

**FANS Interoperability Team Meeting
(FIT/22)**

**Santiago, Chile
3-4 March 2015**

Agenda Item: 4 Working Papers

Inappropriate use of free text

Presented by: Boeing

SUMMARY

Inappropriate use of free text has long been discouraged, because of its human factors effects. This paper addresses the impacts of free text on airplane and ground automation.

1. INTRODUCTION

- 1.1 The use of specific CPDLC message elements with their associated parameters allows for automation, both on the ground and on the airplane, This automation can enhance CPDLC operations by ensuring that the data used by both airplane and ground systems is not affected by having data manually re-entered, and that ATC instructions are executed as intended.
- 1.2 Free text message elements, on the other hand, do not provide for this kind of assurance, and their use can sometimes prevent this automation from working, while giving the appearance that all is functioning normally.

2. DISCUSSION

- 2.1 Airplanes provide a number of different kinds of automation, associated with CPDLC uplinks, including the following. Note that the particular capabilities vary by airplane model.
 - (a) Loading of route modification uplinks into the Flight Management System
 - (b) Loading of data in vertical, speed and heading/track clearances into the autoflight system
 - (c) Loading of frequencies and transponder codes into the communication system
 - (d) Loading of altimeter settings to the altimeter

- (e) Feedback to the flight crew when clearances have been entered properly in the respective system – sometimes called “dial feedback”
- (f) Monitoring for early execution of conditional clearances
- (g) Alerting when conditional clearances are due to be executed
- (h) Display of where the conditional clearance is to be executed on the map display

2.2 The purpose of these automation features is to ensure that the clearances received from ATC are properly applied in the appropriate onboard system, and that they are executed correctly. Additionally, airplane automation associated with downlink CPDLC messages includes the following:

- (a) Providing data for downlink reports
- (b) Route downlinks (reports and requests) accurately reflecting the FMS route
- (c) Additional data such as duplicate waypoint latitude/longitude
- (d) Arming of reports to be sent automatically

2.3 The purpose of these automation features is to ensure that the content of reports accurately reflects the onboard situation, and that reports that are to be sent on the occurrence of a particular event are sent promptly.

2.4 ATC ground systems also provide automation that uses the contents of downlinks messages from airplanes, both to create uplink clearances/responses and to determine whether requests from the airplane would, if allowed, conflict with other airplanes' clearances.

2.5 Some ANSPs, for example, have started using um37 (CONFIRM ASSIGNED ROUTE), and then use the resulting dm40 (ASSIGNED ROUTE [routeclearance]) as a means to verify that the airplane's planned route conforms to the filed/cleared route of flight.

2.6 Free text message elements have been used in both uplinks and downlinks in ways that will defeat the automation. For example, we have seen:

1 - Free text used to convert an ordinary CONTACT message into a conditional one

```
ATC DL Uplink Message AT1 – XXXXXXXX - .X-XXXX - CRC is valid
2,,06:19:02
0(169): [freetext]
  freetext(): AT<SP>XXXXX
1(117): Contact [icaounitname] [freq]
  icaounitname(): XXXX,CENTER
  freq(vhf): 124.550
2(123): Squawk [beacon]
  beacon(): 3135
```



This would be displayed as:

AT XXXXX,
CONTACT XXXX CENTER ON 124.550MHZ,
SQUAWK 3135.

To the crew, this looks just like a um 121 combined with a um123 (except that more would be displayed on the first line with a um121), and would have the same response attribute (WILCO or UNABLE), but on airplanes that provide monitoring/alerting of conditional clearances (or display where they should be executed on the map), this automation will not occur, and as crews come to rely on that automation, there is a possibility that the instruction might not be executed as intended.

On airplanes that provide conditional clearance monitoring, and loading of the clearance data to other systems, then the data would be loaded on acceptance of the uplink (rather than when the condition was met), thus actually encouraging early execution. With the example above (loading of a frequency), this would probably not be an issue, but if it were an altitude clearance, it could lead to the airplane executing the climb early.

2 - Free text used to respond to a report request from ATC

Free text has been used for a number of reports, including position reports, and more recently in response to CONFIRM ASSIGNED ROUTE uplinks. Some examples that have been seen include:

ATC DL Downlink Message AT1 - XXXXXXX - .X-XXXX - CRC is valid
9,,15:42:32

0(67) : [freetext]

freetext():ADSAM<SP>-<SP>70N070W<SP>-
<SP>FLT<SP><SP>PLAN<SP>TO<SP>KSFO

ATC DL Downlink Message AT1 - XXXXXXX - . X-XXXX - CRC is valid
4,,16:20:27

0(67) : [freetext]

freetext():
JUST<SP>TO<SP>CNFIRM<SP>RTE<SP>AFTER<SP>BI
RD<SP>6310N<SP>6640<SP>6550N<SP>EMBOK

ATC DL Downlink Message AT1 - XXXXXXX - . X-XXXX - CRC is valid
6,,15:56:30

0(67) : [freetext]

freetext(): ROUTE<SP>IS<SP>CORRECT

- 2.7 All of these lose the assurance that the data actually represents what is in the airplane's FMS, and the controller would also have additional work to be able to use the free text. The last of those shown above, of course, really conveys no information at all.

3. ACTION BY THE MEETING

- 3.1 The meeting is invited to:
- a) Note the information in this working paper.
 - b) ANSPs are asked to ensure that controllers and/or automation use predefined messages where those are provided, rather than using free text. In particular, ANSPs should ensure that controllers do not use free text to add a condition to a clearance, and instead use the predefined conditional clearance messages.
 - c) Operators are asked to ensure that flight crews use the built-in capabilities in the airplane FMS to respond to report requests, rather than respond using free text.