



PAKISTAN CIVIL AVIATION AUTHORITY
(SAFETY & INVESTIGATION BOARD)



**SERIOUS INCIDENT TO GULF STREAM-1 OF
M/S. KING AIR SERVICES (SOUTH AFRICA) REG. NO.
ZS-NHW ON 14 MARCH 2007
AT
ISLAMABAD INTERNATIONAL AIRPORT**

FINAL REPORT

SERIOUS INCIDENT TO GULF STREAM-1 OF M/S KING AIR SERVICES (SOUTH AFRICA) REG # ZS-NHW ON 14 MARCH 2007 AT ISLAMABAD INTERNATIONAL AIRPORT

Authority: Director General Pakistan Civil Aviation Authority Memorandum
No. HQCAA/1901/314/SIB dated 22 March 2007 (**Appendix 'A'**)

SYNOPSIS: On 14 March 2007 a non scheduled cargo flight, aircraft Gulf Stream-I, operated by Air King South Africa landed on Islamabad runway with nose landing gear (NLG) in retracted position. The aircraft was on a chartered flight from Muscat to Islamabad (**Appendix 'B'**). The notification of serious incident as per ICAO Annexure 13 was issued (**Appendix 'C'**). The NLG could not be extended despite of all efforts by aircrew and was confirmed in retracted position by ATC. Aircraft sustained damage to its both propellers and nose dome. However, no injury to any person or damage to ground equipment occurred. CAA and PAF authorities extended emergency and rescue facilities in excellent manner. The investigations revealed damages to NLG doors and control rods due to vibrations and rubbing during nose gear up landing. The exact cause of failure of normal NLG could not be determined due to non availability of hydraulic components facility in Pakistan. The emergency handle was also found jammed in its position. The aircraft operator M/s. King Air Services is not responding to extend any help either for component testing or for aircraft recovery. In these circumstances the aircraft will be auctioned to recover the charges to be paid to PAF for parking and recovery from runway. (**See Photograph K-1**).

1. FACTUAL INFORMATION

1.1. **History of the Flight:** From South Africa with four landings on route to Islamabad (**Appendix 'D'**).

1.2. AGENCY/ACTIVITY WHERE LATEST SCHEDULED / UNSCHEDULED INSPECTION OF THE AFFECTED COMPONENTS SYSTEM WAS CARRIED OUT.

(a) Aircraft 150 hrs inspection was performed at Airframe 21044.6 hrs, 20011 landings on 10th November, 2006 at South African AMO 882.

(b) Last Landing Gear functional test was carried out at 20597.6 airframe hours, 19799 landings on 8th December, 2005.

1.2. **Injuries to Persons:** Nil

1.3. **Damage to Aircraft:** Nose area structure and propellers were bent due to ground rubbing while in rotation (**See Photographs K-2 and K-10**). The movie of aircraft while landing is attached to the report in electronic version.

1.4. **Aircrew Information:**

1.4.1. Captain Bjorn Holmer Pilot Not-Flying

1.4.2. First Officer Brett Nell-Boss Pilot Flying

1.4.3. Captain Ricky Talevi Third Pilot.

1.5. **Aircraft Information:** Manufacturer Grumman, type Gulf Stream-1, G-159, Aircraft Serial # 141, Reg. # ZS-NHW. It was certified by South African register in accordance with Civil Aviation Regulation 1997.

1.5.1 **Address of the Owner:** M/s. King Air Services Partnership, PO Box # 29044, MELVILLE 2109 South Africa.

1.6. **Flight Recorders / CVR / TCAS:** Part No. 17N 903-274 Serial No. 06668. The owner was given a no objection certificate for carrying flight data recorder along with CVR and TCAS equipment for the purpose of investigation at South Africa (**Appendix 'E' & 'F'**)

1.7. **Impact Information:** Scratch impact marks on runway – no major damage to runway surface.

1.8. **Medical & Pathological Information:** N/A

1.9. **Fire:** No fire.

2. **ANALYSIS**

2.1. **Operational Analysis:** Air crew handled the situation professionally and applied correct techniques by landing without nose gear, aircrew exhibited good situation awareness and emergency handling with calm and maintained discrete communication with ground.

2.2 **Technical Analysis:** Aircraft Flight Plan shows that it made four landings on its way from Johannesburg, South Africa to Muscat; and aircrew did not write any observation /defect on the landing gears extension and retraction function (**See Appendix 'H'** for aircrew evidence). The examination of NLG area revealed:

- (a) The doors of nose gear were found jammed in closed position.

- (b) Once nose gear doors were removed by disconnecting their link rods, it extended itself. As a safety precaution the NLG was locked manually followed by installation of safety pin.
- (c) Left nose gear door link rod was found bent. (Refer Exhibit A5). Right nose gear door link rod was found broken from its lower end. **(Photographs K-4 & K-5).**
- (d) Emergency bottle pressure was found 1800 psi.
- (e) Nose gear door operating actuator was in fully extended position an indication that nose door did not open.
- (f) There was no hydraulic leak in the nose landing gear bay; all the components and links except the doors and door opening and closing link rods were in good condition.

2.3 The landing gear system of Gulfstream is all mechanical supported with hydraulic power. There is a sequencing valve, a hydraulic actuator which controls the movement of link rods for both doors for NLG; the last mechanical linkage between side doors and hydraulic actuator **(See Appendix 'G' & Photograph K-3)**. In addition to normal NLG retraction and extension system there is a emergency system which operates with the help of 1800 psi pneumatic bottle. Apparently both systems failed to extend the nose landing gears, whereas the main landing gears were extended successfully. Hence it can be concluded that the hydraulic power was available but either the control valve, door actuator or the sequence valve malfunctioned. The malfunction of either of these components would hinder the opening of the nose landing gears doors; and as long as nose landing gears doors are not open the NLG can not extend. That is why when on ground once the doors were opened mechanically, the NLG came down automatically.

2.4 The analysis of the damages to the doors and door links; that is bent on left door control rod and breakage of right door control rod indicates that these damages are post occurrence and are not the cause of the incident **(See Photographs K2 – K10)**. There are two distinct areas of investigation. Firstly the failure of NLG under normal hydraulic system and secondly and an area of serious concern, why did the emergency system failed to bring the NLD down.

2.5 The normal NLG retraction / extension system was studied and analysed. It is considered that failure or malfunction of following components might lead to the failure of the system.

- a. Door Control Valve.
- b. Nose door Actuator
- c. Nose Gear sequencing valve

2.6 In the absence of any licensed engineer these can not be removed by CAA Pakistan and despatched to operator or manufacturer for functional testing and investigation. The investigation of these components at an approved maintenance organisation can be helpful for determining the exact cause of failure of normal NLG extension sequence. However it was possible to study the emergency NLG lowering system. The system comprises of a handle in the cockpit, which when pulled during emergency directs a pneumatic pressure to NLG actuator directly. The movement of actuator ensures opening of the doors and NLG downwards movement. The emergency bottle pressure was found 1800 PSI; which means that it did not deplete. In the cockpit the emergency handle was found un-pulled and jammed in its position. The aircrew stated that the handle could not be pulled despite of their best efforts. In the absence of documents it could not be determined as to where it was last certified for correct operation.

2.7 **Lack of Accident Investigation Support by Operator:** SIB facilitated the crew of M/s. Super King Services with all possible actions and DFDR & CVR were handed over to Captain Ricky Talevi, the third pilot with an understanding that these will be down loaded and data will be sent to SIB. In addition to notification issued, the Civil Aviation Authority South Africa was contacted through fax, telephone and e-mails for participation into the accident investigation. However, the response from state Civil Aviation as well as the operator M/s. King Air Services was lacking, hence the inquiry has been completed with limitations (**See Appendix 'J'**).

3. FINDINGS

3.1 Aircraft Nose Landing Gear failed to extend during extension cycle of the landing phase.

3.2 Emergency extension of the nose landing gear could not be accomplished, as emergency extension handle was stuck in its rest position.

3.3 Aircraft landed with Nose Gear in retracted position.

3.4 Aircraft nose, propellers and forward fuselage were damaged. Nose gear landing doors, link rods and hinges were damaged/broken bent severely.

3.5 Upon mechanical opening of the nose gear doors, nose gear fell down under gravity, as it's up lock was found open. (The operator of the King Air has not responded to SIB for any contribution in the investigation or recovery of the aircraft.)

3.6 Islamabad Airport in coordination with PAF authorities provided excellent rescue facilities to the aircraft landing in emergency and its safe removal from runway.

CAUSE OF OCCURRENCE

At this stage it is difficult to ascertain the exact cause of the occurrence.

FINALIZATION

The investigation is finalized as

Failure of Main and Emergency NLG Extension Systems

Maintenance Factor – Avoidable

4. RECOMMENDATIONS

4.1 Director General Civil Aviation Authority South Africa is requested to:

- (a) Investigate the causes of the main and emergency nose landing gear extension system failure.
- (b) Determine short comings/weaknesses at the Approved Maintenance Organisations (AMO) for M/s. King Air Services which might be the contributory factor for malfunction/failure of nose landing gear extension.

4.2 Director General Pakistan Civil Aviation Authority may dispose off the aircraft as per existing procedures. The amount so recovered may be utilized to pay off the expenditure incurred so far by CAA and PAF.



APPENDIX K1

GENERAL VIEW OF THE AIRCRAFT BEFORE
RECOVERY FROM RUNWAY



APPENDIX K2

DAMAGE TO NOSE DOME AND NLG DOORS



**APPENDIX
K3**

**A GENERAL VIEW SHOWING NOSE LANDING GEAR BAY,
NLG ACTUATOR, CONTROL VALVES, EMERGENCY PNEUMATIC
CONNECTIONS AND DOOR LINK RODS ARE VISIBLE**



APPENDIX K4

**RIGHT DOOR LINK OF NLG FOUND BROKEN
DUE TO GROUND IMPACT**



**APPENDIX K5 RIGHT NOSE LANDING GEAR LINK ROD BROKEN END
SHOWING BENDING AT THREADED END BEFORE FAILURE
DURING IMPACT**



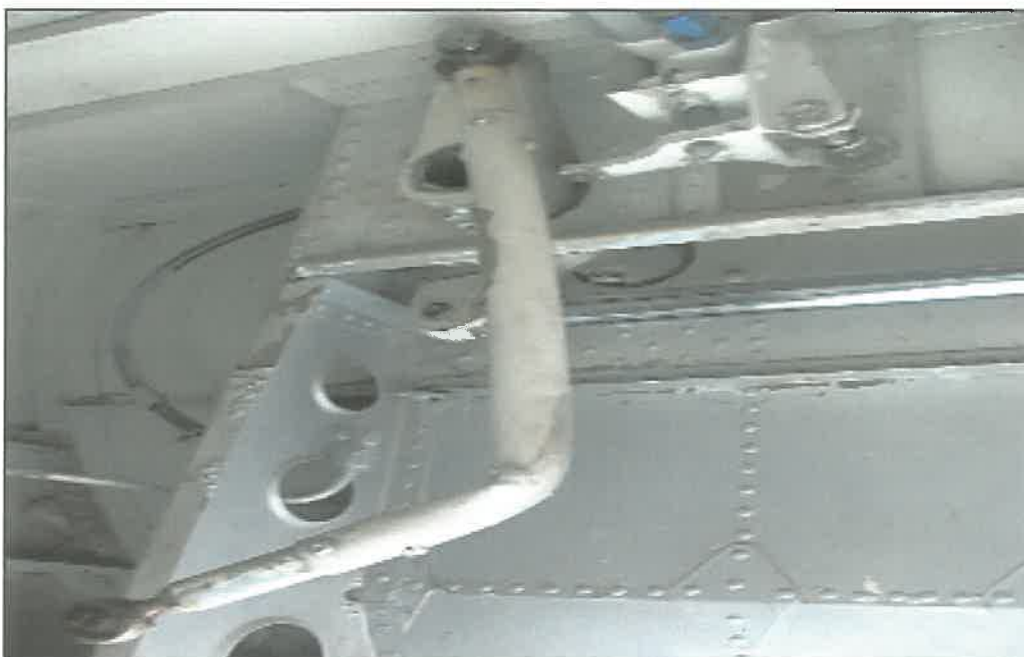
**APPENDIX K6 LANDING GEAR DOORS – EXTERNAL DAMAGE –
DUE TO CONTINUOUS GROUND RUBBING**



**APPENDIX K7 LEFT NOSE LANDING GEAR DOWN –
EXTENT OF DAMAGE DUE TO GROUND RUBBING**



**APPENDIX K8 PROPELLER TIP DAMAGE – A CONSEQUENCE OF HIGH RPM
DURING LANDING**



APPENDIX K9 NOSE LANDING GEAR LEFT DOOR LINK ROD BENT DUE TO CONTINUOUS IMPACTS OF DOORS WITH GROUND



APPENDIX K10 NOSE LANDING GEAR ACTUATOR IN FULLY EXTENDED POSITION – NO EVIDENCE OF HYDRAULIC LEAK