

# Graphic Simulation Generation Tool (GSGT)

## Functional Design Guide

Version 0.1

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Scope and purpose:

The purpose of this document is to describe the designed functionality of GSGT as it pertains to user accessible aspects of the system.

The scope of this document will be limited to descriptions of the functionality of GSGT. The functionality of the Graphic User Interface is described in full the document titled GSGT User Guide.

1. Graphic development environment.

1. Online Help.

For a complete description of the graphic user interface (GUI) see the online help provided with GSGT (Graphic Simulation generation Tool).

1. Adaptation based on ACES data.

1. Airspace and [Equipment](#) data are based on ACES (Adaptation Collection Environment System) data.

ACES data is parsed to provide all data relevant to the airspace model. This data includes:

- Airways

- Fixes
- FPA

The equipment list from which messages are to be input is auto generated.

The integrated aircraft performance characteristics table is validated against the values found in the ACES data.

1. Dialogs are provided to select and change the ACES charting cycle.
1. Data entry templates.
1. Flight entry dialog.
1. Radar flight entry ("Attributes").

Input in this tab is required for each flight as this data defines the flight as an entity. Every flight that is to be included (unless input as a system command) must have at least the name field filled in.

All input required for generation of a radar flight plan is input in this dialog. Flight plan entry is either point-and-click or manual entry. Data input in this dialog is checked for validity.

Radar flight plans can have a comment field. If used the comment will be displayed in the master flight list.

A record select indicator (RSI) can be set for each flight, allowing selective use at simulation run time.

1. Non-Radar entry ("Message").

All requisite non-radar messages will be auto generated by default. These messages can be displayed and edited.

Additional message entry is also supported. Auto generated messages consist of the following:

- Flight Plan (FP), Filed from the sector or facility controlling the point of origin.

- Internal departures will have P-times.
- External departures will have D-times.
- Departure Message (DM), Internal departures will have a DM message.
- Track Start
- Flights originating in the center airspace will have a QT (track start) message.
- Flights from adjacent facilities or internal TRACON airspace will have TI (Track Initialization) messages input by the facility (ARTS or adjacent NAS).
- Handoff messages (QN). A series of handoff messages, initiate and accept, will be input to transition the flight across all the sectors indicated by the flight plan. This will include handoffs from and to adjacent facilities.

When editing a flight plan message a flight-plan dialog is supplied. Other message editing is accomplished via the generic message dialog. Message entry is validated, content is not. This provides the capability to simulate invalid message content.

Non-Radar messages can have comment and expect fields and be input from NAS or DSR (Display System Replacement) or be marked for LIVE input.

A record select indicator (RSI) can be set for each message, allowing selective use at simulation run time.

## 1. Maneuvers.

Modification of the radar flight track is provided via the maneuver dialog. By default messages entered in this dialog will produce corresponding non-radar messages. Available maneuvers include, altitude, speed, beacon, ACID (Aircraft ID), primary and secondary blip-scan. These messages can be input

based on either time or position.

#### 1. Radar Detection parameters ("Detection").

This dialog allows control of radar detection. Radar detection modes affect the radar returns generated and placed on the NAS "Merge" simulation tape.

The parameters provided are primary and secondary blip-scan, ghosting, time-in-storage and run-length.

#### 1. Target Detection Parameters settings:

- The "Blip-scan" section presents the user with blip-scan percentage selectors for both primary and secondary antennae. The blip-scan percentage (default of 100) determines the likelihood that the corresponding antenna will detect the target each scan. A blip-scan of 50 means that the target will be detected by that antenna in 50 % of all of the scans in a simulation. The overall blip-scan for a target is the product of the target blip-scan times the radar blip-scan. Note that a mode 3A equipped target with a 50 % secondary blip-scan (and all other blip-scans 100%) would generate primary only returns 50 % of the time. A target that is not mode 3A equipped would not be affected by either target, or radar secondary blip-scan and would always generate only primary returns.
- The "Ghosting" section controls secondary antenna ghost returns. The user chooses the percentage (default 0) of secondary returns for a target that will also generate a ghost return. A ghost return is a duplicate transponder response caused by a reflection from a different location. The actual ghost percentage for a target is the product of the target and radar ghost percentages. A target with a 50 % ghost return value and a radar ghost value of 100 % will generate an extra secondary radar return (ghost return) in 50 % of the total scans of a simulation.
- The "Radar Return Parameters" section provides time in storage and run length value manipulation. Run length is the length of the target as seen by

the radar in ACPs (Azimuth Change Pulses); and is a field in primary return messages. Time in storage represents how long the radar message, primary or secondary, remained in the output buffer at the radar site before being transmitted.

- Static messages.

1. System Message entry.

System messages are free text and not validated for content or device eligibility. All messages can have comment and expect fields associated. Messages can be input from NAS or DSR or be marked for LIVE input.

1. Graphic Preview

1. Target preview mode.

Provides a graphic representation of all the flights in the simulation displayed on the airspace depiction.

For a full listing of airspace depiction functions see section 1.

1. Full preview mode.

In addition to Target preview, Full preview provides a dialog displaying all message entry. This information is broken down by input source. All local messages (internal to this ARTCC (Air Route Traffic Control Center)) are displayed on the first tab, titled "KB (Key Board) log". Other messages are displayed on tabs referring to the external facility from which they are to be injected.

1. Single target preview.

Presents all the data available in "Full preview" mode for a single flight only. This mode is accessed from the radar target input dialog.

1. Fast mode play back is provided.

Speeds from Pause to MAX (limited only by computer cycles) are provided. The default speed is 10x, at which ten playback seconds transpire every second of clock time.

Use of the step feature, available while paused, will advance the clock one playback-step (ten seconds while at 10x speed).

1. Import.

1. NAS simulations.

Importation of NAS simulations requires all the CARDS required by NAS SIM.

Equipment will initially be based on the devices imported from ACES. Any device definition provided in NAS simulation input (EQUIP) overrides a device of the same name previously defined by GSGT; devices in addition to those previously defined will be added. Any radar site information (RSITE/CSITE) is included in the equipment definitions and therefore follows the same rules.

Any modify (MODIFY) cards that are encountered will have the effect of modifying the previously defined device. Change equipment cards (CHEQP) will be included in the equipment file as equipment entries, containing the new values; they will become effective at the original time of entry.

When a MULTI card is encountered the specified data expansion will be performed, the resulting card images will be represented as actual messages and/or flights.

Comment and Expect cards are associated with the flight preceding them. Comments before the first flight will be associated with the simulation itself.

Control cards (CONTL) will be imported and reflected as GSGT RSI (Record Select Indicator) values.

1. Non-Radar.

All non-radar aircraft will have a placeholder in the "Attributes"

tab of the "target editor" dialog. This placeholder will consist of the aircraft call sign as found in the imported Flight-Plan message and the time of the first message associated with this flight.

All messages that have been associated with each flight will appear in the "Messages" dialog for that flight. The auto-generation of messages feature is turned off for all flights; thus the only messages that will be available for output are those that have been imported or added manually.

Any messages that could not be associated with a flight will be included as "System Commands".

## 1. Radar.

Radar simulation conversion uses the route (RTE) or PLANE and maneuver (MANVR) cards as the basis of the radar route of flight.

If the MIX option is selected as part of the non-radar control card then RTE cards are processed. Additionally any PLANE or MANVR cards will be processed. In the event that both RTE and PLAN/MANVR cards exist for the same flight the RTE card information will be used.

POINT cards are checked for validity before use. If a POINT card is within an optional distance (nominally set to 10 nmi.) of a defined FIX of the same name, the FIX position is used. Points farther than the defined distance are converted to Latitude/Longitude fixes.

Upon discovery of a LAND card (with the MIX option selected) in the non-radar flight-plan, the GSGT LAND option for this flight will be set.

Aircraft characteristics will be based on the nominal values as they were with NAS SIM aircraft type zero. Imported aircraft characteristics cards (ACHAR) will be honored. There is no practical limit as to the number of ACHAR cards that can be imported and stored. Aircraft characteristics based on the GSGT aircraft type, as indicated by the Flight Plan (FP) message for this flight, would result in improved realism and fidelity. The GSGT development team decided to use the same values as NAS SIM in order to provide radar profiles comparable to those of the legacy

system.

The resultant flight profiles are displayed on the Attributes tab of the target editor dialog.

#### 1. SAR (System Analysis Recording)

Full simulation from SAR data extraction.

Includes all controller entries.

Radar flight profiles reflect controller entry of altitude and rerouting messages in addition to applied preferential routing.

#### 1. Export.

##### 1. SDRR (Looped Sim Drive System) simulation files.

Export simulation for use on the SDRR system. When complete, an SDRR directory will have been added to the directory containing simulation the source. This directory will contain the information required by SDRR to inject this simulation.

##### 1. NAS simulation tapes.

NAS simulation tapes have two main formats; one contains simulated radar returns the other contains simulated non-radar message input. These two types of simulation may be merged to form a super set called a "Merge" or "Direct" simulation tape.

- Radar

Radar data for all defined flights as seen by every defined radar site is written to tape.

- Non-Radar

All messages, System or Target related, excluding radar returns are written to tape.

- Merge

Both radar and non-radar messages as described above are written to tape.

#### 1. SAR tape plotting.

1. Graphic display of SAR data on the GSGT airspace depiction is provided.

This feature plays back track data from a SAR recording. Tracks are depicted as they were displayed on the DSR system at the time of recording.

#### 1. Simulation listings.

1. GSGT listings vary greatly from those of NAS SIM, as they are not used as a means of reporting errors. Errors are reported at time of entry.

#### 1. Sorting

Listings can be sorted in descending or ascending order by clicking on the item header.

#### 1. Filters

Filters allow for the display of selective subsets of the entire simulation listing. The creation of new filters is proved via the "TOOLS/New Filter" menu item.

Pull-down menus provide lists of available items on which to filter. Additionally, text search, time span and "Show only LIV (live) messages" options are provided. These filter items may be combined in any order. Allowing myriad number of unique filters to be defined.

#### 1. LIVE messages

Messages marked for live input (LIV cards) can be filtered and display/printed to produce live input listings for distribution to testers.

#### 1. Printing

Each tab may be printed independently. To do so select "Print Tab" from the File menu while on the tab you wish to print.

## 1. Help

### 1. GSGT Help

Gsgt help is provided as html linked documentation. This document will be updated to reflect the evolution of the GSGT tool.

### 1. About

Provides information about the GSGT program software installed on your system.

### 1. Scenario Info

Displays information about the simulation loaded in the tool, including:

- Start Time
- ACES adaptation, SITE name, Charting Cycle date and NAS system level.
- A list of simulation statistics.