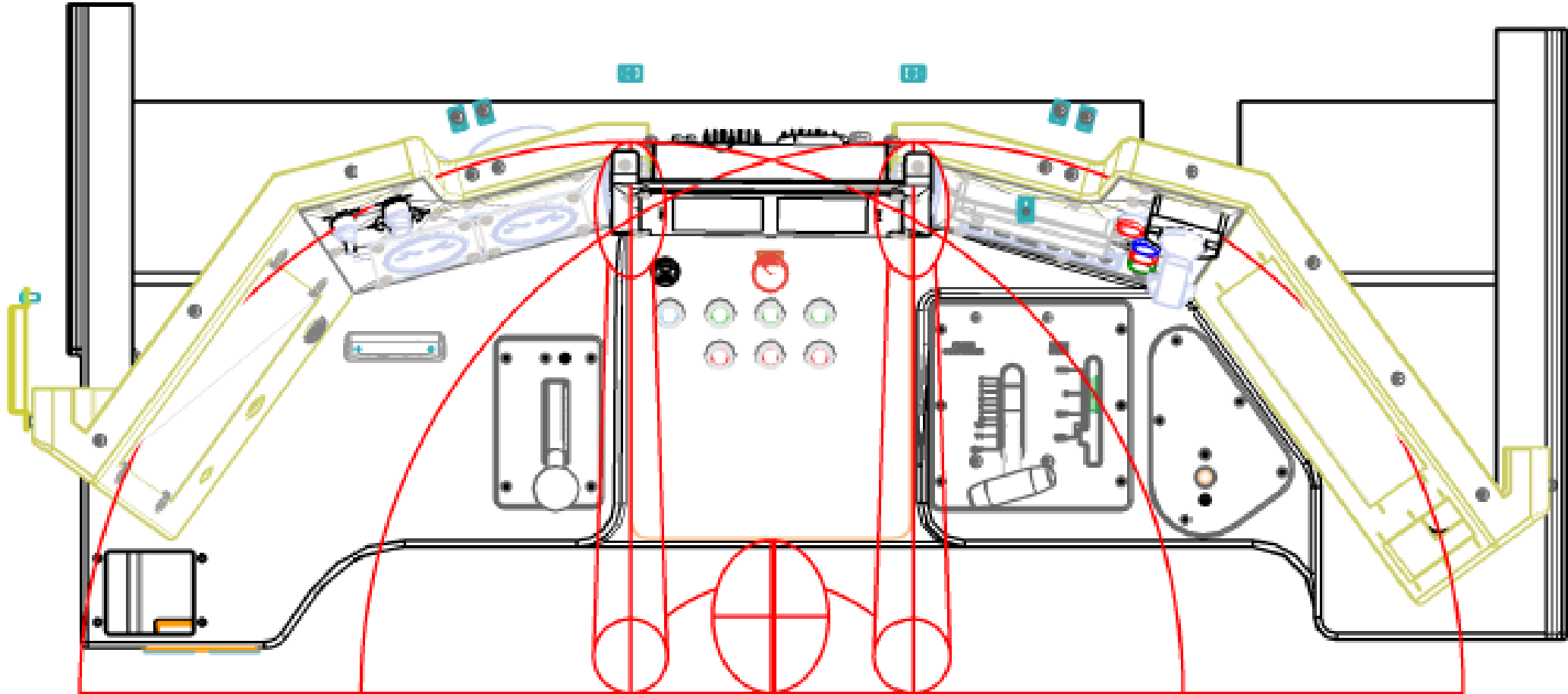


**Figure 15: Proposed position of the ETCS DMI on the central panel**

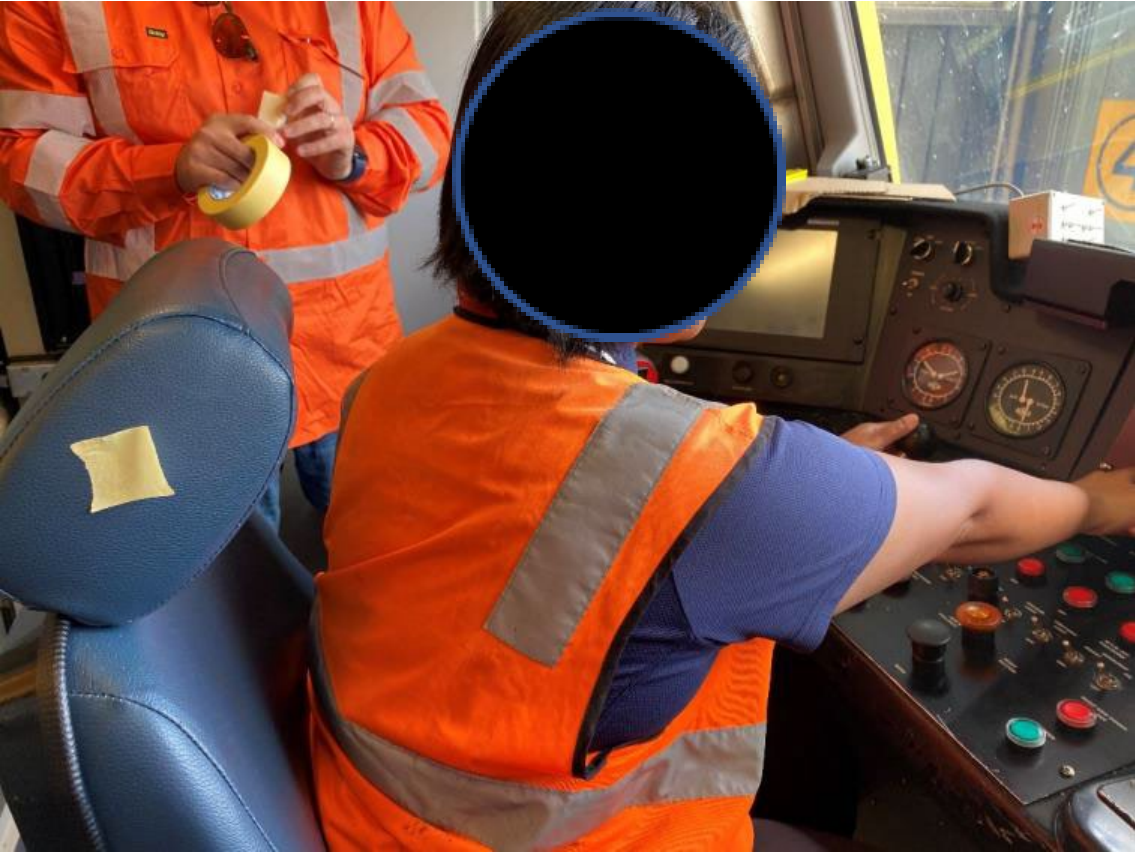
# TRAIN CAB DESIGN



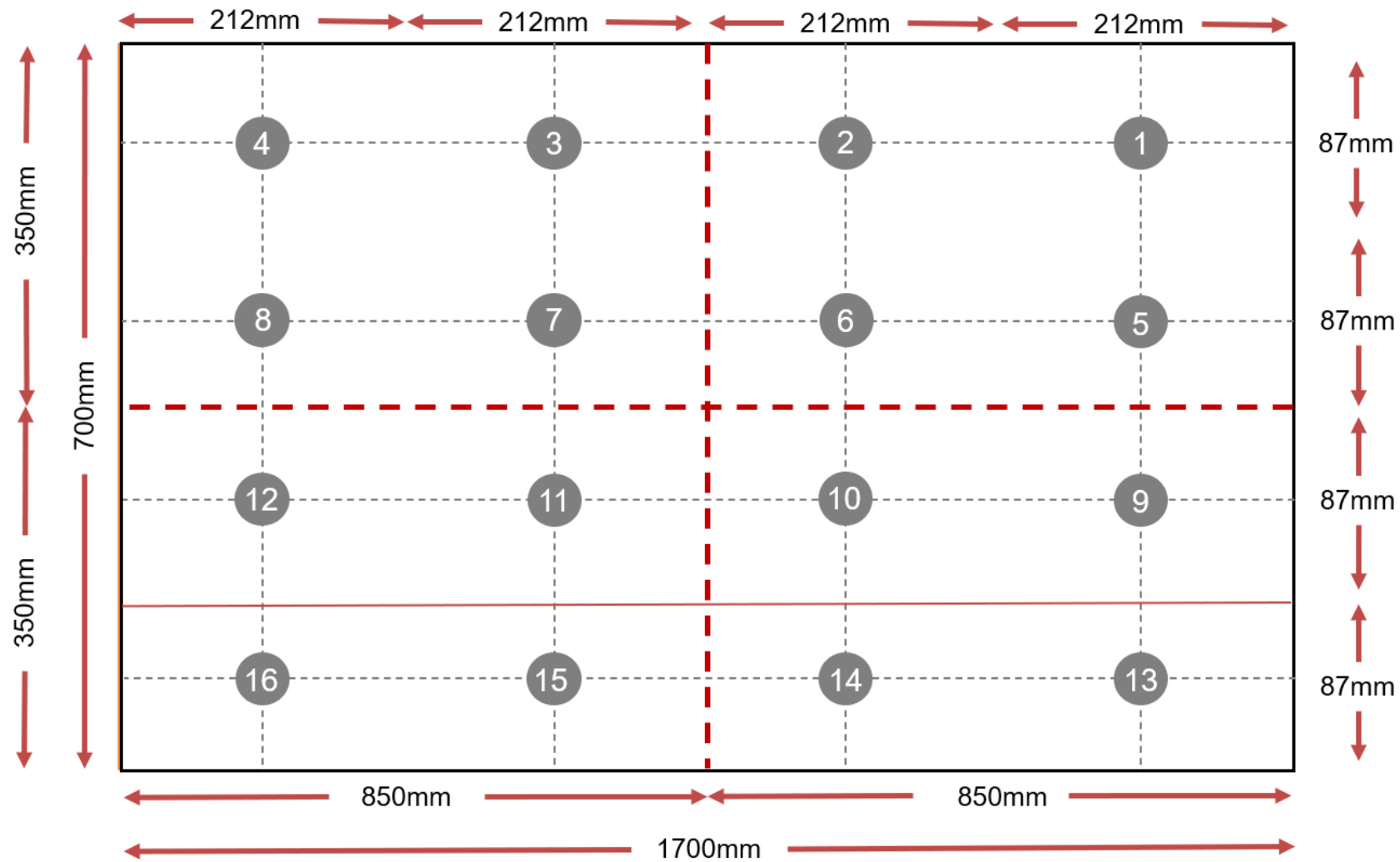
# TRAIN CAB DESIGN - REACH



# TRAIN CAB DESIGN - REACH



# GLARE & REFLECTION

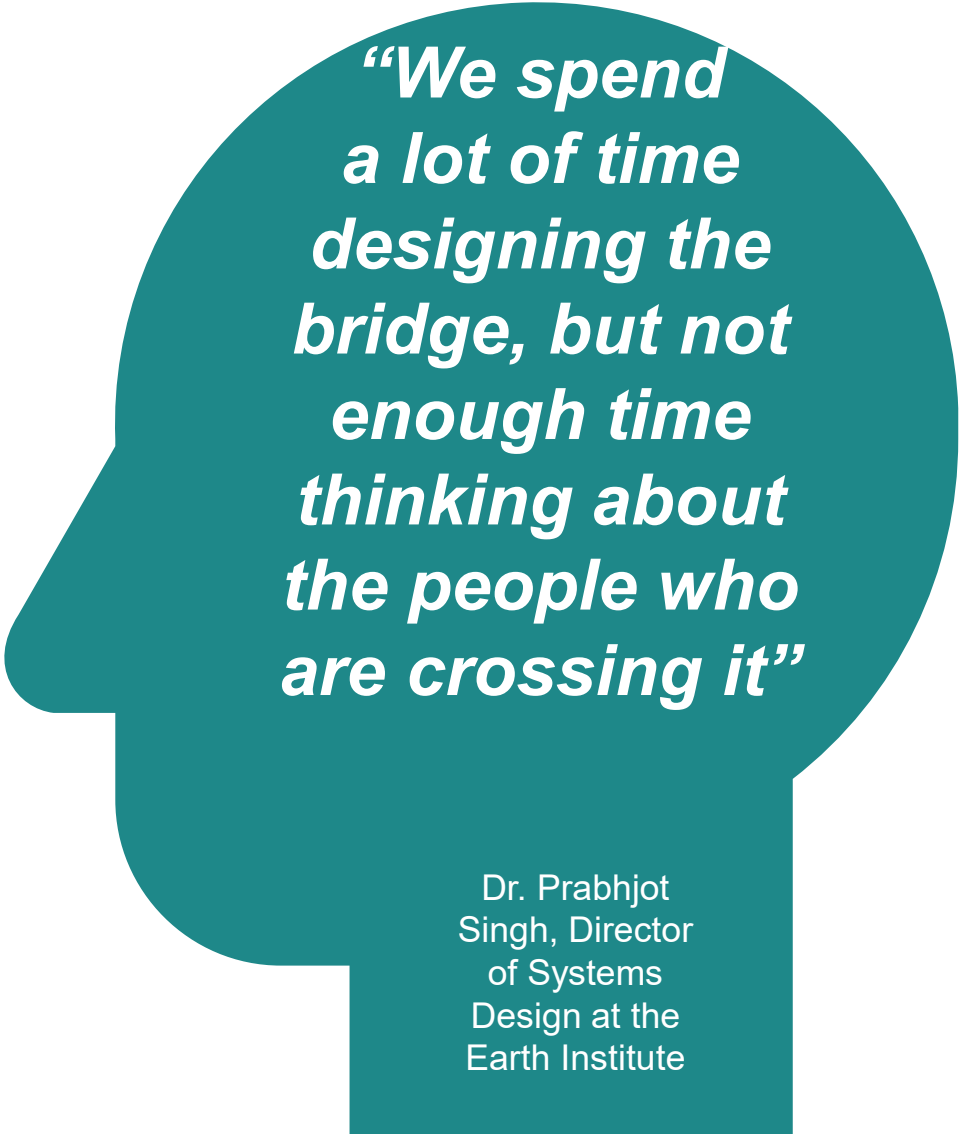


\*Note: Not to Scale

\*Note 1: Grid flipped to show user facing windscreen from inside train.

# SUMMARY

- The introduction of in-cab signaling (ETCS) introduces complex human factors challenges
- Application of Human-Centred Design to cab design is key to optimising human-system performance
- Key takeaways...
  - Understand the context of use
  - Engage early with end-users
  - Design and test through an iterative process
  - Not just a tick-box exercise



***“We spend a lot of time designing the bridge, but not enough time thinking about the people who are crossing it”***

Dr. Prabhjot  
Singh, Director  
of Systems  
Design at the  
Earth Institute

