



iStream Tool Requirements Strategic & Tactical Phases

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Table of contents

Page

1	Introduction and purpose.....	3
2	Strategic phase	3
2.1	Goal:	3
2.2	Input:	3
2.3	Algorithm:	4
2.4	Output:	4
3	Tactical Phase	5
3.1	Goal:	5
3.2	Input:	5
3.3	Algorithm:	6
3.4	Output:	6
4	HMI	7
5	Post-OPS phase	7
6	Glossary	7
1	Introduction	9
1.1	Purpose	9
1.2	Scope.....	9
2	Functional Packages	9
2.1	Statistics	9
2.2	Optimize short-haul adherence	14
2.3	TTO Forward	14
2.4	Retrieve the ETFMS profiles	15
3	System Setup for Tests and Live-Trial.....	16
3.1	iStream Production System	16
3.2	iStream PJ25 System	16
3.3	Test Phase	16
3.4	Live Trial Phase.....	16

1 Introduction and purpose

For the implementation of the iStream a web base tool shall facilitate process. The tool shall have a high level of automation.

The tool shall be able to collect information from different sources (e.g. e-mail), combine the collected information, and calculate a sequence based upon defined parameters and factors. This is followed by an automatic validation, which after successful validation sends out emails to the participating airlines with the sequence information.

The overall process is split in two phases. The strategic element shall purely provide a heads up regarding the planning framework which is to be considered, while the tactical element is based on a collaborative approach, receiving information and the providing the conclusion out of it for execution by the pilots/ airlines.

- A contact database is required which lists the ICAO and IATA aircraft operator agencies identifier and the email address(es) to be used, including other possible contacts like phone numbers.
- List the acceptable waypoints used in the process (IAFs or entries into the STARs or whatever point is chosen).

2 Strategic phase

The iStream process calculates the strategic sequence

2.1 Goal:

- **Enhance the awareness** of the airlines to plan their flights according to their STA.
- This Strategic phase targets the **Flight Planning phase**.
- The Strategic sequence shall be sent each day **at 10:00 LT¹** latest.
- The strategic sequence is focused on landing times
- The times provided shall be in UTC, where of the mentioned time is wintertime and the one in brackets is summer time.
- The Airlines will have to be aware that they can expect a **TTO within a [-5';+5'] window of their Expected Landing Time**, and so are requested to plan their flights "adjustable" (Cly) within this range.

2.2 Input:

- CSV file from the concerned Airport received via E-mail.

¹ The point in time has been set to catch the flight-planning phase of the long haul flight within the process.

- Column A
 - STA of the flights (which is an on block time).
 - UTC Time in a simple number format
- Column B
 - The call sign of the flight in IATA format

2.3 Algorithm:

1. Flights with an STA after 06:00 (05:00)^{2*} shall be disregarded
2. Distribute the Landing Times 05:04-06:00 (04:04-05:00) to all flights in the list (no change in the order)
 - a. Earliest landing time is 05:04 (04:04)
 - b. The gap between two flights is 2 minutes.
3. Take the average of the landing times for all flights having the same STA and allocate this average to these flights = this is the "Expected Landing Time".
 - a. If a calculated "Expected Landing Time" is earlier than the STA -5min, the "Expected Landing Time" is equal to STA -5min.
 - b. Create a window of -5/+5m to the expected landing time.
3. Take the average of the landing times for all flights having the same STA and allocate this average to these flights = this is the "Expected Landing Time".
4. Distribute the Strategic Landing Times:
 - a. Assign the Landing Times (calculated in point 2)
 - b. If the Landing Times is out of the -5/+5 window of the Expected Landing Time, assign the Start-time of the window + 2 minutes
 - c. Increment by 2 minutes for the following flight / Ensure the 2 minutes gap between all flights

2.4 Output:

- Create a visualization which
 - Includes all the planned flights
 - Their Strategic landing time (SLDT)
 - Their Strategic Planning Time Frame
- Present the information to the user (optional as process is automated).
- Distribute the whole information to the airspace users according the address book and the flights identification.
 - If no contact is found for one or more flights, the information shall still be sent to the available contacts.

Example of the intended visualization:

² this timeframe is specific for the Zurich arrival context application; it must be defined for the corresponding environment

Destination LSZH / ZRH

27.04.2016

Flight	SLDT	STA	Strategic Planning Time Frame
LX139	06:04	06:10	06:04 - 06:11
LX179	06:06	06:10	06:04 - 06:11
LX289	06:08	06:10	06:04 - 06:11
LX087	06:10	06:15	06:08 - 06:17
LX155	06:12	06:15	06:08 - 06:18
LX294	06:14	06:15	06:08 - 06:19
LX147	06:16	06:20	06:11 - 06:21
LX1179	06:18	06:25	06:15 - 06:25
LX243	06:20	06:25	06:15 - 06:26
CX383	06:22	06:30	06:20 - 06:30
LX2801	06:40	06:45	06:35 - 06:45
QR093	06:42	06:45	06:37 - 06:47
EY073	06:45	06:50	06:40 - 06:50

For flight planning and tactical adjustments

Currently expected landing time

3 Tactical Phase

3.1 Goal:

- Collect information about the expected flights
- Update them with the information received from the airspace users.
- Compute the planned **Initial Approach sequence**
- Send out the tactical arrival sequence daily latest 00:30 (23:30 the day before) to the airspace users, automatically based on two validation criteria: majority of long-haul flights have provided their ETOs and no more than 1 flight has a TTO deviating more than 5min from the ETO. If these validation criteria are not fulfilled, the sequence is canceled.

3.2 Input:

- Gather the expected flights for the concerned airport TFV from NM between 04:30-06:00 (03:30-05:00).
- Gather the expected times over the chosen point (IAF/STAR/other) of the flights within the above list.
 - Collect the flight data for each flight in the above list.
 - Consider the time over the first chosen point (IAF/STAR) mentioned within the flights profile.

- Read the e-mails of participating Airlines containing Flight Callsign (in ICAO) / IAF / ETO / Crew's preference information and replace the NM data where possible.

3.3 Algorithm:

1. Calculate the Estimated Landing Times (ETO + flying time from IAF/STAR/other point to touchdown = ELDT).
 - a. Waypoint A xx min
 - b. Waypoint B yy min
 - c. Waypoint C zz min
 - d. Waypoint D tt min
 - e. ...
2. Correct any landing time earlier than 05:04 (04:04) to the aforementioned value.
3. If two landing times are equal or the gap of two minutes is not assured, adjust the sequence.
 - a. The flight being closer to its STA
 - b. In case flights have the same STA, the flight where the minimum deviation to both provided ETOs is reached
4. Calculate the TTO resulting out of the sequence calculation
5. Present the calculated sequence to the user (optional as process is automated)
 - a. Highlight flights which
 - i. An ETO has been received via Mail and the TTO is deviating more than 5min from the ETO, except if the ETO resulted in an ELDT before 05:04 (04:04)

3.4 Output:

- Create a visualization which includes
 - Rank number (Earliest to latest ELDT)
 - Flight callsign
 - IAF/STAR point/other chosen point
 - TTO
- Present the information to the user (optional as process is automated).
 - Option "Send"
 - Option "reset"
 - Users shall be capable of resetting the manual modifications brought, if any (users have the possibility to adjust the order and the corresponding calculations in the background and add or delete flights).
 - Option "cancel"
- Distribute the information to the airspace users according the address book and the flights identification.
 - If no contact is found for one or multiple flights, the information shall still be sent to the available contacts.

4 HMI

This paragraph describes the requirements regarding the look and feel of the tool.

- No possibility to publish twice (greyed out)
- Displayed in ICAO only (as far as possible).
- Mouse over decodes the information.

5 Post-OPS phase

Complete the Excel file (or other format in use for the future) with the Actual Time Over the IAFs or entries into the STARs or whatever point is chosen and the Actual Landing Times from radar/Flight Data Processing System data.

6 Glossary

ETO	Estimated Time Over <i>The time over the IAF as provided by the airline or gathered from the NM systems.</i>
ELDT	Estimated Landing Time <i>The time calculated during the creation of the sequence. From the ELDT the TTO can be generated based upon a backward calculation.</i>
IAF	Initial Approach Fix <i>The fix from which the approach of the flight starts and the flight is normally in the hands of Zurich Approach, for vectoring.</i>
IATA	International Air Transport Association <i>The trade association of the airlines. IATA supports airline activity and helps formulate industry policy and standards. It is mentioned in the requirements as there exist IATA and ICAO abbreviations for airports and airline agencies, and it needs to be clear which one is available.</i>
ICAO	International Civil Aviation Organisation <i>It codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth.</i> <i>It is mentioned in the requirements as there exist IATA and ICAO abbreviations for airports and airline agencies, and it needs to be clear which one is available.</i>



STA	Schedule Time of Arrival <i>The time at which the flight is scheduled to arrive at the gate of his destination airport. Meaning it is reflecting the time he docs onto the gate and not the landing time on the runway.</i>
STAR	Standard Arrival Route <i>is a standard ATS route identified in an approach procedure by which aircraft should proceed from the en-route phase to an initial approach fix</i>
NM	Network Manager <i>A unit within Eurocontrol in charge of managing the European network in regard to traffic flow and a key partner in operations for any corresponding measures taken.</i>
TFV	Traffic Volume <i>Within NM the traffic expected during a defined period and reference location is captured within a traffic volume. This is used for the traffic prediction and represents the basis of the Initial Approach Sequence.</i>
TTO	Target Time Over <i>The output of the iStream process. The time over the IAF/STAR point of the flight which he shall target to achieve.</i>

iStream - PJ25 WP8 EXE#3

Detailed Specifications

1 Introduction

1.1 Purpose

This document collects the specifications for the four functional packages that were implemented in the iStream application, in the frame of the PJ25 project.

The goal is to provide both the business representatives and the developers with a way to agree on what was expected in the application.

1.2 Scope

This document is limited to the application extensions that are covered by PJ25 Work Package 8 Exercise #3.

2 Functional Packages

2.1 Statistics

2.1.1 General specifications

All statistics results are displayed on one Web page. The web-page shall be accessible via the iStream website, via a new tab named "Post-OPS statistics" (next to the current existing ones: "Phases / Documentations / Administration").

2.1.2 Date Range Selection

On top of the page a date range can be selected by the user, and the statistics can be refreshed to include data in this date range.

The reference for the term 'Date' is the iStream sequence date.

When the page is first accessed in a session, the statistics are immediately displayed, with the default 1-day date range: last sequence date.

2.1.3 Efficiency Indicator

2.1.3.1 Functionality

At the top right of the page, a **Green** or **Red** indicator is displayed, based on

Nb of differences between the calculated sequence and the arrival sequence (position order)

Nb of Gaps > 5 mins

This indicator must be **Green** if:

Max 2 différences (max 4 aircraft moved from their original position number)

AND

Max 2 gaps > 5 min (gap = time difference between 2 Actual Landing Time)

Otherwise the indicator must be Red.

2.1.3.2 Special Rules

When the user opens the statistics page, the indicator will reflect the situation of the latest flown sequence.

The user will normally not access the statistics before 08:30LT. At that time, all ATL should be available from the NM, except in the rare case of cancelled or late flight.

The indicator should base itself on data retrieved at 08h15LT

If at least one ALT is missing at 08:15 then the indicator is not calculable and this should be indicated to the user, with the missing callsigns indication.

No history of this indicator will be stored in the system.

2.1.4 Frequency on ETO reception / per airline (received before deadline)

2.1.4.1 Data to display

Period	Airline	Total flights	Updated flights	Percentage of updated flights
Date range	Airline callsign/name	Nb of flights in the date range for this airline	Nb of flights having ETO (valid and processed mail) update in the period	Updated flights/Total flights

2.1.4.2 Special rules

- **Sorting:** Alphabetical airline call-sign.
- 'Out of window' flights are included in 'Total flights'

2.1.5 Frequency iStream cancelled due to missing ETO (more than 2 missing airlines), and who is missing in these cases (top 3 airlines)

2.1.5.1 Data to display

Period	Cancelled due to missing ETOs	Total sequences	Percentage
Date Range	Number of sequences cancelled where more than 2 airlines did not send ETOs by mail	Number of sequences in data range	Cancelled sequences/Total sequences

Period	Top 3 missing airlines	Participation in cancelled sequence
Date Range	Airline name	Number of cancelled sequences in the date range, where this airline has not sent ETOs by mail
	Airline name	
	Airline name	

2.1.6 Frequency (nb days) & list of flights of too early ETOs (landing before 06:04) & corresponding STA

2.1.6.1 Data to display

Date	Call Sign	IAF	ETO	ELDT	STA
1st sequence date in selected range	Call sign 1	IAF	ETO	ELDT	STA (from strategic sequence)
	...				
	Call sign n				
Same for every day in the selected date range					
TOTAL	Total nb of flights in the report	Total number of days in the selected range			

2.1.6.2 Special rules

The report must contain only the flights that correspond to the following condition:

- 'Too early ETO' : ELDT < 06h04 LT.

2.1.7 List of successful / cancelled sequences and reasons

2.1.7.1 Data to display

Date	Sent	Cancelled	Reason if cancelled (missing ETOs / no NM synchronization / no Strategic Sequence / more than 1 flight indicated in red / Other)
1rst sequence date in selected range	1		
....		1	
Last sequence date in selected range			
TOTAL	Number of Sent sequences	Number of Cancelled sequences	
PERCENTAGE	Percentage of sent sequences / total nb of sequences in date range	Percentage of sent sequences / total nb of sequences in date range	

2.1.8 Adherence ATA / ELDT (ETO provided by airline)

2.1.8.1 Data to display

Period	Airline	Flight	Nb of flights	Adherence ATA-ELDT (sum in mlnute)	Average
Date range	Name	Call sign	Number of flights in date range with this call sign	Sum of abs (ATA-ELDT) for all flights with this call sign	Adherence ATA-ELDT / nb of flights

2.1.8.2 Special rules

For this table, only the flights with an ETO received by mail (and taken into account for the sequence computation; i.e. received before the deadline in the correct format) are counted.

As no ATA is in the current iStream database, since the beginning of production, the ATA for these past flights will be imported from the Flight Data Processing system.

A mechanism will be implemented for PJ25 to retrieve the ATA for the flights during the Live Trial.

2.1.9 Adherence ATA / ELDT (ETO not provided by airline)

2.1.9.1 Data to display

Same as in 2.1.6

2.1.9.2 Special rules

For this table, only the flights with **no** ETO received by mail (or received, but not considered for the sequence; i.e. incorrect format) are counted.

2.1.10 Adherence ATA / ETA (ETO provided by airline)

This statistics block has identical requirements as the one in 2.1.8, but uses ETA (=Estimated time over + flight time) instead of ELDT

2.1.11 Adherence ATA / ETA (ETO not provided by airline)

This statistics block has identical requirements as the one in 2.1.9, but uses ETA (=Estimated time over + flight time) instead of ELDT

2.1.12 Average spacing in minutes between each arriving aircraft, over the chosen point (IAF, STAR entry point or other) and on the RWY Threshold during the hour (06:04 – 07:00 LT)

2.1.12.1 Data to display

Period	Point	Average gap b/w flights	Nb of gaps of			
			1	...	7	>7
Day 1 in date range	IAF 1	Sum of gaps/nb of flights over this IAF	Nb of gaps of 1 min in date range for IAF		Nb of gaps of 7 min in date range for IAF	
	IAF 2					
	RWY					
Day n in date range						
Total range	IAF 1	Sum of gaps/nb of flights over this IAF	Nb of gaps of 1 min in date range for IAF		Nb of gaps of 7 min in date range for IAF	
	IAF 2					

Period	Point	Average gap b/w flights	Nb of gaps of			
	RWY					

2.1.12.2 Special rules

The gap calculation is made based on actual flight data.

The RWY gaps are calculated based on the actual landing time (ATA)

2.1.13 List of unexpected flights (flights not found in Strategic phase but are in NM flight list)

2.1.13.1 Data to display

Period	Flight
Day 1 in date range	Call sign 1
	...
	Call sign n
...	"
Day n in date range	"
TOTAL	Total nb of unexpected flights in data range

2.2 Optimize short-haul adherence

2.2.1 Business purpose

Test (in coordination with NM) and trial new B2B service to optimize short-haul flights' adherence (API TargetTakeOffTime)

2.2.2 Functional changes

- Compute the arrival sequence, as today
- For each 'short-haul' flight in the sequence : Send callsign+TTO to NM, using the new B2B API service

2.2.3 Open points

- 'Short-haul', 'Long-haul', others: the definition is based on airport of departure. This information is stored in the Airspace Users database.

2.3 TTO Forward

2.3.1 Business purpose

Test (in coordination with NM) and trial new B2B service in order to exchange our local iStream sequence to NM (API TargetTimeOver).

2.3.2 Functional changes

- Compute the arrival sequence
- At 01:31 LT (just after the sequence is computed), and for each flight in the sequence, send the TTO to NM, using the new B2B service (API TargetTimeOver)*.
It must be ensured, whatever the setup for the Live-Trial, that the TTOs are corresponding to the sequence computed and sent to the airlines on the operational iStream instance.
- If the sequence is Cancelled, this function must not be executed (no TTOs sent).
- .

2.4 Retrieve the ETFMS profiles

2.4.1 Business purpose

Collect the estimated flight data at different times in the cycle to evaluate the effect of sending the TTOs.

It is designed for post-analysis purposed in order to study if the API functionality correctly updates the flights' profiles.

All the API B2B functionalities must be kept ready for the future if NM put into operations/updates the service.

2.4.2 Functional changes

- Retrieve the Estimated Times at IAF/STAR entry/other point & Estimated Landing Times at the following times:
 - Before the TTOs are send (ex : 0100 LT)
 - After the TTOs are sent (ex : 0200 LT)
 - After the IFPS zone boundary (entry into European continent, so time is 0430 LT by default)
- Retrieve the Actual time at the chosen point (if existing) and Actual Landing Time at the following times:
 - After the end-of sequence time (ex : 08:00LT)
 - For a last update (ex : 12:00LT)

This retrieval must collect the data for flights included in the sequence window, and also the flights after the sequence window, until the execution time of the request, to be able to retrieve data of late flights.

- Timings (times at which the retrievals is performed) will be stored in a configuration file.
- If the sequence has been cancelled (in production istream), this retrieval should not be done.

3 System Setup for Tests and Live-Trial

During the Tests and the Live Trial, the normal iStream process will continue, and will still be the one sending the sequence as it does now.

To be able to do the Tests and the Live Trial, a specific setup is needed, with modifications done to the production iStream system.

This section describes this particular setup, corresponding to the following diagram:

3.1 iStream Production System

The current iStream production system will continue to run, operated as it is currently, but with the following additions:

- The statistics page, as specified in the previous section.
- The more flexible recognition of the Airline mail subjects
- The updated list of chosen points and landing times

3.2 iStream PJ25 System

This platform will be used in parallel with the iStream Production System.

From the functional point of view, it will have the same features as the iStream Production System, plus:

- ATA Retrieval for flights in the sequence
- TTO Forward
- Retrieve the ETFMS profiles, as specified in the previous chapter.
- The PJ iStream system will receive the same inputs as the production System, but will not send any mail to the airport, FMP and airlines.

3.3 Test Phase

The following principles apply for the Test phase:

- The PJ25 System will use its own Database to store the additional data needed for the PJ25 project. This minimizes the risk of incident for the Production system, while the PJ25 features may not yet be stable.

For the Test phase it will be needed to ensure that the sequence decision (Send/Cancel) is mirrored from the Production system to the PJ25 system.

3.4 Live Trial Phase

The following principles apply for the Live-Trial phase:

- Both systems will use the Production database, ensuring that the data will be the same.

On request from the users, the PJ25-specific functions sending data to NM should be switched off (TTO forward, Short-haul Regulations). This request must be received by technical team before 17:00 the day before the activities must be stopped