

# LOSS OF CONTROL ROOT CAUSE MODELING

Meeting 9 – Report out to EAA

June 14<sup>th</sup> 2019



# WELCOME



▶ Andy

▶ Bryan

▶ Charlie J

▶ Dave

▶ Jim

▶ Mike

▶ Robert P

▶ Tom

▶ Robert O



# CHECK IN

Loss of Control Root Cause Modeling



▶ Meeting Objectives:

1. Present our results to the EAA
2. Get EAA guidance on next steps



▶ Discussion Topics

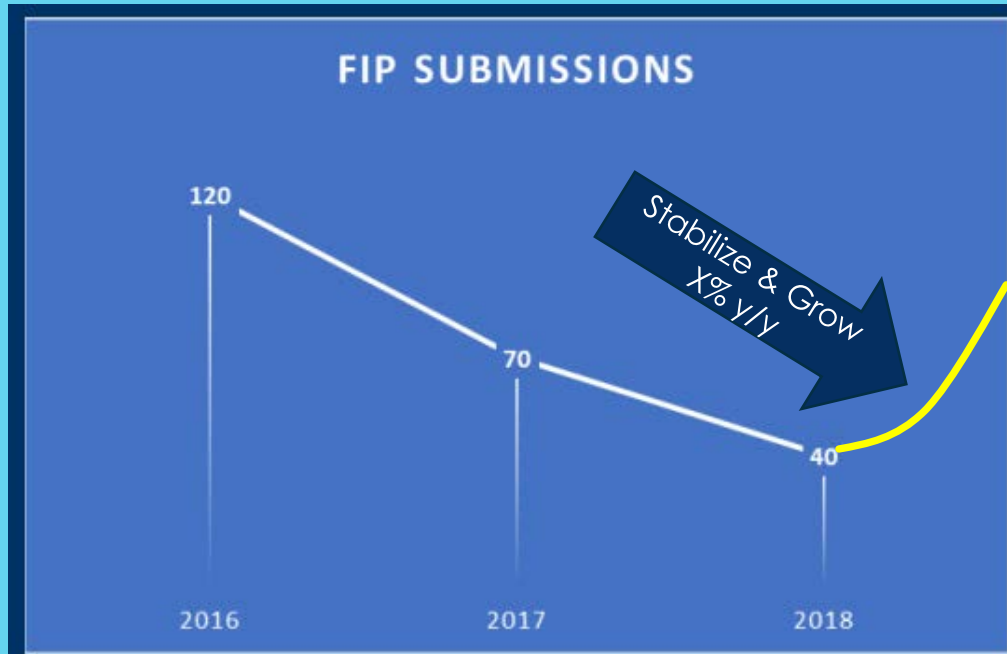
- ▶ Introductions - EAA and our Team
- ▶ Overview of the Root Cause Model development
- ▶ High-level model architecture
- ▶ Presentation of groupings details
- ▶ Learnings
- ▶ Innovation space, bow tie and swiss cheese models
- ▶ Other uses for the model
- ▶ Next Steps - how to communicate to the FIP community, other applications

# MEETING OBJECTIVES & AGENDA

# FIP PROGRAM GOALS

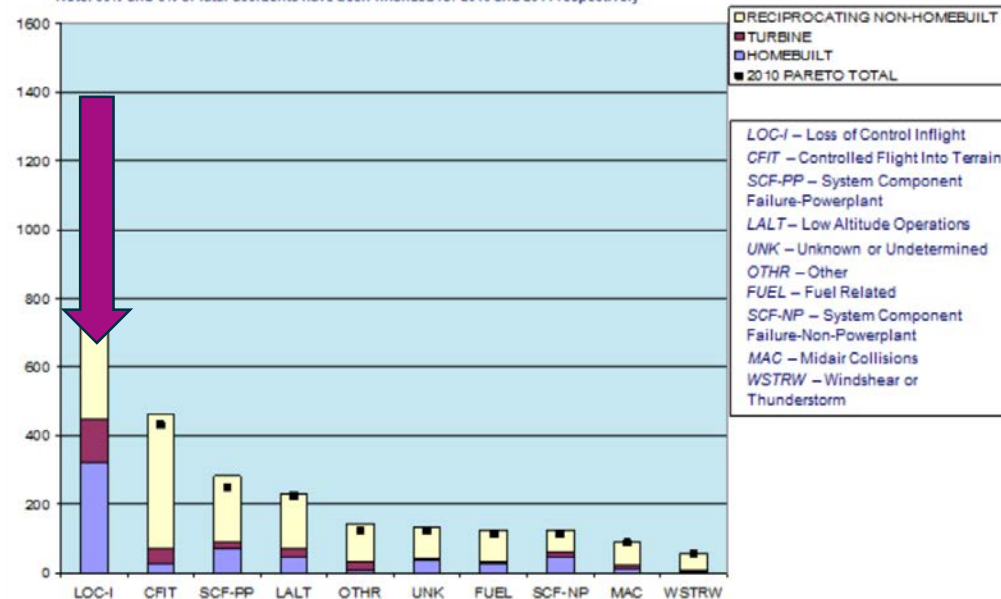
(PROPOSED TO EAA IN 2018)

- ▶ Dramatically Increase the FIP Program in Three Dimensions:
  - ▶ 1. Number of FIP submissions
  - ▶ 2. Quality of Submissions
  - ▶ 3. "Conversion Rate" to implemented solutions in the GA fleet
  
- ▶ To achieve a measurable decrease in LOC fatalities



### GAJSC Pareto CY2001-CY2011

Source: NTSB Aviation Accident/Incident Database.  
Note: 66% and 5% of fatal accidents have been finalized for 2010 and 2011 respectively



## Our Efforts

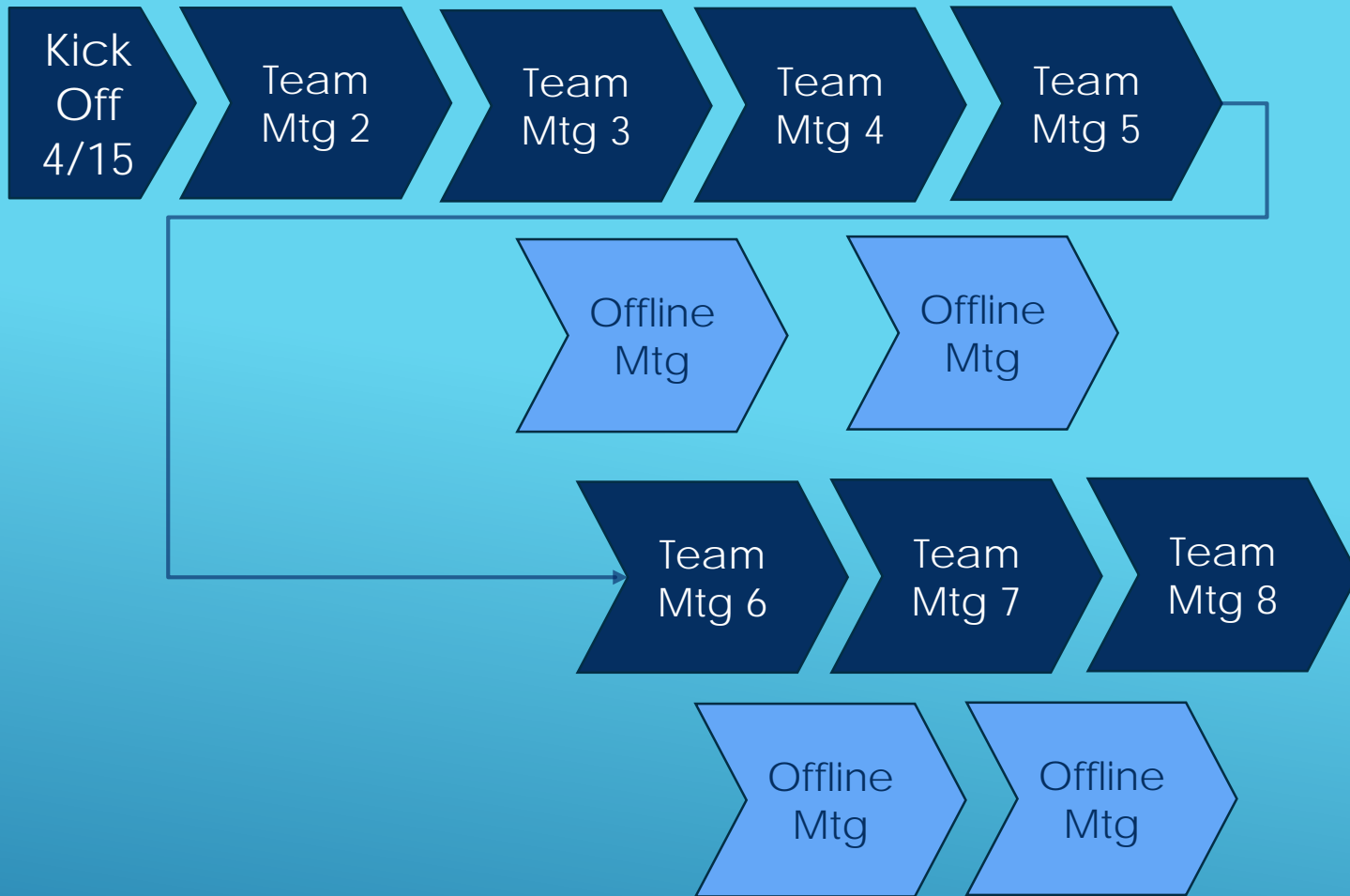
- RCM →
- Narrative



# END IN MIND

Loss of Control Root Cause Modeling

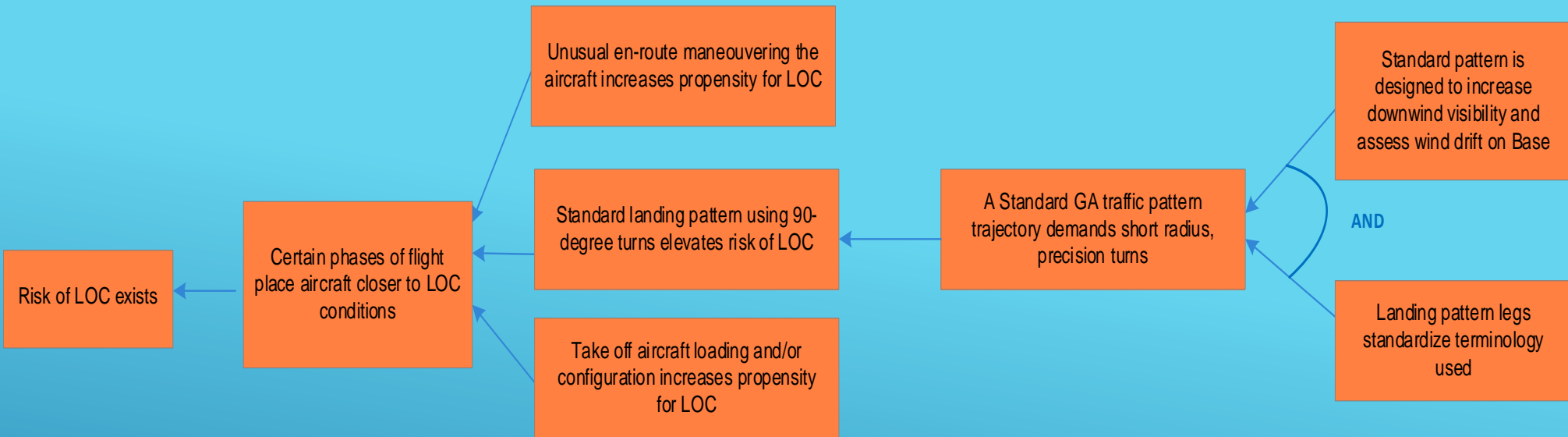




# BRIEF OVERVIEW OF MODEL DEVELOPMENT







RISK OF LOC EXISTS - MIKE

It is possible to command an aircraft to exceed the performance envelope

(Performance: cost trade off that meets market preferences)

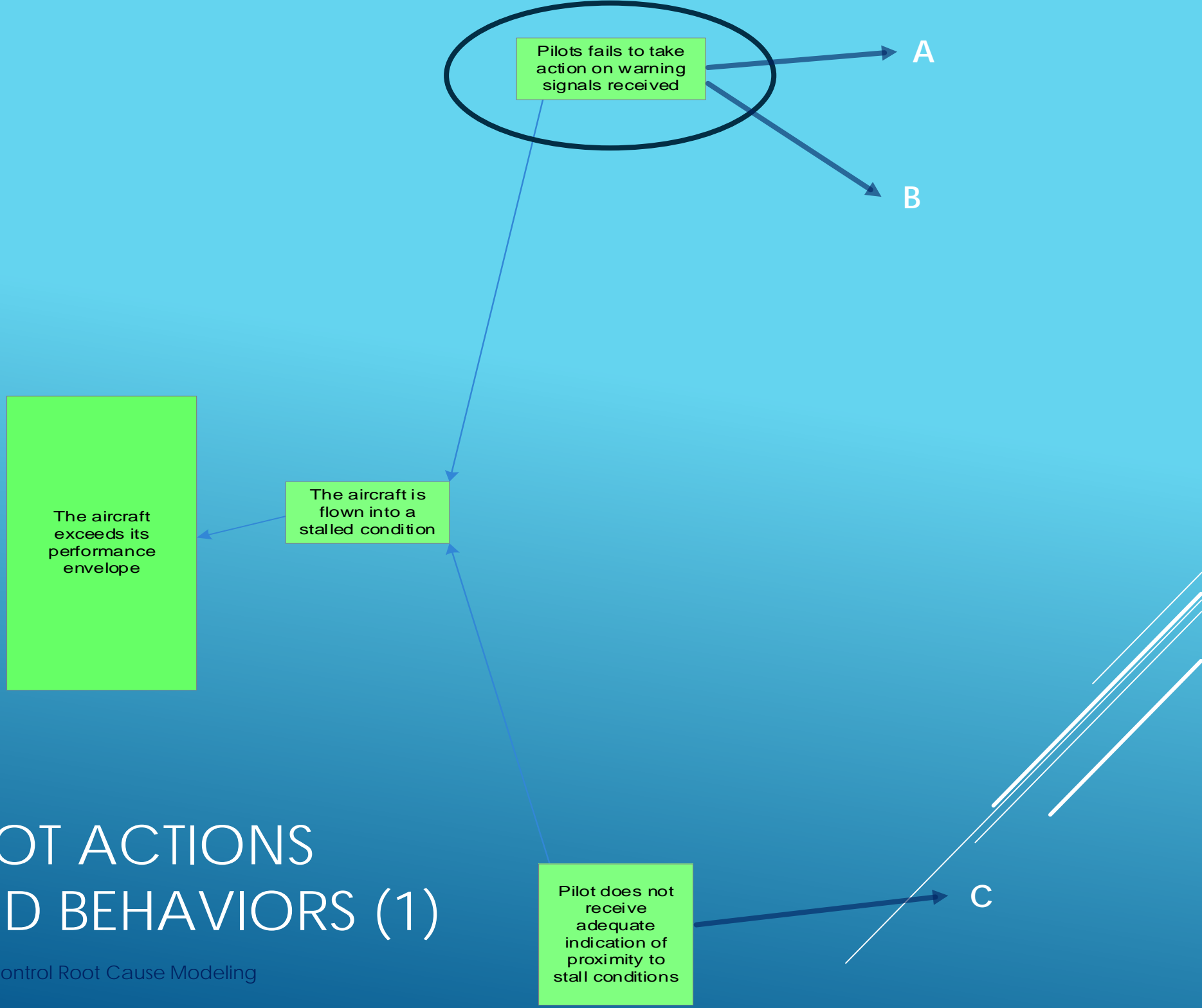
## ▶ Aircraft Design

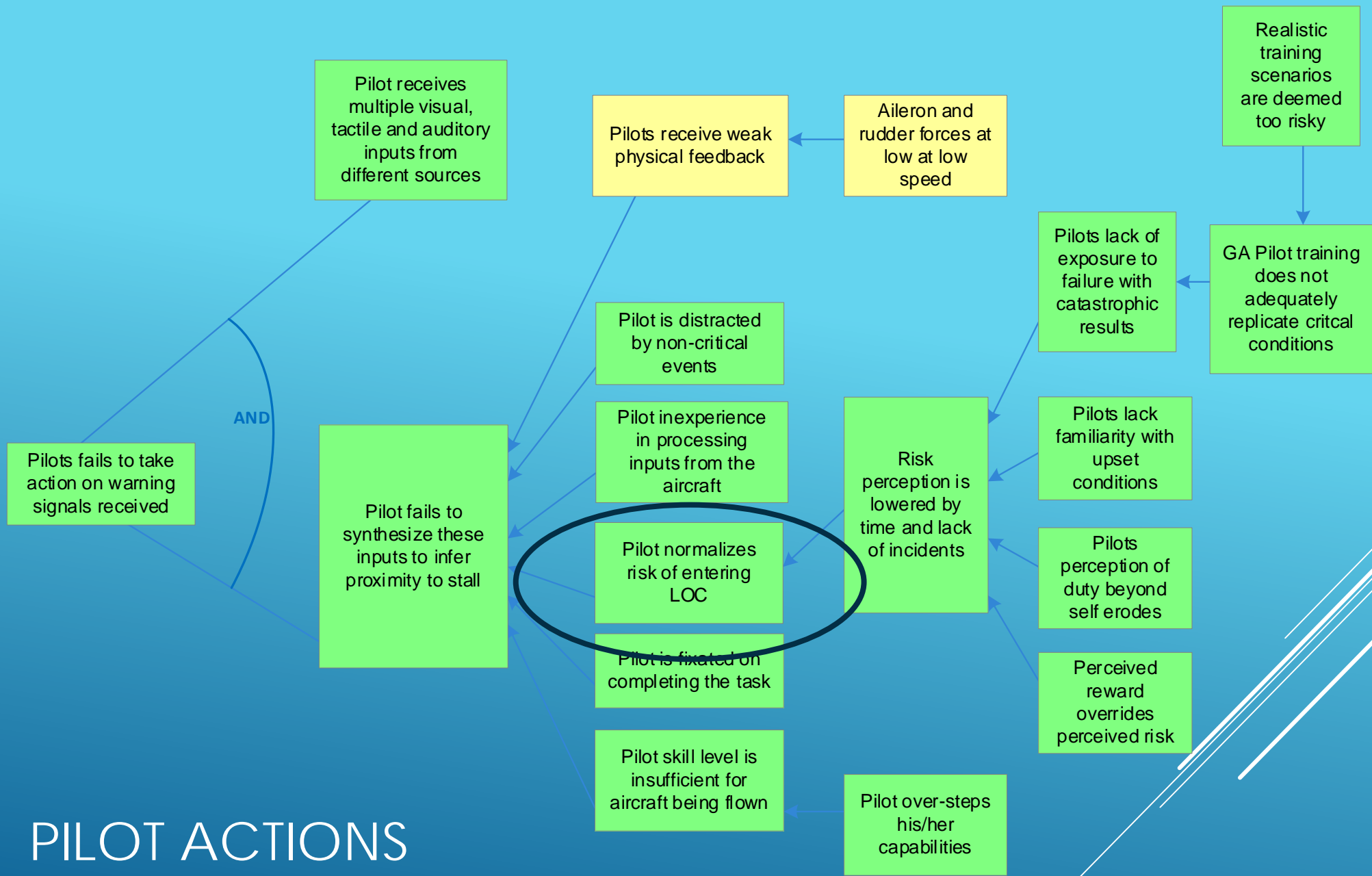
- ▶ Design trade-offs mean that aircraft are capable of exceeding their performance envelopes

# AIRCRAFT DESIGN

# PILOT ACTIONS AND BEHAVIORS (1)

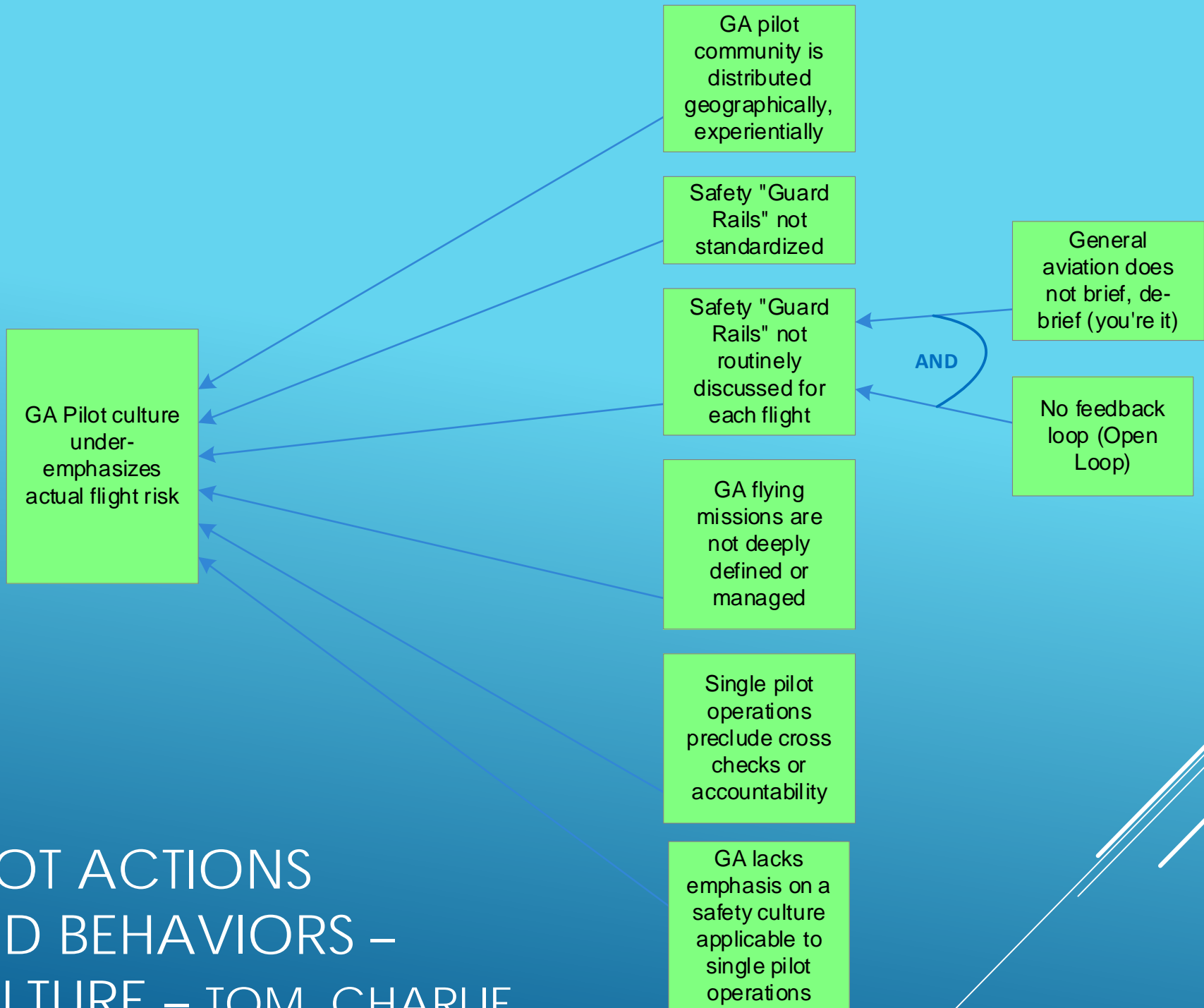
Loss of Control Root Cause Modeling



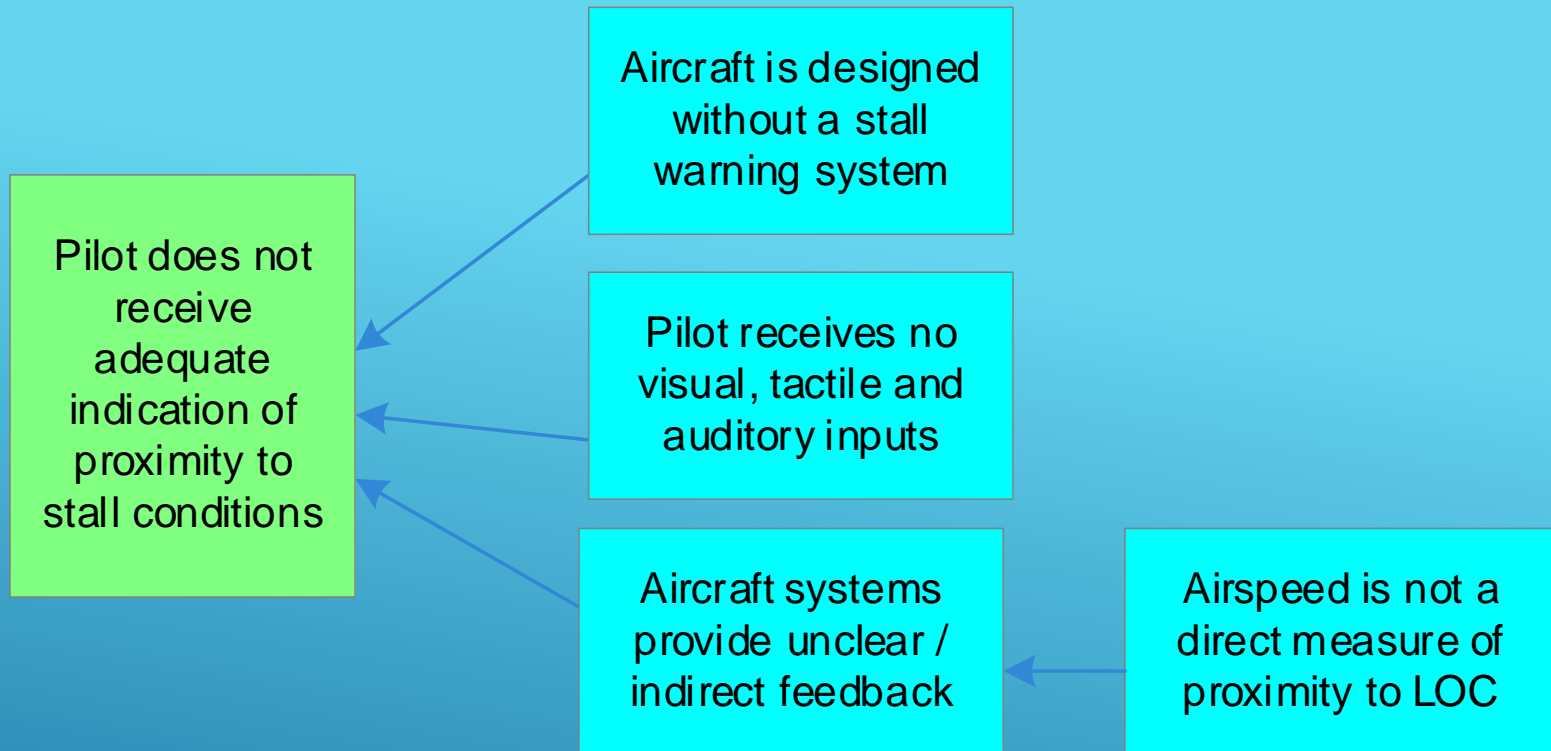


# PILOT ACTIONS AND BEHAVIORS – JIM, DAVE

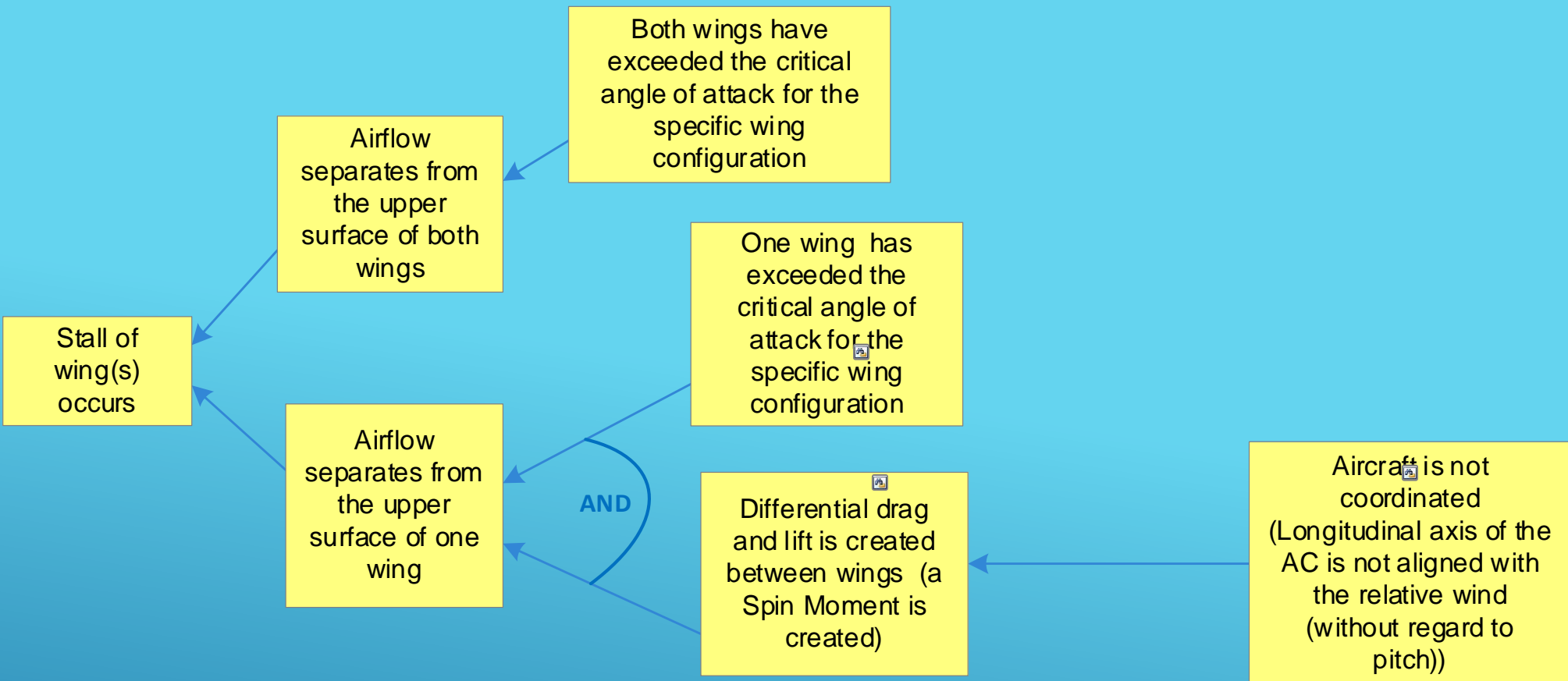
Loss of Control Root Cause Modeling



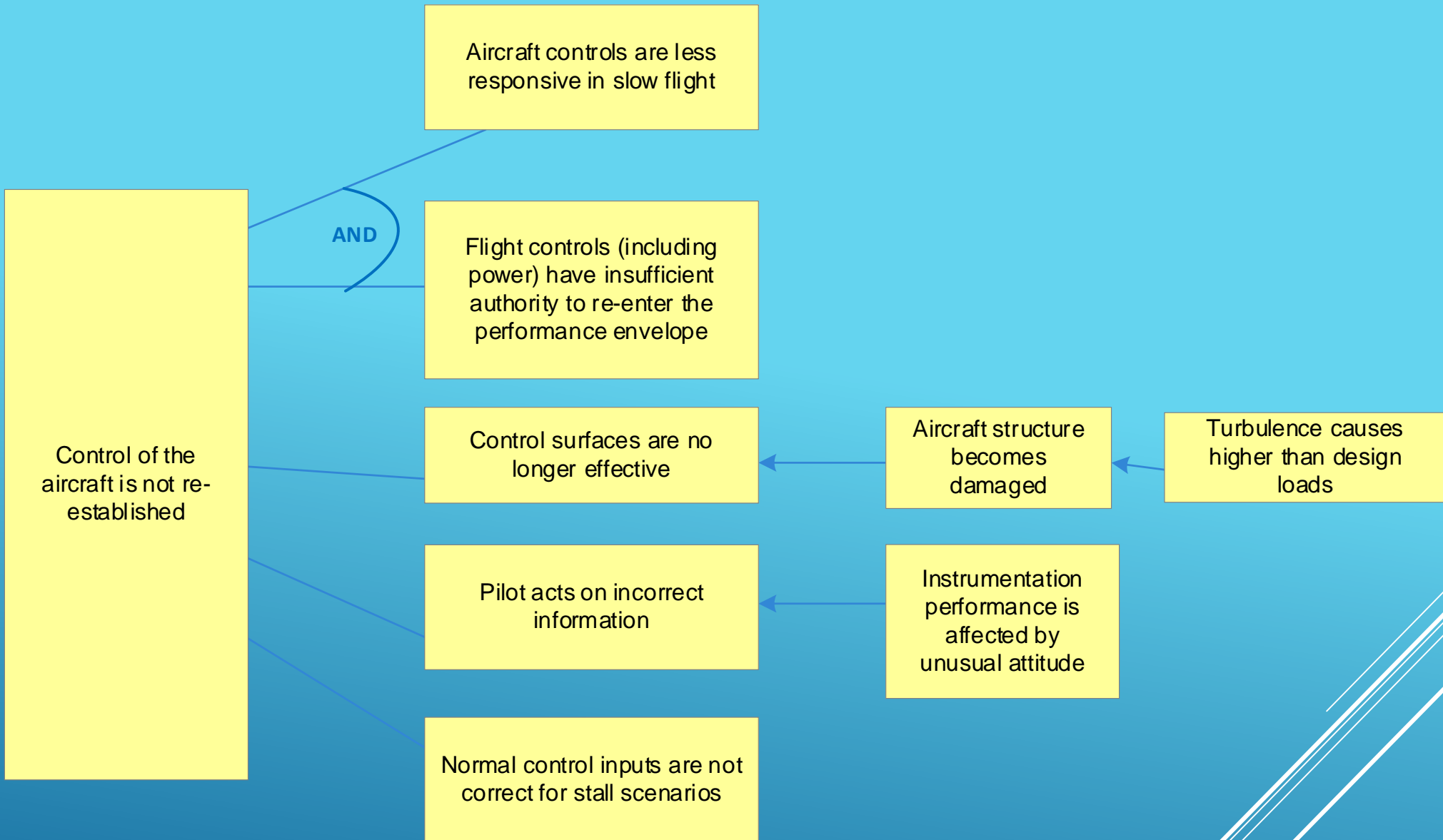
# PILOT ACTIONS AND BEHAVIORS – CULTURE – TOM, CHARLIE



# PILOT ACTIONS AND BEHAVIORS (C) – AIRCRAFT SYSTEMS SUFFICIENCY BRYAN



# BASIC AERODYNAMICS



# CONTROL IS NOT RE-ESTABLISHED (1)

DAVE

Loss of Control Root Cause Modeling



Control of the aircraft is not re-established

Aircraft aerodynamics and/or aircraft systems do not adequately contribute to LOC recovery

Pilot does not take effective corrective action

There is insufficient time to recover control of the aircraft

Aircraft is flying at low altitude

Pilot fails to recognize entry to stall or stall-spin

Human natural response incorrectly over-rides training or other inputs

Pilot lacks training in recovery techniques

Pilot mis-perceived the flight condition

Training in the intensity of the experience is insufficient

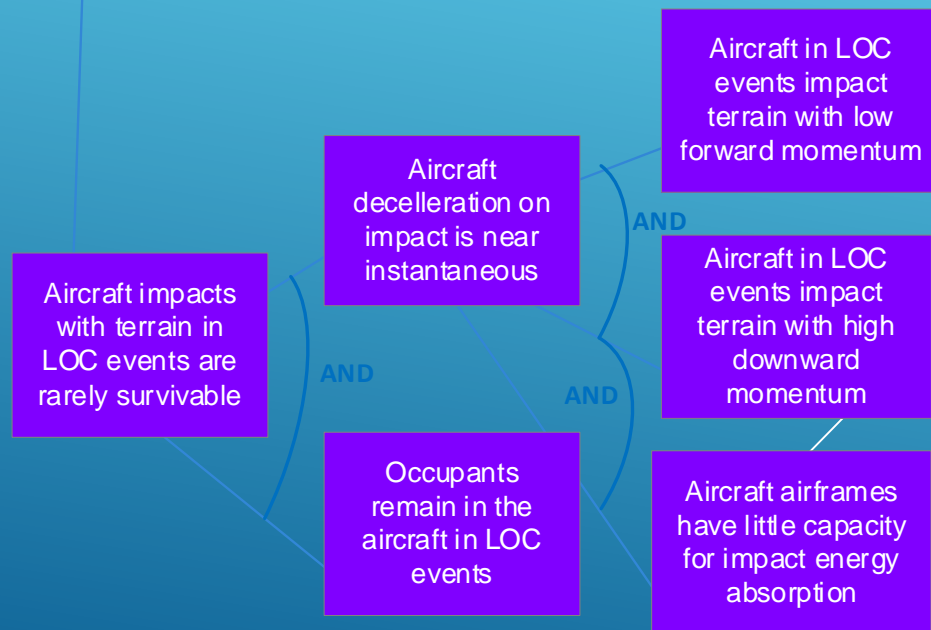
Pilot is disoriented

Pilot task saturation precludes consideration of flight conditions

# CONTROL IS NOT RE-ESTABLISHED (2) - MIKE

# IMPACTS ARE FATAL ROBERT

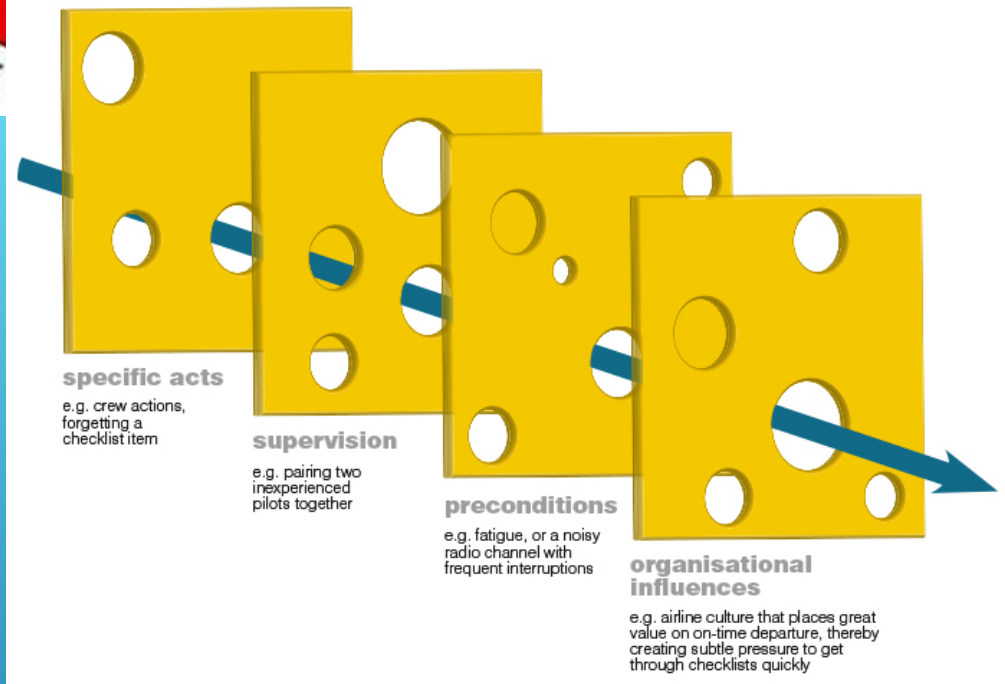
Loss of  
Control  
Fatalities  
Occur



- ▶ LOC fatalities have a multitude of causes
  - ▶ There is no one solution to this problem
- ▶ The preponderance of causes are “green” – Pilot Actions and Behaviors
- ▶ Single GA Pilot **risk normalization** and lack of a **cohesive safety culture** are likely major underlying causes
- ▶ There is little data on LOC accidents at the granularity of this model
- ▶ There is ample innovation space on specific causes in the model
- ▶ There is also innovation space in addressing the chain of events
  - ▶ Bow tie and Swiss Cheese models illustrate additional opportunities

## KEY LEARNINGS





# SAFETY BOW TIE & SWISS CHEESE MODELS

- ▶ FIP Judging Criteria
- ▶ Pilot Training syllabi upgrades
- ▶ CFI Training syllabus upgrade
- ▶ Improved GA Accident Investigation Template (LOC only)
- ▶ Innovation around Better Accident Data Gathering
- ▶ ERAU Interest
  - ▶ Tom

## OTHER USES FOR THE MODEL

DISCUSSION AND NEXT STEPS



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