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Traffic Flow Management System ADL Delta and Historical File Format Specification for the Traffic Flow Management-Modernization (TFM-M) Program



Final, Release 5, Version 1.5

Contract Number: DTFAWA-04-C-00045

CDRL: E05

January 10, 2011

Prepared for:
U.S. Federal Aviation Administration

Prepared by:
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North American Public Sector – Civil Group
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Rockville, MD 20850



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ADL Delta and Historical File Format Specification
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1.1	11/07/2005	Updated to Reflect ADL Version 10 ADL Specification (ETMS/FSM 8.2)
1.2	2/10/2006	Updated to Reflect ADL Version 11 ADL Specification (ETMS/FSM 8.3)
1.3	05/24/2010	Updated to Reflect ADL Version 12.0 ADL Specification (TFMS R5/FSM 9.0) <ul style="list-style-type: none">○ Added handling of “HISTORICAL_POPUPS” block.
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Introduction

The Aggregate Demand List (ADL) is the data product that drives FSM and the TFMS Ground Delay Program Enhancements operations. The ADL is composed of data extracted from the TFMS-Core databases, which are maintained with a combination of OAG data, airline-provided flight data messages, NAS messages generated from the ATC system, and issued ground delays (EDCTs). The ADL also includes GDP-specific data entered by the traffic management specialist using FSM.

The Delta ADL is the data product that details the changes between two subsequent ADLs. The format of the Delta ADL follows the same format of the full ADL with some exceptions. The purpose of this document is to describe the differences in formatting and content between the Delta ADLs and the full ADLs.

- Part 1 - General Description: Provides an overview of the Delta ADL differences.
- Part 2 – Data Blocks Differences: Describes the data blocks differences in the Delta ADL.
- Part 3 – Flight Data Differences: Describes the flight data differences in the Delta ADL.

File Descriptions

There are three types of files that contain demand information for an element:

- ADL – TFMS Provided Data File. Each ADL is a self contained, full and complete snapshot. Data needed for airport monitoring is fully reconstituted with the receipt of a single ADL.
- Delta ADL – FSM Created Data File. Each Delta is only the difference between a specific ADL and the last ADL previous received by that FSM Server.
- Historical File – FSM Created Data File. Each Historical File is a concatenation of all the Delta files FSM has created for a specific airport on that TFMS day (0800z to 0759z)

This document pertains to the latter two file types.

References

The following documents are useful in understanding the contents of this document.

1. *Aggregate Demand List (ADL) and Broadcast File Format Specification - Version 12.4*
(http://flycdm.org/ad/CDM-GDP_specs.htm).
2. *FSM ADL Parameters File Format Specification – Version 5.4*
(http://flycdm.org/ad/CDM-GDP_specs.htm).

1. General Description

1.1. Contents

The Delta ADL file contains all data required to transition from a previous ADL to the current ADL. For example, given the full ADL for 1530 and the Delta ADL for 1535, the full ADL for 1535 can be derived. The Delta ADL can contain any of the same data blocks and information as a full ADL. If there is no previous full ADL, such as when FSM first starts or at the beginning of a new day, the Delta ADL and the full ADL contain the same information.

Historical Data Files are a special type of Delta ADL files that normally contain more than one update. The Historical file for a past day contains all of the Delta ADLs created on that operations day (0800z to 0759z). The content of Historical Data Files is identical to that of Delta ADL files with the exception that more than one START_UPDATE block may be present in the file. An update in a Historical Data File is the delta to transition from the previous update to the new update time.

Delta ADL files are always written in the latest ADL version format supported by the FSM version which creates the file, even if the full ADL files on which they are based are formatted the same as an earlier version. For example, FSM 8.20 produced Delta ADL files are written as version 10 even if the ADL received is a version 9 or earlier ADLs. Historical Data Files are written in the version from which they were created with new Historical Data Files being created as version 10. This allows FSM to be installed over an earlier release and before a revised TFMS release is deployed.

1.2. File Naming

1.2.1. Delta ADL Files

The Delta ADL naming format is the same as the full ADL naming format with the report type set to “dcdm” instead of “lcdm”.

For example, a Delta ADL file generated for the ATCSCC for Boston arrivals on February 6 at 15:35:33 Z is named:

```
bos__dcdm.06153533.01.arr.unfilt
```

A Delta ADL file generated for American for Dallas arrivals and departures on July 17 at 09:17:05 is named:

```
dfw__dcdm.17091705.01.all.aal
```

A Delta ADL file generated for an FEA named “EWR_A” on July 17 at 09:17:05 is named:

```
ewr_a.dcdm.17091705.01.fea.unfilt
```

A Delta ADL file generated for an FCA named “FCA027” on July 17 at 09:17:05 is named:

```
fca027.dcdm.17091705.01.fca.unfilt
```

The suffix “.gz” indicates a file is compressed (using “gzip”). The suffix “.enc” indicates a file is encrypted (using blowfish). The suffix .gz.enc indicates a file is both compressed and encrypted.

1.2.2. Historical Data Files

The naming format of Historical Data Files consists of three parts separated by periods (.):

- Element identifier for which the data was generated;
- For airports ADLs – three or four alpha-numeric character airport identifier.

- For FEA ADLs – up to six characters limited to alpha-numeric, “-“, and “_”; any of which can be used in any position. NOTES - FEA names are not guaranteed to be unique and can duplicate airport names, in such a case they should not be considered to be the same element. FEA names can be reused within the same day, in such a case they should not be considered to be the same element.
- For FCA ADLs – six alpha-numeric characters beginning with “fca” and then an alpha-numeric identification number.
- Data type ,
 - For airports ADLs – “apt” for Airport.
 - For FEA ADLs – “fea” for Flow Evaluation Area
 - For FCA ADLs – “fca” for Flow Control Area
- The suffix “dat”

For example, a Historical Data File generated for Boston is named:

bos.apt.dat

A Historical Data File generated for an FEA named “EWR_A” is named:

ewr_a.fea.dat

A Historical Data File generated for an FCA named “FCA027” is named:

fca027.fca.dat

1.3. Organization

Delta ADL files are organized the same as full ADL files. The ADL Header is only included in the first Delta and thus only listed at the beginning of the Historical File.

1.4. General Formatting

Delta ADL files are formatted the same as full ADL files with the following exception:

- Flight record fields are listed in up to 4 different blocks: ARRIVALS, DEPARTURES, DROPPED_ARRIVALS, and DROPPED_DEPARTURES. If there are no flights for a particular block, that block is not included.
 - ◆ The DROPPED_ARRIVAL block follows immediately after the ARRIVALS block.
 - ◆ The DROPPED_DEPARTURES block follows immediately after the DEPARTURES block.
- Flight record fields are tabbed delimited instead of fixed width. A comment line is used to separate each line of flight data. This allow for a small file size reduction in uncompressed files and most importantly makes the MSSQL bulk put process easier to implement.
- Leading zeroes are not used in numerical fields.
- A blank block (start and end markers only) indicates that block is now empty and any previous data for that block should now be disregarded.
- Data within blocks are not prefixed by a space as in the full ADL.

1.5. Header

The header of the Delta ADL file is the same as the full ADL file. Note that case for these values is not specified in the ADL ICD. Therefore, the full ADL file and the Delta file may use different cases for these values.

A sample header follows:

```
: Product Code: 0xfaa
: Magic Number: 0xfaa1
: Version Num: 0xc
#
#
: Date: 11/16/2005
: First Update: 16010315
#
```

2. Data Block Differences

The delta file can contain any of the data blocks valid for full ADL files. There are two additional data blocks which although not valid for full ADLs, may appear in delta files: DROPPED_ARRIVALS and DROPPED_DEPARTURES. The following sections describe any differences for the specific data blocks between the delta ADL and full ADL files.

2.1. ADL_DEFINITION

This block always appears in all delta and historical files and is identical in content to the full ADL.

2.2. AFIX and DFIX

These blocks appear in all airport delta and historical files if there is at least one fix listed. These blocks do not appear in delta or historical files for FEAs or FCAs.

2.3. AAR

This block always appears in all delta and historical files and is identical in content to the full ADL.

2.4. ADR

This block always appears in all airport delta and historical files and is identical in content to the full ADL. This block does not appear in delta or historical files for FEAs or FCAs.

2.5. HISTORICAL_POPUPS

This block only appears in delta and historical files if it was present in the full ADL and a change is detected. Since the block content is only changed by the TFMS-Core once per hour, it is typically only present in the delta and historical files in the first update of each hour.

2.6. ELEMENT_DEFINITION

This block only appears in delta and historical files if it was present in the full ADL and a change is detected. The ELEMENT_DEFINITION contained in the delta and historical file includes an XML Declaration, which is not included in the ADL.

In a full ADL the ELEMENT_DEFINITION looks like;

```
START_ELEMENT_DEFINITION
<FCA>
  <FCA_ID>fca.metron.lxdev02.20051216190351</FCA_ID>
  <NAME>FCAMT8</NAME>
  <DOMAIN>PUBLIC</DOMAIN>
[...]
```

The delta or historical file the ELEMENT_DEFINITION looks like;

```
START_ELEMENT_DEFINITION
<? Xml version="1.0" encoding="UTF-8"?>
<FCA>
```

```
<FCA_ID>fca.metron.lxdev02.20051216190351</FCA_ID>  
<NAME>FCAMT8</NAME>  
<DOMAIN>PUBLIC</DOMAIN>  
[...]
```

2.7. METAR and TAF

These weather blocks only appear in delta and historical files if they were present in the full ADL and a change is detected.

2.8. UNASSIGNED_SLOTS

This block is included in delta and historical files only if a change is detected. If the current airport does not contain this block, the value NO_UNASSIGNED_SLOTS is included. Note that this is different to NONE which indicates the presence of this block but no slots. The following is an example of a Delta file block indicating no UNASSIGNED_SLOTS block was included in the full ADL;

```
START_UNASSIGNED_SLOTS  
NO_UNASSIGNED_SLOTS  
END_UNASSIGNED_SLOTS
```

2.9. GDP_PARAMS and GS_PARAMS

These blocks only appear in delta and historical files if a change is detected. If the block was removed from the current ADL, an empty block consisting of only the start and end tags is included in the delta file. The PGM_TERMINATED keyword is only included the first time it appears. If there is a change to either the proposed or actual parameter, both are included in the delta provided both appear in the full ADL. The following is an example of a Delta file block indicating that the GDP_PARAMS block is no longer included in the full ADL;

```
START_GDP_PARAMS  
END_GDP_PARAMS
```

2.10. COMP_PARAMS and BKT_PARAMS

These blocks only appear in delta and historical files if a change is detected. If the block was removed by the current ADL, an empty block consisting of only the start and end tags is included in the delta. The following is an example of a Delta file block indicating that the COMP_PARAMS block is no longer included in the full ADL;

```
START_COMP_PARAMS  
END_COMP_PARAMS
```

2.11. SUB_FLAG

This block always appears in the delta, including all carriers for which bridging is off. The SUBS and SCS lines are included only if at least one of them has changed. Note that this can result in the content of the SUB_FLAG block in the Delta file not being an exact match to the SUB_FLAG block in the full ADL.

2.12. FADT_TIMES

This block is only included in the delta if it exists in the current ADL and has changed. When a TMI is purged, this block drops from the full ADL and displays in the Delta ADL with a “TERMINATED” message:

```
START_FADT_TIMES  
TERMINATED  
END_FADT_TIMES
```

2.13. ARRIVALS and DEPARTURES

These blocks contain only those flights whose information has changed. If no flights have been changed, the block is omitted. Additionally, the START_ARRIVALS and START_DEPARTURES keywords in each delta indicate the number of flights that have changed whereas the full ADL indicates the total number of flight records listed.

2.14. DROPPED_ARRIVALS and DROPPED_DEPARTURES

These blocks are unique to the Delta and Historical Files. Flights are listed in these blocks when they are no longer listed in the ADL (i.e. the flight was listed in the last ADL, but is no longer in the ADL for which the Delta is being created). If no flights have been dropped from the arrival and/or departure blocks of the full ADL, the associated dropped block(s) are not included. Additionally, the START_DROPPED_ARRIVALS and START_DROPPED_DEPARTURES keywords in each delta indicate the number of flights that are listed as dropped.

Typically very few dropped flights are seen in delta files generated throughout each hour. The first delta after the top of each hour has the most dropped flights since as the ADL moves into a new hour an entire hour worth of flights are dropped as the ADL time frame moves forward. For documentation purposes “Adhoc Drop” refers to a flight that has been dropped from the ADL mid hour (i.e. was not dropped due to the time frame of the ADL shifting forward). “Dropped Hours” refers to flights that are dropped from the ADL as a result of the time frame of the ADL shifting forward at the beginning of each hour.

The following rules apply to the DROPPED_ARRIVAL and DROPPED_DEPARTURES blocks.

For a stand alone Delta ADL file;

- Each file lists all flights that have been dropped from the full ADL. This includes adhoc drops, and dropped hours.
- The first delta generated after 0000z includes all flights and no flights are ever listed as dropped, even though flights are in reality dropped from the full ADL as the time frame shifts. Users of this delta file must make the assumption that all data is considered to be dropped when the first delta after 0000z is received, and that the first delta is the equivalent of a full ADL.

For a Delta ADL included in the Historical file;

- The dropped flights section of delta files included within historical files includes only adhoc dropped flights; flights from dropped hours are never listed as dropped. This allows users to see the entire day’s operation (beyond ADL time frame) while in historical mode.
 - ◆ For the first update each hour flights meeting the following criteria are assumed to be dropped from the full ADL due to the time shift and are thus not included in the Delta ADL included in the historical file;
 - For Airport Arrivals – The ETA is more than one hour before the update time.

- For Airport Departures – The ETD is more than one hour before the update time.
- For FEA/FCA Flights – The EXIT is more than one hour before the update time.
- The first delta generated after 0000z includes all flights, and no flights are listed as dropped. Users of this delta file must assume that after 0000z all data is dropped and that the first delta is the equivalent of a full ADL.

3. Flight Data Differences

Flight data for delta ADL and historical files are contained within the ARRIVALS, DEPARTURES, DROPPED_ARRIVALS, and DROPPED_DEPARTURES blocks.

3.1. Included Flight Fields

Unlike the full ADL which contains different flight fields for airport and FEA/FCA ADLs, the delta and historical files contain all flight fields that might be encountered in Airport, FEA, or FCA ADLs. If the value is not valid for the element type the field is indicated as blank with a “-“ in the first column of the field.

The following flight field header is used for all version 12 delta and historical files:

#ACID	ETMSID	DEST	ACENTR	ORIG	DCENTR	ETD	ENTRY	EXIT	ETA
DFIX	EDFT	DP	DTRSN	AFIX	EAFT	STAR	STRSN	USR	TYPE
CTG	CLS	ARTD	ARTA	CR_TIME	SGTD	SGTA	IGTD	IENTRY	IGTA
PGTD	PGTA	PETE	LRTD	LRTA	LGTD	LGTA	ERTD	EENTRY	ERTA
OUT	OFF	ON	IN	OETD	OENTRY	OETA	BETD	BENTRY	BETA
OCTD	OCTA	CTD	CTA	ASLOT	CTL_ELEM	CTL_TYPE	CTL_EXMPT	SL_HOLD	
DVREC	DO	UX	FX	RZ	RS	TO	DV	RM	ALD
GDP	AFP	DAS	GSD	TOD	CTL_ALM	CDM_MBR	SUB	MAJOR	GCD
LTOD	NRP	LFG	III	ATV	SWP	DVT	ADC	FCA	WXR

3.2. Field Formats

Unlike full ADL files in which flight fields are aligned in columns to help with readability, flight fields in delta and historical files are tab delimited. Each flight record is separated by an empty comment line consisting of a single ‘#’ in the first column. By using a single tab character between fields instead of multiple spaces, uncompressed files are smaller in size and easier to import into databases.

No leading zeroes are added to numerical fields. Leading zeroes can confuse some systems into assuming the number is in octal (base 8) representation when in fact all numerical flight fields are decimal (base 10) numbers except CTL_ALM which is a hexadecimal (base 16) number. This affects the following fields:

- PETE [33] – this field is formatted as a 1-4 digit decimal number ([ddd]d) without leading zeroes.
- CTL_ALM [75] – this field is formatted as a 1-4 digit hexadecimal number with a ‘0x’ prefix (0x[ddd]d) but without any leading zeroes.
- GCD [78] – this field is formatted as 1-5 digit decimal number ([ddd]d) without leading zeroes.
- LTOD [79] – this field is formatted as a 1, 2, or 3 decimal number ([dd]d) without leading zeroes.