Management summary

**Independent investigation
of the technical malfunction at the air navigation
service provider Skyguide on 15 June 2022**

Translation (original German)

Background: At 3.07am on the morning of 15 June 2022, the air navigation service provider Skyguide experienced a technical malfunction in its network. For safety reasons, a 'zero rate' was applied. This meant that no new air traffic was admitted to the airspace under Skyguide's control for around five hours. Once the disruption was remedied, Skyguide was again able to offer its services at full capacity.

Objectives: The investigation pursued the following three objectives according to the specifications document:

- To determine the root cause of the technical network malfunction that led to a 'clear-the-sky' situation on 15 June 2022 and five-hour long 'zero rate'. Excluded from this are the 'application' and 'server' levels.

- To subject Skyguide's internal investigation, which has been ongoing since 15 June, to an external review.

- To propose preventive and corrective measures, and identify areas that could be improved.

Scope: The investigation covered the technical incident and crisis management, and took into account the technical systems, human interactions and the organisational framework.

Methodology: The investigation followed an iterative process and was carried out in three phases:

- In a first step, the events of 15 June 2022 were presented in their (factual, objective) context and an easy-to-follow overview was established.

- In a second step, the events that took place ('work as done') were compared with the functional requirements, Skyguide's procedures, the COS (Crisis Organisation Skyguide) and the defined responsibilities of the employees involved.

- In a third step, the events that took place were put in causal order and analysed to determine whether systems, functions and involved persons had followed defined procedures correctly.

- Finally, recommendations were made to improve cooperation, communication and decision-making.

Results: The crisis management investigation showed that the crisis management governance model Skyguide has established is comprehensive, and that it was applied effectively on 15 June 2022. We found that the 'clear-the-sky' decision to close Switzerland's airspace had been appropriate, as it was not possible to predict the severity of the disruption or how long it would take to resolve.

Despite its redundancies, the network had been severely impaired due to the malfunction of a network switch in Dübendorf on 15 June 2022. The investigation of the network showed that warning signals (i.e. log entries on individual network components) had been present on 13 June already. The analysis further showed that Skyguide does not have operational processes for crisis management in the network areas (in particular a Network Operating Manual) in place that would have ensured warning signals are analysed and rectified in an effective and efficient way. In addition, the software version that was installed on the faulty switch components on the day of the incident was not the switch manufacturer's minimum maintenance release version. This is a conscious decision by skyguide, since the operation of firmware versions is governed by a special maintenance contract which guarantees skyguide support outside the minimum maintenance release.

Skyguide also does not have an end-to-end monitoring solution in place that would have contributed to an effective and efficient analysis, correlation and rectification of log entries from various data sources in this situation.

Our review of Skyguide's internal investigation found it to be a detailed analysis with a focus on safety. It makes valid and useful recommendations and comments.

Conclusion: Our investigation report comprises 14 recommendations. Five of these had already been identified in Skyguide's own report.

Recommendations can be highlighted in the following five improvement areas:

1. Business Continuity Management (BCM) strategy regarding safety management

2. Overarching architecture & resiliency

3. Business continuity plans & processes

4. Network

5. Monitoring & tooling integration

The following table lists the recommendations we have identified as part of our investigation. They are split into two phases (prioritisation) and three levels (strategic, tactical and operational).

	Phase 1		**Phase 2**	
	• Strongly impacts Skyguide's operations • Lays a foundation for further recommendations		• Depend on other recommendations being implemented first • Skyguide's current solution to this issue could be improved upon	

Strategic level

1.1 Develop a comprehensive BCM governance model and BCM strategy

1.2 Improve the transparency of Skyguide's application and infrastructure landscape

5.1 Develop an end-to-end monitoring strategy*

2.1 Align the existing application and infrastructure landscape with the BCM governance model and BCM strategy*

2.2 Develop a comprehensive disaster recovery strategy

Tactical level

1.3 Address the risks identified in the business impact analysis

4.1 Create a network operations manual

4.3 Improve network firmware management governance

4.4 Evaluate network skills (at various levels) in regards to the technologies used by Skyguide

3.3 Improve communication and collaboration with external stakeholders

4.2 Improve training processes for new network technologies*

5.2 Evaluate the possibility of integrating future end-to-end monitoring capabilities in Skyguide's COS cockpit

Operational level

3.1 Improve the emergency checklist for supervisors*

3.2 Improve information transparency with air traffic controllers*

■ 1-3 months   ■ 4-6 months   ■ 7-12 months   *Already identified in Skyguide's internal investigation report