

**Twenty Fourth Meeting of the
Informal South Pacific ATS Co-ordinating Group (ISPACG/24)**

**FANS Interoperability Team Meeting (FIT/17)
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Agenda Item 8: SATCOM Performance, Inmarsat and Iridium

FANS 1/A OVER IRIDIUM (FOI) OPERATIONAL TRIALS

Presented by Federal Aviation Administration\

SUMMARY

This paper provides an update on the FANS 1/A over Iridium (FOI) project underway by the FAA-sponsored Performance-Based Operations Aviation Rulemaking Committee's Communications Working Group (PARC CWG). The paper also invites the ISPACG FIT to continue to support FOI operational trials and cooperate in providing FOI data in accordance with Appendix D of the GOLD, or in a form that is suitable for investigating FOI performance.

1 INTRODUCTION

- 1.1 The Performance-Based Operations Aviation Rulemaking Committee (PARC) is an FAA-sponsored activity that operates according to the Administrator's authority under 49 USC 106(p)(5). The PARC comprises members from the FAA and the aviation community at large and provides recommendations to FAA's Senior Management for action and implementation.
- 1.2 The PARC Communications Working Group (CWG) develops recommendations that support matters directly related to the FAA's regulatory criteria and guidance material for implementation of voice and data communications.
- 1.3 The PARC CWG recognizes that global harmonization is crucial to the success of any State or regional implementation initiative. As such, the PARC CWG prepares coordination drafts of its material for broad review and solicits input from the aviation community on such matters of international interest.
- 1.4 The PARC CWG has been evaluating FANS 1/A using the Iridium short burst data (SBD) satellite communication service. The SBD satellite communication service is seen as a lower cost solution to long range communications for air traffic control (ATC) and could potentially expand data link service, coverage and users for FANS 1/A operations.
- 1.5 This paper provides an update on the FANS 1/A over Iridium (FOI) project.



2 DISCUSSION

FOI project overview

- 2.1 The objective of the FOI project is to substantiate recommendations to FAA to use Iridium as a viable sub-network for FANS 1/A applications supporting required communication performance (RCP) 240 and surveillance performance type 180 operations, e.g., reduced separation standards.
- 2.2 To substantiate its recommendations, the PARC CWG is relying on laboratory evaluations, pre-FOI operational trials to evaluate performance of aeronautical operational control (AOC) communications, and FOI operational trials.
- 2.3 All stakeholders in the FOI end-to-end system, i.e., operators, aircraft manufacturers, avionics suppliers, communication service providers (CSPs), Iridium, and air traffic service providers (ATSPs) are participating in the project to track system configuration, analyze data and correct problems.
- 2.4 Two operators are currently participating in FOI operational trials. Continental Micronesia (CMI) operates 11 Boeing 737-800s and 737-700s in and out of Guam. Cargolux (CLX), in Luxemburg, operates 13 Boeing 747-400s to over 60 flight destinations worldwide. Delta and UPS are participating in pre-FOI operational trials and are planning to participate in FOI in the near future.
- 2.5 A number of ATSPs are cooperating in the trials. The South Pacific ATSPs, the Civil Aviation Bureau of Japan (JCAB), and some North Atlantic ATSPs, including Nav Canada, Isavia Iceland and United Kingdom National Air Traffic Services (UK NATS) are participating.
- 2.6 Currently, reduced ADS-C distance-based separation is not being applied between FOI aircraft and other aircraft.
- 2.7 There are no additional requirements—from those applicable to FANS 1/A—for operators with FOI aircraft to participate in the operational trials, except in Fukuoka FIR, the following applies:
 - a) Operators must complete coordination with JCAB at least 4 days prior to commencement of FOI operations;
 - b) The flight crew must send down a CPDLC free text message indicating FOI upon entry into Fukuoka FIR; and
 - c) The flight crew must send CPDLC position reports at compulsory reporting points (HF/VHF position reports are not required).
- 2.8 While the PARC CWG provides a forum to coordinate and exchange information on the FOI project, operators are not required to participate. Furthermore, an operator's authorization from the State of the Operator or State of Registry does not necessarily include any special requirements or restrictions regarding the use of Iridium in FANS 1/A operations. The ATSP may need to consider any special requirements or restrictions in service provisions and/or Regional Supplementary Procedures (SUPPs), Aeronautical Information Publication (AIP), or equivalent.

CMI operational trials

2.9 The following provides the FOI configuration of the CMI aircraft:

Component Description	Component Configuration
Iridium Satellites:	Avionica SatLINK <ul style="list-style-type: none"> • ARINC 741 compliant • Voice and data capable • Iridium-based satellite system
ACARS	Rockwell Collins CMU-900
FMC w/FANS 1	GE Aviation
Service Provider	SITA

2.10 The following CMI aircraft are participating in FOI operational trials:

Aircraft Type	A/C Registration	FOI Status
B737-800	N14235	FOI Ready
B737-800	N14240	FOI Ready
B737-800	N25201	FOI Ready
B737-800	N26232	FOI Ready
B737-800	N27246	FOI Ready
B737-800	N35236	FOI Ready
B737-800	N14249	Planned
B737-700	4 – B737-700s TBD	Planned
Updated: 3 February 2010		

2.11 The FOI operational trial for CMI started 12 December 2009 with 6 B737-800 aircraft, initially in Oakland (KZAK) and Fukuoka (RJJJ). It has since expanded to include Brisbane (YBBB) and Nadi (NFFF). Brisbane ATC (YBBB) also provides CPDLC and ADS-C services in the Honiara (AGGG) and Nauru (ANAU) above FL245.

2.12 All CMI flights will soon be dispatched using CPDLC and ADS-C to maximize use of FOI for data collection purposes.

2.13 From 11 December 2009 to 31 January 2010, the FAA investigated FOI data collected from Oakland Center in accordance with Appendix D of the Global Operational Data Link Document (GOLD). During that period, there were data from 2,681 ADS-C reports and 155 CPDLC transactions (with W/U response attribute). The ADS-C report delivery times were worse than the actual technical performance (ACTP) of the CPDLC transaction times. While ACTP met the RCTP 95% criteria of 120 seconds; there was insufficient data to draw any conclusions. The ADS-C report delivery times did not meet the 95% criteria of 90 seconds. Similar to Inmarsat, neither the ADS-C report delivery times nor the ACTP of the CPDLC transaction times met the 99.9% criteria.

2.14 From 12 December 2009 to 21 February 2010, CMI reported 30 problem reports to the Central Reporting Agency (CRA). All but two of these reports have been analyzed. 16 of them were related to Iridium and a problem has been found with the SatLINK equipment. An Avionica service bulletin to update the SatLINK software was released in February 2010. The schedule to incorporate the service bulletin in the CMI fleet is pending.

CLX operational trials

2.15 The following provides the configuration of the CLX aircraft:

Component Description	Component Configuration
Iridium Satellites:	ICG ICS-220A <ul style="list-style-type: none"> • One ICG ICS-220 Iridium Communication System • One Sensor Systems Dual Iridium Antenna • One ICG external CIM (Configuration Identity Module) • Two SIM cards for 2 SATCOM voice channels
ACARS	Rockwell Collins DLM-900
FMC w/FANS 1	Honeywell
Service Provider	SITA

2.16 The following CLX aircraft are participating in the operational trials:

Aircraft Type	A/C Registration	FOI Status
B747-4R7F	LX-GCV	FOI Ready
B747-4R7F	LX-LCV	FOI Ready
B747-4R7F	LX-MCV	FOI Ready
B747-4R7F	LX-NCV	FOI Ready
B747-4R7F	LX-OCV	FOI Ready
B747-4R7F	LX-PCV	FOI Ready
B747-4R7F	LX-RCV	FOI Ready
B747-4R7F	LX-SCV	FOI Ready
B747-4R7F	LX-TCV	FOI Ready
B747-4R7F	LX-UCV	FOI Ready
B747-4R7F	LX-VCV	FOI Ready
B747-4R7F	LX-WCV	FOI Ready
B747-4R7F	LX-YCV	FOI Ready
Updated: 22 February 2010		

2.17 Cargolux was granted operational approval by the Luxembourg Civil Aviation Authority on the 7 September 2009.

2.18 Operational trials started with a few flights from Auckland to Los Angeles in November 2009, initially Oakland (KZAK), Auckland (NZZO), Tahiti (NTTT). Since that time, Cargolux has been equipping their fleet and training their 400+ flight crew members.

2.19 Cargolux intends to begin FOI operations with its entire fleet on 15 March 2010 in the South Pacific, Africa, North Atlantic, South Atlantic, Bay of Bengal, India, and South East Asia. Cargolux is currently in process of obtaining approval for FANS operation on the L-888 route in China.

Iridium SBD service

2.20 Iridium is planning an upgrade to the short burst data service (SBD 5.2) scheduled for April 2010. SBD release 5.2 will include a change to address delays caused by a race condition on

the ring alert. The ring alerts for international mobile equipment identifiers (IMEIs) with the current mobile originator established will be queued and delivered to the IMEI upon completion of the mobile originated session. Currently, the ring alerts are suppressed and discarded.

2.21 Other changes include increase in system capacity and improvement to system monitoring.

2.22 SBD 5.2 is expected to show an improvement in overall performance of the SBD service.

PARC CWG work program

2.23 The PARC CWG agrees to initiate projects that are believed to be in the best interest of the aviation community to advance communication technology, leveraging existing capabilities, to meet operational needs.

2.24 Each participant has volunteered to participate in the FOI operational trials on their own accord, and has agreed to bear their own costs and provide information and data to substantiate the recommendations for this project.

2.25 The PARC CWG appreciates the cooperation of operators, ATSPs, communication service providers, satellite companies, avionics suppliers, aircraft manufacturers, regulators, and all those who were essential in bringing this project to where it is today.

2.26 Additionally, the PARC CWG appreciates the cooperation of central reporting agencies (CRAs) and data link monitoring agencies (DLMAs). The PARC CWG's reliance on the CRA/DLMA is intended to optimize proper handling of the data and capitalize on the resources and expertise needed to conduct data analysis, evaluation, and coordinate on corrective actions.

2.27 The PARC CWG has embraced the Global Operational Data Link Document (GOLD) for the FOI project to:

- a) Establish the success criteria, in accordance with RCP 240 and surveillance type 180 specifications, provided at Appendix B and Appendix C, respectively, of the GOLD; and
- b) Monitor and analyze the data, in accordance with guidelines provided at Appendix D of the GOLD.

2.28 As we move into the next phase of the project, with the cooperation of ATSPs, the PARC CWG will need to gather a statistically sufficient sample of consistent data from a stable configuration indicating acceptable performance.

2.29 Ideally, each ATSP would provide FOI data in accordance with Appendix D of the GOLD. However, the PARC CWG recognizes that the GOLD standard is relatively new and plans are still underway to automate data collection in this manner. Therefore, the ATSP could provide FOI data in a different form that can be used to draw a conclusion on the Iridium performance.

2.30 The data should be collected for CPDLC transactions (with W/U response attribute) and ADS-C reports in any given month for each FOI aircraft (aircraft registration) and provided in csv, excel, or similar format.



3 ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) Note the information in this paper;
- b) Continue to support FOI operational trials and cooperate in providing FOI data in accordance with Appendix D of the GOLD, or in a form that is suitable for investigating FOI performance; and
- c) For more information on the PARC CWG FOI project, please contact Mr. Arnold Oldach (aoldach@rockwellcollins.com) or Mr. Tom Kraft (tom.kraft@faa.gov), the co-chairmen of the PARC CWG.