TARGET GENERATION FACILITY (TGF)

XML FLIGHT PLAN DOCUMENT

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Referenced Documents

TABLE 2-3-8 in the Air Traffic Control Manual at http://www.faa.gov/airports_airtraffic/air_traffic/publications/atpubs/ATC/Chp2/atc0203.html#t1846atc

TGF Miscellaneous Utilities at http://public.tgf.tc.faa.gov/documentation/misc/misc.htm

TGF User Manual at http://public.tgf.tc.faa.gov/documentation/eco/ecomanual.html

XML Editor Manual at http://public.tgf.tc.faa.gov/documentation/xmleditor/xmleditormanual.html

List of Acronyms

ACID – Aircraft Identifier

ADS-B - Automatic Dependent Surveillance-Broadcast

AID – Aircraft Identifier

ARTCC – Air Route Traffic Control Center

ARTS – Automated Radar Terminal System

ATC – Air Traffic Control

CDTI – Cockpit Display of Traffic Information

CID – Computer Identifier

CSV – Comma Separated Values

DME – Distance Monitoring Equipment

ETMS – Enhanced Traffic Management System

FAA – Federal Aviation Administration

FMS – Flight Management System

FPA – Fix Posting Area

FRD – Fix Radial Distance

GNSS – Global Navigation Satellite System

GPS – Global Positioning System

IFR – Instrument Flight Rules

ILS – Instrument Landing System

INS – Inertial Navigation System

IRU – Inertial Reference Unit

LORAN – Long Range Navigation

NAS – National Airspace System

PVD – Plan View Display

RNAV – Area Navigation

RNP – Required Navigational Performance

RS – NAS command to remove a flight

RVSM – Reduced Vertical Separation Minimum

SAR – System Analysis Recording

SID – Standard Instrument Departure

STAR – Standard Terminal Arrival Route

TACAN – Tactical Air Navigation

TAS – True Airspeed

TGF – Target Generation Facility

UAT – Universal Access Transmitter

UFP – Universal Flight Plan

VFR – Visual Flight Rules

VHF – Very High Frequency

VOR – Very High Frequency Omni-Directional Range Equipment

WAAS – Wide Area Augmentation System

XML – Extensible Markup Language

1 Introduction

This document provides a Target Generating Facility (TGF) user with an overview of flight plan development and contains an element-by-element explanation of the Universal Flight Plan XML File. Since the XML flight plan file will eventually replace the TGF's CSV flight plan file this document also includes information on converting a CSV flight plan file into an XML flight plan file.

2 Flight Plan Development

Currently the development of flight plans for a simulation can be accomplished through several different methods. For EnRoute simulations an initial flight sample can be extracted from SAR tapes based on a given time period. This initial sample then needs to be run and modified to suit the specific simulation. For a terminal simulation an initial flight sample can be extracted from an ETMS data feed. This initial flight sample also will need to be refined in a similar fashion as a SAR extraction for an EnRoute flight sample. The customer may also choose to manually develop his or her own flight sample using either TGF's XML Editor or TGF's extension to Open Office Calc.

2.1 System Analysis Recording (SAR)

Before flight plans can be extracted from a SAR tape the customer will need to provide specific information regarding the involved sectors, time segments, and any other information dependent upon their requirements. This information is normally gathered during the initial planning stages of a simulation. The resulting flight plans will be in the new Universal Flight Plan XML format and the process of testing and refining can begin. Any further changes to the flight plans will be made manually and/or through computer manipulation.

2.2 Enhanced Traffic Management System (ETMS) Data

Similar to SAR recording extraction, the ETMS data feed allows TGF to pull real flights with their flight plans from any airport in the USA. TGF maintains a database of flights for a whole year. Given a date and an airport a flight sample can be automatically generated and be ready for further processing in a matter of hours.

2.3 TGF XML Editor

TGF has an XML Editor that can be used to create/edit an XML flight plan. Please see the XML Editor Manual at http://public.tgf.tc.faa.gov/documentation/xmleditor/xmleditormanual.html for more information TGF's XML Editor.

2.4 Open Office Calc TGF FPX Extension

Coming Soon!!!

3 UFP XML Flight Plan Data File

This data file has been designed for use by all groups involved in a simulation project. These groups include the customer, TGF, NAS, and ARTS. The file contains flight data associated with a particular Air Route Traffic Control Center (ARTCC). Each record is listed in a separate Flight element, which contains data associated with an individual flight. Upon completion, this file will then be used to initialize TGF, create a NAS simulation tape, and create the ARTS interfacility flight plans as needed for the specific simulation. Please see Section 5.1 for more information on the Flight element.

4 Element Descriptions

This section explains how the individual elements in the XML are described in the following sections.

Tag Name

This section provides the tag name of an element.

General Description

This section provides general information about an element's uses and implications.

Maximum

This section describes the maximum number of times an element appears in its parent element (i.e. the element that contains this element).

Minimum

This section describes the minimum number of times an element appears in its parent element (i.e. the element that contains this element).

Attributes

This section describes an elements attributes. Only appears in description of elements that have attributes.

Format

This section describes the format of the data.

Key:

Symbol	Definition
A	A single alphanumeric character
L	A single alphabetic character
D	A number between 0 and 9, otherwise called a digit
H	A digit indicating an hour
M	A digit indicating a minute
S	A digit indicating a second
[]	Optional data
""	Use verbatim
|	Either or but not both

Note: Alphabetic characters refer to Capital Letters unless otherwise stated.

Default Value

This section contains the default value of an element. Only appears in the description elements that have a default value.

Data Sources

This section describes the possible sources for the data.

- *TGF SAR ANALYSIS*
  - Describes analysis of NAS SAR tapes, as provided by TGF. Details where the data comes from and what processing is performed.
- *TGF ETMS EXTRACTION*
  - Data is captured in real time in daily operations and stored in a database for later time based queries and creation of flight samples.
- *TGF AUTO-GENERATION*
  - TGF generated, using rules described in the post processing section. The ability to selectively post-process data is supported. Data for some elements use a combination of other data elements and a set of rules.
- *USER ENTRY*
  - The user provides the necessary data.

Specific Usage

This section provides an explanation of how a particular element is implemented by NAS and TGF. Any special advantages or disadvantages that this element provides will be elaborated under the individual group's heading.

NAS TGF ARTS

Post Processing

This section describes any processing to the file after TGF has received the flight sample from the customer. Under the heading associated with each group, is an explanation of any process performed concerning an element.

NAS TGF ARTS

Example

This section provides a sample of the XML element

5 All Flight Data

Tag Name

Flights

Description

The Flights element contains all of the flights that will be loaded into the scenario. It is the root element or top-most element in the .fpx file. It must contain a least one Flight element. Please see Section 5.1 for more information on the flight element.

Attributes

This element has two attributes that are used to help with validation of the XML.

- Xmlns:xsi – where to find schema language definition always set to http://www.w3.org/2001/XMLSchema-instance

- Xsi:noNamespaceSchemaLocation – where to find the schema that contains the definition of the XML. For example file:///tgf/xml/flights/flight.xsd

Example

```
<?xml version="1.0" encoding="UTF-8"?>
<Flights xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLoca
tion="file:///tgf/xml/flights/flight.xsd">
  <Flight>
    <Tgf>
      <TgfStartTime>00:00:01</TgfStartTime>
      <Acid>N123MC</Acid>
      <Complexity>1</Complexity>
      <AcType>PA31</AcType>
      <Beacon>0763</Beacon>
      <Frequency>120080</Frequency>
      <StartAltitude Units="HundredsOfFeet">020</StartAltitude>
      <InterimAltitude Units="HundredsOfFeet">000</InterimAltitude>
      <TargetAltitude Units="HundredsOfFeet">020</TargetAltitude>
      <StartType>A</StartType>
      <NavEquip>R</NavEquip>
      <NavType>P</NavType>
      <ArrivalRunway>33R</ArrivalRunway>
      <Route>BOS129010..BOS132005..BOS</Route>
    </Tgf>
    <Nas>
      <NasRoute>BOS129010..BOS132005..BOS</NasRoute>
      <Cid>102</Cid>
      <FiledAltitude Units="HundredsOfFeet">020</FiledAltitude>
      <AssignedAltitude Units="HundredsOfFeet">020</AssignedAltitude>
    </Nas>
    <Arts />
    <ProjectSpecific>
      <Datalink>true</Datalink>
    </ProjectSpecific>
  </Flight>
  <Flight>
    <Tgf>
      <TgfStartTime>00:03:00</TgfStartTime>
      <Acid>EGF3291</Acid>
      <Complexity>1</Complexity>
      <AcType>E145</AcType>
      <Beacon>4763</Beacon>
      <Frequency>120080</Frequency>
      <StartAltitude Units="HundredsOfFeet">000</StartAltitude>
      <InterimAltitude Units="HundredsOfFeet">000</InterimAltitude>
      <TargetAltitude Units="HundredsOfFeet">100</TargetAltitude>
      <StartType>E</StartType>
      <NavEquip>R</NavEquip>
      <NavType>P</NavType>
      <DepartureRunway>27</DepartureRunway>
      <Route>BOS..GARVE..BOSOX.PVD.JFK</Route>
    </Tgf>
    <Nas>
      <NasRoute>BOS..GARVE..BOSOX..PVD..JFK</NasRoute>
      <Cid>141</Cid>
      <FiledAltitude Units="HundredsOfFeet">270</FiledAltitude>
      <AssignedAltitude Units="HundredsOfFeet">100</AssignedAltitude>
    </Nas>
    <Arts />
    <ProjectSpecific />
  </Flight>
</Flights>
```

Figure 1 A sample of the Flights element.

5.1 Individual Flight Data

Tag Name

Flight

Description

The Flight element contains information about a single flight in a scenario. This element contains the following child elements:

1. Tgf (Please see Section 5.1.1 for more information.)
2. Nas (Please see Section 5.1.2 for more information.)
3. Arts (Please see Section 5.1.3 for more information.)
4. ProjectSpecific (Please see Section 5.1.4 for more information.)

Maximum

Unlimited

Minimum

1

Example

```
<Flight>
  <Tgf>
    <TgfStartTime>00:00:01</TgfStartTime>
    <Acid>N123MC</Acid>
    <Complexity>1</Complexity>
    <AcType>PA31</AcType>
    <Beacon>0763</Beacon>
    <Frequency>120080</Frequency>
    <StartAltitude Units="HundredsOfFeet">020</StartAltitude>
    <InterimAltitude Units="HundredsOfFeet">000</InterimAltitude>
    <TargetAltitude Units="HundredsOfFeet">020</TargetAltitude>
    <StartType>A</StartType>
    <NavEquip>R</NavEquip>
    <NavType>P</NavType>
    <ArrivalRunway>33R</ArrivalRunway>
    <Route>BOS129010..BOS132005..BOS</Route>
  </Tgf>
  <Nas>
    <NasRoute>BOS129010..BOS132005..BOS</NasRoute>
    <Cid>102</Cid>
    <FiledAltitude Units="HundredsOfFeet">020</FiledAltitude>
    <AssignedAltitude Units="HundredsOfFeet">020</AssignedAltitude>
  </Nas>
  <Arts />
  <ProjectSpecific>
    <Datalink>true</Datalink>
  </ProjectSpecific>
</Flight>
```

Figure 2 A sample Flight element.

5.1.1 TGF Section

Tag Name

Tgf

Description

The Tgf element contains information about a flight that is used by TGF to simulate the flight. This element contains the following child elements:

1. TgfStartTime (Please see Section 5.1.1.1 for more information.)
2. Acid (Please see Section 5.1.1.2 for more information.)
3. Complexity (Please see Section 5.1.1.3 for more information.)
4. AcType (Please see Section 5.1.1.4 for more information.)
5. Beacon (Please see Section 5.1.1.5 for more information.)
6. Frequency (Please see Section 5.1.1.6 for more information.)
7. StartSpeed (Please see Section 5.1.1.7 for more information.)
8. TargetSpeed (Please see Section 5.1.1.8 for more information.)
9. StartAltitude (Please see Section 5.1.1.9 for more information.)
10. InterimAltitude (Please see Section 5.1.1.10 for more information.)
11. TargetAltitude (Please see Section 5.1.1.11 for more information.)
12. StartType (Please see Section 5.1.1.12 for more information.)
13. NavEquip (Please see Section 5.1.1.13 for more information.)
14. NavType (Please see Section 5.1.1.14 for more information.)
15. DepartureRunway (Please see Section 5.1.1.15 for more information.)
16. ArrivalRunway (Please see Section 5.1.1.16 for more information.)
17. Route (Please see Section 5.1.1.17 for more information.)
18. GroundArrivalRoute (Please see Section 5.1.1.18 for more information.)
19. GroundDepartureRoute (Please see Section 5.1.1.19 for more information.)

Maximum

1

Minimum

1

Example

```
<Tgf>
  <TgfStartTime>00:00:01</TgfStartTime>
  <Acid>N123MC</Acid>
  <Complexity>1</Complexity>
  <AcType>PA31</AcType>
  <Beacon>0763</Beacon>
  <Frequency>120080</Frequency>
  <StartAltitude Units="HundredsOfFeet">020</StartAltitude>
  <InterimAltitude Units="HundredsOfFeet">000</InterimAltitude>
  <TargetAltitude Units="HundredsOfFeet">020</TargetAltitude>
  <StartType>A</StartType>
  <NavEquip>R</NavEquip>
  <NavType>P</NavType>
  <ArrivalRunway>33R</ArrivalRunway>
  <Route>BOS129010..BOS132005..BOS</Route>
</Tgf>
```

Figure 3 A sample of a Tgf element.

5.1.1.1 TGF Start Time

Tag Name

TgfStartTime

Description

The TgfStartTime element contains the TGF start time is in units Hours:Min:Sec and is relative to the commencement of the simulation. (For example if a flight is to start 1 hour and 10 minutes into a simulation this element would contains 01:10:00.)

Maximum

1

Minimum

1

Format

HH:MM:SS

The format of this element is that non-significant zeroes are included in the time.

Data Sources

SAR Analysis	Yes
ETMS extraction	Yes
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

Multiple flights can be started at the same time.

Post Processing:

None required.

Example

<TgfStartTime>01:10:00</TgfStartTime>

5.1.1.2 Aircraft ID

Tag Name

Acid

General Description

The Acid element contains the aircraft identification/call sign of a flight. This ID is used as the name of the flight both in discussion and in data reduction and analysis.

Maximum

1

Minimum

1

Format

LA[A][A][A][A][A]

Examples:

- N2
- N271P
- AAL9271

The Acid element has a seven characters maximum. The ID must start with a letter and be followed by one to six alphanumeric characters.

Data Sources

SAR Analysis	Yes
ETMS extraction	Yes
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

Used as AID element (2) of NAS filed flight plan.

TGF

Used as TGF ACID.

Post Processing

None required.

Example

<Acid>N876Y</Acid>

5.1.1.3 Complexity

Tag Name

Complexity

General Description

Complexity allows the flexibility of flying a subset of flights from one large traffic sample. The Complexity element contains a number that identifies the flight's subset. Note: If subsets of a large sample are not needed then this element should be 1.

Maximum

1

Minimum

0

Format

D

Complexity is a single digit ranging from 1 to 5. A complexity of 5 includes all possible subsets, while a complexity of 1 is the smallest possible subset.

Example: 1

Default Value

1

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

Used to set up control cards on the NAS Sim tape, indicating which level of complexity the aircraft should be included.

TGF

This element identifies the subset in which the aircraft is included, so that upon scenario initialization, if the operator selects this aircraft's subset identifier it will include in the sample along with all lower complexity level flights.

Example:

- If Complexity 5 is chosen Complexity Levels 1, 2, 3, 4, and 5 will be included.
- If Complexity 3 is chosen only Complexity Levels 1, 2, and 3 will be included.

For more information on how complexity is used see Section 6.

Post Processing

None Required.

Example

<Complexity>2</Complexity>

5.1.1.4 Aircraft Type

Tag Name

AcType

General Description

The AcType element represents the type of aircraft.

The aircraft type may be preceded by the following indicators:

- A digit that indicates the number of aircraft the will be sharing this flight plan.
- A letter indicating a weight class or special/experimental equipment an aircraft is using. For example "H/" is used to indicate a heavy aircraft.

The aircraft type may be succeeded by indicator of the flight's airborne equipment. For example /X indicates an aircraft with DME equipment but no transponder. See TABLE 2-3-8 in the Air Traffic Control Manual at http://www.faa.gov/airports_airtraffic/air_traffic/publications/atpubs/ATC/Chp2/atc0203.html#t1846atc for more information on airborne equipment qualifiers.

These indicators are separated from the aircraft type by a "/" character.

Maximum

1

Minimum

1

Format

[[D][L]"/"]LA[A][A]["/"L]

This element contains a maximum of nine characters.

Example:

- 3H/C5A/R
- B/B747/R
- B707
- 3/F18/R

Data Sources

SAR Analysis	Yes
ETMS extraction	Yes
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

Used as the aircraft data element (3) of NAS filed flight plan. This is the aircraft type that appears in the NAS database and flight strips.

TGF

Used as TGF aircraft type to determine aircraft performance and navigational characteristics. If TGF is unable to determine a flight's aircraft type then a default aircraft type of B733 is used.

Post Processing

None required.

Example

<AcType>B737</AcType>

5.1.1.5 Beacon

Tag Name

Beacon

General Description

The Beacon element contains the Beacon code assigned to the aircraft. The beacon code must be unique within the flight sample (with the exception of VFR or 1200 beacon code aircraft).

Maximum

1

Minimum

1

Format

DDDD

The format for this element is zero filled, and represents octal beacon code.

Example:

- 0217
- 1432

Data Sources

SAR Analysis	Yes
ETMS extraction	Yes
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

Used as the beacon code element (4) of the NAS filed flight plan.

TGF

Used as the beacon code of the flight.

Post Processing

None required.

Example

<Beacon>4121</Beacon>

5.1.1.6 Frequency

Tag Name

Frequency

General Description

The Frequency element contains the air-to-ground VHF frequency for the initial (controlling) sector.

Maximum

1

Minimum

0

Format

DDDDDD

The format of this element is a six digit decimal number, the decimal is assumed to be after the third digit.

Example 123.456 is written as 123456

Default Value

000000

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

The flight will begin the simulation in the sector controlled by this frequency. This frequency is also used to assign the flight to a Sim-Pilot Workstation.

Post Processing

None required.

Example

<Frequency>120990</Frequency>

5.1.1.7 Start Speed

Tag Name

StartSpeed

General Description

The StartSpeed element allows the input of a start speed. This element contains the start speed in units of knots of type True Airspeed. The aircraft will fly this speed as it begins the simulation. It is very important to provide the appropriate speed for the altitude at which the aircraft is entering the simulation. (For more information on start speed see the TGF Specific Section below.)

Maximum

1

Minimum

0

Format

DDD

The format of this element is a zero filled three integer digits in units of knots.

Example:

- 310
- 010

Attributes

This element has two attributes that help users to determine the type of speed and the units used.

- *Type* – the type of speed always set to TAS
- *Units* – the units the value is specified in always set to Knots

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

Not used.

TGF

The simulator has its own models for aircraft speed. For best results leave this element blank and let the simulator calculate the speeds. If you enter a speed, it will override the simulator's calculations and the speed will be flown, regardless of the altitude, or maneuver. This may cause unrealistic aircraft performance.

Post Processing

None required.

Example

<StartSpeed Type="TAS" Units="Knots">310</StartSpeed>

5.1.1.8 Target Speed

Tag Name

TargetSpeed

General Description

The TargetSpeed element contains the target speed in units of knots of type True Airspeed. The aircraft will approach this speed after it enters the simulation. It is very important to provide the appropriate speed for the altitude at which the aircraft is entering the simulation. For more information on target speed see TGF Specific Section below.)

After an aircraft starts, it will approach the speed provided in this element.

Maximum

1

Minimum

0

Format

DDD

The format of this element is a three integer digits in units of knots.

Example: 350

Attributes

This element has two attributes that help users to determine the type of speed and the units used.

- *Type* – the type of speed always set to TAS
- *Units* – the units the value is specified in always set to Knots

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

Not used.

TGF

The simulator has its own models for aircraft speed. For best results leave this element blank and let the simulator calculate the speeds. If you enter a speed, it will override the simulator's calculations and the speed will be flown, regardless of the altitude, or maneuver. This may cause unrealistic aircraft performance.

Post Processing

None required.

Example

<TargetSpeed Type="TAS" Units="Knots">230</TargetSpeed>

5.1.1.9 Start Altitude

Tag Name

StartAltitude

General Description

The StartAltitude element contains the TGF starting altitude in units of hundreds of feet. Aircraft departing from an airport with A-, H- and P- type track stars will depart from the airport element elevation. Airport element elevation is provided in the TGF database. For more information on Start Type, please see Section 5.1.1.12.

Maximum

1

Minimum

1

Format

DDD

The format of this element is zero filled, three integer digits, and in units of hundreds of feet.

Example:

- 270
- 050

Attributes

This element has one attribute that help users to determine the units used.

- *Units* – the units the value is specified in always set to HundredsOfFeet

Data Sources

SAR Analysis	No
ETMS extraction	Yes
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

Used as the starting altitude of the simulated aircraft.

Post Processing

NAS

None required.

TGF

For Flight's taking off from a runway at its departure airport the runway's elevation will be used instead of start altitude. It is recommended that in this case the start altitude be set to 000.

Example

<StartAltitude Units="HundredsOfFeet">100</StartAltitude>

5.1.1.10 Interim Altitude

Tag Name

InterimAltitude

General Description

The InterimAltitude element contains a controller-assigned interim altitude. It will be set to zero if no interim altitude exists. The altitudes are in units of hundreds of feet.

Maximum

1

Minimum

0

Format

DDD

The format of this element is zero filled, three integer digits, and in units of hundreds of feet.

Example:

- 270
- 050

Attributes

This element has one attribute that help users to determine the units used.

- *Units* – the units the value is specified in always set to HundredsOfFeet

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

If non-zero, used as NAS element (76) in an interim altitude message issued for this flight. The interim altitude is displayed in the full data block on the controllers display.

TGF

TGF does not currently use this element. This element does not effect the simulation of the flight but it is very important to the process that creates the interfacility flight plan.

Post Processing

None required.

Example

<InterimAltitude Units="HundredsOfFeet">150</InterimAltitude>

5.1.1.11 Target Altitude

Tag Name

TargetAltitude

General Description

The TargetAltitude element represents the altitude to which the aircraft will climb or descend, if it is different from the TGF starting altitude. If no target altitude is supplied then the flight's starting altitude is used. The altitude is in units of hundreds of feet.

Maximum

1

Minimum

0

Format

DDD

The format of this element is zero filled, three integer digits, and in units of hundreds of feet.

Example:

- 270
- 050

Attributes

This element has one attribute that help users to determine the units used.

- Units – the units the value is specified in always set to HundredsOfFeet

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

None Required.

Post Processing

NAS

The following rules apply:

Target altitude will be set to the NAS assigned or interim altitude for Enroute starts.

Target altitude will be set to the ceiling of the initial sector into which the aircraft departs, based on analysis of fix posting areas (FPA) for A-type and H-type track starts. For more information on Start Type, please see Section 5.1.1.12.

Example

<TargetAltitude Units="HundredsOfFeet">240</TargetAltitude>

5.1.1.12 Start Type

Tag Name
StartType

General Description
This element controls the way the aircraft enters the simulation. These start types have been included to provide profiles that support realistic simulations of aircraft as they are started in an exercise.

A - ARTS
The aircraft will depart an airport within an ARTS facility. The data extraction is based on the first operational NAS position that works the aircraft. The aircraft will start at the airport elevation and be climbing.

E - ENROUTE
The aircraft will (generally) be EnRoute from another sector or an adjacent facility.

P - PROPOSAL
The aircraft will depart an airport that is not within an ARTS facility. Therefore, the controller will be required to call for the aircraft to be released. The aircraft will start at the airport elevation and be climbing.

H - HOST/NON-HOST
The aircraft departure message will be processed by an adjacent center that is not in the simulation and passed to a center that is in the simulation.

V - VFR
The aircraft will file for IFR clearance while in the air.

C - DEPARTURE (before the start of simulation, Second Sector)
The aircraft will depart an airport within an ARTS facility before the simulation started and the sector number (Section 5.1.2.6 NAS Sector data element) represents the second sector that would normally work the aircraft. The aircraft should be started at the handoff X/Y position (Section 5.1.2.12 Gate Position data element), at the handoff altitude.

O - Oceanic Arrival
The aircraft is entering the sector of concern from Oceanic Control. TGF will provide the pilot prompt for this aircraft.

K- International Arrival
The aircraft is entering the sector of concern from Canadian or Mexican airspace. TGF will provide the pilot prompt for this aircraft.

Maximum
1

Minimum
0

Format
L

The format for this element is one letter character from the list above.

Example: A

Default Value
A

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS
Determines the way NAS handoffs and departures are handled.

TGF
The Start Type determines whether TGF starts the flight automatically or manually. A manual start requires that a controller clear the aircraft for takeoff. An automatic start does not require a clearance for takeoff.

Post Processing

NAS
The way the aircraft is started on the SIM tape will vary by using the differing start types to best model the actual flights.

TGF
None Required.

Example
<StartType>P</StartType>

5.1.1.13 Navigation Equipment

Tag Name

NavEquip

General Description

The NavEquip element specifies the type of airborne navigation equipment available onboard the aircraft. The following are the valid equipment:

Letter	Definition
A	DME, transponder with Mode C
B	DME, transponder with No Mode C
C	RNAV with LORAN, VOR/DME, or INS, transponder with No Mode C
D	DME, No transponder
E	RNAV with FMS with DME/DME and IRU position updating, transponder with Mode C
F	RNAV with FMS with DME/DME position updating, transponder with Mode C
G	RNAV with GNSS, including GPS or WAAS, with en route and terminal capability, transponder with Mode C
I	RNAV with LORAN, VOR/DME, or INS, transponder with Mode C
J	RNAV with FMS with DME/DME position updating and RVSM, transponder with Mode C
K	RNAV with FMS with DME/DME position updating, and RVSM, transponder with Mode C
L	RNAV with GNSS, including GPS or WAAS, with en route and terminal capability, and RVSM, transponder with Mode C
M	TACAN, No transponder
N	TACAN, transponder with No Mode C
P	TACAN, transponder with Mode C
Q	RNAV with RNP and RVSM, transponder with Mode C
R	RNAV with RNP, transponder with Mode C
S	RNAV, transponder Mode S
T	VOR Only, transponder with No Mode C
U	VOR Only, transponder with Mode C
W	RVSM
X	VOR Only, No transponder
Y	RNAV with LORAN, VOR/DME, or INS , No transponder

For more information on Navigation Equipment Types, please see Table 2-3-8 in 7110 Air Traffic Control Manual at http://www.faa.gov/airports_airtraffic/air_traffic/publications/atpubs/ATC/Chp2/atc0203.html#t1846atc

Maximum
1

Minimum
0

Format

L

Example: B

The format of this element is a single capital character from the list above.

Default Value
A

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS
None required.

TGF
This element is now only used for presentation purposes within PVD. The value in the element will show up on the aircraft id tag on PVD.

Post Processing
None Required.

Example
<NavEquip>A</NavEquip>

5.1.1.14 Navigation Type

Tag Name

NavType

General Description

The NavType element describes the type of navigation model to be used for the flight**.**

The following are the supported types:

- P = Perfect
- G = GPS
- D = DME/DME
- V = VOR/DME

A moderate level of navigation error is supported. Broader modeling is under development.

Maximum

1

Minimum

0

Format

L

The format for this element is a single letter character from the above valid types.

Example: P

Default Value

P

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

This element determines how the aircraft will be controlled by a controller.

Post Processing

None required.

Example

<NavType>P</NavType>

5.1.1.15 Departure Runway

Tag Name

DepartureRunway

General Description

The DepartureRunway element contains the aircraft's departure runway. Aircraft will depart by following the runway heading and will turn to join their route once maneuvering altitude has been achieved.

Maximum

1

Minimum

0

Format

DD["L"|"R"|"C"]

Examples: 09

The format for this element is zero-filled, with two integer digits representing the runway name followed by an optional letter to denote one parallel runway from another.

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

TGF uses the runway name to initialize the flight on the correct runway for departure and provide the initial heading for the flight.

Post Processing

None required.

Example

<DepartureRunway>35R</DepartureRunway>

5.1.1.16 Arrival Runway

Tag Name

ArrivalRunway

General Description

The ArrivalRunway element contains the aircraft's arrival runway. If a Standard Arrival Route (STAR) or Instrument Landing System (ILS) is being used on the approach, an arrival runway is required.

Maximum

1

Minimum

0

Format

DD["L"|"R"|"C"]

Example: 34C

The format for this element is zero-filled, with two integer digits representing the runway name and an optional letter to denote one parallel runway from another.

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

TGF uses the runway name to approach the correct runway and determine if the aircraft is landing.

Post Processing

None required

Example

<ArrivalRunway>36L</ArrivalRunway>

5.1.1.17 Route

Tag Name

Route

General Description

The Route element contains the TGF route of flight. This is a list of navigational fixes and airways that make up the route the aircraft will travel. The aircraft will start at the initial fix and continue following each step of the flight plan until it terminates or lands at the final fix. Please see Section 7 for more information on Routes.

Maximum

1

Minimum

1

Format

Valid characters for this element are [A-Z, 0-9, space, equals, dot, semi-colon, left square bracket, right square bracket, forward slash, and comma].

Data Sources

SAR Analysis	Yes
ETMS extraction	Yes
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

Used as the TGF route of flight.

Post Processing

None required.

Example

<Route>LEJOY..AVERE..EWC185026..KODIE..LIVER..EWC282043..DJB..TRYBE..GEMNI..MUSCA..GLOZE..DTW</Route>

5.1.1.18 Ground Arrival Route

Tag Name

GroundArrivalRoute

General Description

The GroundArrivalRoute element contains a list of fixes on the ground or taxiway names. The aircraft will start at the initial fix and continue following each step of the ground route until it terminates or it reaches the final fix. Please see Section 7 for more information on Routes.

Maximum

1

Minimum

0

Format

Valid characters for this element are [A-Z, 0-9, space, equals, dot, semi-colon, left square bracket, right square bracket, forward slash, and comma].

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

This element is used to move a flight around on the ground at its Arrival Airport.

Post Processing

None required.

Example

<GroundArrivalRoute>15R5C.EN12.V165.V157.V735</GroundArrivalRoute>

5.1.1.19 Ground Departure Route

Tag Name

GroundDepartureRoute

General Description

The GroundDepartureRoute element contains a list of fixes on the ground or taxiway names. The aircraft will start at the initial fix and continue following each step of the ground route until it terminates, takes off, or it reaches the final fix. Please see Section 7 for more information on Routes.

Maximum

1

Minimum

0

Format

Valid characters for this element are [A-Z, 0-9, space, equals, dot, semi-colon, left square bracket, right square bracket, forward slash, and comma].

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

This element is used to move a flight around on the ground at its Departure Airport.

Post Processing

None required.

Example

<GroundDepartureRoute>V145.C.V446.D.ED3.271C</GroundDepartureRoute>

5.1.2 NAS Section

Tag Name

Nas

Description

The Nas element contains NAS information about a flight. This element contains the following child elements:

1. NasRoute (Please see Section 5.1.2.1 for more information.)
2. Cid (Please see Section 5.1.2.2 for more information.)
3. CoordinationFix (Please see Section 5.1.2.3 for more information.)
4. CoordinationTime (Please see Section 5.1.2.4 for more information.)
5. TrackControl (Please see Section 5.1.2.5 for more information.)
6. Sector (Please see Section 5.1.2.6 for more information.)
7. FiledSpeed (Please see Section 5.1.2.7 for more information.)
8. FiledAltitude (Please see Section 5.1.2.8 for more information.)
9. HandOffAltitude (Please see Section 5.1.2.9 for more information.)
10. AssignedAltitude (Please see Section 5.1.2.10 for more information.)
11. StartPosition (Please see Section 5.1.2.11 for more information.)
12. GatePosition (Please see Section 5.1.2.12 for more information.)
13. NasStartTime (Please see Section 5.1.2.13 for more information.)
14. HandOffTime (Please see Section 5.1.2.14 for more information.)
15. HandOffAcceptTime (Please see Section 5.1.2.15 for more information.)
16. FlightDurationTime (Please see Section 5.1.2.16 for more information.)
17. Remarks (Please see Section 5.1.2.17 for more information.)

Maximum

1

Minimum

0

Example

```
<Nas>
  <NasRoute>DTW./.RODO26009..ROD..FLM..AZQ200008..AMG.LEESE9.MCO</NasRoute>
  <Cid>135</Cid>
  <CoordinationFix>RODO26009</CoordinationFix>
  <CoordinationTime>0005</CoordinationTime>
  <TrackControl>98</TrackControl>
  <Sector>98</Sector>
  <FiledSpeed Type="TAS" Units="Knots">463</FiledSpeed>
  <FiledAltitude Units="HundredsOfFeet">330</FiledAltitude>
  <HandOffAltitude Units="HundredsOfFeet">33300</HandOffAltitude>
  <AssignedAltitude Units="HundredsOfFeet">33000</AssignedAltitude>
  <StartPosition>
    <StartX>298.6482</StartX>
    <StartY>315.1191</StartY>
  </StartPosition>
  <GatePosition>
    <GateX>298.6482</GateX>
    <GateY>315.1191</GateY>
  </GatePosition>
  <NasStartTime>000500</NasStartTime>
  <HandOffTime>000600</HandOffTime>
  <HandOffAcceptTime>000700</HandOffAcceptTime>
  <FlightDurationTime>010000</FlightDurationTime>
  <Remarks>Sample flight plan</Remarks>
</Nas>
```

Figure 4 A sample Nas element

5.1.2.1NAS Route

Tag Name

NasRoute

General Description

The NasRoute element contains the NAS route of flight. This is a list of navigational fixes and airways that make up the route the aircraft will travel. The aircraft will start at the initial fix and continue following each step of the flight plan until it terminates or lands at the final fix.

Maximum

1

Minimum

0

Format

Up to 48 elements as described in NAS documentation.

Data Sources

SAR Analysis	Yes
ETMS extraction	Yes
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

Used as the route element (10) of the NAS flight plan for this aircraft.

TGF

Used as input to a process that creates the TGF flight plan.

Post Processing

NAS

None required.

TGF

This element is validated, conversions are performed, and runway, heading, and altitude date are added to the flight plan.

Example

<NasRoute>CLE..ACO..AIR.J162.MGW..ESL..IAD</NasRoute>

5.1.2.2 Computer ID

Tag Name

Cid

General Description

This element contains a unique numeric identifier for this flight.

Maximum

1

Minimum

0

Format

DDD

The format of this element is zero filled, with three integer digits.

Example:

- 270
- 050

Data Sources

SAR Analysis	Yes (Typically, the CID is supplied by a SAR tape.)
ETMS extraction	Yes
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

This element is used to specify multiple flight plans for a single ACID.

TGF

This element is used to specify multiple flight plans for a single ACID.

Post Processing

None required.

Example

<Cid>142</Cid>

5.1.2.3 Coordination Fix

Tag Name

CoordinationFix

General Description

This element contains the fix in relation to which facility/sector will handoff, transfer control, or coordinate flight progress data. It represents the point where coordination should occur. For airport departures of the A- and P-type, this would be the airport fix. For more information on Start Type, please see Section 5.1.1.12.

Maximum

1

Minimum

0

Format

The format of this element is up to fifteen alphanumeric characters.

Example: POLUX180035

Data Sources

SAR Analysis	Yes
ETMS extraction	Yes
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

Used as the coordination fix element (6) in the NAS filed flight plan.

TGF

The coordination fix may appear in the TGF route of flight.

Post Processing

NAS

None required.

TGF

Any NAS "tailoring" is removed and the coordination fix is used as the first step in generating the route of flight.

Example

<CoordinationFix>HAPPY</CoordinationFix>

5.1.2.4 Coordination Time

Tag Name

CoordinationTime

General Description

The CoordinationTime element contains the estimated time at the coordination fix (data element 23) for E-type track starts. For P- and A-type track starts, it contains the proposed track start time for the aircraft. For more information on Start Type, please see Section 5.1.1.12.

Maximum

1

Minimum

0

Format

HHMM

The format of this element is four integer digits representing HHMM.

Example: 1223

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

Used as the coordination time element in the NAS filed flight plan.

TGF

None required.

Post Processing

NAS

Rule: the track start time will be used.

TGF

None required.

Example

<CoordinationTime>1223</CoordinationTime>

5.1.2.5 Track Control

Tag Name

TrackControl

General Description

The TrackControl element represents the sector that controlled the flight before the flight entering the simulation.

Maximum

1

Minimum

0

Format

DDD

The format of this element is zero filled, with three integer digits.

Example: 001

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

If the previous sector is in the simulation, a force message is issued to display the full data block on the previous sector's display. The aircraft is under control of the previous sector, but has bee handed off and has switched its radio frequency over to the sector of concern.

TGF

None required.

Post Processing

NAS

The sector (data element 11) will be used.

TGF

None required.

Example

<TrackControl>001</TrackControl>

5.1.2.6 Sector

Tag Name

Sector

General Description

The Sector element represents the initial (controlling) sector that will work the aircraft.

Maximum

1

Minimum

0

Format

DD

The format of this element is zero filled, with two digits.

Example: 02

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

Used as the sector to receive control of this aircraft.

TGF

None required.

Post Processing

None required.

Example

<Sector>01</Sector>

5.1.2.7 Filed Speed

Tag Name

FiledSpeed

General Description

The FiledSpeed element contains the speed "as filed" in a NAS flight plan. The speed is of type True Airspeed in units of knots.

Maximum

1

Minimum

0

Format

DDD

The format of this element is zero filled, with three digits, and in knots.

Example:

- 270
- 050

Attributes

This element has two attributes that help users to determine the type of speed and the units used.

- *Type* – the type of speed always set to TAS
- *Units* – the units the value is specified in always set to Knots

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

Used as the airspeed element (5) of the NAS filed flight plan.

TGF

None required.

Post Processing

None required.

Example

<FiledSpeed Type=”TAS” Units=”Knots”>350</FiledSpeed>

5.1.2.8 Filed Altitude

Tag Name

FiledAltitude

General Description

The FiledAltitude element contains the altitude filed in element 8 or 9 of the NAS filed flight plan and may contain a block altitude. The altitude is in units of hundreds of feet.

Maximum

1

Minimum

0

Format

DDD["B"DDD]

The format of this element is zero filled, with at least three digits. A maximum of seven characters is permitted in this element. Altitude is in hundreds of feet.

Example:

- 350
- 040
- 170B190

Attributes

This element has one attribute that help users to determine the units used.

- Units – the units the value is specified in always set to HundredsOfFeet

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

This element is used as element 8 or 9 of NAS filed flight plan.

TGF

None required.

Post Processing

None required.

Example

<FiledAltitude Units=”HundredsOfFeet”>170</FiledAltitude>

5.1.2.9 Hand Off Altitude

Tag Name

HandOffAltitude

General Description

The HandOffAltitude element represents the altitude at which the aircraft was handed into the sector of concern, or the elevation of the aircraft at the gate fix, if needed. The altitude is in units of hundreds of feet. This element is also used as the gate altitude of an A- or H-type start that is using the gate position to simulate departure gating at an ARTS facility that is not controlled as part of the simulation. For more information on the Gate Position element, please see Section 5.1.2.12. For more information on Start Type, please see Section 5.1.1.12.

Maximum

1

Minimum

0

Format

DDD

The format of this element is zero filled, three integer digits, and in units of hundreds of feet.

Example:

- 270
- 050

Attributes

This element has one attribute that help users to determine the units used.

- Units – the units the value is specified in always set to HundredsOfFeet

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

Used as an interim altitude at the gate fix for A- and H-type starts. For more information on Start Type, please see Section 5.1.1.12.

Post Processing

None required.

Example

<HandOffAltitude Units="HundredsOfFeet">420</HandOffAltitude>

5.1.2.10 Assigned Altitude

Tag Name

AssignedAltitude

General Description

This element represents the aircraft's NAS altitude restriction, if an assigned altitude has been entered for the aircraft that differs from the filed altitude. The altitude is in units of hundreds of feet.

Maximum

1

Minimum

0

Format

DDD

The format of this element is zero filled, with three integer digits in units of hundreds of feet.

Example:

- 270
- 050

Attributes

This element has one attribute that help users to determine the units used.

- Units – the units the value is specified in always set to HundredsOfFeet

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

If the NAS interim altitude does not apply and the assigned altitude differs from filed altitude, this element is used as NAS element (76) in an interim altitude message.

TGF

None required.

Post Processing

NAS

Rule: TGF target altitude will be used if element is left blank.

TGF

None required.

Example

<AssignedAltitude Units=”HundredsOfFeet”>270</AssignedAltitude>

5.1.2.11 Start Position

Tag Name

StartPosition

Description

The StartPosition element contains information about the position at which a flight first appeared on the indicated sector's PVD. This element contains the following child elements:

1. StartX (Please see Section 5.1.2.11.1 for more information.)
2. StartY (Please see Section 5.1.2.11.2 for more information.)

Maximum

1

Minimum

0

Example

```
<StartPosition>
  <StartX>298.6482</StartX>
  <StartY>315.1191</StartY>
</StartPosition>
```

Figure 5 A sample StartPosition element

5.1.2.11.1 Start X

Tag Name

StartX

General Description

The StartX element represents the X-coordinate at which the aircraft first appeared on the indicated sector's PVD.

Maximum

1

Minimum

1

Format

[D][D]D["."D[D][D]]

This element is a decimal number with up to seven characters, at least one digit but can be up to three digits before and up to three after the decimal point.

Example:

- 121.125
- 123
- 1.1

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

Used as the X position of the track start point for the aircraft. This is the original handoff position, rounded to the nearest eight nautical miles.

TGF

Used as the X position of the aircraft's start point.

Post Processing

NAS

Rule: The coordination fix X will be used to fill in this element.

TGF

Rule: The coordination fix X will be used to fill in this element.

Example

<StartX>121.125</StartX>

5.1.2.11.2 Start Y

Tag Name

StartY

General Description

The StartY element represents the Y-coordinate at which the aircraft first appeared on the indicated sector's PVD.

Maximum

1

Minimum

1

Format

[D][D]D["."D[D][D]]

This element is a decimal number with up to seven characters, at least one digit but can be up to three digits before and up to three after the decimal point.

Example:

- 121.125
- 123
- 1.1

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

Used as the Y position of the track start point for the aircraft. This is the original handoff position, rounded to the nearest eight nautical miles.

TGF

Used as the Y position of the aircraft's start point.

Post Processing

NAS

Rule: The coordination fix Y will be used to fill in this element.

TGF

Rule: The coordination fix Y will be used to fill in this element.

Example

<StartY>121.125</StartY>

5.1.2.12 Gate Position

Tag Name

GatePosition

Description

The GatePosition element contains information the position of a flight's departure gate. This position is used to simulate the departure gates of an ARTS facility. This element contains the following child elements:

1. GateX (Please see Section 5.1.2.12.1 for more information.)
2. GateY (Please see Section 5.1.2.12.2 for more information.)

Maximum

1

Minimum

0

Example

```
<GatePosition>
  <GateX>298.6482</GateX>
  <GateY>315.1191</GateY>
</GatePosition>
```

Figure 6 A sample GatePosition element

5.1.2.12.1 Gate X

Tag Name

GateX

General Description

The GateX element represents the X-position of the departure gate used by the aircraft and is only used with A- and H-type track starts. This element is used to simulate the departure gates of an ARTS facility. If this element is used, the handoff altitude element should be set to the desired gate crossing altitude. For more information on Start Type, please see Section 5.1.1.12.

Maximum

1

Minimum

1

Format

[D][D]D["."D[D][D]]

This element is a decimal number with up to seven characters, at least one digit but can be up to three digits before and up to three after the decimal point.

Example:

- 121.125
- 123
- 1.1

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

The gating fix is inserted into the route of flight to simulate gating on departures that are not on the Standard Instrument Departure (SID). The handoff X position is also supplied, but this is not always suitable for use as the gate X position.

Post Processing

NAS

None required.

TGF

If a Fix Radial Distance (FRD) was specified, it will be converted into X/Y's and the X will be used in this element. This data will be checked to see that the gate X/Y fits into the flight plan.

Example

<GateX>153.125</GateX>

5.1.2.12.2 Gate Y

Tag Name

GateY

General Description

The GateY element represents the Y-position of the departure gate used by the aircraft and is only used with A- and H-type track starts. This element is used to simulate the departure gates of an ARTS facility. If this element is used, the handoff altitude element should be set to the desired gate crossing altitude. For more information on Start Type, please see Section 5.1.1.12.

Maximum

1

Minimum

1

Format

[D][D]D["."D[D][D]]

This element is a decimal number with up to seven characters, at least one digit but can be up to three digits before and up to three after the decimal point.

Example:

- 121.125
- 123
- 1.1

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

The gating fix is inserted into the route of flight to simulate gating on departures that are not on the Standard Instrument Departure (SID). The handoff Y position is also supplied, but this is not always suitable for use as the gate Y position.

Post Processing

NAS

None required.

TGF

If an FRD was specified, it will be converted into X/Y's and the Y will be used in this element. This data will be checked to see that the gate X/Y fits into the flight plan.

Example

<GateY>153.125</GateY>

5.1.2.13 NAS Start Time

Tag Name

NasStartTime

General Description

The NasStartTime element represents the time the aircraft will start on the TGF simulation pilot displays and the time that the NAS track will be started.

Maximum

1

Minimum

0

Format

HHMMSS

The format of this element is zero filled, and a six-digit integer number.

Example:

- 123456

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

Used as NAS element (2) in a track start message issued for this aircraft.

TGF

Used as the start time of the aircraft.

Post Processing

None required.

Example

<NasStartTime>123332</NasStartTime>

5.1.2.14 Hand Off Time

Tag Name

HandOffTime

General Description

The HandOffTime element represents the actual time that handoff was initiated into the sector of concern.

Maximum

1

Minimum

0

Format

HHMMSS

The format of this element is zero filled, and a six-digit integer number.

Example: 123456

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

Used as the time to initiate handoff of the aircraft into the sector of concern.

TGF

None required.

Post Processing

NAS

Rule: The track start time plus 1 minute will be used.

TGF

None required.

Example

<HandOffTime>123456</HandOffTime>

5.1.2.15 Hand Off Accept Time

Tag Name

HandOffAcceptTime

General Description

The HandOffAcceptTime element represents the time the receiving controller accepted the handoff.

Maximum

1

Minimum

0

Format

HHMMSS

The format of this element is zero filled, and a six-digit integer number.

Example: 123456

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	No
Customer Supplied	No

Specific Usage

None required.

Post Processing

None required.

Example

<HandOffAcceptTime>123456</HandOffAcceptTime>

5.1.2.16 Flight Duration Time

Tag Name

FlightDurationTime

General Description

The FlightDurationTime element provides a time at which to send an RS message to NAS for the removal of flight data for this flight.

Maximum

1

Minimum

0

Format

HHMMSS

The format of this element is zero filled, and a six-digit integer number.

Example: 23456

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

This element is used to provide a time in which to send an RS message to NAS essentially terminating the aircraft from the PVD.

TGF

None required.

Post Processing

None required.

Example

<FlightDurationTime>123456<FlightDurationTime>

5.1.2.17 Remarks

Tag Name

Remarks

General Description

The Remarks element contains remarks for the NAS flight plan.

Maximum

1

Minimum

0

Format

Alphanumeric, the length of this element and the route element combined must not exceed 250 characters. The Remarks element may contain both upper and lower case alphabetic characters.

Example: H36, N25

Data Sources

SAR Analysis	Yes
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

NAS

Used solely by NAS to contain remarks needed in building NAS simulation tapes.

TGF

None required.

Post Processing

None required.

Example

<Remarks>H36, N25</Remarks>

5.1.3 ARTS Section

Tag Name

Arts

Description

The Arts element contains information used to by ARTS to make an interfacility flight plan.

Maximum

1

Minimum

0

Example

```
<Arts>
  <FixPair>
    <Fix1>ROD</Fix1>
    <Fix2>FLM</Fix2>
  </FixPair>
</Arts>
```

Figure 7 A Sample Arts element

5.1.3.1 Fix Pair

Tag Name

FixPair

Description

The FixPair element contains information a pair of fixes that is used for interfacility flight plans. This element contains the following child elements:

1. Fix1 (Please see Section 5.1.3.1.1 for more information.)
2. Fix2 (Please see Section 5.1.3.1.2 for more information.)

Maximum

1

Minimum

0

Example

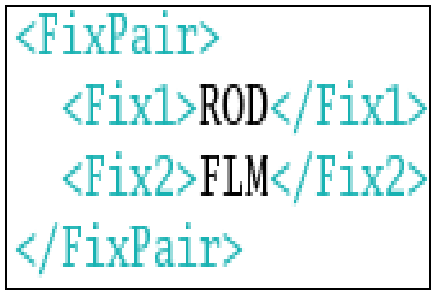

Figure 8 A sample FixPair element

5.1.3.1.1 Fix 1

Tag Name

Fix1

General Description

The Fix1 element contains the initial fix of a fix pair.

Maximum

1

Minimum

1

Format

This element contains up to fifteen alphanumeric characters.

Example: POLUX180035

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

ARTS

This element is used to provide the initial fix of a fix pair for interfacility flight plans.

TGF

None Required

Post Processing

None required.

Example

<Fix1>POLUX</Fix1>

5.1.3.1.2 Fix 2

Tag Name

Fix2

General Description

The Fix2 element contains the destination fix of a fix pair.

Maximum

1

Minimum

1

Format

This element contains up to fifteen alphanumeric characters.

Example: POLUX180035

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

ARTS

This element is used to provide the destination fix of a fix pair for interfacility flight plans.

TGF

None Required

Post Processing

None required.

Example

<Fix2>POLUX</Fix2>

5.1.4 Project Specific Section

Tag Name

ProjectSpecific

Description

The ProjectSpecific element contains information special uses as needed for a given project. This element contains the following child elements:

1. Datalink (Please see Section 5.1.4.1 for more information.)
2. Adsb (Please see Section 5.1.4.2 for more information.)
3. AdsbLink (Please see Section 5.1.4.3 for more information.)
4. Cdti (Please see Section 5.1.4.3 for more information.)
5. Lifeguard (Please see Section 5.1.4.5 for more information.)

Maximum

1

Minimum

0

Example

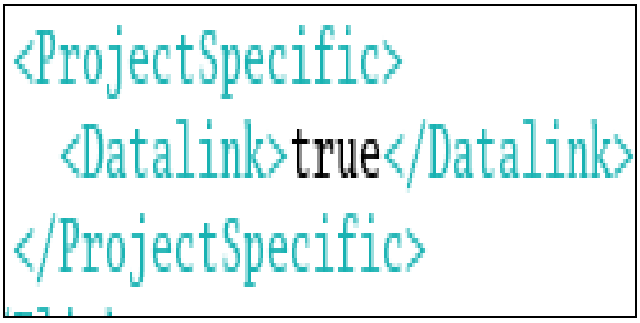

Figure 9 A sample ProjectSpecific element

5.1.4.1 Datalink

Tag Name

Datalink

Description

The Datalink element contains whether a flight has Datalink equipment.

Maximum

1

Minimum

0

Format

Either “true” or “false”

Default Value

false

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	Yes
Customer Supplied	Yes

Specific Usage

NAS

None required.

TGF

This element is used by TGF to determine the following:

1. Whether an aircraft should be told to monitor or contact a controller when the aircraft changes frequencies.

2. Determines whether Datalink messages sent to an aircraft are ignored.

Post Processing

None required.

Example

<Datalink>true</Datalink>

5.1.4.2 Automatic Dependent Surveillance-Broadcast

Tag Name

Adsb

Description

The Adsb element contains a flight's ADSB equipage.

Maximum

1

Minimum

0

Format

One of the following values:

- None
- In
- Out
- Both

Default Value

None

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

None required.

Post Processing

None required.

Example

<Adsb>In</Adsb>

5.1.4.3 ADS-B Link

Tag Name

AdsbLink

Description

The AdsbLink element contains a flight's ADS-B Communications link.

Maximum

1

Minimum

0

Format

One of the following values:

- None
- UAT
- 1090ES
- Both

Default Value

None

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

None required.

Post Processing

None required.

Example

<AdsbLink>UAT</AdsbLink>

5.1.4.4 Cockpit Display of Traffic Information

Tag Name

Cdti

Description

The Cdti element contains whether a flight has cockpit information display equipment.

Maximum

1

Minimum

0

Format

Either “true” or “false”

Default Value

false

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

None required.

Post Processing

None required.

Example

<Cdti>true</Cdti>

5.1.4.5 Lifeguard

Tag Name

Lifeguard

Description

The Lifeguard element contains whether a flight is carrying donor organs or on an urgent medical mission and will require expeditious handling.

Maximum

1

Minimum

0

Format

Either “true” or “false”

Default Value

false

Data Sources

SAR Analysis	No
ETMS extraction	No
TGF Automation	No
Customer Supplied	Yes

Specific Usage

None required.

Post Processing

None required.

Example

<Lifeguard>true</Lifeguard>

6 Supporting Files

The following XML files contain data that is used in conjunction with the Flight Plan:

1. Aircraft Baseline – contains aircraft performance data. Typically, in a file called AircraftBaseline.xml.

2. Airports – contains airport, runway, and approach data. Typically, in a file called Airport.xml.

3. Fix – contains data on fixes used to fly in the air. Typically, in a file called Fix.xml.

4. Ground Fix – contains data on fixes used to taxi around on the ground. Typically, in a file called GroundFix.xml.

5. Ground Fix Connections – contains data on how ground fixes are connected. Typically, in a file called GroundFixConnections.xml.

6. Ground Route – contains data on taxiways. Typically, in a file called GroundRoute.xml.

7. Ground Route Intersections – contains data on where taxiways intersect. Typically, in a file called GroundRouteIntersections.xml.

8. Route – contains data on jet route and airways. Typically, in a file called Route.xml.

9. Sector – contains sector names and frequencies. Typically, in a file called Sector.xml.

10. Sid – contains data on standard instrument departure routes. Typically, in a file called SidRoute.xml.

11. Star – contains data on standard terminal arrival routes. Typically, in a file called StarRoute.xml.

For more information on these XML files, please see the TGF User Manual at http://public.tgf.tc.faa.gov/documentation/eco/ecomanual.html.

7 Creating a Route

This section explains how to create a TGF/Ground Route.

7.1 A few Route terms

This section explains a few terms used.

7.1.1 Fix

A Fix is a physical radio beacon located on the ground at a specific geographic point. This type of fix is a VOR (VHF Omni-directional Range). A three-letter identifier always refers to a fix in a flight plan (e.g. PKD).

7.1.2 Waypoint

A Waypoint is a specific geographic point in space. This type of fix is always referred to by a five-letter identifier in a flight plan (e.g. VALOR).

7.1.3 Fix Radial Distance

An Fix Radial Distance (FRD) is a fix that is determined by referring to another fix's position, a certain radial from that fix, and a certain distance from that fix (e.g. PKD035025 is a point located 35 degrees and 25 miles from PKD).

7.1.4 Airway

An Airway is a unidirectional route in the air. Airways are laid out between fixes.

7.1.5 Jet Route

A Jet Route is a bidirectional route in the air. Jet routes are laid out between fixes.

7.1.6 Standard Instrument Departure

A Standard Instrument Departure (SID) is a route an aircraft will follow immediately upon take-off.

7.1.7 Standard Terminal Arrival Route

A Standard Terminal Arrival Route (STAR) is a route the aircraft can follow to its arrival airport.

7.1.8 Ground Fix

A Ground Fix is a Fix/Waypoint that is located on the ground.

7.1.9 Taxiway

A Taxiway is a path on the ground at an airport connecting runways with ramps, hangars, terminals, and other facilities using ground fixes.

7.2 The differences between a TGF Route and a Ground Route

There are the following differences between a TGF Route and a Ground Route:

1. A TGF Route is used by flights that are in the sky, while a Ground Route is used by flights on the ground. If a user attempts to use the wrong kind of route, they will receive an error message and the route will be ignored.

2. Once a flight has reached the end of its filed TGF Route the flight will terminate. However, once a flight has reached the end of its ground route the flight will hold at the end ground fix and await further instructions.

3. A Flight that starts on a Ground Route does not start moving until instructed to.

4. A Ground Route can have Taxiway.Taxiway.GroundFix, so long as the two taxiways are connected some how and the direction to go on the second taxiway is specified using a Ground Fix.

7.3 Basic TGF/Ground route

TGF expects a filed route to be a string of fixes (e.g. waypoints, FRD's, VOR's) separated by a double dot.

.

For example: **PKD..VALOR..PKD035025**

The above route instructs TGF to fly from PKD to VALOR to PKD035025. The flight will terminate at PKD035025. This is the simplest type of filed route. The aircraft will simply fly point to point.

Ground Routes work similar to a route, while the ground route is a string of ground fixes separated by a single dot.

For example:

V201.V213.V165.V159.V155.V1370.V1828.V1834.V217.V137.EF4.EF3.V770.V96 .EF2.4R8C.22L5C.22L4C.33R1C

The above ground route move from ground fix to ground fix.

7.4 Adding a Route/Taxiway to a TGF/Ground route

Airways and Jet ways are added by using the name of the Airway/Jet way in the TGF Route and providing an entry fix before the Airway/Jet way name and exit fix after the Airway/Jet way name. The preceding and following fix must be a valid fix on the Airway/Jet way. There are no special separators to worry about, just continue separating pieces of the flight plan with a single dot (".").

For example: **PKD..VALOR.J31.PKD035025**

The above route instructs TGF to fly from PKD to VALOR, an entry fix for J31, and join Jet way J31 heading in the direction of the exit fix PKD035025. The flight will terminate at PKD035025.

Ground Routes work similar to TGF Routes except for the fact that they use ground fixes and taxiway names.

For example: SPOT4**.E.ED3.271C**

Instructs to TGF to have an aircraft on the ground enter taxiway E at ground fix SPOT4 and follow to ground fix ED3 from there go to ground fix 271C. However, unlike a normal TGF route when the end of ground route is reached an aircraft will hold at the end fix and await further instructions.

7.5 Bracket Logic

TGF will fly the above flight plans automatically without intervention from pilots. If desired the controller can call the pilot and cause a change in the dynamics of the aircraft (e.g. heading, speed, and altitude). If an aircraft is expected to make changes to speed, altitude or heading without controller intervention; bracket logic can be used to effect these changes.

The brackets [ ] are inserted between the fix to which the logic is being applied and the separating dot.

For example: **PKD[cmd = x VALOR a080 s250]..VALOR..PKD035025**

TGF will attempt to cross VALOR at 250 knots and 8000 ft.

Another example: **PKD..VALOR[cmd = h340]..PKD035025**

The above flight plan will cause TGF to leave the flight plan at VALOR and continue the flight on a vector of 340 degrees. The flight plan cannot be resumed unless directed by a controller to resume flight plan. In which case the aircraft will turn to the next fix in the flight plan no matter where that fix is located.

In most cases, bracket logic is used to restrict the crossing of a fix at certain speeds and altitudes, or to cause an aircraft to fly a SID without controller intervention.

The bracket logic command format is as follows:

CMD=<SimPilot Command>

To specify multiple commands in a single bracket separate the commands with a space.

BWI..PKD..VALOR[cmd=s250 a080]..PKD035025.DUPNT3.PHL

The above flight plan instructs TGF to depart BWI proceed to PKD, cross VALOR at 250 knots and 8000 ft, proceed to PKD035025, an entry fix for DUPNT3, and head in the direction of the exit fix PHL.

Any SimPilot command can be executed with bracket logic. For more information on SimPilot commands, please see the Sim-Pilot Operations Guide at http://public.tgf.tc.faa.gov/.

8 Support Elements

The main part of a flight plan is the route of flight. However, many other elements support the route of flight and allow more control over how the aircraft will behave in the simulation. This section should help explain how to use these support elements to achieve desired realistic effects.

The elements that must be completed to create a valid flight plan have element names beginning with **TGF**. The element format and content is explained in Data Description section, the following is a list of previously experienced air traffic control situations and how they were accommodated in the flight plans.

8.1 Call for release

Change the StartType element to “P”. For more information on the StartType element see Section 5.1.1.12.

8.2 Ghost sectors and Frequency element

Since representing all the sectors involved in real air traffic control can become a costly challenge it is often decided to simplify the simulation by combining many sectors into one or more ghost sectors operated by a controller to hand the aircraft off to a controlled sector. Every controlled sector and these ghost sectors must be represented by a unique VHF frequency. This frequency is entered Frequency into the element. For more information on the Frequency element please Section 5.1.1.6.

8.3 Starting at an altitude and climbing or descending

There is often a need for aircraft to start at one altitude and be changing altitude. This is achieved by using the StartAltitude and TargetAltitude elements. Enter the start and target altitudes into their respective elements. If an aircraft is to initiate into level flight enter the altitude into the StartAltitude element and leave TargetAltitude element blank. For more information on the StartAltitude element please see Section 5.1.1.9. Please see Section 5.1.1.11 for more information on the TargetAltitude element.

8.4 Approaches other than ILS and RNAV

Currently, TGF only supports ILS and RNAV approaches. Other types of approaches have been simulated by creating an imaginary ILS, either along the runway centerline or along some approach path to an airport.

TGF also can simulate a visual approach by setting up a PVD workstation between two SimPilots. A controller can then watch the aircraft as they approach the airport and give the necessary commands to the pilots. The result is a realistic visual approach as seen by the terminal controller.

8.5 Multiple traffic volumes and complexity levels

It is possible to create different volumes of traffic by assigning complexity levels to the flight plan. Begin by making your smallest sample and assigning complexity level 1 to these flight plans. When you add more traffic increase the complexity level assigned to these flight plans. Repeat this process for each successive addition of traffic. There is a limit of 5 levels of complexity. When all the traffic has been added it is now possible to run the entire sample by selecting the highest complexity or a fraction of the sample by selecting the appropriate complexity level at the start of a TGF scenario. For more information on setting complexity see the Complexity element in Section 5.1.1.3.

9 Summary of XML flight plan elements

The following table contains a summary of all the XML flight plan elements. It contains the tag name of the element, the minimum and maximum number of times an element appears inside of its parent element, the type of data (if any) the element contains, and a brief description of the element.

Tag Name	Min	Max	Data Type	Description
Flights	1	1	N/A	Root Element that contains all the flight data to load into a scenario
Flight	1	None	N/A	Contains data for an individual flight
Tgf	1	1	N/A	Contains TGF data about a flight
TgfStartTime	1	1	Numeric	Start Time in HH:MM:SS
Acid	1	1	Alphanumeric	Aircraft Identification
Complexity	0	1	Numeric	Complexity level assigned to flight
AcType	1	1	Alphanumeric	aircraft Type identifier
Beacon	1	1	Numeric	Beacon code assigned to flight
Frequency	0	1	Numeric	Initial controlling frequency Speed of aircraft at start of Sim
StartSpeed	0	1	Numeric	Speed of aircraft at start of flight
TargetSpeed	0	1	Numeric	Speed to approach after starting
StartAltitude	1	1	Numeric	Starting altitude of flight
InterimAltitude	0	1	Numeric	Controller assigned interim altitude
TargetAltitude	0	1	Numeric	Altitude to approach after starting
StartType	0	1	Alpha	Denotes how the flight should start (Hold for release, Automatic etc.)
NavEquip	0	1	Alpha	Denotes navigation equipment in use
NavType	0	1	Alpha	Denotes navigation rules to follow
DepartureRunway	0	1	Numeric	Departure Runway name
ArrivalRunway	0	1	Numeric	Arrival Runway name
Route	1	1	Alphanumeric	Route of flight in TGF format
GroundArrivalRoute	0	1	Alphanumeric	Route to follow on ground in TGF format
GroundDepartureRoute	0	1	Alphanumeric	Route to follow on ground in TGF format
Nas	0	1	N/A	Contains NAS data about a flight

NasRoute	0	1	Alphanumeric	Route of flight in NAS format
Cid	0	1	Numeric	Unique numeric identifier for flight
CoordinationFix	0	1	Alphanumeric	PVD coordination point
CoordinationTime	0	1	Numeric	PVD coordination time
TrackControl	0	1	Numeric	Sector previously controlling flight
Sector	0	1	Numeric	Sector to control flight
FiledSpeed	0	1	Numeric	NAS filed true airspeed
FiledAltitude	0	1	Numeric	NAS field 8 or 9
HandOffAltitude	0	1	Numeric	Altitude aircraft is handed off
AssignedAltitude	0	1	Numeric	NAS altitude restriction
StartPosition	0	1	N/A	Contains the start position of a flight
StartX	1	1	Numeric	X-Coord. on PVD at start of flight
StartY	1	1	Numeric	Y-Coord. on PVD at start of flight
GatePosition	0	1	N/A	Contains the position of a flight's departure gate
GateX	1	1	Numeric	X-Coord. of departure gate
GateY	1	1	Numeric	Y-Coord. of departure gate
NasStartTime			Numeric	Start time in HHMMSS
HandOffTime	0	1	Numeric	Hand off time in HHMMSS
HandOffAcceptTime	0	1	Numeric	Hand off accept in HHMMSS
FlightDurationTime	0	1	Numeric	Length of flight in HHMMSS
Remarks	0	1	Alphanumeric	NAS remarks for Sim Tape
Arts	0	1	N/A	Contains ARTS data about a flight
FixPair	0	1	N/A	Contains a pair of interfacility fixes
Fix1	1	1	Alphanumeric	First fix of interfacility fix pair
Fix2	1	1	Alphanumeric	Second fix of interfacility fix pair
ProjectSpecific	0	1	N/A	Contains project specific data about a flight
Datalink	0	1	Boolean	Contains whether a flight is Datalink equipped
Adsb	0	1	Alpha	Contains the type of ADSB equipment a flight has
AdsbLink	0	1	Alphanumeric	Contains the type of ADSB Link equipment a flight has
Cdti	0	1	Boolean	Contains whether a flight has cockpit display information equipment

Lifeguard	0	1	Boolean	Contains whether a flight is a lifeguard flight

10 Sample files

This Section contains the following sample data files:

1. Section 10.1 - Sample CSV flight plan files
2. Section 10.2 - Sample XML flight plan files
3. Section 0 - An XML Sim Event file

10.1 Sample CSV flight plan files

This section contains sample CSV flight plan files.

10.1.1 CSV Sample

```
00:05:00,NWA834,1,L/B752,5761,128775,463,463,333,0,330,E,A,P,Y,Y,N,,,ROD026009.R
OD.FLM.AZQ200008,DTW./.ROD026009..ROD..FLM..AZQ200008..AMG.LEESE9.MCO,135,ROD026
009,0005,98,98,463,330,33300,33000,298.6482,315.1191,298.6482,315.1191,000500,00
0600,000700,010000,ROD,FLM,DATALINK,Sample flight plan
```

Figure 10 A sample CSV flight plan file

10.1.2 CSV Sample with ground routes

```
00:00:01,N964FL,1,P28A,4202,120080,,,000,000,030,A,R,P,Y,Y,N,33R,,BOS.MALDY.SWIG
G.PVD.JFK,BOS..MALDY..SWIGG..PVD..JFK,107,,,,,,030,,030,,,,,,,,,,,GROUNDD=[V201.
V213.V165.V159.V155.V1370.V1828.V1834.V217.V137.EF4.EF3.V770.V96.EF2.4R8C.22L5C.
22L4C.33R1C],
00:00:01,NWA758,1,B752,4252,120080,180,180,030,000,020,A,R,P,Y,Y,N,,27,LONER.RIP
IT.BOS,LONER..RIPIT..BOS,109,,,,,020,,020,,,,,,,,,,GROUNDA=[92C.EW1.V785.V670.
EE4.V332.V336.V348.V350],
```

Figure 11 Another sample CSV flight plan file

10.2 Sample XML flight plan files

This section contains sample XML flight plan files.

10.2.1 Minimal XML flight plan samples

This section contains XML flight plans that contain the minimum about of data need to run the flight plans with TGF.

10.2.1.1 Departure flight

The following is an example of the minimum about of data needed in order to have an aircraft takeoff from a runway at an airport and fly to a given destination. **NOTE** as stated in Section 5.1.1.9 Start Altitude a departure flight's starting altitude is ignored in favor of the runway's altitude. It is therefore recommended that the starting altitude be set to 000 for flight's takeoff from a runway.

```
<?xml version="1.0" encoding="UTF-8"?>
<Flights xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLoca
tion="file:///tgf/xml/flights/flight.xsd">
  <Flight>
    <Tgf>
      <TgfStartTime>00:00:01</TgfStartTime>
      <Acid>USA447</Acid>
      <AcType>A333</AcType>
      <Beacon>0212</Beacon>
      <StartAltitude Units="HundredsOfFeet">000</StartAltitude>
      <TargetAltitude Units="HundredsOfFeet">100</TargetAltitude>
      <DepartureRunway>27</DepartureRunway>
      <Route>BOS..GARVE..BOSOX..PVD..JFK</Route>
    </Tgf>
  </Flight>
</Flights>
```

Figure 12 A sample Departure flight

If this flight plan was run US Air four forty-seven would start at the end of Boston's Runway 27, take off from the runway and climb to 10,000 feet. From BOS the flight would fly to GARVE to BOSOX to PVD to JFK. The flight would terminate once it reached JFK.

10.2.1.2 Arrival Flight

The following is an example of the minimum about of data needed in order to have an aircraft fly from a given fix and landed on a given airport's runway.

```
<?xml version="1.0" encoding="UTF-8"?>
<Flights xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLoca
tion="file:///tgf/xml/flights/flight.xsd">
  <Flight>
    <Tgf>
      <TgfStartTime>00:01:45</TgfStartTime>
      <Acid>CAA2146</Acid>
      <AcType>CRJ1</AcType>
      <Beacon>3151</Beacon>
      <StartAltitude Units="HundredsOfFeet">030</StartAltitude>
      <ArrivalRunway>33L</ArrivalRunway>
      <Route>COHAS..COHAS298002..HULLZ..BOS</Route>
    </Tgf>
  </Flight>
</Flights>
```

Figure 13 A sample arrival flight

If this flight plan was run Candler twenty-one forty-six would start at 3,000 feet at fix COHAS. The flight would fly from COHAS to COHAS298002 to HULLZ to Boston Airport (BOS). The flight would land on Boston's runway 33 Left and terminate.

10.2.1.3 Over Flight

The following is an example of the minimum about of data needed in order to have an over flight.

```
<?xml version="1.0" encoding="UTF-8"?>
<Flights xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLoca
tion="file:///tgf/xml/flights/flight.xsd">
  <Flight>
    <Tgf>
      <TgfStartTime>00:01:45</TgfStartTime>
      <Acid>DAL95</Acid>
      <AcType>B737</AcType>
      <Beacon>1200</Beacon>
      <StartAltitude Units="HundredsOfFeet">300</StartAltitude>
      <Route>SIE.J55.GRINS</Route>
    </Tgf>
  </Flight>
</Flights>
```

Figure 14 A sample over flight

If this flight plan was run Delta ninety-five would start at an altitude of 30,000 feet and fly from SIE to GRINS using Jet Route J55. This flight will fly over Boston Airspace. Once the flight reaches GRINS it will terminate.

10.2.1.4 Ground Departure Flight

The following is an example of the minimum about of data needed in order to have an aircraft taxi to a runway at an airport and takeoff from the runway and fly to a given destination. **NOTE** as stated in Section 5.1.1.9 Start Altitude a departure flight's starting altitude is ignored in favor of the runway's altitude. It is therefore recommended that the starting altitude be set to 000 for flight's takeoff from a runway.

```
<?xml version="1.0" encoding="UTF-8"?>
<Flights xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLoca
tion="file:///tgf/xml/flights/flight.xsd">
  <Flight>
    <Tgf>
      <TgfStartTime>00:00:01</TgfStartTime>
      <Acid>CHQ5582</Acid>
      <AcType>E145</AcType>
      <Beacon>0676</Beacon>
      <StartAltitude Units="HundredsOfFeet">000</StartAltitude>
      <TargetAltitude Units="HundredsOfFeet">100</TargetAltitude>
      <DepartureRunway>33L</DepartureRunway>
      <Route>BOS..MALDY..SWIGG..PVD..JFK</Route>
      <GroundDepartureRoute>EC7.EC6.V758.EC5.EC4.V446.EC3.E2C.V550.EC1.33L2C</GroundDepa
rtureRoute>
    </Tgf>
  </Flight>
</Flights>
```

Figure 15 A sample ground departure flight

If this flight plan was run Chautauqua fifty-five eighty-two would start at ground fix EC7. Once instructed to move it would taxi from EC7 to EC5 to V758 to EC5 to EC4 to V446 to EC3 to EC2 to V550 to EC1, and stop and await clearance to taxi onto runway 33 left. Once the flight was cleared to taxi onto runway 33-left the flight gets into take off position and await clearance to take off. When Chautauqua fifty-five eighty-two was cleared for take off the flight would take off from Boston's (BOS) runway 33L and climb to 10,000 feet and fly to MALDY. From MALDY the flight would fly to SWIGG to PVD to JFK. At JFK, the flight would terminate.

10.2.1.5 Arrival Ground Flight

The following is an example of the minimum about of data needed in order to have an aircraft fly from a given fix and landed on a given airport's runway and taxi to a given destination.

```
<?xml version="1.0" encoding="UTF-8"?>
<Flights xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLoca
tion="file:///tgf/xml/flights/flight.xsd">
  <Flight>
    <Tgf>
      <TgfStartTime>00:07:00</TgfStartTime>
      <Acid>COA808</Acid>
      <AcType>B733</AcType>
      <Beacon>3467</Beacon>
      <StartAltitude Units="HundredsOfFeet">030</StartAltitude>
      <ArrivalRunway>33L</ArrivalRunway>
      <Route>COHAS..COHAS298002..HULLZ..BOS</Route>
      <GroundArrivalRoute>33L7C.15R9C.EXT1.V789.V787.EQ2</GroundArrivalRoute>
    </Tgf>
  </Flight>
</Flights>
```

Figure 16 A sample ground arrival flight

If this flight plan was run Continental eight zero eight would start at 3,000 feet at fix COHAS. The flight would fly from COHAS to COHAS298002 to HULLZ to Boston Airport (BOS). The flight would land on Boston's runway 33 Left and taxi to ground fix 33L7C where it would exit the runway. Once Continental eight zero eight would stop and await clearance to resume taxing. When the flight was cleared to resume taxiing it would taxi from 15R9C to EXT1 to V789 to V787 to EQ2. At EQ2, the flight would stop and await further instructions.

10.2.1.6 A Gate-to-Gate Example

The following is an example of the minimum about of data needed in order to have an aircraft leave gate at one airport and fly from that airport to another airport land and taxi to another gate.

```
<?xml version="1.0" encoding="UTF-8"?>
<Flights xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLoca
tion="file:///tgf/xml/flights/flight.xsd">
  <Flight>
    <Tgf>
      <TgfStartTime>00:00:06</TgfStartTime>
      <Acid>BTA8968</Acid>
      <AcType>E145</AcType>
      <Beacon>4335</Beacon>
      <StartAltitude Units="HundredsOfFeet">000</StartAltitude>
      <TargetAltitude Units="HundredsOfFeet">250</TargetAltitude>
      <DepartureRunway>27</DepartureRunway>
      <ArrivalRunway>27R</ArrivalRunway>
      <Route>BOS..LUCOS..SEY067.SEY..HTO.J121.BRIGS.VCN8.PHL</Route>
      <GroundArrivalRoute>09L2C.K5.V76</GroundArrivalRoute>
      <GroundDepartureRoute>V253.C.V446.D.ED3.271C</GroundDepartureRoute>
    </Tgf>
  </Flight>
</Flights>
```

Figure 17 A sample gate-to-gate flight

If this flight plan was run Jet Link Eight-Nine Sixty-Eight would start at Boston Airport on Ground Fix V253. Once instructed to move the flight would taxi from V253 take Taxiway C to Ground fix V446 at Ground Fix V446 it would turn onto Taxiway D and take it to Ground Fix ED3. At ED3 the flight would stop and await clearance to taxi onto Runway 27 at Ground fix 271C. Once the flight was cleared to taxi onto runway 33-left the flight gets into take off position and await clearance to take off. When Jet Link Eight-Nine Sixty-Eight was cleared for take off the flight would take off from Boston's (BOS) runway 27, climb to 25,000 feet, and fly to LUCOS. From LUCOS the flight would fly from fix SEY067 at SEY067 it would fly the route called SEY until HTO where it would merge onto J121. The flight would fly J121 until it reached BRIGS where it would then take the STAR route VCN8 using the BRIGS transition route to fly into PHL. The flight would land on Philadelphia's runway 27 right and taxi to ground fix 09L2C where the flight would exit the runway. Once the flight was done exiting the runway it would stop and await clearance to resume taxing. When the flight was cleared to resume taxiing it would take taxiway K5 to Ground Fix V76. Once at Ground Fix V76, the flight would stop and await further instructions

10.2.2 A more complex XML flight plan sample

This section contains a sample of a more complex XML flight plan.

```
<?xml version="1.0" encoding="UTF-8"?>
<Flights xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLoca
tion="file:///tgf/xml/flights/flight.xsd">
  <Flight>
    <Tgf>
      <TgfStartTime>00:02:30</TgfStartTime>
      <Acid>TRS634</Acid>
      <Complexity>1</Complexity>
      <AcType>B712</AcType>
      <Beacon>4440</Beacon>
      <Frequency>120990</Frequency>
      <StartSpeed Type="TAS" Units="Knots">180</StartSpeed>
      <TargetSpeed Type="TAS" Units="Knots">180</TargetSpeed>
      <StartAltitude Units="HundredsOfFeet">030</StartAltitude>
      <InterimAltitude Units="HundredsOfFeet">000</InterimAltitude>
      <TargetAltitude Units="HundredsOfFeet">020</TargetAltitude>
      <StartType>A</StartType>
      <NavEquip>P</NavEquip>
      <NavType>R</NavType>
      <ArrivalRunway>27</ArrivalRunway>
      <Route>LONER[CMD=CLA]..RIPIT..BOS</Route>
      <GroundArrivalRoute>93C.E.EE4.V332.V336.V348[CMD=TERM].V350</GroundArrivalRoute>
    </Tgf>
    <Nas>
      <NasRoute>LONER..RIPIT..BOS</NasRoute>
      <Cid>109</Cid>
      <FiledAltitude Units="HundredsOfFeet">020</FiledAltitude>
      <AssignedAltitude Units="HundredsOfFeet">020</AssignedAltitude>
    </Nas>
    <Arts />
    <ProjectSpecific />
  </Flight>
  <Flight>
    <Tgf>
      <TgfStartTime>00:03:00</TgfStartTime>
      <Acid>ASH5873</Acid>
      <Complexity>1</Complexity>
      <AcType>CRJ1</AcType>
      <Beacon>3463</Beacon>
      <Frequency>120080</Frequency>
      <StartAltitude Units="HundredsOfFeet">000</StartAltitude>
      <InterimAltitude Units="HundredsOfFeet">000</InterimAltitude>
      <TargetAltitude Units="HundredsOfFeet">100</TargetAltitude>
      <StartType>E</StartType>
      <NavEquip>P</NavEquip>
      <NavType>R</NavType>
      <DepartureRunway>27</DepartureRunway>
      <Route>BOS..GARVE..BOSOX..PVD..JFK</Route>
      <GroundDepartureRoute>V253.C.V446.D.ED3[CMD=HOLD].271C</GroundDepartureRoute>
    </Tgf>
    <Nas>
      <NasRoute>BOS..GARVE..BOSOX..PVD..JFK</NasRoute>
      <Cid>110</Cid>
      <FiledAltitude Units="HundredsOfFeet">280</FiledAltitude>
      <AssignedAltitude Units="HundredsOfFeet">100</AssignedAltitude>
    </Nas>
    <Arts />
    <ProjectSpecific>
      <Datalink>true</Datalink>
    </ProjectSpecific>
  </Flight>
</Flights>
```

Figure 18 A more complex sample XML flight plan

10.3 A Sample XML Sim Event file

This section contains a sample XML Sim Event File that is used to execute commands for a given flight when a specific condition is meet. For more information on the XML Sim Event file, please see The TGF User Manual at http://public.tgf.tc.faa.gov/documentation/eco/ecomanual.html.

```
<?xml version="1.0" encoding="UTF-8"?>
<SimEventObject>
  <SimEvent>
    <Predicate ClassName="TimePredicate" Args="00:00:32" />
    <Action ClassName="SpCommandAction" Args="AWI7751, r45" />
  </SimEvent>
  <SimEvent>
    <Predicate ClassName="TimePredicate" Args="00:07:40" />
    <Action ClassName="SpCommandAction" Args="AWI7751, a190" />
  </SimEvent>
  <SimEvent>
    <Predicate ClassName="TimePredicate" Args="00:08:07" />
    <Action ClassName="SpCommandAction" Args="AWI7751, v+500" />
  </SimEvent>
  <SimEvent>
    <Predicate ClassName="TimePredicate" Args="00:10:43" />
    <Action ClassName="SpCommandAction" Args="AWI7753, r45" />
  </SimEvent>
  <SimEvent>
    <Predicate ClassName="TimePredicate" Args="00:11:50" />
    <Action ClassName="SpCommandAction" Args="AWI7753, a200" />
  </SimEvent>
  <SimEvent>
    <Predicate ClassName="TimePredicate" Args="00:12:04" />
    <Action ClassName="SpCommandAction" Args="AWI7753, v+500" />
  </SimEvent>
</SimEventObject>
```

Figure 19 A sample XML Sim Event file

11 XML flight plan versus CSV flight plan

Since the XML flight plan will eventually replace TGF's CSV flight plan format the following table shows the correlation between XML elements and csv fields.

XML Tag Name	CSV Name	CSV Field No.
Flights	N/A	N/A
Flight	N/A	N/A
Tgf	N/A	N/A
TgfStartTime	TGF_Start_Time	1
Acid	TGF_Acid	2
Complexity	TGF_Complexity	3
AcType	TGF_Ac_Type	4
Beacon	TGF_Beacon	5
Frequency	TGF_VHF_Frequency	6
StartSpeed	TGF_Start_Speed	7
TargetSpeed	TGF_Target_Speed	8
StartAltitude	TGF_Start_Altitude	9
InterimAltitude	TGF_Interim_Altitude	10
TargetAltitude	TGF_Target_Altitude	11
StartType	TGF_Start_Type	12
NavEquip	TGf_Nav_Equip	13
NavType	TGF_Nav_Type	14
N/A (Obsolete)	TGF_ILS_Capable	15
N/A (Obsolete)	TGF_Piloted	16
N/A (Not Supported)	TGF_Mil_Op	17
DepartureRunway	TGF_Departure_Runway	18
ArrivalRunway	TGF_Arrival_Runway	19
Route	TGF_Route	20
GroundArrivalRoute	NAS_Project_Specific (GroundA=)	41
GroundDepartureRoute	NAS_Project_Specific (GroundD=)	41
Nas	N/A	N/A
NasRoute	NAS_Route	21
Cid	NAS_Cid	22
CoordinationFix	NAS_Coordination_Fix	23
CoordinationTime	NAS_Coordination_Time	24
TrackControl	NAS_Track_Control	25
Sector	NAS_Sector	26
FiledSpeed	NAS_Filed_Speed_TAS	27
FiledAltitude	NAS_Filed_Altitude	28
HandOffAltitude	NAS_Hand_Off_Altitude	29
AssignedAltitude	NAS_Assigned_Altitude	30
StartPosition	N/A	N/A
StartX	NAS_Start_X	31
StartY	NAS_Start_Y	32
GatePosition	N/A	N/A
GateX	NAS_Hand_Off_X	33
GateY	NAS_Hand_Off_Y	34
NasStartTime	NAS_Start_Time	35
HandOffTime	NAS_Hand_Off_Time	36
HandOffAcceptTime	NAS_Hand_Off_Accept_Time	37

FlightDurationTime	NAS_Est_Flight_Duration_Time	38
Remarks	NAS_Remarks	42
Arts	N/A	N/A
FixPair	N/A	N/A
Fix1	ARTS_Pair1	39
Fix2	ARTS_Pair2	40
ProjectSpecific	N/A (Split into individual elements)	N/A
Datalink	NAS_Project_Specific (DATALINK)	41
Adsb	NAS_Project_Specific (ADSB=)	41
AdsbLink	NAS_Project_Specific (ADSBLink=)	41
Cdti	NAS_Project_Specific (CDTI)	41
Lifeguard	NAS_Project_Specific (Lifeguard)	41

12 Converting a CSV flight plan into an XML flight plan

TGF has a java utility called Csv2XmlFpConverter that can convert a CSV flight plan into an XML flight plan. To execute the utility type in "java –Xmx1000M –cp <TGF jar file> faa.tg.prep.util.Csv2XmlFpConverter –c <input file> [–x <output file>]" in a command line terminal. The –c command line option is used to specify the full path and file name the CSV flight plan file to convert. The optional –x command line option is used to specify the full path and file name where write the XML flight plan file. If the user does not specify an output file via the –x command line option, then the program will take the name of the file and put an x at the end the extension (i.e. file.fp becomes file.fpx). For example "java –Xmx1000M –cp /tgf/lib/tgf.jar –c /tgf/data/genera/test.fp" would convert the CSV flight plan file /tgf/data/genera/test.fp into an XML flight plan file called /tgf/data/genera/test.fpx For more information on converting a csv flight plan into an XML flight plan please see TGF Miscellaneous Utilities at http://public.tgf.tc.faa.gov/documentation/misc/misc.htm.

End of Document