

Aircraft Capacity and Environment Simulator (ACES)

Purpose: The purpose of ACES is to provide simulated beacon-equipped aircraft replies, digitized primary radar reports, and a fruit interference load in order to establish and validate Mode S and monopulse system sensor capacity and performance in the NAS System.

Current (Mode S) and future (ASR-11 and ATCBI-6) Monopulse Secondary Surveillance Radars (MSSRs) employ monopulse receiving techniques. ACES is required in order to establish and validate MSSR performance during acceptance, installation, operational, and production testing. ACES is automated and linked to the MSSRs via RF interfaces, and responds to MSSR uplink interrogations with variable Mode S and ATCRBS range, azimuth, and message content replies. It also provides digitized primary radar reports; and pseudo-random fruit interference up to MSSR specified interference immunity levels if desired.

Background

By the year 2000 and beyond, all the new ATCBI and ASR production radars will be monopulse systems, capable of working with both ATCRBS and Mode S transponders. The FAA current capacity simulator (i.e. ARIES) in use today is limited in chip technology, system architecture, and the



adaptability needed to support the production test requirements of current and future generation beacon radar systems.

To provide a state-of-the-art Aircraft Capacity and Environment Simulator (ACES) for production test article validations, a two-solicitations/awards contract approach was implemented. The first solicitation/award consists of a development and acquisition program for a RF Target Simulator Subsystem (RFTSS), or a new ACES front-end development using the latest LSI technology. The subsequent acquisition consists of obtaining and integrating a VME based COTS computer platform back-end to the front-end RFTSS by FAA Product Team engineers, resulting in



the ACES System (see Figure 1). Final production efforts by Product Team engineers will result in the delivery of five ACES production systems to FAA major program test teams for factory acceptance, production line, and field site validations. Capabilities included are as follows:

- Surveillance- Generation of up to 2000 ACRBS or Mode S compliant targets per scan (up to 255 nmi. in range)
- Communication- Generation of Comm-A's (& linked), and Comm-C's (16 segment, Max.) for Data Link.
- Interference- Generation of 50K/Sec. ACRBS and 1K/Sec. Mode S Fruit.
- Radar- Generation of digital radar reports for ADCCP(ASR-9/CD-2 to Mode S) and CD-2 (Common Digitizer-2).
- Data Extraction- Generation of user selectable target, track, and report files, for beacon targets, and report files for radar targets.
- Scenarios- Generation of up to 2000 user selectable targets with a mix of Mode S and/or ACRBS targets and random target Fruit replies, selectable by target reply range, azimuth, scenario time, target Id, and reply type executed on the ACES platform.
- Simulate ADS-B target environment to test GPS position reporting.
- Support higher accuracy target position information and ASTERIX surveillance data formats.

Key Projects

- Award I. A competitive procurement for the design, development, testing, and delivery of the RFTSS.
- Award II. A competitive procurement for the design, development, testing, and delivery of a VME based COTS computer platform back-end system.

Key Accomplishments

- Award-1: Awarded to Freestate Electronics Inc. 12-96, the RFTSS Award was completed in 1-98 with 4 RFTSS units purchased.
- Award-2: Awarded to EWA Laboratories Inc.

Status

- Currently, the ACES is in mid-stage of the Award 2 program, wherein integration is on-going between the RFTSS front-end and the COTs- VME Platform back-end, by FAA Product Team engineers.

Plans

- ACES System Test complete by July '99.
- Five ACES Production Units completed by FAA Product Team Engineers by Oct. '99.
- Major FAA program support by ACES (production article validations), e.g. ATCBI-6, ASR-11, and Safe Flight 21, by Dec. '99.

To find out more about the Aircraft Capacity and Environment Simulator contact:

Ray Alimenti, ACT-310

Communications/Navigation/Surveillance
Engineering and Test Division
Surveillance Branch

Federal Aviation Administration
William J. Hughes Technical Center
Atlantic City International Airport, NJ
08405
Phone: (609) 485-5392
Fax: (609) 485-5995
www.tc.faa.gov