



To	: José SEIXO, Andy BARFF, Adrian GIZDAVU, Peter MARTIN, Steve OWEN		
Date-version	: 05/04/06-V 0.2		
Subject	: Specifications of HMI for TTA management by the TC/PC/MSP.		
From	: A. DORBES		ECHOES Project 

Objective

This document presents the specifications of the tool provided on the TC/PC/MSP Controller Working Positions to support the controllers in the management of the TTA. It is strictly limited to the description of the CWP HMI, without considering any technical aspect of TTA monitoring at the level of the air/ground systems¹. The proposed HMI is based on previous work carried out by the SPD project, which documentation² describes the underlying operational concept and the activity diagrams related to the management of TTA. The following activity diagrams are covered:

- Evaluate and ('coordinate') new TTA on ground.
- Instruct a/c just new TTA with no lateral/vertical constraint (ATC constraints other than the TTA will be added in a later phase).

Note: The proposed HMI can also be used for evaluation/coordination/instruction of a vertical constraint on the TTA point, by replacing the TTA hh:mm value by an FL value.

Proposed HMI

C-ATM equipage

A C-ATM equipped aircraft has:

- **Datalink** capability: indicated by a frame around the Callsign.
- **ADS-B** capability: indicated by the shape of the position symbol (triangle or square).
- Advanced FMS capable of **P-RNAV** and **RTA**. For the RTA, the difference between C-ATM and non C-ATM aircraft is the **size of the TTA window**: 5 minutes (-2/+3) for C-ATM, 15 minutes (-5/+10) for non C-ATM (for En-Route). Of interest here is the RTA capability: in the SPD doc² it is suggested that as the non C-ATM aircraft have a larger TTA window, they are more likely to be moved (e.g. if a choice is to be made by the controller in case of a conflict with a C-ATM aircraft). This means that at least the RTA capability of the aircraft should be somehow presented to the controller.

Note: in this note, the term TTA is used for TTA requested by the LTM, (R)TTA is used for RTA sent by the aircraft.

Proposed solution: for **all the aircraft**, the TTA point name and the TTA value (time) are added to the **Extended Radar Label** as illustrated below. In **addition**, the **C-ATM** equipped aircraft are indicated by a **frame** around the TTA point name.

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AFR1234 NS Type W tas RFL TECH
AFL CFL sp hh:mm ADEP ADES Lrw Msp MFL
XFL XPT WPx WPn WPm TTApt Psp PFL
hxxx mxx rxx hh:mm hh:mm hh:mm hh:mm msp
SSRC Fre.que Company ICAOadr. [A-M]

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Extended Radar Label (illustration for Datalink, ADS-B and C-ATM equipped aircraft).

¹ This is described in "Notes of Meeting EVP WP2 SPD C-ATM Prototyping, 6/2/06"

² SPD Human Factors Delivery 10, Draft 0.1, 27 January 2006.

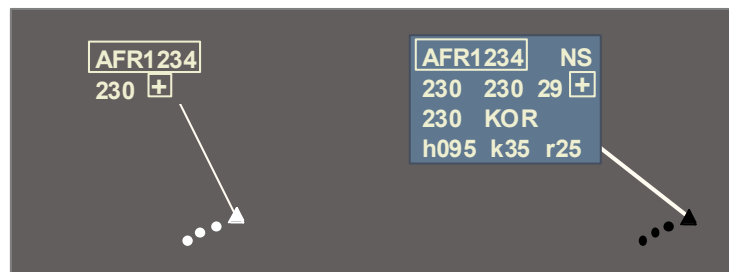
Speed tendency

An indication in the **Radar Label** shows to the current controller the speed tendency **to apply** to the aircraft in order to be able to respect its TTA (i.e. “speed up” or “slow down”). The tendency is indicated by “+/-” displayed right to the ground speed as illustrated below (it is framed to be visually dissociated from the speed):

- “+” sign displayed: aircraft is flying slow and it slips out of the beginning of the TTA window. The controller may “speed it up”.
- “-” sign displayed: aircraft is flying fast and it slips out of the end of the TTA window. The controller may “slow it down”.

The display of the speed tendency is optional in the unselected label (displayed only on controller request by selection of the related option to be added to the Label configuration tool) and its display is managed independently from the ground speed.

In the unselected label, when the ground speed is not displayed, the speed tendency should be compacted to the left.



Unselected and selected label, with display of speed and tendency.

LTM Message Window

A specific LTM Message Window is proposed for the display of TTA management messages.

Rationale: the TTA management messages are different from the standard ground-ground and air-ground exchange messages, in that:

- The current controller is only transmitting to the relevant actors the change of TTA initiated by ground (Local Flow Manager, Airline, Sequence Planner) or by air (RTA missed).
- Transfer of the aircraft is allowed when there is an ongoing exchange of TTA management messages (see below § ‘Transfer of aircraft’).

The presentation of the TTA management messages is based on the following principles:

- There is only one TTA message at a time for a given aircraft.
- The different steps of the TTA management process are reflected through the “status” field of the message, through the modification of the presentation of its components and of the available actions.
- The same colour and presentation coding as for the rest of the HMI ground-ground and air-ground exchanges is applied.
- The background colour of the received TTA value and the available actions (buttons displayed in the message) show who is the originator of the message and who is the final recipient.






Assumptions:

- For Datalink equipped aircraft, air-ground exchange of TTA messages is performed via Datalink.
- The technical means for ground-ground exchange of TTA messages are not defined.

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1 - Datalink equipped aircraft: the content of the TTA management messages is the following:

- Time (hh:mm): new TTA sending time (by LTM or by the aircraft). Indication for the controller since how long the TTA modification is requested.
- Callsign of the aircraft.
- TTA value (hh:mm).
- TTA point.
- Status of the message (see below the different cases).
- Three push buttons:
 - UPLINK: available when new TTA is received from the LTM.
 - UNABLE: available when new TTA is received from the LTM.
 - SEND: available when new (R)TTA is received from the aircraft.
- (An optional field may be added in relation to ATC constraints other than the TTA: message expiry time input by the LTM to indicate the time limit after which the message is no more relevant and should be removed from the window).

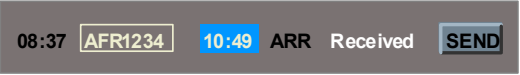
Datalink equipped aircraft	
A - New TTA sent by the LTM is received.	
<p>TTA message is displayed in the LTM Message Window. New TTA value is displayed on <i>UplinkReminder</i> colour background (standard ground incoming message presentation, indicating to the controller that a parameter is waiting to be communicated to the aircraft). Status of the message: Received.</p>	
<p>1) SC AB on UNABLE: 'Unable' is sent to LTM. Status of the message changed to Unable. As no further controller action is required, it is presented in grey. The message is removed when LTM acknowledgement is received.</p>	
<p>2) SC AB on UPLINK to instruct the new TTA to the aircraft. The new TTA value is framed (standard uplink presentation). Status of the message changed to Uplinked. As no further controller action is required, it is presented in grey.</p>	
<p>2-a) Receive pilot WILCO (no controller action required). The message is removed.</p>	
<p>2-b) After a time out (parameter), pilot WILCO is not received. The TTA value is framed in <i>Warning</i> colour. Status of the message changed to NO REPLY, in <i>Warning</i> colour. - SC IB on the message to remove it and use R/T. or: - SC AB on UPLINK to re-uplink it (see 2) above).</p>	
<p>2-c) After a time out (parameter) Logical Acknowledgement (LACK) message for the uplink is not received. Datalink Error message is generated. Same presentation and actions as in 2-b) above.</p>	


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Datalink equipped aircraft

B - New (R)TTA sent by the aircraft is received.

If the aircraft is not able to achieve the TTA (old or new), an "RTA missed" alert is issued and a new best achievable (R)TTA value is downlinked by the aircraft.
Note: RTA missed may be issued and consequently new (R)TTA may be downlinked even if pilot WILCO is previously received (case **A-2-a** above).

<p>(R)TTA message is displayed in the LTM Message Window. New (R)TTA value is displayed on <i>FMSTraj</i> colour background (standard presentation of a pilot downlink). Status of the message: Received. The message is presented during a parameter time. If the controller does not SEND the message during this time, the message is automatically sent to the LTM (result as below).</p>	 <p>08:37 AFR1234 10:49 ARR Received <input type="button" value="SEND"/></p>
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<p>SC AB on SEND to send the new (R)TTA to LTM. Status of the message changed to Sent. As no further controller action is required, it is presented in grey. The message is removed when LTM acknowledgement is received.</p>	 <p>08:37 AFR1234 10:49 ARR Sent <input type="button" value="SEND"/></p>
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2 - Non Datalink aircraft: the content of the TTA management messages is the following:

- Time (hh:mm): new TTA sending time (by LTM or by the controller). Indication for the controller since how long the TTA modification is requested.
- Callsign of the aircraft.
- TTA value (hh:mm).
- TTA point
- Status of the message (see below the different cases)
- Two push buttons: R/T and UNABLE. Both available when new TTA is received from LTM.

Non Datalink aircraft	
A - New TTA sent by the LTM is received.	
TTA message is displayed in the LTM Message Window. New TTA value is displayed on <i>UplinkReminder</i> colour background (standard ground incoming message presentation, indicating to the controller that a parameter is waiting to be communicated to the aircraft). Status of the message: Received.	<p>08:37 BAW1234 10:45 ARR Received <input type="button" value="R/T"/> <input type="button" value="UNABLE"/></p>
1) SC AB on UNABLE: 'Unable' is sent to LTM. Status of the message changed to Unable. As no further controller action is required, it is presented in grey. The message is removed when LTM acknowledgement is received.	<p>08:37 BAW 1234 10:45 ARR Unable <input type="button" value="R/T"/> <input type="button" value="UNABLE"/></p>
2) SC AB on R/T (and instruct the new TTA to the aircraft via R/T): the message is removed.	
B - New (R)TTA is communicated by the aircraft via R/T	
The aircraft is no longer able to achieve the TTA, the FMS issues an "RTA missed" alert. The new best achievable (R)TTA value is communicated by the pilot via R/T. <u>Note:</u> RTA missed may be issued and consequently new (R)TTA may be communicated even after a previous pilot 'Roger' to a new TTA given by R/T (case A-2 above).	
The controller inputs the new (R)TTA communicated by the pilot: SC AB on the TTA value in the Extended Radar Label: a time menu is displayed (current TTA value in white). Select the new value in the menu. TTA message with the new TTA value sent to the LTM is displayed in the LTM Message Window. Status of the message: Sent. The message is removed when LTM acknowledgement is received.	<p>BAW1234 NS Type W tas RFL TECH AFL CFL sp hh:mm ADEP ADES Lrw Msp MFL XFL XPT WPx WPn WPm TTAp Psp PFL hxx mx rxx hh:mm hh:mm hh:mm hh:mm msp SSRC Fre.que Company ICAOadr. [A-M]</p> <p>BAW1234 NS Type W tas RFL T 10:48 AFL CFL sp hh:mm ADEP ADES 10:47 Msp MFL XFL XPT WPx WPn WPm 10:46 Psp PFL hxx mx rxx hh:mm hh:mm hh:mm 10:45 msp SSRC Fre.que Company ICAOadr. 10:44 [A-M] 10:43 10:42</p> <p>08:37 BAW1234 10:53 ARR Sent</p>

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Transfer of aircraft

When the aircraft is transferred, all the pending messages in the LTM Message window are transferred together with the aircraft. This is different from the other co-ordination or uplink/downlink messages (transfer is not allowed until the ground-ground or air-ground dialogue is closed).

Aircraft route modification

To avoid conflicting orders and updates of aircraft trajectory, 2D modification of aircraft route by input of direct route or trajectory edition is made unavailable to all the sectors during the TTA modification process, i.e. when an (R)TTA is downlinked or TTA change is initiated by LTM. As a result:

- The XPT field must be made temporarily unavailable for input with Action Button.
- In the current SPD implementation, the modification of aircraft trajectory is performed directly on the flight leg and not using the TED as in ECHOES. Consequently, input with Action Button must also be made unavailable on the flight leg.