

*International Civil Aviation Organization*

ICAO

## INFORMATION PAPER (IP/17)

ICAO Asia and Pacific (APAC)  
Twenty-Ninth Meeting of the Meteorology Sub-Group  
(MET SG/29)

Bangkok, Thailand, 18 - 22 August 2025

**Agenda Item 6: Research, development and other initiatives****MET EXERCISES IN THE EUR/NAT REGION**

(Presented by New Zealand)

**SUMMARY**

This paper provides information on the two VOLCEX exercises carried out in the Europe / North Atlantic regions during 2023 and 2024, and a space weather exercise planned for 2025.

**1. INTRODUCTION**

1.1 The VOLCEX23 and VOLCEX24 exercises simulated eruptions of European volcanoes and their impact on the aviation system. The lessons learned from these exercises may be of interest to States in the APAC region. Further, outcomes from the upcoming North Atlantic space weather exercise may provide an opportunity for APAC States to improve their own readiness for future space weather events.

**2. DISCUSSION**EUR/NAT VOLCEX23 Exercise

2.1 VOLCEX23 took place on 21 November 2023 and simulated a volcanic eruption of Snæfellsjökull in Iceland. The simulated volcanic ash cloud impacted a large area including Iceland, southeast of Iceland into northern and northwestern Europe.

2.2 Recommendations and outcomes of interest include the following (non-exhaustive):

- The issue of some operators missing the status indicator 'EXER' in the body of the SIGMET for VOLCEX23 was seen during the exercise – as has been noted in previous APAC VOLCEX exercises. It was noted by VOLCEX23 that EUR Doc 014 recommends a line break after 'EXER' – and this has now been included in the upcoming Amendment 82 to Annex 3. The exercise recommendations further request ICAO to include the full word 'EXERCISE' in the exercise SIGMETs.
- Cross-border SIGMET coordination needed further improvement, in particular where some MWOs based their SIGMETs on the VAA, while others used the (legacy) European Concentration Charts.
- Consideration of the inclusion of commercial weather providers in the exercise, as authorised by the national regulators of the operators.

- Airline operators to share individual safety risk assessment policies on levels of volcanic ash concentration each operator can penetrate in order to assist ANSPs in predicting air traffic flow rates.

2.3 The full set of recommendations from VOLCEX23 are provided in Appendix A to this paper.

#### EUR/NAT VOLCEX24 Exercise

2.4 VOLCEX/24 was held 19 November 2024, simulating an eruption of the volcano Santa Barbara in Azores, Portugal, with volcanic ash impacting northern and western Europe, then extending to the east and south.

2.5 VOLCEX/24 demonstrated the use of quantitative volcanic ash concentration information (QVA), with many recommendations relating to this. Recommendations and outcomes of interest include the following (non-exhaustive):

- Again, the use of EXER in exercise SIGMETs not being obvious was highlighted as an issue.
- Regulatory implementation of new product QVA must be prioritised. Current products should be available and used until new ones are fully approved and operationalised.
- NOTAMs shall not refer to individual SIGMETs to avoid mismatching.
- Increase efforts to harmonize vertical limits in VAG charts with VAAC concentration models.
- To minimize delays, use direct and fast communication channels between ACC and MWO during NOTAM issuance.

2.6 The full set of recommendations from VOLCEX24 are provided in Appendix B to this paper.

#### NAT Space Weather Exercise Plan

2.7 The North Atlantic Space Weather Exercise 2025 (NAT SWX2025) will be conducted (in person) as a tabletop exercise from 10 to 11 December 2025 at the ICAO EUR/NAT Office in Paris, France.

2.8 The NAT SWX2025 exercise will be based on the approved NAT Space Weather exercise directive and will simulate the effects from the eruption of a large solar flare on the NAT traffic flows.

2.9 Participants are expected from all four ICAO SWX Centres, aircraft operators, regulators and meteorological offices from European States and the USA, as well as representatives from ICAO, EUROCONTROL, IATA, IFALDA and IFALPA.

### **3. ACTION BY THE MEETING**

3.1 The meeting is invited to note the information contained in this paper.

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## **APPENDIX A – VOLCEX23 Outcomes**

### **National Procedures:**

- Request States to review their national contingency plan procedures and ANSPs to ensure that local operations procedures are updated (and in some cases developed) in line with national Safety Risk Assessment (SRA) policies which should be in line with the EUR/NAT Volcanic Ash Contingency Plan (EUR Doc 019, NAT Doc 006, Part II); and
  - National contingency plan procedures should include contingency arrangements with border States.
  - *Note that VOLCEX21, VOLCEX22 and VOLCEX23 reported no airspace closure in the NM network – a major achievement.*

### **Scenario Attributes:**

- Continue combination of one- to two-day preparatory workshop with 1-day exercise (continue to focus on participant preparedness);
- Consider two part exercise: AM – start of eruption phase and PM – fast forward to a day after the start of eruption (could make this part a surprise to ANSPs and operators);
- Use scenario that provides more medium and high-level volcanic ash concentration areas;
- Agree on volcano name (e.g. reference Smithonian);
- Consider using changeable VONA (e.g. eruption starts, stops, starts again, different ash heights);
- Consider expanding to other regions (e.g. MID) in future exercise (e.g. 2024+);
- Identify resource requirements to support a random scenario (FAA to provide information in future event);
- Extend ash cloud into Central/Eastern Europe during the exercise time of 0800-1600 UTC; and
- Consider a future eruption of a volcano in Greece.

### **Collaborative Decision Making (CDM):**

- Continue sharing airport surface status information;
  - Include possible use of taxiways and runways for parking positions in future exercise;
- Continue practicing the management of stranded passengers and consider coordination with alternative modes of transport;
- Record teleconferences and make the recordings available to the exercise participants; and
- AOs encouraged to share individual SRA policies on levels of volcanic ash concentration each operator can penetrate in order to assist ANSPs in predicting air traffic flow rates. IATA to invite airlines to indicate what volcanic ash concentration levels they would fly into when the invitation is sent in July for the next VOLCEX. This is intended to be used as an indication during the exercise only and be part of the Exercise Directive. An up-to date summary of this information for real-time use should be pursued through EASA and the national regulators.

### **EVITA:**

- Continue to provide routine annual on-line training on EVITA and record this training (could replace training zone videos); and
- Remind participants at the preparatory workshop to apply for an NOP token in advance of the Exercise.

### **Participation:**

- Encourage more ANSP participation based on La Palma experience and e.g. NATS detailed reports on managing contingencies on volcanic ash;
  - Readily availability of operational procedure based on ICAO VACP DISTAFF needed for exercise coordination with participating ANSPs;
- Consider a more active role for commercial weather providers as authorized by the national regulators of the operators as many large operators utilize their products in their volcanic ash SRA methodology. These products should be compliant with ICAO provisions (e.g. use of

EXER in SIGMET) and displayed such that real and exercise products (e.g. SIGMET) can be easily identified. IATA will remind AOs to ask their commercial weather providers to be involved in the exercise when inviting AOs to participate. This can be done during the email invite in July and in the preparatory workshop;

- Focus be placed on airports and passengers;
- Verify that participants listed in the Directives plan to participate (can be done in the State letter that requests States to update the contact information); and
- Encourage more NAT participation – particularly, Canada and the United States; and
- Emphasize that DISTAFF manage their sections prior and post exercise. DISTAFF to encourage participation (e.g. DISTAFF member for NOTAMs to manage NOF issue NOTAM in accordance to the VACP, and DISTAFF member for MWOs to manage SIGMETs by Skyvector and Aviation Weather). DISTAFF to collect reports in their field and provide one consolidated report for the debrief meeting.

**Danger Area:**

- Continue to monitor the issuance of Danger Areas in the Exercises; noting only one Danger Area should be issued at the time of the eruption before SIGMET is available, in accordance with the EUR/NAT VACP Attachment X4

**VAAC:**

- When starting the exercise a few days into the eruption, create charts, and other products that show the situation up to 12-24 hours prior to the start of the exercise. This would give long-haul operators the information needed to make operational decisions for flights that are being planned several hours in advance of the start of the exercise;
  - Make clear label of the purpose of these charts in the Exercise Directive;
- Backup VAAC re-issue VAG/VAA product when VA comes to within ~300 nm of the area of responsibility of the backup VAAC;
- Clarify use of VAA header;
- Improve VAAC website by making clear an exercise is ongoing as well as make the concentration charts visible on the website for downloading;
- Assure VA cloud coordinates match those in the Directive;
- Harmonize vertical extent and map projections of volcanic ash cloud between VAA/VAG and VACC, which is used in EVITA;
- Improve forecast granularity (e.g. some users requested forecast sets with smaller – 3 hour or less time steps);
  - This recommendation is acknowledged by the VAACs, but it is not something that can be delivered in the short-term. However, the adoption of the Quantitative Volcanic Ash (QVA) approach by all VAACs will deliver 3-hourly granularity for VA concentration information, and other additional information, in the medium term;
  - Promote preparedness for use of QVA likely to be introduced by ICAO from 2024 and/or 2025. Coordination of its operational implementation by ICAO; and
  - Provide guidance material on interpreting QVA(e.g. how will probabilities be used by national regulators and aircraft operators, and for which engine types).

**NOTAM:**

- Consider development of guidance material that addresses cases where a State issues NOTAM on volcanic ash for multiple FIRs (when guidance is available, examples should be provided in the Exercise Directive);
- Issue NOTAM in accordance to the EUR/NAT VACP, which means the horizontal extent of the volcanic ash cloud, would not be indicated since this information is in VAA, VAG and SIGMET (note: do not reference specific times of these products, the stakeholders should simply reference the latest information available); and
- Clarify use of QWWLW code in NOTAM noting that WW stands for volcanic ash and LW means will take place. For notification message, use of QWELW as WE stands for the

announcement of an exercise. Do not use QAFXX. Include this information in the Exercise Directive.

#### SIGMET:

- Cross-border SIGMET coordination still needs improvement as gaps were identified (where ash was observed or forecasted) and differences were identified cross-border as some MWOs based their SIGMETs on VAAs/VAGs while others based their SIGMETs on the Concentration Charts (which can be interpreted as allowed based on ICAO Doc 014 para 2.2.12 – clarity on this to be addressed by the METG SIGMET ad-hoc group);
  - SIGMET should be based on VAA/VAG (all ICAO products) and other information such as e.g. special air-reports on volcanic ash, lidar observations and harmonize the times with respect to the time stamps in the VAAs;
- Use of EXER is in accordance to Annex 3 – educate users that they can search for EXER to know if the SIGMET is issued as part of an Exercise – short term: VOLCEX AO participants to provide this information to crew and their commercial provider, if applicable, in advance of an exercise – long term: ICAO consider proposal to change EXER to EXERCISE to the appropriate ICAO global group in order to avoid unnecessary safety issues;
- Consider cross-border coordination on exchanging special air-reports on volcanic ash to assist in generating SIGMET;
- Coordinate with NOAA for correctly displaying SIGMET (to be conducted by MWO DISTAFF); and
- Operators prefer simplified SIGMET and should be reflected in the Exercise Directive.
- *Note that referencing a fixed point (e.g. VOR) is not compliant with Annex 3.*

#### Special Air-Reports

- Continue practicing the relay of special air-reports on volcanic ash from pilot to ATS via VHF (or other means e.g. HF, CPDLC) and the follow-up dissemination of these reports from ATS to MWO by dissemination means agreed upon locally. The MWO then sends the special air-report to its respective Regional OPMET Centre (ROC), which will be sent to the SADIS Gateway via the EUR Regional OPMET Data Exchange (RODEX) Scheme using AFS. EVITA should use these reports to avoid non-ICAO dissemination of meteorological information and duplication (green light by ICAO for SADIS feed into EVITA). Note that the MWO also sends the special air-reports on volcanic ash to the associated VAAC;
  - In addition to the above, stakeholders are expected to include the special air-report in EVITA;
- Continue coordination between ANSPs and AOs on testing the dissemination of special air-reports (this would allow ANSPs to expect the special air-report for further dissemination in accordance to ICAO provisions);
- Encourage airlines to provide the location of the special air-reports using coordinates as referenced in Annex 3; and
- Encouraged the dissemination of special air-reports.

#### VOLCEX Directives

- Provide clear guidance on the lead time of issuing SIGMET in accordance to Annex 3, paragraph 7.1.6 - ...*In the special case of SIGMET messages for volcanic ash cloud and tropical cyclones, these messages shall be issued as soon as practicable but not more than 12 hours before the commencement of the period of validity;*
- Update the use of all messages and communications shall start with the warning ‘EXERCISE VOLCEX23 EXERCISE’ and end with the warning ‘EXERCISE EXERCISE EXERCISE’ **to exclude SIGMET since SIGMET uses EXER in the message in accordance to Annex 3.** In addition, non-compliant SIGMET to Annex 3 will result in a TAC to IWXXM translation failure;
- Align the example NOTAM to the above; and

- Include guidance of use of NOTAM Q code as mentioned above and clarify use of vertical information.

#### **Dynamic Airborne Reroute Procedure**

- Test Dynamic Airborne Reroute Procedure that includes:
  - Demonstrate the viability, functionality and the operational value of DARP during a volcanic ash event. DARP facilitates a rapid efficient change of route with minimal workload for ATC;
  - Demonstrate the safety aspects of DARP. ATC loadable CPDLC route clearance uplinks are expeditious, eliminate flight crew typing errors and in the case of unexpected concentration levels of volcanic ash; enabled re-routes into safer airspace. DARP is safer than flight crews independently executing contingency procedures with no ATC coordination;
  - Demonstrate DARP to destination. Downstream FIR coordination between ANSPs – focus on Gander, Reykjavik, Shanwick and Santa Maria Oceanic FIRs) to prevent any interruption (route discontinuity) in the aircraft FMS. 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;
  - Exercise DARP where capabilities exist and procedures are established; and
  - Include additional DARP exercises under existing ICAO NAT working groups.

## **APPENDIX B – VOLCEX24 Outcomes**

### **National Procedures**

- Request States to review their national contingency plan procedures and ANSPs to ensure that local operations procedures are updated (and in some cases developed) in line with national Safety Risk Assessment (SRA) policies which should be in line with the EUR/NAT Volcanic Ash Contingency Plan (EUR Doc 019, NAT Doc 006, Part II); and
  - National contingency plan procedures should include contingency arrangements with the Border States.
  - *Note that VOLCEX21, VOLCEX22, VOLCEX23, and VOLCEX24 reported no airspace closure in the NM network – a major achievement.*

### **Scenario Attributes**

- Continue a combination of one- to two-day preparatory workshops with 1-day exercise (continue to focus on participant preparedness);
- Maintain the two-step exercise format to balance workload and avoid afternoon fatigue.
- Introduce unexpected crisis elements to mimic real-world scenarios better.
- Expand the complexity of the scenario to introduce unexpected crisis events that better mimic real-world challenges. Exercises could be more effective if scenarios were not disclosed in advance, making them more realistic and testing actual preparedness. Subject to resource availability.
- Consider expanding to other regions in future exercises (e.g., 2025+);
- Extend ash cloud into North and Western Europe during the exercise time of 0800-1600 UTC.

### **Collaborative Decision Making (CDM) Enhanced Coordination and Communication**

- Encourage ATS provider participation in future VOLCEX exercises to ensure a comprehensive evaluation of all exercise components.
- To minimize delays, use direct and fast communication channels between ACC and MWO during NOTAM issuance.
- Explore the integration of platforms to streamline tactical messaging among participants during crises.
- Encourage broader ANSP participation to improve response coordination, mainly for handling non-standard traffic and enhanced communication requirements.
- Foster collaboration between EACCC, AOCCC, and airports to streamline information sharing during crises. The Airport Corner service proved effective and should continue with improvements.
- Strengthen tactical communication tools, introducing common communication platforms to enable rapid sharing of critical updates among all stakeholders, including airlines, airports, and ATCs.

### **Participation**

- Encourage more ANSP participation based on NATS experience, detailed reports on managing contingencies on volcanic ash;
- Verify that participants listed in the Directives plan to participate (can be done in the State letter that requests States to update the contact information);
- Emphasize that DISTAFF manages their sections prior to and post-exercise. DISTAFF to encourage participation (e.g. DISTAFF member for NOTAMs to manage NOF issue NOTAM in accordance to the VACP, and DISTAFF member for MWOs to manage SIGMETs by Skyvector and Aviation Weather). DISTAFF to collect reports in their field and provide one consolidated report for the debrief meeting.

### **Danger Area**

- Continue to monitor the issuance of Danger Areas in the Exercises; noting only one Danger Area should be issued at the time of the eruption before SIGMET is available, in accordance with the EUR/NAT VACP Attachment X4.

#### VAAC

- Increase efforts to harmonize **vertical limits** in VAG charts with VAAC concentration models.
- Prioritize the **regulatory implementation** of new probabilistic and deterministic products (e.g., QVA) and clarify operational guidance before use. Coordinate with EASA to improve the regulatory framework in line with new QVA requirements.
- Improve color differentiation in ash concentration charts to enhance usability.
- Test and implement the new QVA product (once regulatory approval is obtained), integrating probabilistic data for better operational planning
- To enhance the assessment of QVA from the users and provide VAACs with additional insights during the QVA familiarization process. To add a QVA-specific assessment question to the existing report form.

#### NOTAM

- Ensure NOTAMs reference volcano number and geographical location to avoid ambiguities.
- ATCOs in charge of Area Centers shall be trained to originate NOTAMs to their respective NOF according to expected ash contamination or reported volcanic activity within their ATS jurisdiction.
- NOTAMs shall not refer to individual SIGMETs to avoid mismatching.
- NOTAM offices shall be aware of how to technically manage NOTAM requests by ATS concerning volcanic activity in accordance with published VONA and/or VAA/VAG issues.
- Specific procedures shall be updated in the AIS Documentation (e.g., ICAO PANS AIM 10066, ICAO Doc 8126 Aeronautical Information Services Manual, EUR Regulation through OPADD EUROCONTROL Guidelines for AIS Dynamic Data).
- Volcano activity NOTAMs shall also be sent by NOF to their respective VAAC.

#### SIGMET

- Draw user's attention to identify EXER instead of "Exercise – Exercise – Exercise" labelling in SIGMETs
- Consider cross-border coordination on exchanging special air-reports on volcanic ash to assist in generating SIGMET;
- Test cross-border SIGMET coordination further to handle FIR complexities effectively.

#### Special Air-Reports

- Continue practicing the relay of special air- reports on volcanic ash from the pilot to ATS via VHF (or other means, e.g., HF, CPDLC) and the follow-up dissemination of these reports from ATS to MWO by dissemination means agreed upon locally. The MWO then sends the special air-report to its respective Regional OPMET Centre (ROC), which will be sent to the SADIS Gateway via the EUR Regional OPMET Data Exchange (RODEX) Scheme using AFS. EVITA should use these reports to avoid non-ICAO dissemination of meteorological information and duplication (green light by ICAO for SADIS feed into EVITA). Note that the MWO also sends special air-reports on volcanic ash to the associated VAAC;
- Continue coordination between ANSPs and AOs on testing the dissemination of special air-reports (this would allow ANSPs to expect the special air-report for further dissemination in accordance with ICAO provisions);
- Consider using a single platform under ICAO's auspices (EVITA?) for viewing both AIREP specials and SIGMETs, avoiding reliance on third-party platforms (e.g., aviationweather.gov, SkyVector).



- Invite the EASA meteorological representative to future VOLCEX exercises to enhance collaboration and harmonization of procedures/messages, addressing existing regulatory discrepancies.
- Encourage MWOs to ensure timely distribution of AIREP Special reports to VAAC through ROC, utilizing contingency measures (e.g., emails/fax) when AFS is unavailable.
- Encourage ANSPs to regularly check messages concerning VA activity (NOTAMs, SIGMETs, and Special AIR Reports) to promptly inform crew members during pre-flight preparation.
- Encourage airlines to provide the location of the special air-reports using coordinates as referenced in Annex 3;
- The AIREP special for VA regarding the exercise should be issued with at least some elements concerning the volcanic ash cloud and not be left blank or with inappropriate elements (e.g., using "eruption" in unrelated areas).
- Aircraft operators shall be trained in VA Special Air Reports.
- To enhance the harmonization of AIREP data between the two databases and workflows, it is recommended that ICAO revisit the Annex 3 description of an AIREP. The review should assess the possibility of simplifying and relaxing AIREP input requirements to facilitate more efficient and user-friendly reporting by pilots. This could improve the timeliness and accuracy of in-flight volcanic activity reports, thereby strengthening the overall effectiveness of volcanic ash monitoring and response.

#### Documentation and Alignment

- The proposal for amendment ICAO EUR DOC 018 (EUR OPMET Data Management Handbook) should be presented on the METG35 to accommodate AIREP headers according to the FIR where the volcanic ash phenomenon has been reported rather than being linked to the ATS unit reporting.
- DOC 018 should provide specific details and examples regarding aircraft reports of volcanic ash phenomena outside the ATS area of responsibility, possibly relaying AIREP data to the MWO associated with the FIR where the VA has been encountered.

#### VOLCEX Directives

- Provide clear guidance on the lead time of issuing SIGMET in accordance to Annex 3, paragraph 7.1.6 -...*In the special case of SIGMET messages for volcanic ash cloud and tropical cyclones, these messages shall be issued as soon as practicable but not more than 12 hours before the commencement of the period of validity;*
- Update the use of all messages and communications shall start with the warning 'EXERCISE VOLCEX23 EXERCISE' and end with the warning 'EXERCISE EXERCISE EXERCISE' **to exclude SIGMET since SIGMET uses EXER in the message in accordance to Annex 3.** In addition, non-compliant SIGMET to Annex 3 will result in a TAC to IWXXM translation failure;

#### Dynamic Airborne Reroute Procedure

- Test Dynamic Airborne Reroute Procedure that includes:
  - Demonstrate the viability, functionality, and operational value of DARP during a volcanic ash event. DARP facilitates a rapid, efficient change of route with minimal workload for ATC;
  - Demonstrate the safety aspects of DARP. ATC loadable CPDLC route clearance uplinks are expeditious, eliminate flight crew typing errors, and, in the case of unexpected concentration levels of volcanic ash, enable re-routes into safer airspace. DARP is safer than flight crews independently executing contingency procedures with no ATC coordination;
- Encourage more using of DARP across more operators and regions, ensuring robust training for flight crews and ATC.

#### Operational Readiness and Procedures

- Conduct regular **training for operational personnel** on tool like EVITA and on a procedure like DARP.
- Include and encourage the participation of **international airports** in coordination plans to improve readiness.
- Align local ANSPs contingency procedures with ICAO EUR/NAT VACP standards.
- Regularly update and test **national contingency plans** to align with ICAO VACP and ensure stakeholder consistency.

## Lessons Learned

- **Scenario Complexity**
  - The **two-step scenario** added significant complexity, simulating the immediate response to an eruption and prolonged operational disruptions.
  - While preparation and coordination were effective, scenarios like step 2 showed the potential for overwhelming disruption if a real event occurred, highlighting the need for better long-term planning.
- **Effective Tools and Platforms**
  - EVITA proved effective as a decision support tool for air traffic management, improving coordination between ATS and ATFM.
  - Including AIREPs in EVITA enhanced situational awareness, although some ATCOs faced surprises due to inadequate preparation.
- **Preparedness**
  - Comprehensive pre-exercise directives and workshops significantly contributed to participant preparedness.
  - Participants appreciated the straightforward structure and guidance in exercise directives, enabling efficient operation.
- **Operational Challenges**
  - The scenario highlighted the **need for greater ANSP involvement**, especially in **handling non-standard traffic and increased coordination demands**.
  - Limitations in current regulatory and technological frameworks, such as the absence of CPDLC in some regions, were evident.
  - Stakeholders demonstrated readiness and familiarity with contingency procedures, tools (EVITA, DARP), and coordination protocols. However, continued improvement in procedures and technology is necessary.
  - The lack of airspace closures underscored the success of the **SRA methodology** but also revealed the need for better ATM impact analysis.
  - Emphasize that DISTAFF manages their sections prior to and post-exercise. DISTAFF to encourage participation (e.g., DISTAFF member for NOTAMs to manage NOF issue NOTAM in accordance to the VACP, and DISTAFF member for MWOs to manage SIGMETs by Skyvector and Aviation Weather). DISTAFF to collect reports in their field and provide one consolidated report for the debrief meeting.
- **Documentation and Alignment**
  - The exercise provided a valuable opportunity to test and update **national contingency plans** and operational documentation.
- **Stakeholder Collaboration**
  - Effective collaboration between VAAC, ANSPs, MWOs, and AOs demonstrated the value of a coordinated approach to volcanic ash events.
- **Information Sharing**

- Utilizing platforms such as Airport Corner and EVITA proved to be highly advantageous for data exchange, yet refining the integration of live AIREPs into larger systems remains essential.
- Airports and airlines gained from real-time updates, but they emphasized the need for better interaction between tactical and operational aspects updates.
- **Crisis Coordination**
  - The involvement of the Aircraft Operator Crisis Coordination Cell (AOCCC) significantly enhanced crisis response efficiency. The activation of **EACCC and AOCCC** effectively facilitated cross-border coordination. However, the proactive involvement of additional participants is needed to address gaps in handling complex scenarios.
- **Regulatory and Technological Gaps**
  - Regulatory implementation of new product QVA must be prioritized. Current products should be available and used until new ones are fully approved and operationalized.
  - European ATN airspace needs updates to support DARP and similar rerouting technologies