2 Analysis

2.1 General

The weather conditions at Guernsey, of which both pilots were aware, were acceptable for a Category I ILS approach to Runway 27. The aircraft was suitably equipped and the crew were both properly qualified for the flight. The aircraft, which was free from defects, was 2,945 kg below its maximum landing weight at the time of the incident. At that weight, the LDR of 1,052 metres was well within the LDA of 1,453 metres. The unfactored distance required for the aircraft to stop after touching down was also within the estimated 400 metres to 550 metres of runway remaining, assuming that the aircraft was able to achieve the average performance of an HS 748 Series 2A when flown in accordance with the required technique. However, the aircraft failed to stop and overran the end of the runway.

Due to the lack of FDR data, it was not possible to determine the touchdown point from the recorded data with accuracy. However, the aircraft was still 50 feet above the runway when the EGPWS recorded a GPS position that was 596 metres beyond the start of the 1,463 metres runway (Figure 1, page 6). This information, coupled with eyewitnesses, radar data and CVR timing, indicate that G-BVOV touched down between 400 and 550 metres before the end of the runway. Factoring the wind into the radar-derived ground speed, the aircraft final approach airspeed averaged 113 kt over the last minute, above the minimum threshold figures stated by the crew during the approach checks.

The following analysis considers the condition of the runway, the condition of the aircraft, the crew procedures, crew resource management and the regulatory oversight of the operator.

2.2 Condition of the runway

The aircraft touched down in wind conditions which were within limits for landing on a wet runway and the overall Friction Level for the runway was greater than the Maintenance Planning Level. In the areas where the readings were just under this level, they were in excess of the Minimum Friction Level, below which a runway shall be notified as ‘may be slippery when wet’. Overall, friction testing of the runway indicated that the runway surface condition was not a factor in the aircraft over-running the runway.

However, there was some evidence on the tyre on the No 4 wheel, corresponding to witness marks on the concrete surface at the ‘stop’ end of Runway 27, that it may have aquaplaned over a short distance.

2.3 Condition of the aircraft

The tyre marks at the end of the runway and the flattened 'heated' area on the No 4 tyre did appear to be consistent with a locked wheel on a wet runway, a condition associated with aquaplaning. After the incident to G-BVOV, the Maxaret unit fitted to the No 4 wheel was replaced as '*possibly not functioning correctly',* although in the subsequent bench test it was found to function satisfactorily.

The lack of speed information from the FDR meant that only a crude estimate of the aircraft ground speed as it entered the grassed area could be made using the CVR data to estimate the time to cover the 145 metres on the grass. The estimate for this speed was around 50 kt; that is, below 75 kt, which is a typical threshold for aquaplaning for this aircraft.

The marks at the end of the runway surface, and the condition of the tyre, suggest that some aquaplaning may have occurred on the No 4 tyre. This may have been due to the local conditions on the concrete part of the runway, including the presence of significant areas of paint for the 'piano key' threshold markings, and, possibly, due to marginal performance from the Maxaret on the No 4 wheel and aggressive braking as the aircraft left the runway. However, all the tyres, including those fitted to the nosewheels (which are not braked), made some 'steam cleaning' marks on this part of the runway and there was no evidence of aquaplaning elsewhere on the runway or on other tyres. It is, therefore, reasonable to conclude that any aquaplaning would have had a marginal effect and that it was not a factor in the aircraft overrunning the runway.

With the lack of any other defects found during the post-incident inspections, and no reported problem with the aircraft's performance on the landing after the ferry flight back to the UK, it is concluded that there was no evidence that a technical problem with the aircraft contributed to this incident.

2.3.1 Flight data recorders

The FDR was not operational at the time of the incident and the CVR was only partially operational. Previous AAIB investigations concerning this operator had indicated problems in ensuring adequate levels of flight recorder serviceability. However, as this operator ceased operations in 2006, no specific Safety Recommendation is appropriate.

2.4 Crew procedures

The aircraft was satisfactorily established on the ILS localiser and glideslope for the final approach to Runway 27 and was correctly configured for a landing. However, the procedure briefed by the commander for the challenge and response callouts during the approach, and those used during the flight, differed significantly from those stipulated in the Operations Manual. This appears to have created a confused decision-making process as the aircraft approached the DA. In response to one of the calls from the co-pilot near the end of the approach, the commander indicated that he was going to continue the descent, as if the co-pilot might be expecting otherwise. The co-pilot commented that there was still further to go to their decision.

The crew continued the approach until they heard the call "MINIMUMS MINIMUMS" which was triggered by the setting of the bug on the radio altimeter. This was contrary to the procedures laid down in the company Operations Manual regarding use of the radio altimeter during an ILS. PF then asked PNF whether he was visual, as opposed to the SOP in which PNF should have called "DECIDE", to which PNF should have responded "LAND" or "GO AROUND", depending on whether or not he could see the necessary visual references.

Having established visual contact with the runway, the commander recalled seeing the aircraft's left wing tip over the right edge of the runway when he first became visual with the approach and runway lights. This indicated a lateral displacement of about 37 metres to the right of the runway centreline, which was still within the criteria for 'one dot' displacement on the localiser display at the point of the DA. However, the commander's description of the aircraft's position suggests that it was much nearer the runway threshold than it would normally be at the DA if it was on the ILS glideslope, namely a distance of some 852 metres short of the runway threshold (1,152 metres short of the runway touchdown aiming point).

The delay in making the decision to land, followed by reduction in the rate of descent while the aircraft was manoeuvred to the left, over the downward sloping portion of the runway surface, resulted in the aircraft landing beyond the touchdown zone and over half-way down the runway. It had been observed by personnel in the VCR of the ATC tower still airborne, at a height of about 50 feet, with approximately 730 metres of runway remaining.

After landing, possibly yawed to the right, the commander switched on his windscreen wipers, called for "LOCKS" and applied the brakes, while also

correcting the yaw. The co-pilot attempted to engage the control locks but was prevented from doing so by the interlock with the FFPS, which remained engaged. This is contrary to the SOP in which PF should call for the withdrawal of the FFPS immediately after landing and, having done so, PNF should respond with the information that the six appropriate lights have come on, or not, as the case may be.

Not withdrawing the FFPS after touchdown reduced the rate at which the aircraft decelerated, thereby increasing the landing ground roll. Being unaware that they had departed from the SOP, the crew may have attributed the aircraft's slow deceleration to some other cause, such as aquaplaning. In releasing and reapplying ('cycling') the brakes the aircraft's ground roll would have been increased still further. It could also not be determined how rapidly and heavily the commander applied the brakes immediately after touchdown, before he realised that the aircraft was further down the runway than he had initially thought and applied maximum braking.

2.5 Crew Resource Management

The commander, a TRE and IRE, was more experienced, better qualified and older than the co-pilot, who was in his first six months in the company. This created a steep 'cockpit gradient' in which non-standard procedures were more likely to survive if they were initiated by the more senior of the two pilots.

The commander had been assessed as exceptional by the operator during recent recurrent training. This was likely to have encouraged his confidence in his procedures, techniques and ability. In addition, it would have taken confidence and discipline for the relatively inexperienced, newly joined co-pilot to challenge the procedures and technique being used by an experienced training captain who had been in the company for eleven years.

The fact that the aircraft ahead of them, a DHC-8, had landed successfully may have boosted their expectation that they, too, would be able to land in the weather conditions that existed at the time.

2.6 Regulatory oversight

The operator had been under close scrutiny by the CAA for at least two years but there was a history of concern which stretched back further. In 2000 the AAIB recommended that the CAA review the effectiveness of its AOC Holder Oversight Programme. The CAA undertook to do that.

Over recent years the CAA had clearly expended much time and effort in providing guidance and advice to enable the operator to achieve an acceptable standard. There was a consistent thread of close supervision and concerns about the operator's management structure and competencies. Also, concerns were raised in audit reports and correspondence between the CAA and the operator about the operator's training system, including CRM training, failure to remedy non-conformances within the appropriate timescale and the operator's ability to maintain standards of safety. This serious incident, to G-BVOV, reflects some of those findings and concerns. It also echoes a previous AAIB report on a serious incident in 2005, involving one of the operator's aircraft, in which the flight crew did not comply with SOPs.

The CAA audit, which was carried out on the operator's training department in late March 2006, highlighted that:

> *'there was no oversight of the standards of the training and checking by the operator, as evidenced by the TRE's lack of knowledge of SOPs.'*

This prompts the question as to how that could happen in an organisation that had come to the CAA's attention over a number of years and was being closely monitored.

It is clear that much was done by the CAA, over a sustained period, to enable the operator to achieve an acceptable standard of safety. However, there was also evidence that the operator was not narrowing the gap between its performance and the required standard. In the seven months leading up to the incident, the CAA gave the operator increasingly clear objectives and timescales to meet. The evidence indicates that the circumstances surrounding this incident were a symptom of a pattern more widespread within the company, rather than being specific to this crew. Although the CAA audits had identified safety-related shortcomings to the operator, the situation did not seem to improve and this appears due, in part, to the lack of a robust, consistent and timely framework of progressive limitations on an AOC holder failing to meet the required standard.

Consequently, the following Safety Recommendation is made:

> It is recommended that the Civil Aviation Authority implement a more robust process of graduated measures for addressing identified safety-related shortcomings in an AOC Holder's operations, within an appropriate timescale, to ensure that the AOC Holder meets and maintains the required standard. (Safety Recommendation 2008-026)