FIB Processing Rules

Specification

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Change summary

Version	Date	Change description
12	15 March 2024	Updated to latest template. Updated Maestro ETA matching threshold (ASID 102298)
11	15 March 2024	Updated to latest template. Replaced ATFM with ATFM. Revise list of airline codes for which cancellations are not sent to ATFM.
10	22 November 2017	Updated Section 6.12
9	17 November 2017	As per change bars. Updated Section 5.1 and removed Appendix A.
8	16 Mary 2016	ASID 68391: Add Tiger designator TGG Updated format to current Airservices version

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Table of contents

1 Purpose

This document describes the business logic processing employed by the Flight Information Broker (FIB) system.

2 Scope

This document covers selected key business rules. It does not comprehensively document all processing rules implemented by FIB.

3 Definitions

3.1 Sensitive Information

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3.2 Non-Runway Flights

Certain kinds of flights do not use runways (such as helicopters). Where data is supplied to a system that is only interested in flights that use runways, the inclusion of non-runway flights can skew the processing.

A *non-runway flight* is a flight with an aircraft type that is classified as a helicopter (document R3).

3.3 Flight States

Flights stored in FIB pass through the states defined in Table 1.

Table 1 - Flight States

State	Description
OSCH	Not used.
USCH	Not used.
HELD	Not used.
PLAN	Flight created/modified from flight plan or related message (document R4).
CNL	Flight has been cancelled.
The remaining states are Eurocat states	
PREA	Flight is pre-active: A flight enters a pre-active state approximately 40 minutes before departure or 40 minutes before entering Australian airspace.
COOR	Flight is coordinated.
CONT	Flight is controlled.
HAND	Flight is being handed over between controllers: Treated the same as CONT.
SUSP	Flight is suspended: Treated the same as CONT.
INHB	Flight is inhibited: Treated the same as CONT.
UNC	Flight is uncontrolled: FIB flights are never assigned a UNC state.
FIN	Flight is complete: The flight destination is an Australian airport and Eurocat has finished with the flight (generally, the flight has landed). Flight bound for an overseas location will not achieve a FIN state unless a confirmed arrival time is received.

3.4 Flight State Transitions

This section defines the state transitions that describe the lifecycle of a flight (employing the states defined in Table 1). The state transition diagram is defined in Figure 1. Note that pseudo-state ACTV denotes the set of flight states {CONT,HAND,SUSP,INHB} which are always treated in the same manner.

The numeric labels on the state transition diagram refer to the state transition descriptions in

Table 2. A state with a numeric label (at the top) is an abbreviation for an event that leaves the flight in the same state.

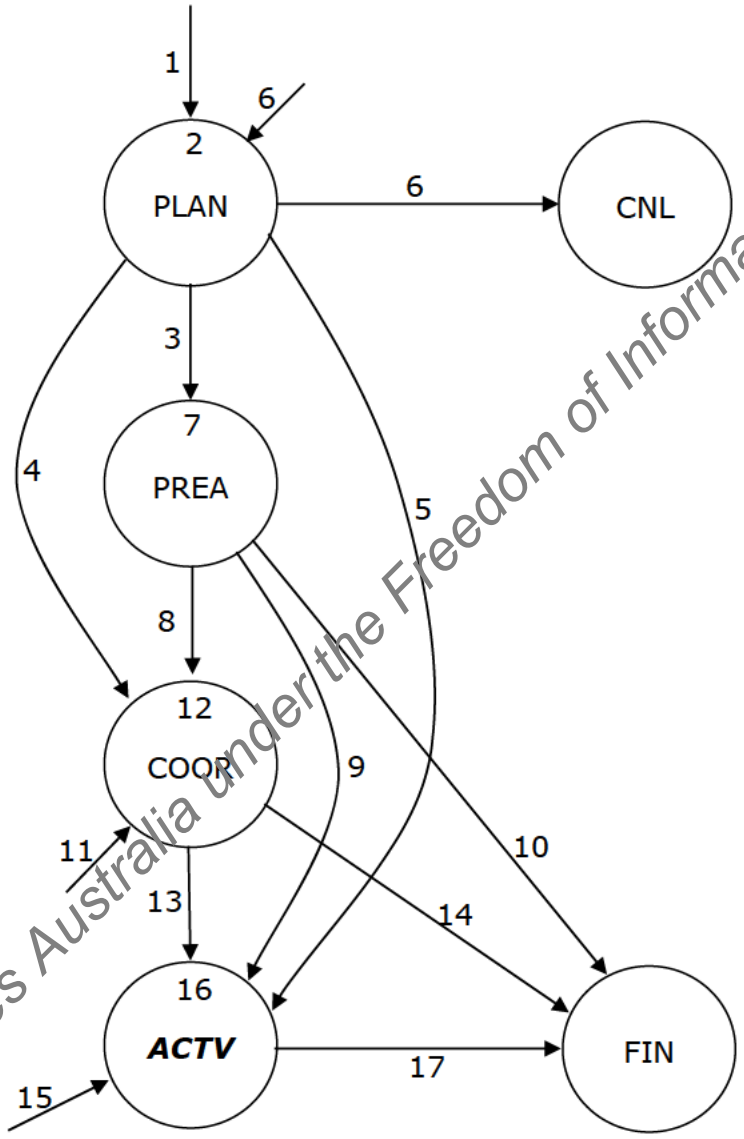

Figure 1 - Flight State Transition Diagram

Table 2 provides details of the state transitions. The columns are:

- Number - the transition number (refer Figure 1);
- Source – the state of the flight prior to transition;
- Event – the event that occurs to cause the transition;
- Precondition – a condition that must hold for the transition to take place;
- Sink – the state of the flight after transition.

If the **Source** state in a transition is N/A (not applicable), a new flight is created, otherwise a match with an existing flight has been found and that flight is updated

Table 2 - State Transition Table

Number	Source	Event	Precondition	Sink
1	N/A	FPL received or FDR PREA received[1]	No matching flight	PLAN
2	PLAN	FPL/CHG/DLA received	Matches with PLAN flight	PLAN
3	PLAN	FDR PREA received	Matches with PLAN flight	PREA
4	PLAN	FDR COOR received	Matches with PLAN flight	COOR
5	PLAN	DEP received or FDR ACTV received	Matches with PLAN flight	ACTV (if DEP, sink state=CONT)
6	PLAN	CNL received	Matches with PLAN flight	CNL
7	PREA	FDR PREA received	Matches with PREA flight	PREA
8	PREA	FDR COOR received	Matches with PREA flight	COOR
9	PREA	DEP received or FDR ACTV received	Matches with PREA flight	ACTV (if DEP, sink state=CONT)
10	PREA	FDR FIN received	Matches with PREA flight	FIN
11	N/A	COOR received	No matching flight	COOR
12	COOR	COOR received	Matches with COOR flight	COOR
13	COOR	FDR ACTV received	Matches with COOR flight	ACTV
14	COOR	FDR FIN received	Matches with COOR flight	FIN
15	N/A	FDR ACTV received	No matching flight	ACTV
16	ACTV	FDR ACTV received	Matches with ACTV flight	ACTV
17	ACTV	FDR FIN received	Matches with ACTV flight and flight is not outgoing international	FIN

[1] When a flight plan is issued within 45 minutes of departure, Eurocat immediately issues a FDR PREA. This causes a race condition which, in the worst case, can see the FPL and PREA processed simultaneously resulting in a duplicate flight. It is normal business for Qantas to issue FPL for domestic flights less than 45 minutes prior to departure and, consequently, this creates an issue for Qantas flights (since the FIB duplicate propagates to ATFM). Presently, FIB does not create a new flight from a FDR PREA for Qantas (i.e. Callsign starts with 'QFA').

4 Processing Rules

4.1 Flight Filtering

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4.2 Flight Number Transformation

4.2.1 MVT

Leading zeroes in the flight number are removed. For example, flight number ANG003 has ACID ANG3.

Qantas and Qantaslink flight movements are all reported in MVT using a QFA prefixed flight number. These are transformed:

Flight Number	ACID
QFA14nn	QLK4nn
QFA15nn-QFA19nn	QJE15nn-QJE19nn
QFA2nnn	QLKnnn (leading zeroes suppressed)
All other QFA	Remains as QFA (leading zeroes suppressed)

MVT messages contain a departure airport (optional) and a destination airport. These airports are expressed as IATA codes. FIB translates IATA airport codes in MVT messages to their ICAO equivalents. Note: the IATA/ICAO airport code mapping used by FIB is obtained from Metron Traffic Flow (ATFM) adaptation data.

4.3 Flight Matching

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4.3.1

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4.3.1

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4.3.3

4.3.4

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4.3.5 Maestro

When a Maestro record is received it matches with a flight in the database if:

- the flight state is one of CONT, HAND, INHB or SUSP;
- the flight ACID matches the Maestro ACID;
- the flight ADEP matches the Maestro ADEP;
- the flight ADES matches the Maestro ADES;
- the flight ETA is within 60 minutes of the Maestro ETA;
- if more than one flight matches by the above rules, choose the flight whose ETA is closest to the Maestro ETA.

4.4 Fix Assignment

A departure fix (DFIX) or arrival fix (AFIX, also known as feeder fix) may be assigned to a flight based on a flight plan or a FDR. FIB determines the departure/arrival fixes that are associated with an airport from ATFM adaptation data (see section 4.10.6).

4.4.1 Flight Plan

The route in a flight plan is expanded based on the fixed ATS route structure. After the route is expanded, FIB searches through the waypoints matching with the known fixes for the departure and destination airports. If a match is found the fixes are assigned/updated.

4.4.2 FDR

The FDR route is searched for matches with the known fixes for the departure and destination airports. If a match is found the fixes are assigned/updated. For each route point a FDR report an estimated time of overflight (ETO). The ETO is recorded with the fix in the flight entity.

4.5 Flight Archiving

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[redacted]

4.6 Flight Purging

A flight is purged from the archive database 35 days after its timestamp value.

4.7 Arrival Time Calculation

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[redacted]

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4.8 Airborne Delay Calculation

4.8.1

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4.8.2

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4.8.3

4.9 Runway Processing

FIB receives runway information via the Eurocat Advanced Surface Movement Guidance and Control System (A-SMGCS) interface in Flight Data Records (FDR), and from Maestro. For ATC operational reasons, the runway value received may not be an actual runway. FIB only stores a runway value if:

- The value consists of two digits optionally followed by 'L', 'C' or 'R';
- The two digits represent a number between 01 and 36 inclusive.

4.10 ATFM Integration

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4.10.1

4.10.2 Overseas Departures

When a FPL is received for a flight, the flight is placed in a PLAN state. If a DEP message is received the actual departure time is recorded but the flight remains in a PLAN state. For domestic departures FDR will, in general, have been received prior to a DEP progressing the state to PREA/COOR/CONT. For an overseas departure no FDR will have been received.

ATFM does not process actual times for a flight in a PLAN state. As a result, the actual departure time for an incoming international is not recorded by ATFM till the aircraft reaches Australian airspace. To prompt ATFM to update actual departure time:

- When a DEP is received for an incoming international and it matches with a flight in a PLAN or a PREA state, set the state of the flight to CONT.

4.10.3 Estimated/Actual Departure Times

ATFM assumes that when an actual departure time is provided, the estimated departure time is the same as the actual. FIB does not guarantee they are the same; the estimated and actual times are set from different source fields. To prompt ATFM to use the actual departure time:

- When FIB sends a flight record to ATFM, and both estimated and actual departure times are available, FIB sets the estimated departure time ('E' phase) to be the same as the actual departure time ('A' phase).

4.10.4 Update of Estimated Departure Time

ATFM assumes that once an estimated time is available for a flight that it is active, and once active it can never go back to a previous state. A flight may go PREA then not fly for various reason, but if the ETD is propagated to ATFM it is considered active. To avoid this situation:

- Do not update the **E** phase departure time in FIB on receipt of a FDR PREA.

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4.10.5.1 s47E(d)

4.10.5.2 FIN Flights

When a flight is in a PREA state and a FDR FIN for the flight is received, the FIN is not sent to ATFM. This is to prevent loss of a slot in ATFM in a similar manner to cancellations as described in section 4.10.5.1.

4.10.5.3 Sensitive Flight Information

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4.10.5.4 Non-Runway Flights

Information on non-runway flights is not passed to ATFM.

4.10.5.5 Inhibit Arrival Fix Time

FIB maintains the estimated arrival fix time (EAFT) of a flight based on known fixes (obtained from ATFM adaptation data) and the projected time over those fixes (obtained from Eurocat). The provision of an EAFT to ATFM results in ATFM using its static trajectory model to calculate the estimated landing time (ELDT), which is less accurate than the FIB provided ELDT (sourced from Eurocat). The EAFT is suppressed from a FIB flight record prior to transmission to ATFM to ensure ATFM uses the FIB ELDT.

4.10.6 Adaptation Data

FIB incorporates the ***Airport.xml*** file generated from the ATFM adaptation data set. This file is used by FIB as the source of departure and arrival fixes for an airport.

4.11 Inhibiting Flight Data to Flight Explorer

4.11.1 Sensitive Flight Information

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4.11.2 QUT

Queensland University of Technology (QUT) receives an identical feed to Flight Explorer: sensitive flight information is inhibited.

4.12 Inhibiting Flight Data in Web Service Calls

All calls to a web service to retrieve flight data must provide credentials (user id and password). Users are classed as UNRESTRICTED or EXTERNAL. An UNRESTRICTED user receives all requested flight data. An EXTERNAL user does not receive sensitive flight information in the response to a request for flight data.

5 Definitions

Within this document, the following definitions apply:

Term	Definition
ACARS	Aircraft Communications Addressing and Reporting System
ACID	Aircraft identifier (Callsign)
ADEP	Departure Airport
ADES	Destination Airport
AFIX	Arrival Fix
AFTN	Aeronautical Fixed Telecommunications Network
A-SMGCS	Advanced Surface Movement Guidance and Control System
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
CDM	Collaborative Decision Making
DFIX	Departure Fix
EAFT	Estimated Arrival Fix Time
ELDT	Estimated Landing Time
ETA	Estimated Time of Arrival
ETO	Estimated Time of Overflight
FDR	Flight Data Record
FIB	Flight Information Broker
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
PIBT	Planned In Block Time
POBT	Planned Off Block Time
PTOT	Planned Take Off Time
QUT	Queensland University of Technology
RDR	Radar Data Record
SSR	Secondary Surveillance Radar
STA	Time of Arrival (computed by Maestro)
TAAATS	The Australian Advanced Air Traffic System
TUID	TAAATS Unique Identifier

6 References

This document contains the following references.

Title	Number
Eurocat-X – A-SMGCS ICD, E09-ICD-E32, revision KA	R1
Maestro/External ICD, E09-ICD-E91, revision LA	R2
ICAO Doc 8643, Aircraft Type Designators	R3
ICAO Doc 4444	R4