Australian Government
Australian Transport Safety Bureau

Unstable approach involving de Havilland Canada Dash 8 VH-XFZ

Laverton Aerodrome, WA | 17 May 2012

Investigation

ATSB Transport Safety Report
Aviation Occurrence Investigation
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Addendum

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Safety summary

What happened

On 17 May 2012, the flight crew of a de Havilland Canada Dash 8 aircraft, registered VH-XFZ and operated by Skippers Aviation Pty Ltd, was conducting a circling approach to runway 07 at Laverton Aerodrome, Western Australia. In conditions of low cloud, the crew positioned the aircraft on a close base leg to maintain visual reference with the runway threshold. This led to a steep final approach and a high rate of descent that triggered alerts from the aircraft's Enhanced Ground Proximity Warning System (EGPWS) and exceeded the operator's stable approach criteria. The crew heard some alerts from the EGPWS and knew they had a high rate of descent but at the time did not identify an unstable approach. The crew continued the approach and landed.

What the ATSB found

The ATSB found that at the time of the occurrence the flight crew did not have an adequate understanding of operational aspects of the aircraft's EGPWS and the operator's standard operating procedures in regard to mandatory go-arounds. Crew fixation on the runway environment at a time of higher than normal cognitive workload and an inadequate monitoring of the aircraft's rate of descent resulted in the continuation of an unstable approach, contrary to the operator's procedures. The ATSB also determined that the operator's minimum height for achieving the criteria for a stable approach was lower than recommended by the International Civil Aviation Organization.

What has been done as a result

In response to this occurrence, the operator implemented a number of safety actions to refine their stabilised approach criteria and formulate a method of incorporating realistic EGPWS warning events in the Dash 8 simulator training program. The intent was to enhance crews' ability to recognise and respond correctly and rapidly to EGPWS alerts.

Safety message

The ATSB continues to stress the risks associated with the handling of an approach to land. The Flight Safety Foundation cites a lack of go-arounds from unstable approaches as the number one risk factor in approach and landing accidents and the primary cause of runway excursions. This occurrence highlights the importance of crews adhering to standard operating procedures and correctly responding to cockpit warnings.

Contents

The occurrence

On 17 May 2012, a de Havilland Canada Dash 8 aircraft, registered VH-XFZ and operated by Skippers Aviation Pty Ltd, was being operated on a passenger charter flight from Perth to Laverton, Western Australia. The flight crew consisted of a captain and a first officer with the first officer designated as pilot flying for the sector. Both crew members were appropriately qualified to conduct the flight and were adequately rested prior to commencing duty at 0500 Western Standard Time[1].

The aircraft departed Perth Airport at 0616 with the relevant area forecast indicating areas of fog and low cloud until 0900. The aerodrome forecast (TAF) for Laverton included a 30 per cent probability of fog until 0900, after which time no significant weather was forecast. As similar weather conditions were predicted for nearby aerodromes, the crew elected to depart Perth with full fuel tanks to enable diversion from Laverton to the closest suitable alternate aerodrome, Meekatharra, if the destination weather precluded a landing. The TAF for Meekatharra indicated clear weather conditions; however, the area forecast indicated areas of fog to the south of Meekatharra and light winds. The captain recalled that due to the sometimes unpredictable nature of fog formation he had deliberated the 'what if' scenario for a diversion to Meekatharra during the outbound flight.

As the crew commenced descent into Laverton they observed that the weather in the area was mostly clear but there were bands of fog and low stratus cloud in the general vicinity of the aerodrome. They did not sight the aerodrome at that stage. There were a number of instrument approach options available to the crew but the inbound track to Laverton and the light south-easterly wind indicated by the Aerodrome Weather Information Service (AWIS)[2] favoured a landing on runway 07. The flight crew chose to conduct the global navigation satellite system arrival procedure in anticipation of making a straight-in approach to runway 07. That arrival procedure allows crews to minimise manoeuvring as they descend from the en route phase to circling height to enter the circuit or conduct a straight-in approach to land. The runways at Laverton were not equipped with any visual approach slope indicator systems.

At 0745 the aircraft was about 5 NM (9 km) from the aerodrome, approaching the final approach fix at the appropriate height and airspeed. The crew had configured the aircraft for landing with the landing gear extended and flap15 selected. The descent, conducted with the autopilot engaged, was continued in accordance with the arrival procedure to the Minimum Descent Altitude (MDA) of 2,220 ft, which was about 690 ft above aerodrome elevation. Approaching the aerodrome's non-directional beacon[3], the crew sighted the runway through a thin patchy cloud layer that was below their level. At this point the crew decided to join the circuit upwind for a right visual circling approach at about 1,000 ft above ground level for a landing on runway 07.

The first officer recalled that to maintain visual contact with the runway he commenced a turn from downwind on to the base leg earlier than normal, about 10—15 seconds after passing abeam the runway 07 threshold. The base leg was flown as a continuous level turn but overshot the extended runway centreline, requiring a continuation of the turn to re-intercept centreline from the left. The captain recalled that the approach end of the runway was visible through a gap in the cloud and that a mutual decision was made to continue the approach, but requiring a steep descent through the gap to keep clear of cloud.

At 0751:29, while still in the turn, the autopilot was disengaged, the power was reduced to flight idle and a rapid descent was commenced. Recorded data indicated that at 900 ft the aircraft was

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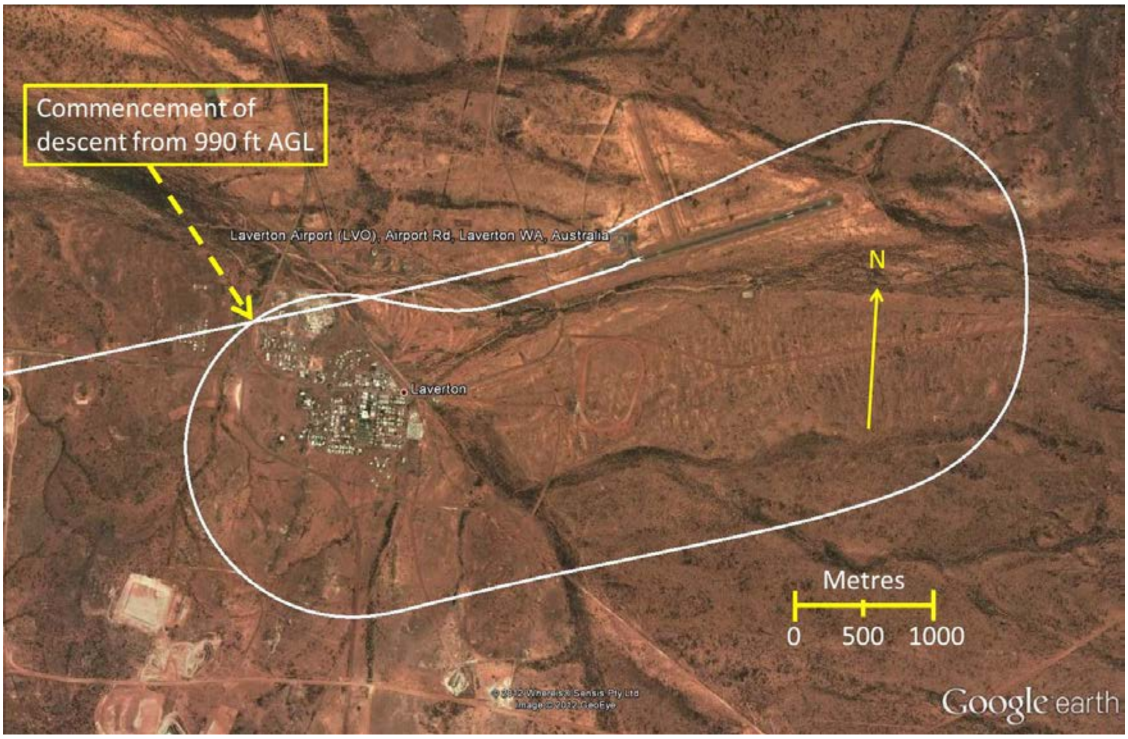
[1] Western Standard Time (WST) was Coordinated Universal Time (UTC) + 8 hours.

[2] The aerodrome weather information service (AWIS) provides actual weather conditions, via telephone or radio broadcast, from Bureau of Meteorology automatic weather stations.

[3] A non-directional (radio) beacon (NDB) is a radio transmitter at a known location, used as a navigational aid. The signal transmitted does not include inherent directional information.

banked 25° to the right and the derived rate of descent was around 1,400 ft/min. The first officer recalled not thinking that the rate of descent was extreme but disclosed that he did not refer to his vertical speed indicator. His main focus of attention was on the runway aspect with occasional glances at the airspeed indicator. He also remarked that he was reliant on the captain to call excessive parameter deviations. The operator's operations manual detailed the role of the monitoring pilot (in this instance the captain), which included the requirement for a standard 'sink rate' call to the pilot flying if the aircraft's rate of descent on final exceeded 1,000 ft/min. The captain stated that because of the high rate of descent and their proximity to the ground his main focus of attention was also outside the cockpit.

Figure 1: Plot of the recorded approach path from the flight data recorder



Source: Mapdata Google Earth and GeoEye, with flight data overlaid by the ATSB.

Both crew members recalled that they were aware the aircraft was high on profile but believed that the initial high rate of descent was bringing them back on to a more normal profile, the approach was stabilising, and that they were in a position to land. The aircraft was fitted with an Enhanced Ground Proximity Warning System (EGPWS)[4] to alert crews about potential conflicts with terrain and obstacles and which provides a number of terrain alerting modes. During the descent on final a number of EGPWS alerts sounded. The first officer stated that he believed the alerts were spurious but added that his exposure to EGPWS alerts was very limited. The captain stated that that in response to the first of the EGPWS alerts he instructed the first officer to reduce the rate of descent and also because he believed the aircraft was nearing the correct approach profile. At the subsequent alert the captain noted that the vertical speed indicator was trending to a lesser rate of descent, and the approach aspect was normalising. He was confident in the first officer's aircraft handling abilities and did not feel that he had to instruct the first officer to discontinue the approach.

At 0751:36, at 730 ft, the peak rate of descent derived from the recorded data was about 2,500 ft/min. At 0751:48, while passing 300 ft the derived rate of descent was still

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[4] EGPWS is the Honeywell Inc. proprietary name for a terrain awareness and warning system (TAWS). TAWS is the term used to describe equipment meeting the International Civil Aviation Organization standards and recommendations for GPWS equipment that provides predictive terrain-hazard warnings.

about 1,800 ft/min, the speed was 11 kt above the reference approach speed (V_{ref}) and the aircraft was banked 23° to the left as the runway centreline was intercepted. At 0751:55, at 100 ft, the derived rate of descent was about 1,200 ft/min as the landing flare was commenced and a small amount of power reintroduced. The touchdown on the 1,800 m paved runway was normal at 0752:12.

The crew recalled that they discussed the approach after landing and were unsure whether the aircraft was stabilised at the operator's minimum stabilisation height of 300 ft. The crew of XFZ did not report the incident to the operator and the chief pilot became aware of the incident and the EGPWS warning about a week later. The chief pilot immediately reported the occurrence to the ATSB and commenced an internal investigation.[5]

[5] The Aeronautical Information Publication Australia (AIP) ENR 1.14 *AIR TRAFFIC INCIDENTS* section 3.2 stated that a ground proximity warning alert is a routine reportable matter for all air transport operations and requires a written report to the ATSB within 72 hours. An 'air transport operation' is a regular public transport operation or a charter operation. The definition of a routine reportable matter is prescribed in the Transport Safety Investigation Regulations 2003 (Cth).

Context

Enhanced ground proximity warning system

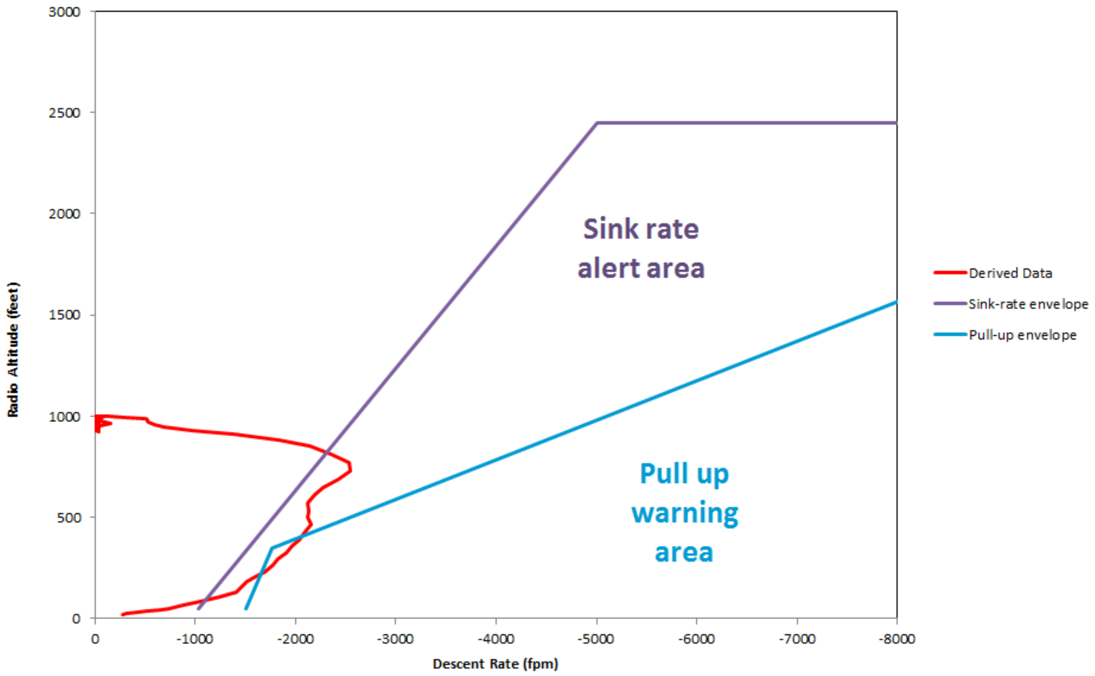
The objective of EGPWS is to reduce the risk of accidents involving controlled flight into terrain. Outputs from the EGPWS computer provide visual and audible synthetic voice cautions and warnings to alert crew about potential conflicts with terrain and obstacles.

The EGPWS provided a number of terrain alerting modes. Mode 1, excessive descent rate, relies on the aircraft's radio altimeter system and provides alerts for excessive descent rates with respect to radio altitude above ground level. It has inner and outer alert boundaries, as displayed in Figure 2.

Penetration of the outer boundary activates the EGPWS caution lights and a 'sink rate' alert annunciation. Additional 'sink rate' messages will occur for each 20 per cent degradation in altitude. Penetration of the inner boundary activates the EGPWS warning lights on the aircraft's glareshield panel and changes the audio message to 'pull up', which repeats continuously until the inner warning boundary is exited.

Figure 2 incorporates XFZ's radio altitude and derived rate of descent during final approach and shows that both caution alert and warning alert envelopes were penetrated. The crew stated that their recollection of the exact nature of the EGPWS alerts occurring during the approach was unclear.

Figure 2: EGPWS Mode 1 alerting envelope



The operator provided the crew with operations manuals to provide the necessary limitations, procedures, performance and systems information to safely operate the Dash 8 aircraft. The Dash 8 operations manual contained information in relation to EGPWS, including the following:

- In response to any caution alert, the crew must acknowledge the alert and adjust the configuration, flight path or speed of the aircraft to correct the unsafe indication.
- The required response to EGPWS warning alerts was, unless in day visual meteorological conditions and the warning could be confirmed as erroneous, the crew were to advance the

power levers to maximum take-off power, rotate the aircraft to the go-around attitude and climb to a safe height.

Stabilised approach concept

International Civil Aviation Organization Guidance – stabilised approach criteria

Unstabilised approaches are frequent factors in approach-and-landing accidents, including those that involve controlled flight into terrain. The Flight Safety Foundation (FSF)[6] suggests that an approach is stabilised only if all the criteria in company standard operating procedures (SOP) are met before or when reaching the applicable minimum stabilisation height. The FSF recommended minimum stabilisation heights to achieve a stabilised approach are in accordance with those recommended for the guidance of flight crew by the International Civil Aviation Organization (ICAO) in *Procedures for Air Navigation Services – Aircraft Operations* (PANS - OPS, Doc 8168), which states:

> The elements of a stabilised approach shall be stated in the operator's SOPs. These elements should include as a minimum:
>
> a) that in instrument meteorological conditions (IMC), all flights shall be stabilised by no lower than 1,000 ft height above threshold; and
>
> b) that all flights of any nature shall be stabilised by no lower than 500 ft height above threshold.

The FSF Approach-and-Landing Accident Reduction Task Force identified several factors that contribute to unstabilised approaches. These include:[7]

- Flight crew fatigue
- Failure to recognize deviations or failure to adhere to the excessive-parameter-deviation limits
- Belief that the aircraft will be stabilized at the minimum stabilization height or shortly thereafter
- Excessive confidence by the pilot-not-flying that the pilot flying will achieve a timely stabilisation
- Flight crew too reliant on each other to call excessive deviations or to call for a go-around.

Stabilised approach criteria

The following operations manual extract described the operator's stabilised approach requirements:

> A stabilised approach configuration means:
>
> "An approach where the aircraft is on the correct glide path with an attitude, heading, rate of descent, airspeed and power setting requiring little or no adjustment to reach the target point on or above the runway at the target speed".
>
> A normal, all engine, stabilised approach configuration with landing flap is to be achieved no lower than 300 ft above the landing threshold elevation.
>
> The criteria required for a stabilised approach is:
>
> - aircraft in landing configuration with landing checklist completed as far as possible, and
> - IAS not greater than V_{ref}+10 and not less than V_{ref}, and
> - aircraft rate of descent not greater than 1,000 ft/min, and
> - aircraft on or near the extended runway centre line, and
> - little or no change required in track to maintain centre line, and
> - little or no change required in power setting to maintain airspeed and aiming point, and

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6 The Flight Safety Foundation is an international non-profit organisation whose sole purpose is to provide impartial, independent, expert safety guidance and resources to the aviation and aerospace industry.

7 Further information on Approach-and-Landing Accident Reduction is available at: http://flightsafety.org/

- on correct glide path. The approach shall be established on the correct glide path by reference to electronic glideslope or, if unavailable, by reference to secondary visual devices such as VASIS or PAPI where provided. Should neither of these devices be available then using an aiming point 300 meters into the runway from the landing threshold and a standard pilot interpreted 3 degree approach is acceptable.

WARNING

IN OTHER THAN EMERGENCY OPERATIONS, A MISSED APPROACH MUST BE CONDUCTED IMMEDIATELY SHOULD AN APPROACH NOT BE STABILISED BY THE ALTITUDE DETAILED IN THIS SECTION.

The minimum stabilisation height of 300 ft differed from that recommended by ICAO. However, the criteria for a stabilised approach are not legislated and are established by each operator to suit their individual operations.

Safety analysis

Introduction

During the circling approach, the aircraft was allowed to descend on final at a rate that generated a series of Enhanced Ground Proximity Warning System (EGPWS) alerts and exceeded the stable approach criteria as published in the operations manual for a mandatory go-around. While on final, the derived rate of descent peaked at about 2,500 ft/min and was in excess of 1,800 ft/min at 300 ft above the ground. Despite the EGPWS alerts and stabilisation criteria not being met, the crew did not conduct a go-around. Although the subsequent landing was without incident, the deviation from standard operating procedures by the crew put the aircraft at an increased risk of a hazardous situation developing. The following analysis discusses the factors contributing to the unstable approach and the crew's deviation from standard operating procedures.

Approach into Laverton

The flight crew departed Perth with the knowledge that the forecast fog and low cloud at Laverton might delay their landing, and they planned the flight accordingly. The descent and subsequent circling approach was flown in accordance with standard operating procedures. The crew observation of the runway through thin patchy cloud encouraged them to perform the visual circling approach, but to keep the runway environment in sight the first officer flew a closer than normal circuit. When the opportunity arose for a descent clear of cloud, the crew's agreed assessment was that a safe descent through that gap, although steep, was achievable. Nevertheless, their position in relation to the runway required a glide path angle that was more than twice the normal approach gradient of 3°, and it was predictable that a high rate of descent would be required. This should have heightened their awareness of the likelihood of not achieving the parameters to perform a stable approach and consequently having to conduct a go-around.

To keep clear of the cloud the aircraft was initially pitched down to -10°. The high rate of descent which followed, together with the proximity to the ground, triggered the EGPWS 'sink rate' caution. Both crew recalled their response was to reduce the rate of descent and recorded data showed a modest reduction in pitch angle and rate of descent.

In the absence of any visual approach slope indicator system at Laverton, the crew were reliant on their judgement based on experience to decide whether the approach profile was manageable. Recorded data showed that the period from commencement of descent through the gap in the cloud until the start of the landing flare was 30 seconds. For that relatively short period of time and due to the high rate of descent close to the ground, the cognitive workload for both crew members was most likely higher than normal.

Factors contributing to the unstable approach

Workload

Workload has been defined as 'reflecting the interaction between a specific individual and the demands imposed by a particular task.[8] An individual has a finite set of mental resources they can assign to a set of tasks. The resources available to an individual can change given the experience and training they have had or the level of stress and fatigue they are experiencing. An individual will seek to perform at an optimum level of workload by balancing the demands of their tasks.

8 Orlady, H.W. & Orlady, L.M. (1999). *Human factors in multi-crew flight operations.* Ashgate: Aldershot, UK p.203.

When workload becomes excessive, the individual must shed tasks. An individual can shed tasks in an efficient manner by eliminating performance on low priority tasks or they can shed tasks in a non-efficient fashion by abandoning tasks that should be performed.[9]

The momentarily high workload the crew experienced was apparent from their recall that their monitoring of the flight instruments was minimal and their attention was fixated on maintaining visual contact with the runway environment. There was also the absence of verbal callouts by the captain on excessive sink rate, an essential and required element of the monitoring pilot's role, to enhance the first officer's situation awareness. These aspects of the approach were consistent with task shedding on the part of the flight crew in an effort to manage the momentarily excessive workload.

Degraded situational awareness

Situation awareness is a human perceptual state in which information is gained from the environment through a number of processes. These processes are believed to be the perception of environmental elements, the comprehension of their meaning and the projection of their status following a change in a variable (such as time).[10] It is having an accurate understanding of what is happening around you and what is likely to happen in the near future.

The crew's monitoring of the aircraft's rate of descent and altitude relative to the minimum stabilisation height was secondary to their monitoring of their position in relation to the ground. This external focus degraded the crew's overall situation awareness. The increased cognitive workload may also have interfered with the crew's perception of the risk involved.

Situation awareness is strongly related to the decision making process. Situation awareness is not just a vital input for decision making but may impact the process of decision making. It is the pilot's understanding of the unfolding situation that determines their choice of decision process.[10]

Response to the EGPWS cautions and warnings

The recorded data indicated that several EGPWS 'sink rate' cautions would likely have occurred, followed at about 400 ft by a 'pull up' warning. The operations manual provided specific guidelines for those circumstances, but the crew, unaware that a go-around was required for a valid EGPWS warning in day VMC, continued the approach. If the crew had responded to the warning with a scan of the instruments they would have realised that the descent rate of about 2,100 ft/min at the time was excessive for the height above terrain and the warning was valid. By not responding effectively to the EGPWS cautions and warnings, the crew increased the risk of an approach or landing accident.

An appropriately equipped simulator is an effective training tool to enhance crews' ability to recognise and respond correctly and rapidly to an EGPWS alert. The operator's Dash 8 crews were subject to regular simulator training; however, the chief pilot reported that at the time of the incident, the trainers had no normal method of simulating an EGPWS alert other than to deliberately manoeuvre so as to cause one. This would be a poor training technique, possibly resulting in pilots dismissing the EGPWS alerts as spurious and thus resulting in negative training. The operator has since resolved this issue with the Dash 8 simulator.

The EGPWS warning should also have given the flight crew a strong indication that the approach was not stable. However, they continued with the approach despite not being able to satisfy the stabilised approach criteria at the height specified the operator's standard operating procedures. The flight crew recalled that they elected to continue the approach as the aircraft's speed was relatively stable, the rate of descent seemed to be normalising and a landing appeared to the crew to be achievable. However, the EGPWS warnings indicated a potential hazard and a go-around

9 Wickens, C.D. & Hollands, J.G. (2000). *Engineering psychology and human performance, 3rd Edition.* Prentice Hall: New Jersey.

10 Endsley, M.R. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors,* vol. 37(1), pp 32-64.

should have been initiated. There was adequate fuel on board for the flight crew to hold or to make further approaches.

Weather can change quickly and pose a challenge for situation assessment and risk assessment is a desirable attribute for flight crew. However in this instance, it may have resulted in the captain perceiving a threat of 'worst-case-scenario' weather at the nearest suitable alternate, Meekatharra. This self-imposed pressure possibly motivated the captain to continue the approach and complete the landing at the first attempt, rather than wait for conditions to improve as forecast.

Stabilised approach criteria

The criteria for a stabilised approach are established by each operator to suit their operations; however, the stabilised approach criteria recommended by the International Civil Aviation Organization are widely accepted. It is, however, unclear whether a minimum stabilisation height higher than 300 ft would have prompted the flight crew in these circumstances to discontinue the approach. Research studies sponsored by the Flight Safety Foundation indicate that 97 per cent of unstabilised approaches continue to be flown to touchdown and full landing, contrary to operators' standard operating procedures (SOPs).[11] The foundation cites a lack of go-arounds from unstable approaches as the number one risk factor in approach and landing accidents and the primary cause of runway excursions.

At the point where the aircraft crossed the minimum stabilisation height the flight crew were most likely still assessing the approach in the same way they had from the commencement of the descent. Rather than a conscious breach of SOPs, the flight crew were prone to follow their own judgement and experience in deciding whether the continuation was safe as the approach progressed. That is, their decision was not based on the stabilisation criteria.

Summary

This occurrence highlights the importance of crews adhering to SOPs and reacting appropriately to cautions and warnings from the EGPWS. Non-adherence to SOPs has frequently been established as a factor in accidents and incidents and can significantly erode safety margins and increase risk. High rates of descent in close proximity to the ground can result in a high crew workload, reduced margins for safety and increased risk of controlled flight into terrain.

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[11] Flight Safety Foundation Year in Review, International Air Safety Seminar 2011.

Findings

From the evidence available, the following findings are made with respect to the unstable approach, involving a Dash 8 aircraft registered VH-XFZ, that occurred at Laverton Aerodrome, Western Australia on 17 May 2012. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing factors

- While manoeuvring to avoid cloud during a visual circling approach, the flight crew positioned the aircraft on final approach with an excessive rate of descent of 1,800 ft/min when passing the 300 ft minimum stabilisation height, and then continued the approach rather than going around as required in the case of an unstable approach.
- At a time when the flight crew were focussed on descending through a break in the cloud and the first officer was relying on the captain to call deviations from stable flight, the captain did not monitor the aircraft's rate of descent, resulting in degraded situation awareness.
- The flight crew did not execute a go-around following an enhanced ground proximity warning system 'pull up' warning alert at 400 ft on final approach due to an inadequate understanding of the applicable standard operating procedure.

Other factors that increase risk

- During the visual circling approach, the flight crew did not respond effectively to the cautions and warnings from the enhanced ground proximity warning system.
- At the time of the occurrence, simulator training was not provided to enable crews to recognise and respond correctly and rapidly to cautions and warnings from the enhanced ground proximity warning system.

Other findings

- The minimum stabilisation height of 300 ft in visual meteorological conditions as stipulated in the operations manual was lower than the 500 ft recommended by the International Civil Aviation Organization.
- At the time of the occurrence, the weather conditions at Laverton were consistent with the forecast and the crew had planned the flight accordingly.
- The crew did not report the warning alert from the enhanced ground proximity warning system to the operator, delaying notification to the Australian Transport Safety Bureau.

Safety issues and actions

The Australian Transport Safety Bureau did not identify any organisational or systemic issues that might adversely affect the future safety of aviation operations. However, the following proactive safety action was reported in response to this occurrence.

Proactive safety action

The aircraft operator advised that as a result of this incident:

- the flight crew was debriefed on the outcomes from the operator's internal investigation and completed a ground and flight re-training package
- a company memorandum was distributed to all flight crew on 30 May 2012 regarding: the procedures to be followed in the event of an Enhanced Ground Proximity Warning System (EGPWS) warning, the necessity for flights to be carried out in accordance with the operator's SOPs and, the reporting requirements for EGPWS alerts
- follow-up fleet meetings were conducted to brief crews on the stabilised approach criteria
- the stabilised approach criteria was reviewed and amended to limit the aircraft's rate of descent when below 1,000 ft in instrument meteorological conditions or below 500 ft in visual meteorological conditions to not greater than a 1,000 ft/min
- the flight standards department formulated a method of incorporating an EGPWS warning event in the Dash 8 simulator training program. As a direct result of this incident, EGPWS training is now carried out twice a year by all Dash 8 crews.

General details

Occurrence details

Date and time:	17 May 2012 – 0752 WST	
Occurrence category:	Incident	
Primary occurrence type:	Unstable approach	
Location:	Laverton Aerodrome, Western Australia	
	Latitude: S 28° 36.8	Longitude: E 122° 25.4

Aircraft details

Manufacturer and model:	de Havilland Canada DHC-8-314	
Registration:	VH-XFZ	
Serial number:	365	
Type of operation:	Charter	
Persons on board:	Crew – 4	Passengers – 36
Injuries:	Crew – nil	Passengers – nil
Damage:	None	

Crew details

	Captain	First officer
Total flight hours	5,000	2,070
Flight hours on DHC-8	2,900	685
Flight hours last 90 days	120	200
Recent simulator check	27 March 2012	23 January 2012
Crew Resource Management course	14 October 2011	3 August 2011

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- operator and flight crew of VH-XFZ
- aircraft's flight data recorder
- Bureau of Meteorology.

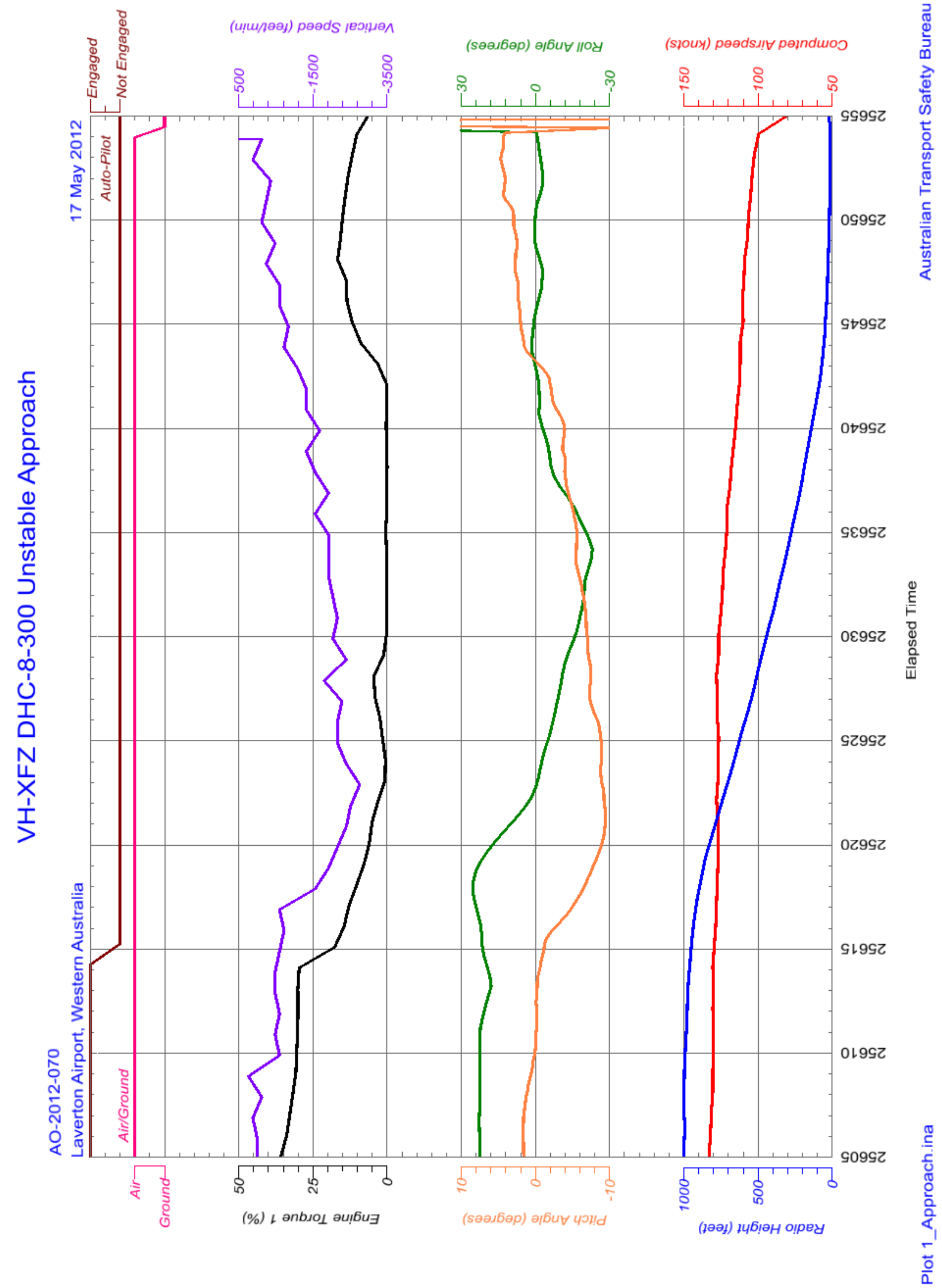
Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the operator and flight crew of VH-XFZ and the Civil Aviation Safety Authority (CASA). A Submission was received from CASA. The submission was reviewed and where considered appropriate, the text of the report was amended accordingly.

Appendices

Appendix A – selected parameters from the flight data recorder



Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Australian Transport Safety Bureau

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Investigation

ATSB Transport Safety Report
Aviation Occurrence Investigation
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