

Civil Aviation Authority of New Zealand

Design Considerations for the Human Contribution to Safety

Matt Harris – Safety Investigator





ZK-MBX – RANS Aircraft S-19

Departure From
Controlled Flight

25 June 2017, Near Hyde, Central Otago



Incident timeline

- 25 June 2017
- 08:35 (approx.) The pilot/owner arrives at Taieri Aerodrome and completes a pre-flight aircraft inspection
- 10:30 (approx.) Pilot attends a briefing and conducts pre-flight planning
- 11:09 (approx.) ZK-MBX departs Taieri Aerodrome for Omarama Aerodrome
- 11:20 (approx.) The pilot lets the passenger fly the aircraft
- 11:29 (approx.) The passenger is about to make a radio call when the departure from controlled flight occurs
- 11:30 (approx.) The aircraft impacts terrain and comes to rest upside down approximately three nautical miles south east of Hyde in Central Otago
- 13:00 (approx.) Pilots from the group fly away attempt to contact the pilot and passenger by cell phone
- 15:00 (approx.) RCCNZ notify the CAA Duty Investigator of the missing aircraft, an aerial search is underway
- 16:30 (approx.) RCCNZ report that the aircraft has been found. The passenger is taken to hospital by rescue helicopter.

Incident map

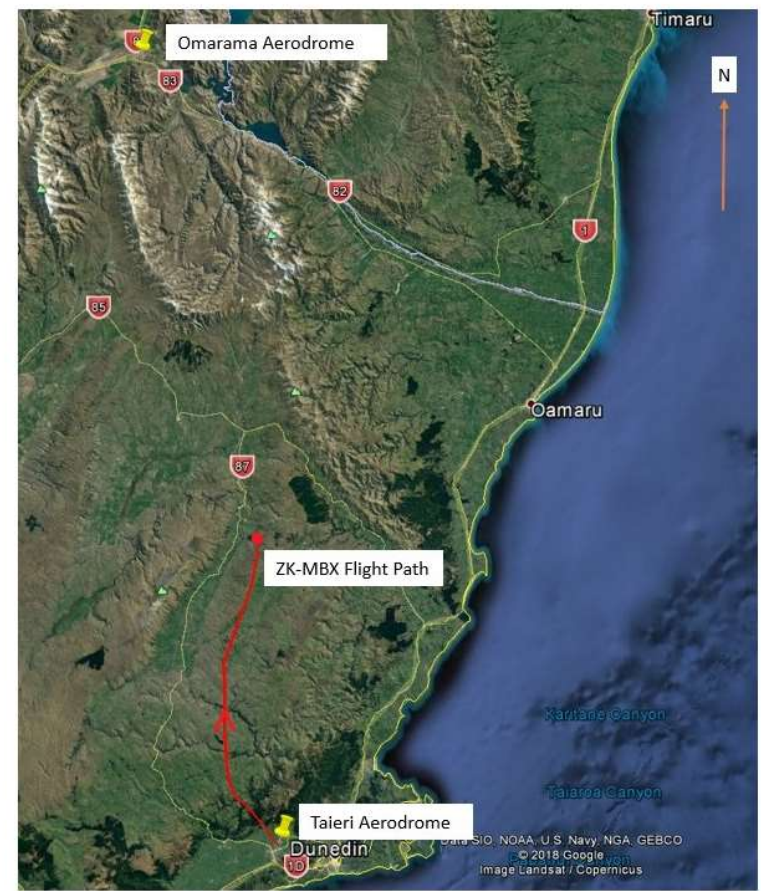
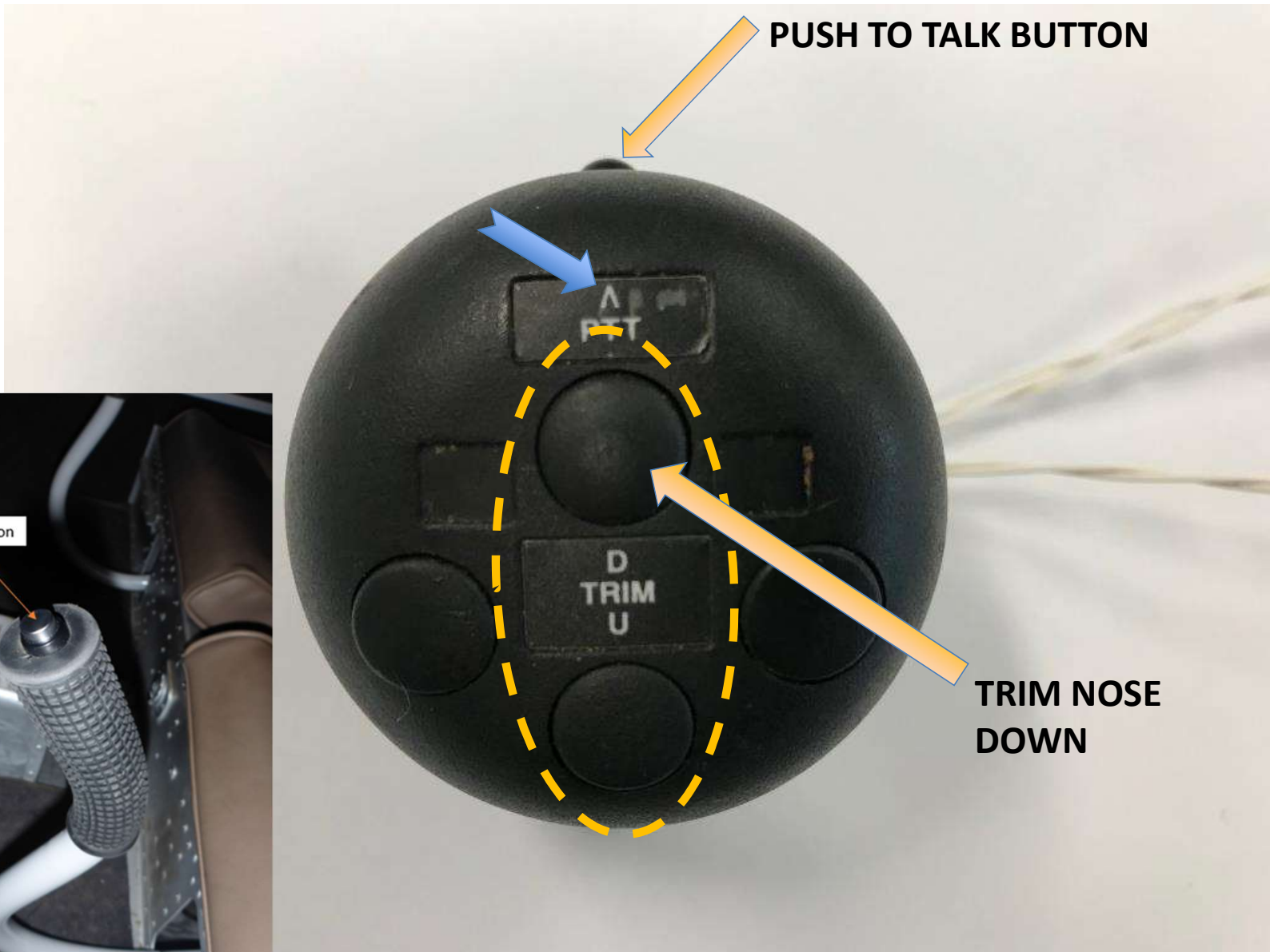
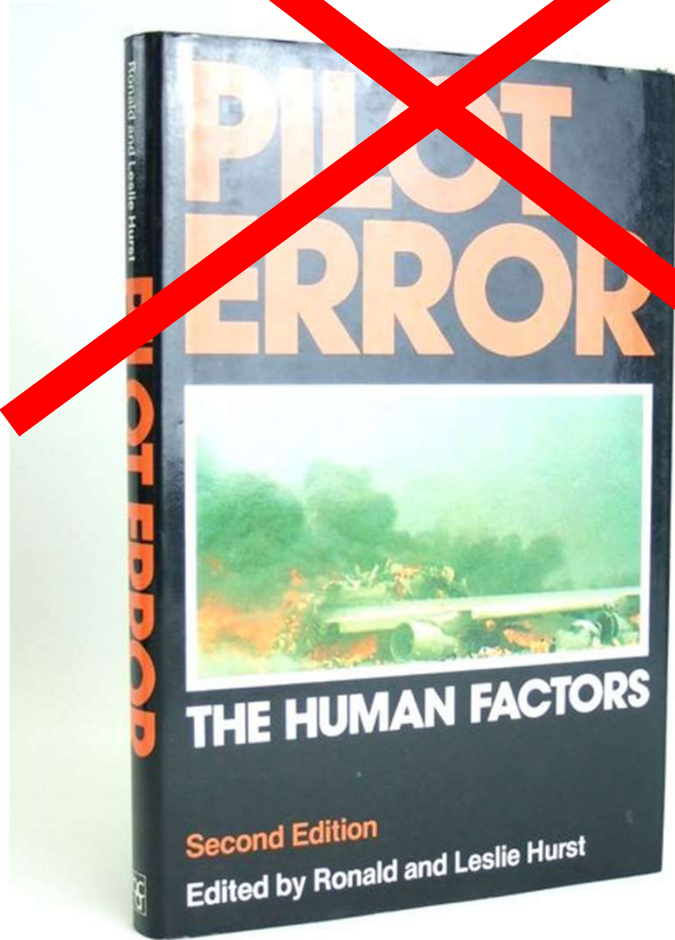


Figure 1: Map of flight path (Google Earth)





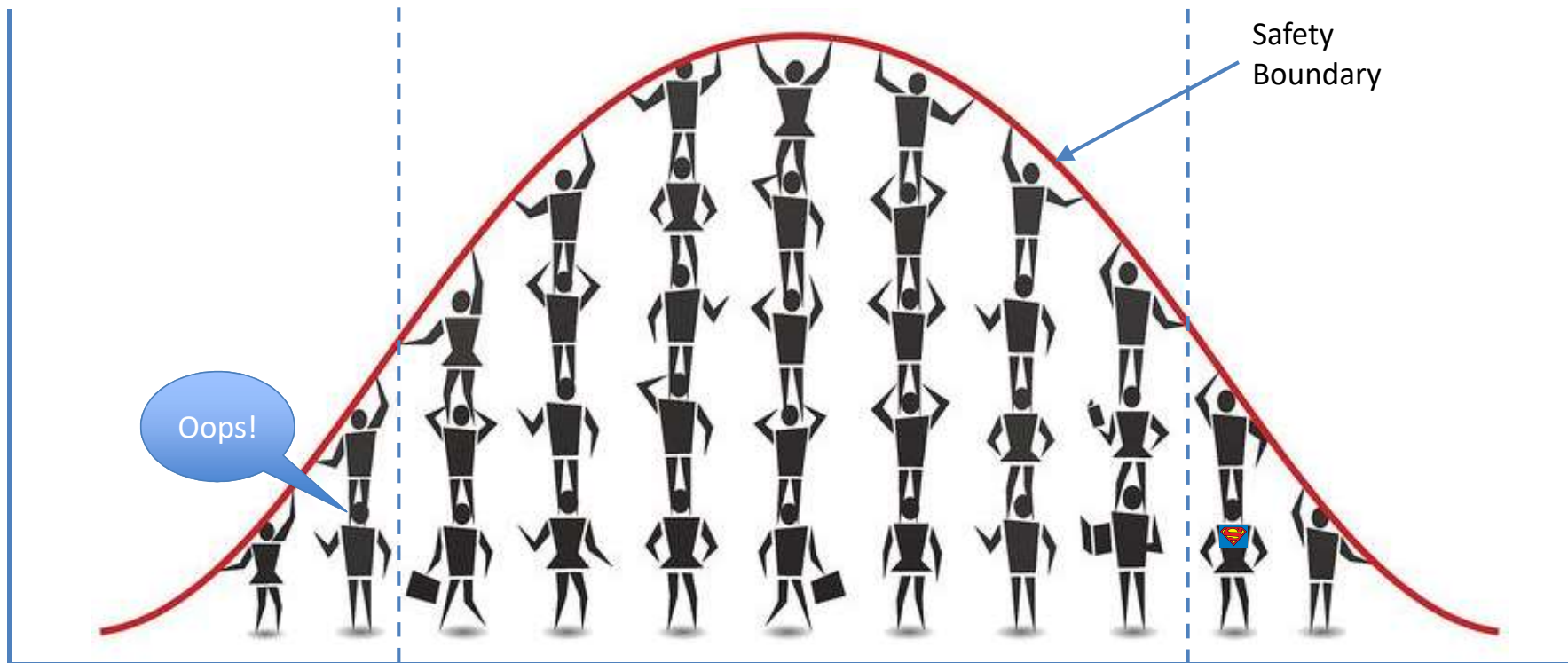
Human Error



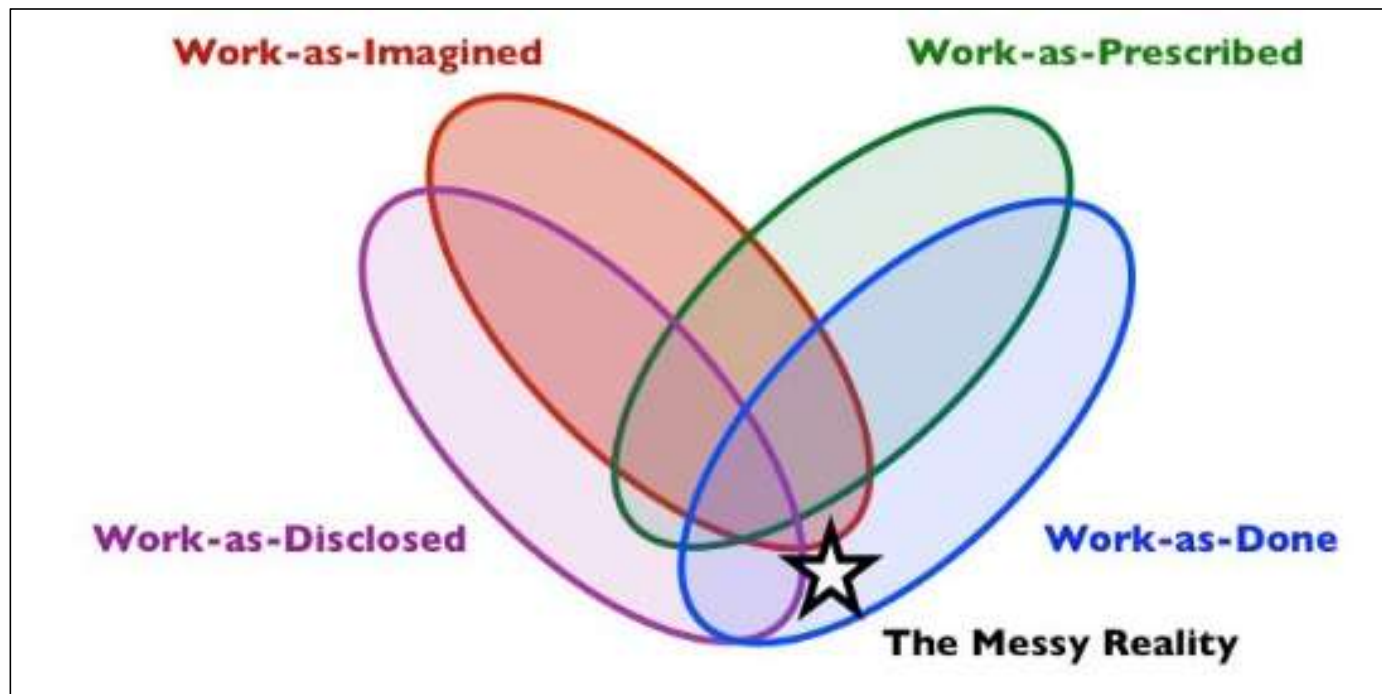
‘Error’

- Is a label based on hindsight.
- It's attributed with outcome bias.
- It doesn't really explain anything.
- The complexity of the situation can be overlooked.

The Human Contribution to Safety



Types of 'Work'



The varieties of human work
[2 March, 2017 Steven Shorrock](#)

ICAO Human Performance Manual

(draft 2018 – due for publication 2019)

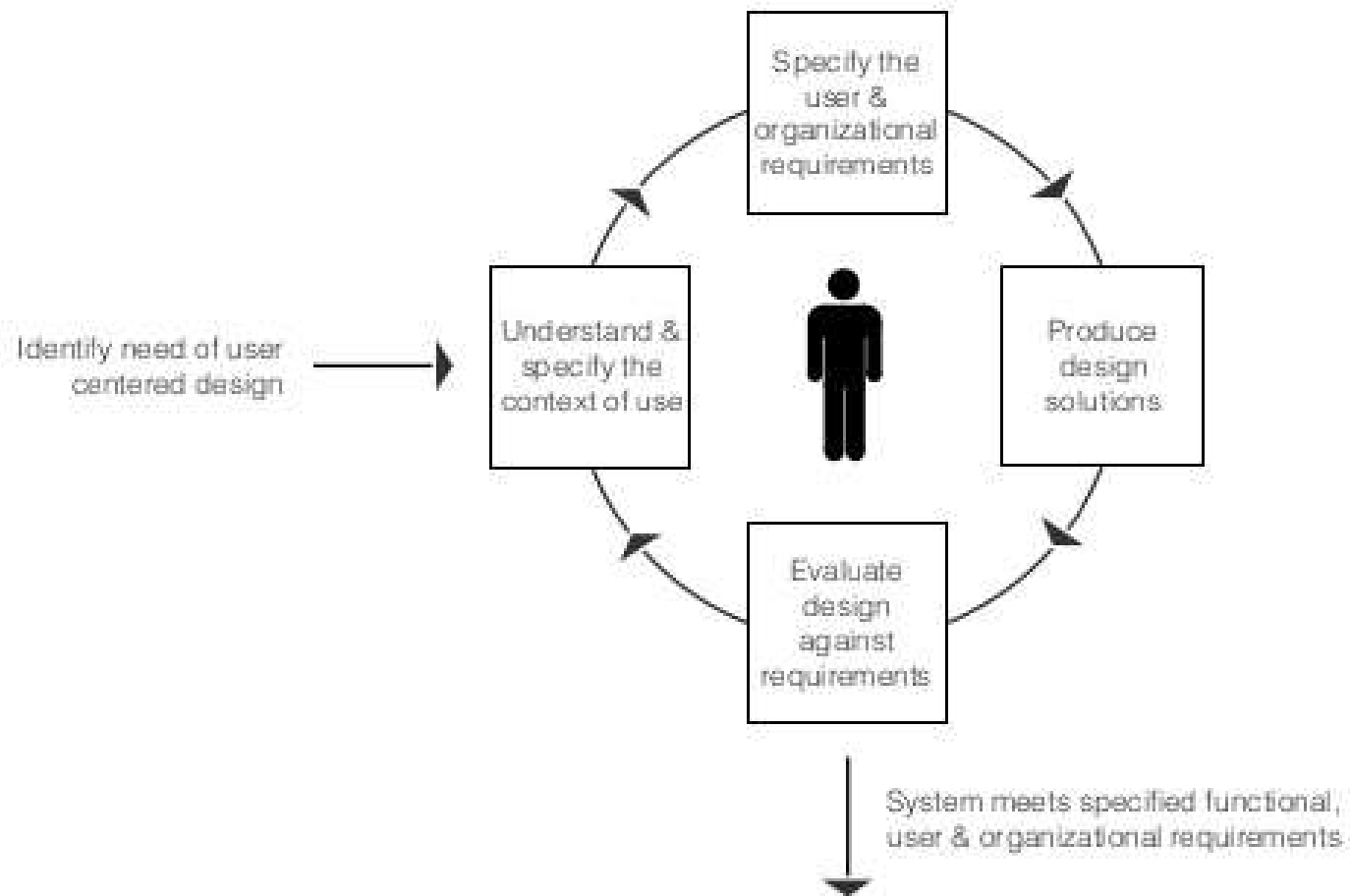
- Making it **easy to do the right thing**,
- making it **difficult to do the wrong thing** and
- making it **almost impossible to do the catastrophic thing**

ICAO Human Performance Principles

- Peoples' performance is shaped by their capabilities and limitations
- People perform in ways that make sense to them at the time
- People adapt to the demands of a complex and dynamic work environment
- People assess risk and make trade-offs all the time
- Peoples' performance is influenced by being with other people

USER CENTERED DESIGN: ISO 13407 (1999)

6 STEPS, ITERATING



Human-Centred Design (HCD)

A HCD approach that integrates the understanding of the HP Principles can:

- shorten the implementation phase
- lead to higher acceptability by users
- improve system performance and human wellbeing
- reduce the likelihood of being surprised by unintended consequences

Steps To Good Design

- 1) A philosophy of operation (or use) is identified.
- 2) Design requirements are identified.
- 3) Prototype designs are developed.
- 4) Prototype designs are tested and evaluated.
- 5) The design is selected.
- 6) Implementation guidance is developed.
- 7) Implementation is monitored.

Boeing B737-8 MAX

Departure From Controlled Flight After Take-off
29 October 2018, Lion AIR Flight JT610,
Jakarta, Indonesia

10 March 2019, Ethiopian Airlines Flight 302,
Addis Ababa, Ethiopia.



Joint Authorities Technical Review

Boeing 737 MAX Flight Control System

- *A comprehensive integrated system-level analysis recognizing that in this complex interactive system, every change could interact with other parts of the system.*
- *Ensure that compliance, system safety, and flight deck/human factors aspects are considered for the aircraft design throughout its development and certification.*
- *Have a system safety function that is independent from the design organization, with the authority to impartially assess aircraft safety and influence the aircraft/system design details.*
- *Integrate and emphasize human factors and human system integration throughout its certification process.*
- *Adequately evaluate operational impact, systems integration, and human performance.*



To Design Safer Systems

Understand the messy reality of Work-as-Done.

Any Questions?