No: 1/93 **Ref: EW/C92/9/1** **Category: 1a**

Aircraft Type and Registration:	Airbus Industrie A.300 B4-203, I-BUSL
No & Type of Engines:	2 General Electric CF6-50C2 turbofan engines
Year of Manufacture:	1982
Date & Time (UTC):	14 September 1992 at 1150 hrs
Location:	Stand G12 at London Heathrow Airport
Type of Flight:	Public Transport
Persons on Board:	Crew - 12 Passengers - 252
Injuries:	Crew - None Passengers - None
Nature of Damage:	Deformation to skin and underlying frames of fuselage left side culminating in a 15 inch tear in the pressure hull
Commander's Licence:	Italian Airline Transport Pilot's Licence
Commander's Age:	51 years
Commander's Flying Experience:	Approximately 13,000 hours (of which 5,000 were on type)
Information Source:	AAIB Field Investigation

Stand G12

Stand G12 is part of the Terminal Two complex at London Heathrow and is capable of accepting aircraft up to the size of the Boeing 747. Two passenger loading bridges are installed, the shorter one being nearer to the terminal and referred to as the B bridge and the longer one the A bridge. These bridges take the form of a telescopic tunnel pivoted at the terminal building and supported at the opposite end by a structure which itself is mounted on two wheels. The wheels, which are hydraulically driven and steered, allow the bridges to be positioned anywhere within a defined area; there is also a simple manual backup with which to move the wheels backwards or forwards should the power drive fail to operate. The support structure is designed such that the height of the open end of the bridges may be adjusted. To park, aircraft approach the stand nose first along a straight yellow reference line and stop at a position, appropriate to the aircraft type, as indicated from the parallax aircraft parking aid. The bridge, or bridges, are then driven by suitably qualified airline staff (in this instance the dispatcher), from their parked position to mate with the aircraft at the two front left side doors. The normal driving position is located in the open end of the bridge and the airline's own staff were handling the turn around.

History of the Accident

When the aircraft arrived on stand G12, the dispatcher had attempted to manoeuvre the B bridge onto the most forward cabin door but the bridge would not reach and had stopped in a position where the entrance was several feet clear from the aircraft's side and slightly forward of the door's position. The dispatcher then went to the A bridge and successfully manoeuvred that on to the second door aft on the left side to allow passengers to disembark and later to embark.

Clearance to push-back was requested by the flight crew at 1150 hrs UTC in order to make good a take-off slot time of 1206 hrs. On completion of the turn-around the door was closed and then, because the auxiliary power unit was unserviceable, the right engine was started on stand. Before push-back was due to commence, the same dispatcher attempted to remove the A bridge from the door but it would not retract. He telephoned the British Airports Authority (BAA) and reported the defect but, because the bridge was still in contact with the aircraft, he was reminded that no help would be available from the BAA engineers until the bridge was no longer in contact. He removed his key from the control panel in the cab of the bridge, went down to the apron and prepared to retract it manually. After releasing the extension/retraction motor brakes using the same key, he began to wind the bridge wheels backwards using a handwheel provided for this purpose. He found the task arduous but the group leader in charge of the apron loading team came to his assistance and took over the task of winding back the bridge. To escape the noise of the idling engine, the dispatcher then went to sit in his car leaving his keys in the A bridge brake release switch.

The group leader wound the A bridge back a distance estimated by the ground engineer in-charge to be between 15 and 20 centimetres. The group leader then left the A bridge without removing the key or re-setting any of the bridge standby controls in order to move the air starter which was parked on the other side of the aircraft. From his position in the tractor's cab, the tractor driver was unable to see the clearance between the B bridge and the aircraft and he waited until the ground engineer signalled to him to push the aircraft. The tractor driver stated that during the push-back he attempted to increase separation between the A bridge and the aircraft by moving the tractor gently to the right but, after about 10 feet of travel, the ground engineer who was on his right side, instructed him to stop. The engineer then instructed the tractor-driver to re-position the aircraft on the stand so that the passengers could be disembarked.

During push-back the corner of the floor of the A bridge had made contact with the fuselage. This resulted in a heavy witness mark along the aircraft's side at floor level, just forward of the No 2 door, which locally deformed the skin and underlying frames. The damaged area was some five feet in length and culminated in a skin tear approximately fifteen inches long and two to three inches across. It was reported at the time by the dispatcher that the A bridge had rolled forward as the aircraft began to push back.

Shortly after the incident the aircraft, and the A & B bridges, were examined by the AAIB in conjunction with the Heathrow airport authorities, the aircraft being released back to the airline almost

immediately. Both bridges were operated under normal power with no apparent defects being discovered. It was ascertained that the B bridge, as found, was at the extremity of its angular range of movement.

Air Bridge Operating Procedures

The air bridges are equipped with safety switches at various locations such that if the driver attempts to position the open end of the bridge outside of its angular or extension limits it will stop. Additionally, the bridge will stop once contact with the aircraft has been made. There are two levels of switching. On first contact with the aircraft (soft impact) the movement of the bridge towards the aircraft will cease, but its direction may be reversed. If the second level switch makes contact (hard impact) it is then not possible, under power, to move the bridge in either direction although it may be wound away using the manual system.

The manual operation of both bridges was examined and found in general to be satisfactory although operation of their handwheels was found to be tiring. It was so tiring that manual retraction of the bridge from its normal extended position to its normal parked position was impractical. This was because to move the bridge a small distance, a large number of turns was required and the handwheel took the form of a smooth disc some 8 inches in diameter which was located close to ground level. During this examination it was apparent that immediately the handwheel was released, the system would backdrive to a small extent and the bridge could travel forwards by some two to three inches if the brakes were not engaged. The brakes are operated by using the driving key in a brakes 'normal/release' key switch located between the bridge wheels. During the functional tests of both bridges it was apparent that, if the hydraulic valve was not isolated during manual operation, it was more difficult to operate the handwheel and the bridge would more readily move forward on release, although it did not travel any further forward than before. This was as a result of pressure being built up in the system by the hydraulic motor which was directly coupled to the handwheel but pressure quickly dissipated by internal leakage soon after rotation of the handwheel ceased.

The procedure for manual retraction of the bridge was laid down in an Operational Safety Instruction (OSI), dated 28 August 1992, issued by the airport authorities as follows:-

> *Isolate the power to the bridge by turning the central key to the OFF position and remove the key from the switch at the normal driving position.*
> *Switch on the 'stop short' sign to prevent the next arriving aircraft from colliding with the extended loading bridge.*
> *Isolate the power at apron level by turning the switch behind the loading bridge wheels to the OFF position,*
> *Release the hydraulic valve behind the metal fairing above the wheels by turning the handle through 90°.*
> *Turn the winding disc clockwise to wind the bridge from the aircraft.*
> *Return the hydraulic valve to its original position on completion of the above.*

No mention is made in these instructions of releasing the brakes or re-applying them once the operation is completed nor of how far the bridge should be moved away from the aircraft's side. The procedure for manual retraction of the air bridge after docking is also described in a pocket-sized set of reference cards entitled 'Heathrow Loading Bridges Operating Procedures' and issued to staff holding air bridge driving permits. The 'Failure After Docking' procedure is:

1. *Ensure switch is 'off" and key removed.*
2. *Go beneath bridge and switch isolation switch to 'off'.*
3. *Release the extension/retraction motor brakes.*
4. *With handle provided and fitted on winding coupling, wind bridge clear of the aircraft.*
5. *Reset brakes, remove and stow handle, set isolation switch to 'on' and close and lock doors.*

There were also three placards adjacent to the bridge wheels which instructed the operator (in no particular order) to switch off the isolation switch, operate the hydraulic shut-off valve to the free-wheel position and move the brake key switch to the release position before attempting manual retraction. Significantly, there was no reminder to reset the brakes after manual retraction and no one claimed to have done so before the aircraft was pushed-back.

The dispatcher was properly licensed to operate the bridge but he was not carrying the cards at the time of the incident; there was no requirement for him to do so. There was, however, an unwritten understanding that the above procedure could be used to reset the second-level limit switch thereby restoring normal operation from the cab. The bridge could then be power-driven back to its normal parking position before push-back commenced.

Safety Recommendation

As a result of inconsistencies between the three sets of instructions concerning manual operation of the air bridges, and the impracticality of manually returning an extended bridge to the normal parking position, one Safety Recommendation has been made to Heathrow Airport Limited.

92-113 Heathrow Airport Limited should review and standardise the air bridge operating procedures.