

INCIDENT

Aircraft Type and Registration:	DHC-8-311 Dash 8, G-NVSB	
No & Type of Engines:	2 Pratt & Whitney PW123 turboprop engines	
Category:	1.1	
Year of Manufacture:	1998	
Date & Time (UTC):	24 March 2005 at 0930 hrs	
Location:	5.7 nm west of Isle of Man (Ronaldsway) Airport	
Type of Flight:	Public Transport (Passenger)	
Persons on Board:	Crew - 4	Passengers - 20
Injuries:	Crew - None	Passengers - None
Nature of Damage:	None	
Commander's Licence:	Air Transport Pilot's Licence	
Commander's Age:	60 years	
Commander's Flying Experience:	17,500 hours (of which 1,200 were on type) Last 90 days - 100 hours Last 28 days - 25 hours	
Information Source:	Aircraft Accident Report Forms submitted by the crew and further enquiries by AAIB	

Background

The crew was flying a visual approach to Runway 08 at Isle of Man (Ronaldsway) Airport. The aircraft descended below the notional glidepath while it was still some distance from the runway. The resulting proximity to terrain triggered an Enhanced Ground Proximity Warning System (EGPWS) warning, which met with a delayed crew response. The co-pilot submitted an Air Safety Report Form 11 days after the incident, which was then referred to the AAIB by the aircraft operator. The commander subsequently completed an Air Accident Report Form at the request of the AAIB.

The flight crew comprised a senior and very experienced captain, with experience in airline training acquired prior to joining the operator in 1998, and an inexperienced

co-pilot who had commenced line flying with the company some five months previously. Significant differences existed between the commander's account of the incident and that of the co-pilot, to the extent that it was not possible to combine the reports in a single narrative.

History of Flight*Co-Pilot's Report*

The flight crew had reported at 0610 hrs for a duty which was to include two return flights from the Isle of Man to Manchester. The aircraft departed Manchester on the first return leg at 0845 hrs with the co-pilot acting as the handling pilot. The co-pilot reported that he attempted

to brief the commander on the expected Localizer/DME (LLZ/DME) approach to Runway 08 at Ronaldsway; the glide slope for that runway being temporarily unavailable. However, the commander indicated he was satisfied that a brief was not necessary. A visual approach was therefore not discussed either. The meteorological report for the airport at 0920 hrs showed a surface wind from 130°(M) at 7 kt, visibility in excess of 10 km, small amounts of cloud at 1,000 feet and broken cloud cover at 4,500 ft. As the aircraft approached the island under radar vectors from ATC, the co-pilot announced that he was “visual”. He intended this to be an information call to the commander, but in response the commander requested a visual approach, which was approved by ATC. The aircraft then flew downwind at 1,700 ft altitude until it commenced its final turn, at a range of about 6.5 nm from the runway (Figure 1). During the downwind leg the co-pilot called for the initial landing checks, but the commander also lowered the landing gear and selected landing flap without reference to the co-pilot, thus completing all the pre-landing check items. The commander also re-tuned the radio navigation receivers from the LLZ/DME frequency to the Isle of Man VOR/DME frequency and selected the flight director system to standby. The co-pilot, who was visual with the airfield, commenced a descent soon after initiating the final turn. The Isle of Man VOR/DME is located on the approach to Runway 08, at 4.6 nm from the airport.

As the final turn progressed, the co-pilot became increasingly uncomfortable regarding his visual contact with the airport, and eventually lost visual contact altogether. He later attributed this to the distraction of the commander’s actions and their effects on the aircraft’s handling, as well as a reducing visibility in haze, though he did not voice his concern to the commander. The aircraft flew through the runway centreline, still descending, and the commander informed ATC of this before enquiring whether the co-pilot was still visual with the airport, to which the co-pilot replied “NEGATIVE”. The commander then made right aileron inputs on the control column though did not assume control of the

aircraft. In response, the co-pilot surrendered control to the commander but did not verbalise this. The co-pilot recalled that, at about this time, there was a brief discussion on the flight deck about the DME indication and the fact that the VOR/DME was not located on the airfield. The co-pilot later said that the situation was very confusing, and believed that he was misled by the DME which he thought was indicating range to the runway, as it would have for a LLZ/DME approach.

The aircraft by this stage was on a south easterly heading, correcting towards the runway centreline from the north and still descending. There was then an EGPWS ‘TERRAIN’ warning followed immediately by a ‘PULL UP’ hard warning. Nothing was said by either crew member, though the co-pilot thought that the commander did reduce the rate of descent. There was then a delay, followed by at least one further warning. The commander, now as handling pilot, announced that they would go-around, and flew the go-around manoeuvre. The co-pilot reported the go-around to ATC and the aircraft subsequently flew a Localizer / DME approach to Runway 08 without further incident.

Commander’s Report

Note: Information common to both reports is not repeated.

The commander reported that the co-pilot had given a good briefing for the approach, which was completed while descending towards the airport. The weather was very good and an early visual contact was made with the runway while it was still some distance away. The commander asked the co-pilot if he would like to fly a visual approach, who replied that he would. The commander asked for, and was given, ATC approval for a visual approach to Runway 08. The commander did not subsequently re-tune the navigation aids; his own VHF navigation receiver was selected to the VOR/DME and he believed the co-pilot’s receiver was selected likewise, as the approach checklist (which includes navigation aids) had been completed after the decision to fly a

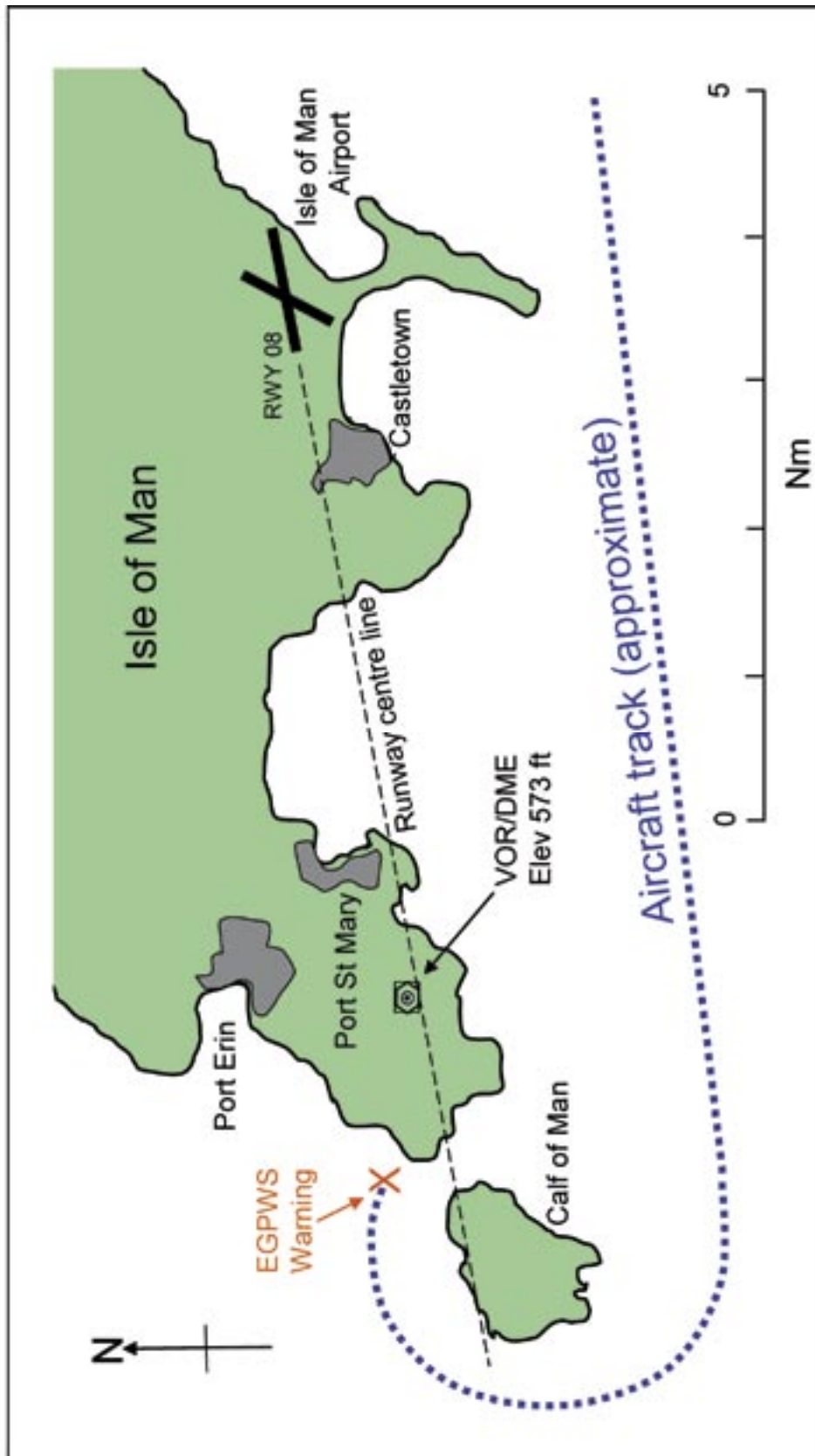


Figure 1

visual approach was made. The aircraft began a visual down wind leg at about 3,000 ft, and the commander twice prompted the co-pilot to descend and turn finals. However, the co-pilot seemed reluctant to follow his guidance, and the commander decided to let the co-pilot extend the down wind leg while losing height. The commander reported that he did not make any selection of landing gear or flap, and the aircraft commenced the final turn in a clean configuration. He was aware of the aircraft's position relative to the airfield, and could not recall why he had let the co-pilot descend where he did, but was content to allow the descent to continue as the weather was good and the aircraft was over the sea. It was only as the finals turn was nearly completed that the commander realised how low the aircraft had become in relation to the runway.

At this point the commander could see the high ground ahead, and believed that the aircraft would clear it by between 300 and 400 ft. The landing gear had not been lowered by this point, as this action would normally be carried out about 4 nm from touchdown. The commander then heard what he believed to be an EGPWS "TOO LOW - GEAR" alert. In response to the EGPWS alert, the commander took control of the aircraft, called for selection of landing gear and flap 15 (which the co-pilot selected) and started to slow the aircraft to its minimum approach speed. The EGPWS then generated a "PULL UP" hard warning, so the commander initiated a gentle climb. His intention was to carry out a steady climb to re-establish on the correct glide path, but became concerned about the effect the persistent and loud "PULL UP" hard warning would have on the passengers sitting at the front of the cabin, so announced a go-around. The commander first considered taking control when it became clear that the co-pilot was flying a poor approach. However, it was only when the EGPWS alert triggered that he actually assumed control, stating "I HAVE CONTROL", to which the co-pilot replied "YOU HAVE CONTROL"

Other witness information

A company flight crew member, who had recently operated the same type and been based at the Isle of Man, was flying as a passenger on the aircraft and submitted a report to the operator at the latter's request. The flight crew member, who was seated at the front left of the cabin, reported that he was aware that the aircraft was down wind for Runway 08 and had passed Port St Mary, where the final turn is normally commenced when flying a visual approach. The aircraft commenced a turn when at about 5 to 7 nm from the airport, which took the aircraft through the runway centre line until it was on a south easterly heading. The aircraft had started to descend in the turn, becoming abnormally low for its position relative to the runway. As the aircraft crossed the coast, there was a "TERRAIN" warning followed by a "PULL UP" hard warning, which could be heard in the passenger cabin. The aircraft was still descending and several warnings followed before there was an obvious increase in power and pitch attitude.

Aerodrome information

Isle of Man (Ronaldsway) Airport is situated on the south coast of the Isle of Man and has a main runway orientated 08/26. Instrument approaches to Runway 08, are based on the ILS/DME, LLZ/DME or VOR/DME, and pass over terrain which reaches an elevation of 573 ft amsl, 4.6 nm from the airport. The Isle of Man VOR/DME is situated at the summit of this high ground, which forms the extreme south western tip of the Isle of Man, and is thus 4.6 nm from the aerodrome. The ILS/DME procedure establishes a minimum altitude of 1,700 ft until descent on the glide path, at 5.2 nm from the runway; range and altitude information is also published to assist pilots to follow a notional 3° glide path when following the LLZ.DME procedure. Minimum Safe Altitude (MSA) within 25 nm to the south west of the airport is 2,600 ft amsl.

Recorded information

This serious incident was reported some time after it occurred; relevant data from the Flight Data Recorder and Cockpit Voice Recorder had been over-written and was not available for analysis. However, limited data was recorded in the EGPWS memory which provided valuable information regarding the EGPWS warnings. The equipment manufacturer was able to determine that the EGPWS warnings were legitimate.

The EGPWS first issued a “TERRAIN TERRAIN PULL UP” hard warning when the aircraft was at 680 ft amsl, flying at 115 kt on a heading of 139°(M) and with a descent rate of 730 ft/minute. At this point the aircraft was configured with the landing gear down and flaps at the landing setting. The aircraft was 5.7 nm from the runway, heading toward the high ground on which the VOR/DME is located, 1.3 nm ahead of the aircraft and at an elevation of 573 ft. The aircraft descended to 650 ft, at which point it levelled off and then began a slight climb. At 1.1 nm before the VOR/DME, at about 670 ft amsl, the EGPWS produced a “CAUTION TERRAIN” alert. The aircraft maintained a slight climb, until at 0.95 nm before the VOR/DME and at 680 ft, when a further “TERRAIN TERRAIN PULL UP” hard warning was triggered. The aircraft continued a gradual climb, until a go-around profile appears to have commenced at 700 ft, at which point the aircraft was 0.75 nm from the VOR/DME and the associated high ground. Based on the ground speed at the time of the first EGPWS alert, the go-around manoeuvre commenced 21 seconds after the first “PULL UP” warning, and some 8 seconds after the second “PULL UP” warning.

Operator’s regulations

Procedures to be followed by flight crew in the event of an EGPWS warning are given in the operator’s operations manual. This states ‘a full energy pull-up manoeuvre must always be flown if a Hard Warning is received below MSA.’ The manual further states that it

is permissible to treat a warning as a caution and continue to land only if the aircraft is below 1,000 ft, the runway is in sight, and the aircraft is in the landing configuration with the landing checks completed.

The operator’s operations manual contained procedures to be followed for a visual approach and these had been modified some four months prior to the incident. The change had been ‘signed as read’ by both pilots as routinely required. The relevant extracts from these procedures are:

‘During a visual approach, if visual reference to the airport or its environment are lost, a go-around must be initiated immediately.’

‘Pilots must not accept a visual approach unless the approach has been pre-briefed during the pre-descent approach briefing. This briefing should include a target altitude and distance for the intended turn onto finals, paying particular attention to any special visual approach requirements detailed in the AERAD plates. It should also include any particular landmarks, terrain features (for visual cues) or high ground within the relevant area.’

Note: AERAD plates are chartlets depicting approach and landing procedures, together with other relevant airport information.

Reporting procedures

The Civil Aviation Authority (CAA) operates a Mandatory Occurrence Reporting Scheme (MORS) which is described in CAP 382. This scheme is intended to ensure that the CAA is aware of potentially hazardous incidents and defects, as well as ensuring that personnel and organisations are able to learn from safety related incidents. An EGPWS warning that arises when an aircraft comes into closer proximity to the ground than had been planned or anticipated is included as an item which should be reported, normally within 96 hours.

The Air Navigation Order defines the categories of persons or organisations which are required to report occurrences and these include, but are not restricted to, the operators and commanders of public transport aircraft. In this case, the commander, who would have been expected to submit a report, stated that it was his intention to report the event but that a period of leave and ill health had delayed him doing so. The co-pilot reported that the flight crew had not discussed the incident after landing and that he was unsure what action he should or could take. After some consideration and discussion with colleagues he approached his company to report the incident.

Analysis

The differing accounts of this incident from each flight crew member and lack of data from the FDR or CVR make it impossible to define a precise sequence of events leading up to the incident, though certain key facts are evident. It is clear that the aircraft was descended at an inappropriate point, that corrective action was delayed and that the crew did not respond to the EGPWS warning in the correct manner.

The decision to fly a visual approach appears to have been reasonable given the weather conditions, though it is doubtful whether the crew met their company's briefing requirements for this. The downwind leg was extended beyond the normal point, and this may have been due to excess height or speed, or to a loss of situational awareness on the part of the co-pilot, possibly caused in part by an unrequested selection of services and re-tuning of the navigation aids. The co-pilot recalls basing his final turn point on the DME, believing it to be referenced to the runway, but which was actually tuned to the Isle of Man VOR/DME at the time. The co-pilot's visual contact with the airfield was tenuous at this stage, so he was basing his decision to descend the aircraft largely on the DME indication. The fact that the discrepancy between the DME indications and the visual cues did not alert the co-pilot to a problem suggests that the co-pilot's

situational awareness was already degraded at the start of the finals turn.

The commander reported that he was aware of the aircraft's position as it turned finals but he could not account for his action in allowing the co-pilot to descend so far without intervention; the aircraft was well below a notional glide path for Runway 08 at the start of the final turn and any descent at this stage would have been inappropriate. However, due to his position on the left of the aircraft, the commander had only limited visual cues from the terrain and would not have been visual with the airfield during the down wind leg or initial part of the finals turn. The co-pilot did not voice his concerns regarding his visual references, had he done so it should be expected that the commander would have taken earlier action to correct the situation.

Significant discrepancy exists regarding each pilot's recall of the EGPWS event. The data recovered from the EGPWS memory supports the co-pilot's recollection regarding the nature of the warning and the aircraft's landing configuration. The commander thought that the EGPWS first generated a "TOO LOW – GEAR" alert and he recalled that he responded by ordering the gear down and flap 15. The fact that the EGPWS data differs from the commander's recall may indicate that the commander's own situational awareness had also degraded by this time. If this were so, it is possible that he may have mistaken the approaching coastline with that later in the approach, the latter being the only coastline that would be crossed during a 'normal' visual circuit.

Regardless of the events leading to the EGPWS warning, when it did finally trigger, the commander did not take the actions that would be expected, namely a positive climb away from the terrain at maximum power.

The circumstances of this incident and the manner in which it was reported suggest the possibility of shortcomings in the crew's application of the principles of good Crew Resource Management (CRM),

though specific examples are hard to extract with any confidence due to the differing accounts. The co-pilot was inexperienced and relatively new to the company, whilst the commander was a very experienced captain. Had the basic principles of good CRM been followed, it would be hard to imagine how a situation could have arisen whereby the co-pilot became so disoriented that he commenced an inappropriate descent without intervention or comment from the commander. It is not clear whether an adequate briefing was given for the approach, but the subsequent events would suggest that the items required by the company to be briefed were

not covered, since details of the visual cues for the final turn, terrain features and hazards would have been fresh in both pilots' minds.

Conclusion

The aircraft was descended at an inappropriate point, causing it to fly well below the notional glide path for the runway in use and into conflict with terrain. The crew's response to the subsequent EGPWS was delayed and not in accordance with their company's instructions.