Measuring Pilot Contributions to Safety Survey Design and Implementation

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Introduction

- Risk and safety management:

  System I – Errors; What went wrong?

  System II – Safety behaviors; What went right?

- Safety behaviors in aviation
  - Highly proceduralized domain
  - We focused on arrival and approach phases

- Defining **resilience**



Background of Project

- **Resilience**:

  - a system's ability to adjust and adapt its functioning to fit the changing demands of its environment to sustain its required operations (Hollnagel, 2011).

- Conceptual framework:

  Resilience Analysis Grid (RAG) Framework (Hollnagel, 2011)

  - Anticipate, Monitor, Respond, Learn



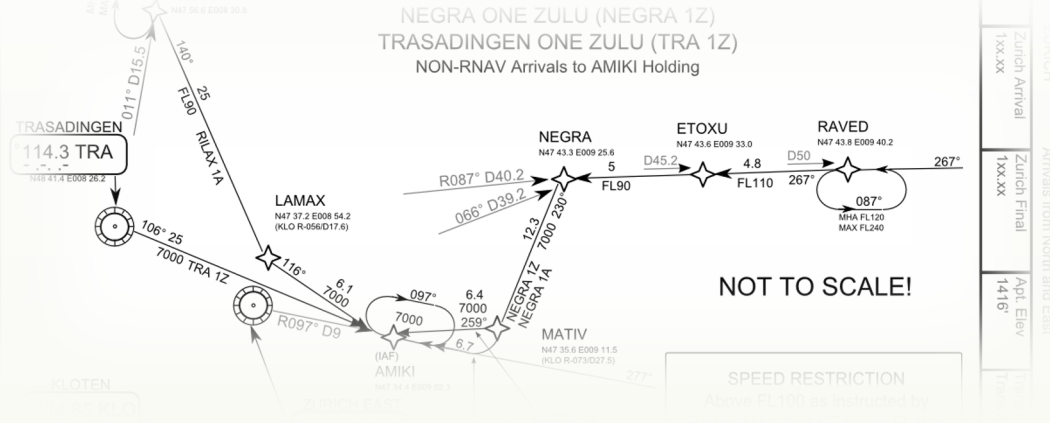


Literature Review – Survey Tool

- Surveys offer an efficient and flexible data collection method
  - Online, phone calls, in person, etc.
- Limitations of self-administered surveys
  - Lower completion rates; satisficing bias (minimal effort/engagement)
- However, they do provide higher quality data and reduce social desirability bias (Connors et al., 2012)
- Survey design strategies help address some of the concerns
  - Attention checks, timing questions, choice randomization, survey flow management, survey feedback (progress bars) etc.

Literature Review – Measuring Resilience

- Subjective, operator-based data are valuable tools to capture resilient behavior and understand rationale behind findings in objective data. (Holbrook et al., 2019)
- Surveying safety practices and attitudes can be used to understand risk areas and develop interventions to address them. (Conway et al., 2014)
- Assessment of Nontechnical Skills (ANTS) in health care industry used as a tool to measure and learn from resilient behaviors. (Flin et al., 2010)
  - Classifies behaviors into one of four categories: situation awareness, decision making, task management, and team working (Flin et al., 2010)
  - Successfully used in training& assessment programs in parts of the UK.



Research Goals

- Developed methodological approach to capture safety behaviors among pilots
  - We aim to capture safety **behaviors** and the **context** in which they occur
  - Performance of the crew instead of just the individual
- Exploratory study
  - Relationships between items: Are pilots reporting appropriate behaviors relevant to the context they provide?
- Focused on the arrival and approach phases of flight
  - Due to complexity of these phases

Methodology

- Reviewed narratives from interviews with subject matter experts
  - The interviews covered the same topics as the survey.
- Developed survey items
  - Checklists, multiple choice, and open-ended questions
- Iteratively refined survey items based on feedback from subject matter expert
  - Formative survey design conducted on Qualtrics.
- Target population
  - Captains and first officers
  - Pilots in US-based airlines

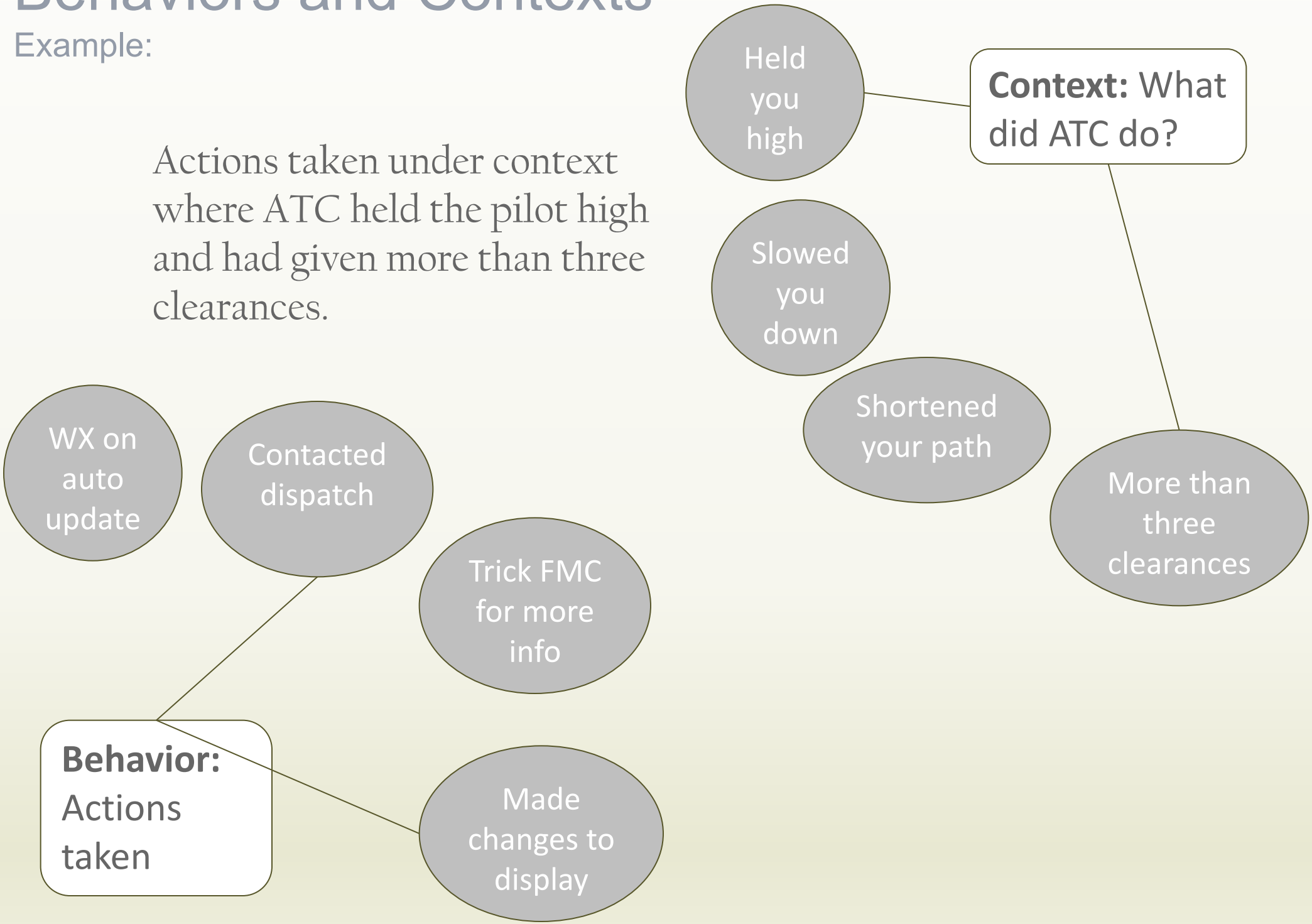
Survey Design

- Focused on capturing specific behaviors at various phases of flight
- Carefully worded items to avoid nuances that could suggest blame
- Demographics items at the end of survey to avoid focusing on ranks and roles
- Organization of survey flow
  - Logical flow of sequences to better match mental model
    - Order of various phases during flight
  - Separated behavioral items from contextual items to assess relations
    - What did you do? (Behavior) vs What happened to you? (Context)

Behaviors and Contexts

Example:

Actions taken under context where ATC held the pilot high and had given more than three clearances.



Survey Design cont.

- Types of items used

  Checklists - ease of use; capturing multiple related behaviors.

  Multiple choice – rating scales; single answer items.

  Open-ended – narratives for qualitative data.

- Timing of survey distribution

  Recall limitations – report on last leg you flew

- Survey duration

  Estimated duration of 30 minutes, variable due to open ended questions

Survey Structure

1. Introduction
2. Destination Details
3. Overall assessment 1
4. Preflight through Cruise
5. Descent briefing and arrival
6. Approach and Landing
7. Overall assessment 2
8. Attitude assessment
9. Demographics
10. Feedback

Sample Items

Intro

Thank you for helping us develop a method for investigating what pilots do that contributes to safety. These questions ask you about behaviors and actions pilots may do. Of course, what is appropriate to do will change from flight to flight and pilot behaviors will change as well.

Checklist Item

Sometimes pilots include additional information during a briefing beyond what is required in SOPs. During the preflight briefing, did you discuss any of the following topics **above and beyond what is required in SOPs?** (Select all that apply)

- departure weather
- weather en route
- weather at airport
- airport instrument or runway conditions
- expected airport traffic (fuel planning)
- minimum equipment list (MEL)

Single Item and Open-ended

How routine was the last leg that you flew?

not routine at all (many unexpected events)	somewhat routine (some unexpected events)	moderately routine (almost no unexpected events)	routine (no unexpected events)

What was most challenging during the last leg that you flew?

Survey Distribution

- Recruitment
  - Pilot testing with subject matter experts from interview sessions
  - Convenience sampling; snowball sampling
- Dissemination
  - Online survey through Qualtrics
  - Survey link sent out shortly after participant completes a trip

Current Status and Next Steps

- Current status:
  - Formative data collection with subject matter experts
  - Preparing for data analysis

- Next steps:
  - Feedback and modifications for next round of survey development and recruitment

Future Direction and Implications

- How can we facilitate safety behaviors?

- Shape potential training programs
  - Training non-technical skills

- Impacts of safety behavior survey on resilience
  - Introspective assessment of performance
  - Opportunity for reflection and learning

Acknowledgments

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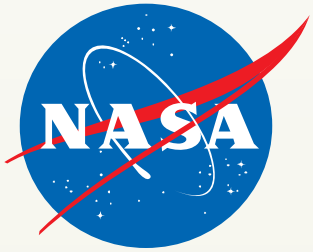
The rest of the team and subject matter experts

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Questions?


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