Norwegian Safety Investigation Authority

Published February 2022

REPORT AVIATION 2022/01

Aviation accident at Notodden Airport Tuven, 15. August 2021 involving Diamond DA40 NG, LN-PFJ

The Norwegian Safety Investigation Authority (NSIA) has compiled this report for the sole purpose of improving flight safety.

The purpose of the NSIA's investigations is to clarify the sequence of events and causal factors, elucidate matters deemed to be important to the prevention of accidents and serious incidents, and to make possible safety recommendations. It is not NSIA's task to apportion blame or liability.

Use of this report for any other purpose than for flight safety should be avoided.

Photo: The Police

This report has been translated into English and published by the NSIA to facilitate access by international readers. As accurate as the translation might be, the original Norwegian text takes precedence as the report of reference.

Factual information

This investigation has been of limited scope. The NSIA has therefore chosen to use a simplified report format. A report format in accordance with the recommended practices in ICAO Annex 13 is only used when this is necessitated by the scope of the investigation.

Type of aircraft:	
Type and reg.:	Diamond Aircraft Industries GmbH DA 40 NG, LN-PFJ
Production year:	2019
Engine:	Austro Engine E4 series, AE300
Operator:	Pilot Flight Academy AS
Radio call signal:	PIP972J
Date and time:	Sunday 15 August 2021, at 1619 hours
Incident site:	Notodden Airport Tuven (ENNO), Telemark
ATS airspace:	Uncontrolled airspace, class G
Type of incident:	Aviation accident, loss of control during landing (runway veer off)
Type of flight:	Training flight, solo navigation flight
Weather conditions:	Variable wind direction and wind strength. Variable cloud cover and scattered rain showers. Temperature approx. 19 °C.
Light conditions:	Daylight
Flying conditions:	VMC
Flight plan:	VFR flight plan
Persons on board:	1 (commander/solo student)
Personal injuries:	No physical injuries
Damage to aircraft:	Damage to aircraft fuselage, wings, landing gear and engine. Damaged propeller and general structural damage.
Other damage:	None
Commander:	
Age:	34 years
Certificate:	CPL student with VFR solo flight certificate SEP (LAND)
Flying experience:	Total 75:40 hours of flight time, all with the same type of aircraft. Last 90 days/24 hours: 37:50/03:35 hours.
Sources of information:	Reports from the flight academy, commander, flight instructor, Notodden Airport, Flyteknisk Notodden and the Norwegian Safety Investigation Authority's own investigations

All times given in this report are local times (UTC + 2 hours), unless otherwise stated.

INTRODUCTION

The commander was a student at the Pilot Flight Academy (PFA) and was based at Notodden Airport Tuven (ENNO). The planned navigation flight was the commander's fifth solo flight.

NOTODDEN AIRPORT

Notodden Airport has a 12/30 runway direction, a Landing Distance Available (LDA) of 1,000 metres and a width of 45 metres[1]. The runway is asphalted and there is a windsock at both ends of the runway. Aerodrome Flight Information Services (AFIS) are available at Notodden. Due to holidays the control tower was not manned on the Sunday in question.

Gliders are often in action at the airport at weekends. There was also other General Aviation (GA) traffic at the airport, mainly PFA training flights. The commanders coordinated with each other and reported their position and intention, transmitting blind on the Notodden frequency (118.800 MHz).

THE COMMANDER'S PLANNING OF THE SOLO NAVIGATION FLIGHT

In accordance with the PFA programme, the solo navigation flight was to cover 300 NM and include landing, stopping at and taking off from two other airports. The flight was planned to depart from Notodden. The aircraft was supposed to land, stop at and depart from Hønefoss Airport Eggemoen (ENEG) and Sandefjord Airport Torp (ENTO) before returning to Notodden.

The commander has reported that he spent a quiet Saturday evening and stayed overnight in Notodden. At 1100 hours on Sunday, he had a briefing with the flight instructor at the flight academy's premises near the airport. The commander completed a final meteorological briefing. A METAR weather report was not available from Notodden as the control tower was unmanned.

The commander and the PFA flight instructor arrived at the airport at 1200 hours. Prior to the flight, the commander performed the daily inspection of the aircraft and went through the checklist together with the flight instructor.

The aircraft was fitted with Garmin G1000[2] instrumentation, and according to this the LN-PFJ took off from Notodden at 1243 hours, almost four hours before the accident. The aircraft landed, stopped at and departed from Hønefoss Airport Eggemoen at 1330 hours, and from Sandefjord Airport Torp at 1500 hours. Both landings were carried out in headwind, with a speed within the limits. There were no problems on the flight back to Notodden until the first landing attempt.

FIRST LANDING ATTEMPT, WITH MISSED APPROACH AS A RESULT

The commander of LN-PFJ checked in on the Notodden frequency at 1552 hours, when the aircraft was 3 NM from Sauland, north-northwest of the airport. The commander heard that there was quite a bit of traffic, including a glider with the call sign LN-GIF. He could not make out the position of the glider due to unclear radio communication. He called LN-GIF several times without getting an answer. He received assistance from another PFA aircraft, LN-FTW, which had checked in seven minutes before LN-PFJ. This aircraft stated that there was a glider between Sauland and the airport at an altitude above 4,000 ft and that the glider, which was probably LN-GIF, was not responding to calls. LN-FTW repeated the information about the glider two minutes later. The glider ground station called LN-GIF and asked whether they had heard what had been said. A further four

[1] The Landing Distance Available for the 12/30 runway can be expanded to 1,511 metres when Notodden AFIS is manned and the crossing road is closed.

[2] The NSIA has gained access to data from the Garmin G1000 instruments installed in LN-PFJ and the airport's video of parts of the landing that resulted in the accident. Garmin G1000 logs values, including speed and altitude.

calls were transmitted with poor sound quality up until 1600 hours. The glider ground station responded to the calls and said that the radio communication from LN-GIF was difficult to read.

The commander of LN-PFJ heard that runway 30 was in use and chose to use it. When he had entered right downwind 30 at an altitude of 1,800 ft, he noticed that the wind direction was variable, approx. 110 to 150°. This means tailwind with a crosswind component for runway 30. The commander heard that there was an instructor on board LN-FTW. Since the crew of this aircraft had also chosen runway 30, he interpreted this as confirmation that the wind closer to the ground supported this choice.

Crackling noises on the radio from the aircraft assumed to be LN-GIF were heard intermittently. The commander continued to look out for the glider, but never saw it[3]. LN-PFJ was on right downwind 30 when an unclear radio message was broadcast at 1610 hours stating '*for landing runway 30*'. The commander of LN-PFJ immediately responded '*972J, right base runway 30, looking for glider*'[4]. The next message was unclear, but included '*are you on base?*'. The commander of LN-PFJ responded '*Glider transmission unclear. Are you on final?*', which LN-GIF denied. The sound quality was better at this point and LN-GIF can be heard saying that they will land after LN-PFJ. The commander of LN-PFJ continued flying right downwind, base and final for runway 30.

The recorded Garmin G1000 data indicate that LN-PFJ flew with between 5 and 10 kt tailwind on the final approach. The commander has explained to the NSIA that he felt that the aircraft was not stabilised, and that he floated for some time above the runway. He therefore decided to perform a missed approach, which he reported on the frequency at 1612 hours. The commander could not recall whether he had looked at the windsock in connection with the missed approach. Glider LN-GIF landed on runway 30 at 1615 hours, a landing that the commander of LN-PFJ did not see.

SECOND LANDING ATTEMPT, RESULTING IN THE ACCIDENT

After the missed approach, the commander decided to fly right downwind 30 again. He looked down at the runway and observed an aircraft preparing for departure on runway 30. He heard on the radio that the aircraft was LN-FTY, a third aircraft from the same flight academy, with a student and an instructor on board. He looked down at the windsock but could not see what it was indicating.

After the commander turned from right downwind to base for runway 30, he saw that LN-FTY was still on the runway. He therefore circled above Notodden town. The commander has explained to the NSIA that while he was circling above the town, he considered the pros and cons of landing on runway 30, instead of switching to runway 12:

- The commander considered switching to runway 12 because the G1000 instrument indicated that the wind was variable at approx. 110 to 150°. This could mean tailwind during landing on runway 30, and he had already made one missed approach where he had experienced that the aircraft had floated for some time above the runway.
- The commander's reasons for not switching to runway 12 were gliders in the area whose position he did not know. Two other PFA aircraft had also recently chosen runway 30 for

[3] PFA aircraft have mode S transponders and they can see the positions of other PFA aircraft in relation to their own on the G1000 screen, but they cannot see gliders as they do not normally have transponders. Gliders can, however, see other gliders' positions via FLARM (Flight Alarm 'traffic awareness and collision avoidance technology'), which is installed on most gliders.
[4] The commander reported his position here as 'base', instead of 'downwind'.

landing (LN-FTW) and departing (LN-FTY). Both aircraft had instructors on board, and their crews thus had more experience than he did.

He decided to continue as planned, and entered the final approach for runway 30. The second landing attempt was initially similar to the first attempt. The aircraft again had tailwind of between 5 and 10 kt. The commander has explained that he configured the aircraft as normal during the landing attempt. According to the data from Garmin G1000, the approach was not stable[5] under 1,000 ft. He had, for example, a sink rate of up to 1,400 ft per min. when he was at an altitude of 300 ft. The airspeed was also high, it should have been approx. 74 kt at 50 ft, but was around 80 kt.

The commander has explained that he did not find the approach stable this time either and that the aircraft floated for some time above the runway. The speed decreased to stall speed approx. 55 kt. The commander noticed that the aircraft was veering to the right. He corrected this with the left aileron and applied full throttle to abort the landing. This led to the aircraft veering to the left at the same time as the aircraft nose pitched markedly. A video received from the airport shows that LN-PFJ, in connection with the landing, initially touched the runway with its landing gear, partly bounced up, hit its left wing on the asphalt and skidded to the left off the runway. The uncontrolled veering to the left led to the aircraft ending up on the grass off the runway (see Figure 1). The aircraft finally stopped 30 m from the edge of the runway with its nose pointing west (see Figure 2).

Several people present at the airport ran to the accident site to help the commander. The airport fire and rescue services reached the scene six minutes after the accident. The commander was not physically injured in the accident but spent one night in hospital for observation. The aircraft sustained significant damage with damage to the aircraft fuselage, wings, landing gear, propeller and engine (see Figure 3). No technical malfunctions have been found in the aircraft that may have had any impact on the sequence of events.

Figure 1: Still of LN-PFJ, circled in red, with its left wing-drop on the asphalt. Video: Notodden Airport

[5] By stable approach is meant that the speed and altitude are correct so that only minor changes need to be made to the aircraft's altitude and speed to reach the runway correctly.

Figure 2: Mark made by the left wing tip. Photo: The Police

Figure 3: LN-PFJ photographed after it was moved to the hangar. The photo shows damage to the front of the fuselage, damaged landing gear and damaged propeller, where all the blades have been knocked off. Photo: NSIA

WEATHER REPORT FROM THE NORWEGIAN METEOROLOGICAL INSTITUTE

The NSIA requested an extended weather report from the Norwegian Meteorological Institute for Notodden for 15 August 2021. A quote from the report summary;

> *Gusts of up to 6.7 m/s (13 kt) were observed at Notodden. The wind direction varied over the course of the day between northwest and east-southeast. The gusts of wind observed were not troublingly strong. Stronger gusts of wind cannot however be ruled out in connection with CB activity, and may have come without warning.*

WITNESS OBSERVATIONS LINKED TO WIND AND LANDING CONDITIONS

The NSIA has spoken with several experienced pilots who were familiar with the flying conditions at Notodden Airport, and who either observed LN-PFJ's landing attempts and/or landed there themselves that afternoon.

The instructor in LN-FTW has stated that there had been 1-2 kt headwind/crosswind during landing on runway 30 approx. nine minutes before the accident occurred, and that the wind direction changed straight afterwards. Another witness described seeing the windsock being clearly in favour of runway 12 when LN-PFJ missed the first approach approx. seven minutes before the accident occurred. A third witness with long experience as a pilot landed glider LN-GIF on runway 30 approx. four minutes before the accident occurred. He has described that the wind direction and wind strength were very variable at Notodden that afternoon, and that this was not uncommon. A fourth witness described the windsock as being in favour of runway 12 when he observed LN-FTY taking off on runway 30 approx. three minutes before the accident occurred.

THE COMMANDER'S PROGRESS DURING FLIGHT TRAINING

The commander started his flight training at the Pilot Flight Academy (PFA) in August 2019. After completing the theoretical part of the training, he started flight training in November 2020. At the time of the accident, he was a solo student in phase 3 of the flight academy's training programme. He informed the NSIA that his progress was good during phase 1 of the training programme, but that he had struggled towards the end of phase 2, which he had started on 2 March 2021. He had failed the pre-solo check twice.

The Pilot Flight Academy wrote in its internal investigation report that it was standard procedure to carry out a progress meeting if a student had failed a progress check twice. The progress meeting was held on 3 June, and the flight academy's training managers then decided that the commander had to undergo further training prior to another pre-solo check. According to the commander it was also decided that he would be flying with the same instructor until he passed phase 2 solo check to ensure consistency in the instructor remarks and thereafter follow up. After more hours of training, he passed the progress check on 18 June. He was issued a VFR solo flight certificate, and did his first solo flight that same day.

The commander started phase 3 of the training programme on 28 June. Progress test was passed on 30 July, after some extra hours taken to ensure readiness for the test. He did three solo flights in August without further comment.

In its internal investigation report, the Pilot Flight Academy wrote that they were more or less closed from mid-March to mid-April 2021 due to the Covid-19 pandemic. The commander had five flights in that period. He informed the NSIA that he had four instructors during phase 2. The commander acknowledged the flight academy's challenges relating to instructor staffing because of its closure during the pandemic but believed nonetheless that switching instructors had a negative impact on his training progress.

RISK-REDUCTION MEASURES CONSIDERED BY THE PILOT FLIGHT ACADEMY

In the Pilot Flight Academy's internal investigation, the investigation group proposed several measures for consideration by the academy's management. Below is a quoted list of recommendations given by the internal safety investigation, and status of each as of February 2022:

	Implemented and closed
	Assessing/closing action received
	Open/work in progress

Finding	***Description***	***Action***
Weather Information	*Installation of a company weather station accessible by instructor and student.*	*Should be part of an integrated/approved EFB solution to avoid the use of unapproved devices during critical phases of flight.*
Windsock	*Knowledge of extraction of windsock information.*	*Considered sufficient since part of phase briefing and airport briefing.*
Student Records	*Use of FlightLogger, specifically «Repetition needed» and «Extra Lesson»*	*Instructors are not consistent in the use of the two options and work in progress to improve standardization and knowledge.*

Crosswind Definition	*What is a crosswind landing?*	*A number of knots will not be implemented since several factors determine if a landing should be considered a crosswind landing.*
Crosswind Grading/logging	*FlightLogger should have a better way to log landings in general and crosswind specially.*	*Emphasize the manual system currently in use and work with software developer to improve software.*
Required Crosswind/phase	*A number of crosswind landings are required prior to first solo.*	*Requierment remain as is.*
Grading Guidelines	*Grading standardization.*	*The grading system is already well described and has been emphasised during standardization events.*
Communication training	*Consider introduction of more communication training prior to flight training.*	*The use of simulators and/or aircraft on ground to improve communication skills.*
Communication Student/Instructor	*Designated company frequecy available for company-student comm.*	*Application sent to NKOM.*
Go-Around Characteristics	*Increase awareness of SEP flight characteristics during a go-around.*	*SOP rewritten.*
Stabilization Criteria	*Increase awareness of stabilized approaches/criteria.*	*SOP rewritten.*
Go-Around Procedure	*When and how should a go-around be performed.*	*SOP rewritten.*
Stabilization Criteria	*Consider stabilized approach critieria.*	*SOP rewritten.*
Stabilization Call-Outs	*Consider the stabilized approach call-outs.*	*No change deemed required.*

The Norwegian Safety Investigation Authority's assessments

INTRODUCTION

The aviation accident involving LN-PFJ is an example of how a landing attempt with too much initial energy and a subsequent missed approach at a low altitude can culminate in a loss of control and an accident. The commander, who was a solo student, found himself in a situation that he did not master. Everything happened very quickly, and he was unable to avoid losing control of the aircraft.

CHOICE OF RUNWAY DIRECTION AND TRAFFIC CONDITIONS AT THE AIRPORT

The commander's decision to use runway 30 instead of runway 12 was unfavourable because it meant that the aircraft landed with approx. 10 kt tailwind.

Different people have described the wind that afternoon as being variable both in direction and strength. A METAR weather report was not available as the control tower was unmanned. The two windsocks were the most important sources of information for wind strength and wind direction on the ground. The NSIA believes that the commander could have used the windsocks more actively during the landing circuit, and if necessary, flown over the runway to see the windsocks better. Had a fly-over revealed that the wind conditions would mean tailwind for runway 30, as he experienced during the first landing attempt, he could have entered a new approach to runway 12.

The NSIA's investigation has shown that runway 30 was used by both departing and landing aircraft that afternoon, also when the windsock indicated in favour of runway 12. These aircraft were manned with at least one experienced pilot. The crew thus had a higher level of experience than the commander of LN-PFJ. The NSIA can understand that the commander, as an inexperienced solo student, decided to land at the runway in use that afternoon, and not be the one to change the runway direction. If the wind conditions were stabilising in favour of runway 12, it would perhaps have been more natural for more experienced pilots to take the initiative to change the traffic pattern.

It may be difficult for an inexperienced pilot to form a good overview of the traffic and wind conditions at an airport, particularly if the wind conditions are variable as in this case. It may thus be advantageous for the aircraft in the traffic pattern to inform each other about the conditions so that landing aircraft are as well prepared as possible. Experienced pilots should not take for granted that solo students have the necessary overview of the conditions. It is important at the same time that all pilots who are uncertain of the conditions ask others for advice on their own initiative.

The commander was concerned to come in conflict with the glider LN-GIF, whose position he did not know, and whose radio communication he could not make out. The commander did not see that glider LN-GIF landed after he missed the first approach. He was thus still on the look-out for the glider with its poor radio connection during the second landing circuit. The NSIA considers it probable that the commander, who had undertaken an almost four-hour solo navigation flight, was fatigued and was distracted by this and that this may have had a negative impact on the upcoming landing. It is important that all aircraft operating at airports where other traffic can be expected have good quality radio communication.

The NSIA also believes that the fact that the gliders and PFA aircraft operating at Notodden that afternoon were not fitted out in the same manner may have been significant. Both groups of aircraft

could maintain an overview of their position in relation to other aircraft with the same system, FLARM for the gliders and transponders with ADS-B for the PFA aircraft. Better opportunities for being seen and being able to register all other aircraft may have improved safety. However, all aircraft cannot be expected to have such equipment. Nor should electronic equipment replace the importance of checking altitude and speed on the instruments and looking out of the cockpit, and monitoring radio communication.

MISSED APPROACH AND LOSS OF CONTROL

During the second attempt to land in tailwind, the commander came in too high during the final approach and forced the aircraft down towards the runway at a steep approach angle. He succeeded in reducing the energy before he was over the limit, but the approach was not stable. The NSIA is of the view that the commander did the right thing in interrupting an unstable approach, but that he should have done so earlier.

The aircraft was above the runway at a low speed when the commander decided to abort and applied full throttle. The effect of the propeller's slipstream on the tail fin, combined with the torque supplied by the engine, led to the aircraft veering to the left. The aircraft nose pitched at the same time. This led probably to the left wing stalling, such that the commander lost control of the aircraft.

The NSIA is of the opinion that the commander pitched the aircraft's nose too early during the aborted landing. The aircraft thus did not have time to gather enough speed prior to starting its ascent. There is much to suggest that the situation was too demanding for the commander's skill level.

THE FLIGHT ACADEMY'S FOLLOW-UP OF PROGRESS

The commander was a solo student and had experienced progress issues on several occasions during the programme, most recently the month before the accident. The NSIA considers it likely that the flight academy may have let the student advance in the programme prematurely. Pilot Flight Academy commented the NSIA draft of the final report on the aviation accident involving LN-PFJ at Notodden airport on 15 August 2021. The flight academy does not share the NSIA's opinion that the student was allowed to advance too early.

The flight academy knew that the control tower was unmanned that Sunday, and that the AFIS service was thus not in place to provide assistance in the form of traffic information, wind direction and runway in use. The flight academy was aware that the wind conditions at Notodden were variable and that the runway in use could change. The flight academy was also aware that there were gliders in the area at weekends, and that motor aircraft had to show particular consideration in their vicinity.

The flight academy could have provided better assistance to its students if, for example, they had an instructor with a radio at the airport, like the glider ground station had. The instructor could then have picked up the problem linked to the glider not being located because of the poor radio connection.

The Pilot Flight Academy has performed an internal investigation of the accident, in which several measures were proposed to improve safety in connection with solo flights. The NSIA has noticed in particular that emphasis has been given to factors relating to documentation of clearer criteria for stable approaches.

The NSIA otherwise recommends those who fly light aircraft to read good guidelines available in the FAA's summary of its '*Airplane Flying Handbook*', Chapter 8 '*Approaches and Landings*'[6].

Conclusion

Unstable wind conditions and distractions linked to the traffic pattern probably contributed to the solo student (the commander) being unable to establish the aircraft on a stable approach during the last part of the final approach. The NSIA is of the opinion that the commander implemented a missed approach late, and that he lost control of LN-PFJ because he was unable to correct the aircraft's movements with engine and rudder control. The NSIA considers that the accident indicates that the commander faced greater challenges than he was able to handle.

Norwegian Safety Investigation Authority
Lillestrøm, 24 February 2022

[6] *Link to FAA 'Approaches and Landings':*
https://www.faasafety.gov/gslac/ALC/course_content_popup.aspx?cID=34&sID=169