ACCIDENT

Aircraft Type and Registration:	Beech BE99, VQ-THL
No & Type of Engines:	2 Pratt And Whitney PT6-27 turboprop engines
Year of Manufacture:	1974
Date & Time (UTC):	7 December 2014 at 1910 hrs
Location:	Providenciales Airport, Turks & Caicos
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 2 Passengers - 2
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to lower nose cone, both propellers
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	34 years
Commander's Flying Experience:	5,905 hours (of which 1,871 were on type) Last 90 days - 227 hours Last 28 days - 80 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional AAIB inquiries

Synopsis

During a flight from Providenciales to Grand Turk, the crew were unable to extend the nose landing gear either by the normal or emergency procedures. The aircraft eventually landed with the nose gear locked in the UP position. It was subsequently found that a chain in the nose gear linkage had failed following the failure of the master link. The design of the system was such that the chain failure effectively isolated the nose gear from the operating mechanism.

History of the flight

The aircraft had departed Providenciales Airport for the short flight to Grand Turk. On selecting the landing gear down during final approach, the crew noted an 'unsafe' indication for the nose leg. Recycling the gear effected no change in the condition, so the co-pilot called ATC to advise them of the situation and to request permission for the aircraft to over-fly the airfield at 500 ft. This allowed ATC personnel in the tower to confirm that the nose landing gear had not extended. The commander then flew the aircraft in a holding pattern overhead the airfield while he considered his options. He decided to return to Providenciales as he considered that the airport there was better equipped for emergencies and it was also the maintenance base for the aircraft. After contacting the airfield the commander entered a hold approximately 15 nm away while he attempted to extend the landing gear manually in accordance with the Emergency Checklist. This once again resulted in the main landing gear extending, but the nose leg remained in the UP position.

The commander then called his company's Flight Operations department who sought advice from the maintenance team. They suggested conducting a 'touch and go' on the main wheels in an attempt to shake the nose leg into the DOWN position. The commander performed this manoeuvre but to no avail. Considering he had explored all the available options, he then took the aircraft back into a holding pattern while he briefed the co-pilot and passengers for an emergency landing. The commander declared an emergency and advised the tower of his intentions. The aircraft landed on its main landing gear and, as the speed decayed, the nose lowered to the runway surface, causing abrasion damage to the underside of the nose cone and nose gear doors. The propeller tips also contacted the runway. The aircraft was met by airfield Fire Service vehicles but there was no fire and the occupants vacated the aircraft without injury.

Investigation

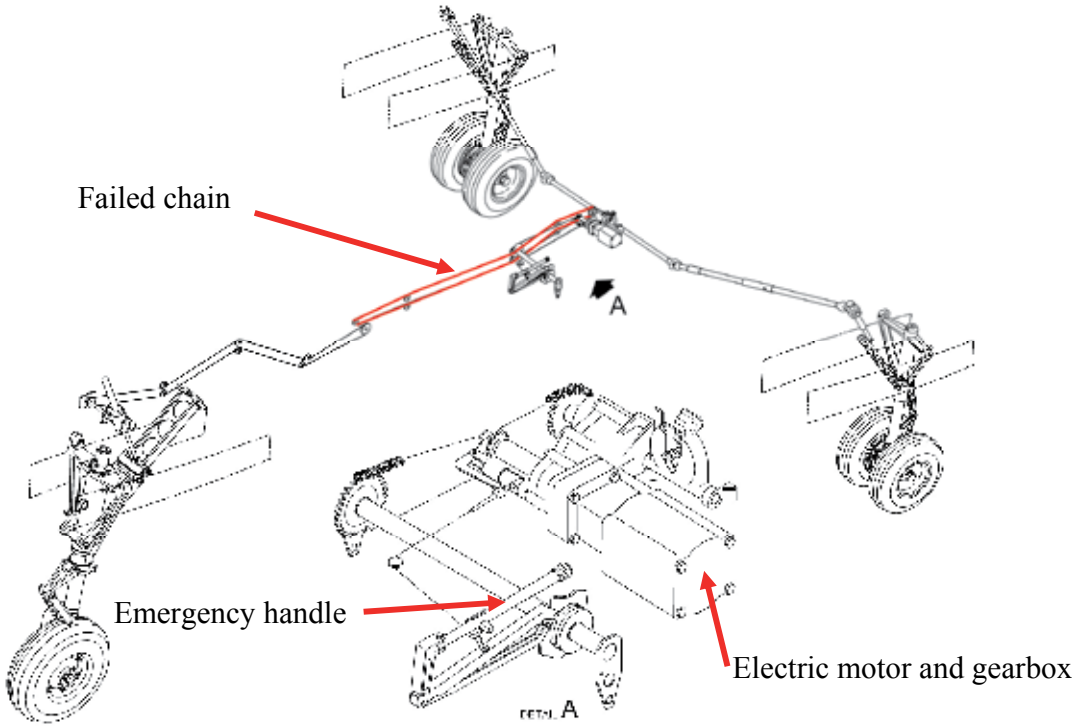

Figure 1

Illustration of Beech 99 landing gear operating system

A diagram of the landing gear system is shown at Figure 1. It can be seen that the gear is raised and lowered by an electric motor driving the linkage via a gearbox; the two other Beech 99 aircraft in the operator's fleet are equipped with a hydraulic system.

Investigation by the operator's maintenance organisation revealed that the forward segment of the chain (the portion within the area bounded by the red line in Figure 1) was found broken at the master link following a failure of the master link itself. This effectively isolated

the nose gear from the rest of the system, such that operation of the emergency handle (intended to be used in the event of a failure of the motor or gearbox) would only operate the main gear. Figure 2 shows a photograph, taken by the maintenance company, of the master link components.

Figure 2

Master link components

The chain had been installed new on the aircraft on 2 October 2014 and had achieved approximately 185 hours and 540 cycles at the time of the accident. The Aircraft Maintenance Schedule required inspection at intervals of 100 flying hours; it was last inspected 39 hrs and 102 cycles prior to the accident.

The reason for the failure of the master link was not established with clarity; all the observed fracture surfaces were the result of overload. After the operator's preliminary investigation the aircraft and chain components were examined by an independent engineer. Whilst it was theoretically possible to install the master link incorrectly, the engineers who had installed the chain and the independent engineer were confident that the work had been carried out correctly.

Following the accident, the maintenance organisation has revised their maintenance programme such that, following any maintenance task requiring removal of the subject chain, an inspection will be carried out after 50 cycles. After this initial inspection the schedule would revert to the 100 hrs interval.