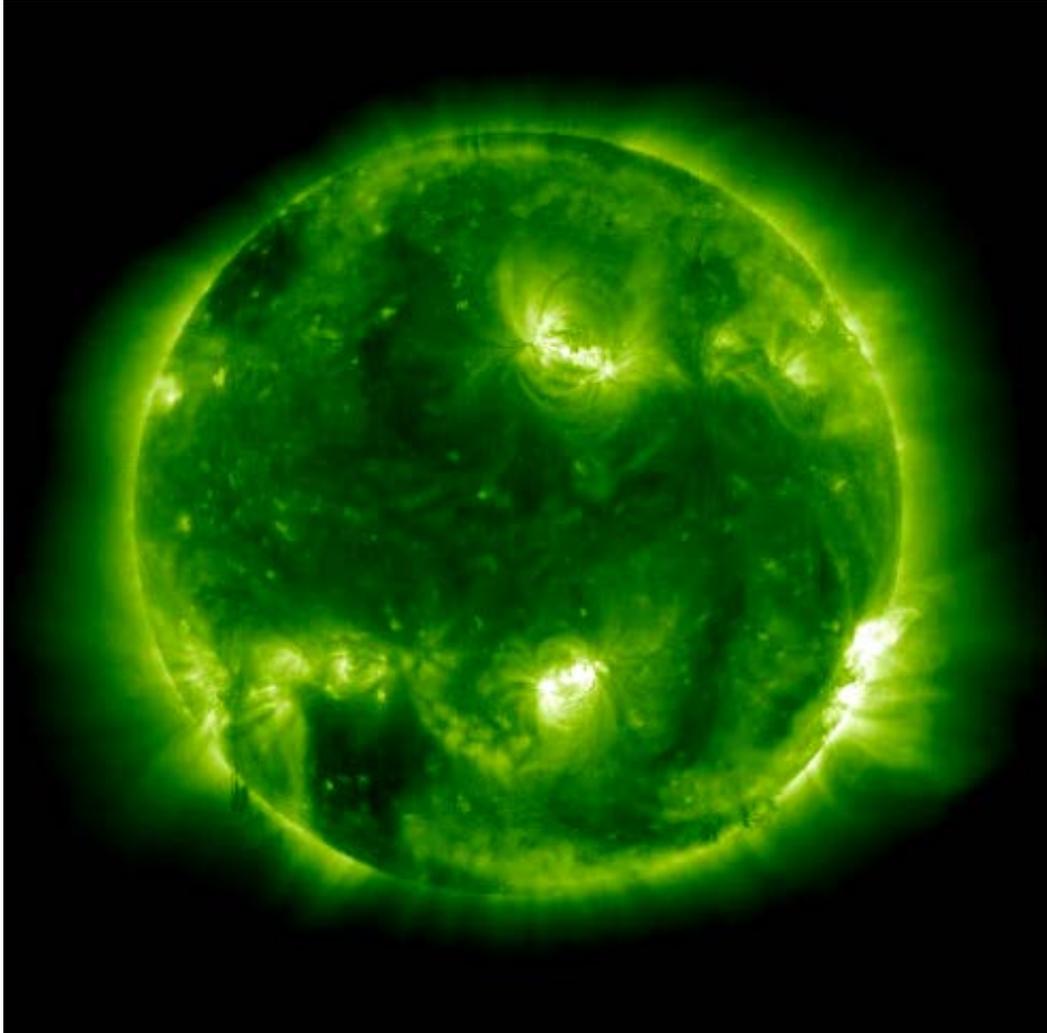


SWXEX23

Draft Directives



A Flare and Coronal Mass Ejections (CME) erupts from the Sun

~8 minutes later: Radio (HF) communications are lost

½ hour to 16 ½ hours later: satellites and polar flights affected

1-4 days later: electric power, navigation systems and radio communications affected

N9000 – N6000 from W01500 – W06000

Document Title:

SWXEX23 Directives

Edition: 1.0
Date: 31 Oct 2023
Status: Draft

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1 INTRODUCTION

The exercise will simulate a Flare and CME eruption from the Sun

Exercise date and time (UTC): dd Mmm 2023 (hh00 to hh00 UTC)

Exercise Leader: State

Initial Exercise Report: to be submitted to the Exercise Leader by each participating organization by dd Mmm 2023 (consolidated reports due dd Mmm)

Debrief Meeting: dd Mmm 2023, Paris

Debrief Host: ICAO EUR/NAT RO, Paris

2 PARTICIPATING AGENCIES

A list of confirmed participants in the exercise, listed according to area of activity (i.e. Aerodrome Meteorological Offices (AMO)s (in some cases this coincides with the Meteorological Watch Office (MWO)), Air Navigation Service Providers (ANSP)s, Airline Operators (AO)s, NOTAM Offices (NOF)s, Space Weather Advisory Centres (SWXC)s, Regional OPMET Centres (ROC)s, Regulators and international organisations etc.).

Detailed list of participating agencies and their Directing Staff is given in Appendix A.

Important note: Exercise participants should bear in mind that all exercise actions and procedures shall not affect real operation. Therefore, all SWX messages shall include the term EXER in the status indicator of the advisory message. Also, all SWX messages should include EXERCISE SWXEX23 EXERCISE in the remarks section. NOTAMS shall indicate "EXERCISE SWXEX23 EXERCISE" and end with the warning "EXERCISE SWXEX23 EXERCISE" (for details see Section 10).

3 AIMS AND OBJECTIVES

The objectives of the exercise are:

- Exercise NAT Doc 006, Part III, Space Weather Contingency Plan – North Atlantic Region;
 - For individual States: test the effectiveness of their national procedures in accordance with the ICAO plan including that local operations (e.g. AMO, ANSP, AOs, NOF, regulator) procedures are updated (and in some cases developed) in line with national SRA policies;
 - ANSP review of operational procedures that should be aligned with the NAT Doc 006, Part III and ensure ATCO awareness and management of the operational situation in a SWX event;
 - For all participants: test the effectiveness of local (organizational) SWX contingency plans and/or procedures;
 - Exercise the origination, dissemination, reception and use of SWX related aeronautical/meteorological information (including SWX advisory information, NOTAM and

AIM); ensure that NOTAM are in accordance with Annex 15; and

- Conduct a workshop on exercise preparation with an emphasis on reviewing the new NAT Doc 006, Part III (with an emphasis on AMOs, ANSPs, AOs, NOFs and National Regulators);
- Test the ATM responsiveness to need of AO operational flexibility;
- Test Dynamic Airborne Reroute Procedure that includes
 - Unexpected avoidance in the vicinity of a SWX effect resulting in minimal use of Contingency Procedures by pilots. This will dramatically reduce ATC workload and provide a safer airspace;
 - Training of ATC in the use of Controller Pilot Data Link Communications (CPDLC) loadable uplinks to re-route multiple aircraft in real time. ATC must be confident in their ability to move multiple aircraft safely and efficiently. This also mitigates the potential for human error in the flight deck;
 - Shifting of NAT tracks, if not yet issued, in response of a real-time SWX event. This is not a “pre-planning” event, but rather a real-time response; and
 - Downstream FIR coordination between ANSPs (including NM for those eastbound flights that exit oceanic airspace at a different oceanic exit point) to prevent any interruption (route discontinuity) in the aircraft FMS (Flight Management System). This is vital in the event of a loss of communication scenario, since both ATC and pilots must know what the route expectation is downstream.

4 SUPPORTING DOCUMENTS

In addition to the Exercise Directive the exercise participants may use the following documents in SWXEX23:

- NAT Doc 006, Part III, *Space Weather Contingency Plan – North Atlantic Region*
- ICAO Annex 3, *Meteorological Service for International Air Navigation*
- ICAO Doc 4444, *Procedures for Air Navigation Services Air Traffic Management (PANS-ATM)*;
- ICAO Doc 10100, *Manual on Space Weather Information in Support of International Air Navigation*

5 EXERCISE DURATION

The Exercise will take place on:

- dd Mmm 2023 hh:00 – hh:00 UTC

SWX Advisories will be issued by SWXC PECASUS (United Kingdom).

Details about all the products, URLs etc. will be contained in this document. DISTAFF will be informed if there are any amendments to this information.

SWX products will be issued every 6 hours.

First operational teleconference is scheduled at **tbd** UTC, second operational teleconference at **tbd** UTC.

6 EXERCISE PHENOMENON

A Flare and CME erupts from the Sun

N9000 – N6000 from W01500 – W06000

7 EXERCISE SCENARIO

The exercise will simulate a flare and CME eruption from the Sun on **tbd**.

SWX effects:

- ~8 minutes later: Radio (HF) communications are lost (HF COM)
- ½ hour to 16 ½ hours later: satellites and polar flights affected (SATCOM, RADIATION)
- 1-4 days later: electric power, navigation systems and radio communications affected (GNSS)
- FIRs expected to be impacted:
 - Gander, Nuuk, Scottish, Shannon, Shanwick, Reykjavik.
Note that some FIRs south of the SWX event were included in order to coordinate re-routing further south of the event.

SWXC PECASUS will generate SWX Advisories every 6 hours using the World Meteorological Organization (WMO) Headers for Traditional Alphanumeric Code (TAC) and ICAO Meteorological Information Exchange Model (IWXXM) as follows:

- TAC advisory IWXXM advisory
- FNXX01 EGRR LNXX01 EGRR

Note the numbers in the headers indicate the following SWX effects:

- 01 = GNSS
- 02 = HF COM
- 03 = RADIATION
- 04 = SATCOM

SWX Advisories can be found in the Appendix B.

The OPS Teleconferences will discuss current ATM network situation (based on ATFM simulation) and outlook (based on SWX Advisories) for the next 18 hours.

8 EXERCISE SCHEDULE

Below is the chronological list of the actions to be undertaken before and during the exercise by participants. **Will update dates and times later**

Date/Time (UTC)	Player	Event/Action
30 Apr 2023	SWXC PE-CASUS (UK)	SWX advisory products available
Aug 2023	Exercise leader and ICAO Secretariat	Initial draft Exercise Directive available to DISTAFF
31 Aug 2023	Exercise Leader and ICAO Secretariat	Final Draft Exercise Directive available on ICAO Portal under group SWX
13-14 Oct 2023, location tbd	Open to everyone, with an emphasis on AMOs, ANSPs, AOs, NOTAM Offices, SWXCs, ROCs, Regulators and international organisations	Exercise preparatory workshop
31 Oct 2023	Exercise leader & DISTAFF	Final Exercise Directive available on ICAO Portal under group SWX
15 Nov 2023	ACCs or FMPs	Issue to their NOFs a request NOTAM message to inform the aviation community of the exercise
15 Nov 2023	NOFs	Issue consequential NOTAMs to inform the aviation community of the exercise
17 Nov 2023		START EXERCISE SWXEX23 Activities
06:00	SWXC PE-CASUS (UK)	Issues SWX advisory at 17/0600 with forecasts to 18/0000 at intervals of 6 hours

17 Nov 2023		EXERCISE SWXEX23
08:00	Exercise Leader	Start of SWXEX23 announced by AIM
sequentially	States affected	Publish NOTAM based on SWX advisory

Document Title:

SWXEX23 Directives

		Provide SWX advisory to operators and flight crew members for preflight planning, inflight replanning, used by flight crew members before departure and aircraft in flight
sequentially	National Supervisory Authority	Define national strategies for airspace management according to State policy
sequentially	AOs	Assess flight impact against SWX advisories and NOTAM
sequentially	AOs & ANSPs	Consider the use of DARP in providing potentially multiple aircraft alternate routes to avoid the effects of SWX
sequentially	ANSPs	Analyse what airspace restrictions can be relaxed to accommodate rerouting traffic most efficiently
08:15	Exercise Leader	Issues an AIM invitation to teleconference (at 09:00 UTC)
09:00	All	Operational teleconference to discuss the latest situation and outlook
11:30	Exercise Leader	Issues an AIM invitation to teleconference (at 13:30)
12:00	SWXC PE-CASUS (UK)	Issues SWX advisory at 16/1200 with forecasts to 17/0600 at intervals of 6 hours
sequentially	States affected	Publish NOTAM based on SWX advisory Provide SWX advisory to operators and flight crew members for preflight planning, inflight replanning, used by flight crew members before departure and aircraft in flight
sequentially	AOs	Assess flight impact against SWX advisories and NOTAM
sequentially	AOs + ANSPs	Consider the use of DARP in providing potentially multiple aircraft alternate routes to avoid the effects of SWX
sequentially	ANSPs	Analyse what airspace restrictions can be relaxed to accommodate rerouting traffic most efficiently
12:45	Exercise Leader	Issues an AIM invitation to teleconference (at 13:30 UTC)
13:30	All	Operational teleconference to discuss the latest operational situation and outlook
16:00	Exercise Leader	End of SWXEX23 announced by AIM
sequentially	ACC	Request a NOTAM to notify end of SWXEX23
sequentially	NOFs	Publish NOTAM as requested
END		

9 EXERCISE SCENARIO MESSAGES

Scenario messages related to the exercise, including at least one example for each of the following: AIM, SWX advisory and NOTAM.

Examples of the SWXEX23 exercise messages are set out in Appendix D.

10 COMMUNICATIONS

Instructions regarding message handling and other communications:

NOTAMs to be promulgated by all participating NOFs at least two days prior to the exercise, advising that the exercise will take place.

NOTAM and AIM messages to be issued to normal addresses and the general free text is to start with the expression **"EXERCISE SWXEX23 EXERCISE"** and to end with the expression **"EXERCISE – SWXEX23 – EXERCISE"**

Note that in space weather advisories, the expression **'EXERCISE SWXEX23 EXERCISE'** should be included in the remarks section.

11 SPECIAL INSTRUCTIONS

Operational teleconferences organised by the Exercise Leader at 09:00 UTC and 13:30 UTC. Details and participation instructions are available in Appendix E.

General tasks to be performed within the role of specific groups of participants (AMOs, ANSPs, AOs, NOFs, SWXCs, ROCs, Regulators and international organisations, etc.) are available in Appendix F. To end the exercise, the Exercise Leader will agree with all exercise participants the ENDEX time. The exercise is terminated by cancelling existing NOTAM and AIM (**how is SWX Advisory cancelled**):
EXERCISE SWXEX23 TERMINATED.
ENDEX TIME 1600.

Appendix H contains a list of abbreviations used in this document.

12 TRANSMISSION OF INFORMATION CONCERNING SPACE WEATHER ACTIVITY

Referencing PANS-ATM 9.1.3.8, Information on space weather phenomena that have an impact on high frequency radio communications, communications via satellite, GNSS-based navigation and surveillance systems, and/or pose a radiation risk to aircraft occupants at flight levels within the area of responsibility of the ATS unit, shall be transmitted to the affected aircraft by one of more of the means specified in PANS-ATM 9.1.3.1.1 ((a) the preferred method of directed transmission on the initiative of the appropriate ATS unit to an aircraft, ensuring that receipt is acknowledged; or (b) a general call, unacknowledged transmission to all aircraft concerned; or (c) broadcast; or (d) data

link. *Note.* – It should be recognized that in certain circumstances, e.g. during the last stages of a final approach, it may be impracticable for aircraft to acknowledge directed transmissions.)

ICAO Annex 3, Chapter 9 provides detailed Standards and Recommended Practices for meteorological information to be supplied to operators and flight crew members for preflight planning, inflight replanning, used by flight crew members before departure, and aircraft inflight (Annex 3, Chapter 9, paragraph 9.1.3 k) refers).

Useful authoritative and free websites include:

Australian Bureau of Meteorology

<http://www.bom.gov.au/aviation/space-weather-advisories/>

Finnish Meteorological Service

<https://www.ilmailusaa.fi/warnings.html#top=0#id=swx#FMILang=en#select-area=4>

Basic information about the ICAO SWX advisories is available on the website of PECASUS, one of the ICAO Global SWX Centres

<https://pecasus.eu/?p=789>

13 DESCENTS BY AIRCRAFT DUE TO SOLAR RADIATION FROM SPACE WEATHER EVENTS

Referencing PANS-ATM 15.5.5, Air traffic control units should be prepared for the possibility that aircraft may, on rare occasions, experience a rise in solar radiation which requires them to descend to lower levels. When such a situation is known or suspected, air traffic control units should take all possible action to safeguard all aircraft concerned, including any aircraft affected by the descent.

Note. – All aircraft in a particular portion of airspace and above a certain altitude may be affected at the same time, and the event may be accompanied by a deterioration or loss of air ground communications. It is expected that the aircraft will alert air traffic control units before the radiation reaches a critical level and will request a descent clearance when the critical level is reached. However, situations may occur in which the aircraft will need to descend without waiting for a clearance. In such cases, the aircraft are expected to advise air traffic control units, as soon as possible, of the emergency action taken.

14 DYNAMIC AIRBORNE REROUTE PROCEDURE

Dynamic Airborne Re-route Procedure (DARP)

What is DARP?

- The procedure for executing a re-route clearance initiated by a request from AOC (Aeronautical Operational Control), the Flight Crew, or ATC.

Why use DARP?

- The purpose of DARP is to allow AOC to initiate the process for an airborne aircraft to be issued an amended route clearance by the ATS unit.

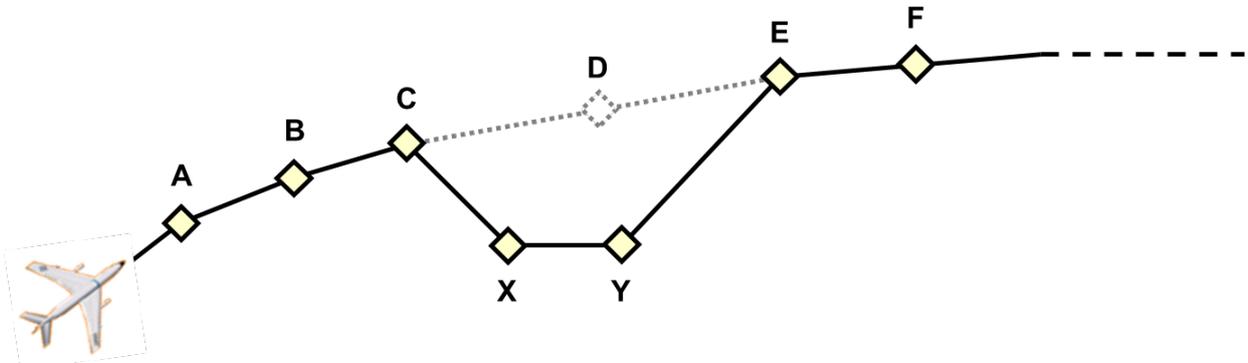
- Operator, flight crew and ATC work together to coordinate a change in aircraft routing with little to no operational impact on the flight.
- Loadable Controller Pilot Data Link Communications (CPDLC) route clearance uplinks are expeditious, eliminate flight crew typing errors and in the case of unexpected concentration levels of volcanic ash (or other hazards); enable reroutes into safer airspace.
- Reduces workload for flight crew and ATS.

What is needed for DARP?

- Aircraft with operational CPDLC capability
 - ATC, operator and pilot training on the use of CPDLC
 - Reference ICAO Doc 10037, *Global Operational Data Link Manual (GOLD)*
 - See chapter 5 that contains
 - AOC-initiated re-route procedures
 - ATC-initiated re-route procedures
 - The following have examples in **Appendix A** (below)
 - EXAMPLE - A**
 - ATC-initiated re-route – the CLEARED TO waypoint in the new route is on the current route and there is no route discontinuity
 - EXAMPLE - B**
 - ATC-initiated re-route – the CLEARED TO waypoint in the new route is not on the current route and there is a route discontinuity
 - EXAMPLE - C**
 - ATC-initiated re-route – aircraft is cleared direct to a fix that is located downstream in the current route
 - Communications between ACCs
 - Air Traffic Services (ATS) Inter-facility Data Communications (AIDC) or
 - Online Data Interchange

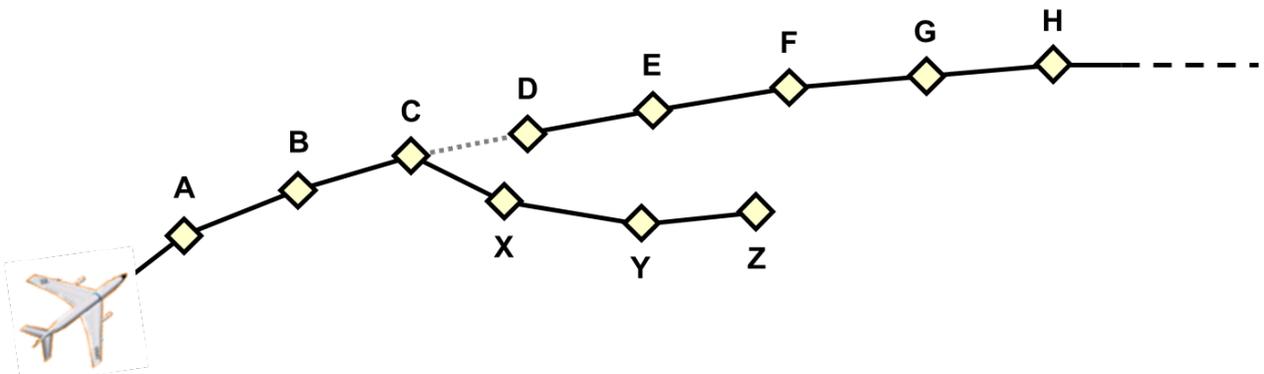
Appendix A - CPDLC Route Clearance Uplink Scenarios

EXAMPLE - A:



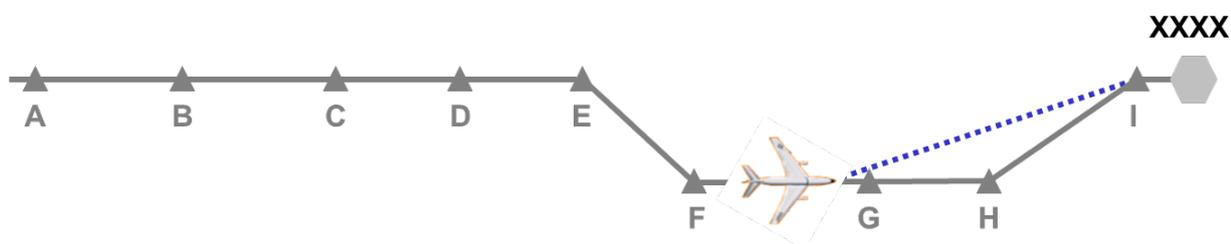
1	<p>a) ATC sends the clearance CLEARED TO (E) VIA (A B C X Y) to the aircraft using UM79 / RTEU-6 CLEARED TO (position) VIA (enRoute data). There is no discontinuity because the uplink fix (E) is in the existing cleared flight plan; or</p> <p><i>Note 1.</i> – Forecast weather data in the FMS is lost for waypoints A, B, C, D. Waypoints X, Y do not contain any forecast weather data. Forecast weather data for waypoints E, F, etc. remains intact.</p>
2	<p>The flight crew responds to the clearance with RSPD-1 WILCO or RSPD-2 UNABLE, as appropriate.</p>

EXAMPLE - B:



1	<p>ATC sends the clearance CLEARED TO (Z) VIA (A B C X Y) to the aircraft using UM79 / RTEU-6 CLEARED TO (position) VIA (enRoute data).</p> <p><i>Note 1.</i> – Forecast weather data in the FMS is lost for waypoints A, B, C. Waypoints X, Y, Z do not contain any forecast weather data. Forecast weather data for waypoints D, E, F, G, H, etc. remains intact.</p>
---	---

2	<p>a) The flight crew responds to the clearance with RSPD-1 WILCO or RSPD-2 UNABLE, as appropriate.</p> <p>b) This clearance creates a route discontinuity at Z. The flight crew should obtain further route clearance from ATC before the aircraft reaches Z (that clearance could, for example, be from Z direct to G). In the meantime, the flight crew should overcome the discontinuity at Z by applying their existing company practices under the assumption that a further route clearance will be received before reaching Z.</p>

EXAMPLE - C:

1	ATC sends the clearance UM74 / RTEU-2 PROCEED DIRECT TO (fix I) to the aircraft.
2	The flight crew responds to the clearance with RSPD-1 WILCO, immediately loading the clearance into the FMC and proceeding direct to the cleared direct-to fix I.

DARP examples involving one ACC in the NAT during VOLCEX21

Useful to perform a test within the FIR with an operator prior VOLCEX22. VOLCEX22 DARP test will involve multiple FIRs

DL 84 A330 KATL-LFPG NAT Track X

- PORTI...47N050W...49N040W...50N030W...50N020W...SOMAX
- 35W @ 0845 communicated to flight dispatcher increased ash cloud concentration
- After reviewing latest EVITA information, flight dispatcher up-linked a revised routing one-degree south for 20W and the oceanic exit point (OEP)

Flight crew request to Shanwick (EGGX) for revised routing loaded into the Flight Management System (FMS)

- Downlink sent @ 30W to EGGX controller requesting revised routing

EGGX controller review of requested revised routing

- EGGX unable to approve request due to traffic

Flight crew response

- ATC advised executing inflight contingency procedure
- Broadcast intentions to all a/c, offset 5nm and descended below FL290 where ash cloud concentrations were nil
- EGGX controller then cleared the a/c direct to BEDRA

DL 15 A330 EDDF-KATL Random Track

- BEDRA...48N020W...48N030W...47N040W...47N050W...PORTI
- Approaching the OEP, flight crew advised flight dispatcher of increased ash cloud concentration
- After reviewing latest EVITA information, flight dispatcher up-linked a revised routing one-degree south for 20W and 30W

Flight crew request to Shanwick (EGGX) for revised routing

- Flight dispatcher revised routing loaded into the FMS
- Downlink sent @ BEDRA to EGGX controller requesting revised routing

EGGX controller review of requested revised routing

- EGGX approved revised routing and uplinked the new route

Flight crew response

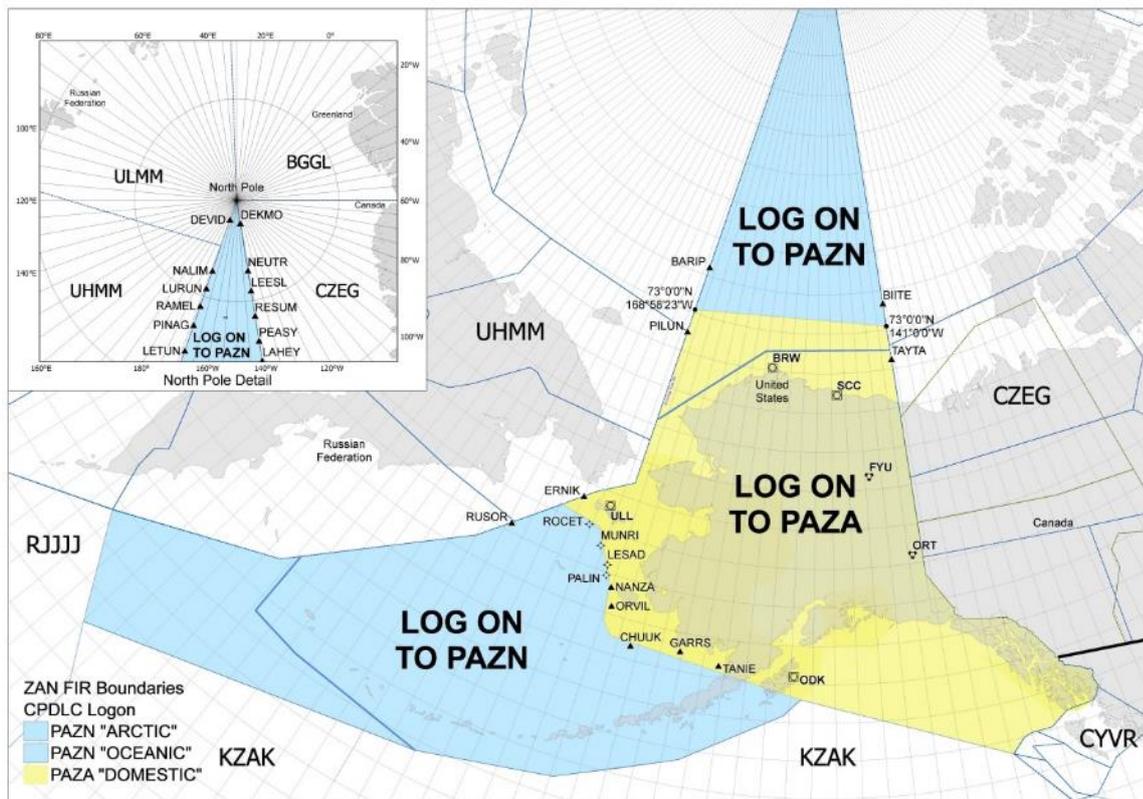
- Flight crew reviewed the uplink, loaded it into the FMS, and responded with UNABLE (due to informal trial restrictions)

The revised routing provided an acceptable level of ash cloud concentration

SWEX23 Directives

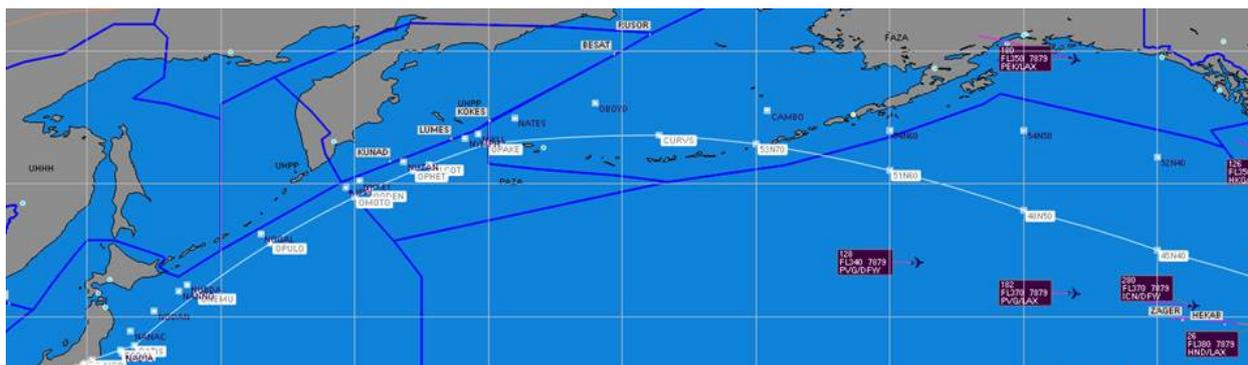
DARP example involving multiple ACCs in the North Pacific

Areas in Anchorage Air Space that can support a CPDLC test using DM24 and UM80: *this corresponds to Advanced Technologies and Oceanic Procedures (ATOP) airspace shaded in blue below*



Example flight for sending reroute information via CPDLC to PAZN. Then ACC Anchorage can pass this information to ACC Magadan via AIDC.

AAL183 KLAX-ZSPD (provided this route uses PAZN ATOP airspace and there are no significant operational delays):



Use of CPDLC for American Airlines Operations

SWXEX23 Directives

- Dispatch will provide the cockpit a proposed flight plan to deviate around volcanic ash. This will be uplinked from dispatch to the cockpit.
- The pilot will forward that flight plan (route request) via CPDLC to ATC.
- The ATC being communicated with e.g. Edmonton will coordinate with the downstream ACCs to where the reroute request rejoins the original flight plan e.g. ACCs – Anchorage, Magadan or Oakland before a clearance is issued.
 - Note that the point that rejoins the original flight plan needs be done before reaching Chinese, Korean or Taiwanese airspace.
- The pilot is expected to receive a reroute clearance via CPDLC from ATC (UM79, UM80 or UM83).
- The pilot is expected to provide a response to ATC (DM0, DM1 or DM2) accepting this reroute clearance. The response depends on the aircraft.
 - For AAL B777/787, the following procedure applies:
 - **ACCEPT** or **REJECT**
 - For AAL A330, the following procedure applies:
 - **WILCO** or **UNABLE**

Appendix A SWX Participants (DISTAFF)

A.1 Directing Staff

Organization	Name	Job Title	E-mail Address	Office Phone Number
EXERCISE LEADER	-	-	-	+-
ICAO	Christopher KEOHAN	Regional Officer - MET	ckeohan@icao.int	+33 1 46 41 85 16
SWXC PE-CASUS (UK)	-	-	-	+-
ROC London	Matt Wagner	Data Services Support	Matt.Wagner@NATS.co.uk	+44 14 89 88 71 85
ANSP	-	-	-	+-
NOF	-	-	-	+-
AMO	-	-	-	+-
Regulator	-	-	-	+-
EUROCONTROL NM	Armin SCHAWWE	Network Crisis Management Expert	armin.schawe@eurocontrol.int	+32 27299877
IATA	-	-	-	+-
IFALDA	-	-	-	+-
IFALPA	-	-	-	+-

A.2 Aircraft Operators

Aircraft Operator	Name/Job Title	E-mail Address	Office Phone Number	Telecon Phone Number
Aegean Airlines	Nikolaos Vasilakis / Head of Flight Dispatch	vasilakis.nikolaos@aegeanair.com	+30 210 3550107	+30 210 3550107
Aer Lingus	Grattan Lee / Flight Operations Compliance Specialist	grattan.lee@aerlingus.com	+353872917485	+353872917485
Air Corsica	Daniel Sebe / OCC Manager	dasebe@aircorsica.com	+33420107381	+33495290277 +33495290533
Air France	Francois Roppe / Dispatch Duty Manager	frroppe@airfrance.fr	+33 6 22 38 00 03	+33 1 41 56 45 55
Air France	Raphael Eyrolle / Responsable – Pole ATM-CNS/SESAR	raeyrolle@airfrance.fr	+33 6 38 33 08 82	+33 1 41 56 45 55
American Airlines	Steve Smith / Flight Dispatch Instructor	stephen.smith@aa.com	+1 682 315 4806	+1 682 315 4806
American Airlines	Bill Trott / Dispatch Instructor – Air Transportation Supervisor	bill.trott@aa.com	+1 682 315 4813	+1 682 315 4813
American Airlines	David Noble / Dispatch Instructor – Air Transportation Supervisor	david.noble@aa.com	+1 682 315 4808	+1 682 315 4808
American Airlines	Wayne Snyder / Fleet Captain B777/787	wayne.snyder@aa.com	+1 817 586 6359	+1 817 586 6359
British Airways	Alexander Smith / Flight Dispatch Strategy Manager	alexander.smith@ba.com	+447789 611059	+447789 611059
Brussels Airlines	Thomas Smeets / IOCC Liaison Officer	thomas.smeets@brusselsairlines.com	+32 2 723 8857 +32 473 97 57 82	+32 2 723 88 65
Cal Cargo Airlines	Shlomi Sason / OCC Manager	shlomos@cal-cargo.com	+972 504417766	+972 3 9779966
CityJet	Darren Donnelly / Head of Operations Control	darren.donnelly@cityjet.com	+353 1 895 0704	+353 1 895 0704
Danish Air Transport	Paulius Grumadas / Head of Operations	gru@dat.dk	+45 76 92 30 14 +370 695 275 85	+45 76 92 30 14 +370 695 275 85
Delta Air Lines	Janine Mardell / Supervisor Flight Control International Operations	janine.mardell@delta.com	+1 678 876 9201	+1 404 715 0209

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Aircraft Operator	Name/Job Title	E-mail Address	Office Phone Number	Telecon Phone Number
easyJet	Geoffrey Kingston / Head of Navigation Delivery	geoffrey.kingston@easyjet.com	+44 (0)7595 039057	+44 (0) 1582 525098
Edelweiss Air	Philipp Elksnat / Manager Flight Dispatch	philipp.elksnat@flyedelweiss.com	+41 43 564 55 38	+41 43 564 55 38
Eurowings	Diana Pares-Selders / Product Owner Flight Planning	diana.pares-selders@eurowings.com	+49 151 589 46 929	+49 151 589 46 929
Eurowings	Marc Hasenbein / Captain A320	marc.hasenbein@eurowings.com	+49 151 5890 1239	+49 151 5890 1239
Eurowings	Patrick Thorn / First Officer A320	patrick.thorn@eurowings.com	+436767344593	+436767344593
Eurowings	Pia Zahran / Senior Flight Operations Controller OCC	pia.zahran@eurowings.com	+49 151 589 673 35	+49 151 589 673 35
Eurowings	Timo Rapp / Head of OPS Steering & Efficiency	timo.rapp@eurowings.com	+49 151 58 92 74 64	+49 151 58 92 74 64
Egyptair	Mohamed Ali Elsayed / Crisis Manager	mohamed.elhag@egyptair.com	+2 01061879793 +2 01280548666	+202 22681976 +202 22674671 +2 01280548666
EL AL	Tal Dillon / Chief Dispatcher	taldi@elal.co.il	+972 3 9716842	+972 3 9716842
Ellinair	Nikoglou Athanasios / COO	anikoglou@ellinair.com	+306979720581	+302311224765
Emirates	Kaspars Vitols / Flight Dispatch Examiner	kaspars.vitols@emirates.com	+971 4798 1058 +971 52 8754 192	+971 4798 1058
Etihad	Roshantha Arachchige / Technical Flight Dispatcher	rarachchige@etihad.ae	+971 2 511 2269	+971 2 511 2269
FedEx	Justin Lonie / International ATC – Flight Dispatch Analyst	justin.lonie@fedex.com	+1 901 584 8071	+1 901 584 8071
Iberia	Cristina Serrano Martinez / Flight Watch & ATFM Supervisor	cserranom@iberia.es	+34 913055305	+34 913055305
Iberia	Maria Teresa Lumberras	mtlumberras@iberia.es	+34 609428334	+34 609428334
Iberia	Felipe Laorden	flaorden@iberia.es	+34 609428371	+34 609428371
Iberia	Jaime Sotillo	jsotillo@iberia.es	+34 630990986	+34 630990986

Document Title:

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Aircraft Operator	Name/Job Title	E-mail Address	Office Phone Number	Telecon Phone Number
KLM	Martin Dijkzeul / ATC Coordinator/Flow Control	martin.dijkzeul@klm.com	+31 20 3041151/2	+31206041126
LOT	Wojciech Kacprzak / Airline dispatcher	w.kacprzak@lot.pl	+48 22 6066685	+48 22 6066685
LOT	Slawomir Zabkowicz / Flow Control Section Manager	s.zabkowicz@lot.pl	+48 22 6066685	+48 22 6066685
Lufthansa	Gerd Mattes / Senior Manager Flight Dispatch and ATM	gerd.mattes@dlh.de	+49 69 696 91818	+49 69 696 91818
Novair	Peter Bjorklund / Operations Manager	peter.bjorklund@novair.se	+46 72 973 2797	+46 72 973 2797
Novair	Henrik Ekstrand / Ecology and Performance Manager	henrik.ekstrand@novair.se	+46 72 973 2797	+46 72 973 2797
NyxAir OU	Sergei Gudov / Compliance Monitoring Manager	compliance@nyx.ee	+372 56926616	+372 56926616
Saudia	Mohammed Alghamdi / Mgr Flt Dispatch & Training	mohdsalghamdi@saudia.com	+966506361613	+966126860812
Saudia	Fouad Alotaibi / Flight Dispatcher	fralotaibi@saudia.com	+966554556070	+966126860812
Saudia	Albaraa Halawani / Flight Dispatcher	albhalawani@saudia.com	+966552120484	+966126860812
Singapore Airlines	Low Yong Lin / Senior Executive Flight Control	yonglin_low@singaporeair.com.sg	+65 6540 3125	+65 6540 3125 +65 6542 7442
Singapore Airlines	Tan Ai Luan / Flight Follower	ailuan_tan@singaporeair.com.sg	+65 641 33370 +65 64133369	+65 64133369
TAP Air Portugal	Carlos Branco / Flight Operations Officer	cmbranco@tap.pt	+351 217 656 102	+351 217 656 102
TAP Air Portugal	Vitor Martins / Flight Dispatch and Operational Control Manager	vmsmartins@tap.pt	+351 91 218 2273	+351 21 841 5948
TUI	Peter Machts / Duty Manager Group Operation Centre	peter.machts@tuifly.com	+49 511 9727247	+49 511 9727247
TUI	Lauren Fry / Operations Duty Manager	lauren.fry@tui.co.uk	+44 2034 512874	+44 7740 349204
UPS	Claus Pantring / ATC Manager Europe	claus.pantring@europe.ups.com	+49 170 922 1948	+49 170 922 1948
Virgin Atlantic Airways	Ian Roy / Manager – Aeronautical Services and ATM	navigation.services@fly.virgin.com	+44 1293 444452	+44 (0) 344 2097390

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Wideroe	Ronny Silberg / Flight Planner	ronny.silberg@wideroe.no	+47 75 51 37 10	+47 75 51 37 10
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A.3 SWXCs

SWXC	Name	Job Title	E-mail Address	Office Phone Number
PECASUS	-	-	-	+-
ACFJ	-	-	-	+-
NOAA SWPC	-	-	-	+-
China/Russia Consortium	-	-	-	+-

A.4 ANSPs

State	Name	Job Title	E-mail Address	Office Phone Number
Canada	-	-	-	+-
Denmark	-	-	-	+-
France	-	-	-	+-
Iceland	-	-	-	+-
Ireland	-	-	-	+-
Norway	-	-	-	+-
Portugal	-	-	-	+-
United Kingdom	-	-	-	+-
United States	-	-	-	+-

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A.5 NOFs

State	Name	Job Title	E-mail Address	Office Phone Number
Canada	-	-	-	+-
Denmark	-	-	-	+-
France	-	-	-	+-
Iceland	-	-	-	+-
Ireland	-	-	-	+-
Norway	-	-	-	+-
Portugal	-	-	-	+-
United Kingdom	-	-	-	+-
United States	-	-	-	+-

A.6 AMOs

State	Name	Job Title	E-mail Address	Office Phone Number
Canada	-	-	-	+-
Denmark	-	-	-	+-
France	-	-	-	+-
Iceland	-	-	-	+-
Ireland	-	-	-	+-
Norway	-	-	-	+-
Portugal	-	-	-	+-
United Kingdom	-	-	-	+-
United States	-	-	-	+-

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A.7 Regulators

State	Name	Job Title	E-mail Address	Office Phone Number
Canada	-	-	-	+-
Denmark	-	-	-	+-
France	-	-	-	+-
Iceland	-	-	-	+-
Ireland	-	-	-	+-
Norway	-	-	-	+-
Portugal	-	-	-	+-
United Kingdom	-	-	-	+-
United States	-	-	-	+-

Appendix B Scenario

(SWXC PECACUS to update – can graphic be used)

First Series of SWX Advisories issued on 17 Nov 2023 at 0600 UTC

SWX Advisory 0600 UTC 17 Nov 2023

-

SWX Advisory forecast 1200 UTC 17 Nov 2023

-

SWX Advisory forecast 1800 UTC 17 Nov 2023

-

SWX Advisory forecast 0000 UTC 18 Nov 2023

-

Second Series of SWX Advisories issued on 17 Nov 2023 at 1200 UTC

SWX Advisory 1200 UTC 17 Nov 2023

-

SWX Advisory forecast 1800 UTC 17 Nov 2023

-

SWX Advisory forecast 0000 UTC 18 Nov 2023

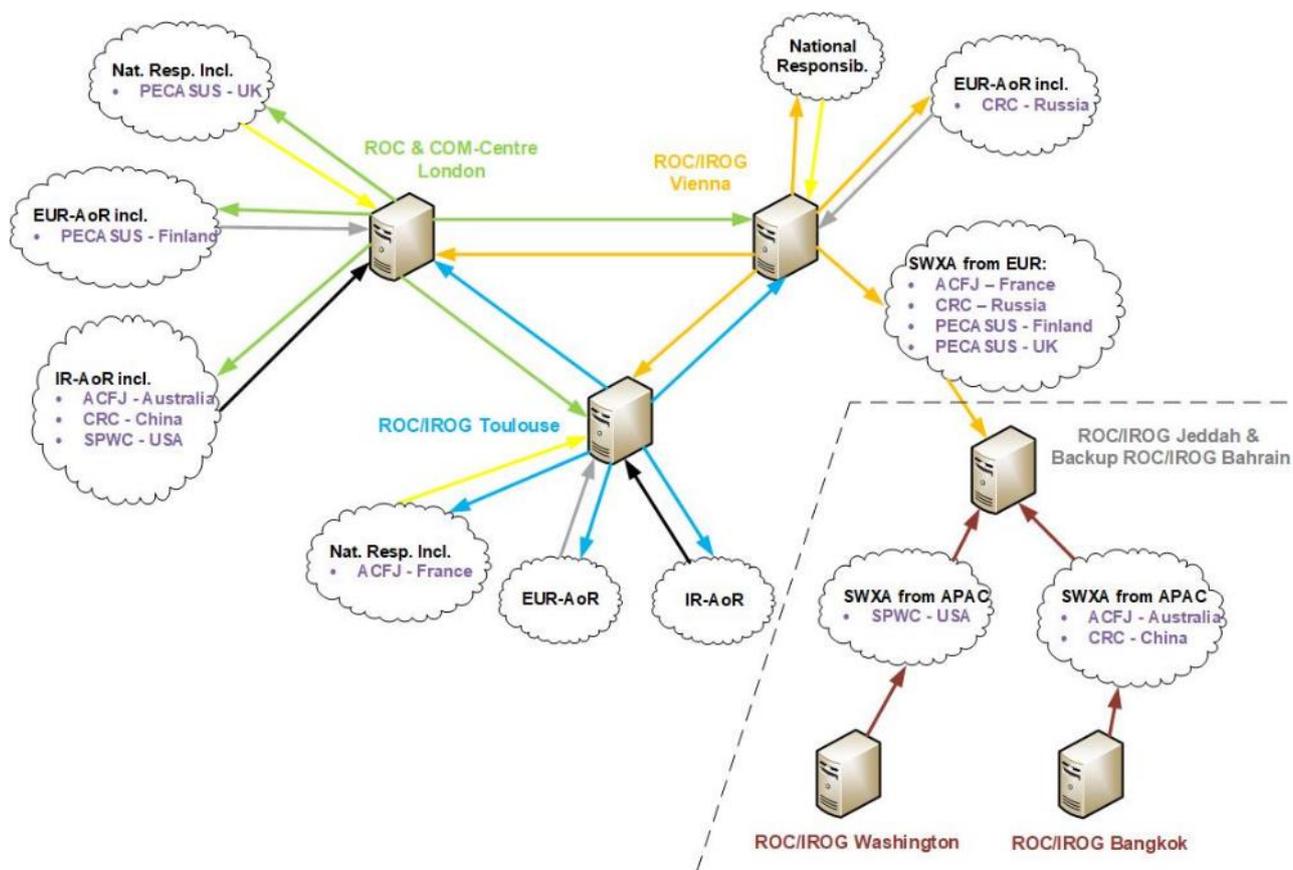
-

SWX Advisory forecast 0600 UTC 18 Nov 2023

-

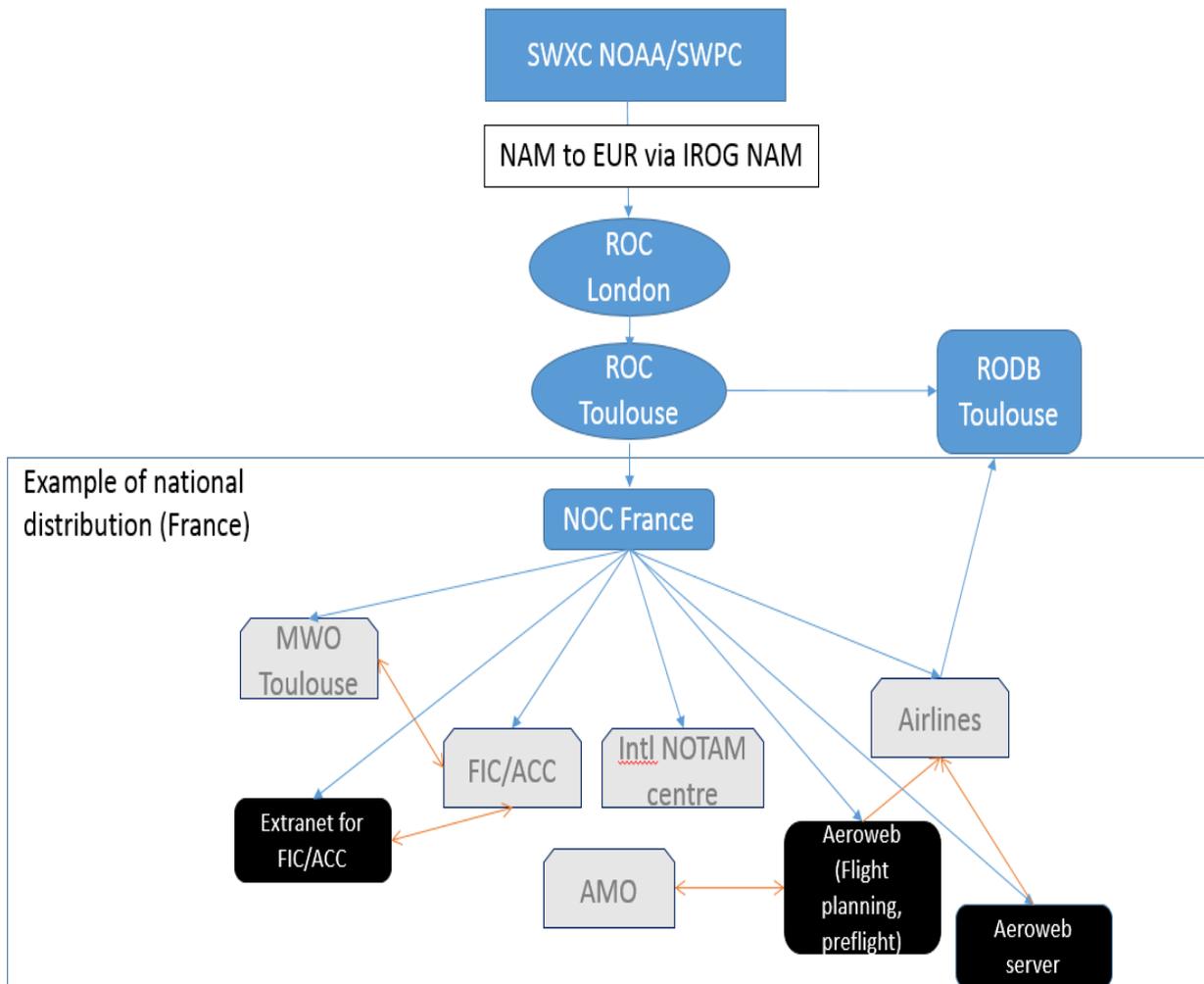
Appendix C SWX Advisory Information Flow

Currently, the flow of inter-regional and regional space weather advisory information is as follows:



State example of space weather information flow:

SWXEX23 Directives



Appendix D Examples of Messages

Scenario messages related to the exercise, including at least one example for each of the following: SWX Advisory, NOTAM and AIM.

D.1 SWX Advisory

SWX Advisory 0600 UTC 17 Nov 2023

(SWXC PECASUS to update)

=

SWX Advisory 1200 UTC 17 Nov 2023

(SWXC PECASUS to update)

D.2 NOTAM examples

Collection of NOTAM templates are provided using samples from previous exercises; they represent different information according to the policy that each State has adopted and are **not designed to be copied and pasted**. Dates, coordinates and other references are only for the purpose of this exercise. Only text is provided each NOF shall code requested NOTAM according to defined procedures as in the documents:

1. ICAO DOC 8126 and/or
2. OPADD Operating Procedures for AIS Dynamic Data (ECAC States approved guidelines)

NOTAM informing the aviation community prior to the exercise and ending of exercise

EXERCISE SWXEX23 EXERCISE

SPACE WEATHER EXERCISE 'SWXEX23' WILL TAKE PLACE ON 17 NOVEMBER 2023 FROM 0800 TO 1600 UTC.

ANY PUBLICATION SUCH AS SWX ADVISORY AND NOTAM PUBLISHED FOR AND IN RELATION TO THE EXERCISE SHALL BE DISREGARDED AND NOT BE USED FOR OPERATIONAL PURPOSES.

SPACE WEATHER ADVISORY MESSAGES USE THE TERM 'EXER' IN THE STATUS INDICATOR IN ACCORDANCE TO ICAO ANNEX 3 AND THE EXPRESSION 'EXERCISE SWXEX23 EXERCISE' SHOULD BE INCLUDED IN THE REMARKS SECTION

NOTAM AND AIM MESSAGES START WITH THE EXPRESSION 'EXERCISE SWXEX23 EXERCISE' AND END WITH 'EXERCISE – SWXEX23 – EXERCISE'

NOTAM for space weather

EXERCISE SWXEX23 EXERCISE

SPACE WEATHER...

NOTAM cancelling space weather exercise

EXERCISE SWXEX23 EXERCISE

...

D.3 AIM to be issued by Exercise Leader

AIM – PRE EXERCISE 14/11/22 AIM 0 GENERAL INFO

TITLE: EXERCISE SWXEX23 EXERCISE

GENERAL INFO VALID FROM: 14 NOVEMBER 2023 TO 17TH NOVEMBER 2023

1. GENERAL INFORMATION

THE NAT SPACE WEATHER EXERCISE (EXERCISE SWXEX23) WILL TAKE PLACE ON THE 17TH OF NOVEMBER 2023 FROM 08:00 UTC TO 16:00 UTC.

EXERCISE LEADER: ...

SPACE WEATHER EVENT: THE EXERCISE WILL SIMULATE A FLARE AND CME ERUPTION FROM THE SUN WITH EXPECTED RADIO COMMUNICATIONS LOST AS WELL AS SATCOM DISRUPTIONS AND INCREASES RADIATION AND GNSS MAY BE AFFECTED

SWXC PECASUS WILL GENERATE SWX ADVISORIES AT SIX HOURLY INTERVALS WITH FORECASTS TO 18 HOURS AT SIX HOURLY INTERVALS.

DURING THE EXERCISE A NUMBER OF MESSAGES (E.G. NOTAMS, SWX ADVISORIES, AIMS) WILL BE ISSUED. THE NOTAM AND AIM MESSAGES WILL START WITH THE EXPRESSION 'EXERCISE SWXEX23 EXERCISE' AND END WITH 'EXERCISE – SWXEX23 - EXERCISE.'

SPACE WEATHER ADVISORY MESSAGES USE THE TERM 'EXER' IN THE STATUS INDICATOR IN ACCORDANCE TO ICAO ANNEX 3 AND THE EXPRESSION 'EXERCISE - SWXEX23 - EXERCISE' SHOULD BE INCLUDED IN THE REMARKS SECTION

IN THE EVENT OF AN ACTUAL SPACE WEATHER EVENT, THE EXERCISE WILL BE TERMINATED.

2. OBJECTIVES OF THE EXERCISE.**To add.****3. SPACE WEATHER EVENT INFLUENCED OR VERY CLOSELY INFLUENCED:**

GANDER, NUUK, REYKJAVIK, SCOTISH, SHANNON, SHANWICK

4. DE-BRIEFINGDE-BRIEF MEETING PARIS **MMM YYYY**.

DE-BRIEF HOST ICAO EUR/NAT RO.

ON BEHALF OF THE EXERCISE LEADER

EXERCISE-EXERCISE-EXERCISE

AIM 1

SPACE WEATHER (SWXEX23) EXERCISE

VALID FROM: 17 NOVEMBER 2023, 0800 UTC UNTIL, 17 NOVEMBER 2023, 1600 UTC.

EXERCISE SWXEX23 EXERCISE - FOR EXERCISE PURPOSES ONLY -

.
CAUTION: THIS IS AN EXERCISE AIM RELATED TO A FAKE SPACE WEATHER EVENT INTENDED FOR AN INTERNATIONAL EXERCISE (SWXEX23) AIRLINES SHOULD NOT TAKE ANY ACTION.

.
EXERCISE LEADER HAS BEEN INFORMED THAT A SPACE WEATHER EVENT IS ONGOING.

.
MEANWHILE AIRCRAFT OPERATORS SHALL CLOSELY MONITOR ALL RELEVANT NOTAMS.

.
NMOC, **BRUSSELS**

.
- FOR EXERCISE PURPOSES ONLY -
EXERCISE – SWXEX23 - EXERCISE

Appendix E Instructions for Teleconferences

On the exercise day, 2 operational teleconferences where the Exercise Leader invites operational stakeholders to assess the situation and discuss measures to be taken.

E.1 Operational teleconference

Each teleconference is led by the Exercise Director. They will start at 09:00 UTC and 13:30 UTC and run for approximately 60 minutes. It is proposed to join the telecom 10 minutes earlier than the start time to allow proper identification.

Agenda for Operational teleconferences 1 and 2

1	Welcome – Exercise Leader	Run through the list of participants.
2	PECASUS	Update on the space weather event. The SWXCs participate during the first 10 minutes of the teleconference only.
3	Exercise Leader	Assumptions made for purposes of this exercise.
4	Exercise Leader	Current Network situation Summarise the individual state intentions regarding the SRA approach Inform the participants of the current ATFCM situation and events Discuss the predicted evolution of the space weather event for the next 18 hours and the intentions of AOs and ANSPs in response.
5	AMOs	Current situation including Weather.
6	ANSPs	ANSP current situation. Address individual FMPs about their intentions and ability to respond to AO needs for operational flexibility. Discuss use of DARP.
7	AO	Outlook and requests – Address AO participants individually for their flight operational input in comparison with the applicable ATM Network Impact simulation and their needs for operational flexibility (e.g. relaxation of airspace flight planning restrictions). Discuss use of DARP.
8	Exercise Leader	Summary and next teleconference.

The Exercise Leader will summarise conclusions of the teleconference and confirm any actions agreed. Moreover, the Exercise Leader will stress that if the need arises it may organise another teleconference.

Appendix F Roles of Participants

F.1 Role of Exercise Leader

The role of the Exercise Leader in a Space Weather Exercise is:

- Define the scenario (in conjunction with SWXC and the SWX SG)
- Produce the Exercise Directive in accordance with the timeline as agreed during the exercise planning meeting
- Coordinate with all participants in the preparatory tasks
- Manage the exercise tasks
- Collect exercise assessment reports produced by all participants
- Produce global exercise report draft and submit it to the appreciation of all participants
- Produce global final exercise report to be presented at the debriefing meeting
- Chair the debriefing meeting

F.2 Role of SWXC

The role of the SPWC in the exercise is to:

- Process all available data
- Produce and issue the SWX Advisory messages that have an impact on HF, SATCOM, GNSS and RADIATION exposure at flight levels with identified and projected areas
- Issue advisory information regarding the extent, severity and duration of the space weather phenomena
- Supply advisory information to ACCs/FICs, AMOs in its area of responsibility which may be affected, other SWXCs and international OPMET databanks, NOFs and aeronautical fixed service Internet-based services

F.3 Role of ANSPs

The role of ANSPs (eg. ACCs and/or its Flight Management Positions) in a Space Weather Event Exercise is related to both air traffic control and management procedures.

In the case of the SWX exercises, as it is defined a virtual scenario not intending to affect real traffic, ANSPs do not usually drill control tasks, but only exercise and test air traffic management situations.

Their role will be

- Paying attention to the advisory messages of the exercise (SWX Advisories, NOTAMs, AIMS) and identify if those advisories affect their areas
- Following ICAO SWX Contingency Plan
- Producing and provide the full assessment of mitigation actions and their impact based on the space weather event situation and the impact to ATFM
- Analyse what airspace restrictions can be relaxed to accommodate rerouting traffic most efficiently

F.4 Role of NOFs

The role of NOF Centres during a Space Weather Exercise is to issue NOTAMs requested by ACCs /FMPs and AD authorities after they receive SWX Advisories. This information includes observations or forecasts of space weather phenomena, the date and time of their occurrence, the flight levels where provided and portions of the airspace which may be affected by the phenomena.

In the case of NOF agencies responsible for more than one affected FIRs they may consider, in close coordination with the respective ACCs/FMPs, the production of multi-FIR NOTAMs. This is a known procedure to shorten the response time in contingency situations. So, its use shall be carefully thought and only applied if the following conditions are assured:

- Responsibility for NOTAM request is clearly defined and expressed
- Coordination is strongly assured
- Shortening response time clearly justify the procedure

F.5 Role of AMOs

The role of the AMOs is to:

- Provide SWX advisory information relevant to the whole route to operators and flight crew members (included in flight documentation)
- Share current weather hazards and information with stakeholders

F.6 Role of State Regulators

The role of the State Regulators in a Space Weather Exercise is to:

- Ensure that all the Operators, ANSPs and Aerodromes are aware of the current ICAO SWX Contingency Plan and understand how this will be implemented
- Ensure that their State has a clear policy in respect of the SRA approach (reference ICAO Doc 9974)
- Ensure that the various NOTAMs are issued at the agreed times and with a good quality and in accordance with ICAO policy
- Ensure AMOs provide SWX advisory information relevant to the whole route to operators and flight crew members (included in flight documentation)

F.7 Role of Aircraft Operators (AOs)

Each participant in the exercise (state, ANSP, and AO) will be assessing current procedures and information flows and what they need to do in the future.

For the AO:

- assess the way that early information is received by them, whether the content is sufficient for them to assess the level of activation of their resources, etc.
- required to analyse the space weather forecast and give feedback during the teleconferences on what actions they would have taken with their flights compared to the ATM network impact. AOs will also be asked to indicate airspace restrictions (e.g. RAD restrictions) which they would like to see relaxed to enable most efficient re-routings.
- assess the flight impact according to their company approved SRA taking into consideration the policy communicated by each State.
- encouraged to use DARP in requesting reroutes

Appendix G **Measure of Effectiveness of SWXEX23**

- Dissemination (timeliness and effectiveness) of operationally relevant information (SWXC advisories/NOTAM etc.) - quantitative assessment
- Evaluation of ATM responsiveness to AO need for operational flexibility (qualitative and quantitative assessment)
- Ability of States to manage their airspace (qualitative assessment) and publish operational information (quantitative assessment) and the Airline use of the information to plan flights (qualitative assessment) Effectiveness of internal State communications (qualitative assessment)
- Use of DARP by AOs and ANSPs (qualitative and quantitative assessment)
- Use of the ICAO SWX Contingency Plan by Operators, ANSPs and Aerodromes and understanding any issues associated with its implementation (qualitative assessment)
- Review of SWXCs performance.

Appendix H List of Abbreviations

A list of abbreviations used in the Exercise Directive, including but not limited to, the following:

Abbreviation	Decode
ACC	Area Control Centre
AIM	Aeronautical Information Message
AIS	Aeronautical Information Services
AO	Aircraft Operator
ANSP	Air Navigation Service provider
ATFCM	Air Traffic Flow and Capacity Management
ATM	Air Traffic Management
ATS	Air Traffic Services
FMP	Flow Management Position
NM	EUROCONTROL Network Manager
NMOC	Network Manager Operations Centre
NOF	International NOTAM Office
NOTAM	A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations
SWX	Space Weather
SWXC	Space Weather Centre