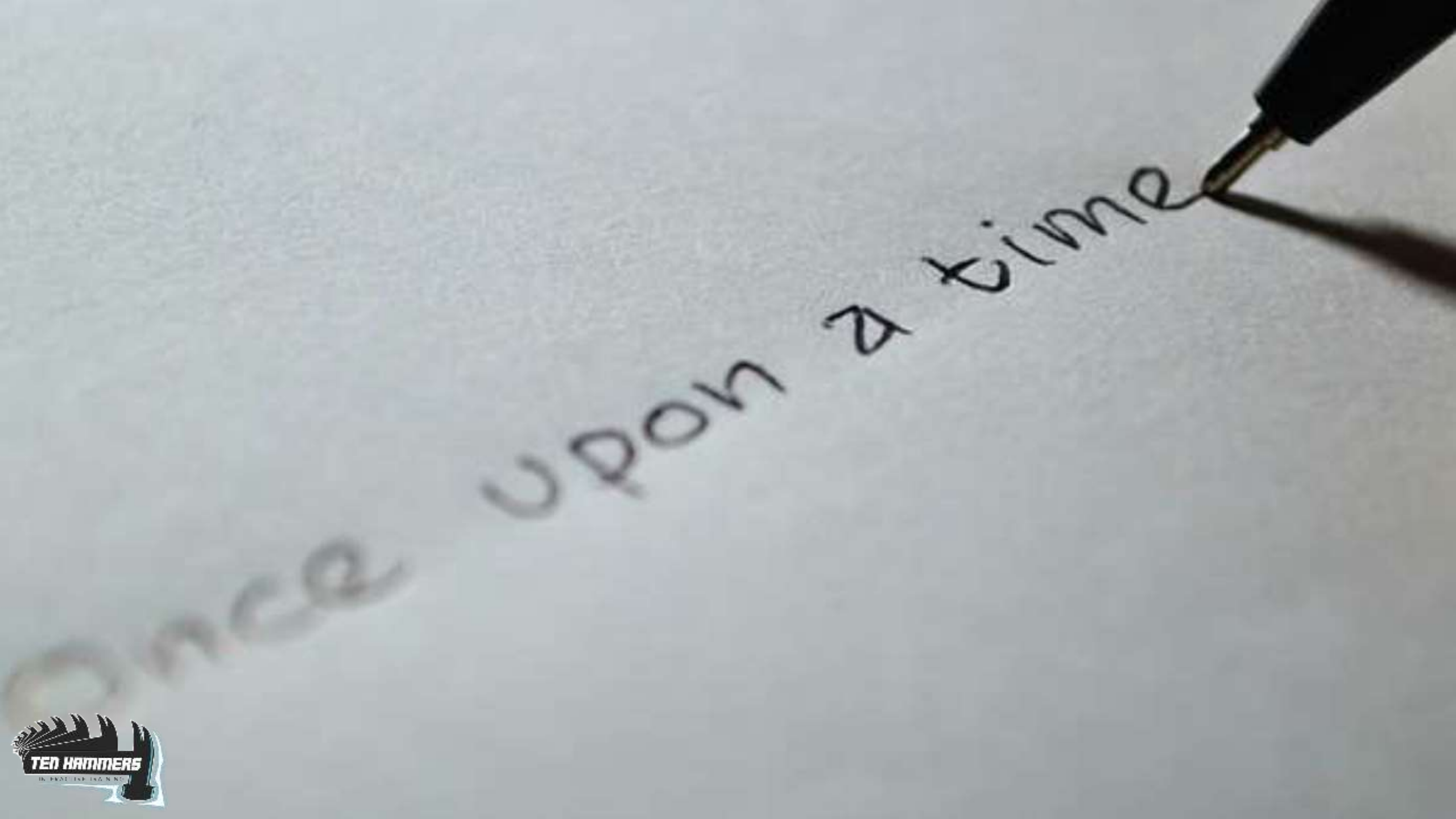
Multimodal Sensory Effectiveness

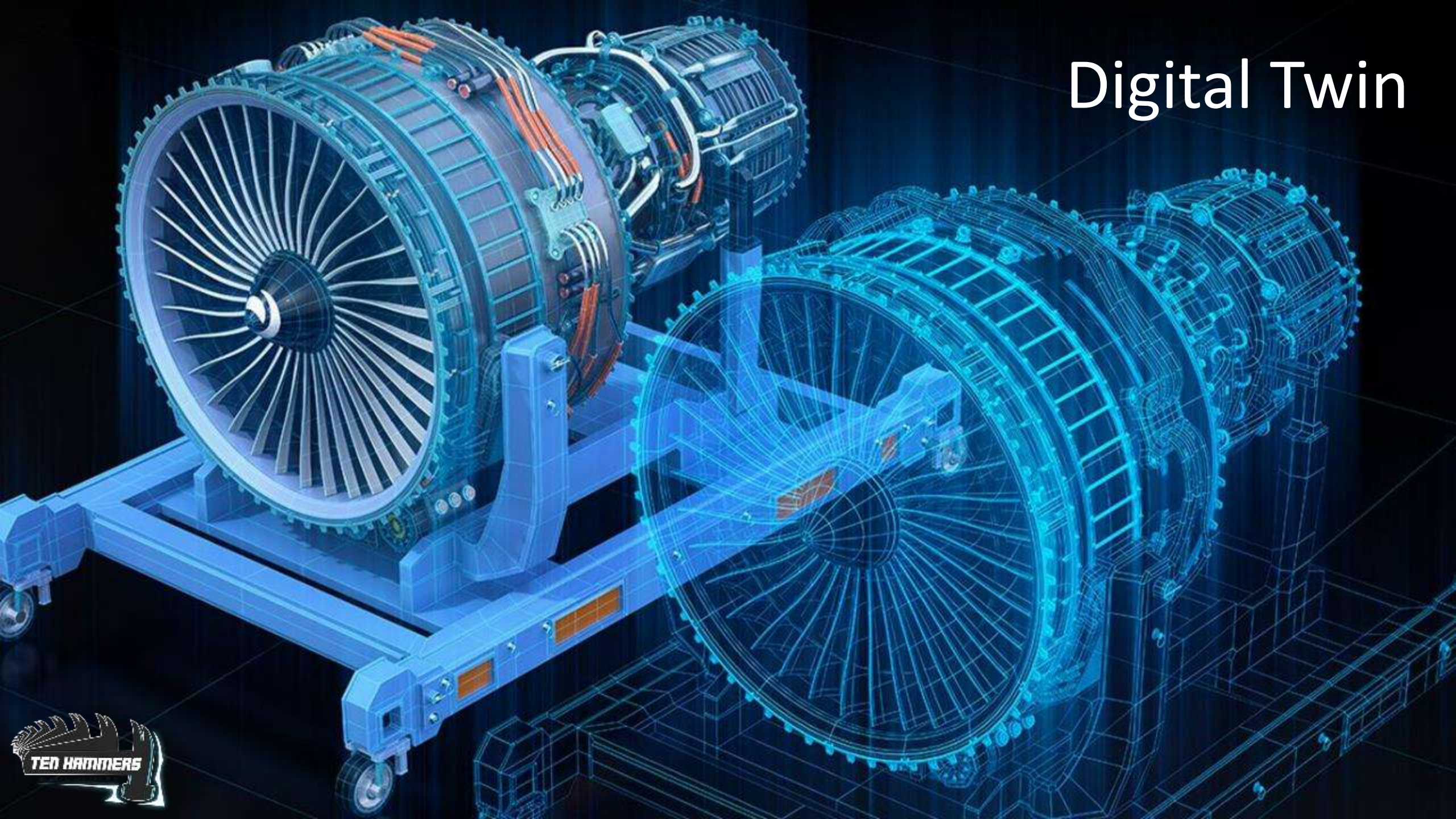
Improving the Realism of Virtual Reality Training

Moving Beyond the Digital Twin

Denis Manson – **Ten Hammers**


Once upon a time

Digital Twin



One Way of Categorising Digital Twins

Courtesy: Jeff Winter

How ‘twin’ is the digital twin?

We KNOW we can GAIN
by using extended reality.

But what do we LOSE?

Senses

2/5 = 40%

What Makes Training Most Effective?

Trainee situational awareness

Cooper, N. et al (2018)

Multisensory feedback on task performance and the sense of presence in a virtual reality environment

Marucci, M. et al (2021)

Multisensory integration and perceptual load in virtual reality settings on performance, workload and presence

Melo, M. et al (2020)

Do multisensory stimuli benefit the virtual reality experience?

Hale, K. et al (2009)

Multimodal sensory information requirements for enhancing situation awareness and training effectiveness

Human Factors 101

SITUATIONAL AWARENESS

1. Perception
2. Comprehension
3. Projection

What Makes Training Effective in XR?

Presence and immersion

- Place illusion

"Being there"

- Plausibility illusion

"I know it's not real, but this is truly happening to me!"

TEN HAMMERS

Reduced sensory information?

Limited presence

\+ Limited plausibility

= Less perception/comprehension

= Reduced situational awareness

= Less effective training

Touch

Haptic feedback is available in various forms today.

But … replicating weight and motion?

Not yet.

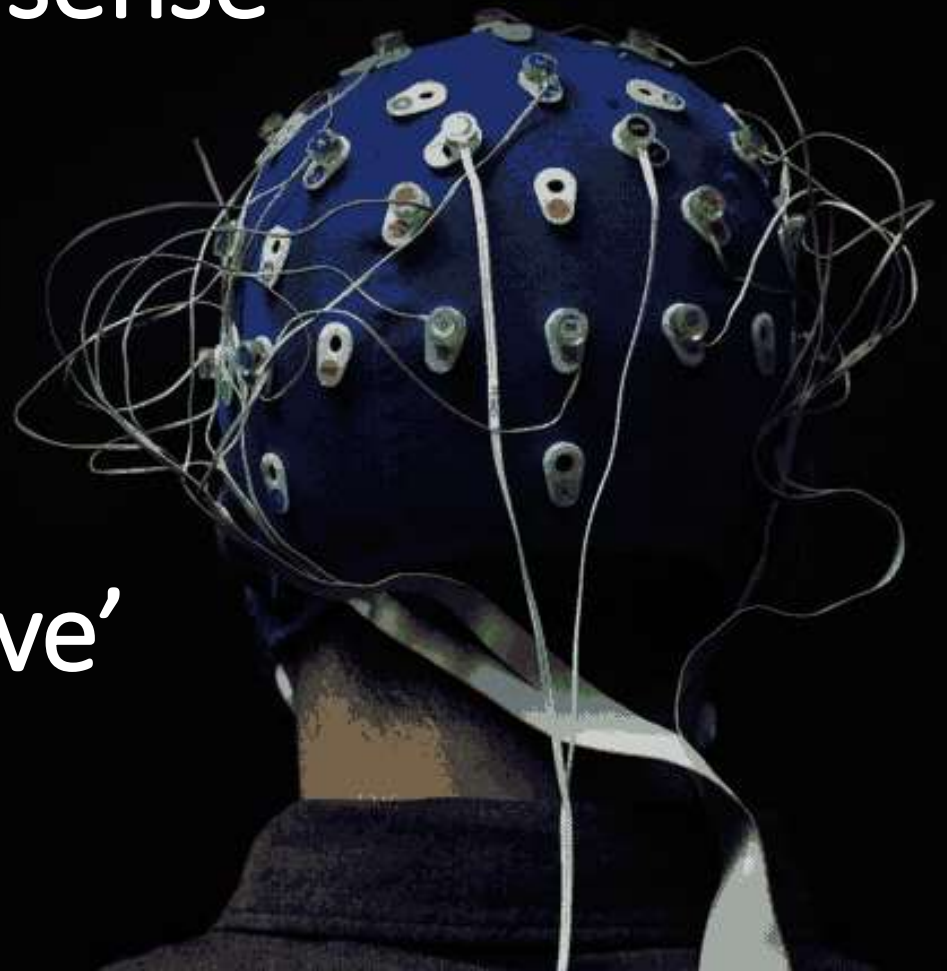
Smell and taste?

Brain Stimulation

Single sense

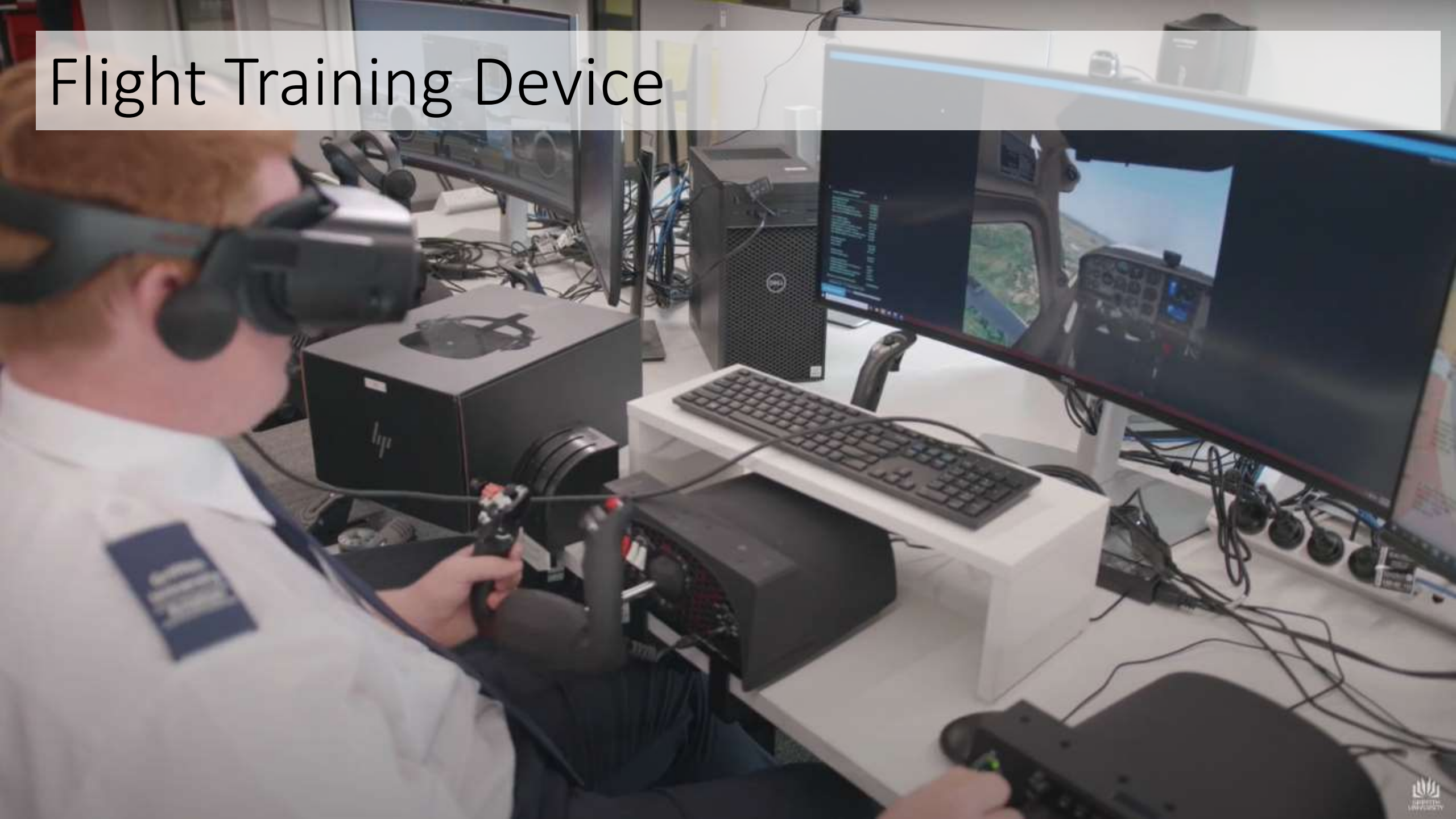
or

‘full dive’



Multimodal sensory information enhances XR

Flight Training Device



Helicopter rescue crew rear deck

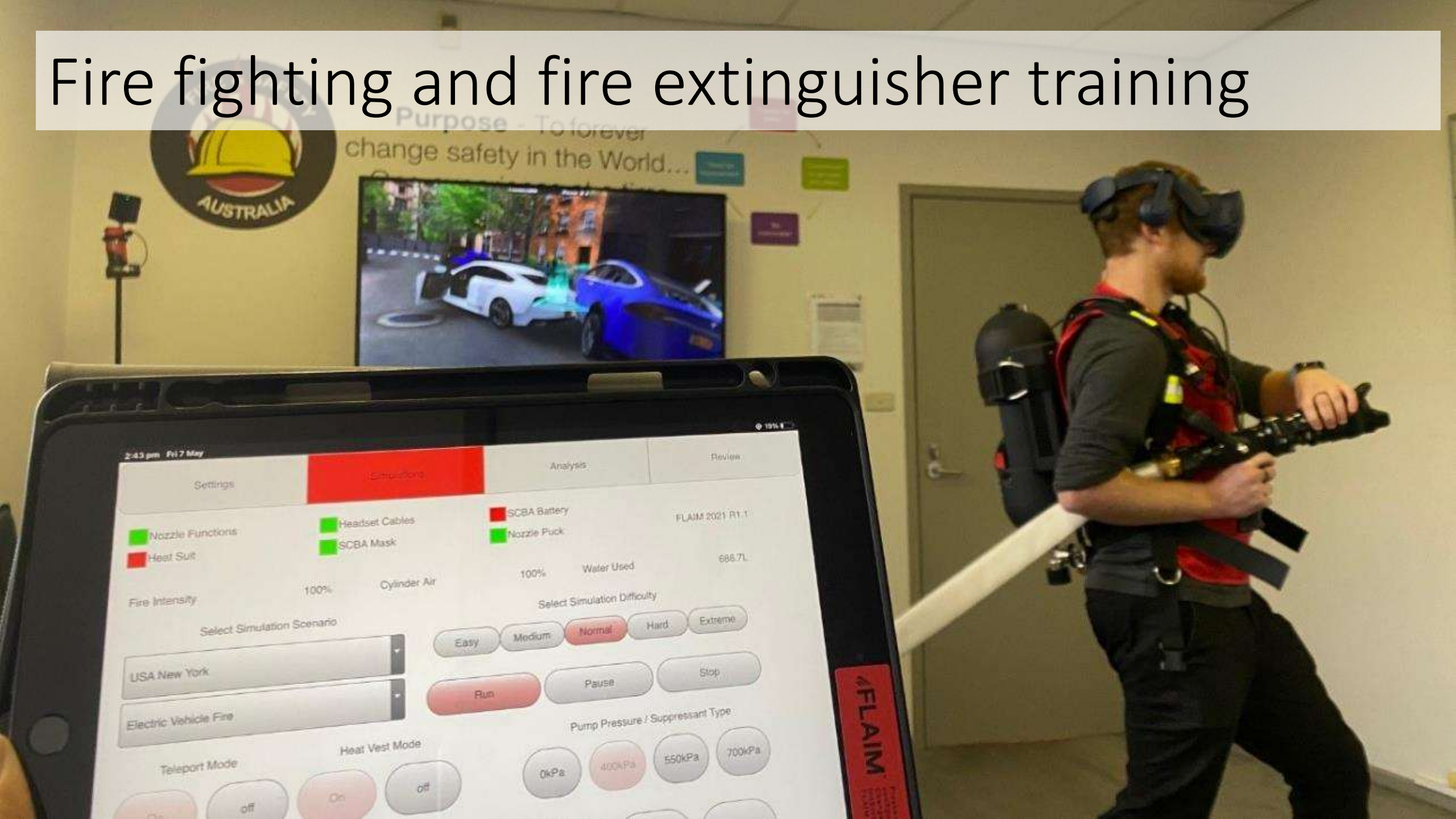
"Skills not attainable in the virtual world"

fraser lukin GROUP

Parachute training and commercial joy-jump

Also … realistic practice for working at heights

Fire fighting and fire extinguisher training



First Aid and CPR

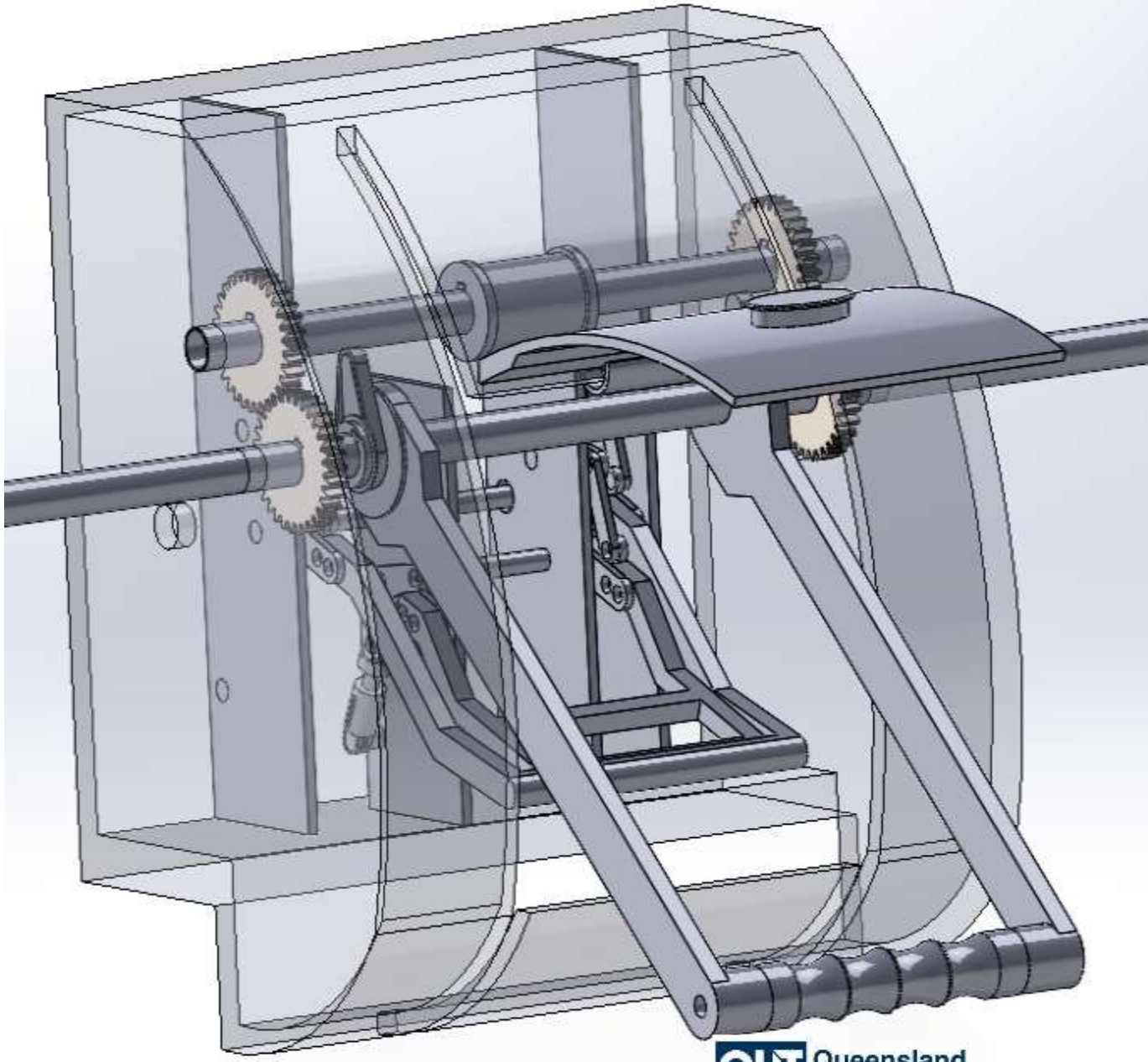
Ludus

Welding and soldering

Various driving simulators

Cabin crew door training

BOLVËRK XR



QUT Queensland University of Technology

What’s coming next?

TEN HAMMERS

Has VR Been Superseded?

- No!
- All XR resources are valuable
- All other training techniques

Multimodal Sensory Effectiveness

Denis Manson - **Ten Hammers**

Thank you.