MINISTERE DE L'EQUIPEMENT, DES TRANSPORTS, DE L'AMENAGEMENT DU TERRITOIRE, DU TOURISME ET DE LA MER - BUREAU D'ENQUETES ET D'ANALYSES POUR LA SECURITE DE L'AVIATION CIVILE

BEA

Incident
on 18 January 2003
at Paris Charles de Gaulle airport
to the Boeing 747-412F
registered 9V-SFH
operated by Singapore Airlines Cargo

REPORT

9v-h030118a

F O R E W O R D

This report presents the technical conclusions reached by the BEA on the circumstances and causes of this incident.

In accordance with Annex 13 of the Convention on International Civil Aviation, the conclusions 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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S Y N O P S I S

Date and time
Saturday 18 January 2003 at 5 h 06 (1)

Site of incident
Paris Charles de Gaulle Aerodrome (95)

Type of flight
International cargo transport

Aircraft
Boeing 747 - 412F

Owner
Singapore Airlines Cargo

Operator
Singapore Airlines Cargo

Persons on board
2 pilots

Summary

During taxiing at night in thick fog on the Romeo taxiway, before take-off from runway 26 right, the right wing of the airplane struck a de-icing vehicle. The crew did not notice the collision with the vehicle and undertook its flight to Dubai without further incident. Some debris was found in Paris. At Dubai, some debris was found on the ground and damage was observed on the airplane.

Consequences

	Persons			Equipment	Third Parties
	Killed	Injured	Unhurt		
Crew	-	-	2	Right wing slightly damaged	De-icing vehicle damaged
Passengers	-	-	-		

(1) Except where otherwise noted, the times shown in this report are expressed in Universal Time Coordinated (UTC). One hour should be added to obtain the time applicable in metropolitan France on the day of the incident.

1 - FACTUAL INFORMATION

1.1 History of Flight

On 18 January 2003, Singapore Airlines Cargo flight 7377 was preparing to undertake the flight between Paris Charles de Gaulle and Dubai.

The aerodrome was foggy, visibility was variable.

At 4 h 00, taking into account the atmospheric conditions, the Sierra Echo (SE) de-icing zones were opened to allow for the flights that were scheduled for that day. Consequently, the team took de-icing vehicles out from the garage and positioned them at SE1. At about 4 h 30, they left the zone to go to the de-icing control center.

At 4 h 40, the airplane crew made their first radio contact with the « de Gaulle data » pre-flight frequency and requested start-up and push back.

At 4 h 43, the supervisor of the de-icing control center advised the duty chief in the central tower [(2)] that the de-icing zones were open.

At 4 h 50, the airplane began taxiing towards the runway 26 right holding point via the Romeo taxiway. At 5 h 06, it entered the SE1 zone without any intention to de-ice. The right wing struck the de-icing vehicle's operator's control cabin. The crew did not notice the impact and continued taxiing towards the holding point.

At 5 h 15, the airplane took off.

At 6 h 54, le supervisor of the control center noticed the damage on the de-icing vehicle and warned the control tower.

In the course of the morning, some research was carried out among operators to identify the airplane concerned. The time period defined covered a Singapore Airlines Boeing 747 bound for Madrid.

At about 12 h 30, Singapore Airlines station agents at Dubai warned their counterparts in Paris that an airplane coming from Paris had suffered damage. The latter informed the aerodrome authorities.

1.2 Killed and Injured

Not applicable.

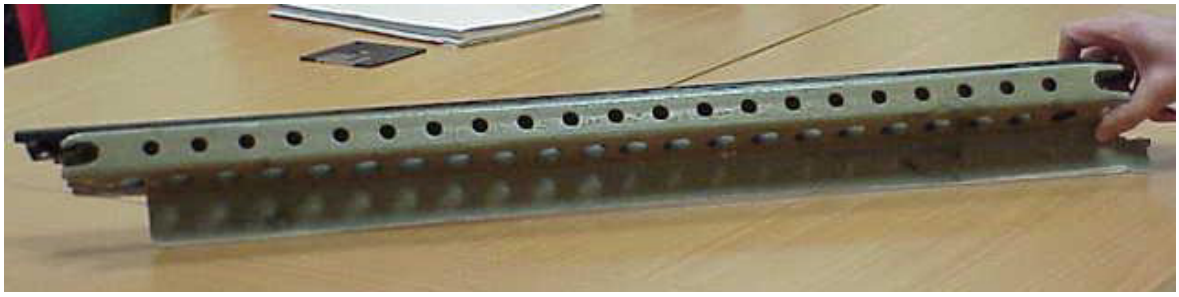
[(2)] Previously called « North tower ».

1.3 Damage to Aircraft

The airplane was damaged at the level of leading edge flap [3] 26 E on the right wing [4]. The wing leading edge was also slightly damaged.

On the de-icing zone, some small pieces of debris were found.

A part of flap 26 E was found on the northern edge of runway 26 right between taxiways S4 and S3.



The main damaged part of flap 26 E was found at Dubai.

[3] These mobile surfaces on the leading edge are generally called slats, but in the manufacturer's documentation, both in the original English version and in the French version used by a French operator, the name "flap" is used.

[4] Flap 26 E is part of the outer unit nearest to the wing tip.

1.4 Other Damage

The operator's control cabin on the de-icing vehicle was damaged.

1.5 Personnel Information

1.5.1 Flight crew

Captain

Male aged 53.

Professional Pilot's License issued by Singapore, valid until 30 June 2003.

Experience: 18,974 flying hours.
Experience on Boeing 747-400: 5,439 flying hours.

The Captain had performed two daytime flights from Paris Charles de Gaulle in the course of the previous two years. He had made his last flight into Paris Charles de Gaulle on 14 January 2003, with an arrival at 02 h 51 min, and had had four days' rest before the incident flight.

Co-pilot

Male aged 49.

Professional Pilot's License issued by Singapore, valid until 30 April 2003.

Experience: 9,136 flying hours.
Experience on Boeing 747-400: 7,756 flying hours.

In the course of the previous two years, the co-pilot had performed one flight from Paris Charles de Gaulle, arriving in the morning during daytime. He had made his last flight into Paris Charles de Gaulle on 14 January 2003, with an arrival at 02 h 51 min, and had had four days' rest before the incident flight.

On 18 January, he was Pilot Flying (PF).

1.5.2 De-icing team personnel

The operator who had positioned the accident vehicle was a reserve operator. He had never worked at the zone but had visited it during his training period.

1.6 Aircraft Information

Airframe

- Manufacturer: Boeing
- Model: Boeing B747-412F
- Serial N°: 28032 / 1224
- Year of manufacture: 1999

Engines

- Manufacturer: PRATT & WHITNEY USA
- Type: PW4056

On departure, there were 82,000 kg of fuel on board compared to a total capacity of approximately 160,000 kg (203,000 liters). At this fuel level, the ground clearance where the impact occurred was estimated as follows:

- 5.50 m approx. at the base of the winglet;
- 5.35 m at the outer base of flap 26 E;
- 5.20 m at the inner base of flap 26 E.

The distance from base of the winglet on the outer edge of flap 26 E was 1.27 m.

The total wingspan of the B 747–400 cargo is 64.44 m with empty tanks, and can reach 64.90 m with full tanks.

The total height of the wing at the upper winglet level is 9.32 m with empty tanks, and can be 6.70 m with full tanks.

From the right cockpit seat, the damage to the right wing was about 48 m away at an angle of 145° (55° towards the aft).

1.7 Meteorological Conditions

Observations at the Paris Charles de Gaulle meteorological station:

- at 04 h 30: wind 220° / 4 kt, variable from 180° to 250°, visibility 1,200 m, RVR runway 26 R above 1,500 m, mist, cloud BKN at 100 ft, temperature 3 °C, dew point 3 °C, QNH 1018 hPa ;

- at 05 h 00 : wind 210° / 5 kt, visibility 900 m, RVR runway 26 R above 1,500 m, fog, cloud OVC at 100 ft, temperature 3 °C, dew point 3 °C, QNH 1018 hPa.

The visibility was variable in time and space and was less than one hundred meters in places. It was dark at the time of the event.

1.8 Aids to Navigation

The taxiway boundary lights were all in working order. The centerline lighting was used by the crew to position the airplane precisely on the taxiway, taking into account the visibility conditions.

1.9 Telecommunications

The ground radio communication equipment was in working order. The ATIS and the communications on the Ground and Tower frequencies are included in the appendices.

Relevant elements from the 04 h 50 Quebec ATIS:

…Wind two unit zero degrees, four knots. Visibility nine hundred meters. Fog. Cloud cover at one hundred sixty feet ….

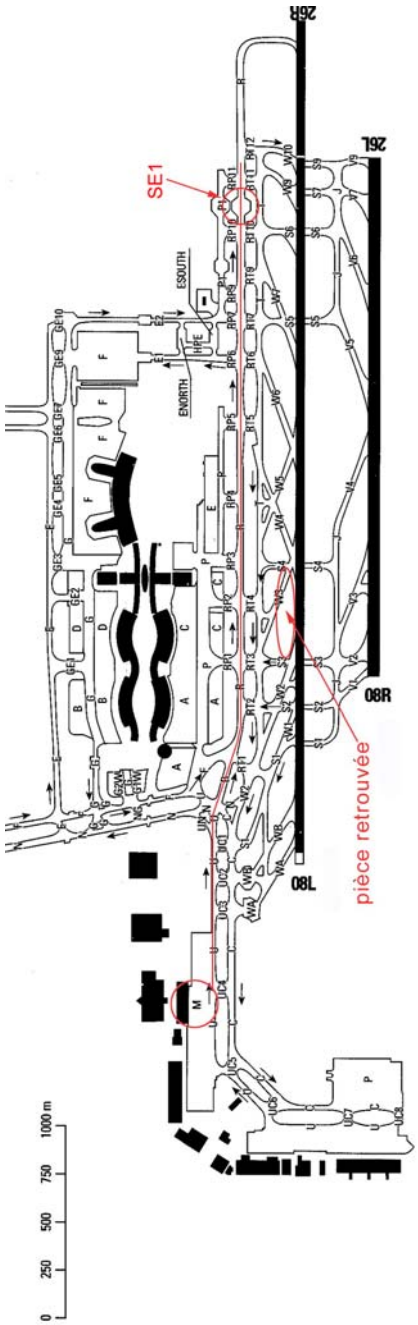
No specific elements that may have had a relation with the event were noted in the radio communications. The Controller asked the crew to hold their position, four minutes after the beginning of taxiing, in order to let another airplane pass. At no time did the crew make any comment on any problem and the airplane took off twenty-five minutes after the start of taxiing, including seven minutes' wait because of aerodrome activity.

1.10 Aerodrome Information

1.10.1 Background

Paris Charles de Gaulle aerodrome is a controlled civil aerodrome open to public air transport, operated by Aéroports de Paris.

The airplane's route between its ramp stand and its passage through SE1 de-icing zones is shown below.



1.10.2 Information on de-icing vehicles

Manufacturer: Verstergaard
Model: Elephant Beta

These autonomous vehicles allow heated de-icing liquids to be sprayed via a rotating cannon located at the end of the telescopic boom. The operator gets into the rotating cabin. There is a flashing light at a height of 4.10 m.

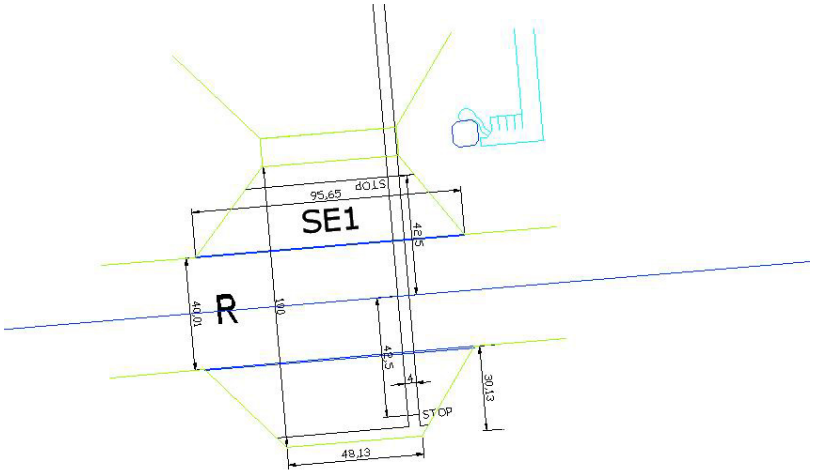
	
Arm and control cabin in retracted position	**Arm and control cabin in extended position**

When the arm is retracted, the cabin can be in a high position (during use) or in a low position (during vehicle movements). The overall height of the vehicle is then 5.20 m and 4.10 m respectively. At the time of the collision, the cabin was in the high position, with the arm retracted.

1.10.3 Information on the de-icing zones

The aerodrome has five de-icing zones: to the east and west before the parallel north runway, to the east and west before the parallel south runway and close to terminal 1. With the exception of the latter, each zone consists of two adjacent areas numbered 1 and 2. The one where the accident occurred is located to the east. It is intended to serve the south parallel runway by threshold 26 and is called SE (Sierra Echo). More precisely, the accident occurred on area Sierra Echo 1 (SE 1), the first area in the zone.

The shape of de-icing zone SE 1 can be compared to a hexagon on either side of taxiway Romeo.



Painted white lines define the area to be left clear for aircraft to taxi.

When vehicles are positioned beyond the markings, their position allows a Boeing 747-400 to pass with a lateral margin estimated at about ten meters, as shown in the photo.

The dissymmetry between the surfaces defined by the painted lines should be noted: the surface to the north of the area is clearly larger than that to the south. As a result, the vehicle has to be parked parallel to the taxiway in order to remain within the defined area whereas to the north it can be oriented in any direction.

1.11 Flight Recorders

The airplane was equipped with two flight recorders as required by the regulations.

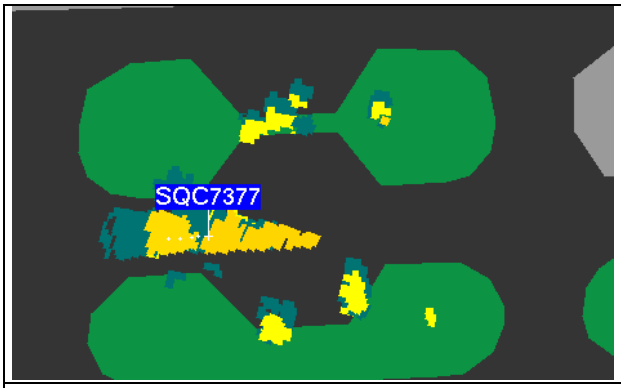
The cockpit voice recorder was not removed as the flight time between Paris and Dubai exceeded the length of the recording.

The Flight Data Recorder was read out. The data showed that the heading during taxiing on the taxiway was constant and that there was no noticeable change of direction, either before or after the collision. The recording did not provide any further information relevant to the investigation.

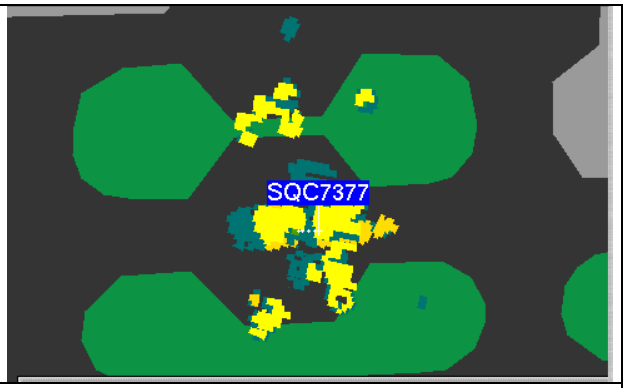
1.12 Wreckage and Impact Information

The ground radar recorded the airplane's movements from taxiing to take-off. The following photos are taken from the recorded images. They show the situation just before and during the collision. The surrounding area is shown in various colors: black is for the taxiways (the hexagonal shape of SE1 included), green is for the verges and orange or yellow for radar returns from fixed or mobile objects. The precision and sampling rate do not allow the outlines of the various vehicles to be defined exactly. The group of yellow and orange dots at the center of the area, moving from west to east, corresponds to the airplane. The tag indicating the flight number is superimposed on the radar return of the airplane.

These images show that the de-icing vehicle parked to the south-east is positioned differently than the three others, in a more withdrawn position (group of yellow dots).



Before the collision



At the moment the collision occurred

Note: Controllers only consult the ground radar to know aircraft positions and to ensure they avoid each other. Avoiding obstacles is the pilot's responsibility.

This radar data and on-site observations after the collision showed the approximate position of the vehicles on the de-icing zone a few seconds before the collision:

1.13 Additional Information

1.13.1 Testimony

1.13.1.1 Crew

According to the crew, the taxiing speed did not exceed three knots due to the limited visibility, which was diminishing. The taxiway and runway access lighting

was on. The reflective studs on the runway side lighting and the taxiway centerline lighting were clearly visible.
To help the co-pilot with the ground route, the Captain called out the taxiway intersections that they were passing.

Approaching the de-icing area, the intense light from the spotlights on the left side was rather disturbing.

The Captain said that the vehicles stationed to the right of the airplane seemed to him to be perhaps a little closer than those on the left but, since the latter were at a good distance, he supposed that those on the right were as well. From his side, the so-pilot stated that at that moment he could see the right wingtip and the airplane's navigation lights. A vehicle was slightly visible but he could not make out the exact shape and size. He was, however, able to check that the clearance available was adequate and, in particular, that the flashing light was clearly lower than the airplane's wings. A little later, he noticed the outline of another vehicle to the right that seemed to be a little further forward than the first one. He continued to taxi slowly and he was sure that the wing tip was higher than that of the vehicle's flashing light. There was no noise and no vibration.

1.13.1.2 De-icing personnel

The de-icing supervisor

This person supervised the movement of the de-icing vehicles but did not check that they were correctly positioned. Because of the dark and the fog, it was impossible for him to determine, from his control center, that the de-icing vehicle was badly positioned.

Driver of vehicle

This person positioned the de-icing vehicle perpendicular to the Romeo taxiway on the eastern edge of the tarred SE 1 zone. The fog and the dark prevented him from ascertaining that the vehicle was badly positioned.

1.13.2. De-icing zones

Aéroports de Paris sub-contracts de-icing operations on the southern runways of Paris Charles de Gaulle to the Aquaraile Runway company. These operations are described in the de-icing manual published by ADP. Training of agents undertaking de-icing includes a theoretical part delivered by Air France and a practical part delivered by Aquaraile Runway. Qualification for de-icing operations is attributed following an examination at the end of the training course.

1.13.2.1 Status of zones

The operations manual specifies, in general, that a zone can be “active” or “de-activated”. Other expressions are used in places: “entry into service”, “entry into use”, “zone open”, “station operational”. A case where vehicles are positioned in the absence of operators is not specifically referred to in the documentation. In practice, an undefined intermediate status exists, without any official status, called “areas open” when vehicles are pre-positioned, though the personnel is absent. This was the case at the time of the collision.

Note: when the de-icing zones are de-activated, they are classified as part of the movement area. When they are active, they are classified as part of the maneuvering area and aircraft movements are managed by the use of two- or three-color lights.

1.13.2.2. Movement and positioning of vehicles

Prefect’s order N° 00-2988 of 8 August 2000, applicable at Paris Charles de Gaulle aerodrome, stipulates in article 13 that *« no vehicle shall be left unattended on the movement area »*.

Everyday practice means that, when the zones are de-activated, the de-icing vehicles are moved back behind the white lines marked on the ground, so as to allow aircraft to pass and to be positioned. This is not explicitly stated in the documentation: the painted lines are not mentioned therein.

Equally, there is no instruction about the position of the control cabin when the vehicles are in position in the absence of the operators.

It should be noted that in the weeks that followed the event, ADP put in place systematic checks on the positioning of vehicles by the supervisor and by the driver of the vehicle on the opposite side.

1.13.2.3. Distinctions between zones

The operations manual mentions « *zones BD 1, BD 2, BD 7, BD 8, SE 1 and SE 2 are identical »*.

The dissymmetry of zone SE1 described in 1.10.3. is not featured in the documents given to de-icing operators. Nor is it mentioned that the illustrations are not to scale (see schematic in appendix).

2 - ANALYSIS

2.1 Positioning of the De-icing Vehicle

The documentation on the parking of de-icing vehicles is imprecise. The dissymmetry of some zones is not indicated, nor is the function of the ground markings in relation to the positioning of the vehicles. On the contrary, the schematic diagrams for positioning the de-icing vehicles in operation (see the example relating to the B 747-400 in the appendix) may lead to the conclusion that positioning the vehicle onto the painted line does not create any risk; an agent's experience would confirm this in fact, unless he had the opportunity to work on one of the rare zones where this supposition is incorrect.

The de-icing agent, who had never worked at SE 1, did not know its specific characteristics, despite having visited it on foot during his training, and the bad visibility prevented him from noticing that he was placing his vehicle too near to the aircraft taxiing path. He did not pay any particular attention to the ground markings, probably routinely.

At the time the vehicles were put in place, the zones were not exactly activated, but « open ». This intermediate status, which leads to leaving the vehicles in place for a prolonged period with no driver, is not defined in the operations documentation and there is thus no precise corresponding procedure. This probably constitutes procedural drift.

The absence of any instructions relating to waiting time situations thus allowed the de-icing agent to leave the control cabin in the high position, a position usually reserved for de-icing operations, and to leave his vehicle without any other lighting than the position light.

As there was no check procedure, either by the supervisor or by cross-checking, there was no chance that the incorrect positioning of the vehicle would be noticed and corrected as long as the visibility did not improve.

Once again, the BEA is led to note the lack of consistency between the level of requirements relating to airplane operations and the level of those that are applied in the immediate environment of the airplane on the ground.

2.2 Airplane Taxiing

Crossing this de-icing zone was carried out, as was all the taxiing, at low speed. The crew was vigilant but it is clear that they did not expect to meet an obstacle; after all, an aerodrome is first and foremost designed for aircraft movements and pilots naturally expect to be warned of any abnormal situation. The crew was thus, above all, keeping the route under surveillance.

They did notice the de-icing vehicle near the taxiway but, considering the bad visibility, they were not able to judge the exact distance that separated them from it. Nevertheless, the other vehicles seen had left them enough space to pass, which is both normal and usual; this led them to believe that the same applied with this one. Further, the pilot flying was able to see that the vehicle's position light was lower than his wing. He considered, logically but incorrectly, that this light marked the highest point on the vehicle. This series of incorrect interpretations led the crew to continue taxiing.

There remained only one possibility for avoiding the collision. The ground controller had a radar screen that showed a spot, thus an obstacle, closer to the airplane's route than the other comparable spots. There was, however, traffic on the aerodrome, despite the early hour, and the controller's role was to manage the traffic, not to ensure no collisions occurred with obstacles. Furthermore, for him the only possible risk that could occur on a taxiway would be from moving objects, which he would normally be aware of. Thus, he was not following this specific aircraft particularly closely and saw neither the obstacle nor the collision.

When the wing struck the de-icing vehicle's control cabin, the latter moved slightly, thus absorbing a part of the energy, which probably disguised the shock from the crew. Since no alarms were set off and the airplane's condition was nominal, the crew did not notice anything. They thus took off and performed the whole flight with a damaged airplane.

3 - CONCLUSIONS

3.1 Findings

- The airplane was certified and maintained in accordance with the applicable regulations.
- The crew possessed the licenses and qualifications required to undertake the flight.
- Visibility was reduced at the aerodrome, due to fog.
- De-icing zone SE 1 had the informal status of an « open » zone, not defined in the operations manual.
- A de-icing vehicle was positioned incorrectly. Its telescopic boom was retracted with the control cabin in the high position.
- The de-icing personnel possessed the necessary qualifications. However, the agent who had positioned the vehicle had never undertaken de-icing at SE 1.
- The position of vehicles is not defined precisely in the documentation; the position to the south on SE 1 is not very wide.
- There was no procedure for checking the positioning of vehicles.
- The crew noticed some vehicles but considered, in a difficult environment in terms of lighting, that there was space to pass.
- The airplane touched the de-icing vehicle's control cabin. The crew did not notice this and performed the planned flight.
- The impact caused some damage to the wing; this damage did not have any consequences for the flight.

3.2 Probable Causes

The causes of the accident were:

- the incorrect positioning of a de-icing vehicle left without its driver;
- the crew's incorrect perception of the dimensions of the obstacle in a difficult environment in terms of lighting;

And, as a contributory factor:

- the positioning of the control cabin in the high position;

- the fact that the de-icing vehicle's flashing light was not at the highest point on the vehicle, whereas the crew thought this to be the case, leading the pilots to estimate that the wing would not collide with the obstacle;

- the likely procedural drift represented by the undefined procedure for pre-positioning the de-icing vehicles;

- incomplete and imprecise documentation on the de-icing zones;

- the absence of checks on the positioning of vehicles in the procedures for setting up the de-icing areas.

List of Appendices

APPENDIX 1

Radio communications

APPENDIX 2

Schematic diagram of B747-400 de-icing from the de-icing operations manual

Radio Communications

Page 1

TRANSCRIPTION D'ENREGISTREMENT

OBJET : SQC 7377 **DATE** : 18 janvier 2003 **de** 04h 30.30 UTC **à** 05h 23 30 UTC

AERODROME:CHARLES DE GAULLE **POSITION**:SOL S/LOC S/LOC N **FREQUENCE**:121.8/120.9/119.25 Mhz

1 DE	2 A	3 HEURE	4 COMMUNICATIONS	5 OBSERVATIONS
SQC 7377	SOL S	04h 40 32	De Gaulle Data, bonjour, "Sing Cargo 7 3 7 7".	
SOL S	SQC 7377	04h 40 36	Call you back !	
SOL S	SQC 7377	04h 41 11	"Sing Cargo 7 3 7 7", start-up approved, expect runway 2 6 right, "LASIV 9 Bravo" departure, squawk 5 6 3 3.	
SQC 7377	SOL S	04h 41 30	"Sing Cargo 7 3 7 7", we 'ld expect runway 2 6 right, and "BUBLI 9 Bravo", correction 6 5 3 3 squawk ?	
SOL S	SQC 7377	04h 41 39	"Sing Cargo 7 3 7 7", the squawk is 5 6 3 3.	
SQC 7377	SOL S	04h 41 46	Roger, 5 6 3 3, and we are ready for push and start, information "Papa".	
SOL S	SQC 7377	04h 41 51	"Sing Cargo 7 3 7 7", the departure is "Lima Alpha Sierra India Victor 9 Bravo".	
SQC 7377	SOL S	04h 42 00	Roger, "LASIV 9 Bravo", "Sing Cargo 7 3 7 7".	
SOL S	SQC 7377	04h 42 05	And "Sing Cargo 7 3 7 7", push approved.	
SQC 7377	SOL S	04h 42 09	Approved, roger.	
SQC 7377	SOL S	04h 51 20	De Gaulle, "Sing Cargo 7 3 7 7", request taxi ?	
SOL S	SQC 7377	04h 51 23	"Sing Cargo 7 3 7 7", taxi holding point 2 6 right, "Whisky 10", via "Roméo".	
SQC 7377	SOL S	04h 51 29	Holding 2 6 right, "Whisky 10", via "Roméo", "Sing Cargo 7 3 7 7".	
SOL S	SQC 7377	04h 55 55	"7 3 7 7", please hold position !	Pour laisser passer MEA 209
SQC 7377	SOL S	04h 55 58	Hold position, "7 3 7 7".	
SOL S	SQC 7377	04h 56 00	Thank you very much !	
SOL S	SQC 7377	04h 57 33	"Sing Cargo 7 3 7 7", behind the A 3 21 ahead of you, you can resume taxi via "Roméo".	
SQC 7377	SOL S	04h 57 43	OK, behind heu…the traffic ahead, we can resume taxi via "Roméo", "7 3 7 7".	
SOL S	SQC 7377	05h 06 33	"Sing Cargo 7 3 7 7", taxi to "Whisky 10", and monitor Tower 1 2 0 decimal 9.	
SQC 7377	SOL S	05h 06 43	We monitor 1 2 0 9 on "Whisky 10", "7 3 7 7".	

OBJET : SQC 7377 **DATE** : 18 janvier 2003 **de** 04h 30.30 UTC **à** 05h 23 30 UTC

AERODROME:CHARLES DE GAULLE **POSITION**:SOL S/LOC S/LOC N **FREQUENCE**:121.8/120.9/119.25 Mhz

1 DE	2 A	3 HEURE	4 COMMUNICATIONS	5 OBSERVATIONS
			Changement de fréquence	
SQC 7377	**LOC S**	**05h 08 21**	**"Sing Cargo 7 3 7 7", bonjour, we are ready for departure.**	
LOC S	**SQC 7377**	**05h 08 25**	**"Sing Cargo 7 3 7 7", maintain holding point 2 6 right. Due to low visibility procedures, we have quite a lot of arrivals, call you back as soon as possible for the departure.**	
SQC 7377	**LOC S**	**05h 08 34**	**Roger.**	
LOC S	**SQC 7377**	**05h 11 54**	**"Sing Cargo 7 3 7 7", departure in about a minute, and have 2 minutes from now.**	
SQC 7377	**LOC S**	**05h 12 01**	**"Sing Cargo 7 3 7 7", roger.**	
LOC S	**SQC 7377**	**05h 14 30**	**"Sing Cargo 7 3 7 7", line-up runway 2 6 right, and be ready for a quick departure.**	
SQC 7377	**LOC S**	**05h 14 35**	**Roger, line-up 2 6 right, "Sing Cargo 7 3 7 7".**	
LOC S	**SQC 7377**	**05h 15 22**	**"Sing Cargo 7 3 7 7", clear take off 2 6 right, wind calm.**	
SQC 7377	**LOC S**	**05h 15 26**	**Clear for take off 2 6 right, "Sing Cargo 7 3 7 7".**	
LOC S	**SQC 7377**	**05h 17 04**	**"Sing Cargo 7 3 7 7", climb flight level 100 on the "LASIV 9 Bravo" departure.**	
SQC 7377	**LOC S**	**05h 17 11**	**Roger, "LASIV 1 Bravo, 9 Bravo", climb to 1 0 0, "Sing Cargo 7 3 7 7".**	
LOC S	**SQC 7377**	**05h 18 18**	**"Sing Cargo 7 3 7 7", continue climb flight level 1 9 0.**	
SQC 7377	**LOC S**	**05h 18 25**	**Flight level 1 9 0, "Sing Cargo 7 3 7 7".**	**Changement de contrôleur**
LOC S	**SQC 7377**	**05h 20 09**	**"Sing Cargo 7 3 7 7", contact De Gaulle on 1 1 9 2 5.**	
SQC 7377	**LOC S**	**05h 20 16**	**1 1 9 2 5, good morning !**	
			Changement de fréquence	
SQC 7377	**LOC N**	**05h 20 29**	**Ah De Gaulle, bonjour, "Sing Cargo 7 3 7 7", climb, passing flight level 5 0.**	
LOC N	**SQC 7377**	**05h 20 35**	**"Sing Cargo 7 3 7 7", climb to flight level 1 9 0, and turn left now inbound "LAURA" direct.**	
SQC 7377	**LOC N**	**05h 20 50**	**Roger, climb flight level 1 9 0, and confirm left turn direct**	

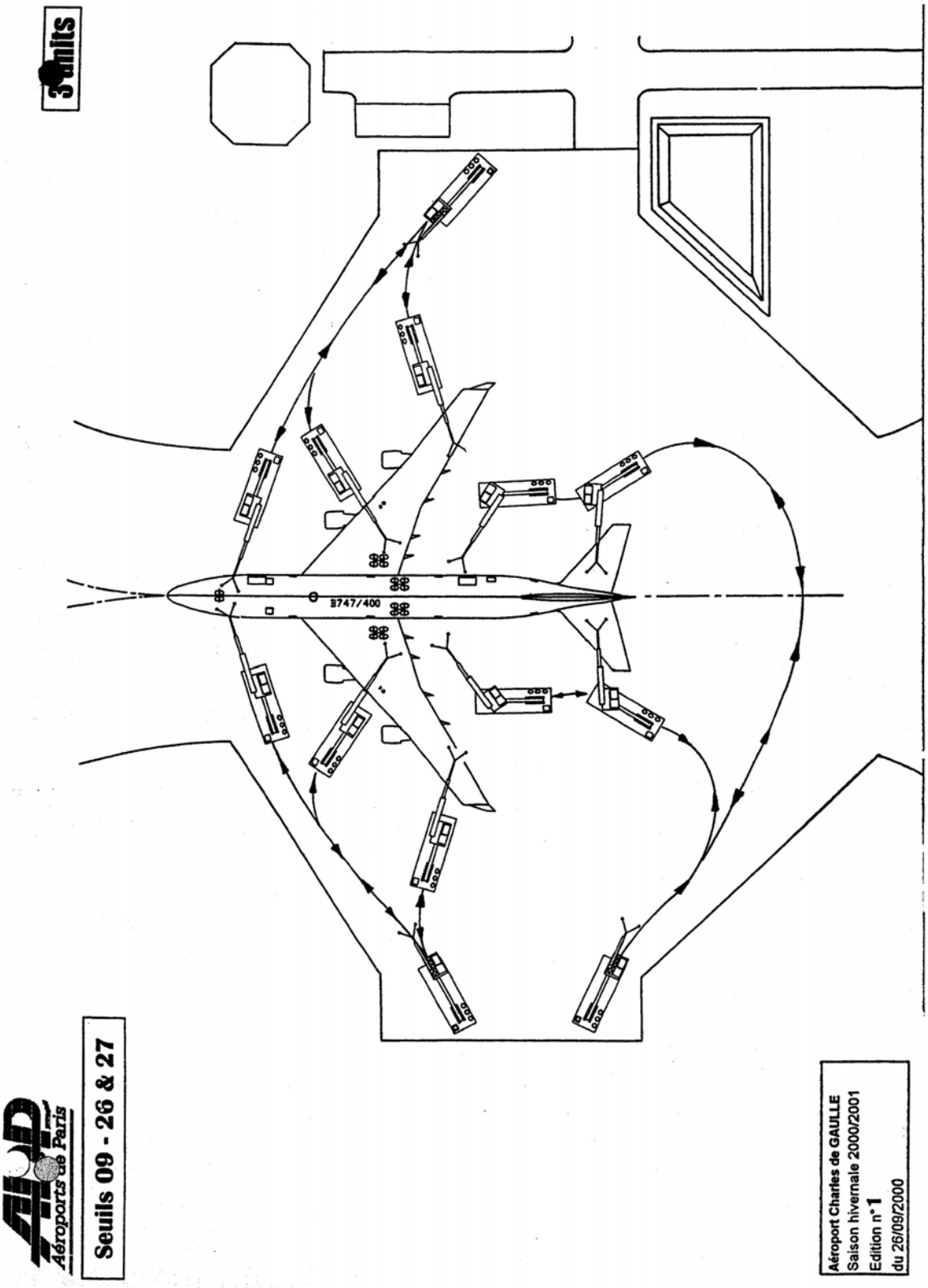
TRANSCRIPTION D'ENREGISTREMENT

OBJET : SQC 7377 **DATE** : 18 janvier 2003 **de** 04h 30.30 UTC **à** 05h 23 30 UTC

AERODROME:CHARLES DE GAULLE **POSITION**:SOL S/LOC S/LOC N **FREQUENCE**:121.8/120.9/119.25 Mhz

1 DE	2 A	3 HEURE	4 COMMUNICATIONS	5 OBSERVATIONS
			to what position ?	
LOC N	**SQC 7377**	**05h 20 56**	**"LAURA", R/nav point "LAURA", "Sing Cargo 7 3 7 7".**	
SQC 7377	**LOC N**	**05h 21 00**	**Roger, understand point "LAUVA", "Sing Cargo 7 3 7 7".**	
LOC N	**SQC 7377**	**05h 21 02**	**Check "LAURA", with "Roméo", it is "Lima Alpha Uniform Roméo Alpha".**	
SQC 7377	**LOC N**	**05h 21 12**	**Roger "LAURA", "Sing Cargo 7 3 7 7".**	
LOC N	**SQC 7377**	**05h 23 23**	**"Sing Cargo 7 3 7 7", contact Paris 1 2 0 decimal 9 5, good flight !**	
SQC 7377	**LOC N**	**05h 23 30**	**Roger, au revoir !**	

Schematic diagram of B747-400 de-icing from the de-icing operations manual



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