aibn Accident Investigation Board Norway

Issued June 2013

REPORT SL 2013/17

REPORT CONCERNING AIR INCIDENT DURING APPROACH TO OSLO AIRPORT GARDERMOEN ON 19 DECEMBER 2008 WITH AIRBUS A320-214, VP-BWH

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As accurate as the translation might be, the original Norwegian text takes precedence as the report of reference.

Photos: AIBN and Trond Isaksen/OSL

Statens Havarikommisjon for Transport

REPORT

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Date of submission: 11.06.2013
SL Report: 2013/17

This investigation has had a limited scope, and the AIBN has therefore chosen to use a simplified report format. This report format, in accordance with the guidelines given in ICAO Annex 13, is only used when necessitated by the scope of the investigation.

All hours stated in this report are local time (UTC + 1 hour) unless otherwise indicated.

Aircraft:	
- Type and reg.:	Airbus A320-214, VP-BWH
- Year of manufacture:	2003
Operator:	Aeroflot Russian Airlines
Radio call sign:	AFL211
Date and time:	Friday, 19 December 2008 at 2127 hrs
Incident site:	15 NM north of Oslo Airport Gardermoen (ENGM), 60°26'N 11°12'E
ATS airspace:	Oslo TMA, Class C airspace
Type of incident:	Aviation incident, descending below approach altitude
Flight type:	Commercial, scheduled flight
Weather conditions:	METAR at 2120 hrs: ENGM 2020 23004KT 200V270 2500 0500W R19R/1100VP1500U R01R/0600V0800D PRFG NSC M04/M04 Q1004 TEMPO 0500 FZFG VV002
Light conditions:	Night
Flight conditions:	VMC
Flight plan:	IFR
Persons on board:	6 crew members (2+4) and 55 passengers
Injuries:	None
Damage to aircraft:	None
Other damage:	None
Commander:	
- Gender and age:	Male, 54 years old
- Licence:	ATPL (A)
- Pilot experience:	16 170 hours in total, of which 1035 on the aircraft type in question, 125 hours last 90 days, 2 hours last 24 hours
First officer:	
- Gender and age:	Male, 35 years old
- Licence:	CPL (A)

- Pilot experience:	1400 hours in total, of which 800 on the aircraft type in question, 235 hours last 90 days, 2 hours last 24 hours
Air traffic controller (”Director”):	
- Gender and age:	Male, 49 years old
- Certified:	October 1983
- Authorised:	June 1995
- Privileges:	Necessary authorisations
Sources of information:	The commander's report (NF-2007), report from Oslo ATTC, internal investigation report from Avinor and AIBN's own investigations.

FACTUAL INFORMATION

AFL211

Aeroflot flight AFL211 took off from Moscow airport Sheremetyevo (UUEE) at 2113 hrs local time (1913 hrs Norwegian time) with Oslo Airport Gardermoen (ENGM) as its destination. The commander was ”Pilot Flying” (PF) and the first officer ”Pilot Monitoring” (PM). There were 55 passengers on board, and the crew consisted of two pilots and four cabin crew members. The commander was on his first flight following a duty-free period of three days, while the first officer was on his first flight following a duty-free period of two days. Both pilots have stated that they were rested when starting the new work period. The commander had flown to Gardermoen on two previous occasions, and the last flight was made about one year earlier. The first officer had flown to Gardermoen a total of three times, and the last flight took place about one month before the incident. The flight proceeded as normal until the approach in to Gardermoen.

When AFL211 was approaching Oslo TMA, the crew prepared for the landing at Gardermoen. They noted latest information from ”Automatic Terminal Information Service” (ATIS), issued at 2050 hrs. ATIS stated that visibility at the airport was more than 10 km with a visibility reduction to the west of 3500 metres. Furthermore, the crew were informed of a temporary visibility of 800 metres in fog, and that arriving aircraft could expect that the runway in use would be 19R. The commander briefed the first officer for both 19R/L CAT-I approaches. He also took into account that a CAT-II approach could become necessary if visibility at the airport was further reduced, and therefore also briefed the first officer on this procedure. He inserted 19R as primary and 19L as secondary approach in the aircraft's Flight Management Guidance System (FMGS).

At 21:16 hrs, AFL211 checked in with Oslo Approach (Oslo APP) and reported that they were established on SUMAK 5M (see Figure 1) and that they were passing FL246 on their way to FL120. Oslo APP responded that AFL211 could expect landing on runway 19L. The commander therefore changed runway from 19R to 19L in the FMGS. At this stage AFL211 overheard ATC instructions to other aircraft stating Low Visibility Procedures (LVP) at Gardermoen. AFL211 was never directly issued the same information and this caused some uncertainties in the cockpit since either runway 01R or 19R will be the active runway for approaches during low visibility operations at Gardermoen.

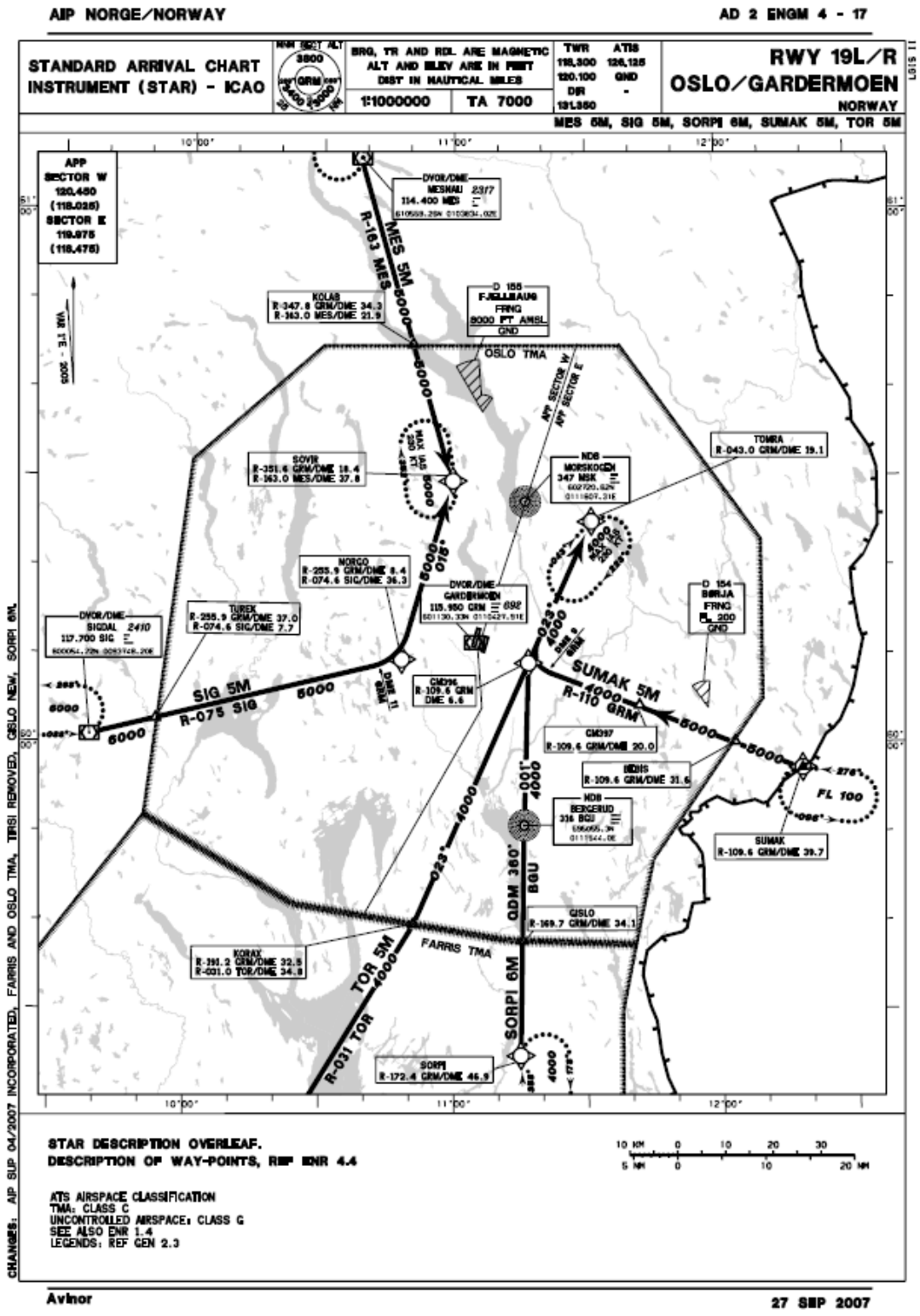

Figure 1: Approach map for landing on runways 19L and 19R.

At 21:17 hrs, AFL211 was asked if they could fly directly towards TOMRA at a speed of more than 300 kt. The crew accepted and set the course accordingly.

At 21:23 hrs, AFL211 was instructed to proceed on the current heading and reduce speed to 210 kt.

At 21:24 hrs, AFL211 was instructed to contact the air traffic controller on ”director” (DIR) frequency 131.35 MHz.

At 21:24:28 hrs, AFL211 checked in on the DIR frequency , which responded the following : ”Aeroflot two one one good evening descend 5 000 feet, turn left heading 280, prepare now for 19 right, 19 right the localizer frequency 111.3 due weather conditions”.

The crew have explained that they did not catch that the landing runway had been changed again, and therefore responded: “Descending 5 000 feet, heading 280 cleared ILS 19 left”.

In the meantime, DIR had to provide approach instructions to a different aircraft prior to resuming communication with AFL211.

At 21:25:14 hrs, DIR repeated that runway 19R had to be used for landing and that the change was due to weather conditions at the airport. At 21:25:50 hrs, AFL211 acknowledged that they had understood the new instructions. AFL211 then had about 20 NM left to fly before landing at Gardermoen. The aircraft's position was approximately 4 NM from localiser 19R. This means that the crew had about one minute to go before the aircraft would turn onto the final approach (see Figure 2 at 2126 hrs). The aircraft was configured with “Flaps 1” and had a speed of 210 kt. Maximum speed for the configuration is 230 kt.

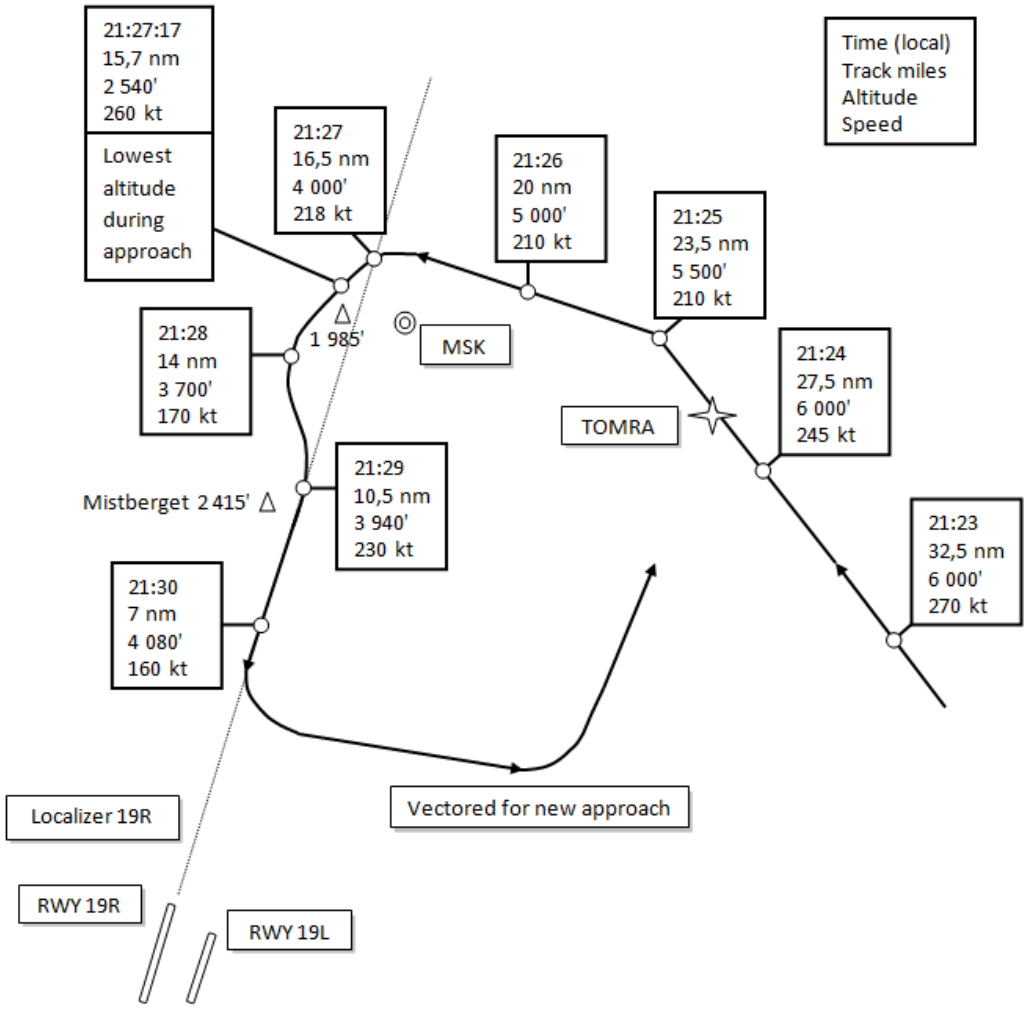

Figure 2: The estimated flight path based on radar data and flight data recorder.

The commander has explained that he did not feel comfortable with the situation and that he considered requesting vectors for a new approach. Due to a lot of traffic on the radio, and the fact that the aircraft was quickly approaching "capture" on localiser 19L, a situation with time pressure arose. The commander therefore decided to reprogram FMGS to follow the approach to the cleared runway 19R.

It is common procedure that the controls are transferred to the PM (Pilot Monitoring) if the PF (Pilot Flying) has to do anything else than flying the aircraft. The commander followed this procedure and handed the controls over to the first officer. The commander needed two attempts to key in the correct runway for landing, but did not realize that this was caused by mental overload and high stress level. Having done this, he took over the controls again and activated approach mode on the autopilot. This means that the aircraft will capture the localiser (approach beam) when the autopilot is engaged and automatically follow the localiser towards the runway. The commander explained that he called "I have control" and engaged approach mode on autopilot before focusing on the flight instruments.

Air traffic control's clearance to approach 19R was issued without giving AFL211 an intercept heading. When the commander activated "approach mode", the aircraft was so close to the localiser that "capture" happened almost immediately. When AFL211 captured the localiser, the aircraft flew through the LOC at an angle of about 90 degrees, and as a result the autopilot intensively banked the plane to the left with some sideslip to capture the localiser beam. When the commander raised his head, after having made inputs to the FMGS control panel, he got an illusion of aggressive aircraft pitch up instead of bank. Instinctively he deactivated the autopilot and pushed the sidestick down to counteract the fictitious aircraft pitch up motion. According to his own description of the situation, the commander was disoriented at the time and therefore aborted the approach. He deactivated the autopilot and autothrottle in an attempt to regain control and situational awareness. After the incident the commander explained that he most likely was exposed to spatial disorientation.[1] The Australian Transport Safety Bureau (ATSB) has issued a safety study: *"An overview of spatial disorientation as a factor in aviation accidents and incidents"* (B2007/0063) describing and analysing the phenomena.

When the commander deactivated the autopilot, the aircraft was at 4 380 ft with a 30° bank to the left and a descent rate of 2 200 ft/min. When the aircraft passed 4 000 ft a few seconds later, the bank was approximately 35° and the descent rate had increased to 4 600 ft/min (see Figure 3). At the same time, the aircraft was flying through the localiser with a heading of approximately 240°, still in a left turn to follow the localiser which has an inbound approach course of 195°.

[1] "Spatial disorientation is a term used to describe a variety of incidents occurring in flight where the pilot fails to sense correctly the position, motion or attitude of his aircraft or of himself within the fixed coordinate system provided by the surface of the Earth and the gravitational vertical (Benson 1988)."

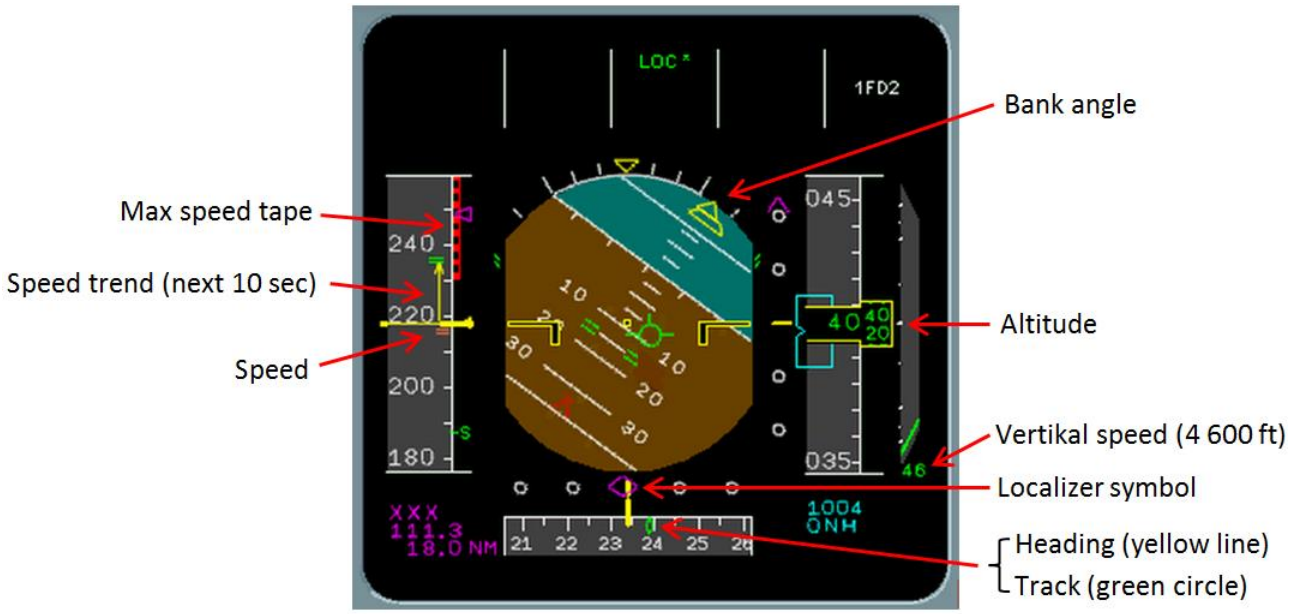

Figure 3: Still picture from animation based on data from the flight data recorder (FDR).

The aircraft continued with a descent rate which maxed out at 5 800 ft/min before the commander made corrections which reduced the rate. The speed increased due to the high descent rate, and the first officer has explained that he reacted by calling out "speed-speed" to notify the commander that the speed was approaching maximum permitted speed limit. He did not recognise the absence of the commanders' response as a sign of incapacitation and therefore did not intervene by taking controls. However flight data recorder shows that the co-pilot on two occasions briefly introduced back stick force during the pullout. The EGPWS[2] terrain warning system was activated: "TERRAIN AHEAD – TERRAIN AHEAD".

The aircraft was maneuvered to wings level and after a while the commander was able to recover the aircraft back to the cleared altitude of 4 000 ft. The altimeter showed that the aircraft had been down to 2 540 ft at the lowest before it started climbing again. The radar altimeter showed that the lowest altitude above the terrain during the incident was 2 030 ft. About 17 seconds elapsed from when the aircraft passed the cleared altitude of 4 000 ft and until it reached the lowest altitude of 2 540 ft. During this time, the speed increased to 260 kt which is 30 kt higher than the maximum permitted for the configuration with "flaps 1".

When AFL211 approached the lowest altitude before it started to climb, the air traffic controller (DIR) observed the altitude deviation and instructed the crew to immediately start climbing to a "safe altitude" of 4 000 ft. The aircraft disappeared from radar for a brief period, and the air traffic controller feared that an accident had happened. His relief was therefore considerable when AFL211 reappeared on radar. When the aircraft approached the cleared altitude of 4 000 ft, it was coordinated with a new approach and the crew received vectors to start the approach to runway 19R over again. The rest of the flight proceeded as normal and AFL211 landed at Gardermoen at 2149. When the aircraft had parked, it was inspected by a qualified technician who did not find any faults or damage as a result of "flap overspeed".

[2] EGPWS – Enhanced Ground Proximity Warning System

Air traffic control (ATC)

During the evening, runway 01L/19R had to be closed temporarily due to winter maintenance. At approximately 2045 hrs, Oslo APP and Gardermoen control tower agreed that the runway should be closed for a period from 2130 hrs.

About half an hour before AFL211 was expected to land, it was coordinated that the landing for AFL211 would take place on 19L instead of 19R, as the estimated time of arrival for the aircraft was in the period when 19R was scheduled to be closed for winter maintenance.

Visibility conditions at Gardermoen varied this evening, mainly due to freezing fog. In periods, visibility was reduced to less than 550 metres, which is the minimum requirement for approach and landing at runway 19L. Runway 19R is equipped with CAT-II/III ILS and accordingly has lower visibility requirements. Scheduled landings at 19L therefore had to be aborted and transferred back to 19R.

Coordination between Oslo ATCC and Gardermoen control tower was at times problematic as two of the four direct lines were out of service. When contact was established after repeated attempts, a decision was made to defer the closing of 19R by 20 minutes and take AFL211 in on 19R. The consequence was that AFL211 had come relatively close to the final approach to 19L before having their clearance for which runway to land on changed yet again.

Later that evening, after AFL211 had landed, the head air traffic controller at Gardermoen was contacted by the commander on a scheduled flight operated by a different company , who had also approached and landed at Gardermoen at the same time as AFL211. The commander was experienced with flights to Gardermoen and had full control of the situation, whereas his first officer was inexperienced and became significantly stressed as a result of the late runway change.

The European Organisation for the Safety of Air Navigation (EUROCONTROL) has prepared a document [3]concerning issues relating to runway excursions. The following is a quote from page 55 of the document, where the issue of changing runways is discussed:

> *"[…] Late runway change for landing*
>
> *A late runway change for landing, if not anticipated by the crew, will lead to an increase in workload for the flight crew. Flight crews should not accept a runway change unless a briefing, including the go-around for the new runway, performance calculation and FMC preparation can be safely completed in due time. Ideally the runway change should not be accepted below FL 100.*
>
> *Crews should not start an approach until all of the above is completed.*
>
> *Issues which might arise if all of the above is not completed before starting the approach are:*
>
> - *Rushed and unstabilised approaches.*
> - *Wrong radio and navigation settings for approach.*
> - *Flying the wrong approach.*
> - *Not intercepting the cleared approach in time. This is especially critical on airports with parallel runway operations.*

[3] European action plan for the prevention of runway excursions

- *Flying the wrong go-around route.*
- *Errors in performance calculations which might lead to runway excursions.*
- *Discrepancies in the stored FMC data leading to crew confusion.*
- *Etc. […]"*

A serious aviation incident sharing characteristics with this incident took place with Icelandair on 22 January 2002 during approach to Gardermoen. Strong tailwind and shorter vectoring during the approach to the final approach contributed to the crew not managing to establish a stabilised approach. The resulting report (2003/07) is available on AIBN's website.

THE ASSESSMENTS OF THE ACCIDENT INVESTIGATION BOARD

AFL211 had a crew with limited experience from approaches to Gardermoen. The relatively large amount of information in the given clearances and additionally several changes to the active runway prior to landing, were factors which resulted in misunderstandings which again led the crew to "fall behind" when attempting to get the airplane established on the ILS approach. When the aircraft quickly approached the final approach, the crew became stressed at a time when the focus should be directed at flying the aircraft, not making changes in the aircraft's systems e.g. changing the active landing runway. Although not desirable, flight crew will at times be in a situation at lower altitudes where cockpit tasks beyond focus at flying are a necessity. In order to reduce the risk of spatial disorientation, one option could be that Pilot Flying (PF) continues to fly the aircraft and asks Pilot Monitoring (PM) to execute any changes to the aircraft systems.

Based on the actual track and the distance to terrain when AFL211 was at its lowest altitude, the AIBN believes that a risk of controlled flight into terrain (CFIT) was present but not imminent. When at its lowest altitude of 2 540 ft, it would have required approximately one minute of level flight before it would be in conflict with rising terrain ahead. Although the recovery was late and slow, once initiated it was positive to the point where the First Officer elected not to intervene more aggressively.

It is not uncommon for air traffic services to initiate quicker and shorter approaches than normal to process traffic more efficiently. Flexibility to achieve efficient traffic processing is desirable, but must not be at the expense of safety. There is a point where flexible and efficient traffic processing reaches a limit which may threaten safety. Crews which regularly take off and land at an airport will probably handle last-minute changes better than crews which seldom have been at the airport. The challenge for the individual air traffic controller is then to have an understanding of what the individual crew can handle.

Established work methodology should not be deviated from, for example changing the landing runway when the aircraft is less than 30 NM out should not happen unless the crew accept the change. In this case, at the final change of landing runway, the crew could have been offered new vectors instead of being notified of a new landing runway.

Regardless of factors that could have been changed by air traffic control, the commander has the overall responsibility for safe flying. The commander wanted to abort the approach when the final change was announced, but chose to continue the approach due to time pressure. The commander became disoriented which resulted in an incorrect response when the aircraft passed cleared altitude and continued with a high descent rate before correct recovery was initiated. This incident

demonstrates that it can be a challenge for crews to recognize exposure to spatial disorientation which again most likely will result in a delayed corrective action.

Air traffic control expects that any crew will report unable if they cannot comply with a given clearance. AIBN believes that in this incident both ATC and the crew had time to solve the misunderstandings prior to AFL211 approaching the localiser. It is both parties responsibility to ensure precise communication.

The Accident Investigation Board Norway
Lillestrøm, 11 June 2013