NASA/FAA Research Proposal: Interviews To Explore Controllers' Behavioral Markers Of Reaching The Edge Of Performance
Executive Summary

Introduction
Air traffic controllers are at the sharp end of safety critical operations. It is essential that controllers maintain a consistently high standard of performance during each session in order to maintain flight safety and efficiency. If it was possible to detect when controllers were reaching their limits of maintaining performance, supportive strategies may be able to be implemented prior to a performance decline or performance related incident. This document outlines a research proposal for conducting interviews with FAA controllers. The aim of the proposal is to generate expert opinion regarding the indicators of potential performance decline in an ATC setting. An additional aim is to identify indicators that are commonly associated with specific factor influences on performance.

Findings will be used to characterize controller performance degradation and the notion of a human performance envelope. Findings are operationally relevant, and will be utilized to inform trainee and Crew Resource Management training, and build controller resiliency.

Method
Aims
The aim of this study is to generate expert opinion regarding the indicators of potential performance decline in an ATC setting. An additional aim is to identify indicators that are commonly associated with specific factor influences on performance.

Design
It is proposed that 60 or more one-hour semi-structured interviews are conducted with FAA controllers. A set of topics of interest will be agreed, as will specific lead questions. An interview schedule will be developed to guide the semi-structured interview. The interviews will be orthographically transcribed and will be analyzed using thematic analysis. The interviews will take place in a pre-agreed confidential meeting room at the facility.

Participants
Approximately 60 controller interviews are planned with at least 20 controllers from each area of ATC (tower, TRACON, enroute). Each group of around 20 controllers should be selected to represent several sub-groups of controllers, based on age, sex, experience, and role including OJTIs, supervisors and competency assessors. Individuals in the FAA and Union should confirm the exact centers, controllers and interview dates according to interest and operational constraints. Participation will be voluntary and the interviews will be completed on duty time.

Data Protection
Information acquired shall be kept strictly confidential. Findings will be described in aggregate, publications will not identify individuals, and shall be limited to group statistics. Where specific quotations are used the controllers' name will not be identified, although the type of control (tower, TRACON, enroute) or their role may be used to provide contextual information. The detailed interview notes shall not be disclosed to the Agency. If audio recordings are utilized, participants will have the opportunity to decline recording. The audio files or transcriptions of the interviews will not be shared with the FAA, and will be deleted within 30 days of the completion of the written report of findings, and the union will be notified when the deletion has occurred. Participating controllers or their designated

Union representative shall be afforded an opportunity to review and comment, in advance, on any publication based on or derived from such controller studies.

Required resources

Resource	Time demand	Total time
60 controllers (at least) to take part in the interview	1 hour per interview	60 hours (approximately 1 week per control group)
Meeting room in each location; must allow for confidentiality	1 hour per interview	Approximately 20 hours (20 interviews per control group) or 1 week
NASA interviewer	1 hour per interview	60 hours (approximately 1 week per control group) – excluding travel time
Travel expenses – estimate of $1500 per trip	-	-
2-3 interview transcribers (interns?)	Approx. 6 hours per interview	360 hours. With two transcribers, full time, approximately 1.5 months
Analysis – coding	2 interviews per day	approximately 2.5 months for all, or 20 days for control group if working on the project 50% of time
Analysis – reviewing coding	Approximately 2 weeks	-
Written report of findings	To include marker lists, frequency counts, and theme identification as well as resulting recommendations	Approximate 2 months if group if working on the project 50% of time

Suggested deliverables
a. Final proposal of work, once review has occurred
b. Tables of markers identified and associated frequency count of number of controllers who identified the marker.
c. Written report including method, analysis and findings, specifically identifying themes raised in the interviews, and associated recommendations.

How the data may be used
Results will add to the development of an existing notion in ATC of the 'human performance envelope' (e.g. Edwards et al., 2012; Graziani et al., 2016). This is a framework which aims to understand interacting factor influences on controller performance, and to predict and identify when controllers are reaching the edge of performance, so that supportive strategies and mitigations may be implemented prior to performance decline and potential performance related incidents. Through this, findings will also support solutions to prevent degradation in TBO operations. With understanding of when controllers are reaching their limits of performance, a design space can be developed to prevent the system from pushing controllers to these limits. Finally, findings can be applied in Next Gen to support graceful degradation in TBO environments. Findings will contribute to identifying the appropriate tolerance and precision of the environment and system in TBO that would bring efficiency gains, but so that the controller is still able to recover the system in the event of a system degradation.