Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

# AVIATION INVESTIGATION REPORT

A01C0115

## LOSS OF SEPARATION

NAV CANADA

WINNIPEG AREA CONTROL CENTRE

LATITUDE 64°00’ N, LONGITUDE 080°00’ W, NUNAVUT

10 JUNE 2001

Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

# Aviation Investigation Report

# Loss of Separation

# Nav Canada
# Winnipeg Area Control Centre
# Latitude 64°00' N, Longitude 080°00' W, Nunavut
# 10 June 2001

# Report Number A01C0115

## *Summary*

Scandinavian Airlines Flight 938 (SAS938), a Boeing 767-300, was en route from Seattle, Washington, to Copenhagen, Denmark. Royal Dutch Airlines Flight 602 (KLM602), a Boeing 747-300, was en route from Los Angeles, California, to Amsterdam, the Netherlands. A segment of the planned route in the Canadian Northern Control Area (NCA)—from about 150 nautical miles northeast of Churchill, Manitoba, to 65° north latitude and 70° west longitude—was identical. (See Appendix A.) Before entering the NCA, both flights were under the radar control of the Winnipeg Area Control Centre's (ACC) Trout Lake (TL) sector controller. KLM602 was 13 minutes behind SAS938.

As the two aircraft were approaching the common route segment near Churchill where radar control would change to procedural control, they were assigned flight level (FL) 330 and mach .82. This arrangement would have provided more than the required procedural separation standard of 10 minutes. Before SAS938 reached Churchill, the TL controller rerouted SAS938 north of the flight-planned route to avoid a potential conflict with other traffic. SAS938 was to return to its original flight-planned route at 65° north / 70° west. Control of SAS938 and subsequently KLM602 was passed to the Edmonton ACC's Nunavut (NU) sector controller; however, the change in routing for SAS938 was not passed. When SAS938 reported at 64° north / 80° west and not 63° north / 80° west, as anticipated from the flight plan, the NU controller realized that the procedural separation standard of 10 minutes had degraded to only 9 minutes. Based on estimates from the aircraft, KLM602 would have crossed 65° north / 70° west about 11 minutes after SAS938. The NU controller descended SAS938 to FL310, re-establishing the required separation.

*Ce rapport est également disponible en français.*

# *Other Factual Information*

Separation of aircraft in procedurally controlled airspace is achieved by assigning specific routes and altitudes for the aircraft to fly, with confirmation provided by periodic position reports. Separation standards are greater than those for radar-controlled airspace. In the Northern Control Area (NCA), flight crews typically make position reports every 10° of longitude or over mandatory reporting points. Depending on the location of the aircraft, these reports may be made by VHF (very high frequency) or HF (high frequency) radio transmissions to Arctic Radio in North Bay, Ontario. These transmissions are then relayed to the controller in the area control centre (ACC). VHF is line-of-sight and short range and has limited use in the area of the occurrence. HF radio communications are long range, and the quality can vary widely because the signal is subject to ionospheric disturbances. After the two aircraft were beyond Churchill, they were under procedural control, and the communications with the Nunavut (NU) controller were relayed from North Bay after the flight crews communicated with Arctic Radio by HF radio. At the time of the occurrence, HF communications were frequent because of the volume of traffic and were difficult because of static interference.

The aircraft were operating in Required Navigation Performance Capability (RNPC) airspace. The flight plans indicated that each aircraft was RNPC certified. The Nav Canada *Air Traffic Control Manual of Operations* (ATC MANOPS) permits 10 minutes of separation between RNPC aircraft in RNPC airspace. However, when SAS638 was rerouted by the Trout Lake (TL) controller, the spacing between the two aircraft degraded to 9 minutes at 64°north / 080°west before increasing to 11 minutes at the next common point.

In the Winnipeg ACC, the northern speciality comprises four control sectors: north high, north low, TL, and La Ronge. The La Ronge sector is not active evenings or overnight. A portion of the northern speciality area—primarily north of Churchill—is non-radar, and procedural control is used in this area. The northern airspace display system (NADS), a computer-generated display, assists the controller in the procedural area. The NADS provides the controller with predicted conflicts between aircraft based on the flight progress information input into the system. On the evening of the occurrence, at about 2300 central daylight time,[1] all sectors were combined into one sector, TL, which was staffed by two controllers. One controller worked the data position; the other worked the radar position. The radar controller monitors the radar for radar traffic and the NADS display for procedurally controlled aircraft. In addition, this controller communicates with the aircraft under control where direct VHF radio communication is available. The data controller handles flight progress strips and communications with other control agencies.

In the Edmonton ACC, the NU sector is adjacent to and north of the Winnipeg TL sector. Procedural control is used in the NU sector. The NADS situational display (NSiT)—an upgraded version of NADS— assists the NU controller in the procedural area. The NSiT provides the controller with predicted conflicts between aircraft, based on the flight progress information input into the system.

The NADS computers in the Winnipeg ACC are not linked, and data entered by one sector must be re-entered by the next sector as the aircraft progresses through Winnipeg airspace. The TL data controller correctly entered the reroute of SAS938 into his NADS computer display. The NADS system in the Winnipeg ACC is not linked to the NSiT computers in the Edmonton ACC,

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[1] All times are central daylight time (Coordinated Universal Time minus five hours).

and data entered into one system are not passed electronically to the other system. On the evening of the occurrence, the NU controller entered the original flight plan of SAS938 into the NSiT because he had not received the reroute. Thus, his display of SAS938's route was incorrect and showed SAS938 ahead of KLM602 by about 13 minutes on the identical route segment.

Standback supervision is not provided continuously for each speciality in the Winnipeg ACC and was not allocated for the north speciality on the evening of the occurrence. A supervisor was assigned but was expected by management to work as a controller about 75% of the time. The supervisor on duty had been a controller for about 31 years and had about 10 years' experience as a supervisor. He had worked exclusively in the north speciality since its inception in about 1974. On the evening of the occurrence, the supervisor had worked control positions for several long time periods. Just before 2230, he took over the TL radar position and remained there until relieved after midnight.

The occurrence took place on a Sunday evening. Staffing of the northern speciality is reduced by one position on Sunday evenings because of lighter traffic. From 1830 on Sunday evenings, the staffing level is initially five controllers plus one supervisor. The supervisor and the controllers end their shifts at staggered times. The stagger provides for one of the controllers to depart at 2030, 2230, 2300, and 2330, without replacement. The supervisor and the remaining controller work to 0015 and are replaced by two controllers who remain overnight until the day shift starts. That Sunday, one controller was sick and absent for the 1830 to 2030 period. After 2030, the staff available was in accordance with the established requirement, which management considered adequate. The controllers scheduled to work to 2230 and 2330, respectively, were released about 30 minutes early as sectors were closed. Only the supervisor and one controller were controlling from 2300 to 0015.

The requirement for aircraft to file published tracks is implemented when the resources required to manage the expected traffic flow will be significantly reduced. To be effective, the requirement to file published tracks needs to be implemented before the expected traffic flight plans are filed. For two hours on the evening of the occurrence, the number of controllers available for duty was one less than the staffing requirement. Nevertheless, staffing was considered adequate by Nav Canada supervisory personnel, and the requirement to file published tracks was not implemented.

The speciality supervisor has two methods of estimating traffic before it enters sectors under his/her supervision. First, each supervisor has an enhanced traffic management system (ETMS) consol on his/her desk. This system predicts traffic flows based on scheduled and flight-planned traffic and is updated as flights progress. It provides advance notification of traffic through control sectors. Second, flight plans for traffic entering sectors are received at least 55 minutes before the traffic enters the sector.

A review of the voice communication tapes revealed a change in the pace of communications at 2300, about five minutes after the sectors were combined into the TL sector. The rate of speech increased, and the tone of voice indicated that the controller perceived a significant increase in workload. The wave of traffic moving northeast through the TL sector was heavy and complex. While this traffic could have been anticipated from the ETMS and flight plans, the voice tapes revealed control communications from other sectors that were not anticipated. From 2305 to 2330, when the SAS938 estimate was passed to the NU controller, communications were rapid and continuous. The traffic situation was such that when the next shift data controller arrived, he and the outgoing data controller had to work together for about 20 minutes to bring the

position up to date. The outgoing TL data controller advised the shift manager that the combined sector had been nearly unmanageable at the end of the shift. During the period of intense activity, the data controller did not accept some aircraft in the low structure and left them with an adjacent sector.

During this period of intense control activity, the two controllers decided to reroute SAS938 from its flight-planned route because of a traffic conflict. This reroute was passed to SAS938 at 2319. SAS938 then followed the new clearance tracking north of Churchill (see Appendix A) to 64° north / 80° west and on to 65° north / 70° west. KLM602, which was about 13 minutes behind SAS938, remained on the flight-planned route over Churchill to 63° north / 80° west and then to 65° north / 70° west. The controller entered the change into NADS. Because both flights would enter airspace controlled by Edmonton ACC, the TL data controller contacted the NU sector controller at approximately 2330 with an SAS938 estimate. However, the TL controller did not advise the NU controller of the change in SAS938's routing, and the NU controller entered the original flight-planned route into his NSiT. The two flights then flew into NU sector at FL330 and mach .82.

SAS938 left radar coverage at about 2330, and KLM602 at about 2340. At 0052, Arctic Radio relayed the position report of SAS938, by 64° north / 80° west, to the NU controller. He was advised that SAS938 had been by 64° north / 80° west at 0043 and was estimating 65° north / 70° west at 0115. The NU controller believed the position report to be inaccurate and queried the reports through a series of relayed communications with SAS938. By approximately 0055, he had established that the position report was correct and that the flight-planned route that he had entered into the NSiT was inaccurate. Approximately 10 minutes later, at 0105, the NU controller received the position report of KLM602, by 63° north / 80° west at 0052, estimating 65° north / 70° west at 0126, from Arctic Radio. The NU controller realized that the two flights would converge at 65° north / 70° west with 11 minutes' spacing and recleared SAS938 to FL310. The clearance was relayed to SAS938, and separation was re-established by 0110.

# *Analysis*

The analysis will examine the following: the effect of the reduced staffing level in the north speciality, the decision making of the supervisor, the communication of the TL data controller, control communications in the north, and the procedural control tools (NADS) provided to the controllers.

The supervisor was not functioning as a standback supervisor. Management expected him to spend a significant portion of his time directly controlling traffic. With fewer staff, the supervisor had less time to spend in decision making in response to the traffic flows. His decisions to close sectors and release controllers might have been different had he had more time to consider the traffic that would arrive after 2300. He had resources that he could have retained, as indicated by his early closing of sectors and the release of controllers before the buildup of traffic in the TL sector. By 2305, he had no flexibility left and had to deal with the traffic personally in conjunction with the one remaining controller.

The TL data controller was likely task saturated—as shown by the pace and tone of communications and his task-shedding actions concerning the low-level airspace. Task saturation likely also influenced his communication with the NU controller. His motivation was likely to shed tasks as quickly as possible; in his haste, he did not include vital information on the rerouting of SAS938.

The workload accepted by the TL supervisor and the handoff performed by the TL controller started the process that led to the eventual loss of separation of SAS938 and KLM602. Nevertheless, the control tools provided in the northern sectors were the primary mechanisms of the loss of separation. The underlying factor is the lack of air traffic radar beyond Churchill. The volume of traffic is high and tends to concentrate to take advantage of favourable winds and altitudes. Without radar, greater separation standards have to be applied, and the only means of confirming separation is by position reports—not made directly to the controller but relayed through a third agency using radios subject to atmospheric disturbances. The geographic reporting system was used because of the lack of radar; consequently, the time required for the NU controller to detect and correct the problem was about 1 hour 40 minutes. The true position of SAS938 was effectively unknown to Edmonton ACC for about 1 hour 25 minutes. The NU controller received SAS938's position report 9 minutes late and KLM602's 13 minutes late.

The NU controller's confirmation activities were hampered and delayed by a lack of a direct pilot-to-controller communications capability and by a degraded HF communications environment over Hudson Bay. The time taken to establish communications, verify the aircraft position, and coordinate and issue a clearance for SAS938 to descend to FL310 was approximately 5 minutes.

The lack of automatic electronic data transfer between ACC NADS and NSiT display computers increases controller workload as aircraft move from sector to sector. The probability of error detection is low if the verbal communication between sectors is inaccurate or incomplete. In this occurrence, the NU controller had no indication of a route change from the Winnipeg ACC and had no backup means of detecting the error, even though the information had been correctly entered into the Winnipeg display computer.

## *Findings as to Causes and Contributing Factors*

1. The Winnipeg Trout Lake data controller was likely task saturated and, as a result, did not pass the reroute information of SAS938 to the Nunavut (NU) controller.

2. The NADSs and NSITs in the area control centres do not pass information electronically. As a result, the NU controller did not have a means of checking the rerouting of SAS938 even though the information was entered correctly into the Winnipeg NADS.

3. The absence of air traffic control radar and direct pilot-to-controller communications prevented the NU controller from detecting the true position of SAS938 for about 1 hour 25 minutes and delayed the implementation and confirmation of corrective action for about 1 hour 40 minutes.

4. The supervisor spent a significant amount of time performing control duties, reducing the time available for making informed supervisory decisions. As a result, available controllers were prematurely released from duty.

## *Other Findings*

1. The quality of radio transmissions from the occurrence aircraft to Arctic Radio were poor and difficult to hear.

2. The Arctic Radio communications system is not direct from the aircraft to the controller in the area where the loss of separation occurred. Position reports to the NU controller were delayed by 13 minutes for KLM602 and by 9 minutes for SAS938.

## *Safety Action Taken*

As part of the Northern Radar Strategy developed by Nav Canada, coverage in Canada's northern airspace has been increased. In the last two years, Nav Canada has installed radars at Kuujjuaq, Quebec; Yellowknife, Northwest Territories; and Iqaluit, Nunavut. The Iqaluit radar should be operational in September 2002. Other radar systems will be installed at La Ronge, Saskatchewan; Stony Rapid, Saskatchewan; Chisisabi, Quebec; and Cornwall (Nav Canada Training Institute), Ontario. The Brisay, Quebec, radar will also be upgraded to meet the Nav Canada standard.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 30 July 2002.*

# *Appendix A—Aircraft Routes*