

**Twenty-First Meeting of the Cross Polar Trans East Air Traffic Management Providers' Work Group
(CPWG/21)**

(Montreal, Canada 17-20 May 2016)

Agenda Item 5: Provide Status on CPWG/20 Actions

**Reroutes and Coordination Issues Associated with Volcanic Events
(Action Item # CP18-02)**

(Presented by the Federal Aviation Administration)

SUMMARY

This working paper discusses the challenges of revising routing clearances of airborne aircraft in the event of critical airspace event such as volcanic ash and the forwarding of flight plan changes to downstream facilities. Past meeting discussions have been compiled and draft procedures have been developed to facilitate discussions at the meeting.

1. Introduction

1.1 During the 16th Meeting of the Cross Polar Trans East Air Traffic Management Provider's Work Group (CPWG/16), American Airlines (AAL) presented a working paper (WP04) regarding events affecting an airborne flight during the eruption of the Kliuchevskoi Volcano on the Kamchatka Peninsula on 16 October 2013.

1.2 Updated information provided by Tokyo VAAC indicated that the original impact of the Kliuchevskoi eruption may have been greater than originally forecast. The American Airlines dispatcher made a decision to revise the routing of AAL175 around the volcanic ash plume. AAL175 was approximately 45 minutes into their flight from KDFW to RJAA. AAL dispatch began working with their flight crew and ATC to obtain a revised routing clearance for the aircraft. The AAL dispatcher issued a new routing to the aircraft via ACARS and sent the same routing to ATC.

1.3 There were several issues noted with coordination of the new routing and issuance of the route to the flight crew. AAL noted that while they submitted a new flight plan via a FPL message to US domestic ATC, the flight plan was not received by the facility currently working the aircraft or those facilities further along the aircraft's route in U.S. domestic airspace. Flight plan information was sent successfully to both Russia and Japan. However, it was noted that there were some coordination issues with Japan because they had already received departure message information on the original flight plan.

1.4 ANSPs have expressed concern with use of FPL, CHG, and other route messages for aircraft that are airborne or within close proximity to their proposed departure time. At issue is the potential for introduction of multiple flight plans into the ATC system and potential for route discontinuities between what ATC expects the aircraft to fly (expected vs. flown). Additionally, concerns by aircraft operators and ANSPs have been raised about the process for downstream route coordination and approval, especially in airspace volumes that require advanced approval by the ANSP/State, or requirements for aircraft operation centers (AOCs) to send these types of messages.

1.5 Given the potential for volcanic events and other natural disasters that could disrupt planned routes of flight in the North Pacific (NOPAC) and other regions where CPWG ANSPs provide service, developing a consistent harmonized approach to multiple reroutes is essential. Over the past several meetings, the FAA has presented several working papers for the CPWG to consider. At the previous meeting, the FAA presented WP/08 which outlined how ANSPs process CHG messages and forward information to downstream facilities.

1.6 Considering the difficulties experienced by the flight crew of AAL175 in obtaining a lengthy reroute in domestic airspace, potential for “expected vs. flown” errors that can occur with multiple FPLs or CHG messages being introduced, and other issues associated with significant reroute events, this paper proposes draft procedures that CPWG members may consider as guidelines.

2. Discussion

2.1 At the CPWG 20 meeting several options were discussed for coordinating and obtaining a revised routing clearance for an airborne aircraft when it became necessary due to a critical event such as volcanic ash. Each of the alternatives discussed had its own benefits and challenges. The following draft procedures are proposed to handle contingency situations such as volcanic ash. They are not to be used for efficiency gains.

2.2 It was agreed that the Dynamic Airborne Reroute Procedure (DARP) provided the best solution for issuing a revised routing clearance and coordinating the revised routing between ANSPs. DARP procedures are published in the GOLD and the DARP procedure is only to be used in ANSP airspaces that support the procedure. DARP requires CPDLC to downlink the aircraft routing request /uplink the ATC clearance and Air Traffic Services Interfacility Data Communications (AIDC) to forward the revised routing to downstream ANSPs. The challenge is that not all ANSPs have AIDC connectivity between facilities. Additionally not all ANSP facilities have a CPDLC capability or CPDLC may not be available to INMARSAT aircraft in the Polar Region sometimes above 74 degrees North Latitude. INMARSAT’s Polar coverage depends on the aircraft’s position to the satellites footprint. In some locations an INMARSAT signal may extend as far as 85 degrees North Latitude. Attachment 1 is being created for Operators to access the AIDC and CPDLC capabilities of the ANSPs along an aircraft’s route of flight. Some states also may require pre-approval for a flight to transit their airspace. For instance, State ATM noted that they require an FPL or a CHG message in advance to coordinate a route through their airspace.

2.3 One agreed upon requirement amongst all the ANSPs is that once an aircraft is airborne, the aircraft must request a revised routing clearance from ATC. ANSPs have seen instances where after an aircraft has departed, the dispatcher has filed a revised flight plan and the flight crew will fly the new flight plan without requesting a clearance from the controller. Failing to obtain a revised ATC clearance could result in a Gross Navigational Error (GNE). GNE’s are considered to be a serious safety concern.

2.4 Under ideal circumstances, the preferred method to request and obtain a revised routing would be by use of CPDLC. This paper proposes guidelines to obtain a revised routing clearance when CPDLC is not available and either HF or VHF voice is the primary means of pilot-controller communication. As was seen in the example of AAL175, the aircraft had difficulty obtaining a revised routing from domestic controllers. They did not have time to copy the long international routing request issue the full route clearance via voice, and enter the revised routing into the ATC computer. Further compounding the issue was the lack of familiarity with downstream oceanic routing or procedures. AAL175 ultimately was able to obtain a revised routing clearance through Russian Trans-East (RTE) airspace and reach its final destination. However, it did take a significant amount of time to actually issue even a partial reroute and get the aircraft headed in a direction closer to its newly requested route.).

2.4.1 Based on the lessons learned from AAL175, when requesting a revised clearance via voice keep the request as short as possible. Use route names where possible, route names are shorter and easier for controllers to copy than several waypoints/NAVAIDs. For the following example, an aircraft over North America, outside of CPDLC capability, enroute to the RTE needs a revised clearance via the NOPAC routes.

“AAL175 REQUEST REVISED ROUTING FOR VOLCANIC ASH AVOIDANCE”

This let the controller know the urgency of the request and make sure they are prepared to copy the request down.

ATC- “AAL175 GO AHEAD”

The controller is now prepared to copy the route.

“AAL175 REQUEST CLEARANCE TO THE RJAA AIRPORT VIA DIRECT ANC NICHOR580 OATIS DIRECT

The routing request is short and easy for the controller to copy and enter into the computer. Phonetically spell out the request (“NICHOR NOVEMBER INDIA CHARLIE HOTEL OSCAR, R220 ROMEO 220” etc). This increases the likelihood that the aircraft will be able to obtain a revised clearance on voice. The requested routing after OATIS is not feasible as an arrival routing. But it gets the aircraft on the correct route and once the aircraft is within Anchorage CPDLC coverage the full routing request with a correct arrival routing can be downlinked and a CPDLC routing clearance can be uplinked.

ATC-“AAL175 CLEARED TO THE RJAA AIRPORT VIA DIRECT ANC NICHOR220 OATIS DIRECT

In this case the new revised routing will be forwarded via NAM and AIDC interfaces to the destination. There are more challenges for forwarding the revised flight plan when there is a lack of AIDC or similar ATC flight information systems. These will be discussed later in the paper.

2.5 In the example given above, the aircraft was able to obtain a revised voice clearance. If the controller is unable to issue the routing clearance, the operator/dispatcher needs to coordinate with the appropriate ANSP manager/supervisor to determine the best way to get the aircraft a revised clearance. If it is not possible to get a full revised clearance, is it possible to obtain a partial routing clearance that gets the aircraft heading in the correct direction until a complete routing clearance can be obtained? Does the ANSP need a textual copy of the requested routing to facilitate the reroute? Coordinate with the ANSP manager/supervisor to determine the best way to proceed.

2.6 The next critical step after the clearance is obtained is the forwarding the revised flight plan information to downstream ANSPs. In the example given in 2.3.1 this is an easy task, the revised routing will be forwarded via NAM and AIDC interfaces to the destination. This is not always the case, Attachment 1 was created for operators to see which FIRs have an AIDC or similar connection between their facilities. In addition some ANSPs may also need a revised FPL or CHG message in addition to the AIDC message forwarding.

2.7 A copy of the FPL flight plan processing matrix excel file that has been developed through the CPWG meeting is included with this paper as Attachment 3. This flight planning matrix shows all the complexities of changing a filed flight plan after an aircraft has departed.

2.8 There are 3 basic scenarios that have to be covered in the event of an airborne contingency reroute.

2.8.1 AIDC or a similar connectivity exists between two facilities and is revised flight plan information required with the ANSP.

2.8.2 AIDC does not exist between two ANSPs, the original route of flight entered the ANSP's airspace and the new route of flight will still enter the FIR but on a different route.

2.8.3 AIDC does not exist between two ANSPs, the original route of flight did not enter the ANSP's airspace and the new route of flight will now enter the FIR

2.9 These three scenarios are listed in the Draft Attachment 2 with the actions each ANSP requires. In the event an airborne reroute occurs, the operator would look at the two attachments and determine what actions to take based on the charts in Attachment 1 and the Table in Attachment 2.

2.9.1 The first step an Operator would take after an airborne reroute clearance has been received by an aircraft would be to analyse the new routing with Attachment 1. Determine if the ANSP boundary that will be crossed is AIDC or similarly equipped (Green FIR Line). Having noted that information for each of the affected FIRs, proceed to step 2.

2.9.2 Utilize the FIR interface capabilities from step 1 and evaluate the action to be taken with each FIR using the Attachment 2 Table, Forward the appropriate flight planning messages to each affected ANSP as required by the Table. It is important to note that just because the route is changed beyond an ANSP's airspace, that ANSP still needs the revised routing information. Many facilities are now AIDC connected. If an early ANSP is not advised of a route change that does not occur in their airspace, but the downstream ANSPs are notified, AIDC flight information messages will overwrite the downstream ANSP's flight information.

2.10 There have been many discussions regarding flight plan change requirements and revised routing clearances at the CPWG meetings. This paper has compiled all of the discussions and developed a draft procedure for operators to use when conducting airborne contingency revised routings. The information is not complete for all FIR capabilities in Attachment 1 and the data in Attachment 2 table needs validating.

3 Action by the Meeting

3.1 The meeting is invited to:

- a. Review the information contained in this Working Paper;
- b. Review and update any incorrect or missing data on the charts and tables in the attachments to this Working Paper; and
- c. Discuss and develop an endorsed procedure for operators to use when conducting airborne contingency reroutes.

Attachment 1
Draft ANSP Flight Movement Message Interconnectivity



Map Color Key (light blue or purple dashed lines or no shading need information as to the capability)
 Red FIR Line indicates no automated Flight Information Interfacility Automated Message Processing capability (i.e. AIDC)
 Green FIR Line indicates an automated Flight Information Interfacility Automated Message Processing capability
 Purple Shading of a FIR indicates CPDLC route processing capability.
 Red Shading of a FIR indicates No CPDLC route processing capability

Attachment 2
Flight Plan Change forwarding Matrix.

ANSP	AIDC or a similar connectivity exists between two facilities and is a revised flight plan information required with the ANSP.	AIDC does not exist between two ANSPs, the original route of flight entered the ANSP's airspace and the new route of flight will still enter the FIR but on a different route.	AIDC does not exist between two ANSPs, the original route of flight did not enter the ANSP's airspace and the new route of flight will now enter the FIR.
State ATM	N/A	CHG message Required	FPL message required
JCAB	TBD	TBD	FPL message required
US FAA	FPL or CHG message required	CHG message Required	FPL message required
Norway	TBD	CHG message Required	FPL message required
Canada-Vancouver	TBD	CHG message Required	FPL message required
Canada- Edmonton	TBD	CHG message Required	FPL message required
ISAVIA Reykjavik	TBD	CHG message Required	FPL message required

Flight Planning Condition	State ATM	JCAB	US FAA-ZAN	Norway	CANADA Vancouver	CANADA Edmonton	ISAVIA Reykjavik
En Route change prior to departure	YES	Acceptable	ZAN FDP2000: The system will accept a CHG message for a previously received FPL provided the CHG message is from the same source as the FPL and as long as Flight Progress Strips have not yet been printed at any FDP2000 position. (Strip printing generally occurs 45 prior to the flight proposed departure time if the flight is departing from within FDP2000 airspace. Otherwise, strips are printed 45 minutes prior to the time FDP2000 calculates the flight will enter FDP2000 airspace based upon the proposed departure time and the FIR ETE times filed within field 18 of the FPL.) ZAN ATOP: The system will accept a CHG message. If the system has no matching FPL on file, the CHG message will be routed to the "Supervisor Queue" and/or the "Sector Queue". From that point, any further action would require human intervention, i.e. sending out an RQL message (RQL = Request Flight Plan).	CHG messages from IFPS (Eurocontrol) accepted	Yes CHG messages are accepted prior to departure. Cancel and refile messages are preferred and more common (especially if route has changed), but change messages are actioned. A CHG is used to transmit a change to one or more fields of previously sent fli	YES	Yes

En Route change after departure prior to oceanic entry	YES	Unacceptable	ZAN FDP2000: Yes; the FDP2000 system will accept a CHG message on a flight which has departed but not yet entered ZAN airspace provided that an FPL had already been received and the CHG message came from the same source as the FPL. (Important caveat although FDP2000 accepts a CHG message under this condition, the receipt of an AIDC message such as a CPL -Current Flight Plan- will overwrite any and all previously received route information whether it was in an FPL or CHG message. AIDC messaging is "ATC" coordination and therefore authoritative as to the aircraft's cleared profile.) ZAN ATOP: The system will accept, but not automatically process, a CHG message received for a flight which has departed but not yet entered ZAN ATOP airspace.	ACH-messages from IFPS (Eurocontrol) accepted.	Enroute route changes would only be initiated after a request from the flight crew. Any changes are then manually coordinated with Oakland Oceanic	YES	No
En Route after departure and in oceanic/non-surveillance airspace	YES	Unacceptable	ZAN FDP2000: Any CHG message which is received after FDP2000 has activated the flight plan (either thru controller action or receipt of AIDC coordination) will be rejected. ZAN ATOP: Any CHG message received for a flight after the flight has entered ZAN ATOP airspace will be sent to an error queue for manual processing.	Manual coordination and/or manual AFP message to IFPS (Eurocontrol)	This scenario is not applicable to Vancouver's airspace	CHG Message would be rejected by CAATS but changes could be manually entered.	Not after inbound coordination has commenced.

Processing Flight Plans - prior to departure (how ANSP transmits to downstream facilities)	UPON RECEIVING FPL THREE HOURS BEFORE DEPARTURE, MATMC CHECKS AND APPROVES/DISAPPROVES FPL AND SENDS ACK/REJ MESSAGES TO THE FPL SENDER + PLN (AIRSPACE USE AUTHORIZATION WITH	Airline select addressee	ZAN FDP2000: FDP2000 does not send FPLs. ZAN ATOP: ATOP does not send FPLs.	Via IFPS	Only one FPL, or one CPL, or an FPL followed by a CPL can be sent for the same aircraft. NAM ICD II interface (using the AFTN circuit) is the method of flight plan data transfer between VR ACC and Seattle/Anchorage ARTCCs.	AFTN Link	Via AFTN.
Processing Flight Plans - after departure (incl. how ANSP transmits to downstream facilities)	SAME AS ABOVE BUT IF THERE IS A PREVIOUSLY FILED FPL, IT FIRST NEEDS TO BE CANCELLED BY CNL MESSAGE	▪ JCAB system is unable to receive change message after departure, so JCAB system can't send it to other ANSPs.	ZAN FDP2000: FDP2000 does not send FPLs. ZAN ATOP: ATOP does not send FPLs.	Manual coordination + AFP to IPFS (which then transmits ACH/ APL to affected ANSPs)	CPL's are transmitted to Seattle and Anchorage ARTCC's via the NAM interface. If after transmission of a CPL, a re-route is issued that now avoids that airspace, a cancellation message is sent.	AFTN Link. CNL Message is sent via AFTN Link.	Adjacent ATSUs are notified of aircraft approaching the common boundary by means of ABI messages, followed by CPL messages. A CNL is used to notify of a route change which invalidates coordination.

Is advanced approval required	YES	Not necessary advanced notification except for national aircraft and the aircraft which doesn't belong to ICAO.	ZAN FDP2000: no. ZAN ATOP: no.	FPL from IFPS (Eurocontrol)	Advanced notification is not required	No	Advanced notification according to LoA with adjacent units, 30-50 minutes. No prior landing permissions except in exceptional diplomatic cases.
How much time is required for advanced approval	THE TIMELINE IS THREE WORKING DAYS BEFORE FOR NON-SCHEDULED AND 40 DAYS BEFORE FOR SCHEDULED FLIGHTS PURSUANT TO GEN 1.2 RUSSIAN AIP. IN CASE OF EXCEPTIONAL CIRCUMSTANCES, THE TIMELINES CAN BE REDUCED.	Not required	Not applicable.	N/A	N/A	N/A	N/A
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