

International Civil Aviation Organization



**SPECIAL IMPLEMENTATION PROJECT ON ATS INTER-FACILITY
DATA COMMUNICATION IMPLEMENTATION SEMINAR**

Bangkok, Thailand, 12–13 October 2010

Agenda Item 4: Review of experience gained and lessons learned in the implementation of ICAO 2012 flight plan

LESSONS LEARNED – ADACEL EXPERIENCE

(Prepared by Adacel)

SUMMARY

This paper provides an inside look at 2012 ICAO flight plan implementation in Aurora ATM system.

1. INTRODUCTION

1.1 Adacel's Aurora has completed the implementation of 2012 ICAO flight plan, in the context of ATM system automation and coordination. This paper shares some inside of the implementation and some other enhancements that leverage using of new flight plan format.

2. DISCUSSION

2.1 Transition Phase. Amendment 1 to PANS-ATM Document 4444 15th Edition, applicable on November 15, 2012 requires compatibility with existing ATM systems. Adacel implementation of this amendment assumes that all ATM systems will not become compatible on the same day, therefore the need to support and maintain both 2012 ICAO and existing legacy flight plans, as well as exchanging inter-facility data with adjacent sites that support either legacy or 2012 ICAO format. This transition behavior is achieved through a transition switch. When this transition switch is ON, the system is in transition mode and when set to OFF, system enforces 2012 format and all legacy flight plan format are rejected.

- Format Criteria. By default, ATS messages are considered to be 2012 ICAO format. The criteria used by Aurora to explicitly determine if an externally received message contains legacy data is any of:
 - If field 10a contains the single letter E, J, M or P qualifier
 - If field 10b contains the single D qualifier.
- Flight Plan Filed by Airlines. As airline operations centers progressively transition to 2012 ICAO format, Aurora ATM system maintains and processes both legacy and 2012 flight plan formats, to accommodate users that have not transitioned to 2012 ICAO format.

- Adjacent Facility 2012 Support. Every neighboring facility is adapted with a flag, indicating whether it supports the 2012 ICAO format or not. When forwarding ICAO messages, notification, coordination or negotiation messages to a downstream facility, the 2012 support flag is checked to determine whether to send 2012 ICAO format data in the message, or to first down convert flight data to legacy format, prior to sending it to the downstream facility. This flag is set per adjacent facility.
- Down converting 2012 flight plan format to legacy format. Once a flight plan message has been received with legacy data, the flight plan is considered a legacy flight plan, and any subsequently received 2012 message input data will be down converted to legacy data. For 2012 flight plan data maintained in the database, down conversion occurs when forwarding ICAO or notification/coordination/negotiation messages to a downstream facility that does not support 2012 ICAO format.

Radio Communication, Navigation and Approach Aid Equipment and Capabilities
Grey rows – Conversion Required

Field 10a Item	Information	Legacy Conversion
N	None	N
S (no F)	Standard (VHF RTF, VOR, ILS)	VOL
S (and F)	Standard (VHF RTF, ADF, VOR, ILS)	S or VOLF
A	GBAS landing system	Z (field 18 NAV/GBAS)
B	LPV (APV with SBAS)	Z (field 18 NAV/LPV)
C	LORAN C	C
D	DME	D
E1	FMC WPR ACARS	Z (field 18 COM/FMC WPR ACARS)
E2	D-FIS ACARS	Z (field 18 COM/DFIS ACARS)
E3	PDC ACARS	Z (field 18 COM/PDC ACARS)
F	ADF	F
G	GNSS	G
H	HF RTF	H
I	Inertial Navigation	I
J1	CPDLC ATN VDL Mode 2	J (field 18 DAT/V)
J2	CPDLC FANS 1/A HFDL	J (field 18 DAT/H)
J3	CPDLC FANS 1/A VDL Mode A	J (field 18 DAT/V)
J4	CPDLC FANS 1/A VDL Mode 2	J (field 18 DAT/V)
J5	CPDLC FANS 1/A SATCOM (INMARSAT)	J (field 18 DAT/S)
J6	CPDLC FANS 1/A SATCOM (MTSAT)	J (field 18 DAT/S)
J7	CPDLC FANS 1/A SATCOM (Iridium)	J (field 18 DAT/S)
K	MLS	K
L	ILS	L
M1	ATC RTF SATCOM (INMARSAT)	Z (field 18 COM/INMARSAT)
M2	ATC RTF (MTSAT)	Z (field 18 COM/MTSAT)
M3	ATC RTF (Iridium)	Z (field 18 COM/IRIDIUM)
O	VOR	O
P1–P9	Reserved for RCP	no entry
Q	(not allocated)	Q
R	PBN approved	RZ
T	TACAN	T
U	UHF RTF	U
V	VHF RTF	V
W	RVSM approved	W
X	MNPS approved	X
Y	VHF with 8.33 kHz channel spacing capability	Y
Z	Other equipment carried or other capabilities	Z

Table 1: Conversion Table – field 10a

Surveillance Equipment and Capabilities Specifications: **Gray rows – Conversion Required**

Field 10b Item	Information	Legacy Conversion
N		N
A		A
C		C
E	Transponder — Mode S, including aircraft identification, pressure-altitude and extended squitter (ADS-B) capability	SD
H	Transponder — Mode S, including aircraft identification, pressure-altitude and enhanced surveillance capability	S
I	Transponder — Mode S, including aircraft identification, but no pressure-altitude capability	I
L	Transponder — Mode S, including aircraft identification, pressure-altitude, extended squitter (ADS-B) and enhanced surveillance capability	SD
P	Transponder — Mode S, including pressure-altitude, but no aircraft identification capability	P
S	Transponder — Mode S, including both pressure altitude and aircraft identification capability	S
X	Transponder — Mode S with neither aircraft identification nor pressure-altitude capability	X
B1	ADS-B with dedicated 1090 MHz ADS-B “out” capability	D
B2	ADS-B with dedicated 1090 MHz ADS-B “out” and “in” capability	D
U1	ADS-B “out” capability using UAT	D
U2	ADS-B “out” and “in” capability using UAT	D
V1	ADS-B “out” capability using VDL Mode 4	D
V2	ADS-B “out” and “in” capability using VDL Mode 4	D
D1	ADS-C with FANS 1/A capabilities	D (field 18 RMK/ADSC)
G1	ADS-C with ATN capabilities	D (field 18 RMK/ADSC)

Table 2: Conversion Table – field 10b

2.2 Field 10a and Field 18 PBN/ Designator Consistency. Consistency check is applied between field 10a and the PBN subfield content of field 18 as follows:

RNAV Specifications

Descriptors for PBN Designator	Field 10a requirement	Information	Legacy Conversion
A1		RNAV 10	(field 18 NAV/RNAV10 RNP10)
B1	SOGDI or SGDI	RNAV 5 all permitted sensors	(field 18 NAV/RNAV5)
B2	G	RNAV 5 GNSS	(field 18 NAV/RNAV5)
B3	D	RNAV 5 DME/DME	(field 18 NAV/RNAV5)
B4	SO or SD	RNAV 5 VOR/DME	(field 18 NAV/RNAV5)
B5	I	RNAV 5 INS or IRS	(field 18 NAV/RNAV5)
B6		RNAV 5 LORANC	(field 18 NAV/RNAV5)
C1	GDI	RNAV 2 all permitted sensors	(field 18 NAV/RNAV2)
C2	G	RNAV 2 GNSS	(field 18 NAV/RNAV2)
C3	D	RNAV 2 DME/DME	(field 18 NAV/RNAV2)
C4	DI	RNAV 2 DME/DME/IRU	(field 18 NAV/RNAV2)
D1		RNAV 1 all permitted sensors	(field 18 NAV/RNAV1) (field 10 P)
D2		RNAV 1 GNSS	(field 18 NAV/RNAV1) (field 10 P)
D3		RNAV 1 DME/DME	(field 18 NAV/RNAV1) (field 10 P)
D4	DI	RNAV 1 DME/DME/IRU	(field 18 NAV/RNAV1) (field 10 P)

Table 3: RNAV Specifications – Field 10a and Field 18 PBN/ Designator Consistency

RNP Specifications

Descriptors for PBN Designator	Field 10a requirement	Information	Legacy Conversion
L1		RNP 4	(field 18 NAV/RNP4)
O1	GDI	Basic RNP 1 all permitted sensors	(field 18 NAV/RNP1) (field 10 P)
O2	G	Basic RNP 1 GNSS	(field 18 NAV/RNP1) (field 10 P)
O3	D	Basic RNP 1 DME/DME	(field 18 NAV/RNP1) (field 10 P)
O4	DI	Basic RNP 1 DME/DME/IRU	(field 18 NAV/RNP1) (field 10 P)
S1		RNP APCH	(field 18 NAV/RNP APRCH)
S2		RNP APCH with BARO-VNAV	(field 18 NAV/RNP APRCH BARO VNAV)
T1		RNP AR APCH with RF	(field 18 NAV/RNP AR APRCH RF)
T2		RNP AR APCH without RF	(field 18 NAV/RNP AR APRCH)

Table 4: RNP Specifications – Field 10a and Field 18 PBN/ Designator Consistency

2.3 PBN processing implementation. PBN/ subfield is used as indication of RNAV and/or RNP capabilities, and applied to flight:

- For legacy flight plan:
 - R in field 10a and NAV/RNP10 in field 18 qualifies the flight for D50.
 - R in field 10a and NAV/RNP4 in field 18 qualifies the flight for 30/30 separation.
 - NAV/RNP4 in field 18 qualifies the flight for ADS contract.
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- For ICAO 2012 flight plan:
 - R in field 10a and PBN/A1 in field 18 qualifies the flight for D50.
 - R in field 10a and PBN/L1 in field 18 qualifies the flight for 30/30 separation.
 - PBN/L1 in field 18 qualifies the flight for ADS contract.

2.4 Enhancement to Amendment 1 of PANS-ATM Document 4444 15th Edition. With the addition of new subfields in field 18, the possibility of future subfield addition and the fact that ATM system users pay more attention to certain subfields than others, Aurora has implemented several enhancements to Amendment 1 implementation:

- Subfield priority order: Each subfield of field 18 is assigned a priority order, that determines the order in which the content of field 18 will be shown to the user or inserted in an outgoing message.
- Subfield coherence check: The ATM controller may elect to be notified when a modified subfields, e.g. PBN, STS, etc. cannot be sent to a downstream facility because the coordination revision message does not support field 18 (e.g. EST). For this reason, some subfields will be set in adaptation as eligible for subfield coherence check.
- Field 19 support inside field 18: Some airlines continuous filing of field 19 – Supplementary Information in field 18 - Other Information has prompted the implementation of supporting this capability and accept such flight plans. The Supplementary Information available in field 18 is therefore recognized, parsed and stored as if it was received in field 19, without user intervention, thus reducing user workload and incoming message failures.

2.5 Up converting legacy flight plan to 2012 ICAO format. So far, the need for an up conversion to 2012 ICAO format has not arisen. It will be the case when an adjacent facility switches to support only 2012 ICAO format when its upstream neighbor still supports both legacy and 2012 ICAO format. The infrastructure for such capability is ready in Aurora, and when defined, the up conversion algorithm can be implemented.

3. CONCLUSION

3.1 The meeting is invited to note the above information.
