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FLIGHT SAFETY

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FLIGHT SAFETY & QUALITY ASSURANCE

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Introduction

We are sure you enjoyed reading the Feb. issue of the news letter. We continue with articles on serious incident/accident on aircraft types that KAC operates. In this issue we have an article on landing gear problems of A320. We have also a short note on how to avoid the bounce during landings.

We look forward to your feedback, suggestions and of course contribution to this newsletter in the form of articles, anecdotes, pictures, etc. related to flight safety which can be sent to the address given below.

A320 Landing gear failure

Nose gear stuck at 90 deg. offline in flight

A split second before the nose gear touches the runway

Nose rear tire is dragging and about to catch fire

Nose rear tire is on fire from the heat generated by friction

On Sept.21, 2005, JetBlue flight 292 an A320 left Burbank, California on a transcontinental flight to New York JFK. Shortly after take-off, the pilot was unable to retract the nose landing gear and there were two warning lights indicating problem with the nose gear shock absorber and the steering system. The pilot informed the ATC and the aircraft was vectored to Long Beach airport over which it did a low fly-by and the Jet Blue maintenance staff there confirmed that the nose gear had turned sideways by 90 deg. off the center line which was the reason for the inability to retract.

An emergency landing was planned for the A320 at Los Angeles International Airport (LAX) as it had longer runways compared to Long Beach and Burbank. To reduce the landing weight and hence the landing speed, the aircraft loaded with full fuel, had to be kept airborne for about three hours(A320 does not have means to dump fuel). This also gave time for the pilots to consult experts on ground. During this time, to reduce the risk of nose gear breaking which could lead to more damage to the aircraft and increase the risk of fire, the flight attendants moved passengers and carry-on baggage towards the rear of the aircraft.

Once the decision to land was made and emergency equipment was in place along the runway, the pilots brought the aircraft down on to runway 25L at 120 Kts about 2500ft down the runway. The plane rolled along the runway on main gear as long as possible as its speed decreased. After about 15 seconds the nose gear touched the ground. The gear's rubber tires rapidly shredded away until the metal hubs scrapped the runway pavement. The friction sent a trail of white smoke followed by a shower of sparks and finally the bright flashes of flame due to the burning of rubber tires.

The pilot applied brakes at 90 Kts and shut down the two turbofans at 60 Kts. The plane continued to roll and finally came to rest about 1000ft short of the end of runway. The nose gear had ground into

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NEWS LETTER TEAM

Capt.A/Malek Al Hattab
Dr.M.S.Rajamurthy

Contact:
Flight Safety & Quality Assurance office, Operations dept.
P.O.Box.394,
Safat 13004 Kuwait

Phone: +965- 4725475
Fax: +965- 4749823
E mail:
kwioe@kuwaitairways.com

Flight safety/aircraft accident links

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www.bst.gc.ca/en/index.asp
www.bfu-web.de
www.aaib.gov.uk/home/index.cfm
www.atsb.gov.au/

the runway surface for nearly 20 seconds before the plane finally came to a halt. Except for the nose gear, the plane remained undamaged and no one on board the aircraft were injured during the landing. Captain Scott Burke had accomplished an extra-ordinary emergency landing. Luckily the nose gear did not break loose. This incident was well covered by the local Los Angeles media whose helicopters circle the city 24 hours a day in the hope of covering the next high-speed car chase. But there was plenty of anxiety on board as passengers were able to watch live their own plight being discussed on in-flight newscast.

The investigation photos alongside show the damage of the tires and the wheel rims. The wear out of the two wheel rims can be seen clearly. This A320 was only three years old and had been through a routine maintenance check just five days prior to this emergency. NTSB, USA has said that the investigation could last about six to nine months.

While landing gear problems are not very uncommon, this type of landing gear problem has occurred quite frequently on the Airbus A320 and related A318, A319 andA321. Including this incident there have been seven cases of the nose gear getting locked at 90deg.

According to NTSB records, on Feb.16, 1999 an America West A-320-231with 31 on-board attempting to land at Port Columbus international airport, Ohio (CMH) faced a similar problem. Same kind of ECAM warnings came when the landing gear was lowered. The aircraft had to make an emergency landing and during the final approach the control tower noticed that the nose wheels were rotated by 90 deg. Much like the JetBlue flight 292 the landing was safe except that the evacuation was done with emergency slides because the pilot could see the smoke curling up from underneath but could not get the confirmation from the tower of any fire on the aircraft.

The investigation revealed that not only the seals on the steering control module had failed—and that three similar incidents had occurred - but also that Airbus had several months earlier issued a service bulletin on this. As neither the French DGCA nor the American FAA had adopted it as a mandatory, compliance was advisable, but not mandatory. America West Airlines did not heed the bulletin and hence the problem.

Following the CMH emergency landing, both the French DGCA and the American FAA issued Airworthiness Directives (Ads) on this problem, so that all steering control modules would be repaired and/or modified to prevent a recurrence. FAA gave airlines 12 months time to comply.

Three years later, in Nov. 2002 two incidents occurred. On Nov.1, 2002 a JetBlue A320 landed at JFK with its NLG rotated by 90 deg. The aircraft had come out of maintenance where the NLG dynamic seal was replaced three days prior to the incident. The aircraft had flown 15 cycles and 23 hours since then.

On Nov.21, 2002, United Airlines flight A319 after takeoff from O'Hare, Chicago received a L/G shock absorber fault on the ECAM when the pilot attempted to retract landing gear. When the captain moved the gear lever back to the down position, AUTO FLT A/THR OFF message came on and the autopilot could not be used after that. While the first officer flew the aircraft in Chicago area, the captain went through the book procedures for these messages and also got on the "phone" to System Aircraft Maintenance Controller (SAMC) at United's San Francisco maintenance base. The captain explained to SAMC that the ECAM landing gear page indicated that all three landing gear were down and locked, and the gear doors were closed.

SAMC then instructed the captain to interrogate Centralized Fault Display System (CFDS), which revealed the WHEEL N/W STEER FAULT message. It was decided to return to ORD. While the captain was concerned that nose wheel steering is not available during ground roll, SAMC was of the opinion that it would recover during landing roll, when the nose strut is compressed.

The captain proceeded to land at ORD, on R/W 04R an 8071 ft long, 150 ft wide runway. The runway was wet and initially the landing appeared to be smooth but as they slowed down, tower saw sparks coming from nose gear and around the same time inside the aircraft noise and vibration increased. The nose wheel had turned by 90 deg. both the tires were blown, and the left rim was ground all the way down to the axle. Right rim was also ground but not that far. The fire department arrived within two minutes and found that there were no hazards outside the aircraft and the passengers were safely disembarked.

As mentioned earlier, in all these cases, the steering control module seems to be the culprit. As per Airbus " during landing gear extension, the brake and steering control unit (BSCU) would have been energized and hydraulic pressure would have been directed towards the steering servo valve. The BSCU would have then commanded a small rotation of the nose wheel to check for proper movement. Any disagreement between the commanded position and actual position of the nose wheel would have deactivated the nose wheel steering. However, if hydraulic pressure had bypassed the steering control valve, there would have been continued pressurization to the servo valve, and because of the servo valve's inherent

offset, in-flight rotation of the nose wheels occur. Procedures existed for removal of hydraulic pressure from the steering control module. However, once the nose wheel strut had deflected 90 degrees, the centering cam would have been rotated to a flat area, and would have been incapable of overriding the 3000 Psi hydraulic system, and returning the nose wheels to a centered position."

During the servicing and reassembly of the shock absorber, improper seating of the upper centering cam and consequently mating of the lower cam and the anti-rotation lugs results in the anti-rotation lugs at the upper end of the strut not being properly engaged in the backplate slots. The manufacturers of shock absorbers, Messiers-Dowty have found two additional incidents involving mis-assembly of the NLG shock absorber, one with Canada 3000, A320 and the other occurred in Ireland.

A320s have never been grounded on account of these as none of these accidents resulted in injury. The NTSB investigation may bring out the answer to this problem and identify shortcomings in maintenance or the design.

Although A320 family has an excellent overall safety record with nearly few thousand aircraft operating, a Canadian Report released in 2004 documented 67 cases of nose landing gear failures on A320 since 1989.

Missing wheel on the nose gear

close up of axle fracture

According to a study by the Transportation Safety Board of Canada (TSBC), the nose wheels of A-319, 320 and 321, also have a problem of nose wheel bearing failure. The investigation by TSBC was triggered by a failure on an Air Canada airbus in which the nose wheel broke off due to bearing failure. It is not certain as to why the bearings fail and the wheels fall off, but it is suspected that it is a combination of bearing material, the type and amount of grease used for lubricating the bearings. Proper tools and proper torques of the bearing nuts seems to play an important role. The Canadian report quotes " the investigation of these occurrences did not reveal a definitive determining factor. Various modifications have been done to resolve this type of occurrence: stiffening of the nose wheel axle with a steel sleeve, a spacer inserted between the nose wheel halves, and a larger nose wheel to accommodate larger wheel bearings. These reduced the frequency of failure, but did not completely eliminate it.

Avoiding Hard Landings – bounce recovery techniques

Hard landings account for the highest single number of accidents worldwide among western-built large commercial jets. According to Boeing, hard landings constituted 54 of the total accidents recorded between 1993-2002. While Hard landings typically do not result in fatalities, in majority of the cases the aircraft are either destroyed or substantially damaged.

A Flight Safety Foundation (FSF) study on hard landing concluded that it can be a avoided by conducting stabilized approach and using proper flare and derotation techniques and most important, by going around if the approach became unstable or if the aircraft bounces more than 5 feet.

Flight Safety Foundation's Approach and Landing Accident Reduction (ALAR) task force determined that bounced landings are a result of loss of visual references, excessive sink rate, delay in initiation of the flare, excessive airspeed or power setting on touch down that prevents automatic extension of the ground spoilers.

The ALAR Task Force classifies a bounce as either light or high. A light bounce is 5 feet or less and the high bounce is greater than 5 feet. Bounce recovery technique depends on the aircraft type and the type of bounce.

To recover from a light bounce

the flight crew should do the following.

- Maintain or regain normal landing pitch attitude. (Increasing the pitch attitude increases the likelihood of a tail strike and decreasing the pitch attitude increases the descent rate and could possibly damage the nose gear and the front fuselage.)
- Continue the landing.
- Use power as required to soften the second touchdown.
- Be aware of the increased landing distance.

To recover from a high bounce,

The flight crew should initiate a go-around, because the remaining runway may be insufficient.

The go-around procedure to be followed is

- Maintain or establish a normal landing pitch attitude
- Initiate a go-around by activating the go-around levers/switches and advancing the thrust levers to the go-around thrust position.
- Maintain the landing flap configuration or set a different flap configuration as required by the Aircraft Ops Manual (AOM).

- Be prepared for a second touchdown.
- Be alert to apply forward pressure on the control column (particularly with underwing– mounted engines), and reset trim as the engines spool up.
- When safely established in the go-around and there is no risk of touchdown indicated by a steady positive rate of climb, follow normal AOM go-around procedure.
- In order to reduce work load re-engage automation as desired.
- During landing, be prepared for a bounce and review the recovery techniques - an improper recovery could result in an accident, causing significant damage to the aircraft.

Hard landings in most cases begin with unstable approach - this has been confirmed by studies. In each case, the accident could have been prevented by flying a proper go-around.

To prevent Approach and Landing Accidents, Flight Safety Foundation recommends that the operators should revise operating manuals to include stabilized approach criteria and promote no-fault go-around policies. Pilots should adhere to these practices and initiate a go-around whenever the approach becomes destabilized. In flight operations, safety is paramount and discontinuing a poor approach is a good judgment.

Incident summaries

Flight KU1551, Sector KWI-DAM(A340-300) On approach at Damascus, after selecting Landing Gear down, Landing gear doors not closed came on ECAM. Missed approach was carried out at 3500 ft, entered DAM and hold (VOR). ECAM and paper check list actions were carried out but Nose L/G doors remained open and nose wheel steering lost. ATC was informed and ground emergency services requested and cabin crew alerted as precaution. Normal landing was carried out and aircraft stopped on the runway. Aircraft was towed to the gate. After landing "HYD GREEN RSVR UNDER FILLED" WARNING came on ECAM. Subsequently, ground engineer confirmed an hydraulic leak from the Nose L/G area.

Flight KU552, Sector DAM-KWI(A300-605R) Climbing out of OSDI to 9000 ft. on ABBS 2 departure on radial 083 of DAM, 11DME out and when passing through 8000 ft. TCAS (RA) to descend came. Action was taken and descended to 7000 ft. until cleared of conflict. Reported to DAM controller.

Flight KU104, Sector LHR-KWI(B777-269) At ~ 35 nm from SIDAD(IRAQI FIR), ALI control 132.77 cleared to descent from FL410 to FL210 to cross SIDAD AT ~1622Z. While approaching FL260, suddenly an aircraft was noticed on TCAS at FL250. At the same time TA was activated. Immediately AP was disengaged and FL 260 maintained. ATC later instructed to continue at FL260 followed by instruction to climb to FL270.

Aviation Humour

257: Do you have Charlie?
Tower: 257, Negative, we left him back at the hanger!
257: Do you have Echo?
Tower: 257, Negative, receiving you loud and clear!
257: Do you have Hotel?
Tower: 257, Negative, We are staying with friends!
257: Do you have Juliet?
Tower: 257, Negative, and please don't say anything to my wife!
257: Do you have Kilo?
Tower: 257, Negative, but I think there is a couple of Roaches in the ash-tray
257: Do you have Oscar?
Tower: 257, Negative, but I'm expecting a nomination this year!
257: Do you have Papa?
Tower: 257, Negative, but I wrote him a letter last week!
257: Do you have Romeo?
Tower: 257, Negative, Negative! Wherefore art thou Romeo?
257: Do you have Uniform?
Tower: 257, Negative, just jeans and sweatshirt!

Web watch

www.airlinesafety.com - an airline safety site with detailed information on accidents and incidents
www.aerospaceweb.org - an educative site with information on specific incidents/accidents and various aspects of aviation
/kac-opsweb/ - the intranet site of KAC Operations department - must visit - a useful site

The Confidential Aviation Hazard Reporting System (CAHRS) provides a means of reporting hazards and risks in the aviation system before there is loss of life, injury or damage. It is open to anyone who wishes to submit a hazard report or safety deficiencies confidentially and non-punitively. Reports help to identify deficiencies and provide safety enhancement in areas of aviation. CAHRS forms can be collected at different location of KAC (i.e. Flight Dispatch) Premises. Completed forms can be dropped in FS&QA allocated box at Flight Dispatch or e-mailed to kwioe@kuwaitairways.com or faxed to 00965-4749823 or mail to Flight Safety and Quality Assurance office, Operations Department, P.O. Box 394, Safat 13004, Kuwait Airways –Kuwait.