

SNOWFLAKE – DESIGNING AND ORGANISING A WINTER EXERCISE FOR AMSTERDAM AIRPORT SCHIPHOL

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Keywords: training. CDM. winter. airside. airports

Abstract

Snowflake was a winter exercise held in October 2005 to prepare airside operations teams from Amsterdam Airport Schiphol, KLM and Air Traffic Control the Netherlands (LVNL) for the forthcoming winter. The exercise was carried out by connecting NLR's Air Traffic Control Research Simulator (NARSIM Tower) to a test version of the Central Information System Schiphol (CISS) thus creating a hub simulation facility.

1. Introduction

The geographic location of the Netherlands, close to the North Sea and the Atlantic, in combination with predominant south-westerly winds, usually implies mild winters. However once in a while, for instance as a result of Scandinavian high pressure, winter may strike heavily and unexpectedly. Under these circumstances the implications for public life may be quite significant.

This was the case early March 2005. Unpredicted and severe snowfall kept Schiphol Airport in grip of winter for several days. As a result the airport had to be closed for inbound traffic for a short period of time, and many passengers had to spend a night at the airport.

The parties that are responsible for parts of the airside operations process – Amsterdam Airport Schiphol, KLM Ground Services, KLM Operations Control (OC), KLM Air Traffic Management (ATM), and Air Traffic Control the Netherlands (LVNL) – collectively evaluated these three winter days. Three important causes of the experienced

disturbances were 1. lack of de-icing capacity, 2. suboptimal snow removal at the stands and 3. loss of overview of gates and aircraft.

2. Snowflake

To improve the airside operation at Schiphol airport during winter circumstances, in summer 2005 under the authority of Amsterdam Airport Schiphol, LVNL and KLM, NLR started the development and organisation of a winter exercise called 'Snowflake'. Snowflake aimed to create a realistic simulation environment and winter scenario that could be used to effectively practice winter operations in a collaborative setting. The exercise took place in October 2005, serving as a refresher for airside operations teams for the coming winter.

3. Objectives

The exercise's main objective reads as follows:

“During severe snow and iciness conditions the participants are able to run the airside operations at Schiphol Airport in such a way that the negative effects for the timetable (inbound and outbound) are minimised.”

This objective emphasises the relationship with daily operational airside practice. To realise this objective the key ambition of the project was to create a realistic simulation environment and winter scenario for Schiphol Airport that would enable airside staff to collectively prepare for occasional severe winter conditions.

Besides the general exercise objective a series of concrete practice goals were formulated, which were directly derived from the operational problems of March 2005. The following three goals are an illustration of the practice goals:

- Maximise utilisation of available de-icing capacity;
- Attune snow removal activities at occupied stands to priorities set by KLM;
- Optimise inbound flow given the outbound flow.

4. Parties involved

During a winter day at Schiphol Airport the airside operations are supported by a large number of staff members of different organisations. During Snowflake it was not possible to simulate and accommodate the entire airside operations process. Therefore the scope of the exercise was reduced by diminishing the number of piers from eight to three, which approximately corresponds with 100 in- and outbound flights in four hours. However, these piers accommodate intercontinental and European flights. A further reduction was made by focusing on key functions within the five operational parties. Moreover, a distinction was made between ‘players’ and ‘exercise support staff’. The scenario was written for the players. The support staff was responsible for running the exercise and providing the players with the required information and responding to their calls.

4.1 Players

The players hold key positions in running the airside operations in winter operations. They are the representatives for whom the scenario is written. The following table lists all parties and the players involved. Figure 1 lists the player for all parties involved.

Amsterdam Airport Schiphol	Airside operations manager, Gate planner, apron control
KLM Ground Services	De-icing co-ordinator, Duty Hub Manager, Duty Area Managers, Towing co-ordinator
LVNL	Ground controller, Start-up & delivery controller

Fig. 1. Players

4.2 Exercise support staff

Exercise support staff provided the players during the scenario with information and introduced the so called ‘events’. These events are pre-planned occurrences that the players were confronted with during the exercise. If possible, two support staff functions were combined in one person, like aircraft turnaround and remote de-icing co-ordination. Moreover, during the exercise trained pseudo-pilots drove the virtual aircraft and pseudo-vehicle drivers operated the snow ploughs and de-icing trumps. The exercise support staff were conducted by the exercise leader, an operational manager with an excellent overview of the airside processes at Schiphol Airport. Figure 2 provides an overview of all support staff.

Amsterdam Airport Schiphol	Exercise leader, Snow leader
KLM Ground Services	Platform towing services, Crew co-ordination & information, Aircraft turn around co-ordination, Remote de-icing
KLM Operations Control	Duty Manager Operations & Senior Operations Controller
KLM ATM	Flow Controller and Flight Dispatcher
LVNL	Supervisor Tower / Approach
KNMI (Meteo)	Meteorologist
	Pseudo-pilots Pseudo-drivers

Fig 2. Exercise Support Staff

5. Locations

During each exercise 35 working positions were used, distributed across four different locations.

1. NARSIM Tower, NLR's ATC tower simulator, accommodating the Air Traffic Controllers, Deicing Co-ordinator, Gate Planner and Apron Controller;
2. Exercise support staff room, providing working positions for support staff, including pseudo-pilots;
3. KLM Ground Services, accommodating KLM Ground Services staff;
4. Emergency board room, housing the meeting of duty managers and supervisors of all operational parties. The board meets in case of abnormalities, emergencies and disturbed operations.

6. Simulation environment

The core of the simulation environment was formed by the NLR ATC tower simulator – NARSIM Tower and the Central Information System Schiphol (CISS). NARSIM Tower, the first major component of the simulation environment, consists of different ATC working positions, pseudo-pilot and pseudo-drivers HMI's to drive aircraft and vehicles. In addition, NARSIM Tower provides air traffic simulation, weather information, and an outside view.

Before the exercise the controller HMI's were updated to match the current operational situation. Also foreseen adaptations for the winter 2005/2006 were implemented.

Number of workstations	35
– CISS: 18	
– NARSIM: 17	
Number of R/T points	20
Number of telephones	22

Fig. 3. Statistics Snowflake Simulation Environment

CISS, the second major component, contains and distributes flight and handling information. This web-based system can run on

any remote location. Instalment of the web front-ends at the NLR premises provided airport staff and exercise support staff with the same systems they use in their day-to-day work. An exact copy of the Schiphol Airport Gate Management System (GMS) that is used by the gate planner was also made available during the exercise.

During the exercise NARSIM Tower and CISS were connected thus creating a hub simulation facility.

Due to the nature of the system it proved not possible to integrate a test version of KLM systems for KLM Ground Services, ATM and Operations Control in the simulation environment. To overcome this issue, KLM staff also used CISS and NARSIM. In general, CISS contains the same flight information as KLM systems, only the structure and the HMI is different and KLM systems contain additional company specific information. Therefore, before the start of the exercise a brief familiarisation training and a minimal systems manual were provided to train KLM staff in the use of CISS.

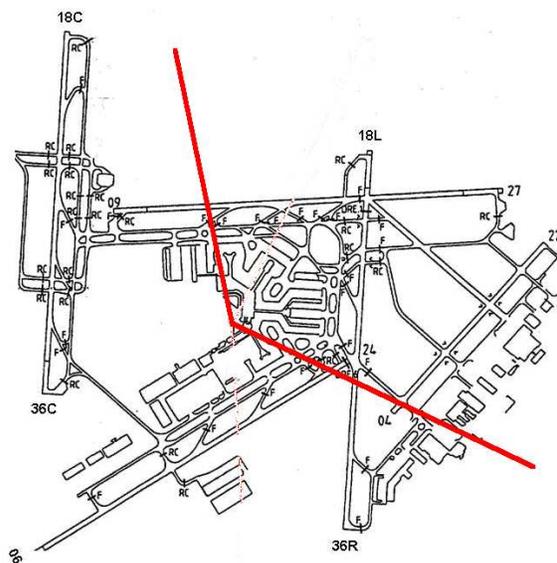


Fig. 4. Selected Field of View from Schiphol Tower as Used During Snowflake

During the exercise the field of view of the NARSIM Tower was 135 degrees, which was sufficient for the purpose of the exercise (see fig. 4). Currently the field of view has been

extended to 270 degrees. The nature of the exercise demanded the visual outside view of Schiphol Airport to be able to show snowfall and reduced visibility conditions.

It was decided that each of the two snowfleet, which normally consist of multiple vehicles, were represented by a single vehicle. De-icing vehicles, which are critical assets during winter operations, played a part during the exercise. Tow trucks were left out, since driving a great number of trucks would imply a significant increase of effort for the pseudo-vehicle drivers, but not provide added value for the exercise. To operate aircraft and vehicles six pseudo-pilot positions and one dedicated vehicle driver position were created.

In addition a weather system provided nowcast and forecast weather data and corresponding radar images. All players and support staff both had weather information available at their working positions.

To enable communications an extensive local telephone and R/T-network was set up. For practical reasons some staff members who normally work with portable telecommunication devices, during the exercise were provided with a fixed telephone line.

7. Scenario

The four hour scenario was directly derived from the situation of early March 2005. KNMI – the royal Dutch meteorological institution – traced historical weather data and radar images, which provided the meteorological background of the scenario (see fig. 5). The storyline stated that snowfall and degrading weather conditions would strike Schiphol unexpectedly, enforcing the operation to retreat to the centre of the airport. The severity of snowfall put the required pressure on the de-icing process, which had shown to be a bottle neck in operational practice.

For the exercise, the number of piers and flights was reduced to the D, E and F pier. The European fleet uses the D-pier, while the intercontinental fleet docks at E and F. There is a conflict of interest between European and

intercontinental flights. As such, involving these flights in the exercise creates an interesting challenge for the players.

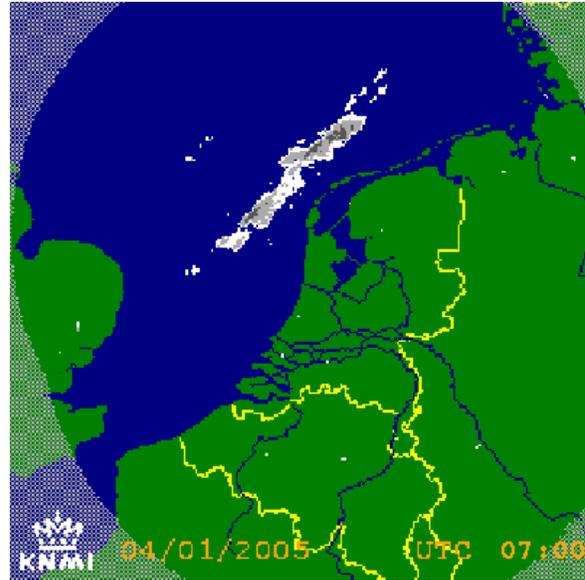


Fig. 5. Weather Radar Image as Used During Snowflake (source); KNMI)

The flight data used represented a random day at the airport. The selected four hours time interval enclosed an arrival peak for the European fleet and a departure peak of the intercontinental fleet.

A series of events – snow fleet needs refuelling, trumps run out of de-icing fluid, aviobridge frozen fast, aircraft with technical problems after de-icing not able to depart and blocking the de-icing spot, etc – that were introduced demanded the players to respond adequately in accordance with the (new) winter procedures.

For the gate planner a representative number of towing movements was scheduled during the exercise to put pressure on the available gates and apron positions.

The exercise was conducted by the exercise manager, assisted by the exercise support staff (see paragraph 3.2). To prepare for the exercise the participants and the exercise staff received a briefing guide. Just before the start of the exercise a meteorologist provided a weather briefing and the exercise manager

briefed the players and the support staff extensively on their duties

8. Evaluation and conclusion

Each organisation provided one or more observers, who gathered performance information during the four days that the exercise was conducted. Each day the exercise was run for a new group of players. During the plenary debriefing sessions observer information was used to start discussion among the participants. After the exercise Schiphol, KLM and LVNL collectively wrote a report to reflect on the specific operational objectives that were set. The lessons learned were directly integrated in the operational processes for the next winter.

Responses to post-exercise questionnaires showed that according to the participants the exercise was sufficiently realistic. KLM participants, however, indicated that they missed the KLM systems they use in their day-to-day work. In general the work load was high, but not too high. More specifically, the workload of the apron controllers appeared to be too high, while the workload of the gate planners proved to be too low. In general during an exercise like Snowflake it is important that workload does not exceed acceptable limits and the participants remain able to do their jobs. The exercise managed to stay within these boundaries.

According to the participants the value of Snowflake was the increased insight in the operational processes as a whole during winter circumstances and the possibility for interpersonal contacts, i.e. meet co-workers from other organisations face-to-face.

Snowflake proved that in addition to the training programmes the individual organisations offer to their operational staff, current technology provides a way to also practice collectively. As such this winter exercise was a good example of a collaborative decision making (CDM) exercise, bringing together organisations that share a responsibility

in the larger operational entity of airside operations.

According to Amsterdam Airport Schiphol “Snowflake and other exercises re-emphasised the importance of fast, complete communication between all parties involved. When it started snowing at the end of December 2005 – after the Snowflake exercise – the exercise appeared to be fruitful, on both the operating as well as the co-ordinating side. The teamwork between the parties involved went better than ever before. The airport remained open, whereas train and car traffic stood still” [1].

The success of this project could only be achieved thanks to the extensive open communication and collaboration with all parties involved, enabling NLR to effectively fulfil the role of integrator and facilitator in this interesting project. Another crucial factor was the ability to connect NARSIM and CISS, as such providing a realistic simulation environment for all participating staff.



Fig. 6. NARSIM Tower during Snowflake (source: KLM Ground Services)

An important factor that enabled NLR to set up the exercise within the short period of three months was the flexibility of the NARSIM simulation environment. The in-house built and maintained environment is normally used for research projects, with demands that may differ significantly and demand a flexible platform that can be tailored to test different new applications.

In October 2006 a successive winter exercise, called ‘Snowwhite’ will be held, using

an altered setup with more players, less support staff and a new scenario.

Future exercises may also cover other disturbances, like reduced visibility, storm conditions or emergency situations, and as such provide a powerful platform for realistic airport crisis management exercises.

References

[1] www.schiphol.nl