ARINC

SIMULATED AIR TRAFFIC CONTROL ENVIRONMENTS IN FLIGHT SIMULATION TRAINING DEVICES

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FOREWORD

The FSEMC, SAE ITC, and ARINC Standards

ARINC Industry Activities, an SAE ITC program, organizes aviation industry committees and participates in related industry activities that benefit aviation at large by providing technical leadership and guidance. These activities directly support aviation industry goals: promote safety, efficiency, regularity, and cost-effectiveness in aircraft operations.

ARINC Industry Activities organizes and provides the secretariat for international aviation organizations (AEEC, AMC, FSEMC) which coordinate the work of aviation industry technical professionals and lead the development of technical standards for airborne electronic equipment, aircraft maintenance equipment and practices, and flight simulator equipment used in commercial, military, and business aviation. The AEEC, AMC, and FSEMC develop consensus-based, voluntary standards that are published by SAE ITC and are known as ARINC Standards. The use of ARINC Standards results in substantial technical and economic benefit to the aviation industry.

There are three classes of ARINC Standards:

a) ARINC Characteristics – Define the form, fit, function, and interfaces of avionics and other airline electronic equipment. ARINC Characteristics indicate to prospective manufacturers of airline electronic equipment the considered and coordinated opinion of the airline technical community concerning the requisites of new equipment including standardized physical and electrical characteristics to foster interchangeability and competition.

b) ARINC Specifications – Are principally used to define either the physical packaging or mounting of avionics equipment, data communication standards, or a high-level computer language.

c) ARINC Reports – Provide guidelines or general information found by the airlines to be good practices, often related to avionics maintenance and support.

The release of an ARINC Standard does not obligate any organization to purchase equipment so described, nor does it establish or indicate recognition or the existence of an operational requirement for such equipment, nor does it constitute endorsement of any manufacturer's product designed or built to meet the ARINC Standard.

In order to facilitate the continuous product improvement of this ARINC Standard, two items are included in the back of this document:

An Errata Report solicits any corrections to existing text or diagrams that may be included in a future Supplement to this ARINC Standard.

An ARINC IA Project Initiation/Modification (APIM) form solicits any proposals for the addition of technical material to this ARINC Standard.

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1.0 EXECUTIVE SUMMARY

Flight crews operate in an increasingly complex and congested environment, where effective and efficient communications with Air Traffic Control (ATC) are essential for safe flight. Modern Flight Simulation Training Devices (FSTD) contain high fidelity systems, such as visual and motion, but still lack realistic communications in a dynamic traffic environment, reducing training effectiveness.

Simulated Air Traffic Control Environment (SATCE) is a system that provides synthetic ATC to the flight crew in training and other simulated traffic with correlated radio and data communications.

The enhanced environment benefits apply to every level of training from ab initio trainees, who are learning ATC communications, to the most advanced pilots who benefit from a more immersive training experience.

In the real-world ATC environment, air traffic controllers communicate with all aircraft under their control. Flight crews continually monitor radio and data communications which increases their cognitive workload. One of the key benefits is that SATCE requires a flight crew in training to listen for their call sign amongst background radio traffic, reflecting real-world cockpit workloads.

Typical flight simulation environments lack the ATC communications complexity of real world flying. Benefit can be gained by exposing students to a representative environment as early as practicable in their flight training.

In training (both civil and military), SATCE provides an environment that supports the development of core pilot competencies necessary for effective training. SATCE supports key training principles such as Threat and Error Management, Crew Resource Management, and the following core pilot competencies recognized by ICAO:

- Communication
- Situational awareness
- Workload management
- Problem solving and decision making
- Leadership and team work, and
- Application of procedures

SATCE only needs to simulate traffic and ATC communications to the fidelity that is required to meet the training objectives; full reproduction of the real-world environment is not the aim of SATCE.

The implementation of a fully automated SATCE, or the ability to accommodate aircraft emergencies and malfunctions, may not be practicable or necessary to achieve effective training.

It is recommended that the scope of simulated communications be confined to both civil and military ATC related communications. Flight crew communications with third parties such as company, operations, ground service providers, passenger address, cabin crew, etc., fall outside of scope.

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2.0 DOCUMENT OVERVIEW

2.1 Introduction

This document provides guidance on provision of an SATCE system in Flight Simulation Training Devices (FSTD) for the benefit of flight crew training. This guidance recommends a more mature set of requirements, and provides commentary on system scope, currently available technologies, integration, qualification, and maintenance.

This work builds upon that originally undertaken by IATA Flight Simulator Working Group in 2002 (IATA, 2002), and further developed in ICAO Document 9625 Editions 3 and 4 (ICAO 9625/4).

This document is intended to be a practical starting point that can serve as the basis for future developments of SATCE. With time, it is hoped that verification through training will build industry experience and refine requirements, and that various solutions will mature assisted by developments in technology. In the longer-term, it is hoped that the fidelity and benefits derived from an FSTD with integrated SATCE will increase and, with this, significantly improve training and ultimately flight safety.

2.2 Scope

This report focuses on the Multi-Crew Pilot License (MPL) and other ab initio flight training, since these are the areas identified in ICAO 9625/4 as having the greatest short-term need and potential benefits. Nonetheless, it may be necessary to establish similar requirements and guidance for other types of applicable pilot training in the future. This may be achieved by using the knowledge gained from initial adoption of SATCE as outlined in this document and in future editions of ICAO 9625.

2.3 Intended Audience

This document is intended for all stakeholders involved in the provision of flight training using FSTDs. It may be of particular interest to training providers, FSTD manufacturers, and National Aviation Authorities (NAA).

Use of this document is recommended for any new or retrofit SATCE system to a FSTD.

Manufacturers and training providers are encouraged to take advantage of this guidance, starting in the earliest phases of FSTD design, by defining requirements to be compliant with the features listed in this document. Compliance can be most readily assured if provided for at the proposal stage between the FSTD manufacturer and the training provider (end user).

2.4 Benefits of Simulated ATC Environment

The benefits of an integrated SATCE system in flight training include:

- Improved overall fidelity of ATC simulation
- Standardization of ATC communications (occurrence and message content)
- Improved exposure to background radio traffic (aiding familiarization and listening comprehension)
- Prescribed adherence to standard Radiotelephone (R/T) phraseology (establishing best practice)
- Increased familiarity with R/T etiquette and ATC procedures

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