ACCIDENT

Aircraft Type and Registration:	Boeing 747-400, G-BNLW
No & Type of Engines:	4 x Rolls-Royce RB211-524G2 turbofan engines
Year of Manufacture:	1992 (Serial no: 25432)
Date & Time (UTC):	5 October 2015 at approximately 0830 hrs
Location:	Cape Town International Airport
Type of Flight:	Passenger Transport
Persons on Board:	Crew - N/A Passengers - N/A
Injuries:	Crew - N/A Passengers - N/A
Nature of Damage:	Damage to ground power receptacle
Commander's Licence:	N/A
Commander's Age:	N/A
Commander's Flying Experience:	N/A hours Last 90 days - N/A hours Last 28 days - N/A hours
Information Source:	Investigation by aircraft operator

Synopsis

Shortly after connecting ground power smoke was seen to emanate from the Ground Power Unit (GPU). The aircraft's ground power receptacles and associated wiring sustained heat damage, but there was no degradation of the structural integrity of the aircraft. The most likely cause of the damage was considered to be misalignment of a ground power socket in the aircraft's receptacle during ground power connection.

Description of the event

After arrival at Cape Town a single ground power unit (GPU) was connected by plugging two sockets into the two electrical receptacles on the aircraft, as per the operator's standard procedures. The ground crew experienced difficult in plugging the No. 1 lead into the aircraft and some "wiggling" of the socket was reportedly required. The ground crew then commenced their walk-around inspection. They subsequently observed smoke coming from the GPU, so they disconnected the plugs and noticed they were warm. An avionics engineer inspected both the external receptacle pins on the aircraft and the Electrical and Equipment (E/E) bay inside the aircraft, but found nothing unusual. Another GPU was subsequently connected, but the aircraft would not accept ground power. Later that day the aircraft's electrical power systems were checked and the aircraft was considered to be serviceable. It was dispatched to London Heathrow Airport and the flight was completed without incident.

The GPU was inspected by the ground service provider and nothing significant was found.

Aircraft information

The Boeing 747 has a small access hatch for the E/E bay on the lower surface of the fuselage near the nose gear leg. The two GPU receptacles are mounted on the fuselage skin and are connected to electrical power cables located under the floor of the E/E bay. There are six male electrical pins inside each receptacle. There is a layer of insulation material between the floor and the cables, with a small air gap around the wiring.

Aircraft examination

A more detailed inspection of the aircraft was carried out after arrival at Heathrow. Examination of the E/E bay revealed significant sooting and heat damage to the power cables, and the insulation in the underfloor compartment appeared to have briefly caught fire (Figure 1). The limited volume of air around the wiring might have been a factor in preventing further damage. The aircraft structure was assessed, including eddy current testing, but despite the sooting there was no degradation in the aircraft's structural integrity.

An inspection of both receptacles revealed that the neutral phases were severely overheated, with some evidence of electrical arcing.

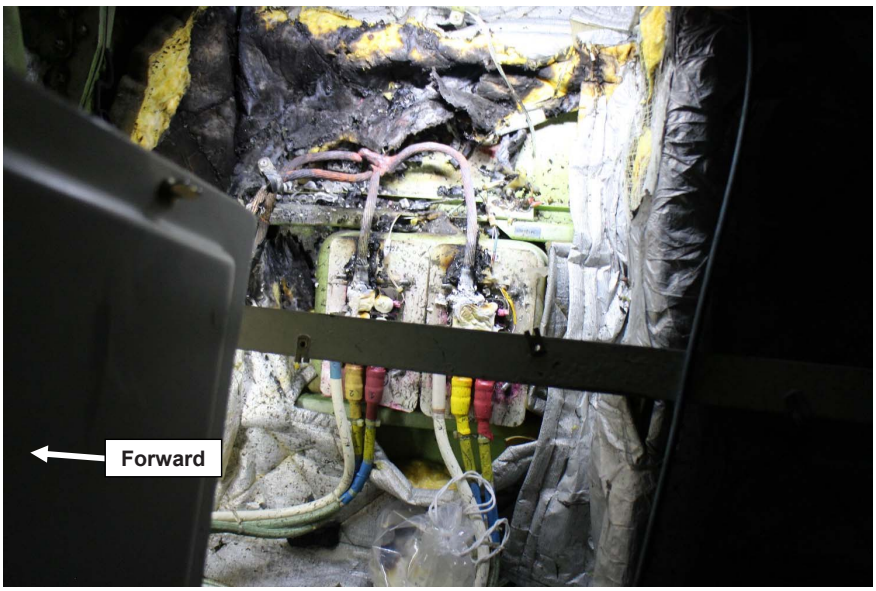

Figure 1

Image of GPU receptacles with the E/E bay floor panel removed showing fire damage

Assessment

It was not possible to be conclusive, but the operator considered that the most likely cause of the damage was misalignment of the GPU socket in the aircraft's ground power receptacle. This could have caused 115V AC power to be supplied to a pin with almost no load, thus resulting in a momentary power surge and electrical arcing.

Safety action

The operator has since notified ground staff to be on the lookout for signs of heat damage to the aircraft receptacles and GPU sockets, and to ensure that connectors are correctly aligned when plugging in ground power.