



FINAL REPORT

**INCIDENT OF SRILANKAN AIRLINES
FLIGHT UL121 AIRBUS A330, 4R-ALC
ON 13TH OCTOBER 2008
AT CHENNAI INTERNATIONAL AIRPORT
INDIA**

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(Publications of the statements of the pilots withheld as per the Chapter 5 paragraph 5.12 of ICAO Annex 13)	

**LIST OF ABBREVIATIONS**

ATC	-	Air Traffic Controller.
ATPL	-	Airline Transport Pilot Licence.
ATIS	-	Automatic Terminal Information Service
CAASL	-	Civil Aviation Authority of Sri Lanka.
CAS	-	Calibrated Air Speed
CPL	-	Commercial Pilot Licence
CVR	-	Cockpit Voice Recorder.
DGCA	-	Director General of Civil Aviation – Sri Lanka
ECAM	-	Electronic Centralised Aircraft Monitoring
FDA	-	Flight Data Analysis
FDR	-	Flight Data Recorder
FOI	-	Flight Operations Inspector
Ft	-	feet
Hrs	-	Hours
ILS	-	Instrument Landing System
IRS	-	Inertial Reference System
Kts	-	Knots
mb	-	millibar
ND	-	Navigation Display
PF	-	Pilot Flying
QAR	-	Quick Access Recorder
QNH	-	Altimeter Sub-Scale setting to obtain elevation when on the ground
RA	-	Radio Altimeter
UTC	-	Universal Time Constant
VIS	-	Visibility
W/V	-	Wind velocity

**AIRCRAFT INCIDENT REPORT****SYNOPSIS:**

Operator : SriLankan Airlines
Airline Centre
Bandaranaike International Airport
Katunayake
Sri Lanka

Registered Owner : Taprobane Ltd
P. O. Box 309
George Town
Grand Cayman
Cayman Island

Aircraft Make and Model : Airbus A330-243

Aircraft Nationality : 4R (Sri Lanka)

Aircraft Registration : ALC

Place of Incident : Runway 07
Chennai International Airport
India

Date and Time : 13th October 2008 at 0311 UTC
(0841 hrs Indian local time)

The incident was notified to the Director General of Civil Aviation by the operator through a telephone call and subsequently by sending an Aircraft Incident/Accident Report compiled by the aircraft pilot. Accordingly, an investigation was initiated by a team comprised of Mr. W.P.M. Fernando, Director Flight Safety as the Team Leader, Gp Capt S.P. Adikaram, Deputy Director – Operations, and Capt. Lucian Ratnayake, Senior Flight Operations Inspector. As the State of Occurrence is India, the investigation initiated by the DGCA, Sri Lanka was conducted as an internal process only in order to recommend Safety remedial actions to a Sri Lankan registered air operator.

The incident occurred at 0841Hrs (Indian time) on 13th October 2008 at Chennai International Airport, India. SriLankan Airlines Flight UL 121 (Reg. 4R-ALC) landed on runway 07 under reduced visibility. The aircraft port outboard wheels overran the runway edge lights on the same side until the nose wheel steering (tiller) was effective to control the aircraft.

The aircraft taxied to the parking stand for passenger disembarkation. Later it was found that four left main wheel tyres had been damaged.



1. FACTUAL INFORMATION

1.1 History of Flight: On 13th October 2008, SriLankan Airlines flight UL 121, Airbus A330-243, registration 4R-ALC, was on a scheduled passenger flight, operated from Bandaranaike International Airport, Colombo for Chennai International Airport, India. The crew had completed the top of descend briefing for approach and the aircraft was making an ILS approach on runway 07 under deteriorating weather conditions. The landing encountered heavy rain and the aircraft IRS (Aircraft Initial Reference) indicated a wind of 164⁰/11Kts at the time of touch down. The visibility at the time was reported as 2000m. The aircraft landed at 0311 UTC.

The aircraft moved 720 meters overrunning 12 runway edge lights until slowing down to regain control by the instructor pilot.

The outboard tyres of the left main landing gear assembly were damaged, while decelerating on the runway before gaining control. While taxiing the crew observed wheel tyre low pressure on the upper ECAM with number 6 wheel pressure indicating zero. Once parked, the Captain advised the Ground Engineer to inspect the wheel tyres and found damages to wheel tyre numbers 1, 2, 5 and 6 of the left main landing gear assembly.

There were no substantial damages to the aircraft other than the damaged tyres.

1.2 Injuries to persons: There were no injuries to the crew or passengers.

1.3 Damage to Aircraft: The port main wheel assembly tyres no 1, 2, 5 and 6 were damaged. There were no extensive damages observed during the aircraft inspection other than the above.

1.4 Other Damages: Twelve numbers of runway edge lights were damaged.

1.5 Personnel Information:

Flight Crew:

Pilot-In-Command : Capt. R.D.A. Perera, Male, 39 years.

Licence : Valid Airline Transport Pilot License (ATPL/A/261)
issued by the DGCA Sri Lanka.

Aircraft Ratings : A320/ A330/ A340

Flying Experience : Total: P1 9800 hrs
Total on type: 2000 hrs
Instructional 2000 hrs

Flight Duty &
Rest period : PIC had 12 days rest prior to the flight

First Officer : I.J.I. Wijetilleke, Male, 43 years.

Licence : Valid Airline Transport Pilot License (ATPL/A/441)
issued by the DGCA Sri Lanka

Aircraft Ratings : A320/A330



Flying Experience : Total: 5000 hrs
Total on A320: 1300 hrs
Total on type: 14 hrs

Flight Duty &
Rest period : F/O had 5 days rest prior to the flight

1.6 Aircraft Information:

Type and Model : Airbus A330-243

Manufacturer's Serial no : 311

Month of Manufacture : December 1999

Certificate of Registration : No. 169, Registered in Sri Lanka Civil Aircraft Register

Certificate of Airworthiness : Valid till 09th December 2008

Total Airframe Hours : 40,848 hrs.

Total Cycles : 12,435

Engines : 02 numbers, RR Trent 772 Turbo Fan Engines

1.7 Meteorological Information :

i. SPECI at 0252 on 13th October 2008

SPECI VOMM 130252Z 00000KT 3000 –TSRA SCT015 SCT020 FEW025CB OVC080
25/24
Q1012 TEMPO 2000 TSRA

ii. SPECI at 0340 on 13th October 2008

SPECI VOMM 130340Z 340/04KT 2000 –TSRA SCT010 SCT020 FEW025CB OVC080
25/24
Q1013 BECMG 3000

1.8 Aids to Navigation: ILS R/W 07 reported serviceable.

1.9 Communication: The aircraft was on the tower frequency of 118.7 MHz. No reported loss of communication.

1.10 Aerodrome Information: Aerodrome meets the relevant standards to support the operation of the A330 aircraft.

1.11 Flight Recorders: The aircraft was fitted with a Model SSCVR, HONEYWELL (P. No 980-6022-001, SN 2206) Cockpit Voice Recorder (CVR) and Model F1000, FAIRCHILD (P. No. AP 411161, SN 403) Flight Data Recorder (FDR). The DFDR was sent to Airbus for analyze and report.

1.12 Wreckage and Impact Information: Not Applicable

1.13 Medical and Pathological Information: Nil



1.14 Fire : There was no fire

1.15 Survival Aspect : Not applicable

1.16 Test and Research : Not applicable for this incident

1.17 Additional Information: Not applicable

2 ANALYSIS

2.1 General: The aircraft was flown by the First Officer who was on training under the supervision of Instructor Pilot. The control was given to Trainee First Officer after the top of descent briefing. ATIS reported visibility was 3000m at 0215 UTC. The aircraft experienced heavy rain over threshold of runway 07 and the visibility reported to be reduced to 2000m at the touch down on runway 07. The aircraft landed with a crab angle with the nose pointing to right. The Trainee First Officer observed that the aircraft touched down towards left of the runway centre line and applied right ruder to correct and noted skidding to the left edge of the wet runway. The aircraft ran over twelve runway edge lights deflating left out board tyres. Subsequently the instructor pilot regained control and managed to bring the aircraft to the centre line of the runway and after clearing the runway, taxied the aircraft to parking stand.

2.2 QAR read out: The QAR data analysis on FDA programme noted a significant change in the wind direction from the time the pilots descended below 1000ft level. The wind velocity readout given by the aircraft Inertial Reference System (IRS) at 1000ft was 017⁰/08Kts which varied progressively to 164⁰/11Kts thus becoming a crosswind. The QAR data analysis indicated two highlighted events at the time of touch down.

- i The aircraft landed in a crab angle (attitude)
- ii. Pitch rate high at landing

2.3 The approach and landing: The crew stated that they completed a standard briefing for the approach and landing on runway 07. While both pilots were familiar with the airfield layout the first officer who was on controls (PF) of the aircraft was on his seventh line training flight on A330 aircraft and was the first training flight to Chennai International Airport on A330.

At the approach preparation, the ATIS information given was 'G' with wind 'Calm' and the visibility of 3000m in 'Haze/Drizzle'.

The approach continued normally but the landing clearance was given by the tower with reported wind as 'Calm' and the visibility down to 2000m in 'Rain' and the runway condition wet.

The crew reported that they disengaged Auto-Pilot at 500ft and on short finals observed that the wind displayed on the Navigation Display (ND) as 145⁰/12Kts. But wind data generated for 0340 UTC SPECI was 340⁰/04 Kts and visibility 2000m.

The Airbus report shows that less than 100 feet Radio Altimeter (RA), aircraft trajectory began to diverge to the left of runway axis. Instead of maintaining right roll orders to counter the right crosswind, the pilot flying;

- i. Has let the aircraft rolled to the left leading to an increase of aircraft deviation to the left of the runway axis.



- ii. Has performed a right ruder pedal leading to an aircraft nose movement to the right, which created an aircraft sideslip. As a consequence, subject action corrected the aircraft heading but not the aircraft track. Aircraft trajectory was not centered on the runway centerline at time of touchdown.

Airbus analysis show strong longitudinal activity on side stick during approach and the flare is performed at 75ft RA through several nose up orders which led to,

- i. Aircraft pitch increase
- ii. Aircraft vertical speed decrease
- iii. Aircraft CAS decrease
- iv. Thrust increase to compensate CAS decrease before thrust levers set on "IDLE" notch

In addition Airbus report states after touchdown, aircraft slid and the subject sliding was due to the difference between the track and the heading at time of touchdown associated with a wet runway.

2.4 Aircraft handling experiences: The aircraft was flown (PF) by the First Officer who was on his seventh line training session on A330 fleet. The training flight was carried out under the supervision of an experienced instructor pilot who had more than 2000hrs of instructional experience on A330 fleet. In the interview the instructor pilot recalled of a landing performed under similar weather conditions around the year 1994 in Changi Airport, Singapore.

2.5 Reported weather at landing: The first officer who was on controls (PF) reported that the weather given by ATC at approach was visibility 2000m and heavy rain over the airfield. The next special forecast generated was for 0340 UTC and indicates W/V 340⁰/04 Kts and visibility 2000m. However, the aircraft pilot reported that the W/V component displayed on Navigation Display was 145⁰/12Kts at the time of aircraft touched down for landing. The wind passed by the tower was 'calm'.

2.6 Preservation of CVR and FDR for retrieval: While FDR was removed for data download, CVR had not been removed, which is a loss of valuable data for analysis.

The report prepared by the Aircraft Manufacturer -Airbus, analysing the data recorded in FDR is incorporated as Appendix- 1.

3 CONCLUSION

3.1 Findings:

1. The aircraft crew was properly licensed and adequately rested to conduct the flight.
2. The aircraft had valid Certificate of Airworthiness and Registration.
3. The aircraft aquaplaned and skidded sideways to the left as it landed with a 'crab angle' to the right consistent with the actual wind conditions.
4. No attempt was made to align the aircraft with the runway using the correct crosswind landing technique just before touchdown.
5. The landing with a 'crab angle' and 'high pitch' rate as recorded in the QAR was within limits.
6. The high pitch rate also delayed touch down of the nose wheel which delayed full control of the aircraft steering on ground.
7. Failure to secure the CVR data was a set back to the investigation.
8. The investigation team is in the view that the Instructor Pilot should have taken over the controls at the correct time or the crew should have initiated a 'Go Around'.



3.2 Probable Causes:

1. Lack of good judgment of the Instructor Pilot who was in command allowing the Trainee First Officer to continue the aircraft landing under deteriorating weather condition.
2. Improper landing technique used by the Trainee First Officer.

4 SAFETY RECOMMENDATIONS

1. The airline to give more emphasis on crosswind landings on contaminated runways during the simulator training sessions.
2. Airline to reiterate the importance of Captains and Instructor Pilots taking over controls at the correct time using good judgement if a situation demands to do so and initiate a go around should it be critical.
3. To subject the instructor pilot for an inspection while he conducts a simulator training session to a student on circuit flying (in simulated adverse weather and wind conditions) under the supervision of a FOI of the CAASL prior to reinstating line training instructional duties.

Recommendations already implemented after preliminary investigation;

1. To subject the First Officer for refresher training on crosswind landings on contaminated runways prior to resuming line training.

**APPENDIX - 1 -AIRBUS REPORT****1/ REPORTED EVENT**

A330-200 MSN 311 experienced a tire N°6 deflated after landing on runway 07 at Chennai airport (India) on October 13th, 2008:

Quote:

After landing on runway 07 at Chennai airport, ECAM message "WHEEL TIRE LO PR" appeared associated with "MLG WHEEL 5/6 TIRE" failure message. After parking engineer informed that wheels 1, 2, 5 & 6 need replacement.

Landing was to the left of centerline in heavy rain and aircraft had a tendency to skid due to the wet conditions. Auto brake "low" was selected for landing. Pilot flying was in training. Captain takeovered the control during roll out phase to bring aircraft on the centerline.

Reported observation / investigation details:

1. During inspection found main wheel tire 6 with some deep cuts on sidewall and crown area.
2. Further inspection found 1, 2 & 5 tires also damage as: (L/H MLG)
 - a) Tire 1 => with some cuts on crown area
 - b) Tire 2 => with sidewall cuts and thread throw
 - c) Tire 5 => with deep cuts on sidewall
3. MCC informed and requested for spares after seeking some assistance with regard to M/W assy's from other airlines in MAA.
4. Inspection after tire burst C/O as per AMM 05-51-15 and nil findings
5. After arrival of spares (04 wheels assy's) and equipments all main wheels assy's replaced as per AMM 32-11-41.
6. After N2 charging A/C released and chocks off at 19:58 (local) with total delay of 09H28mn. Unquote.

2/ DATA USED FOR INVESTIGATION

This analysis has been carried out from plots extracted from available DFDR raw data. These plots are attached in annex.

Note: The potential impact of the event on landing gears, tires and aircraft structure is not mentioned in this report; it is handled separately.



- Sign convention:

- Pitch >0: Nose up
- Pitch < 0: Nose down
- Roll > 0: right wing down
- Roll < 0: left wing down
- Elevators > 0: downwards
- Elevators < 0: upwards
- Rudder position > 0: turn left
- Rudder position < 0: turn right
- Glide Slope > 0: above beam
- Glide Slop < 0: below beam
- Side Stick pitch > 0: down
- Side Stick pitch < 0: up
- Side Stick roll > 0: left
- Side Stick roll < 0: right

3/ DESCRIPTION OF THE EVENT

3.1/ Aircraft configuration

- Aircraft was in approach at CHENNAI Airport on runway 07
- Aircraft weight was about 165T for a MLW=180T
- CG was around 25.3 %
- Aircraft CAS was around 134 kts (VLS +5kts)
- Both AP were engaged in Glide Slope track mode (longitudinal mode) and Loc track mode (lateral mode)
- Both FD were engaged
- ATH/R was engaged in managed speed mode
- Slats/Flaps were in full configuration
- Ground Spoilers were armed
- Autobrake was engaged in low mode

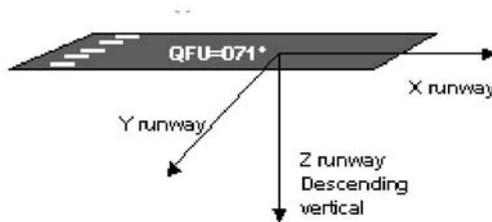
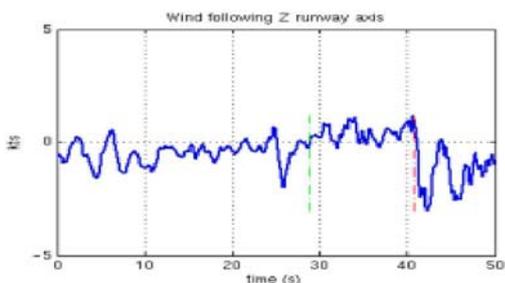
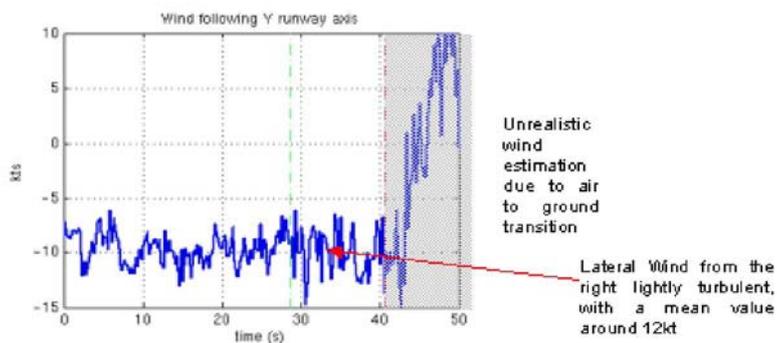
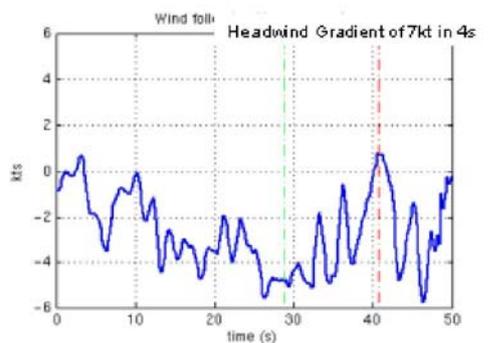
3.2/ Wind (speed and direction) information during approach coming from DFDR raw data

140 degrees < wind direction < 180 degrees (mean wind direction = 160 degrees)
 09 kts < wind speed < 12 kts (mean wind speed = 10 kts)
 72 degrees < aircraft heading < 76 degrees (for runway QFU: 071 degrees)

Above wind information coming from DFDR raw data show that A330-200 MSN 311 experienced during approach a moderate crosswind coming from the right.

Note: Above wind information come from the ADIRS. For weak wind speeds the wind direction is not accurate. Indeed, ADIRS wind information outputs have a precision of 10 degrees or 10 kts for a wind speed greater than 50 kts. As a consequence, for weaker winds, this information should be used just as an indication. However, DFDR raw data provide accurate information concerning headwind component by making the difference between GS and TAS. In addition, Airbus has reconstructed (see hereafter) the actual wind for the last 30 seconds before the touchdown by means of engineering computations.

Wind reconstruction: Runway axis



100ft RA
 ----- Touchdown

T=0s => GMT 03:10:30



3.3/ Factual description

During the whole approach, AP then the pilot flying (from 540 feet RA) track the glide slope and the local-izer beam through:

- 132 kts < CAS ADC < 138 kts
- 2 degrees < Pitch aircraft attitude < + 6.5 degrees
- -3.5 degrees left < Roll aircraft attitude) < +3 degrees right
- +0.87g < Vertical aircraft acceleration < +1.15g
- -0.02g < Lateral aircraft acceleration < +0.04g

Above values indicate that subject approach was carried out in moderate weather conditions.

Approach performed between GMT 03:10:00 and GMT 03:11:00 (75 feet RA)

Both AP are disengaged at GMT 03:10:24 (480 feet RA)

=> Longitudinal axis (Fig 1.1.1)

- Pilot flying tracks the Glide Slope beam => the deviation is contained between +30 μ A (2/5 of a DOT above the glide) and -50 μ A (3/5 of a DOT below the glide)
- Aircraft pitch angle is contained between +1.5 degree and +4.5 degrees
- Aircraft vertical speed is contained between -650 ft/mn and -900 ft/mn
- Aircraft CAS is contained between 132 kts and 138 kts

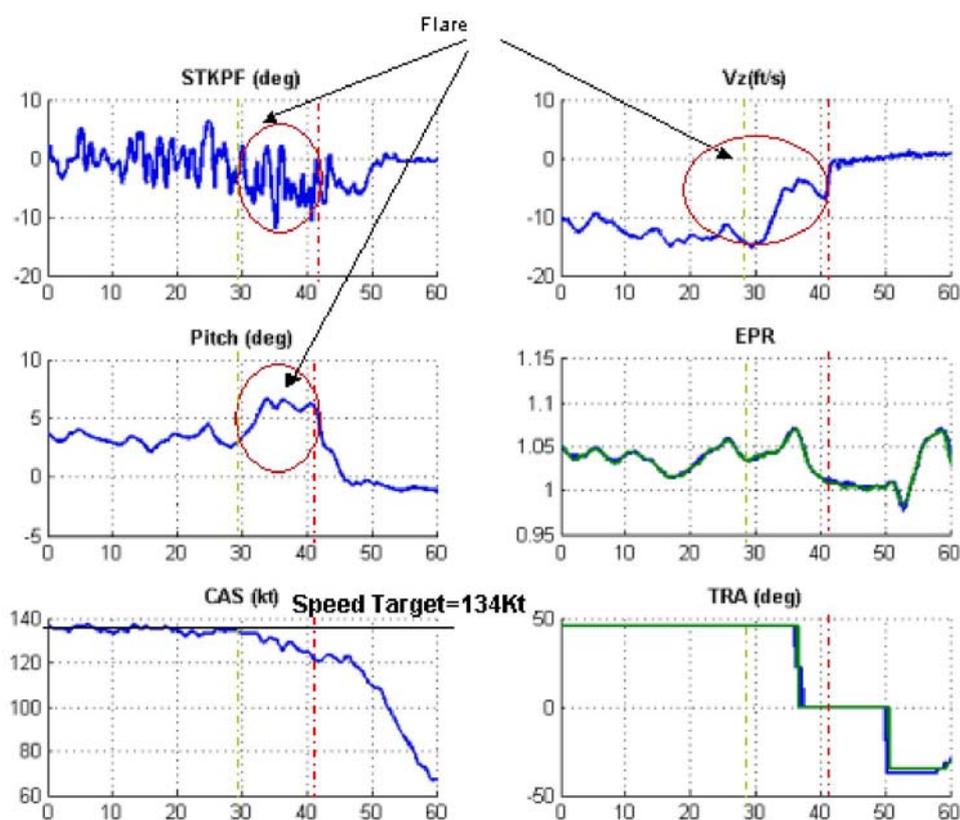
=> Lateral axis (Fig 1.1.2)

- Pilot flying tracks the Localizer beam => the deviation is contained between +16 μ A (1/5 of a DOT on the left of the Localizer beam) and -8 μ A (1/10 of a DOT on the right of the Localizer beam)
- Aircraft roll angle is contained between -3.5 degrees and +3 degrees

Flare performed between GMT 03:11:00 (75 feet RA) and GMT 03:11:12 (ground)

=> Longitudinal axis

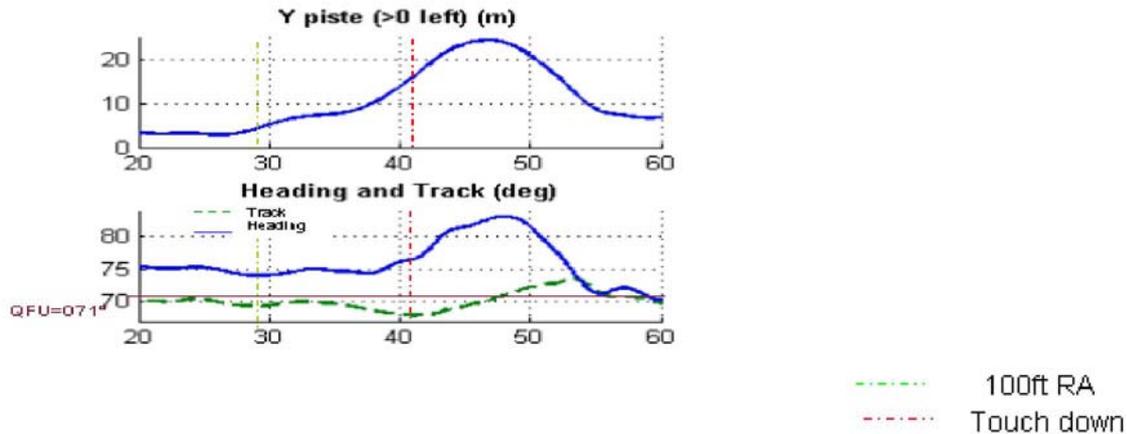
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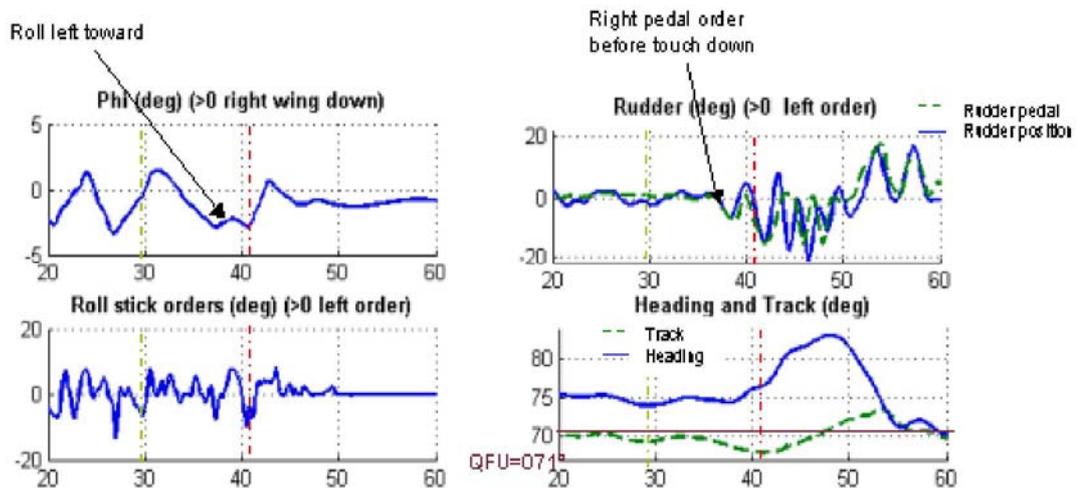
- ◆ Above simulations show a strong longitudinal activity on side stick during approach.
- ◆ The flare is performed at 75 feet RA through several nose up orders which led to:
 - Aircraft pitch increase
 - Aircraft vertical speed decrease
 - Aircraft CAS decrease
 - Thrust increase to compensate CAS decrease before thrust levers set on “IDLE” notch

=> Lateral axis

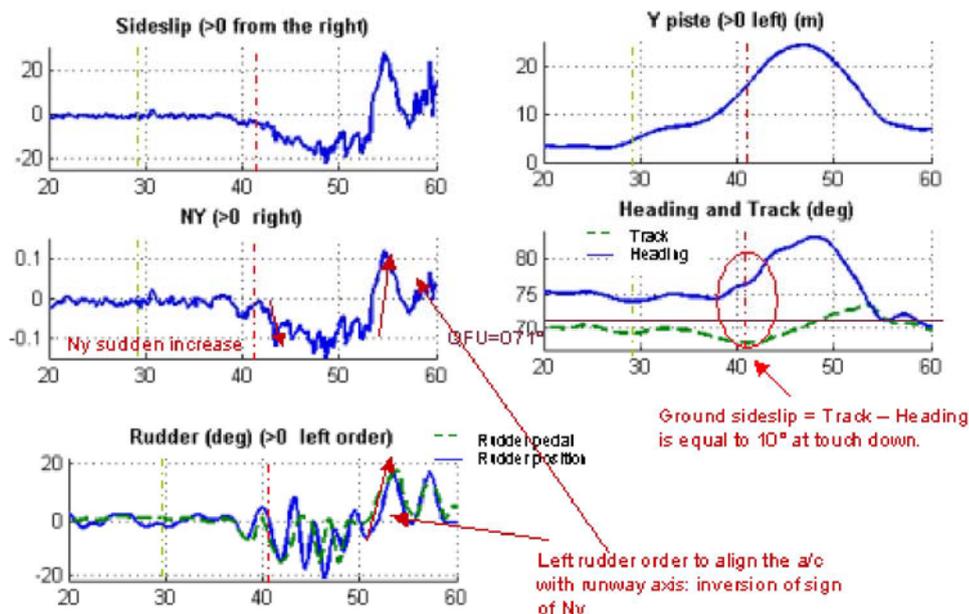
T=20s => GMT 03:10:50



Note: The lateral trajectory has been computed thanks to integration of inertial parameters. According to this trajectory, fewer than 100 feet RA aircraft approached on runway 07 with a divergent trajectory to the left.



- ◆ Above simulations show a strong lateral activity on side stick during approach
- ◆ Under 60 feet RA, aircraft rolls to the left and combined with a right pedal order led to a heading increase to the right creating sideslip => aircraft nose moves to the center line but the track was still divergent at time of touchdown.



- ◆ After touchdown, aircraft heading increases suddenly (aircraft nose moves to the right) until sudden lateral load factors (N_y) increase.
- ◆ Aircraft slides on the runway after touchdown. Subject aircraft sliding is characterized by the fact that lateral load factor is weak initially after touchdown (aircraft sliding) and then increase suddenly (ground adherence recovery).
- ◆ Aircraft sliding is due to the ground sideslip before touchdown associated with a wet runway.
- ◆ The inversion of sign of the lateral load factor corresponds to the left rudder order and the nose wheel steering to align the aircraft on the runway axis.

Following values are recorded at touchdown (GMT 03:11:12)

Touch down occurs with -1.5 degree of left roll angle Aircraft pitch attitude is $+6$ degrees with -8 degrees of drift angle Estimated vertical speed at touchdown is -4 ft/s (± 2 ft/s) Vertical acceleration is $+1.2g$ Lateral acceleration is $-0.04g$

AIRCRAFT TRAJECTORY DURING SHORT FINAL



TRAJECTORY OF LEFT MAIN LANDING GEAR ON THE RUNWAY 07

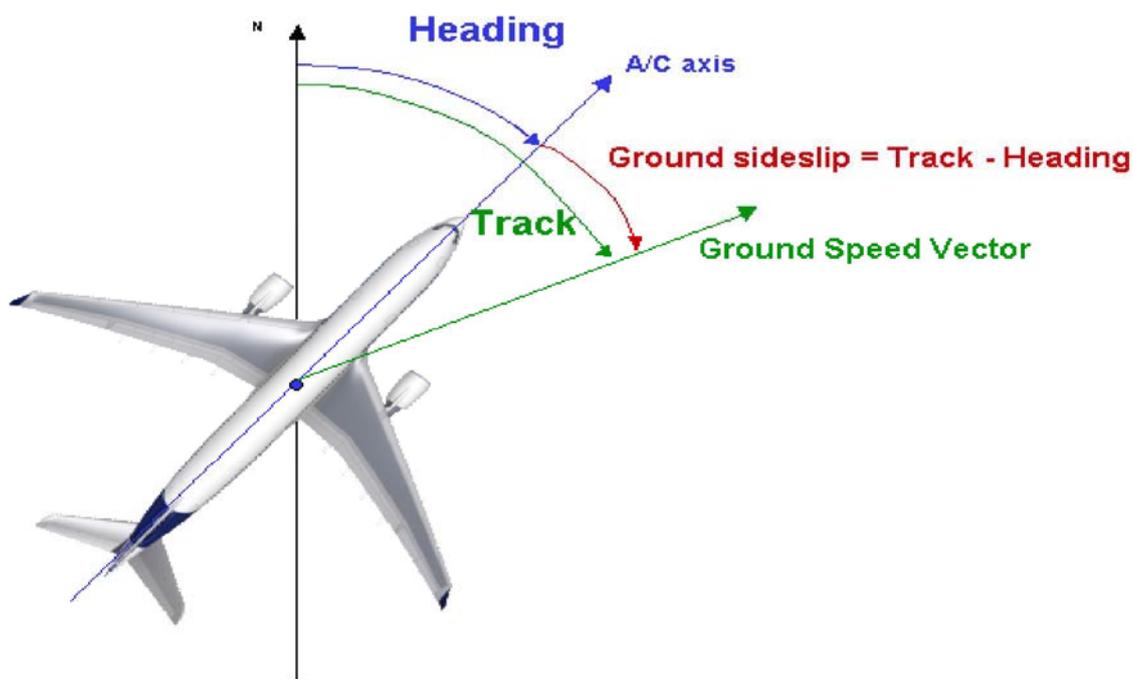


4/ CONCLUSION

A330-200 MSN 311 operated by ALK experienced on October 13th, 2008 a deflated tire N°6 after landing at Chennai Airport on runway 07.

DFDR raw data analysis shows:

- ◆ Approach was performed manually through lightly turbulent weather and with 10 kts of right crosswind
- ◆ Strong lateral and longitudinal activity is recorded during approach
- ◆ Under 100 feet RA, aircraft trajectory began to diverge to the left of runway axis. Indeed, instead of maintaining right roll orders to counter the right crosswind, the pilot flying:
 - Let the aircraft rolled to the left leading to an increase of aircraft deviation to the left of the runway axis
 - Performed a right ruder pedal leading to an aircraft nose movement to the right, which created an aircraft sideslip. As a consequence, subject action corrected the aircraft heading but not the aircraft track => Aircraft trajectory was not centered on the runway centerline at time of touchdown
- ◆ After touchdown, aircraft slid □ subject sliding is due to the difference between the track and the heading at time of touchdown associated with a wet runway.



No system misbehavior has been highlighted during subject event.

**5/ OPERATIONAL RECOMMENDATIONS**

Airbus recommends ALK to refer to:

- FCOM Bulletin N°814/2 “AIRCRAFT HANDLING IN FINAL APPROACH”
- Flight Operations Briefing Note “Landing Techniques => Crosswind Landing”
- Flight Operations Briefing Note “Landing on wet or Contaminated Runway”