Pilot Responses in High Threat Scenarios

GRIFFITH UNIVERSITY

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About

- Instructors: Airline Training and Checking, Military, General Aviation, Aeromedical, Charter
- Courses for all levels of pilots designed to combat Loss of Control-Inflight accidents
- Based in Brisbane, Australia- courses delivered internationally and nation-wide
- International and domestic recognition
- Multiple contract partners

Voepass 2283- 9th August 2024

General Aviation Accidents - Australia

Australia 2003 – 2012

1,457 Accidents

505 Loss of Control (34.6%)

221 Fatal Accidents

Australia 2013-2022

1,934 Accidents

796 Loss of Control (41.1%)

196 Fatal Accidents

ATSB National Aviation Occurrence Database
(www.atsb.gov.au/avdata)

Program Overview- Level 1 UPRT Course

- Day/VFR pilot- RPL/PPL/RAAus experience
- 3 days, 4 flights, 12-14 hrs briefing
- Academics:
  - Aerodynamics
  - Non-Technical Skills
  - Psychophysiological introduction and awareness
- Flights:
  - Approach-to-stall and developed stalls
  - Edge of envelope awareness
  - Nose High Upset recovery
  - Nose Low Upset recovery
  - Spin recovery

Method

- Pre-training survey
- Pre and Post flight questionnaire (*subjective*)
  - STAI- 6
  - NASA-TLX (Post-flight only)
- Hexoskin – physiological (*objective*)
- Instructor competency ratings (*observed*)
- Eye-tracking glasses
- Video recording

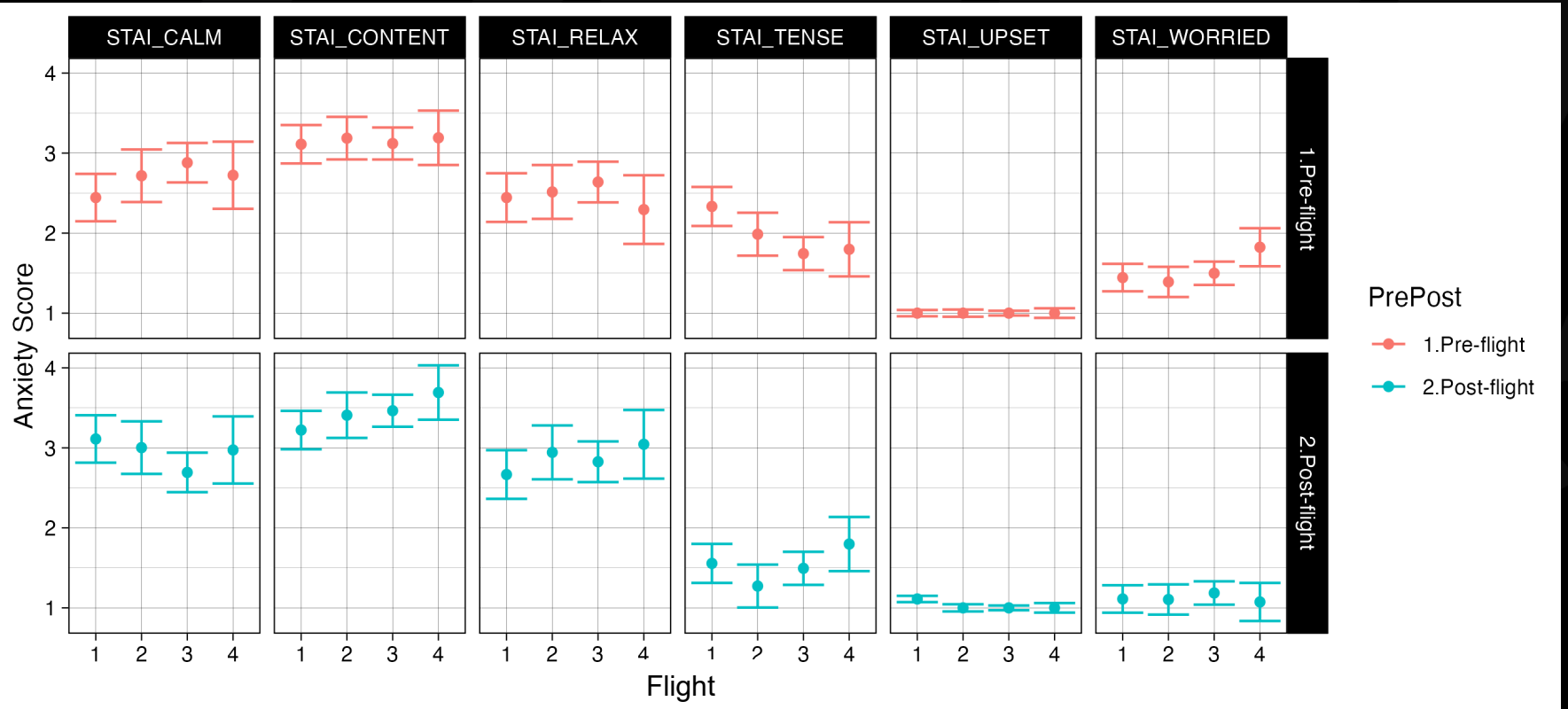
State Trait Anxiety Inventory

- Validated short version of the STAI
  (Marteau & Bekker, 1992; Nilsson, Buchholz & Thunberg, 2012)
- Measures two types of subjective or perceived anxiety
  1. State anxiety being situational and often of a temporary circumstantial nature
  2. Trait anxiety being a more stable aspect of a person's nature
- Six self-evaluation items:

Relaxed	Calm
Content	Tense
Worried	Upset

State Trait Anxiety Inventory

- Significant changes in CONTENT, RELAX, TENSE and WORRIED between pre and post flight, but not across the course



Subjective Workload

- NASA Task Load Index (TLX)
  (National Aeronautics and Space Administration, 2020)
- Evaluated post-flight
- Self evaluation

Mental Demand	Physical Demand
Temporal Demand	Own Performance
Effort	Frustration

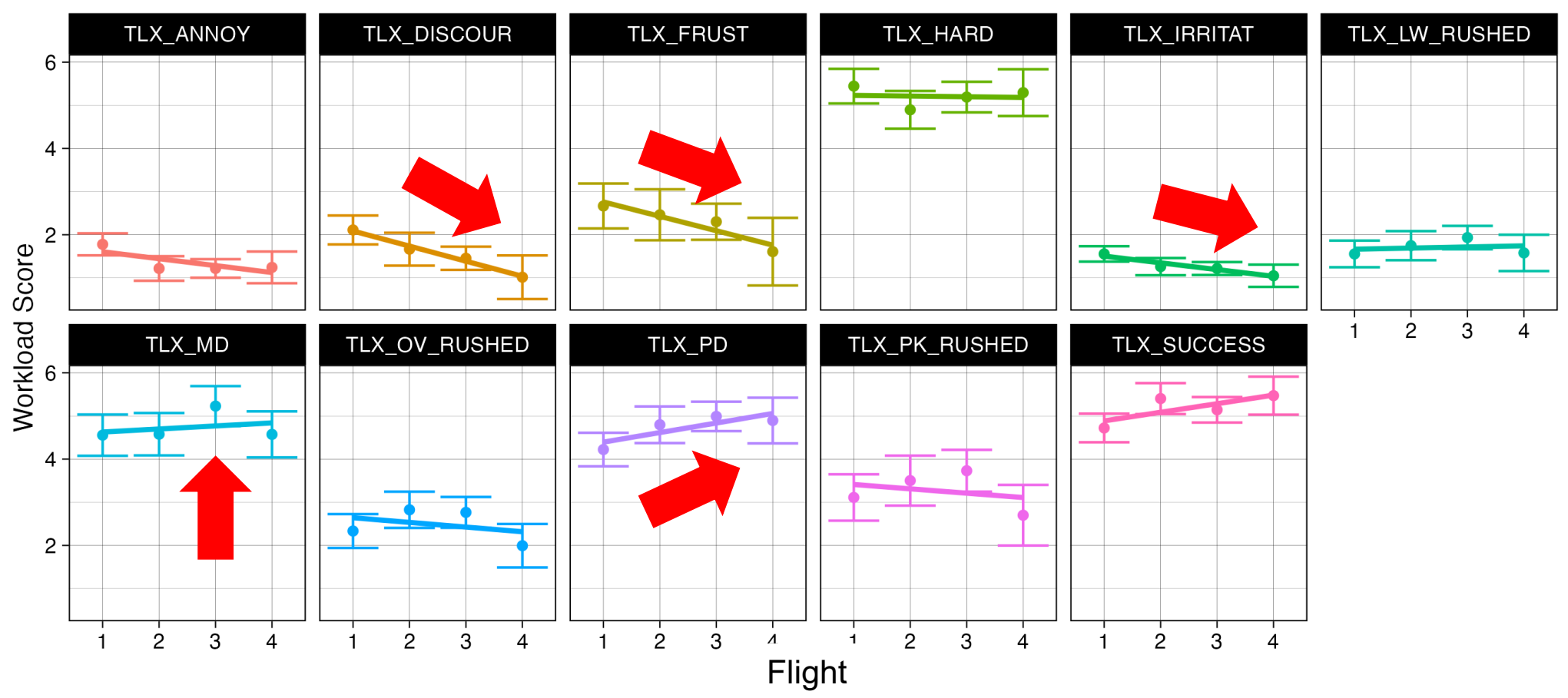
- Temporal demand: "*How rushed was the pace of the flight?*"
- Amended some items to allow assessments of

Overall Temporal Demand	Peak Temporal Demand	Minimum Temporal Demand
Frustration	Discouragement	Irritation
Stress	Annoyance	

NASA Task Load Index (TLX)

Significant ↑ Physical Demand (PD)

Significant ↓ Frustration (FRUST)
Significant ↓ Irritability (IRRITAT)
Significant ↓ Discouraged (DISCOUR)



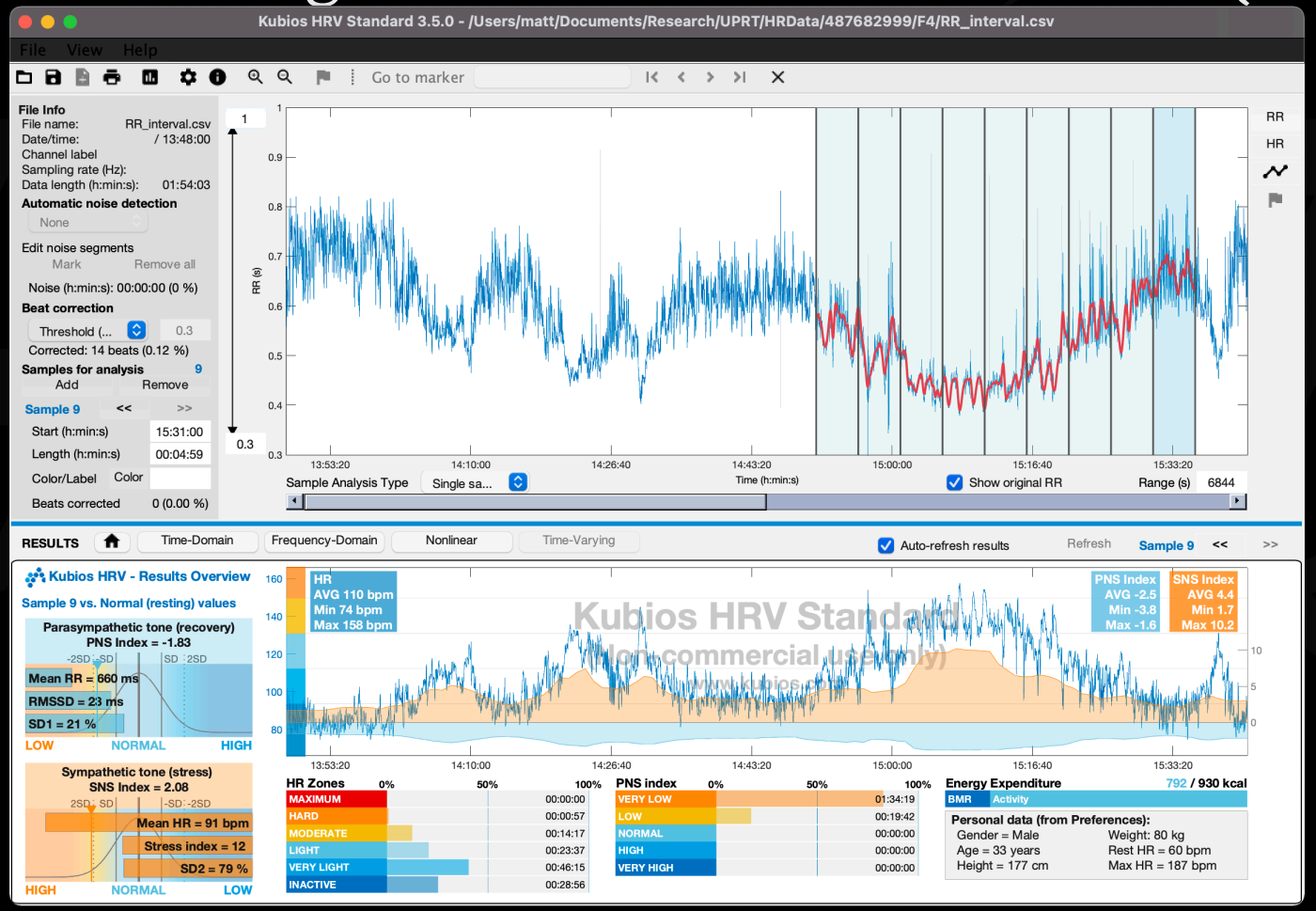
SNS and PNS Response

- Measured through Hexoskin
- Worn throughout training: Brief, flight and post flight

https://hexoskin.com

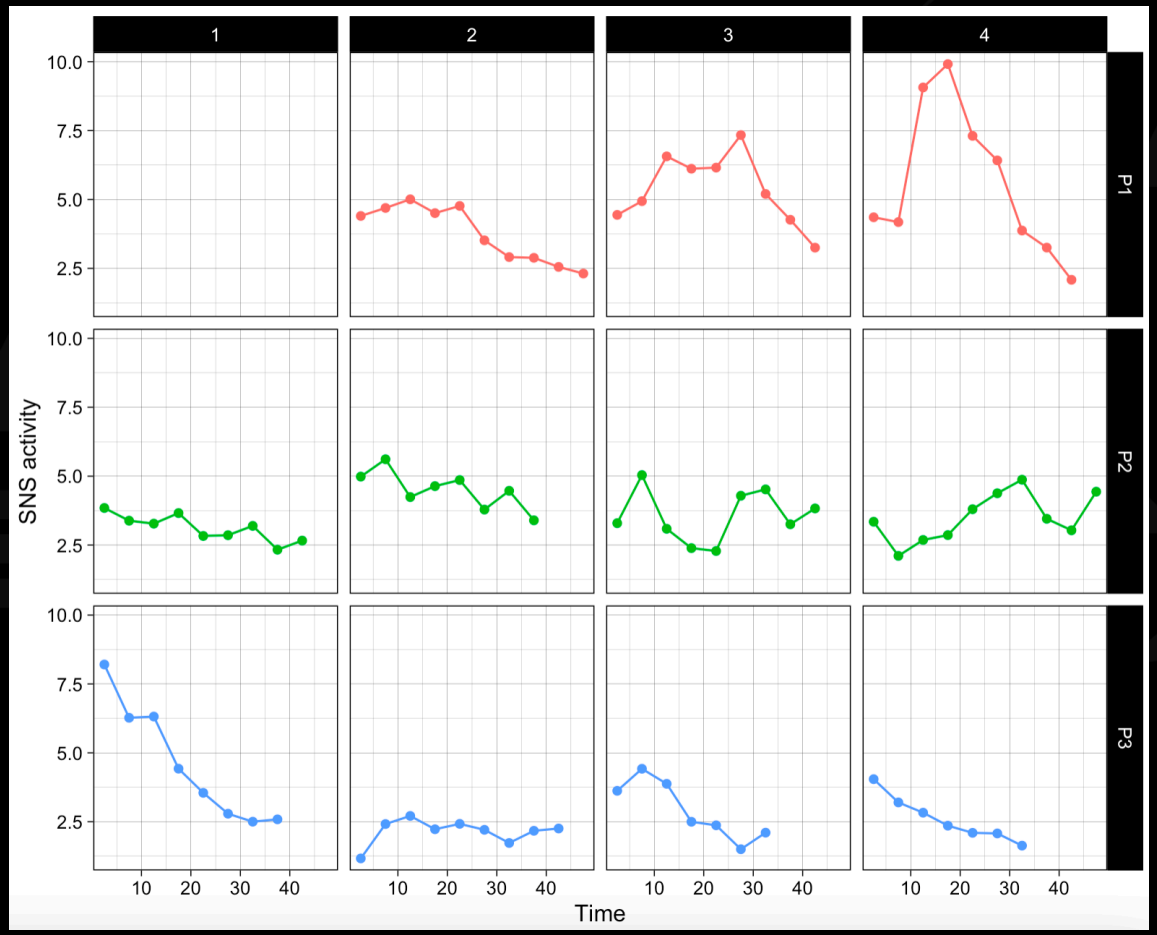
SNS and PNS Response

- Data extracted through Kubios Heart Rate Variation (HRV)



SNS and PNS Response

HRV- measure of SNS and PNS activity



Eye Tracking

- Not as successful as we had hoped:
  - Connectivity and calibration: G load susceptibility
  - Sun glare
  - Participants already wearing corrective glasses not doubling up
- Two video recordings
  - Inside the aircraft (participant reactions)
  - Outside the aircraft (manoeuvres)
- Instructor observations: improvement in data assessment and metacognition

Manifestation of Stress

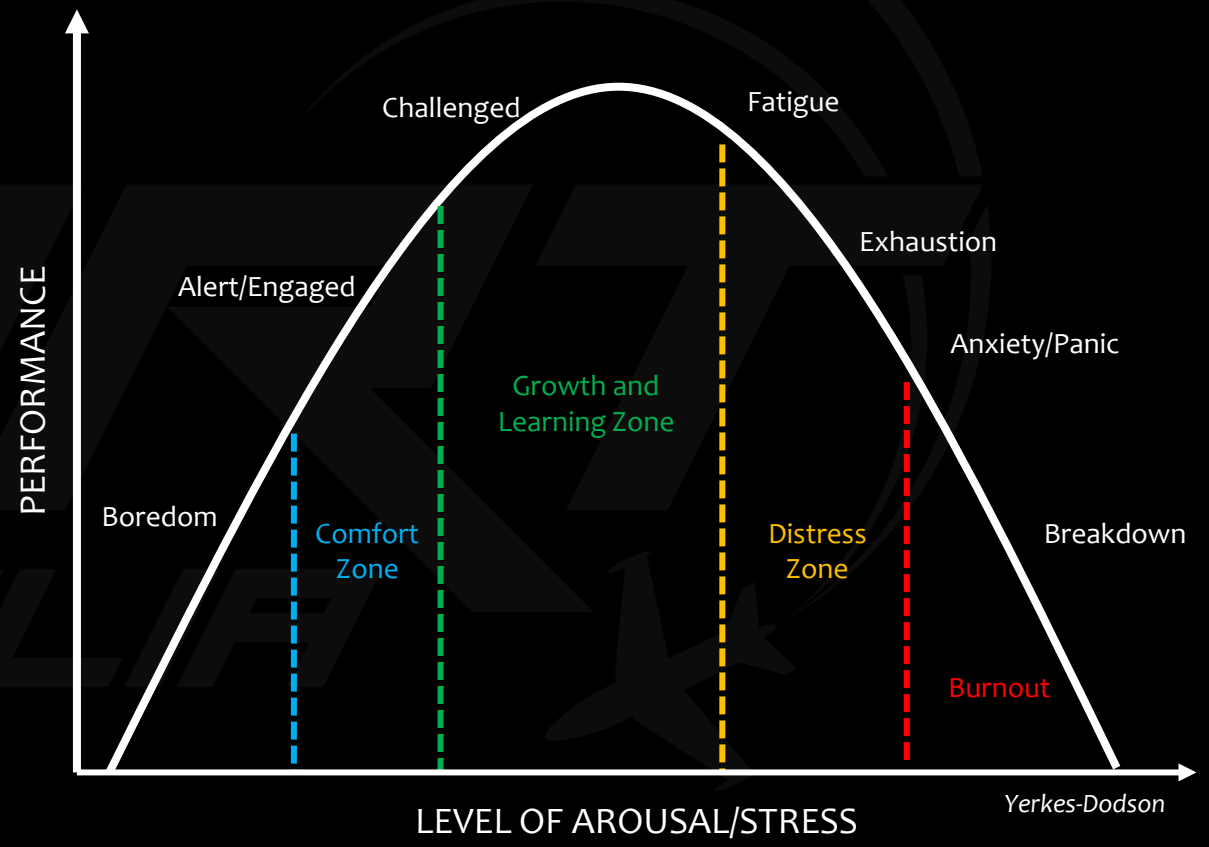
- Loss of Control, subsequent collision with terrain
- Otherwise “strong” pilots having incidents and accidents
- Inappropriate decision making (pushing on, steep turns close to the ground, late go-arounds)
- Poorly handled “normal” manouevres

Conclusions

- More in-depth study required
  - Larger data-set
  - Eye-tracking
- All measures reduced in the final post-flight measurement
- Significant increase in subjective Physical Demand
- Significant decrease in subjective Frustration, Irritability and Discouragement
- Pre-post flight changes in Tension, Relaxation, Contentment and Worry
- Reduction in SNS response evident in most participants
- Observed improvement in competencies

UPRT Ideals- Resilience

- Improved knowledge and awareness to prevent aircraft upsets and LOC-I
- Prevent SNS increase to the point of cognitive lock
- Psychophysiological **and** aerodynamic recovery



Thank You

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