

**Target Generation Facility (TGF)  
ACB-860 Simulation Group**

**Project Summary**

**Fiscal Year 2003**

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## TGF Project Summary FY 2003

### Executive Summary

The Target Generation Facility (TGF) completed another successful simulation year. All simulations were provided on-time and met or exceeded customer expectations. In addition to completing these simulations many enhancements were added to the Target Generation Facility's aircraft dynamics engine, providing realistic approach, landing, take-off, and climb-out capabilities utilizing flaps and variable throttle speeds. The simipilot workstation was de-coupled from the eco and made stand-alone providing the capability of adding simipilots anywhere on a network where a PC is available. TGF also achieved the development of ISO9000 standards from which to gauge our quality of production.

## **Section 1 – Simulation Projects Supported**

This section summarizes the simulation efforts supported by the Target Generation Facility during the fiscal year.

### **1.1 Simulation: Interop (HFL)**

Simulation Dates: April 28, 2003 – June 11, 2003

Program Office: AOZ 40, Free Flight Program Office

Contacts: Mike Gough AOZ-40, Paul Krois AAR-100,  
Randy Sollenberger, ACB-220

#### Simulation Summary

This was a human-in-the-loop study of human factors issues related to combination of air-traffic-control-support tools. Genera Center, sectors 08, high altitude, and 18, low altitude, were used in conjunction with associated D side controllers. The URET (User Request Evaluation Tool) & CPDLC (Controller/Pilot Data Link Communications) tools were added to the D side. TMA (Traffic Management Advisor) & CPDLC were added to the DSR for the control positions. The study consisted of different combinations of the tools, 1.) using all the tools, 2.) using different combinations of the tools and 3.) with no tools at all, to assist the controller in decision making. The study was to determine the effects of the collocation of the different decision support tools and how they would be used.

### **1.2 Simulation: GOERS**

Simulation Dates: October 7, 2002 – November 19, 2003

Program Office: ATP110 En Route Procedures

Contacts: Vince Lasewicz ACB-330 HITL Simulation & Analysis Group  
Charlyn Davis ATP-110 En Route Operations/Procedures Branch

#### Simulation Summary

This simulation of the Jacksonville Center is being conducted to understand the impact of a GPS outage on the workload of an air traffic controller. The study is divided into three observations of GPS signal outages: no outage, a partial outage, and a complete outage. These observations were repeated in an environment in which the available NAVAIDS have been depleted by 50%. This en route simulation involved sectors 14, 15, and 78 of the Jacksonville Center. TGF provides a flexible environment in which these observations can be simulated and evaluated. Enhancements to the TGF VOR navigation algorithms was implemented to validate/in-validate VOR routes.



### 1.3 Simulation: STARS (PHL)

Simulation Dates:    October 17, 2002  
                          October 21, 2002 (LCM)  
                          January 7, 2003 – January 9, 2003 (PHL)  
                          January 27, 2003 – January 29, 2003 (FS2)  
                          March 10, 2003 – March 12, 2003 (LCM2, OT&E)  
                          June 25, 2003 (FS2 + LCM 2/R4)  
                          September 3, 2003 (LCM 2/R5)

Program Office:       ATB

Contacts:             Jack McAuley            ATB-230 (Acting)

#### Simulation Summary

TGF continued supporting the STARS project with the simulation of PHL originally built to test the Full Service 1 build of the STARS system. Full Service 2, Life Cycle Management, and various other OT&E tests of the STARS systems were carried out, often on short notice, leading to the successful roll out of the system in the PHL TRACON.

These scenarios made use of eight sectors:

<u>Sector</u>	<u>Frequency</u>
SA	126.600
FV	125.400
NA	128.400
W	127.350
Y	123.800
SD	119.750
ND	124.350
PHL Tower	118.500

The scenarios ranged in size from 39 to 179 flight plans. Each one was designed to exercise a specific aspect of the STARS FS1 system. These scenarios were all designed to last approximately 1 hour. The simulations required 11 – 14 simpilots to fly the 8 sectors. Each simulation had the PHL ASR9 radar configured.



## **1.6 Simulation: EBUS (Enhanced Back Up Surveillance) Radar Target Test Data**

Simulation Dates: July, 2003  
August 2003

Program Office: ACB-750

Contacts: Reggie Bastiampillai AUA-202 202-493-0206  
Daniel McGovern ACB-710 609-485-5914

### Simulation Summary

The purpose of this project was to support the EBUS project in quantifying the performance of the interface between short-range radars and the ARTCC. To accomplish this quantification a recording of radar target data was required. A specialized target sample was developed that created a specific pattern of flights radiating outbound from the radar antenna. The density of traffic was gradually built over 10 minutes, then maintained for 10 minutes, and gradually diminished in the last 10 minutes. A percentage of primary only targets were maintained throughout the recording. In a second recording, a similar target sample was developed with more emphasis on targets in bunches, while still maintaining the previous ratio of primary vs. beacon reinforced targets. Each of these flight samples were run on the simulator and recorded with the digital recorder.

## **Section 2 – Technical Summary**

This section summarizes the technical achievements of the TGF during the fiscal year.

### **2.1 JAVA-Based simulator in full service**

Every project this fiscal year was conducted solely with the JAVA-Based simulator.

### **2.2 Enhancement of the ILS approach model.**

An extensive investigation of the aerodynamics of approach and take-off flight was undertaken culminating in a successful revision of approach and take-off dynamics to the ADM (Aircraft Dynamics Model).

### **2.3 Simpilot De-coupling**

The simpilot software is now message based and completely independent of the ECO. This re-factoring of the software moves the sim-pilot station management functionality out of the core dynamics engine and into a separate software component.

### **2.4 Automated Verification and Validation of the JAVA-Based Simulator.**

A Python application was developed to automatically run the simulator and a suite of flight samples designed to focus on one maneuver at a time, for each of the models in our database of aircraft. This provides insight into the quality of the simulator as changes are being made. Unexpected effects are easily seen when the benchmark data is compared with the test data.

### **2.5 Verification and Validation Visual Plots**

As an enhancement to the automated Verification and Validation application a visual plot of the benchmark and test data was developed. These plots provide at-a-glance recognition of unexpected effects present in the test data.

## **TGF Acronyms and Abbreviations**

ADAR	ARTS Data Acquisition & Router
AGW	ARTS GateWay
ARTS	Automated Radar Terminal System
ATCT	Air Traffic Control Tower
CAS	Controller Awareness Study
CTAS	Center TRACON Automation System
CHI	Computer Human Interface
CPDLS	Controller Pilot Data Link Communications
DFS	Deutsche Flugsicherung (German Simulation)
DIS	Distributed Interactive Simulation
DRVSM	Domestic Reduced Vertical Separation Minimum
DSR	Display System Replacement
EDC	Early Display Configuration
ETVS	Enhanced Terminal Voice Switch
FAST	Final Approach Spacing Tool
FFP	Free Flight Phase
FS1, 2/2+	Full Service 1, 2/2+
GAO	Government Accounting Office
GOERS	GPS Outage En route Simulation
GPS	Global Positioning System
HAD	High Altitude Demonstration
HAT	High Altitude Test
HFL	Human Factors Laboratory
HLA	High Level Architecture
IIF	Integration and Interoperability Facility
LAAEP	LA Arrival Enhancement Project
McTMA	Multi-Center Traffic Management Advisor
NAS	National Airspace System
NATCA	National Air Traffic Controllers Association

PARR	Problem Analysis Resolution and Ranking
PAS	Pseudo Aircraft System
PDU	Protocol Data Units
PTR	Program Trouble Reports
RDHFL	Research Development and Human Factors Laboratory
RNAV	Area Navigation
RVSM	Reduced Vertical Separation Minimum
STARS	Stand Alone Terminal ARTS Replacement System
TATCA	Terminal Air Traffic Control Automation
TFM	Traffic Flow Management
TGF	Target Generation Facility
TMA	Traffic Management Advisor
TRACON	Terminal Radar Approach CONTROL
URET	User Request Evaluation Tool
WJHTC	William J. Hughes Technical Center
XPVD	X-windows Planned View Display

## **TGF Airports and Centers**

ADW	Andrews Air Force Base
DCA	Ronald Reagan International Airport
EWR	Newark International Airport
Genera	Generic airspace generated for HFL studies
JFK	John F. Kennedy International Airport
PHL	Philadelphia International Airport
ZDC	Washington Center
ZID	Indianapolis Center
ZJX	Jacksonville Center
ZNY	New York Center
ZOB	Cleveland Center