Target Generation Facility (TGF)
ANG-E16 Simulation Group

Project Summary

Fiscal Year 2012

Dan Warburton

November 14, 2012

Table of Contents

TGF Projects Executive Summary FY 2012

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, simulation pilot workstation and hardware infrastructure.

En-Route Automations Modernization (ERAM) Test Support

The TGF provided 52 weeks of simulation support for ERAM test. We supported the ERAM Test Design Group (ATO-E/AJE-12A1) in the Operational Evaluations of System Issues Group (SIG) fixes, Problem Reports (PRs), and Automation Issue Management System (AIMS) tickets for ERAM Release 2. We also supported several Demos to ERAM Key site personnel on critical ERAM fixes. We upgraded all scenarios to use IP radars in the TB1/TB2 labs which provide the benefit of all the Air Traffic Control Center radars being available for use (See section 1.1 for details). **TGF continued to receive support requests from ERAM test for 10 to 20 lab sessions per week, resulting in about 500 lab support requests for fy2012.** Simulation test support is provided upon request 18 hours a day, five days a week in three laboratories (TB1, TB2 and IIF).

NextGen Integration and Evaluation Capability (NIEC) Laboratory Support

The TGF supported multiple projects in the NIEC Laboratory this fiscal year. . We added significant capabilities to the Virtual Airport Immersion Environment (VAIE) supporting the upgrade to the VAIE display and IG equipment. This upgrade from a 180 degree 6 channel rear projection system to a 300 degree 24 channel LCD/LED system provides the NIEC with enhanced capabilities to support simulations needing extending viewing angles. This system was used for the directors ITEA demo taping. TGF enhanced the VAIE installation used to provide out the window (OTW) views for the NIEC cockpit adding enhanced weather effects and integrating of “MAK VR the world” for the WITC studies.

Research Development and Human Factors Laboratory (RDHFL)

TGF provided support to the Human Factors Research and Engineering Group's The RDHFL is using the TGF simulation system as a product. That is, they operate independently with only on call TGF support. On-going TGF support included TGF ECO and Simulation Pilot Workstations upgrades and maintenance as well as software enhancements and troubleshooting as required.

Airway Facilities Tower Integration Laboratory (AFTIL)

TGF sustained and enhanced the 360 VAIE installed in the AFTIL laboratory. Supported a number of tower siting studies using the VAIE. TGF enhanced the VAIE software to provide dynamic re-siting of the tower location.

Integration and Interoperability Facility (IIF)

TGF supported and sustained the installed simulator providing upgrades and updates as necessary. ERAM Operational Test has used the facility extensively.

Surveillance Broadcast System (SBS) Program Support

TGF supported the SBS program with two major simulations. The first simulation was conducted in the technical centers facilities **STARS laboratory**. TGF innovated the techniques used to drive the laboratory enabling ADS-B traffic to be simulated. The second major simulation was conducted in the technical centers **IIF ERAM facility**. This was the first simulation for research purposes supported in the ERAM facilities. Previously all supported simulation was in support of ERAM test.

Air Traffic Operations Support

TGF supported Air Traffic Operation with two separate simulations. The **Chicago C90** simulation in the Common Arts Laboratory (CARTS) was conducted in support of validation of revised air traffic operations in the O'Hare Modernization Plan (OMP)..

TGF supported the Philadelphia (PHL) tower/TRACON training of the staff in preparation for the **2B airspace redesign**. TGF provided an integrated simulation using the STARS laboratory interfaced with the NIEC VAIE, allowing traffic vectored in the STARS laboratory to be viewed in the simulated PHL Tower.

International Test and Evaluation (ITEA) Demonstration

TGF supported the demonstration of the distributed simulation capability of the Technical Center Laboratory infrastructure. TGF provided the core simulation and integration technology to connect disparate organizations simulator assets and integrate them into a single dynamic simulation. In support of this demonstration TGF developed a TENA (Test and Training Enabling Architecture) gateway allowing TGF to interface with a broad range of military simulators.

Section 1 – Simulation Projects Supported

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

1.1 ERAM Operational Testing – Regression Testing – DR Closeout activities

ERAM Operational Testing – Regression Testing – DR Closeout activities

Simulation Dates: October 2011 – September 2012

Program Office: ERAM

Contacts:

NAME	ORG	EMAIL	PHONE	ROLE
Cotterell, Lisa	AJP-7A8	lisa.cotterell@faa.gov	609 485-7223	ERAM Support Operations Test Director
Kelly, Patrick	FAA AJP-7A9	patrick.kelly@faa.gov	609 485-7202	ERAM Test Director
Lawson-Brown, Olethia	FAA AJP-7170	olethia.lawson-brown@faa.gov	609 485-6669	En Route Automation Group
Rimdzius, Stan	TGF	Stan.ctr.Rimdzius@faa.gov	609-485-7226	Scenario Developer
Merel, Jim	TGF	Jim.ctr.Merel@faa.gov	609 485-5492	Scenario Developer
Warburton, Dan	FAA AJP-786	Dan.Warburton@faa.gov	609 485-4480	TGF Technical

Simulation Summary

In Fiscal year 2012 we continued to support the ERAM Test Design Group (ATO-E/AJE-12A1) in the Operational Evaluations of System Issues Group (SIG) fixes, Problem Reports (PRs), and Automation Issue Management System (AIMS) tickets for ERAM Release 2.

This year we continued upgrading scenarios to IP radar coverage. Using IP radar and SDRR has allowed full coverage of radars for any given center.

We continue to accommodate an intensive ERAM system release schedule and completed over 50 uplevels of the SGET scenario data, including CATC1-FS3e, CATC8-AOI, CATC 4-FS10e, atop, e2e, e2e2e, e2t, e2h, ZAB, ZHU ADS-B configurations, and any custom customer supplied scenarios using one of these configurations. In addition our total simulation support time supporting TB1, TB2, TB3, I2F has again reached 3400+ hours.

1.2 UAS Demo

Simulation Dates: 10-18-11 to 04-23-12

Program Office: Research and Technology Development Air Traffic Organization, NextGen Operations and Planning

Contacts:

Warburton, Dan	FAA AJP-786	dan.warburton@faa.gov	609-485-4480	TGF Technical Lead
Peterson-Brown, Robin	FAA AJP-7840	robin.peterson-brown@faa.gov	609-485-7216	NIEC Team Lead for UAS
Buondono, Karen	FAA AJP-661	karen.buondono@faa.gov	609-485-4036	UAS

Simulation Summary

This study was conducted to determine the impact on UAS surveillance using ADS-B integrated with a predator-B Ground Control Station in conjunction w/ lost Link (LL) activity.

1.3 C90 CARTS

Simulation Dates: February 7 – April 10 2012

Program Office: AJR-35 Airspace Management Program

Contacts:

Warburton, Dan	FAA AJP-786	dan.warburton@faa.gov	(609) 485-4480	TGF Technical Lead
Vanderlaan, Vinnie	FAA AJR-35	Vinnie.Vanderlaan@faa.gov	(847) 294-7559	Manager - Chicago Airspace Project
Withers, Anetra	Human Solutions	Anetra.CTR.Withers@faa.gov	(202) 863-0829 or (301) 412-8501	Principal

Simulation Summary

The Chicago TRACON (C90) airspace is being redesigned to accommodate changes in current traffic flow associated with the O'Hare Modernization Plan (OMP). The objective is to perform a human in the loop simulation (HITLS) with C90 ATC's to ensure the viability of the proposed redesign of the airspace controlled by and/or affecting Chicago TRACON, Tower, and various airspace (e.g. Rosemont) in the surrounding area. Accordingly, the Chicago TRACON (C90) and O'Hare International Airport were adapted for use in the simulation.

1.4 AFTIL ORD/CLT/VAIE Tutorials

Simulation Dates: November 7 2011 – January 10 2012

Program Office: Program Operations – Terminal Facilities Group
AJT-15
Tower Replacement Program

Contacts:

Warburton, Dan	FAA AJP-786	dan.warburton@faa.gov	609-485-4480	TGF Technical Lead
Aschenbach, John	FAA AJT-78A	John.Aschenbach@faa.gov	609-485-7452	Engineer
Best, Chris		christopher.ctr.best@faa.gov		Computer Scientist

Simulation Summary

Our customers need to see the location of various tower cab structures in the computer generated model, and require the capability to move their eye-point around inside the computer generated cab model and see the interior displayed on the large screens.

1.5 STARS PHL 2b

Simulation Dates: March – May 2012

Program Office: Philadelphia A.T.CT.
Stars B Philadelphia Airspace Study

Contacts:

NAME	ORG	EMAIL	PHONE	ROLE
Warburton, Dan Warburton	FAA AJP-786	dan.warburton@faa.gov	609-485-4480	TGF Technical Lead
Hamilton, James	ATEC	james.ctr.hamilton@faa.gov	609-485-7227	TGF
Greco, Adam	FAA AJP-786	adam.greco@faa.gov	609-485-4405	
Keller, Bruce	FAA DOT/FAA/ETSU/ PHLATCT	bruce.keller@faa.gov	215-492-4100	Supervisor
Cornett, Walter	FAA DOT/FAA/ETSU/ PHLATCT	walter.cornett@faa.gov	215-492-4100	Controller
Laubach, Kristen	FAA DOT/FAA/ETSU/ PHLATCT	kristen.laubach@faa.gov	215-492-4100	Controller
Niszczak, Bob	PHL	bob.niszczak@faa.gov	(215) 492-4103	Operations Manager
Shepley, Jeff	Mitre	jshepley@mitre.org	703-983-2052	project team manager
Danner, Heather	Mitre	hdanner@mitre.org	703-983-7250	Outcome Lead
Steve Spahn	STARS	steve.ctr.spahn@faa.gov	485-7324	STARS8 Tech
Amy R.Thompson	STARS	amy.r.thompson@faa.gov	485-7753	STARS8 Tech
Michael Tarnowski	ANG-E15	michael.tarnowski@faa.gov	485-7322	STARS2 Tech

Simulation Summary

Three new STAR routes were installed for the new PHL Tower. This simulation studied the impact of these routes on the PHL class B airspace.

Four Sectors in the Stars lab are included in the simulation : Final Vector, Woodstown, South Arrival, South Departure. The Phl Tower is being simulated (using the NIEC VAIE) with a single position, either Local East or Local West, depending on a East or West operation.

Final Vector (1F) 125.400 Vector Aircraft to ILS and clear to land
Woodstown (1W) 127.350 Feeder for Final Vector
South Arrival (1S) 133.870 Feeder for Final Vector
South Departure(1V) 119.750 Accepts departures from local
Local East 118.500 Clears Aircraft for Departure in East Operations
Local West(1Q) 135.100 Clears Aircraft for Departure in West Operations

North Departure (1N) Termination Frequency (10 mins?) for North Departures (have P at the end of ACID)

1.6 RPI SEA/DEN

Simulation Dates: March 2012

Program Office: Bettyanne Davis, RPI/EUI
AJT - 131
(609) 485-9879
bettyanne.davis@faa.gov

Contacts:

NAME	ORG	EMAIL	PHONE	ROLE
Warburton, Dan	FAA AJP-786	dan.warburton@faa.gov	609-485-4480	TGF Technical Lead
Davis, Bettyanne	FAA AJT-131	bettyanne.davis@faa.gov	609-485-9879	RPI/EUI
Frazier-Milton, Jeanne	FAA AJT-131	jeanne.frazier-milton@faa.gov	202-385-8383	Manager, Automation Engineering
Sazon, Tony	FAA AJT-13	tony.sazon@faa.gov	609-485-7481	Engineer

<u>Simulation Summary</u>

The purpose of this simulation was to evaluate the Relative Position Indicator (RPI) early user involvement.

1.7 AAts

Simulation Dates: May 21 – 29 2012

Program Office: ATO Systems Operations
AJR-54

Contacts:

NAME	ORG	EMAIL	PHONE	ROLE
Swantek, Timothy	Engility	Timothy.ctr.Swantek@faa.gov	609-485-4192	TGF PoC
Best, Christopher		Christopher.ctr.Best@faa.gov		Tower/DANSIG support
Delemarre, Mary	ANG-E14	Mary.Delemarre@faa.gov	609-485-5033	NIEC Project Lead
Willems, Ben		Ben.Willems@faa.gov	609-485-4191	Principle Investigator

Simulation Summary

This simulation was a proof of concept for Aircraft Access to SWIM (AATS) to evaluate pilot utilization of AATS data (AIXM/FIXM/WXXM) during flight. The sponsor would like to show the benefits of the pilot having access to the SWIM data from a strategic planning point of view. The goal will be to demonstrate benefits of aircraft having access to SWIM enabled non-safety critical operational NAS data through the various phases of flight.

There were two stages of the project - the CW (cognitive walk through) in March and the demonstration in May. During the CW the pilots and controllers saw the various phases of flight represented in the NIEC (RCS, tower, TRACON, En Route, plus the AOC and TMU) in order to see what different types of data is available. The Electronic Flight Bag (EFB) application the NIEC will be developing was used during the demonstration.

1.8 HFL

Simulation Date: April – May 2012

Program Office:

Contacts:

Simulation Summary

Various projects were completed in the HFL utilizing the TGF Java Simulator and Sim-Pilot Workstations.

1.9 Weather Technology in the Cockpit (WTIC)

Simulation Date: June – July 2012

Program Office: Weather Technology in the Cockpit (WTIC)
Eldridge Frazier (202) 385-7183
Ian Johnson Ian.Johnson@faa.gov (202) 385-7168

Contacts:

Warburton, Dan	FAA AJP-786	dan.warburton@faa.gov	609-485-4480	TGF Technical Lead
Delemarre Mary	FAA/ NIEC	Mary.Delemarre@faa.gov	609-485-5033	NIEC Team Lead
Frazier, Eldridge	FAA	Eldridge.Frazier@faa.gov	(202) 385-7183	
Johnson, Ian	FAA	Ian.Johnson@faa.gov	(202) 385-7168	

Simulation Summary

The simulation was conducted to evaluate the risk of in-flight evaluations of updated weather information in oceanic/remote regions, to increase understanding of impacts to pilot, dispatch, and air traffic management (ATM) decision making; in a collaborative environment when updated oceanic weather information is provided to the flight deck, and to identify demonstration objectives that are best accomplished with an expanded demonstration of uplinked hazardous weather information to transoceanic airline flights.

Flights will traverse Miami center, Havana center, Kingston center, Panama control, Bogota control, Guayaquil control and terminate under Lima control.

1.10 SBS Program ADSB Only (aka GPSOutage)

Simulation Date: STARS October 10-11 2012
ERAM October 16-18, 23-25
Program Office: SBS Program
Preston Barber
AJM-232
(202)385-8282
preston.barber@faa.gov

Contacts:

NAME	ORG	EMAIL	PHONE	ROLE
Warburton, Dan	FAA ANG-E16	dan.warburton@faa.gov	(609)485-4480	TGF Technical Lead
Alexander, Amy	MIT Lincoln Lab	amy.alexander@ll.mit.edu	(781)981-8219	Human Factors (Principal Investigator)
Barber, Preston	FAA AJM-232	preston.barber@faa.gov	(202)385-8282	SBS Program Integration Manager
Bhagat, Asha	FAA ANG-E57	asha.bhagat@faa.gov	(609)485-8472	Test Director
Carreno, Victor	SBS	victor.carreno@ymail.com	(757)880-7440	Safety Team Lead
Chachis, George	TGF/Engility	george.ctr.chachis@faa.gov	(609)485-4479	TGF
Furr, Carla	ANG-E55	carla.ctr.furr@faa.gov	(609)568-6402	SBS Requirements Lead
Harkleroad, Eric	MIT Lincoln Lab	Eric.Harkleroad@ll.mit.edu	(781) 981-2367	Scenarios
Hoang, Kathy	FAA ANG-E151	kathryn.hoang@faa.gov	(609)485-4674	FAA Terminal Maintenance Section Mgr.
Lasewicz, Vince	FAA ANG-E1	vincent.j.lasewicz-jr@faa.gov	(609)485-6805	FAA Laboratory Integration Lead
Luka, Scott	SBS/Regulus-group	sluka@regulus-group.com	(516)840-0187	Air Traffic Control Operations Specialist
Manevski,	TGF/Engility	dejanco.ctr.manevski@faa.gov	(609)485-	Lab

Do			7329	Maintenance Team
Merel, Jim	TGF/Engility	jim.ctr.merel@faa.gov	(609) 485-5492	TGF
Most, Mike	FAA AJM-213	michael.most@faa.gov	(609) 485-5051	ERAM EOPD/SDP SME
Parsons, Tammy	FAA ANG-E151	tammy.ctr.parsons@faa.gov	(240)228-1965	3 NM WG Team Lead
Prata, Michael	ANG-E55	michael.prata@faa.gov	(609)485-5054	FAA Mgr. ATC Surveillance Team
Reingruber, Chris	FAA AJG-1210	chris.reingruber@faa.gov	(609)485-7788	FAA
Ross, Michael	FAA ANG-E16	michael.ross@faa.gov	(609)485-6976	TGF
Souder, Lonnie	TGF/Engility	lonnie.ctr.souder@faa.gov	(609)485-7230	TGF
Spahn, Steve	FAA ANG-E151	steve.ctr.spahn@faa.gov	(609)485-7324	
Thompson, Amy	FAA ANG-E151	Amy.R.Thompson@faa.gov	(609) 485-7753	STARS Lab
Craig Bielek	TEA-A90	craig.bielek@faa.gov	(603) 666-6679 (603) 594-5532	NATCA STARS Lab
Wagner William (Preston)	ANG-E153	william.p.wagner@faa.gov	(609) 485-4108	STARS Audio
Bakanas, Stephen	ANG-E14	stephen.ctr.bakanas@faa.gov	(609) 485-7916	I2F ERAM Audio
Kusza, Robert	ANG-E16	robert.ctr.kusza@faa.gov	(609) 485-4215	CSF

Simulation Summary

The SBS Program performed this Automatic Dependent Surveillance-Broadcast (ADS-B) Only Terminal and En Route Separation Target Level of Safety (TLS) activity to demonstrate the safety case for providing current separation minima in Terminal and En Route airspace using ADS-B as the sole surveillance source. Two Human-In-The-Loop (HITL) experiments (HITL # 1 and HITL # 2) are planned to evaluate the impact of simultaneous loss of GNSS aircraft navigation and surveillance on air traffic controllers and pilots.

1.11 ITEA Demonstration

Simulation Date: August 23 2012

Program Office: Dr. Wilson Felder
ANG-E
609-485-6641
Wilson.felder@faa.gov

Contacts:

NAME	ORG	EMAIL	PHONE	ROLE
Swantek, Timothy	Engility	Timothy.ctr.Swantek@faa.gov	609-485-6557	TENA/HLA/TGF POC and generally nice guy.
Roselli, Nick	FAA AJP-786	nicolas.roselli@faa.gov	609-485-6902	Master of the Voice.
Marzelli, Nick	ANG-E14	nick.marzelli@faa.gov	609-485-5633	NIEC Lab Overlord.
McClain?, Terrence	ANG-E1	terence.mcclain@faa.gov	609-485-6698	Cockpit POC.

Simulation Summary

This demonstration was performed to show the interoperability of 6 different organizations with each participant sending data from a single aircraft into the TGF Next Gen Simulator; thus displayed on controller stations and in the VAIE system. A video recording of this will be made and the resulting 15 minute clip will be presented at the ITEA conference in California in September.

DFW was chosen as the airspace of interest. The participating aircraft were limited to the external targets and a mere handful (less then 10 perhaps) other simulated targets. Background traffic was minimized to prevent distraction from the externally sent targets and all normal functions of the airport were 'postponed' for this demo.

Section 2 – Technical Summary

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

2.1 TGF Simulation Engine (ECO)

The TGF Simulation Engine (ECO) is an air and ground traffic simulator using a physics based approach to simulation of air traffic (see AircraftDynamicsModel.pdf)

The TGF code base is approximately 600,000 Lines of Java Code (LOC) not including the open source libraries.

2.2 Virtual Airport Immersion Environment (VAIE)

A new visual system and upgraded IG's were installed in the NIEC. The NIEC's reconfigurable Cockpit (RCS) out the window view is supported by the VAIE. The AFTIL laboratory is using the VAIE for tower siting. We lost our two primary software developers Chris Best and Joe Schnurr.

The VAIE is a highly extensible 3D rendering solution for the Target Generation Facility's high-fidelity air-traffic simulator. The VAIE uses TGF's internally developed DANSIG image generator software (C++) which was built from the ground up to be modular and easily customizable. DANSIG uses advanced rendering techniques to efficiently handle many scene lights - often 5 per aircraft - that produce highly realistic lighting effects that interact with the terrain and other aircraft in the scene. OpenSceneGraph based rendering of aircraft and airports. Aircraft and Ground vehicle motion projected to a WGS84 coordinate system using TGF's internal algorithms. Real-time ephemeris calculations for sky color, lighting conditions, star field, etc. are performed using SilverLining. Real-time shadow rendering is based on calculated sun/moon position. A real-time aircraft light (navigation, taxi, landing, etc.) that follows the light discipline based on aircraft movement and affects the environment is implemented.. The VAIE renders Real-time weather effects (snow/rain, fog, clouds) and has a Particle-system based special effects for fire, smoke, landing tire smoke etc.

2.3 Sim-Pilot Laboratory Enhancements and Status

The Sim-Pilot laboratory was enhanced with a new pilot station manager and daemon. This replaces the long standing and mysterious c program. A new sector monitor application was deployed to allow monitoring on sector activity.

Each pilot workstation is an Intel I7 with a 26" monitor, running on Linux Cent OS 5.4 with in-house developed java application software. (see simpilotmanual.pdf)

2.4 Networking Enhancements and Status

The TGF network infrastructure comprises ~30 devices. These devices range from the smallest access layer Cisco 2960G switch to the new core Cisco 4506 installed last fiscal year. The devices provide an infrastructure to transport all TGF simulation network traffic. The type of network traffic ranges from point-to-point to multicast to subnet broadcasts. These different types of traffic may originate and terminate locally with the TGF, or inter-lab, e.g., NIEC displays targets driven by the TGF simulator(s).
TGF simulations have increased the network traffic 10 fold with the introduction of VAIE The TGF local LAN provides Gbit1 wire speed switching to the desktop with 10 Gbit uplink to LABNET.

2.5 Workstation Environment

The workstation environment consists of 64 bit OS (Fedora 16/CentOS 5.4) with SSDs for local storage and are running Intel I7's with 6 gb of RAM Each workstation is equipped with a 30" display.. We are using SVN for source code management and GIT for data management. We have an active wiki http://trac.tgf.tc.faa.gov. IBM's open source Eclipse Java Development environment is used for software development.

2.6 TGF Back End Systems and Enhancements

An updated Avamar NDMP compliant NAS storage system to replace the aging SUN NAS storage system was planned for FY12, as well as the addition of an NDMP accelerator node and possibly an additional storage node for the Avamar Appliance was ***postponed due to budget constraints***

2.7 TGF Display Laboratory Enhancements and Status

No significant changes we made to the Display Laboratory this FY. The TGF Display laboratory hosts four (4) controller position workstations and a 4k overhead projector. The display laboratory is a multipurpose space used for project planning, in-briefing, post simulation debrief, scenario development and project simulations.

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
DFW	Dallas Fort-Worth 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