a6-m050704a

Report

Incident on **4 July 2005**
at **Paris Charles de Gaulle (95)**
to the **Lockheed 1011-385-3**
registered **A6-BSM**
chartered by **Olympic Airlines (Flight OA202)**
and operated by **Star Jet**

BEA
Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile
Ministère de l'écologie, de l'énergie, du développement durable et de la mer, en charge des technologies vertes et des négociations sur le climat

Foreword

In accordance with Annex 13 to the Convention on International Civil Aviation, with EC directive 94/56 and with the French Civil Aviation Code (Book VII), the analysis of the accident and the conclusions and safety recommendations contained in this report are intended neither to apportion blame, nor to assess individual or collective responsibility. The sole objective is to draw lessons from this occurrence which may help to prevent future accidents or incidents.

Consequently, the use of this report for any purpose other than for the prevention of future accidents could lead to erroneous interpretations.

SPECIAL FOREWORD TO ENGLISH EDITION

This report has been translated and published by the BEA to make its reading easier for English-speaking people. As accurate as the translation may be, the original text in French should be considered as the work of reference.

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Glossary

AAIB	Air Accidents Investigation Branch (United Kingdom)
ACJ	Advisory Circular Joint (JAA)
AIP	Aviation Information Publication
APU	Auxiliary Power Unit
ATPL	Air Transport Pilot's License
B-RNAV	Basic area Navigation
CAA	Civil Aviation Authority (UK)
CFMU	Control Flow management Unit
CPL	Commercial Pilot's License
CVR	Cockpit Voice Recorder
DGAC	French civil aviation directorate (Direction générale de l'aviation civile)
DME	Distance Measuring Equipment
EASA	European Aviation Safety Agency
ECAC	European Civil Aviation Conference
EGPWS	Extended Ground Proximity Warning System
FAA	Federal Aviation Administration (US)
FCL (JAR)	Flight Crew Licensing (JAR)
FDR	Flight Data Recorder
FMS	Flight Management System
GCAA	Gulf Civil Aviation Authority
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HCAA	Greek Civil Aviation Authority
ICAO	International Civil Aviation Organisation
INS	Inertial Navigation System
IR-ME	Instrument Rating – Multi-Engine
JAA	Joint Aviation Authority
JAR	JAA Regulation
MEL	Minimum Equipment List
MMEL	Manufacturer's Minimum Equipment List
PF	Pilot Flying
PNF	Pilot Not Flying
RNAV	Area Navigation
RNP5	Radio Navigation Precision 5 NM
RVSM	Reduced Vertical Separation Minima
SAFA	Safety Assessment of Foreign Aircraft programme
TCAS	Traffic warning and Collision Avoidance System
UAE	United Arab Emirates
USOAP	Universal Safety Oversight Audit Programme
VOR	VHF Omni-directional Radio Range

Synopsis

Date of incident
4 July 2005 at 16h18[1]

Place of incident
Charles de Gaulle Airport, Paris (95)

Type of flight
Scheduled international flight OA202
Public transport of passengers

Aircraft
L1011-385-3

Owner
Star Air Ltd (Sierra Leone)Operator

Operator
Star Jet (UAE)

Persons on board
233 passengers[2] and 13 crew members

[1]All times in this report are UTC, except where otherwise specified. Two hours should be added to obtain the legal time applicable in mainland France on the day of the incident.

[2]Note: The weight and balance sheet stipulated 252 passengers. Some passengers having disembarked before departure, there is some doubt as to the actual number of persons on board at the time of the event.

Summary

After difficulties during boarding, the airplane, operated by Star Jet and wet-leased by Olympic Airlines, took off late. A short time after retracting the landing gear, the crew heard a series of thumps and noticed that engine 3 TGT was increasing. They applied the FIRE OR SEVERE DAMAGE procedure, performed an aerodrome circuit and landed.

The investigation showed that the engine had suffered from a serious sustained (pop) surge. This was caused by a combination of wear to the compressor blades, damage caused by an object passing through the intermediate and high-pressure compressor stages and the stresses induced by this phase of takeoff.

The investigation also showed that the airplane was in bad overall condition and that the absence of a framework for documentation made it impossible for the operator to ensure appropriate follow-up of maintenance operations.

The investigation showed that, in general, there were numerous failings in the operation established by Star Jet. The safety inspections performed at several levels did not enable these failings to be corrected. Nor did they prevent the airplane from being flown in Europe.

ORGANISATION OF THE INVESTIGATION

The incident, an engine surge after takeoff, stirred great emotions, which were heightened by the publication of a photo of the airplane in flight, with a large flame trailing behind one engine. Questions asked by the passengers and by those from the airport's neighbouring area were widely spread via the media.

(Source Le Parisien)

Faced with this situation, the BEA initially intervened to clarify the circumstances of the event. The first observations showed shortcomings in the context of the operation of the airplane that threatened flight safety, so the BEA decided to launch an investigation. In parallel, the DGAC decided to ground the aircraft while waiting for some work to be performed, considering that its airworthiness was not guaranteed.

In accordance with international agreements, the authorities of the United Arab Emirates (State of Registry of airplane A6-BSM and of the operator Star Jet), the United States (State of Manufacture of the airplane) and Great Britain (State of Manufacture of the engines) participated in the investigation. The Greek authorities also participated, given the charter contract between Star Jet and Olympic Airlines.

The progress of this investigation was impeded by the geographical dispersion of those involved and the difficulties encountered in obtaining precise information and the complete documents required by the regulations relating to the airplane and the flight, which are usually obtained in the course of the first few days. Constituting the investigation dossier required, among other things, filling numerous gaps in the documentation noted in application of the regulations and follow-up of operators, crew and aircraft.

These difficulties brought to mind those encountered during the investigation into the accident that occurred at Cotonou (Benin) on 25 December 2003 to the 727-223 registered 3X-GDO. This is in itself a first conclusion.

The operator's organisation was difficult to pin down, since the operator had successively or simultaneously been subject to different national regulatory systems that were applied with more or less quality, and its written documentation, when it existed, had serious shortcomings. Its change of statute, from Star Air (Sierra Leone) to Star Jet (UAE) without, however, Star

Air being dissolved, as well as its recourse to the means and documentation of other companies, made it difficult to establish the facts. It was thus decided, after some weeks of the investigation, to gather together the parties identified in order to get whatever details could be collected. In May 2006, a further meeting, in the United Arab Emirates, allowed an exchange of views with the GCAA. The operator did not attend this second meeting.

The multiplicity of licenses and type ratings for the flight crew, obtained in disparate manner in a variety of States, also complicated the checking procedure. Under these circumstances, it was necessary to question not only the civil aviation authorities of the United Arab Emirates, responsible for follow-up of licenses and ratings presented by the crew, but also those in charge of oversight of the instructors that had overseen the tests for renewing these documents: the Jordanian, American and German authorities were thus asked. With the exception of Jordan, they replied.

The collection of data from Sierra Leone was facilitated by assistance from ICAO, in particular through its regional representation.

On 22 June 2006, the BEA notified the operator of the requirement for it to supply the relevant documentation concerning the airplane and its operation, including its logbook, the equipment lists, the training manual approved by the GCAA and the FDR decoding document. Almost one year after the incident, the president of Star Jet then sent the investigators a training manual with headings from an airline called Star Jet, but clearly destined for the authorities of Kyrgyzstan. The other documents were never supplied. In addition, after the incident some plane spotters indicated that they had photographed an airplane with serial number 1179, another one from the Star Air fleet, during operations in Japan and Malaysia. It had a Kyrgyz registration. On investigating, it appeared that, following the Paris event, the President of Star Jet had transferred its activities to Kyrgyzstan while keeping the same name for the company. The operator Star Jet, with a Kyrgyz Air Operator Certificate, was banned from operating in the European Union. When questioned, the Kyrgyz civil aviation authority informed the European Commission that it had withdrawn the AOC from Star Jet. It was not possible to determine the subsequent situation of this operator and its airplanes. The A6-BSM airplane was still parked at Paris Charles de Gaulle in April 2008.

The BEA decided to stop the investigation at this stage, passing on to the international community the task of dealing with this type of operator, whose total scorn for regulations and procedures is only matched by its complete ignorance regarding the basic principles of safety.

1 - FACTUAL INFORMATION

1.1 History of Flight

The Lockheed 1011 registered A6-BSM, operated by Star Jet and chartered by Olympic Airlines, arrived at 11h10 at the ramp at Terminal 1 at Paris Charles de Gaulle airport. It was fifty minutes late due to a repair that had to be carried out in Athens, its departure aerodrome.

The next flight, that is to say flight OA202, was scheduled for 11h20. Boarding started at 11h50 without the passengers being allocated seat numbers. Loading was completed by 12h20. Departure was delayed because the forward hold door was jammed open. At 13h00, the cabin doors were still not closed. A mechanic from Star Jet hit the electric closing system of the hold door with a hammer and a chuck, apparently in an attempt to separate it from the structure so as to be able to close the hold door manually. Some passengers, tired of waiting without being given any information from the crew and worried about the apparent state of the cabin and the noise, got up and asked to disembark, and this led to a mass movement. Around 13h30, roughly half of the passengers left the plane. After some time, some of these passengers accepted to return to their seats, while others refused to get back onto the airplane. The crew obtained a new takeoff slot for 16h15. Re-boarding was complete by 15h45, and the airplane left its ramp position at 16h00, nearly five hours late. It took off at 16h17 from runway 27 L. The co-pilot was PF.

Shortly after the landing gear was retracted, the people on board the airplane heard a series of thumps. The crew noticed that the TGT on engine 3 was increasing (up to 80°C).

The passengers seated in several rows on the starboard side saw a flame at the rear of the engine. A wave of panic spread among certain passengers.

In the cockpit, the flight engineer called out severe damage to engine 3. The captain requested the SEVERE DAMAGE procedure and informed ATC that there was an engine failure and that he intended to return to the airport. The crew managed the takeoff track in accordance with the procedure recommended by the manufacturer in the event of engine failure after V1 and shut down engine 3. This stopped the flames. They turned right heading to 090° in compliance with the instructions from ATC.

The captain took over the controls during the approach. ATC suggested a visual approach. The airplane landed on runway 27 L at around 16h29.

1.2 Damage to Aircraft

After the incident, inspection of engine 3 revealed damage (see paragraph 1.9.1). It was not possible to remove the engine, so the investigation was unable to determine in detail which damage was due to the incident.

1.3 Personnel Information

There were thirteen Star Jet crew members on board: the two pilots, the flight engineer, seven flight attendants and stewards, two ground mechanics and a commercial coordinator.

1.3.1 Flight crew

Note: The authorities from the United Arab Emirates indicated that their applicable regulations require at least one of the pilots on board to have an airline pilot's licence from the UAE.

1.3.1.1 Captain

Male, 64 years, of German nationality.

Note: The provisions of ICAO Annex 1 that were applicable at the time of the event did not allow pilots over 60 years of age to work as Captain on international public transport flights. The United Arab Emirates, Greece and France had not notified a difference on this question. After French inspectors from the SAFA programme noticed several cases of foreign airplanes with captains over sixty, the DGAC issued circular A21/00 in 2000 to specify that "Captains over sixty years of age are not authorised to operate international public transport flights within French air space".

The pilot held licences issued by several countries:

- An ATPL issued by Germany on 25 August 1976,
- An ATPL issued by the United States on 23 April 2001,
- An FCL ATPL issued by Germany on 13 April 2004 along with a medical waiver subject to medical check-ups [3]. However, this licence was limited exclusively to Star Air flights on L1011 airplanes after it was noted that the permit of the examiner who had performed the test and issued the FCL licence had expired.

He held DA-2000 and L1011 type qualifications.

His last line check had been performed on simulator on 19 March 2005 under the supervision of a pilot authorised by the Jordanian authorities. It should be noted that the line check report bears no reference to any instructor's licence, permit or qualification and that this report notepaper bears the heading of Air Universal, another operator from Sierra Leone. Further, referral to an American instructor's qualification, expired since 1977, is mentioned on the captain's log book on the line corresponding to this line check. Moreover, an American licence cannot be renewed on a simulator unless the FAA approves the operator's programme (Air Universal's in this case) and no such approval was found on this occasion. So this line check was not valid for renewing the American licence.

The United Arab Emirates validated the American ATPL licence for the period from 30 June to 29 July 2005 so that the captain could fly within the terms of the contract with Olympic Airlines. This validation was subject to obtaining a UAE ATPL licence before the validation expired, and in particular subject to passing the aviation law test.

[3] In addition, the Captain possessed a medical certificate class 1, issued on 14 March 2005 by the FAA, with a rider concerning the wearing of corrective glasses.

The document validating the American licence issued to the captain specifies that it is the captain's responsibility to ensure that his foreign licences and qualifications are up-to-date and that the operator is responsible for ensuring that the line checks are performed in compliance with the regulations of the United Arab Emirates. The GCAA also mentioned verbally that it had asked the FAA and that, since there was no reply, it had assumed that the licence was valid.

Experience:

- Total flying hours: 21,300, including 2,835 as captain,
- On type: 11,000 hours,
- In previous six months: 190 h 40 min,
- in previous three months: 28 h 40 min,
- in previous last 30 days: 14 h 05 min.

When asked, neither the captain nor the operator was able to produce proof that the captain had been trained in cockpit resource management. It was also impossible to determine the process that had allowed this pilot to operate as a captain, or to determine which checks he had been subjected to by Star Air and Star Jet before taking on this role.

The captain said that he was employed by Star Jet as a freelance pilot within the context of a three-month contract.

1.3.1.2 Co-pilot

Male, 46 years, of Jordanian nationality.

The co-pilot indicated that he had obtained a Jordanian flight engineer's licence in 1984, plus Boeing 707 and L1011 type qualifications.

He submitted a CPL licence plus IR-ME and L1011 qualifications issued by Jordan on 4 December 1989.

A line check had been performed on simulator on 3 December 2004 and a Star Air headed report was issued for the renewal of this licence. It was impossible to find out from the Jordanian civil aviation authorities whether or not the examiner's permit was valid.

The investigators found that the co-pilot also held a CPL IR-ME licence issued by the United States on the 8 October 1996.

The United Arab Emirates issued him an ATPL licence on the 30 June 2005 after he successfully passed the aviation law examination and this was valid until the 29 July 2005. During the investigation, the GCAA admitted that there had been an error and that the regulations only allowed a CPL licence to be issued based on the qualifications he already had.

The United Arab Emirates issued him a 60-day temporary medical certificate on 30 June 2005.

Experience:

- Total flying hours: 5,636 including 1,966 as flight engineer (on B707 and L1011) and 3,670 as co-pilot on board L1011 airplanes,
- In the previous six months: 156 h 55 min, including 130 h between 12 January and 12 February 2005.
- In the previous three months: 26 h 55 min.
- In the previous month: 11 h 50 min.
- In the previous three days: 11 h 50 min.

When asked, neither the co-pilot nor the operator was able to produce proof that the co-pilot had been trained in cockpit resource management.

According to the information he provided, the co-pilot worked for Royal Jordanian from 1984 to 1994, then for various charter operators from 2000 to 2005 (including Star Air from 2002 to April 2004).

1.3.1.3 Flight Engineer

Male, 52 years, of Jordanian nationality.

The only licence presented during the investigation was a flight engineer's licence issued by the United States on 21 March 1990 and validated by the United Arab Emirates for the period from 30 June to 29 July 2005.

No mention was made of type qualification on an American flight engineer's licence. His CV indicated that he had worked on L1011 airplanes for Saudi Airlines and Royal Jordanian Airlines. This could not be confirmed.

Last medical certificate issued: 27 October 2004 by the FAA.

Experience:

- Total: flying hours: 12,782, including 6,138 on L1011 airplanes
- In the previous six months: 380 hours.
- In the previous three months: 65 hours.
- In the previous month: 14 hours.

A certificate was provided by the operator showing that he had taken part in a United Airlines seminar on cockpit resource management in 1988.

1.3.2 Cabin crew

Note: The United Arab Emirates notified ICAO on 7 February 1999 of a difference, in relation to Annex 1 to the Chicago Convention concerning cabin crew rating. In addition to the standards stipulated in the Annex, the United Arab Emirates also require cabin crew members to possess a licence covering age, knowledge, experience, class 3 medical level and skills. No licence of this type was produced by the cabin crew or the operator during the investigation. A temporary permit of one month, valid only for the Olympic Airlines contract, was issued on 30 June 2005 to fifteen cabin crew members. All the cabin crew on the flight in question were on the list.

1.3.2.1 Chief Flight Attendant

Male, 55 years old

The chief flight attendant was qualified for B747, B707, B727, L1011, A310 and A320 airplanes. He was appointed chief flight attendant to Royal Jordanian Airlines in 1981. He then worked for Star Air.

Last emergency procedures training on L1011 taken in Amman with Jordan Airline Training and Simulation (JATS) on 18 May 2005.

1.3.2.2 Flight Attendants

In addition to the chief flight attendant, the crew included six flight attendants. The operator only provided certificates proving attendance at a one-day training course entitled "L1011 emergency procedures" given by JATS, and only for some of these attendants. The investigation later showed that they had all attended a one-day training course in L1011 emergency procedures in the course of the previous year. On the other hand, no evidence was found of their initial basic training. According to the Olympic Airlines operating manual that sets out the required safety level for this charter, at least four cabin crew members should have undergone training.

On 2 July 2005, the GCAA carried out a line check while the airplane was on a positioning flight between Abu Dhabi and Athens. This check revealed, among other things, a need to improve the explanation of the safety measures to the passengers, to correctly stow luggage for takeoff and to improve the cabin crew's knowledge of emergency procedures and first aid. It should be noted that according to United Arab Emirates regulations, all or part of the operations licence may be suspended if the above findings are made.

1.4 Aircraft Information

1.4.1 Airplane history

The Lockheed Tristar airplane S/N 1222 had been purchased by BWIA West Indies Airways (Trinidad) and entered into service on 17 October 1981 bearing the registration 9Y-THA. It was parked in Port of Spain on 28 January 2003 when the fleet was renewed. On 3 November 2003, while it was still the property of BWIA, Sierra Leone registered it under the number 9L-LED and issued a certificate of airworthiness valid until November 2004. Its papers at that time indicated that the owner was Star Air Ltd (Sierra Leone). The Trinidad and Tobago authorities only cancelled its registration in October 2004. Thus, contrary to the requirements of Article 18 of the Chicago Convention, the airplane was registered in more than one state between November 2003 and October 2004.

The airplane was only sold to Star Air Ltd on 7 October 2004, when it made a ferry flight to Amman. It was returned to service on 27 October 2004 for a flight to Rome.

No maintenance operations had been carried out on the airplane during its time in Port-of-Spain and no evidence was found of any work performed prior to the ferry flight. Its owner said that the airplane had been serviced by JORAMCO in Jordan prior to its re-entry into service. JORAMCO did not confirm this information (see 1.10.1.1). The log book shows no record of maintenance prior to 29 October 2004. By this date, in addition to the ferry flight, the airplane had made at least three flights.

The airplane was operated by Star Air under the registration 9L-LED from October 2004 to April 2005. Its log book shows no record of landings in Sierra Leone.

While it still belonged to Star Air, the airplane was registered under the number A6-BSM in the United Arab Emirates on 22 June 2005 and a certificate of airworthiness was issued on 1 July 2005. It was operated by Star Jet from 2 July 2005 onwards under a contract with Olympic Airlines (see 1.10.2.3) without any legal or administrative papers being signed as to the change of ownership or operator.

The insurance certificate provided in the airplane documentation, issued by the Willis company, states that the insured party is the "Star Jet, Jordan" company and that the insurance policy covers an "L1011 airplane registered A6-BSM". Since this document has no legal value, the investigators asked the insurer for a copy of the contract. They were unable to obtain this, apparently, without the consent of the executive Director from Star Jet. It was therefore impossible to determine whether or not the airplane was correctly insured.

1.4.2 Airframe

Manufacturer	Lockheed
Type	Tristar L 1011 – 385 – 3
Serial number	1222
Registration	A6-BSM
Entry into service	1981
Certificate of Airworthiness	1st July 2005, valid until 30 June 2006
Flight history recorded in log book by BWIA on 7 October 2004	62,526 flying hours and 20,615 cycles
Flight history recorded in log book by Star Jet on the date of the incident	62,758 flying hours and 20,694 cycles

Notation in the log book of flights by Star Air and Star Jet does not show all of the flights. For the flights performed between 2 and 4 July 2005 for example, the log book simply states the number of landings (nine) and a number of flying hours (twenty) plus a total number of cycles. Moreover, not all of the lines are completed and it was impossible to validate the information in the log book since there was no other available document to refer to.

1.4.3 Engines

Manufacturer: Rolls-Royce
Type: RB 211-524B4-02.

	Engine 1	Engine 2	Engine 3
Serial number	14,831	14,740	14,791
Total flying hours in June 2005	42,293	50,777	46,477
Cycles since installation	14,192	12,238	15,069

Note: This table was drawn up based on the information given by the operator.

1.4.4 Anomalies noted on airframe and equipment

Following the incident, the French authorities carried out a SAFA inspection (see 1.11.1) of the airplane on 8 July 2005. The crew had already left and their licenses could not be checked.

Numerous anomalies were revealed and have been classified in order of seriousness[4] :

- Class 3 B anomalies[5]: fuel leaks outside tolerances on both wings, hydraulic fluid leaks at the port wing root, below the wings and below the APU, oil leak below the APU, erosion of the OGV on engines 1 and 2, worn tyre, brake blocks in poor condition, water leak at the forward service door;
- Class 2 anomalies:
  - two ELT's non-compliant with the regulations in force since 1st January 2005 (ELT's transmitting at 406 MHz), contrary to what was indicated in the airplane's station licence,
  - a ten to fifteen centimetre long hole in the inner starboard flap fairing seal,
  - RVSM approval, but no referral to the flight manual, and a GPWS installed instead of an EGPWS,
  - no B-RNAV navigation minimum equipment list,
  - B-RNAV approval is given on the basis of the airplane being equipped with a GPS, whereas the MEL does not require a GPS,
  - the flight manual was approved by Trinidad and Tobago in 1995 and was last updated in October 1999. The systems descriptions have not been updated since (TCAS and 8.33 MHz channel spacing),
  - no MEL approval (*).

  Note: the GCAA had authorised Star Jet to use the MMEL; see 1.10.1.3 b).
- Class 1 anomalies: the MEL's submitted were on separate sheets of paper, which made checking difficult.

In view of these findings and the findings of the technical investigators during the early days of the investigation, BEA called in a company approved in L1011 airframes and systems to determine the exact condition of the airplane at the

[4] A Class 1 anomaly is simply notified to the captain, whereas a Class 3D anomaly may jeopardize the route rights of the State responsible for the airplane oversight.

[5] A Class 3B anomaly requires corrective action to be taken prior to airplane departure.

time of the incident. The inspection was carried out on 19 and 20 October 2005. Star Jet, the operator, had been notified. Numerous anomalies were noted during this inspection. The most serious are listed below.

a) Altimetric system and equipment

Flying within RVSM[6] controlled air space requires the pitot-static tubes to be replaced regularly as their service life does not exceed ten years. One of the pitot-static probes dated back to 1992 and the other to 1995. It was impossible to determine their date of entry into service[7].

The airplane was fitted with a GNSS HT9100 FMS and a GPS sensor. According to the flight manual, given that the GPS source has a potential integrity problem, this FMS can only be used for VFR flying and a notice must be installed in the cockpit to warn the crew of this constraint. There was no such warning notice. Moreover, the FMS database validity had expired in 2000.

A "digital output failure" alarm was displayed on CDU's 1 and 2.

There was serious corrosion of the backup batteries on the INS systems.

Autopilot control switch B failed to remain in the "ON" position, but kept returning to "CWS" mode. The Roll Speed Rate and Spoilers 5 and 6 port and starboard side (outer) alarms repeatedly activated.

b) Safety and survival equipment

The smoke detectors in the toilets were unserviceable. Some of them even had no batteries.

Some of the passenger oxygen generators had passed their expiry date.

Certain life jackets were not the right size for their storage location and were difficult to pull out.

Note: the fire extinguishing systems were operating, except for the auxiliary fire extinguisher on engine 3, which was empty. The engine fire detection system was operating normally.

c) Airframe

There was serious corrosion on several mechanisms, in particular on the flaps and slats (flap guide rails). Several rivets were missing from the lower left wing. A seal had been added in accordance with a service bulletin, but had been fitted in a makeshift way.

[6] European air space is RVSM above flight level 290.

[7] Annex 6 to the Chicago Convention requires the operator to keep a record of the operating hours of all life-limited assemblies.

Fuel leak detected on opening a landing gear door

Example of a loose screw on a lower wing panel

Example of the fairing of a flap guide rail that had come loose because certain rivets were missing

The following findings were made after pressurizing the circuits and opening the landing gear doors:

- A serious fuel leak outside of safety limits under the right wing. The liquid was flowing onto the brake block of the right L/G. A service bulletin had been issued for this fuel circuit and this seems to have been applied. Damage to the paintwork on the starboard wing seemed to indicate that this leak was not recent [8].

[8] A Star Jet mechanic, authorised by the GCAA to issue APRS, noted on 28 July 2005 a fuel leak underneath one wing. Estimating that it was within maintenance manual tolerances, he signed a technical memo that allowed the repair to be delayed until its return to base.

- A hydraulic fluid leak outside of safety limits (roughly seventy drops per minute) under the left wing. The liquid was flowing onto the left L/G brake block.

The cargo door actuator was ripped off and the support provided for opening did not ensure the safety of the personnel handling the door. The lower nut on the actuator was missing and the screw was almost out of its fitting. An electric cable had been crushed by the closing of the door. The electric motor actuating the door was no longer attached to the airframe. The pressure seal fitted on the door frame was rotten and part of the upper door frame was broken. In view of the condition of this door, the specialists were sceptical as to the potential consequences of performing any new pressurisation cycles.

Off-centre cargo door actuator

Actuator motor separated from the airframe

1.4.5 Weight and balance

1.4.5.1 Number of persons on board

The weight and balance sheet provided at 13h35 by the handling agent used by Olympic Airlines during the stopover, and given to the crew, indicates 252 passengers, two flight crew members and seven cabin crew members. It should be noted that the handling agent did not have the information required to determine the balance.

The operator's weight and balance sheet, filled in by the flight engineer, indicates 259 passengers and three crew members.

After some passengers had disembarked then re-boarded the airplane, the weight estimate issued at 16h15 by the handling agent indicated 237 passengers and specified that this was only an estimation due to the confusing boarding situation (several passengers had refused to return to the airplane). Inconsistency between the different loading documents did not allow determination of whether or not the luggage belonging to the passengers who remained on the ground was removed from the airplane.

The weight and balance sheet was not modified. It is not possible to determine the number of persons on board at the time of takeoff based on these documents.

1.4.5.2 Context and available documentation

The documentation available on board was unclear, incomplete and could not be used to calculate the airplane weight and balance. For example, the version applicable to operations was not defined.

Weight calculation

The table below gives a few examples of the discrepancies in the documentation that Star Jet gave to the crew concerning the data to be used to calculate the airplane weight.

	Operations manual	Loading manual	Other documents
Empty weight equipped			109,753 kg, i.e. 241,457 lbs, in a weight sheet issued by GAMCO on 30 June 2005(*) 242,472 lbs in the weight report issued by BWIA on 20 June 2001
Passenger, luggage weight	84 kgs for an adult (Part A) 75 kgs for an adult (Part B) 11.14 kgs for checked-in luggage in hold (Part B)	183 lbs for a man ; 160 lbs for a woman According to this manual, checked-in luggage must be weighed	
Maximum Take-Off Weight	510,000 lbs in the "limitations" section 430,000 lbs in the "loading" section		409,140 lbs (airplane noise abatement certificate issued by the GCAA) 504,000 lbs (Flight Manual)

(*)Note: This weight sheet, the only one in the airplane documentation that mentioned registration number A6-BSM, corresponds to airplane S/N 1179 (also owned by Star Air)

instead of 1222 (the actual S/N of airplane A6-BSM). In this document, serial number 1179 has been deleted by hand and replaced by serial number 1222. After questioning GAMCO (United Arab Emirates), it was still impossible to determine which airplane was in fact weighed[9].

[9] GAMCO executives stated verbally that airplane S/N 1179 was not in their workshop on the date of weighing.

The only basic weight data for the operating configuration found in the operator's reference documents had been determined by BWIA for its own purposes (for example, 256,497 lbs for a crew of twelve). On the load and trim sheets filled in by the crews, only one basic weight is given for the operating configuration (243,700 lbs). It was impossible to determine the origin of this data.

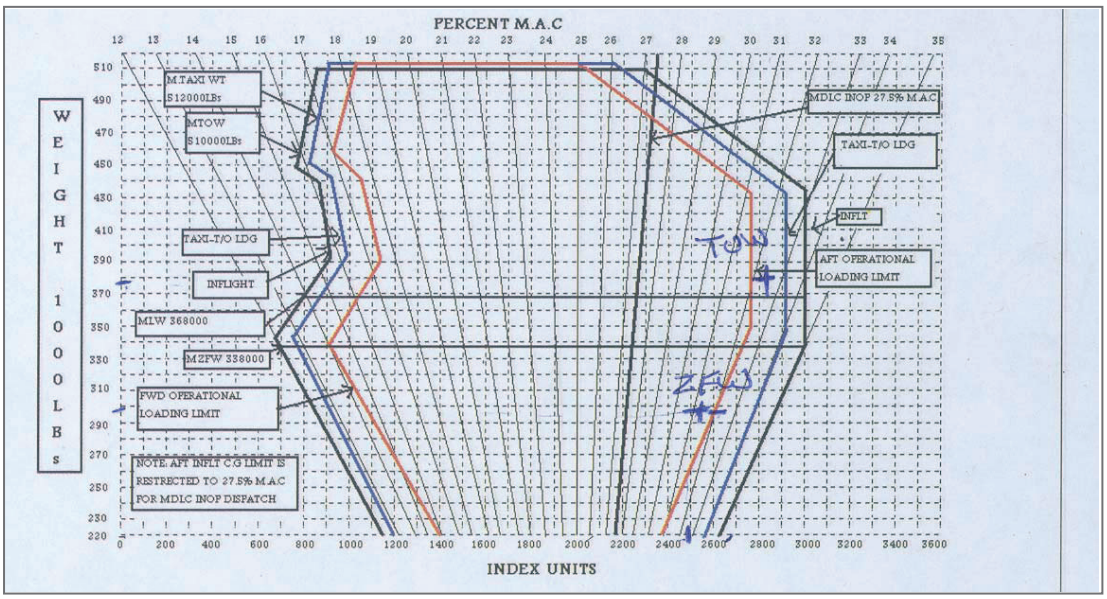
The unit weight values used by the crews for the weight and balance sheets cannot always be deduced from these documents (some contain a passenger weight without mentioning the number of passengers). However, some values were found on these sheets, for example a weight per adult with cabin luggage: this varies from 77.5 kg to 116 kg.

Determining the airplane centre of gravity

On board, the crew had an undated table showing the variations in the index as a function of load distribution. This table shows two indices for empty weight equipped. One (2,782) refers to the airplane's previous registration number (9L-LED); the other (2,555) refers to another airplane, registered 9L-LDR (in other words, airplane S/N 1179). Moreover, the weight report issued by GAMCO gives a value of 2,161.

These three different empty weight equipped indices had been used randomly by the crews on the weight and balance sheets found on board.

Note: The maximum permitted index range calculated for loading is 2,300. This must be compared with the range of uncertainty of 621 between the indices used.



Excerpt from the load sheet filled in for a CDG-ATH flight on 2 July 2005 (using the index given on the weight report issued by GAMCO, i.e. 2,161). The index of 2,782 given in the table provided by the operator for airplane 9L-LED made takeoff impossible.

1.5 Meteorological Conditions

The weather report at 16h00 from Paris Charles de Gaulle indicated a wind direction of 280°, a wind speed of sixteen knots, visibility greater than ten kilometres, showers in the vicinity of the aerodrome, scattered clouds at four thousand feet, scattered clouds at 4,600 ft, a temperature of 19°C and a dew point of 8°C. QNH was 1,012 hPa. No significant change was forecast over the next two hours following this report.

1.6 Telecommunications

According to computerised records, the flight plan was activated at 12h38 and a transponder code 5630 assigned to the flight (at this point, all passengers had boarded and all freight and luggage had been loaded). At 13h07, flight plan activation was cancelled. The flight plan was activated again at 15h24 and a transponder code 0667 assigned. The departure slot was then modified twice by the CFMU. Takeoff was finally scheduled for 16h15.

The recordings kept after the event by ATC began at 15h55m20 and did not cover the conversations concerning the delivery of the departure clearance. Appendix 1 contains a transcript of the ground communications up until 16h12m30. The subsequent communications are included in the CVR transcript. The recordings start with a call from the pilot to the pre-flight controller and mention a takeoff slot at 16h15. It appears that the crew then asked the ground controller several times for a departure clearance[10]. The ground controller did not seem to understand what he was being asked. He issued a start-up clearance then a pushback clearance, then a taxiing clearance.

[10] According to the control tower operations manual, departure clearances are valid as long as they have not been modified.

Appendix 2 shows the radar track of the airplane. It gives further information about the conversations between the crew and air traffic control. It should be noted that the transponder code 5630 remained displayed during the entire flight.

Shortly after takeoff, the LOC N controller contacted the crew twice to ask them to switch to transponder code 0667. When the crew replied, it was to signal an engine failure. At between 2,000 and 2,500 ft, the crew asked for radar vectors to return to the aerodrome. ATC first cleared the airplane to turn right on heading 090° to return to the runway at 2,000 ft, and then let the crew choose the direction of turn. The crew continued turning to the right and asked for clearance to head for the fuel jettison area, then after some confusion, cancelled this request. The controller then asked the crew if they were able to make a "sort of visual approach". The crew replied that the runway was in view and that they were going to try. The controller gave a heading of 180° then 240° to intercept final on runway 27L. Without a reaction from the crew, the controller asked the crew to turn right to the runway centreline then cleared it to land.

Note: during the flight, the controller asked for the type of failure on four occasions, in particular twice while the airplane was on the base leg on heading 180° after being cleared to heading 240° for interception.

1.7 Aerodrome Information

1.7.1 Paris Charles de Gaulle Airport

Paris Charles de Gaulle is a controlled aerodrome open to public air traffic. It is situated twenty-five kilometres north-east of Paris, at an average altitude of one hundred and twenty metres. It has four runways:

- to the south, dual runways 08/26: Runway 08L/26R is 4,215 m long and 45 m wide; runway 08R/26L is 2,700 m long and 60 m wide;
- to the north, dual runways 09/27: Runway 09R/27L is 4,200 m long and 45 m wide; runway 09L/27R is 2,700 m long and 60 m wide.

1.7.2 Engine failure on takeoff

The France AIP does not give any particular instructions in the event of engine failure on takeoff from Paris Charles de Gaulle Airport.

The operator did not define any specific engine failure procedure. The GCAA imposed no specific requirements on Star Jet concerning this situation.

The crew applied the procedure recommended by the manufacturer.

1.7.3 RNAV instructions published at Paris Charles de Gaulle

The Paris Charles de Gaulle terminal control area uses standard RNAV arrival and departure procedures. RNAV procedures can be followed by airplane equipped with a basic surface navigation system (B-RNAV) on condition that:

- they use a database containing the navaids, the waypoints and the encoded tracks of the departure, arrival and initial approach procedures for the area concerned;
- that the crew is informed of the expiry date of the database;
- that the airplane position is computed by the navigation computer based on VOR/DME, DME/DME or GNSS sensor data.

These transitory measures correspond to a required capacity higher than the B-RNAV capacity and are known as "B-RNAV in terminal control areas"[11].

[11]See AIP France.

In the absence of or failure of RNAV capacity, the pilot must announce 'No RNAV'. The crew of the A6-BSM failed to do this.

1.8 Flight Recorders

1.8.1 FDR

The flight data recorder (FDR) installed on board the A6-BSM was a Lockheed model 70-203E (L209), P/N 2222597-3 with S/N 373.

The recorder was not damaged, so the BEA performed a direct data readout in accordance with the usual procedures in this case. However, once switched on, the FDR delivered no data. Since the BEA did not have the equipment required to play back a tape extracted from this rather old type of FDR, it was sent to the AAIB, the British accident investigation board.

On opening the FDR, the AAIB investigators found that the tape was damaged and was rolled around the capstan. This damage seems to have been caused by a malfunction in the automatic rewind system that rewinds the tape on reaching the end and explains why direct playback was impossible.

Part of the extracted tape was played back. But since the operator had not provided the BEA with the decoding grill associated with this recorder[12] and despite the use of a chart from a similar type of airplane, it was not possible to read out the data.

The MEL stipulates that if the crew detects a failure of the FDR at a point where repair is impossible, they have three calendar days (not including the day on which the failure was detected) in which to repair it, provided the CVR is operational. No mention of the failed FDR was indicated on the maintenance sheets on board the airplane.

However, on 26 June 2005, following observation of a warning light that was permanently on in the cockpit, a mechanic from GAMCO had disconnected the FDR, cleaned the connectors then reconnected it. He said that the light switched off after this. The manufacturer confirmed that this procedure could have been enough to solve the problem encountered, provided it was not a recurring problem[13].

1.8.2 CVR

The Cockpit Voice Recorder (CVR) was a four-track Fairchild A100 type recorder. The tape was in good condition, but the recording was of poor quality: a lot of background noise indicated that the crew were probably not wearing headsets.

Appendix 3 contains a complete transcript of the flight recording. The following key points were noted.

Note: The crew repeatedly used ambiguous terms or non-explicit abbreviations.

The recording begins with the normal pre-taxi check-list[14]. Takeoff and initial climb-out were normal. The call-outs were made up until the flaps were retracted from 14° to 10°, at which points thumps were heard.

The flight engineer announced serious damage to engine 3 and the captain called for the SERIOUS DAMAGE emergency procedure to be applied.

An engine 3 fire extinguisher was discharged. At this point, one call from the cabin and two from the controller were heard. The crew ignored these calls and finally informed the controller that there was an engine failure.

The co-pilot grudgingly accepted to hand over control to the captain. It appears that he contested the captain's authority from this point on. It should also be noted that the crew had difficulties in following up their tasks. In particular, the captain no longer followed the controller's instructions, some of his requests not being followed by answers or action. For example, he asked several times for the ILS to be displayed on his side, yet he was unable to see the runway from his position in the cockpit.

[12] Supplement A to Annex 6 of the Chicago Convention states: 'The operator should keep records of the allocation of parameters, the conversion equations, the regular calibration and the operating/maintenance status of the flight recorders. These records should contain sufficient information to ensure that any authorities investigating an accident will have sufficient information to be able to read the data in the form of technical units'.

[13] When asked, the manufacturer was unable to say whether the warning light is supposed to light up if the tape breaks.

[14] Note: The various normal check-lists (post-takeoff, approach and pre-landing) were performed during flight.

Note: from the moment the crew had to deal with the engine failure, they lacked method in applying the procedures and did not accept the captain's authority.

Several calls from the cabin to the cockpit were heard. The flight crew did not reply. On final, the flight engineer informed the passengers that they were returning to land at Paris Charles de Gaulle due to an engine failure.

The captain stated several times, including once during flight that they must not ask for assistance from the fire service, apparently for fear of the associated costs.

At the end of taxiing, the crew discussed the incident. The flight engineer justified his 'serious damage' call by saying that he had judged this by the noises he had heard, not the TGT.

1.9 Examinations and Research

1.9.1 Technical examinations

a) First borescope examination of engine 3

Description of a failure of this type would require an engine examination. In the case of an incident, this examination is usually performed during repair. In this case, the operator had decided to perform the repair in Amman. A borescope examination of engine 3 (limited to the high-pressure compressor only) was carried out on 10 July 2005 and was attended by representatives from the BEA.

Several blades from compressor stages 4, 5 and 6 showed signs of damage (marks, scratches, scores or shocks) on their leading edges and/or their trailing edges. In particular, a piece measuring 0.66 inches long and 0.5 inches deep had been ripped off the top and the trailing edge of a blade from stage 4.

Note: when consulted by the BEA, Rolls-Royce did not consider that this damage was sufficient to explain a surge.

The JALCO (Jordan) workshop, when asked by the owner, said that "the engine could still be used for five flights or twenty-five hours (respecting the most stringent limit) before replacement, provided there was no other damage than that noted during the borescope examination and provided the vibrations and the TGT values remained within acceptable limits".

On 13 July 2005, a mechanic from Star Jet, authorised by the GCAA to issue approvals, issued an approval for return to service for five flights or twenty-five hours (respecting the most stringent limit) so that the engine could be replaced at the airplane's base. However, the DGAC subjected this ferry flight to certain conditions that the operator never complied with.

b) In-depth borescope examination of the engine

After about a year of complete blockage, tired of waiting for the owner to act and without the engine having been removed, the BEA had an in-depth borescope examination of the engine carried out by the manufacturer on 26 June 2006. This examination concerned both the high-pressure part of the compressor that had already been examined, plus the intermediate pressure section.

(15) Jalco officially confirmed this information in a letter on 20 July, apparently a few days after receiving telephone calls from the owner. Note that Jalco's reply is addressed to Star Air.

(16) These conditions included that the operator obtain Rolls-Royce's consent before using engine 3, or if necessary, that it replace the engine, and that it must obtain an airworthiness certificate for the airplane from an L1011 approved agency.

No signs of fire or fire extinguishing agent were detected. It was impossible to determine when the fire extinguisher had been discharged (see above).

High-pressure section of the compressor

In addition to the findings of the examination of 10 July 2005, this examination also found the following:

- Ten blades from stage 4 showed damage caused by an object passing through the compressor.
- Twenty blades from stage 5 had marks on the trailing edge.
- Twenty-five blades from stage 6 showed significant damage to the leading edge. Maximum extent of damage: 10 x 10 mm.

Intermediate pressure section of the compressor

Stages 2, 3, 4 and 5 of the intermediate section of the compressor were damaged. In particular there was extensive damage to the leading edge at both ends of two of the second stage blades (approximately 20 x 13 mm); twenty-five other blades of this stage showed distortion at the leading edge. Similar distortion was observed on stages 3 and 4.

Based on its examination, Rolls Royce concluded that the damage had been caused by an object passing through the intermediate and high-pressure parts of the compressor. Such damage was not sufficient to explain an engine surge.

Note: the reports found on board the airplane did not mention any object being ingested by the compressor. External visual inspections of the rotating assemblies did not show any sign of debris passing through the rear part of the low-pressure turbine. Without additional information, it was impossible to determine what kind of object (internal or external) damaged the high-pressure compressor and on what date this occurred.

c) Acoustic signature of the anomaly on engine 3

The acoustic recording showed that, forty to fifty seconds after the brakes were released, twenty-eight thumping sounds were heard over a period lasting eight to ten seconds. The acoustic signature of these noises corresponds to a sustained (pop) surge. The surge cycles continued until the engine was shut down. This put a stop to the process.

d) Additional information

The captain mentioned in his incident report (see Appendix 5) that no precursors had been noticed, except that engine 3 had taken longer to accelerate during the previous flight. No equipment report mentioned this. The EGT values recorded during the previous five flights show that engine 3 was operating normally with respect to the other engines.

Since the engine was never removed, it was impossible to check certain characteristics that can contribute to surge tolerance, such as the condition of the abrasive coating on the stator casing, or the clearance between the tip of the compressor blades and the stator casing. However, given the number of cycles carried out by this engine since its entry into service, its operating hours and the date of its last overhaul, it is probable that normal wear and tear had reduced compressor efficiency.

The engine manufacturer indicated that taking off with an engine in this condition could lead to a further surge.

1.9.2 Evaluation of the level of safety in the cabin

The flight crew did not declare an emergency and kept control of the airplane. However, regardless of the points covered in paragraph 1.3, the circumstances of the incident led the BEA to question the cabin crew's reactions and the operator's safety procedures.

The following information was mainly gathered from questionnaires drawn up by the BEA and handed out by Olympic Airlines to the passengers.

The passengers had not been informed that the flight was going to be flown by an airline other than Olympic Airlines; At best, they only noticed this on boarding. They were not informed of the reasons for the delay in boarding. Moreover, boarding was disorderly since seat numbers had not been assigned. The airplane was old (ceilings and armrests falling off; overhead bins that did not close).

There was a long wait after boarding, during which the passengers could hear hammering on the fuselage. The passengers had the impression that the cabin crew were out of their depth. On the rare occasions that they gave any information, it was in poor English or in another unidentified language, repeating "No problem". Some passengers thought they understood that there was a problem with the hold[17]. Many passengers finally left the airplane and some refused to get back on board.

[17] See 1.1.

After takeoff, the passengers noticed fire coming out of the starboard engine and an acrid smell of smoke. They became nervous, and then began to panic. The cabin crew did not seem to know how to react. The passengers were not clearly informed of what was happening and received no instructions concerning landing. Moreover, the language difficulties mentioned above made communication difficult and the attitude of the cabin crew discouraged the passengers from asking for explanations.

1.10 Information on Organisations and Management

1.10.1 Star Jet

1.10.1.1 Context of operations

At the time of the incident, the Star Jet airline was being set up in Sharjah in the United Arab Emirates. Its chairman was apparently also the chairman and owner of another airline, Star Air. The personnel and airplane seem to have

been common to both companies. Most of the Star Jet personnel, including the flight crew of the 4 July 2005 flight, had worked for Star Air; others had worked for another operator in Sierra Leone, Air Universal.

a) Star Air

The information gathered shows that Star Air was registered in Gibraltar and its main offices were in Amman in Jordan. The Sierra Leone authorities had issued an airline operator's certificate, renewed on 18 December 2004 and valid until 17 December 2005. In addition to airplane A6-BSM, Star Air also owned two other Lockheed 1011 airplanes. In August 2005, the chairman of both companies told the investigators that one airplane was in the hangar of the GAMCO maintenance company pending its registration in the United Arab Emirates and that the other was parked in Damascus where it was to be sold.

The three airplanes belonging to Star Air had been registered in Sierra Leone and used for chartered flights. In September 2003, the British authorities inspected one Star Air airplane as part of the SAFA inspection programme, and inspected it again in October 2003[18]. In November 2003, in view of the facts established as part of the inspection follow-up procedure, the British authorities decided to authorise Star Air to operate an air service in the United Kingdom only provided sufficient guarantees were given with regard to oversight of the operator. The British authorities considered in particular that Star Air's head office was in Jordan and not in Sierra Leone, so it was not in possession of a valid AOC issued by the State of the Operator (see 1.10.6), in compliance with Annex 6. In January 2004, the British authorities refused air service rights to Star Air.

The European civil aviation authorities taking part in the SAFA programme were informed of this decision by the CAA and the reasons for this. The French DGAC then decided to systematically refuse air service rights to all non-EU airlines using Star Air services for flights in France.

In the reply to the British authorities, the General Director of Civil Aviation of Sierra Leone stated that he had suspended Star Air's and Air Universal's air operator certificates and their airplane registrations as from 27 August 2004. However, no official papers were ever served on these operators, who therefore continued operating.

Note: The African press mentioned at the time that a police investigation was being carried out in relation to the connections between Star Air, Air Universal and International Aviation Surveyors, a British contractor in Sierra Leone. Appendix 4 shows an excerpt from the report published by the Sunday Times of South Africa.

The British authorities were unsatisfied as to the ability of the Sierra Leone authorities to ensure guaranteed oversight (see 1.10.1.3 and 1.10.1.4); so on 7 October 2004, all airlines and airplanes from Sierra Leone were banned from the United Kingdom.

The GCAA also considered that ICAO safety standards were not met and on 25 September 2004 banned all airplanes registered in Sierra Leone from entering the United Arab Emirates.

[18] These inspections were carried out on airplane 9L-LDN. They revealed deficiencies with regard to the safety equipment and with the general maintenance of the airplane. The inspectors also noted hydraulic fluid and fuel leaks, objects that were not tied down in the hold and serious damage to the tyres.

b) Star Jet

Faced with these difficulties, the chairman of Star Air took measures to obtain an air operator certificate from the United Arab Emirates in August 2004 for his new company, Star Jet. The UAE authorities issued him the necessary documents to fulfil the charter contract signed on 29 June 2005 with Olympic Airlines. This temporary AOC was valid from 2 July to 1 August 2005.

1.10.1.2 Organisation of operations

a) Structure

It is impossible to determine how Star Jet is organised based on its operations manual. The list of managers appointed to regulatory functions, such as the operations division or the quality assurance division, does not correspond to the organisation chart presented just three pages earlier. In general, it is clear from the elements gathered as part of the investigation that Star Jet has no crew management structure.

The responsibilities and tasks of the flight safety director are not described in this document. In any case, the efficiency of any such function may be called into question in the absence of flight data analysis, which is contrary to the provisions of Annex 6 applicable in the United Arab Emirates. Moreover, the operations manual does not describe the functions and responsibilities of the 'director of ground operations' and technical documents manager and scheduling manager. The operations manual stipulates that the aviation operations manager temporarily performs the functions of training manager and director of ground operations.

Nothing observed during the investigation supported the idea that the organisational deficiencies described above were simply the result of an inaccurate description in the operations manual, while the actual physical organisation was in fact satisfactory. Quite to the contrary!

The operator's premises in Sharjah were not compliant with the standards defined in UAE regulations, according to the audit performed by the GCAA (see para. 1.10.1.2).

b) Operational documentation

The Star Jet Operations Manual found on the airplane was dated June 2005. The 650 pages of this manual are not divided into any sections or sub-sections. Part A «General» is a rehash of airplane operations regulations (which explains the reference to operations not concerning Star Jet, e.g. single-engine piston aircraft and helicopter operations) alongside instructions for writing an operations manual. Reference is made to sub-sections and figures which are either non-existent or not referenced (no description of management responsibilities, reference to maintenance procedures which are not described, etc.). Clear limitations on the number of route stages or flight time for crews were not found in this manual. It is possible to fly for five consecutive nights.

It would seem that the only purpose of this virtually unusable document was to satisfy regulatory checks with a view to obtaining an air transport

[19] On the other hand, the Star Air operations manual set a limit of thirty-five flying hours over seven consecutive days. Between 14 and 19 January 2005, the co-pilot, then an employee of Star Air, had flown for 53h10mins.

certificate. It does not correspond to a reference document which could be used to organise operations by providing descriptions of the resources and procedures in place to meet regulatory requirements.

Used by Star Jet as the MEL and last revised in 2000, the MMEL does not allow the crew to identify all the equipment required for scheduled flights. For example, it does not provide information for determining the minimum equipment required for entering European RVSM airspace.[20]

On 28 September 2001, the manufacturer issued the last update of the flight manual for airplane no. 1222. Continued follow-up and updates of this manual were not requested either by Star Air or Star Jet. Some sections in this manual are unusable: it is not organised into sections, some photocopies are incomplete and some systems are not described (FMS and TCAS).

Note: a Star Air operations manual dated 1 September 2003 was also found on board A6-BSM. While the form of this document is different, it has similar shortcomings to the Star Jet manual.

[20] A Star Air MEL was also found on board. The approval date by Sierra Leone could not be found; the last revision by BWIA was dated July 2002.

c) Maintenance

General maintenance framework

The United Arab Emirates issued Star Jet a three-month authorisation to use version 7 (from June 2000) of the maintenance programme defined by the manufacturer, pending validation of a maintenance programme specific to the operator. The GCAA also specified that an operator with a AOC was required by national law to sign a maintenance agreement with an approved body.

Star Jet stated that maintenance had been carried out by the JORAMCO workshop (Jordan) when the airplane was registered in Sierra Leone, but was now carried out by the GAMCO JAR-145 workshop based in the United Arab Emirates. When questioned regarding this, GAMCO stated that it had only performed type A and A2 inspections, along with work requested by the operator during an inspection visit from 22 June to 2 July 2005. By August 2005, no maintenance agreement with an approved workshop had been submitted to the GCAA, and no valid agreement had been shown to the BEA. A signed agreement was eventually submitted to investigators in 2006. GAMCO did not confirm the validity of this agreement when questioned. As for JORAMCO, it stated that a non-exclusive agreement, which had expired in January 2005, had been signed with Star Air covering maintenance operations on demand and that the only maintenance operations performed in its workshop on the airplane with serial number 1222 were trouble shooting and repair work on 3 November 2004 and 12 February 2005.

It should be noted that the operator did not provide the crew and mechanics with airplane technical logbooks. Only loose sheets of paper carrying the Star Jet header were found on board. At the June 2005 inspection, the operator had submitted similar loose papers to GAMCO carrying the header of another operator (High Altitude Airlines), stating defects, but without reference to a flight, crew or dates. GAMCO had entered this information on maintenance non-routine cards.

On 3 July 2005, following the Larnaca – Athens flight, the same captain as on flight OA202 on 4 July completed a log sheet indicating the loss of heading reference system indications for a period of 15 minutes. On the same day, the airplane mechanic responded that both systems had been checked and were considered satisfactory. On 4 July, prior to departure for Paris, the mechanic completed a log sheet stating that he had changed two couplers and the compass compensators. This operation may have contributed to the delay in departing from Athens (cf. 1.1).

The log sheets completed on 4, 7 and 27 July 2007 by a Star Jet mechanic stated that the airplane was authorised to fly again. Questions can thus be raised on the thoroughness of the checks carried out, given observations on the real condition of the airplane.

The operator did not submit any satisfactory documents to investigators on the monitoring of life-limited emergency equipment.

Work carried out by GAMCO

The detailed contents of the GAMCO check, a type A check with a series of checks qualified as type A2 by the operator and a certain number of specific requests, were defined by the operator. The maintenance work carried out covered the following elements in particular: engines, wings and their landing gear bay, the outside of the airplane (including a visual check of the hold doors and seals), the flight compartment (crew oxygen system, no verification of the navigation systems or the altimeter system) and the flight cabin (checks for leaks in the oxygen equipment and smoke detector tests in the toilets). On engine 3, the cold air duct and the annulus were to be cleaned, the mobile part of the low-pressure compressor was to be removed and the fan blades to be checked, the fuel flow governor was to be cleaned, the oil was to be changed and the thrust reverser pneumatic motor replaced and checks to be made for signs of overheating.

The reference numbers from the maintenance log sheets were entered in the logbook as and when the problems were dealt with.

Available documents and observations from the investigation suggest that such a limited check could not guarantee the airworthiness of an airplane for which previous maintenance had been inadequate, and that the work carried out was not always satisfactory.

Note: The first item in a type A flight compartment check consists of checking the items listed in the airplane technical logbook to ensure that crew complaints have been correctly dealt with. This may require analysis of previous logbooks. In the absence of these logbooks, it would seem that GAMCO considered that the log sheets submitted by the operator contained all the complaints made.

One of the maintenance follow-up worksheets completed by GAMCO stated the need to update the GPS database; the operator's maintenance director responded on the sheet that this was not needed. The investigation showed that the database was out of date.

As part of the type A check, GAMCO carried out a borescope examination of the high-pressure engine turbines. No anomalies were found or specified.

GAMCO did not observe any malfunction on the smoke detection system in the toilets, whereas it was noted that these detectors were not working. It is impossible, of course, to rule out the possibility that passengers or crew damaged all the detectors during the initial flights, to smoke in the toilets for example.

Note: These detectors must be checked by the cabin crew during the first pre-flight check every day.

When questioned, GAMCO initially stated that no mechanical malfunction had been found on the cargo door. When informed of the BEA's observations, the GAMCO quality manager stated that the front cargo door had probably not been inspected as the technician was unable to properly understand the instructions in English and lacked experienced on this type of airplane. His supervisor had nevertheless asked him to sign the relevant work sheet. It should be noted that this supervisor was no longer a GAMCO employee in 2006.

GAMCO also specified that no fuel leaks had been found, while recalling that the tanks contained little fuel, which made it more difficult to detect a leak during the check.

The mechanic stated that the hydraulic leaks were due to a bayonet connector that was not correctly tightened. The part was tightened and deemed satisfactory.

At the end of the check, a faulty drain valve on a toilet and a damaged anti-collision light cover had not been replaced by GAMCO, the workshop indicating that it did not have the required parts in stock.

1.10.1.3 Authorisation for operations

a) Star Air oversight by Sierra Leone

On 7 October 2004, as part of their international obligations regarding airworthiness oversight and the issue of air transport certificates, the Sierra Leone authorities signed an agreement with a service provider called International Aviation Surveyors (IAS) with offices in the UK, the USA, Sierra Leone and Malta.

The terms of this agreement consisted in providing Sierra Leone with assistance in oversight for operators who conduct most of their operations outside of Sierra Leone. The agreement contains a list of operators, including Star Air, for which IAS is in charge of routine oversight. IAS acts as an advisor to Sierra Leone inasmuch as only the authorities of this country are authorised to deliver air operator certificates and are responsible for safety oversight.

Article 7 of the agreement specifies that the operators under IAS's oversight have their main operations office in Freetown (Sierra Leone). Star Air is however stated in the same agreement as being based in Jordan.

Note: The Sierra Leone authorities used this and another address in Sierra Leone indiscriminately to identify Star Air.

The provisions of the agreement do not describe the organisation and level of inspections carried out by IAS. It is specified, however, that this company can carry out spot inspections on an operator on request from the authorities.

Following an audit carried out by IAS between 12 and 14 December 2004, i.e. after the UK bans, Sierra Leone sent a letter to Star Air on 21 December 2004 requesting the following in particular:

- a general improvement in the appearance of its offices;
- a tidy operations room and measures to prevent people loitering on the premises;
- an improvement in the filing system to be able to differentiate between permanent and temporary crews;
- conversion of the operations manual to JAR-OPS 1 or IOSA format[21] ;
- numbering of the copies of this manual to facilitate tracking;
- the set-up of a quality division;
- a review of its organisation to avoid conflict between operational and commercial aspects.

[21]IOSA: IATA Operational Safety Audit Programme.

Sierra Leone officially suspended Star Air's AOC on 11 July 2005. The reasons given were that it had already issued warnings about false certificates presented to the Nigerian authorities and that the SAFA inspections carried out in London and Paris (following the incident, see para. 1.4.4) were not satisfactory.

b) Certification of Star Jet by the United Arab Emirates

According to United Arab Emirate regulations, there were five phases involved in the AOC delivery process:

- a preliminary application,
- the actual application,
- assessment of the documents,
- an check and test flights, the number of which depends on the type of operations,
- certification.

Star Air had filed a AOC application with the GCAA at the beginning of 2004 with a letter from the Sharjah civil aviation authority stating that it had no objections to this company setting up in the "free zone" in this Emirate[22]. On 21 July 2004, the GCAA suspended the issuance process as the operator had not followed through with the procedure.

[22]The GCAA stated that outside of the "free zones", UAE regulations require most of the capital in companies based in the Emirates to originate from the Emirates.

On 31 August 2004, Star Jet, and not Star Air, submitted its documents for GCAA approval. On 25 September 2004, the GCAA informed it of the shortcomings noted at the first analysis. On 31 May 2005, following a verification of the documents, the GCAA informed Star Jet of the points needing to be corrected, the deadlines for correction depending on the importance of the point. The most significant observations required corrective action within a month. One of these was the request to modify the operations manual, in particular:

- by properly structuring it;
- by ensuring that the actual organisation corresponded to the organisation chart;
- by describing the quality system;
- by describing the flight analysis programme;
- by providing the crews with the procedures for RVSM and BRNAV operations and any relevant training;
- by removing references to non-relevant regulations;
- by adding crew experience requirements.

On 18 June 2005, Star Jet indicated that it had modified its manuals accordingly. The GCAA approved the operations manual and the Star Jet training manual on 1 July before ensuring that the operator had included the modifications in a satisfactory manner.

On 2 July 2005, the GCAA issued a temporary one-month operating authorisation to Star Jet for international flights.

In this temporary authorisation, the GCAA:

- authorized he transportation of hazardous goods (30 June 2005);
- authorized use of the MMEL and the manufacturer's maintenance programme for three months (1 July);
- allowed two Star Jet employees (one on 27 June and the other on 2 July) to deliver approvals for return to service for a period of three months for the L1011s owned by Star Air and operated by Star Jet;
- authorized the use of the format proposed by Star Jet for the airplane technical logbooks and deferred work follow-up (5 July).

On 19 July 2005, the GCAA carried out an check of Star Jet. All the observations raised required corrective action within a month. The following were mentioned:

- premises ill-adapted to operations envisaged;
- vacant positions, including flight operations director, flight safety officer, quality manager, operations personnel and training manager;
- absence of a flight analysis programme;
- absence of a training plan for flight personnel (management of crew resources, emergency equipment, route competence qualification, etc.);
- not enough Jeppesen files, AIP's, airplane manuals, operating manuals, etc. available to employees.

On 1 August 2005, Star Air's temporary AOC expired. On 10 August 2005, the operator responded to the observations of 19 July stating that the corrective action was under way.

On 14 August 2005, the GCAA noted that the airplane maintenance programme had not been submitted. A check carried out on Star Jet documents revealed other organisational shortcomings, in particular:

- comments on maintenance organisation not taken into account;
- no quality manager was appointed.

The procedure for issuing a permanent AOC to Star Jet was thus suspended.

1.10.1.4 Airworthiness Certificates

a) Issue of a certificate of airworthiness by Sierra Leone

An engineer working for a maintenance company based in Malta (NCA) had been commissioned by IAS to inspect the airplane parked in Port of Spain on 1 November 2003[(23)]. The inspection report mentioned certain figures from the airplane documents (e.g. number of engine cycles) and certified as to the presence or absence on board of certain equipment, without commenting on airworthiness. This report was submitted to the Sierra Leone authorities, who used it to issue a certificate of airworthiness and register the airplane as 9L-LED.

[(23)]At this time, collaboration between IAS and the Sierra Leone authorities was not covered by the aforementioned agreement.

According to Article 9 of the agreement of 7 October 2004, airplane registered in Sierra Leone operating for more than six consecutive months under a Seventh Freedom of the Air (i.e. between several airports located outside of Sierra Leone) were subject to inspections by IAS, which had to report its findings to the Sierra Leone authorities. The cost of these inspections was borne by the operator. No airworthiness follow-up report on 9L-LED was produced during the investigation.

Sierra Leone issued an RVSM authorisation on 22 December 2004.

b) Issue of the certificate of airworthiness by the United Arab Emirates

The GCAA stated that it asked Star Jet to have the next check required by the maintenance programme carried out by an approved body. On 22 June 2005, the airplane went to Gamco and was registered under number A6-BSM in the United Arab Emirates.

On 25 June 2005, Star Jet filed an application for a certificate of airworthiness. This application was made by completing a form containing general information on the airplane, a documentation audit, a paragraph about mode S, another about an in-flight check, a paragraph about maintenance and the findings of an airworthiness inspection on the airplane. A Star Jet employee calling himself the quality manager completed this form specifying that the inspections were satisfactory. In particlular the form certified that the operator had signed a maintenance contract with the JORAMCO workshop. It did not highlight any anomalies concerning documentation or the airplane and stated that an in-flight inspection was not necessary; it also mentioned that the last weigh had been in January 2001 and the next one was scheduled for June 2006.

A GCAA inspector approved the issue of a certificate of airworthiness for A6-BSM on 1 July based on this document. The certificate was issued on the same day. A six-month exemption was issued regarding EGPWS. At this stage, maintenance operations were still under way at GAMCO (painting work in particular).

Star Jet had not submitted a valid maintenance agreement to the GCAA (see para. 1.10.1.2 c).

The checklist for the issue of the certificate of airworthiness was approved on 4 July 2005, after the airplane was back in service.

The United Arab Emirates issued an RVSM approval on issue of the certificate of airworthiness, and unlimited approval for B-RNAV and RNP5 operations based solely on the HT9100 GNSS GPS installed on board. It should also be noted that the operational equipment on the airplane, subject to demonstrating that the INS operated correctly, provided at best B-RNAV capacity for flights of no more than two hours.

1.10.2 Conditions of the charter

1.10.2.1 Charter context

Faced with extended unavailability of one of its airplanes due to maintenance, Olympic Airlines had decided to charter a jumbo jet to fly certain European connections departing from Athens.

At the beginning of June 2005, Olympic Airlines called on K&K Airline Services, a service provider acting as an intermediary between airplane charterers and owners. K&K Airline Services called on Star Air, an operator that had already worked for Olympic Airlines in July 2004 through K&K services. The contract was finally signed on 27 June 2005 between Olympic Airlines and K&K Airline Services for the Start Jet charter. The contract between K&K Airline Services and Star Jet was signed on 29 June 2005.

Since this was an ACMI type lease (including airplane, crew, maintenance and insurance), the airplane remained registered under the Star Jet certificate of airworthiness to be operated by its personnel in compliance with its operations manual. Olympic Airlines was responsible for the operational aspects related to stop-over assistance (flight preparation, stop-over operations, etc.) and passenger insurance.

1.10.2.2 Regulations within the European Union

Council Regulation 2407/92 relative to air operator licences established in the Community allow an EU Member State (Article 8.3) to authorise one of its operators to use an airplane registered outside the EU in the context of short-term lease agreements to meet temporary needs or exceptional circumstances.

Note: The regulation does not fix a specific length of time to the notion 'short term'.

Flight OA202 came under Council Regulation 2408/92 relative to access for Community air operators to intra-Community air routes. This regulation does not require notification of national authorities when there is a change in the operating air carrier[24] and the Community air carrier leases a charter from a non-Community air carrier. French authorities were not informed that flight OA202 would be operated by Star Jet.

1.10.2.3 JAR OPS

According to JAR-OPS 1.165 (c)2, when a JAA operator leases an airplane from an entity other than a JAA operator [25] under a wet lease, the following conditions apply:

A JAA operator shall not wet lease-in an aeroplane from an entity other than a JAA operator without the approval of the Authority.

[24] The European Parliament and Council Regulation 261/2004, establishing common rules on compensation and assistance to passengers in the event of denied boarding, cancellation or long delay of flights, gives the following definition of the operating air operator: an air operator that performs or intends to perform a flight under a contract with a passenger or on behalf of another person, legal or natural, having a contract with that passenger.

[25] A "JAA operator" is an operator certified by a Member State of the JAA according to the procedure given in Part 1 of the JAR OPS.

A JAA operator shall ensure that, with regard to aeroplanes that are wet-leased-in:

- the safety standards of the lessor with respect to maintenance and operation are equivalent to JAR's;
- the lessor is an operator holding an AOC issued by a State which is a signatory to the Chicago Convention [….];
- the aeroplane has a standard Certificate of Airworthiness issued in accordance with ICAO Annex 8 ;
- any JAA requirement made applicable by the lessee's Authority is complied with.

These provisions are supplemented by a circular (ACJ) that defines the leasing conditions from an operator other than a JAA operator "when the need is immediate, unforeseen and urgent". This circular specifies the following:

- unless otherwise agreed by the Authority of the lessee, the lessee audits the operation of the lessor to confirm compliance with operating and aircrew training standards equivalent to JAR-OPS 1, maintenance standards equivalent to JAR 145, and airplane certification standards as prescribed in JAR's or FAR's;
- the lease period doezs not exceed five consecutive days;
- for the duration of the lease, the flight and duty time limitations and rest requirements used by the lessor are not more permissive than those that apply in the State of the lessee.

In Greece, a Member State of the JAA, the JAR OPS applies to charter contracts.

1.10.2.4 Oversight by Olympic Airlines

The Olympic Airlines flight operations manual adopts the provisions of the JAR OPS with regards to chartering, in Section 13, paragraph 1. A few excerpts from this operations manual are given below.

13.1 Introduction

To maintain a high level of safety and to avoid significant variations in maintenance and/or operating standards, larger requirements are imposed in the JAA/non-JAA case.

[…] 13.1.1 General

The conditions of leasing will be conducted in accordance with JAR OPS 1.165. In all cases, a leasing agreement will be submitted and the responsibilities of the operator and the authorities involved will be clear. All applicable documents, such as the MEL and maintenance programmes, as applicable, will be submitted to the HCAA.

Before signing the contract, K&K Airline Services received the following documents from Star Jet: a grid of exhaust emission levels, excerpts from the flight manual relevant to the noise level, a letter dated 16 November 2004 from a company confirming its agreement to install shielded doors on aircraft belonging to the Star Air fleet, the A6-BSM registration certificate, the airplane radio broadcast licence and a letter from the Willis reinsurance agent

indicating that it was taking the necessary measures to extend coverage to include third-party damages, and the final insurance certificate.

Note: As mentioned in para. 1.4.1, this insurance certificate did not clearly establish that the airplane was insured.

After the contract was signed between Olympic Airlines and K&K Airline Services, the broker received the temporary AOC from Star Jet (3 July), the list of operational specifications approved by the United Arab Emirates (3 July), the authorisations established by name for those persons certified to sign an approval for return to service (2 July), a letter in which the authorities of the United Arab Emirates indicate that they have no objection to the charter (30 June), the A6-BSM certificate of airworthiness (1 July) and an exemption to operate without EGPWS (2 July).

These documents were sent to Olympic Airlines, since K&K Airlines Services was only an intermediary and Olympic Airlines was responsible for auditing Star Jet. K&K Airline Services had not conducted any particular audits at Star Air or Star Jet before adding them to its list of potential lessors.

When it chartered with Star Air in 2004, K&K Airline Services was operating in partnership with MHB Aviation (another intermediary, based in the UK). A management representative from MHB stated verbally that this broker was in fact aware of the ban on flying within the UK, but since the charter was contracted to fly to Portugal, he considered that the ban did not apply.

When the charter contract was signed with Olympic Airlines, Star Jet did not provide any maintenance documents whatsoever. For the charter flight performed in 2004, Star Air simply submitted a document stating that maintenance operations had been performed by JORAMCO, accompanied by a copy of this organisation's EASA certification. It should be emphasized that this certificate did not apply to the maintenance operations performed by JORAMCO on the airplane, which were conducted in compliance with local regulations only.

1.10.2.5 Approval by authorities

In correspondence dated 29 June 2005, before the airplane certificate of airworthiness and the Star Jet temporary air operator certificate had been issued, the United Arab Emirates authority informed the Greek authority that it had no objection to Star Jet operating A6-BSM as an Olympic Airlines charter flight, without any transfer of responsibility. Since the Star Jet air operator certificate procedure was still in progress at that time, the letter specified that the United Arab Emirates did not have any objection to having the airplane added to the list of airplanes in the Olympic Airlines fleet.

Olympic Airlines had applied to the HCAA on 10 June 2005 to charter the Star Air 9L-LED from 25 June to 10 July 2005. On 1 July, Olympic Airlines submitted another application, this time for approval to charter A6-BSM operated by Star Jet between 2 and 14 July. The Greek authorities informed investigators that in the meantime they had been informed of imminent changes in the legal status of the Star Air airplane and that they had decided to wait for the final official

request before ruling on this question. On 1 July, based on the previously mentioned documents submitted by Star Jet and the correspondence from the United Arab Emirates mentioned above, the HCAA gave its approval under the following conditions:

- the procedures given in JAR-OPS 1.165 (c) (2) and in the ACJ supplement had to be complied with;
- the CAA Directorate for Air Operations/D1 had to be informed;
- the charter contract had to be submitted to the HCAA before the beginning of operations, so that all obligations related to wet-lease conditions could be met.

During the investigation, the HCAA indicated that Greece enforced the JAA and EASA rules. It considers that if the conditions imposed on Olympic Airlines were met, there was no motive that could legally substantiate denial of the charter, even if another State had banned the chartered airline. It specified that compliance with the ACJ as stipulated in the approval implied that this approval was only valid for a maximum of five days.

The conditions applied to the Star Air charter in 2004 corresponded to the same principles. Subsequently, the HCAA did not ask Olympic Airlines for an audit report or any other document demonstrating that the safety level at Star Air met the JAR conditions.

1.10.3 International Civil Aviation Organisation

Standardisation and harmonisation of regulations contribute to the smooth operation of international air traffic. The effectiveness of this approach, defined in Articles 33 and 38 of the Chicago Convention, nonetheless depends on trust between the States and knowledge of any deviations from the norm. Trust is maintained by setting up procedures to check for deviations and to provide information on these situations when they occur.

That is why ICAO launched the Universal Safety Oversight Audit Programme subsequent to the 32nd Session of ICAO Assembly. The purpose of this programme is to ensure that the Contracting States assume their responsibilities with regards to safety oversight, in compliance with Article 37 of the Convention.

In general, according to paragraphs (j) and (k) of Article 54 of the Convention, the Council must report to the Assembly whenever a State has not taken appropriate measures within a reasonable period after being notified of a shortcoming. It must also communicate to all Contracting States any shortcomings observed with regards to the Convention, as well as any instances where Council recommendations or decisions have not been applied.

Faced with the difficulties of certain States, in its 175th Session the Council approved the "Procedure for transparency and disclosure" in Article 54 (j) regarding information involving a State that is deficient in terms of safety oversight. On the basis of USOAP results, and given the type of activities of operators within the State, the Secretariat presents the observed shortcomings to the Council. The Council then contacts the State in question and, if necessary, sends its recommendations to this State. The Council examines the reply to

its recommendations. When it considers that the risks to safety generated by operators within this State are not sufficiently under control, it informs the other Contracting States. It should be noted that when the State cooperates in a satisfactory manner, assistance can be provided, particularly within a regional context. This strategy to disclose safety information was extended after the DGCA/06 meeting, where it was decided that audit reports would be made available to all the States and, on a voluntary basis only, to the general public on ICAO website at http://www.icao.int/fsix.

Article 55 (e) provides that at the request of a Contracting State, the Council may investigate any situation which may appear to present avoidable obstacles to the development of international air navigation and, after such investigation, issue such reports as may appear to it desirable.[26] This provision has never been used. In the same way, Resolution A1-30, voted in the first plenary session of the Assembly, recommended that the Council establish procedures so that Contracting States could observe shortcomings in the application of international standards and then inform the concerned States and ICAO of these situations.

[26] In addition, in compliance with Article 87, each contracting State undertakes not to allow the operation of an airline in the airspace above its territory if the Council has decided that the airline concerned is not complying with international standards (Article 87). A decision of this type cannot be suspended while waiting for ruling on an appeal (Article 86).

1.10.4 Audits of States by ICAO

1.10.4.1 United Arab Emirates

Following up the audit conducted in 1999 regarding the application of Annexes 1, 6 and 8, in March 2002 ICAO established that the GCAA had satisfactorily detailed its requirements concerning the contents of the operations manual to be provided by its operators, in compliance with Annex 6, that it had reinforced its airworthiness oversight by increasing staff and organising the appropriate training courses, and that it had put in place all ICAO provisions regarding special operations, including those involving the MEL or operation in RVSM airspace.

The audit follow-up report established that the GCAA had established an adequate oversight system to oversee its operators and that the appropriate procedures had been written.

1.10.4.2 Sierra Leone

At the time of the incident, ICAO had not yet been able to send an audit team to Sierra Leone, given the crisis situation in this country in the previous years. An audit was finally conducted in May 2006.

1.10.5 SAFA programme

Since 1996, in addition to ICAO audits, the European States have set up the SAFA programme, which is based on inspections conducted on the apron on airplane landing in ECAC States[27], according to a common list of checks established according to the standards in Annexes 1, 6 and 9, while aiming to exchange the data collected and use it towards a common purpose. At the time of the incident, when, subsequent to an inspection, a State decided to ban flight within its airspace, the other States were informed immediately. Since then, any decisions to ban flights are made collectively according to EU Parliament and Council Regulation 2111/2005.

[27] These inspections comply with the provisions (Article 16) of the Chicago Convention.

Note: In the terms of this Regulation, a State reserves the right to prohibit flights in its airspace if it deems that the safety level ensured by the operator does not meet the necessary requirements.

A cooperation agreement was also signed in 2005 between the ECAC and Eurocontrol. It stipulates that 'SAFA warning messages' are to be sent to the CFMU to identify those airplanes or operators banned from flight. The CFMU compares this data with the information provided in the flight plans it receives and when the airplane indicated in an warning message attempts to fly within the ECAC zone, the system informs the aviation authorities of the countries where these airplanes are scheduled to land.

1.10.6 Transfers of responsibility for oversight

Article 83 bis of the Chicago Convention allows the State of Registry to transfer oversight responsibility to the State of the Operator, in other words the State where the operator has its main headquarters or permanent residence. The use of this right must be established in a bilateral agreement recorded by ICAO.

The GCAA did not call on this article for the A6-BSM charter contract. Its proposal to temporarily list the airplane as belonging to the Olympic Airlines fleet did not constitute a transfer of responsibility in the terms of Article 83 bis.

The responsibilities of the authorities that control operators, in particular with regards to the air transport certificate, are not defined explicitly in the Chicago Convention. They are based on from Annex 6, Chapter 4 and Supplement F. Neither the Convention nor the Annex allows the transfer of these responsibilities.

1.11 Additional Information

1.11.1 SAFA inspections

The list of checks included in a SAFA inspection contains 54 points. Inspections, however, do not necessarily cover the entire list (for the A6-BSM, since the crew was not present, their licenses were not checked).

These inspections often have a limited scope. In this respect, the following points should be noted:

- the list of checks only covers a limited number of points;
- it is not always possible to make up a team of inspectors that covers all the skills required to completely inspect the airplane and its operation;
- inspectors often have a limited amount of time to conduct their inspection, given operational imperatives;
- inspections can only be conducted on a sampling basis;
- the lack of transparency in chartering operations restricts the opportunities for scheduling inspections;
- it is not always possible to activate the electrical, hydraulic and pneumatic supplies to airplane systems so that operation of these systems can be checked;
- documents left at stopovers are not checked once the airplane has departed.

1.11.2 JAR 145 approval of Gamco

Gamco is an EASA Part-145-approved maintenance structure, which means that it has the capability to conduct its maintenance work in compliance with European standards. As part of workshop oversight, EASA mandated experts from the CAA to proceed with an audit on 29 January 2006. This audit revealed a Level 1 deficiency involving the use of maintenance data capable of ensuring that repairs are carried out safely. In this case, a yaw damper had been returned to service after a failure, although several required tasks had not been performed. In addition, the work check sheets did not contain the exact details required in the maintenance manuals. On 15 February 2006, EASA suspended approval of this organisation for conducting type C inspections at Gamco. This restriction was lifted on 22 February following another inspection.

Oversight of these workshops by EASA only covers reactivation approvals signed in compliance with European regulations. It should be noted, however, that the United Arab Emirates' regulations on maintenance workshops is largely based on the corresponding European regulations.

1.11.3 Testimony

1.11.3.1 Testimony by crew

The investigators never met the A6-BSM crew member .Contact details for the crew were given to the investigators by Star Jet management.

During a brief telephone interview, the captain did not provide any further details on the incident than those mentioned in the incident report. He did not wish to express himself with regard to the flight environment or the operating context. He did indicate, however, that he knew that the data base had expired and that his contract with Star Jet was for three months. In spite of several attempts to make contact at a later date, he did not respond to phone calls or e-mail messages.

The co-pilot did not wish to add any further information on the event either. He did provide a little information regarding his training.

The flight engineer never answered any phone calls.

1.11.3.2 Testimony by an independent pilot rated on L1011

As part of the investigation, the BEA met with a pilot qualified to fly the L1011 who had wide experience in operating airplanes at the request of various airlines in different countries. This pilot provided the following information:

- The use of independent pilots offers certain operators the advantage of providing an available pool of pilots who want to make a living and maintain their qualification level. In certain cases, the lack of job security or a written contract and the pressure these pilots can be subjected to can incite them to accept certain degraded operating conditions. In this pilot's personal case, for example, at the beginning of his career, he was known to fly much more than 150 hours in 30 consecutive days, or had been forced to accept flights in order to receive pay for previously flown flights; he had

flown with pilots over the age of sixty-five and sometimes with pilots who were inebriated; he had been in the situation where he had to look the other way regarding information revealed during the pre-flight check or the obsolescence of flight documents.

- Flight management with a multicultural crew can be difficult due to problems related to vocabulary or the way in which crew members view their functions in their respective cultures.

2 - ANALYSIS

2.1 Analysis of the Incident

2.1.1 Failure of Engine 3

The significant surge on engine 3 occurred at a time during flight where any engine is subjected to considerable thermal stress and structural deformation. Wear on the compressor blades, associated with damage caused by an object passing through the compressor stages, had probably previously created the conditions that led to the surge.

The burning gasses in the combustion chamber were then ejected directly, forming a flame visible from the ground. A flame is often produced when an engine surge occurs. This does not indicate an engine fire.

An engine surge that is not accompanied by any other incidents does not usually constitute a factor that could lead to an accident. It is generally dealt with in the context of the operator's internal procedures, under the control of oversight authorities. In the case of the A6–BSM, given that no information was available from the operator, the BEA wished to establish that a surge had, in fact, occurred.

In addition to the worrying condition of the aircraft, initial facts gathered showed that, on the one hand the aircraft's flight data recorder was not operating, though it was impossible to determine the date of this failure and,

on the other hand, that the operator had not set up a flight analysis programme or any type of organisation designed to correct problems that might come to light during flight.

Thus, regular follow-up of flight parameters would have allowed the operator to monitor the performance of the engines, likely degraded due to wear, or detect possible damage, which would perhaps have avoided the incident.

2.1.2 Management of the situation

a) Flight crew

The flight crew did not work together in an orderly manner in handling the failure situation and during return to the airfield. It did not inform the cabin crew of its decisions.

No fire alarm was identified on the CVR; the crew did not test the fire detection system. After discussion between the Captain, who was PNF at the time, and the flight engineer, the latter nonetheless pulled the fire handle for engine 3 and the Captain discharged the auxiliary extinguisher. On the ground, the crew did not mention on the report sheets that the extinguisher had been discharged.

The operator's failure to organise a structured common training programme for all crew members made it impossible to achieve mutual trust between the crew members, which led to the isolation of the Captain in an unusual situation.

b) Cabin crew

Faced with worried passengers, the cabin crew did not know how to handle the situation, both during the wait before take-off and during the event itself. Given their difficulties in expressing themselves clearly in English, French or Greek, the few attempts made to communicate were not enough to reassure the passengers. The cabin crew also failed to prepare the cabin for landing.

Given that they were not kept informed of the situation by the flight crew, they were naturally obliged to improvise. But since they were unsure of exactly how serious the situation was, shouldn't they have prepared the passengers for a possible difficult landing?

It thus seems reasonable to question whether this crew would have been capable of organising an emergency evacuation, should it have been necessary. This is consistent with the remarks made by the GCAA regarding the lack of skills of Star Jet cabin crews.

2.2 Context of the Flight

2.2.1 Operation

At the time the contract was signed with Olympic Airlines, Star Jet (like Star Air previously) did not set up the structures or procedures required to ensure safe operation in compliance with international standards: it did not organise its flying activity according to a strict documentary process, and did not take the appropriate measures to provide its crews with the information necessary to safely prepare and conduct their flights; nor did it set up any structures to oversee crew files and qualifications. One of the consequences of all this was to encourage chaotic use of the aircraft.

The numerous anomalies brought to light during the investigation cast great doubt on the aircraft's airworthiness. The owner did not ensure any monitoring of the aircraft's condition. Various items of equipment and systems involving the instrument panel, airframe and avionics compartment that were unserviceable, expired, or damaged had been left untouched. Repairs, generally made during stopovers without the appropriate follow-up documents, were carried out mainly to avoid any interruptions in service. This is exactly what occurred after the incident, when it was necessary to repair the damaged engine: a Star Jet mechanic decided that the malfunctions observed did not require any immediate repairs.

The management at Star Air and Star Jet seems to have favoured a policy based on least-cost, expedient solutions that made it impossible for the company to handle the contingencies of commercial operation without compromising flight safety.

Note: A comparable situation had been seen during the investigation into the 3X-GDO accident in Benin. The fact that operators who refuse to comply with international civil aviation safety concepts can continue to fly in the 21st century, including within European territory, demonstrates the weakness of a system built up over the years based on shared responsibility and adherence to common rules.

2.2.2 Oversight of pilots

Section 1.3 showed that the Captain's and co-pilot's licences and qualifications met flight requirements in appearance only. Part of the cause of this anomaly lies in the difficulty of establishing the validity and coherence of the multiple documents – delivered by different States – held by certain pilots.

Moreover, the pilots undertook their recurrent check tests with companies that did not operate under the jurisdiction of the United Arab Emirates, under the supervision of pilots whose qualifications and status were also difficult to check, in an unclear supervisory context.

In general, the errors or slackness of some authorities can allow a pilot to take advantage of certain licence privileges without meeting the corresponding requirements. The German authority's decision to deliver an FCL to the Captain while restricting the exercise of his privileges to Star Air L1011 flights illustrates this point, as the test required to issue this licence was not valid.

It is essential that the authorities who deliver or validate licences remain extremely vigilant and disciplined in this respect. An unanswered request to an authority must not be considered as an implicit validation.

2.2.3 Oversight of airplanes and operations

According to the provisions of JAR-OPS, the charterer, in this case Olympic Airlines, must ensure that the aircraft lessor meets safety requirements that are at least equivalent to those established in the JAR. This, however, is only one of the links in the chain of oversight. According to this principle:

- the United Arab Emirates, as the State of Registry, was responsible for ensuring aircraft airworthiness;
- the United Arab Emirates, as the State of the Operator, was responsible for overseeing Star Jet operations;
- Greece, as the State of the Charterer, was responsible for approving the lease, which implies setting up a checking procedure.

None of these checking phases were effective in identifying or preventing the deficiencies identified in Star Jet operations.

2.2.3.1 Oversight by States of Registry and the Operator

Oversight over the A6-BSM airplane and the operator Star Jet followed on from that of Sierra Leone over the same aircraft, registered as 9L-LED and over the operator Star Air. Applying these two consecutive "filters" should have contributed to preventing the numerous and extensive deficiencies observed in Star Jet operations. It is therefore of interest to examine the oversight that Sierra Leone was able to exercise.

Oversight by Sierra Leone

Sierra Leone issued an airworthiness certificate, even before the aircraft was sold to Star Air, on the sole basis of an inspection that could not have provided

a correct assessment of the aircraft's condition. Sierra Leone had problems undertaking effective oversight of Star Air and its aircraft due to distance, since most of Star Air's infrastructures were in Jordan, while operations took place mainly outside of Sierra Leone. Faced with these difficulties in exercising oversight, the Sierra Leone civil aviation authority found itself confronted with a situation where its operators and aircraft were banned from the United Kingdom. It is regrettable that this State chose to address this question through a private service provider, which it could not assess or control, rather than turn to other States for help in fulfilling its responsibilities. On top of that, there was no follow-up given to the Star Air audit conducted by this private service provider, since the operator did not take any corrective action and attempted to relocate to another country a few months later.

Note: This same attitude was displayed when, confronted with the situation following the Paris incident and the ensuing investigation, Star Jet decided to simply change status by seeking registration in Kirghizstan.

Oversight by the United Arab Emirates

The GCAA wanted to call on an approved maintenance organisation during the aircraft's registration process. It nonetheless accepted the work and inspection programme proposed by the operator, although this programme could not have established the airworthiness of the aircraft, and, as the investigation would demonstrate, it was not part of a structured aircraft maintenance follow-up plan. This attitude seems to be in contradiction with the suspicion displayed by this same authority on 25 September 2004 regarding aircraft registered in Sierra Leone.

The investigation also revealed significant deficiencies in the way work was carried out by GAMCO.

The inspection conducted before the airworthiness certificate was delivered by a GCA inspector did not reveal any of the aircraft's defects, or those of the navigation equipment. Yet many of the faults found could have been easily identified, as proven by the SAFA inspection.

In parallel, the normal process for issuing an air operator certificate for Star Jet was in progress when the temporary AOC was issued. The criteria for issuing such temporary document are left to the discretion of the authority. However, it should be noted that the implementation of the corrective actions indicated by the operator in response to the documentation audit was not checked prior to the issuing of this authorization. As a matter of fact, the GCAA inspectors identified several shortcomings in Star Jet operating procedure during their various inspections, including after the incident: this confirm that this company required particularly close vigilance by the Authority.

This event shows that the solidity of an Authority's procedures, even when the latter is well organized, can be undermined when an operator does not share Civil Aviation safety culture. Indeed, the whole system based on the Chicago Convention relies on reasonable trust between the various parties. In addition, Star Jet management's continuous pressure applied ad nauseam on

the GCAA in order to expedite the formalities required to take advantage of the opportunity with Olympic Airlines, disrupted the serenity of the approval processes. The relatively short operating period specified in the contract probably contributed to lowering the Authority's assessment of the risk, the latter being concerned not to penalize operations by a newly-created airline.

The impact of the costs of safety requirements on the operator's economic health should nonetheless be kept in perspective. After two days of operations, the Paris incident, which revealed Star Jet's shortcomings, led to grounding of the airplane, entailing a much greater operational impact on the operator and its partners than the loss of a contract. We cannot try to imagine what the consequences would have been had an accident occurred under these circumstances.

2.2.3.2 Approval for charter

Checks performed by Olympic Airlines

As mentioned previously, the documents provided by K&K Airline Services were not sufficient to establish Star Jet's level of compliance with safety regulations. These documents should nonetheless have drawn Olympic Airlines' attention to certain irregularities.

An audit of operating conditions at Star Air (followed by Star Jet), as required in the JAR-OPS, would have given Olympic Airlines a better assessment of the inadequate level of compliance by the operator in terms of safety. Several anomalies could, in fact, have been detected simply by checking the documents and instruments aboard the aircraft.

Given the urgency of the situation, Olympic Airlines probably did not wish to push its investigation, especially since it had already worked with Star Air and K&K Airline Services. The GCAA's letter, indicating that it did not have any objections to the prospective charter, may have had some influence in this context.

The provisions of JAR-OPS 1 (ACJ) may appear unrealistic, since a charter undertaken to meet an urgent situation does not really leave enough time to conduct an audit. But, since Olympic Airlines had already worked with Star Air, it would have been possible to schedule an audit in anticipation of demand for the summer season in 2005. The Greek authorities would then have been able to receive the results before the Star Jet charter. Supposing that Olympic Airlines had not anticipated the demand for charter flights, the time elapsed between 10 June, date of the first charter request, and 1 July, date of the second one, would nonetheless have allowed enough time for a partial audit, enough to check the documents provided by the chartering agent. Finally, since in theory nothing was checked, Olympic Airlines could have conducted certain inspections at the beginning of the flight programme, e.g., by participating in the ferry flight.

Finally, there is also some doubt surrounding the status of the chartering agents. This intermediary does not appear in the international convention and, depending on the country, is not always clearly identified in legal

terms. In light of this investigation, it does appear, however, that this entity influences airline chartering at several levels. First, it has a list of potential owners that can be contacted by operators who need an aircraft. In this sense the chartering agent is one of the first to 'filter' the potential market. Second, it is reasonable to believe that after several transactions, there is a certain amount of confidence between the chartering agent and the charterer. There is some doubt, however, as to how this intermediary selects which airlines to charter, since it does not have any special competence in the matter, or any specialised teams to audit the operators, which, moreover, is not required by international regulations, since these tasks are the responsibility of the charterer. From a certain viewpoint, by not recognising what has become widespread practice to meet commercial demands, and by not holding all of the players responsible for their acts, safety on an overall basis has been weakened.

Approval by Greek authorities

The HCAA also approved the Olympic Airlines charter agreement in order to meet urgent conditions. This haste can reasonably be explained by the wish to avoid penalising the operator, since the need for charter flights was known in advance. Approval was not followed up, however, by a request for submittal of the audit report, even at a later date. The same situation had occurred when the Star Air airplane was chartered the year before. This relative laissez-faire approach seems to be explained by its interpretation of how the JAR-OPS conditions should be applied. The HCAA considers that it is the operator's responsibility to ensure that the applicable regulatory conditions are met and that the Authority does not have any power to intervene in this matter. This interpretation may seem surprising, particularly since it is commonly recognised today that safety is reinforced when actions taken by the operator and the supervisory authority converge. When there is no continuous exchange of information, there is no certainty that safety criteria will always take priority over profitability, given the weight of commercial and financial constraints.

It is unfortunate that the HCAA did not inform Olympic Airlines of the SAFA inspection results and the ban on Star Air in the United Kingdom. It is also unfortunate that the approval issued by the HCAA was worded ambiguously, since this Authority considered that the reference to ACJ OPS 1.165 (c) 2 implied that the charter was limited to five days, whereas it was granted in response to an application requesting fifteen days. Given that there was no reaction from Olympic Airlines, the airline probably did not even take notice of this restriction on the authorised period of charter.

Information exchanged between European States

At the time of the event, information from the SAFA programme was used to various degrees by different States. Recognition of SAFA data on the European level to promulgate a ban should remedy this deficiency. The possibility that a European authority may approve an operator that has changed name and transferred its business, without changing its operating methods after having been banned, cannot to be entirely excluded, however.

In the case of the flight OA202, the system that generated an alert on banned aircraft and operators set up through Eurocontrol would not have functioned. Officially the flight operator remained Olympic Airlines and the A6-BSM call sign was not entered in the SAFA database at the time, simply because it dated from 22 June. Moreover, since it has only recently been created and had no apparent link to Star Air from this point of view, Star Jet was not listed in this database either, and even the mention of the airline operating the flight (the actual air operator) in the observations on the flight plan would not have triggered a warning from the system.

2.2.3.3 Consequences of regulations in force and their interpretation

It appears necessary to clarify the requirements and objectives set out in JAR-OPS 1.165. Are airlines meant to proceed with a complete audit of the lessor, according to the same procedures that apply to the State of the Operator? Or are they simply obliged to conduct an ultimate check that takes into account the commercial requirements of the charterer and its resources? As it stands today, each party involved in operating a charter flight seems to interpret these provisions as suits its own particular needs. This ambiguity concerning each party's function is detrimental to safety.

Moreover, there is no requirement obliging a Community airline to inform European Union Member States that it has chartered an airplane from an operator registered outside the Community to undertake flights within the EU. It is therefore impossible to schedule SAFA inspections for chartered airlines.

This is how the legislation in force for all airlines within the EU, and thus Olympic Airlines, made it possible for Star Jet to operate one of its aircraft in France under an Olympic Airlines flight number. The accident that occurred at Cotonou in 2003 proved that operating conditions similar to those practised by Star Jet can have disastrous consequences. Without entering into futile speculation, suffice it to say that officials at Star Jet were ready to let the airplane leave after the incident while all the inspections conducted had proven that it was in no condition to fly. If the initial surge had been less noticeable, everything may just have happened that way, at least up until take-off...

2.2.4 The role of ICAO

The system established by the Chicago Convention relies on trust between States. This implies that surveillance measures must be implemented to take account of differences that still exist between States. If there is no system to alert Contracting States of any departure from international standards committed by other States, the entire system is undermined.

In light of this event, it appears that the audit procedure controlled by ICAO cannot be the only tool made available to the international aviation community to detect deficiencies in safety oversight. The very satisfactory audit of the United Arab Emirates suggested that the oversight deficiencies revealed during the investigation simply could not have happened. Yet is there reason to question the effectiveness of this type of audit? The conclusions

of these audits depend mainly on the existence of a statutory framework, qualified personnel and procedures that comply with international standards. Without this foundation, there is no effective oversight. Nonetheless, a valid assessment should also consider the effectiveness of how these means are put to use. Administrative means should be considered as a tool to serve the purpose of safety. Various investigations have proven, however, that States, while having adequate means at their disposal, have issued authorisations to operators who are clearly deficient in terms of safety. Even within a satisfactory organisation, there are times when momentary or partial disruption may occur. The investigation showed that the deficiencies observed at Star Jet come under this latter type of circumstance.

It is therefore necessary to expand on the mutual oversight process advocated by ICAO in 1947 at its first Assembly (Resolution A.1-30). This consists of reinforcing the foundations of the system initiated by the Chicago Convention by enhancing cooperation between States.

At the time of the event, ICAO was not able to evaluate the resources allocated to oversight by Sierra Leone. But States flown to by Sierra Leone operators had had the opportunity to point out deficiencies in oversight of these operators. The Council, however, had never ruled on the guarantees provided by Sierra Leone regarding oversight of its operators and fleet, having the prerogative to do so according to Article 55 (e) of the Chicago Convention.

As mentioned previously, the SAFA inspection conducted after the event revealed several deficiencies significant for safety. The follow-up procedure that extended the inspections performed on Star Air aircraft in 2003 even gave the United Kingdom the opportunity to conduct an in-depth analysis of the operator oversight methods employed by Sierra Leone. But the effectiveness of these inspections remains limited, first due to operational constraints, and second, due to the lack of transparency in chartering operations. The oversight procedure may be reinforced by conducting investigations according to the provisions of Annex 13. These investigations would provide the opportunity to identify deficiencies at all levels, while also providing access to information that is sometimes dispersed, and cross-analysing data from various sources. To improve safety it is not enough to simply understand the more visible failures; the aviation operating context must also be analysed systematically.

Once deficiencies have been observed, it is important that corrective measures be taken rapidly, under the authority of ICAO. In this light, it is surprising that Sierra Leone had been able to issue certificates and approvals under the Chicago Convention, while its administration did not appear capable of fulfilling its international commitments. In the same manner, it is not possible to guarantee at this date that the situation revealed in the Start Jet report will not be repeated elsewhere by another operator.

When an operator is banned within the European Union for technical reasons, for example, the case should systematically be submitted to the ICAO Council for a ruling, in compliance with Article 55 (e). If the Council's investigation confirms observations made by the EU, it should alert all the Member States, in application of Articles 54 and 55, and, if necessary, implement the provisions

of Article 87. This approach would supplement the mechanism set up by the 'Article 54 (j) procedure', and would result in cooperation with the Authority of the operator banned in Europe.

Rapid implementation of factual data bases by ICAO regarding aircraft registration, airworthiness information and air transport certificates, as discussed at the DGCA/06 meeting and the 36th Session of the Assembly (September 2007) would clearly improve safety practices, on condition, of course, that these data bases are updated correctly and systematically, i.e. that States are obliged to update them and that adherence to this obligation is monitored continuously.

2.2.5 Transfers of responsibility

The definition of the State of the Operator is determined by commercial criteria and can be considered as a somewhat subjective notion. In reality, airline operation covers a broad horizon where, for example, operational headquarters may be situated in a place that is different from the location where maintenance operations are performed.

In the incident under study here, Sierra Leone remained responsible for oversight of tasks that had been delegated to IAS, without having the resources to actually check the work carried out by this company.

It would probably have been more effective for Sierra Leone to ask Jordan to conduct inspections on aircraft based in its territory for each charter contract or each lease engaged by Star Air. Or for Sierra Leone to consider that it could not intervene as the State of the Operator for this airline.

It has also been shown that the owner of Star Jet and Star Air used several addresses for these two companies and maintained a certain amount of confusion between Star Jet and Star Air in exchanging information with other organisations.

Under these conditions, it is important to establish an effective link between the Authority and the reality of operations. The British CAA had, in fact, previously pointed out a deficiency with regards to this point and the operator Star Air.

A modification to Annex 6 would make it possible to organise the transfer of responsibility from the State of the Operator to other States which would be in a better position to ensure effective oversight over all or part of operations.

In line with Recommendation 2004-8/10 of the Cotonou accident report (2003), at the DGCA/06 Conference a recommendation was made to the ICAO Council that the notion of "State of the Operator" be defined more specifically, to adapt to current commercial practices and arrangements. This incident illustrates, once again, this necessity.

3. - CONCLUSIONS

3.1 Findings

3.1.1 The crew

- The Captain held an air transport pilot's license issued by the USA and validated by the United Arab Emirates for the period from 30 June 2005 to 29 July 2005.
- His L1011 proficiency check, performed on a simulator, was not valid.
- The Captain's age (64), meant that he was not authorised to hold this position aboard an airplane for public transport registered in the United Arab Emirates or overflying French airspace.
- The co-pilot held an ATPL issued mistakenly by the United Arab Emirates on the basis of a commercial pilot's license (CPL) issued by Jordan and an air law examination passed successfully. According to regulations in the United Arab Emirates, passing this exam only allowed him to validate the CPL.
- United Arab Emirates' regulations stipulate that at least one of the pilots must have a national airline transport pilot's licence.
- The flight engineer held a flight engineer's licence issued by the USA and validated by the United Arab Emirates for the period from 30 June 2005 to 29 July 2005. It was impossible to determine whether he was qualified for the airplane type or not.
- The United Arab Emirates notified ICAO of a difference with regard to Annex 1, specifying that members of the cabin crew must be licensed.
- The operator could not produce evidence of a licence for any of the cabin crew members.
- The investigators were not able to obtain documents establishing the qualification of a sufficient number of cabin crew members based on the provisions of the charterer.

3.1.2 The airplane

- The airplane, previously operated by BWIA, had been parked at the Port of Spain aerodrome from January 2003 to October 2004.
- The airplane had been registered to the operator Star Air as 9L-LED and had received a certificate of airworthiness from Sierra Leone in November 2003. It was therefore registered in more than one State between November 2003 and October 2004, at which time it was sold to Star Air and departed for Amman.
- The only maintenance operations revealed by the investigation between 28 January 2003 and 22 June 2005 were two troubleshooting checks performed by JORAMCO (Jordan).
- The airplane was registered as A6-BSM on 22 June 2005.

- From 22 June to 2 July 2005, the airplane underwent an A + A2 check and maintenance operations defined by Star Jet at GAMCO (United Arab Emirates).
- The airplane received a certificate of airworthiness from the United Arab Emirates on 1 July 2005.
- Two ground mechanics, certified by the GCAA, were aboard the A6-BSM.
- The observations made regarding the airplane during the investigation showed that it was not in good condition; the level of safety as defined by international standards could not be ensured.
- Several items of emergency equipment were defective.
- The investigators were unable to establish the airplane's RVSM capability, required for operations in European airspace.
- The airplane was not equipped for BRNAV and RNP5 operations.

3.1.3 Operations

- Star Air, an air operator resident in Jordan, held an air operator certificate from Sierra Leone valid up to 17 December 2005.
- In September 2004 the United Arab Emirates banned Sierra Leone operators from operating in its territory.
- In October 2004 the United Kingdom banned Sierra Leone operators from operating in its territory.
- The Chairman of Star Air created another airline, Star Jet, and submitted its documents to the GCAA in August 2004.
- Star Jet obtained a temporary air operator certificate from the United Arab Emirates for the period from 2 July 2005 to 1 August 2005.
- Star Jet operated only the A6-BSM, still owned by Star Air.
- No contract between Star Air and Star Jet was produced during the investigation.
- The insurance certificate provided by Star Jet showed inconsistencies and mixed information concerning Star Jet and Star Air. Investigators were unable to obtain the original contract.
- The Star Jet operations manual was incomplete, contained several inconsistencies and was not adapted to the operating requirements of A6-BSM.
- The operator was unable to produce an airplane maintenance log during the investigation. The few documents found after the incident were not completed to the expected standards.
- The operator had not set up any structure to conduct flight analysis or provide satisfactory follow-up of the files on its flight crew members.

3.1.4 The charter

- At the beginning of June 2005, Olympic Airlines called on the services of the charter agent K&K Airline Services to wet lease a jumbo jet with crew.
- Olympic Airlines had chartered with Star Air the year before under similar conditions.
- Olympic Airlines applied to the HCAA for an authorisation to lease 9L-LED operated by Star Air on 10 June 2005 for the period from 25 June to 10 July 2005.
- Olympic Airlines renewed its request on 1 July 2005, this time for A6-BSM operated by Star Jet, for the period from 2 to 14 July 2005.
- The HCAA authorised the charter on 1 July, under the condition that Olympic Airlines check compliance with JAR-OPS 1.165 (c) 2 and the supplementary ACJ.
- Olympic Airlines made this check via the documents provided by the operator through the intermediary K&K Airline Services.
- These documents were not sufficient to conclude that Star Jet met the requirements of JAR-OPS 1.165 and the ACJ.
- The duration of the charter did not correspond to the scope of application of the ACJ.
- The HCAA did not request the audit report required by the JAR-OPS regulation for either the Star Air charter or the Star Jet charter.

3.1.5 The flight

- Investigators were not able to determine the weight and balance of the airplane for the 4 July 2005 flight.
- Take-off was delayed by a problem in closing the door on the forward hold.
- Some passengers disembarked without being identified and investigators were unable to determine whether or not their luggage was removed from the airplane.
- A short time after rotation, a sustained (pop) surge occurred on engine 3.
- The crew applied the ENGINE FIRE OR SERIOUS DAMAGE procedure and returned to land at Paris Charles-de-Gaulle.
- The cabin crew was unable to relieve the anxiety of the passengers and prepare them for landing.

3.1.6 Oversight by States

- Sierra Leone was not able to meet its international obligations when issuing the certificate of airworthiness to 9L-LED.
- The United Arab Emirates issued a certificate of airworthiness and B-RNAV, RNP5 and RVSM approvals without conducting all of the associated checks.

- The United Arab Emirates identified several areas of non-compliance in Star Jet's documentation and operations. The operator stated that it had undertaken the required corrective actions.
- A temporary air operator certificate was issued on 1 July 2005.
- This temporary certificate was issued before the GCAA checked that the operator had, in fact, performed the required corrective action.
- The investigation showed that the actions reported by the operator corresponded to a copy of regulations, without any description of methods or means.
- The licences and qualifications of the flight crew were not adequately checked.
- Knowing that the cabin crew did not display sufficient knowledge of the safety procedures during the flight between Abu Dhabi and Athens, the Authority nonetheless did not suspend the authorisation subject to completion of corrective measures.
- The HCAA, having received an application for a two-week charter, asked the operator to comply with a regulation corresponding to a charter of less than five days.
- The HCAA requested that Olympic Airlines ensure that the safety standards applied by Star Jet were equivalent to its own.
- The French authority, DGAC, was not informed that flight OA202 would be operated by Star Jet, which is not from the European Community. This was not a regulatory requirement.
- The systems used to identify and monitor operators who do not comply with international safety standards can be got round by changing the name of a company.
- Differences in how regulatory notions are interpreted (JAR provisions or those of the State of the Operator, for example) undermine an oversight system that depends on mutual trust between States and consistency in checking measures.

3.2 Causes of the Incident and Associated Risk Factors

a) The contained failure of engine 3 on take-off was the result of:

- a combination of three factors:
  - the thermal stress and structural deformations on the engine associated with this phase of flight,
  - wear on the compressor blades,
  - damage to these blades caused by an object passing through the compressor.
- and also a systemic cause: the absence of adequate oversight of the airplane and maintenance operations by the operator.

b) The investigation revealed that the operation of this airplane did not meet the safety requirements stipulated in international regulations. This situation was the result of:

- serious deficiencies in the organisation and operation of the operator Star Jet;
- an inadequate oversight exercised by the States who were successively responsible as the State of the Operator and State of Registry;
- problems in the practical application of oversight due to the various geographic locations involved in the checking process and the changes occurring in the status of the operator and the airplane.

A probable contributing factor was the fact that the persons and organisations involved did not wish to penalise Star Jet's commercial activity.

c) The airplane was allowed to operate in Europe, and in France in particular, for the following reasons:

- Olympic Airlines did not perform an actual check of the safety level of Star Jet before or during the charter period;
- the authorisation for the Star Jet charter was issued by the HCAA without checking the charter conditions.

A probable contributing factor was the fact that the persons and organisations involved did not wish to penalise Olympic Airlines' commercial activity.

4 - SAFETY RECOMMENDATIONS

Reminder: In compliance with Article 10 of Directive 94/56/EC on accident investigations, a safety recommendation is not intended to apportion blame or responsibility for an incident or accident under any circumstances whatsoever. Article R.731–2 of the Civil Aviation Code stipulates that persons or organisations who have received safety recommendations must inform the BEA of the follow-up actions they intend to take and, if applicable, the time required to implement these actions, within ninety days after receiving the recommendations.

4.1 Evolutions since the incident

4.1.1 Corrective actions taken by the United Arab Emirates

Star Jet operations have been suspended indefinitely.

The GCAA has indicated that a new organizational structure has been adopted for the Authority. A new Director General has been appointed, assisted by a new Deputy Director General and a Director of Aviation Safety and Security. A reorganization of accident investigation activities is under discussion.

4.1.2 Corrective actions taken by Greece

The HCAA indicated that, in addition to EU-OPS 1.165, the Flight Standards Division has established procedures in order to ensure that the safety standards of a non-EU operator are satisfactory.

4.1.3 Corrective actions taken by Olympic Airlines

Olympic Airlines managers indicated that all possible steps have been taken so that only aircraft that are either owned or leased long-term by the company are included in its fleet. In exceptional cases, when an unforeseen event leads to wet leasing of an aircraft, JAA AOC holders will be given priority.

The airline further mentioned that the Quality Control Department staff have been trained for the entry into effect of the EU-OPS.

4.1.4 Evolution in European regulations

The EC 859/2008 European regulation of 20 August 2008 (EU-OPS, revised version) no longer contains any ACJ. Thus, the European regulations in force no longer have any specific provisions for leases limited to five days to respond to an urgent need.

4.1.5 Evolution of oversight

The conclusions of the investigation show that a reasonable application of the check and inspection mechanisms in force should have meant a large number of dysfunctions found were avoidable. It should be noted that a significant effort had been made to intensify the application of oversight measures, in particular through the development of SAFA inspections and the broadening of the scope of USOAP audits. It is, none the less, desirable that States and ICAO rely on the findings from future investigations to ensure the relevance of their inspections and audit

Equally, the latest amendments to Annex 6, particularly its Supplement F, clarify for States the steps that they are expected to take with a view to issuing an Air Operator Certificate (AOC). It is notable that it specified that the State of Operator must « evaluate each operator and establish whether it is capable of performing flights in complete safety » and that the issuance of an approval « represents the finding or the determination of compliance with the applicable standards ». It is however regrettable that the Annex does not indicate how to identify the State that is responsible for exercising oversight over an operator. This point was the subject of a recommendation addressed to ICAO by the BEA following the accident that occurred at Cotonou on 25 December 2003.

4.2 Recommendation

Members of the Star Jet cabin crew, faced with difficulties in expression, whether in English, French or Greek, were unable to reassure the passengers. The flight crew's level of English was not good either, though evolutions in Annex 1 have since made the validity of flight crew licenses subject to demonstrating level 4 in the English language in relation to exchanges with air traffic control. This Annex does not have any provision in relation to cabin crews. The EU-OPS requires that all of the crew must be able to communicate in a « common language », but it does not mention exchanges with passengers.

Consequently, the BEA recommends:

- **that EASA impose on cabin crew a minimum level of skills in the English language, as well as in at least one of the languages of the country of origin or destination.**

LIST OF APPENDICES

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Transcript from Roissy ATC up to 16 h 12 min 30 s

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CVR

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Article from Sunday Times of South Africa

Appendix 5:

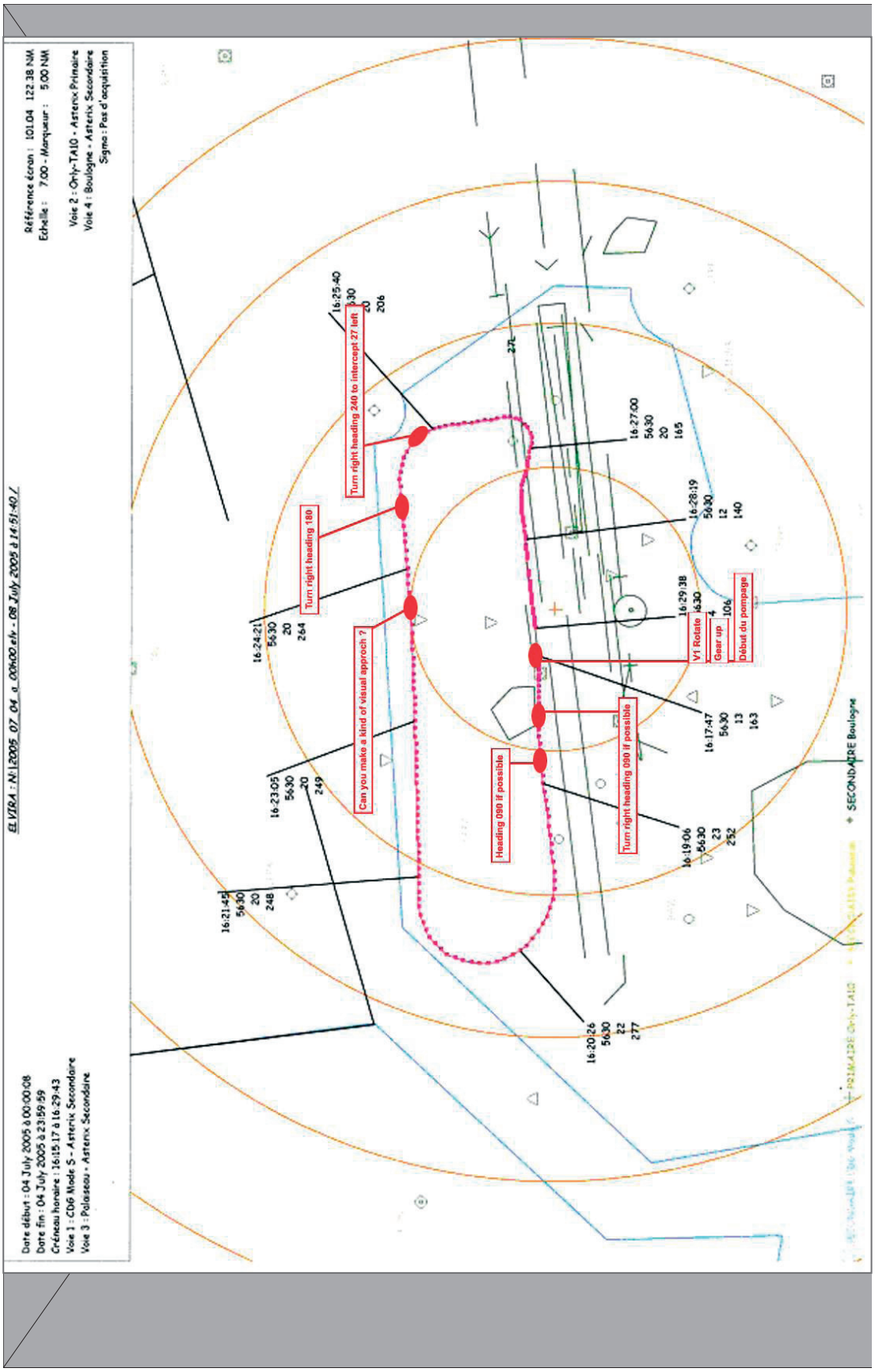
Captain's report

Appendix 1
Transcript of radio communications between the ground and the crew

Time		Radio exchange	Observation
15 h 56 min 53 s	OA 202 – Sol	Charles-de Gaulle ground Olympic 202 good afternoon	
	Sol – OA 202	Olympic 202 bonjour	
	OA 202 – sol	Bonjour, we'll be ready to start up in 10 minutes	
	Sol – OA 202	Olympic 202, start up approved	
15 h 57 min 37 s	OA202- sol	Euh, Olympic 202?	
	Sol – OA 202	Olympic 202, go ahead	
	OA202- sol	Yes sir, we are fully ready for start up, expect clearance	
	Sol – OA 202	But, you…you request taxi?	
	OA 202 – sol	Euh…request start-up expect clearance	
	Sol – OA 202	Euh..Olympic 202..euh… Push back approved… euh…from X4	
	OA 202 – sol	Push-back approved, waiting for start-up clearance, 202 Olympic	
16 h 04 min 07 s	OA202- sol	Olympic 202 (*)	
	Sol – OA 202	Olympic 202, taxi A N D K7, holding point 27 left	
	OA 202 – sol	A N D K7, holding point 27 right, 202 Olympic	
16 h 05 min 34 s	OA 202 – sol	Olympic 202, confirm runway 27 left	
	Sol – OA 202	Olympic 202, I confirm runway 27 left	
	OA 202 – sol	merci	
16 h 07 min 41 s	OA 202 – sol	Olympic 202, confirm right	

	Sol – OA 202	Olympic 202, if you can, first right behind 319 Air France	
	OA 202 – sol	Olympic 202	
16 h 08 min 26 s	Sol – OA 202	Olympic 202, it's a short turn on your right, you wish to turn left ?	
	OA202- sol	Euh..right turn 202 Olympic, and (*)	
16 h 12 min 30 s	Sol – OA 202	Olympic 202, correction taxi Y11, holding point 27 left	

Appendix 2
Radar track



Appendix 3

CVR TRANSCRIPT

NOTE

The following is a transcript of the elements which were comprehensible at the time of the readout of the cockpit voice recorder. This transcript contains conversations between crew members, radiotelephone messages and various noises corresponding, for example, to the movement of selectors or to alarms.

The reader's attention is drawn to the fact that the recording and transcript of the CVR are only a partial reflection of events and of the atmosphere in a cockpit. Consequently, the utmost care is required in the interpretation of this document.

The voices of crew members are heard via the cockpit area microphone (CAM). They are placed in separate columns for reasons of clarity. Two other columns are reserved for the voices of others, noises and alarms, also heard via the CAM.

The radio communications not heard by the crew in the cockpit are not transcribed.

GLOSSARY

UTC	UTC time based on the control tower recordings
FDR time	Generated time as recorded by the FDR in seconds and tenths of a second
ATC	Air traffic control centre on the frequency in use (TWR). In the same column, communications from another aircraft (AF XXX) are listed.
➔	Communication to ATC, to ground or to cabin crew via interphone
( )	Words or groups of words in parentheses are doubtful
(*)	Words or groups of words not understood

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 09 min 04 s	**BEGINNING**	**OF**	**RECORDING**		
16 h 09 min 52 s		All the way to kilo 7			
16 h 10 min 37 s	Okay do the radar check okay radar left radar right flaps flaps fourteen				
16 h 11 min 00 s			(*)		The flight engineer apparently reads out a check-list
16 h 11 min 01 s	Okay				
16 h 11 min 02 s			(*)		
16 h 11 min 05 s			(*) check		
16 h 11 min 26 s	Euh taxi check list please				
16 h 11 min 30 s			Taxi check list		
16 h 11 min 39 s			Brakes		
16 h 11 min 40 s	Euh checked B				
16 h 11 min 44 s			(*)		
16 h 11 min 45 s	On				
16 h 11 min 47 s			Engine anti-ice		
16 h 11 min 48 s	Not required: OFF				
			Altimeter (*)		
16 h 11 min 50 s	Standard, checked				
16 h 11 min 52 s	One zero one one set and cross checked				
16 h 11 min 55 s			Set and cross check?		

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 11 min 55 s		One zero one one set and cross checked			
16 h 11 min 59 s			Set your (*)		
16 h 12 min 01 s	Set and cross checked				
16 h 12 min 03 s			Flaps, slats (*)		
16 h 12 min 05 s	Fourteen fourteen green lights				
16 h 12 min 07 s		Fourteen green			
16 h 12 min 08 s			Stab trim		
16 h 12 min 10 s	Three point what is it				
16 h 12 min 13 s		Three point zero			
16 h 12 min 13 s	three point zero zero zero				
16 h 12 min 15 s		That's right on the right			
16 h 12 min 16 s	Set				
16 h 12 min 19 s			Flight controls		
16 h 12 min 20 s	Free and checked				
16 h 12 min 22 s				3502 kilo bonjour taxi yankee 11 holding point 27 left	
16 h 12 min 27s				Yankee 11 27 left 502 kilo	

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 12 min 30 s	(*)Say again		(*)	Olympic two zero two correction taxi Yankee Kilo holding point two seven left	
16 h 12 min 36 s	(*) it's for line up then	➔ 27 left say the frequency again 202			
16 h 12 min 41 s				Olympic two zero two I confirm Yankee eleven	
16 h 12 min 44 s		➔Yankee eleven thank you			
16 h 12 min 49 s			Yankee eleven, which one is it?		
16 h 12 min 55 s	First first one or second one?				
16 h 13 min 0 s			The one before the last. Yankee eleven.		
16 h 13 min 03 s	Okay this one.				
16 h 13 min 04 s			Kilo seven? What's this?		
16 h 13 min 11 s			Kilo six! Kilo seven the third one.		
16 h 13 min 12 s	We have to go further				
16 h 13 min 37 s	Euh but this is euh what is this?				
16 h 13 min 40 s		The one next (*)			
16 h 13 min 43 s	Not, not this one				
16 h 14 min 06 s	Looks like (*)				

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 14 min 10 s		(*)			
16 h 14 min 12 s	Okay Yankee eleven is the next one				
16 h 14 min 13 s		(*	(*)		Inaudible conversation
16 h 14 min 23 s	One four six euh				
16 h 14 min 24 s		One four six			
16 h 14 min 26 s				Olympic two zero two monitor Tower one two one one nine decimal two five good day	
16 h 14 min 30 s		➔One one nine decimal two five good day			
16 h 14 min 44 s		➔Ah Charles de Gaulle Tower Olympic two zero two good afternoon bonjour			
16 h 14 min 48 s				Olympic two zero two bonjour I call you back	
16 h 14 min 59 s				Olympic two zero two from Yankee eleven line up and wait two seven left	

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 15 min 04 s		➔I line up and wait two zero two runway two seven left			
16 h 15 min 09 s	Line up and wait she said?				
16 h 15 min 10 s		Yeah			
16 h 15 min 11 s	Okay euh before take off check line-up check				
16 h 15 min 15 s	(*) checks was clear				
16 h 15 min 22 s			(*) Given		
16 h 15 min 24 s			Antiskid		
	ON				
16 h 15 min 25 s			Approach is clear runway is clear		
16 h 15 min 32 s			Strobe (*) and landing lights		
	ON				
16 h 15 min 34 s			TCAS transponder and radar		
		(*) ON standby and ON			
16 h 15 min 46 s				Olympic two zero two wind three hundred degrees one five knots runway two seven left cleared to take off	
16 h 15 min 51 s		➔Cleared for take off two seven left Olympic two zero two			
16 h 15 min 54 s	Go ahead with the check-list please				

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 15 min 55 s			(*)		
16 h 15 min 58 s			Brake condition (*)		
			Ignition ON		
			Before take off check-list completed		
16 h 16 min 04 s	We approach, speed brakes, flight controls (*)	(*)			
			(*)		
16 h 16 min 09 s	Wait a minute				
16 h 16 min 10 s			Brake condition good		
16 h 16 min 18 s		Thank you			
16 h 16 min 22 s	Remember me one point five DME straight ahead and then a right turn				
16 h 16 min 26 s		To intercept three three zero			
16 h 16 min 29 s	OK we can keep err going now OK your throttles				
16 h 16 min 39 s	OK take off				
16 h 16 min 42 s	Number three		(*)		

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 16 min 51 s		Speed brakes	Power set		
16 h 16 min 57 s	Your controls One hundred				
16 h 17 min 04 s	V one Rotate				
16 h 17 min 07 s	V two				
16 h 17 min 11 s		Gear up			
16 h 17 min 12 s	Positive rate				
16 h 17 min 20 s		Set flaps ten please			
16 h 17 min 22 s	Flaps ten, speed is checked				
16 h 17 min 25 s					@ Engine noises
16 h 17 min 26 s	What is this ? What is this ?				
16 h 17 min 29 s			Shut down shut down number three only I take care I take care I take care	Olympic two zero two squawk zero six six seven	
16 h 17 min 32 s	OK Hold it slowly				
16 h 17 min 35 s			Severe damage only		
16 h 17 min 38 s	OK do the severe damage check list				
16 h 17 min 40 s		OK One thousand (*) hundreds Speed is (*)			
16 h 17 min 42 s	OK we are going back err…				

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 17 min 43 s				Olympic two zero two squawk zero six six seven	
16 h 17 min 47 s	➔Ah zero six six seven we just have engine failure and we'd like to return back to airport				
16 h 17 min 55 s			Carry on procedure	Roger	
16 h 17 min 57 s	Errr yeah go…go ahead actually I would like to fly it in …				
16 h 18 min 01 s		OK I have it			
16 h 18 min 02s	You you have it OK OK yeah OK				
16 h 18 min 05s			(*) the flaps…		
16 h 18 min 06s		Flaps four			
16 h 18 min 08s	Flaps four				
16 h 18 min 09s		We have we have			
16 h 18 min 10s	Yeah	Stand by for the (*)	We have this is the severe damage		
16 h 18 min 14s	OK Flaps up please				
16 h 18 min 17s	Flaps …yeah		(*) captain		
16 h 18 min 19s	OK go ahead				

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 18 min 21s	Throttle		Just a second (*) that's OK no problem (*) Close ?		
16 h 18 min 24 s	Full (*)		Number three (*) I confirm number three yes	Olympic two zero two euh turn right heading euh turn right heading zero nine zero if possible	
			(*)		
	Okay you pull it				
16 h 18 min 34 s			Number three confirm?		
16 h 18 min 35 s	Confirm		Confirm number three		
16 h 18 min 36 s		Let's going on			
16 h 18 min 37 s	May (*) discharge…to the left			Olympic two zero two?	
16 h 18 min 41 s			Go on to the left yes		Call to cockpit from cabin
16 h 18 min 42 s				Olympic two zero two?	
16 h 18 min 43 s		Answer captain answer to the radio			
16 h 18 min 45 s	➔ Euh Roger go ahead please?				
16 h 18 min 47 s				Confirm you have an engine failure?	

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 18 min 49 s	➔Affirmative we'd like to return radar vector back to Charles de Gaulle				Call to cockpit from cabin
16 h 18 min 54 s				Olympic two zero two turn right heading zero nine zero if possible	
16 h 18 min 57 s	➔Roger heading zero nine zero				
16 h 18 min 58 s	Right right turn				
16 h 18 min 59 s		OK we would like to maintain two thousand five hundreds feet			Call to cockpit from cabin
	Yeah okay				
16 h 19 min 06 s	➔ Euh can we maintain two thousand feet or two thousand five hundred?				

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 19 min 10 s				Olympic two zero two affirm maintain two thousand feet and turn right to return to runway two seven left if possible	
16 h 19 min 20 s	➔ You confirm right turn?				
16 h 19 min 23 s				Affirm (*)	
16 h 19 min 26 s	Right turn				
16 h 19 min 27 s		Yes but (*) ninety degrees			
16 h 19 min 29 s				Euh Olympic two zero two if you turn left it's okay, you do what you want	
		No, no right			
16 h 19 min 35 s	➔ Euh we'd like to have a radar vector again to the runway…	(paroles en arabe)	(paroles en arabe)		
16 h 19 min 42 s	➔ We are in a right turn			OKI	
16 h 19 min 46 s			Ok could you please confirm the (*)		
16 h 19 min 47 s	Euh go ahead, confirm yeah ok				
16 h 19 min 52 s	So the check…		(*)		

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 19 min 59 s			APU is on		
16 h 20 min 04 s			could you please confirm (*) the IDG		
16 h 20 min 08 s	Euh…okay go ahead to confirmed				
16 h 20 min 10 s		Confirmed			
16 h 20 min 14 s			APU is on the line		
16 h 20 min 15 s	Actually (*) I would like to do the landing it's okay yeah can you take ATC?				
16 h 20 min 19 s		It's ok, just confirm the zero nine zero please			
16 h 20 min 23 s		And I would like the landing if you don't mind			
16 h 20 min 25 s	Euh actually actually I would like to do it Shayyeb yeah okay?				
16 h 20 min 28 s		OK			
16 h 20 min 30 s	You have A T C	(*)			Call to cockpit from cabin
16 h 20 min 34 s		Zero nine zero			
	Zero nine zero heading				

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 20 min 39 s	And we are requesting radar vector and no no fire truck required okay		(*)		
			(*) We have (*) degrees		
	Ah okay okay				
16 h 20 min 48 s			I did, we did everything (*)		
16 h 20 min 53 s	Tell her zero nine zero heading turning				
16 h 20 min 55 s		➔Euh Olympic two zero two euh we are on heading zero nine zero we would like radar vectoring for runway two seven left			
16 h 21 min 06 s				Olympic two zero two affirm continue heading zero nine zero and expect short circuit	
					Attempt to engage the autopilot
16 h 21 min 12 s		➔ (*) t zero two			

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 21 min 14 s			APU started, Isolation valve (*) Two packs (*) Anti-ice off Control (*) confirm		
16 h 21 min 20 s				Olympic two zero two confirm you have still two engines	
16 h 21 min 23 s	Affirmative	➔ Affirmative two zero two			
16 h 21 min 26 s		Captain, we would like to maintain the autopilot please			
16 h 21 min 29 s	No, no,let me fly				
			TCAS (*)		
		Speed, speed			
	Yeah				
16 h 21 min 42 s			(*) number 3 electrical power (*) Okay, engine failure check-list is completed complete Checking the landing weight now		

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 21 min 58 s	Think we have to dump some fuel or?				
			I'm working, I'm working		
16 h 22 min 03 s		➔ Euh Olympic two zero two we would like to go to the dump area have a little time to dump some fuel			
16 h 22 min 19 s				Olympic two zero two confirm you want to dump fuel	
16 h 22 min 22 s	Affirmative				
			(L'OMN parle en arabe)		
16 h 22 min 30 s		➔ Euh stand by one (*) may be we will not need fuel dump.			
		(L'OPL parle en arabe)	(L'OMN parle en arabe)		
16 h 22 min 46 s	We we are not asking for fire trucks or something like this OK?				
			(*) No need		
		No need ?			
			No need that's it		

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 22 min 54 s		➔ Euh Olympic two zero two we would like to have a short circuit and land and no need to dump fuel			
16 h 23 min 00 s	Normal landing				
			Normal landing		
16 h 23 min 06 s				Olympic two zero euh two affirm you will have a short circuit	
16 h 23 min 12 s		➔ That's affirmative no need to dump fuel we would like short circuit to go back and land			
16 h 23 min 19 s				Affirm	Call to cockpit from cabin
16 h 23 min 23 s	Euh airport is over there euh she didn't say which runway eh?				
16 h 23 min 27 s			two seven left		
16 h 23 min 28 s	Two seven left okay				
16 h 23 min 29 s	Can you give me the ILS?	Yeah			

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 23 min 39 s			A kind of what ?	Olympic two zero two euh can you make a kind of visual approach ?	
16 h 23 min 47 s		➔ Err we have the field in sight, we'll try (*) (Charlie) Confirm two seven left			
16 h 23 min 54 s				Olympic two zero twol confirm two seven left	
16 h 23 min 57 s		➔ Roger euh thank you			
16 h 23 min 59 s			Okay go for the approach check-list		
	Okay yeah go ahead approach check-list				
16 h 24 min 01 s	Tell me when we are abeam the runway				
16 h 24 min 04 s			After take-off is completed sir		
	Okay thank you				
16 h 24 min 08 s			(*) time for approach check-list		
16 h 24 min 10 s	Yeah okay go ahead				
16 h 24 min 13 s			Time for the flaps		

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
	Yeah let's go flaps four				
16 h 24 min 16 s			Landing lights as required Seat belts- is on Altimeter set and cross check, radioaltimeter set and cross check		
		Radioaltimeter 200			
16 h 24 min 30 s	And flaps ten Are we abeam the runway?	200 (*)			
		Not yet, you have to go further			
16 h 24 min 37 s	Yeah but…are we abeam ?			Olympic two zero two turn right heading one eight zero	
16 h 24 min 41 s		➔ Say again two zero two?			
16 h 24 min 43 s				Olympic two zero two turn right heading one eight zero	
16 h 24 min 45 s		➔ Roger turning right one eight zero two zero two			
16h 24 min 49 s	OK flaps ten please				

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
		Flaps ten you have and (*)			
	Okay one eight zero hein?				
16h 25 min 04 s		Speed captain			
	Now we are flaps ten we can go to…				
		I know but… We would like to maintain speed			
16 h 25 min 14 s		Don't forget the right engine			
16 h 25 min 18 s	Keep the runway in sight if you can please				
			145 Vref		
	145 ?				
			Yes sir		
16 h 25 min 25 s				Olympic two zero two turn right two four zero to intercept two seven left to intercept the final two seven left	
16 h 25 min 32 s		➔ Roger two zero two			
16 h 25 min 34 s	Where's the runway? It's overthere…				
16 h 25 min 40 s		Okay the ILS is set to your side			

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
	Okay give me flaps 22				
		22 you have (*)			
16 h 25 min 46 s				Olympic two zero two confirm your number of engines on failure	
		➔ Say again			
16 h 25 min 53 s				Olympic two zero two confirm the number of engine on failure	
		➔ Number three (*) engine two zero two			
	Can you call the passengers ?				
			After, after let me first (*)		
16 h 26 min 06 s	Can we turn in?				
		No no…			
16 h 26 min 08 s		…Euh Yes			
16 h 26 min 09 s		➔We are turning inbound two zero two			
			(*)		
		Right, right, The engine is still right			
16 h 26 min 15 s	Yes I know, I know				
		Then maintain (*) right			

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 26 min 19 s				Olympic two zero two turn right to come back on final euh two seven left	
		➔ We are turning			
16 h 26 min 26 s	27 left, we have overshooted okay				
16 h 26 min 28 s		Speed captain			
			(*) flaps		
16 h 26 min 31 s		Speed captain			
	Speed is good				
			(*) flaps		
16 h 26 min 34 s	145				
			Down to the landing gear		
16 h 26 min 42 s		Would you like to descend?			
16 h 26 min 44 s	Okay wait a minute, ILS, can you give me the ILS?	Yes			
16 h 26 min 48 s		You have			
	The inbound track 267, 267°	267°			
16 h 26 min 53 s	And gear down				
16 h 27 min 00 s	Approach landing				
		(*) alarm glide slope			Gear not extended horn

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 27 min 03 s				Olympic two zero two clear to land runway two seven left three hundred degrees one seven knots	
16 h 27 min 07 s		➔Roger clear to land two seven left two zero two			
16 h 27 min 10 s			(*) passengers sorry for the inconvenient we are turning back to Paris Charles-de-Gaulle due to engine failure		Announcement made to passengers
16 h 27 min 17 s	Landing check list				Selector noise
	Flaps…				
	Flaps 33		Landing check-list		
			Landing gear		
16 h 27 min 23 s	Down			Pour Flyco huit sur Yankee treize pour l'inspection derrière Olympic	
16 h 27 min 28 s		Below the glide			
16 h 27 min 28 s				(*) Flyco huit (*) pour euh je te rappelle	

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
		(*)	(*)		Inaudible conversation
16 h 27 min 38 s			Operation operation, flaps 33 degrees (*)		
		Speed captain			
	Speed is good				
		You are below the glide			
16 h 27 min 44 s			Landing check-list complete sir		
		(*)	(*)		Inaudible conversation
16 h 27 min 56 s			Landing check completed sir		
	Okay				
	Landing lights		(*)		
16 h 28 min 02 s		We arrive on the glide			
16 h 28 min 13 s	What's the wind?				
16 h 28 min 16 s		Wind two seven zero… One four knots			
	Okay				
		So give it a little more speed captain			
16 h 28 min 32 s		Keep the (*) speed			

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 28 min 34 s				Flyco 8 donc tu pourras pénétrer pour l'inspection derrière le Tristar qui est en courte là.	
16 h 28 min 41 s				J'ai bien vue sur le Tristar et derrière je rentre en 27 gauche.	
16 h 28 min 51 s		(*) speed is good everything is fine what's the height ?			Minima warning
			100		
16 h 29 min 00 s			60		
			40,30, 20, 10		
	Come on				Sound of touchdown
16 h 29 min 13 s			(*) reverse		
16 h 29 min 17 s			Brake pressure normal		
		Speed rushing down			Slowdown, reversers
16 h 29 min 25 s		One hundred			
16 h 29 min 40 s	I take the next one				
16 h 29 min 55 s	Oh they called the fire brigade also, shit				Sound of flap retraction selector

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
		It's the procedure			
16 h 30 min 00 s		Brake pressure normal			
	Okay I think we can take this one				
16 h 30 min 12 s		➔ Olympic two zero two can we take next left?			
16 h 30 min 18 s				Olympic two zero two affirm	
		➔Thank you			
16 h 30 min 25 s		Severe damage ?			
16 h 30 min 28 s			Severe damage yeah		
16 h 30 min 32 s	It was correct that we did the fire procedure because of the severe damage				
16 h 30 min 39 s			In the severe damage only you got the fire procedure		
16 h 30 min 40 s	Okay can you ask for the taxi instructions?				
16 h 30 min 44 s		➔ Euh Olympic two zero two euh runway is clear			
16 h 30 min 50 s				Okay Olympic two zero two euh contact ground one two one eight	

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 30 min 55 s		➔ One two one eight thank you for your cooperation… thanks'			
16 h 31 min 00 s				Welcome correction one two one six	
16 h 31 min 03 s		➔ One two one six			
16 h 31 min 04 s				Sierra Québec	
16 h 31 min 06 s		➔ Euh de Gaulle Ground Olympic two zero two bonjour			
16 h 31 min 09 s		Brake pressure normal APU is on line			
16 h 31 min 11 s				Olympic two zero two bonjour do you need to stop here?	
	Negative we can go to the ramp				
16 h 31 min 18 s		➔ Euh we'll we would like parking			
				Okay	
16 h 31 min 35 s	So initially, straight ahead ?				
16 h 31 min 55 s				Olympic two zero two taxi Sierra two two via Mike and Alpha	

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 32 min 00 s		è Taxi two two via Mike and Alpha two zero two			
16 h 32 min 04 s				Zero two it's left here	
	Flaps UP after landing (*)				
	(*)	(*)			Inaudible conversation
16 h 32 min 32 s		è Two zero two confirm taxi clearance please			
16 h 32 min 36 s				Two zero two it's stand Sierra two two via Mike	
16 h 32 min 42 s		è stand two two via Mike two zero two (Olympic)			
16 h 32 min 45 s				Stand Sierra two two	
		è Sierra two two			
16 h 33 min 00 s	Did somebody call mechanics check whether can they see something?				
	(*)	(*)	(*)		Inaudible conversation
16 h 33 min 32 s	Are you sure?				
		Straight ahead			

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 33 min 55 s		èOlympic two zero two can we proceed straight on Mike ?			
16 h 34 min 05 s				Olympic two zero two mike is on your right but if you can't turn you can go straight ahead	
16 h 34 min 10 s		Roger thank you two zero two			
16 h 34 min 14 s				Flyco eight on fifty?	
				Yes, I'm behind the Olympic	
				Yeah and could you get in front because I have the impression that he's that he can't find it and he'll need a « Follow me » I think	
16 h 34 min 28 s				I'm going to try to get in front of him and I'll let you know when I'm in front	
				Okay well now he's continuing to taxi. Do you want me to ask him to stop?	

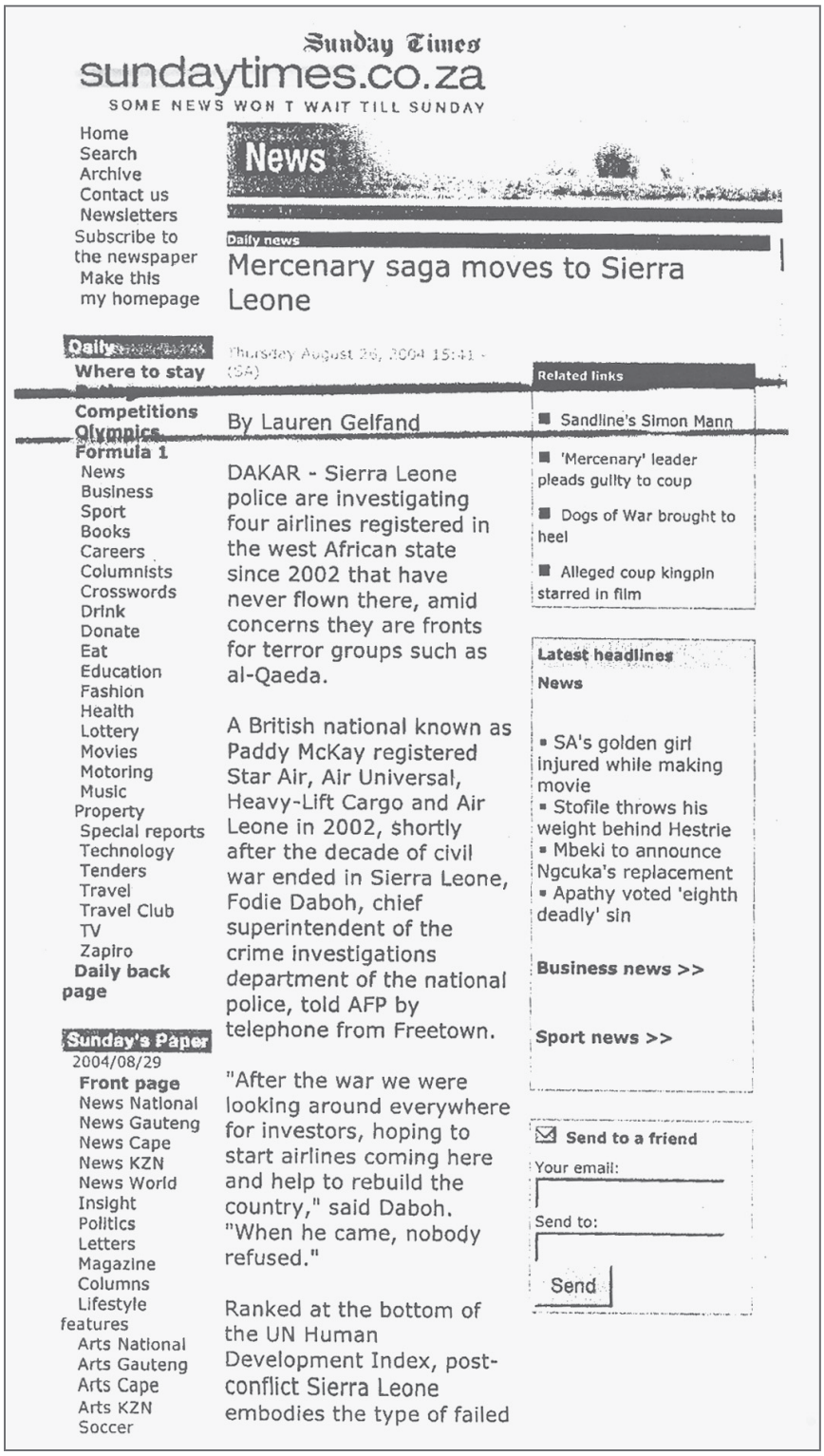
ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
				Okay I'm going to take the next crossway	
16 h 34 min 38 s				Yeah that's gonna be we 'll see okay keep trying	
16 h 34 min 39 s	How much? What was the vibrations during this? (*) TGT ?				
16 h 34 min 47 s			TGT right, with the sound, that's why I said (*)		
				Olympic two…	Interrupted by other traffic
16 h 34 min 44 s				Call you back Olympic two zero two do you need a Follow me?	
16 h 34 min 52 s				Olympic two zero two at the next intersection it's the first on the right	
16 h 34 min 53 s			That's why I said severe damage cause we have bang		

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 34 min 55 s	There was no evidence before the previous flight				
			No evidence		
		It's always vibrations			
16 h 35 min 06 s				The Olympic ought to go that way Flyco right?	
16 h 35 min 14 s				Ground Flyco eight?	
16 h 35 min 16 s				yes Flyco eight, I'm listening	
16 h 35 min 17 s				Is it here where I am now that the Olympic is supposed to go ?	
16 h 35 min 20 s	I know You might have some severe vibrations Do we need that fire truck cause they charge us Normally they do	No they don't			

ATC/UTC Time	Captain	Copilot	Flight Engineer	ATC Cabin Crew	Comments, noises
16 h 35 min 26 s				Okay and after that, where's he supposed to go? Because anyway, so I can direct him in that case.	
16 h 35 min 26 s				He's going to Sierra twenty-two (*) Alpha the other way, okay ?	
16 h 35 min 34 s				Alpha the other way, okay i'm getting in front of the Olympic	
16 h 35 min 37 s				Olympic two zero two can you see the yellow car above you?	
16 h 35 min 40 s	è Affirmative thank you for the cooperation Olympic two zero two				
16 h 35 min 45 s				Okay follow the car	
16 h 35 min 47 s	è Follow the car two zero two				
16 h 36 min 14 s	You check the TGT You haven't seen the TGT right? Number 3				
			Yeah I saw it, yes		
END	**OF**	**THE**	**TRANSCRIPT**		

Appendix 4

Article from Sunday Times of South Africa



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Daily news

Mercenary saga moves to Sierra Leone

Thursday August 26, 2004 15:41 - (SA)

By Lauren Gelfand

DAKAR - Sierra Leone police are investigating four airlines registered in the west African state since 2002 that have never flown there, amid concerns they are fronts for terror groups such as al-Qaeda.

A British national known as Paddy McKay registered Star Air, Air Universal, Heavy-Lift Cargo and Air Leone in 2002, shortly after the decade of civil war ended in Sierra Leone, Fodie Daboh, chief superintendent of the crime investigations department of the national police, told AFP by telephone from Freetown.

"After the war we were looking around everywhere for investors, hoping to start airlines coming here and help to rebuild the country," said Daboh. "When he came, nobody refused."

Ranked at the bottom of the UN Human Development Index, post-conflict Sierra Leone embodies the type of failed

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Appendix 5

Captain's report

STAR AIR

FLIGHT OPERATIONS DEPARTMENT

Engine Failure / Shutdown Report

Flight No OA 202 Time 2030L Sector LFPG-LFAU Date 07/07/2005

A/C Reg. BSM Type L1011 FLT Phase Take off

Pilot in Command [redacted] F/O - F/E [redacted]

Eng. No. 3 TTL HRS

Reason: Failure ___ Fire ___ Severe Damage Precautionary Shutdown ___

Last Engine Reading *(Whatever possible)*

EPR ___ N1 ___ N2 ___ N3 ___ EGT/TGT ___

Vibration Inlet ___ A Turbine ___ B

N L M H N L M H

Oil Pressure ___ Temp ___ Qnty ___ F.F ___

Oil Pressure ___ Temp ___ Qnty ___ F.F ___

Flight Level ___ Mach ___ IAS ___ TAT ___

Engine Condition After Shutdown

EPR ___ N1 ___ N2 ___ N3 ___ EGT/TGT ___

EPR ___ N1 ___ N2 ___ N3 ___ EGT/TGT ___

Vibration Inlet ___ A Turbine ___ B

N L M H N L M H

Oil Pressure ___ Temp ___ Qnty ___ F.F ___

Others

Remarks During Take Off after gear retraction Engine T6T went up to 860°C (red light on) and a big noise was heart (big bang). The Severe Damage Check-list was carried out and the a/c returned to LFPG

[redacted] - F/E Signature

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