RAAD VOOR DE TRANSPORT VEILIGHEID

FINAL REPORT

98-85/S-14

N 193 DN, Boeing 767

10 December 1998 Amsterdam Airport Schiphol

N.B.:

Some parts of this report have been translated into the Dutch language. If there are differences in interpretation the English text prevails.

Aan dit in de Engelse taal gepubliceerde rapport is een beknopte, in het Nederlands vertaalde versie toegevoegd. Bij verschil in interpretatie dient de Engelse tekst als bindend te worden beschouwd

RAAD VOOR DE
TRANSPORT
VEILIGHEID

FINAL REPORT

The Dutch Transport Safety Board is an independent governmental organisation established by law to investigate and determine the cause or probable cause of accidents and incidents that occurred in the transportation sectors pertaining to shipping, civil aviation, rail transport and road transport as well as underground logistic systems. The sole purpose of such investigation is to prevent accidents and incidents and if the Board finds it appropriate, to make safety recommendations. The organisation consists of the Transport Safety Board and a subdivision in Chambers for every transportation sector which are supported by a staff of investigators and a secretariat.

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FINAL REPORT 98-85/S-14

Final report of the investigation into the probable cause of the serious incident with Delta Airlines Boeing 767, N193DN, on 10 December 1998 at Amsterdam Airport Schiphol.

In accordance with Annex 13 of the Convention of Chicago as well as the Directive 94/56/EC of 21 November 1994 establishing the fundamental principles governing the investigation of civil aviation accidents and incidents of the Council of the European Union, the purpose of an investigation conducted under the responsibility of the Dutch Transportation Safety Board is not to apportion blame or liability

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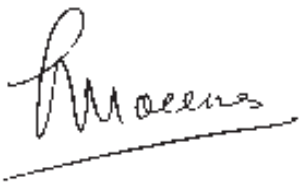

The Hague, January 2001

De Eindrapporten van de Raad voor de Transportveiligheid zijn openbaar.
Een ieder kan daarvan gratis een afschrift verkrijgen door bestelling bij SDU Grafisch Bedrijf, Christoffel Plantijnstraat 2, Den Haag, via telefax nr. 070 378 974

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VOORWOORD

Op 10 december 1998 deed zich op de Luchthaven Schiphol een ernstig incident voor, dat door tijdig reageren van de bemanning van een toestel van Delta Airlines zonder gevolgen bleef.
Het toestel van Delta Airlines, een Boeing 767, kreeg toestemming om te vertrekken, terwijl zich een gesleept vliegtuig (een Boeing 747) op de baan bevond. De bemanning van het Delta-toestel brak bij het zien van deze sleep onmiddellijk de start af en voorkwam daarmee een botsing, die uiteraard ernstige gevolgen had kunnen hebben.

De oorzaak van dit incident moest gezocht worden in enerzijds slecht zicht omstandigheden en anderzijds in onvolkomenheden in de communicatie tussen degenen, die op dat moment met de verkeersleiding waren belast.

De publicatie en daarmee de afronding van het onderzoek heeft langer op zich laten wachten dan bij de Raad voor de Transportveiligheid gebruikelijk is (gestreefd wordt naar een periode van een jaar). De Raad heeft willen wachten op de resultaten van mogelijke internationale ontwikkelingen op het gebied van zogenoemde “runway incursions” teneinde deze ontwikkelingen zo nodig in het onderzoek te betrekken. Deze resultaten hebben echter niet geleid tot andere dan de bestaande systemen op dit terrein.

Ten aanzien van de aanbevelingen, die in dit rapport zijn opgenomen, moet worden gesteld dat de NV Luchthaven Schiphol en de LVLN al direct na het incident maatregelen hebben genomen, om herhaling te voorkomen.

De aanbevelingen en gesprekken met de Luchthaven Schiphol en de LVNL zijn er op gericht dergelijke incidenten in de toekomst uit te sluiten, gelet op de ernst van de consequenties bij een ongeval.

Een samenvatting in de Nederlandse taal is in dit rapport opgenomen. Het rapport is op basis van internationale afspraken in het Engels gesteld.

EINDRAPPORT 98-85/S-14

Beknopte nederlandstalige versie

1. FEITELIJKE INFORMATIE

N.B. Alle in dit rapport genoemde tijden zijn lokale tijden (UTC +1)

Op de dag van het ongeval was het door een combinatie van slecht zicht en een lage wolkenbasis niet mogelijk om vanuit de verkeerstoren visuele controle op het verkeer uit te oefenen. Het gebruik van radar was nodig om het verkeer in de lucht en op de grond van verkeersaanwijzingen te kunnen voorzien.

Om ongeveer 10:18 was de organisatie op de verkeerstoren gewijzigd van twee landingsbanen (19R en 01R) en één startbaan (09) naar een situatie waarbij gebruikt gemaakt werd van één landingsbaan (19R) en twee startbanen (09 en 24).

Om 10:27 werd aan Martinair 629 door de verkeersleider toestemming verleend om op te lijnen op baan 24. Voordat Martinair 629 kon starten moest gewacht worden op een ander vliegtuig dat eerst op baan 19R geland moest zijn. Het verlengde van baan 19R kruist baan 24. (Zie: bijlage 2)
N.B. De betreffende verkeersleider was nog in opleiding. Hij was bezig met "on the job training."

Enige seconden later werd door de assistent verkeersleider een bericht ontvangen van een gele wagen van de Luchthaven Schiphol (roepnaam Charlie 8) met de informatie dat hij met een gesleept vliegtuig bij afrit 2 van baan 06/24 was gearriveerd en met het verzoek om deze baan te mogen oversteken. De verkeersleider die dit gesprek had gehoord, gaf aan de assistent verkeersleider door Charlie 8 opdracht te geven te wachten.
De verkeersleider informeerde vervolgens bij de assistent verkeersleider naar de precieze positie van Charlie 8. Deze antwoordde dat Charlie 8 bij afrit 2 klaar stond om de baan te kruisen richting S-platform. Zoals later bleek was dit een verkeerde veronderstelling.
Hieruit concludeerde de verkeersleider dat de positie van Charlie 8 aan de westzijde van baan 24 moest zijn. (dit komt overeen met een positie voor het kruisen van deze baan richting platform-S)

Nadat de verkeersleider Martinair 629 toestemming had verleend om te starten en hij zeker had gesteld dat het vliegtuig in de lucht was, gaf hij aan de assistent verkeersleider door dat Charlie 8 toestemming kon worden gegeven om de baan over te steken. Op hetzelfde moment werd hij opgeroepen door Delta Air Lines 039, die toestemming kreeg om op te lijnen op baan 24.

Nadat Charlie 8 toestemming had gekregen om de baan over te steken, vroeg deze direct aan de verkeersleiding om de stopbar verlichting uit te zetten. Toen de verkeersleider gevolg gaf aan dit verzoek ontdekte hij dat het betreffende schakelpaneel nog steeds stond ingesteld op de torensituatie van voor 10:18.

Hierop volgde enige discussie tussen de hoofdverkeersleider en enige andere verkeersleiders over de instelling van het schakelpaneel in relatie tot de verantwoordelijkheden van de diverse verkeersleiders.
Intussen had Charlie 8 nogmaals opgeroepen met de mededeling dat de stopbar verlichting nog steeds geactiveerd was. Uiteindelijk werd door de verkeersleider de stopbar verlichting aan zowel de oost- als de westzijde van afrit 2 uitgezet.

Intussen was Air UK 82S bezig met de nadering voor baan 19R. Naar het oordeel van de verkeersleider was er een mogelijkheid om Delta Air Lines 039 te laten starten zodra Air UK 82S geland was. De beschikbare tijd was niet overmatig ruim want een volgend vliegtuig was ook reeds bezig met een nadering voor baan 19R. Conform de voorschriften moest Delta Air Lines 039 met zijn start zijn begonnen voordat dit vliegtuig op 3 nm van het landingspunt was gearriveerd.

Nadat hij op het scherm van de grondradar had gezien dat Air UK 82S was geland, besefte hij dat Delta Air Lines 039 pas kon starten als de sleep vrij was van de baan. Op het scherm van de grondradar zag hij bij afrit 2 een echo aan de S-platform (Oost) zijde van de baan en vrij van de baan. In de veronderstelling dat de sleep de baan inmiddels had verlaten, wendde hij zich naar de assistent verkeersleider met de bedoeling daar bevestiging van te vragen. Op hetzelfde moment zag hij het licht op het stopbar controle paneel van groen op rood springen, hetgeen betekende dat de stopbars weer geactiveerd waren. Tevens hoorde hij radio communicatie tussen de assistent verkeersleider en Charlie 8 en hij nam aan dat dit de oproep van Charlie 8 betrof waarbij deze mededeelde dat hij de baan was overgestoken.

N.B. Stopbars worden automatisch weer geactiveerd wanneer een vliegtuig of voertuig de detectie ringen passeert of na een periode van ongeveer 60 seconden.

De beschikbare tijd om Delta Air Lines 039 te laten starten voordat het andere vliegtuig zich op 3 nm bevond was bijna voorbij en in de veronderstelling dat Charlie 8 en de sleep de baan inmiddels hadden verlaten, gaf hij Delta Air Lines 039 toestemming om te starten.

Ongeveer 20 seconden later riep Delta Air Lines 039 op met de mededeling dat de start was afgebroken omdat er zich een gesleept vliegtuig op de baan bevond.
Delta Air Lines 039 kwam tot stilstand in een positie tussen de afritten 4 en 3 van baan 06/24.

2. ANALYSE

Dit ernstige incident kon gebeuren doordat – in de veronderstelling dat de baan vrij was – Delta Air Lines 039 toestemming werd verleend om te starten, terwijl in werkelijkheid een gesleept vliegtuig begeleid door een volgwagen (Charlie 8) nog steeds bezig was de baan over te steken.

Een belangrijke reden voor deze (verkeerde) veronderstelling was de onjuiste aanname van de positie en de voorgenomen sleeprichting van Charlie 8.

Het begin van deze onjuiste aanname ontstond bij de eerste oproep van Charlie 8, waarbij geen informatie werd gegeven over de feitelijke positie, de gewenste taxiroute en de bestemming. De oproep bevatte alleen het verzoek om baan 24 bij uitgang 2 te mogen kruisen. Dit overigens conform de bestaande procedures.

De assistent verkeersleider verzocht niet om nadere informatie en nam aan zonder duidelijke reden, dat Charlie 8 wachtte bij uitgang 2 W(est) van baan 24 en op weg was naar het S-platform. Deze informatie werd ook doorgegeven aan de verkeersleider.

Gewoonlijk wordt de positie van voertuigen door de assistent verkeersleider visueel vastgesteld. Het zicht vanuit de toren was echter praktisch nihil. De beschikbare beeldschermen waren bezet door de voor de in gebruik zijnde banen verantwoordelijke verkeersleiders en op hun specifieke behoefte ingesteld. De assistent verkeersleider had daardoor niet de mogelijkheid om de positie van de sleep vast te stellen en de beweging te volgen. De onjuiste aanname kon daardoor blijven bestaan.

Uit de verkregen informatie van de assistent verkeersleider concludeerde de verkeersleider dat Charlie 8 stond te wachten bij afrit 2W van baan 24. Toen hij de assistent verkeersleider opdroeg om Charlie 8 toestemming te verlenen de baan over te steken, drukte hij dan ook op de knop van afrit 2W om de stopbar aldaar uit te zetten.
Het stopbar controle paneel stond echter nog afgesteld op de toren configuratie zoals die voor 10:18 van toepassing was. Het resultaat was dat de stopbar waarvoor Charlie 8 daadwerkelijk stond te wachten, bleef branden. Toen ook de volgende acties om de stopbar uit te zetten niet tot resultaat leiden, werden de stopbars aan beide zijden, 2W en 2E uitgezet. De mogelijkheid van een verkeerde aanname van de positie van Charlie 8 werd niet in de overwegingen betrokken.

Gedurende deze periode gingen er ongeveer 2 minuten verloren en de beschikbare tijd om Delta Air Lines 039 te laten starten, begon te verlopen. De verkeersleider, die dit besefte, zag op zijn beeldscherm een radarecho bij de positie van afrit 2E. Dit was de positie waar hij een radarecho van Charlie 8 verwachtte nadat deze de baan zou zijn overgestoken. Hij wendde zich naar de assistent verkeersleider om bevestiging te krijgen van het feit dat Charlie 8 vrij was van de baan. Toen hij de assistent verkeersleider met Charlie 8 hoorde praten nam hij aan dat Charlie 8 op dat moment opriep met de mededeling dat hij vrij was van de baan.
De verkeersleider wachtte niet verder op een formele bevestiging en gaf Delta Air Lines 039 toestemming om te starten.

In plaats van aan te geven dat hij vrij van de baan was, informeerde Charlie 8 de assistent verkeersleider dat hij begon met het oversteken van de baan. Deze oproep viel samen met de oproep van de verkeersleider met de starttoestemming aan Delta Air Lines. Beide verkeersleiders misten daardoor belangrijke informatie die tot een laatste wijziging van de toestemming om te mogen starten had kunnen leiden.

De toeziend verkeersleider (supervisor) was zich bewust dat een sleep op het punt stond baan 24 over te steken. Door de discussie rond de instelling van het stopbar controle paneel miste hij echter de oproep waarbij aan Delta Air Lines 039 toestemming werd gegeven om te starten. Hij had op dat moment geen goed totaal beeld van de verkeerssituatie en greep daardoor niet in.

De ingebouwde veiligheden die de verkeersleiding ter beschikking stonden waren op dit moment gepasseerd. Delta Air Lines 039 begon met zijn startaanloop op het moment dat Charlie 8 vanaf de zijde van het S-platform de baan in gebruik overstak. (van afrit 2E naar afrit 2W)

Alleen doordat de zichtomstandigheden vanuit de cockpit op dat moment redelijk waren en door een snelle en bekwame actie van de cockpitbemanning, die de start afbraken, kon een ernstig ongeval worden voorkomen.

3. CONCLUSIES

Slecht zicht en een lage wolkenbasis maakten visuele controle van het verkeer vanaf de verkeerstoren niet mogelijk. Slecht zicht procedures waren van toepassing voor vlieg- en grondbewegingen.

Er zijn geen aanwijzingen gevonden dat – zoals voorgeschreven bij het van kracht zijn van slecht zicht procedures – voorafgaande coördinatie m.b.t. de sleepbeweging tussen de platform controle dienst en de verkeerstoren had plaatsgevonden.

Afrit 2 van baan 06/24 was niet uitgerust met “traffic lights”.

Het verzoek om de baan te mogen oversteken was niet voldoende gespecificeerd, in de zin dat de gegevens m.b.t. de actuele positie en de voorgenomen sleeprichting ontbraken.

Door de assistent verkeersleider werd geen nadere informatie over de sleepbeweging gevraagd. Door een verkeerde aanname ontstond hierdoor een onjuiste veronderstelling met betrekking tot de positie van de sleep.

Als gevolg van deze onjuiste veronderstelling werd een verkeerde positie van de sleep aan de verkeersleider doorgegeven. Dit resulteerde uiteindelijk in een onjuiste interpretatie van het grondradar beeld.

De werkplek van de assistent verkeersleider was niet uitgerust met een grondradar beeld. Het was voor de assistent verkeersleider daardoor niet mogelijk toezicht op de sleepbeweging te houden.

De verkeersleider baseerde zijn beslissing om Delta air Lines 039 toestemmin voor de start te geven op zijn interpretatie van het grondradar beeld en de indicatie van het stopbar bedienings paneel. Hij heeft niet met de assistent verkeersleider overlegd om met zekerheid te kunnen vaststellen dat de sleep vrij van de baan was.

Door oplettendheid van de cockpitbemanning van Delta Air Lines 039 kon een ernstig ongeval worden voorkomen.

Ontwerp en plaatsing van de bedieningspanelen voor stopbars en traffic lights zijn voor meerdere uitleg vatbaar en daarom gevoelig voor foutief menselijk handelen.

Het niet gebruiken van een checklist bij de overgang van de inkomend verkeer procedure naar de uitgaand verkeer procedure leidde ertoe dat in de beginfase de schakeling van het stopbar bedieningspaneel niet in overeenstemming was met de verantwoordelijkheden van de verkeersleiders. Dit versterkte hun twijfel over de juiste werking van het systeem; het feit dat er mogelijk sprake was van een misverstand m.b.t. de positie van de sleep werd niet onderkend.

De hoofdverkeersleider heeft in algemene zin in onvoldoende mate toezicht gehouden op de uitvoering van de verkeersleiding en heeft niet tijdig ingegrepen om het voorval te voorkomen.

Het verkeersleidings personeel op de toren werkte niet als een team.

4. WAARSCHIJNLIJKE OORZAAK

Onderstaande factoren hebben bij het ontstaan van het voorval een oorzakelijke rol gespeeld:

Slechte weersomstandigheden hadden tot gevolg dat de verkeersleiding het verkeer op de grond niet visueel kon controleren;

Niet voldoende gespecificeerde informatie tijdens de communicatie tussen sleep en verkeerstoren;

Onjuiste veronderstelling m.b.t. positie en bewegingsrichting van de sleep;

Toestemming voor de start zonder met zekerheid vast te stellen dat de baan vrij was;

Onvoldoende samenwerking en toezicht.

5. AANBEVELINGEN

De technische voorzieningen m.b.t. de beveiliging van de baanuitgangen op Schiphol moeten eenduidig zijn zodat voor alle baanafritten een standaard procedure geldt. In het bijzonder geldt dit voor afrit 2 van baan 06/24. Ondertussen moeten, bij het van kracht zijn van slecht zicht procedures, verkeersbewegingen uitgezonderd taxiënde vliegtuigen, van en naar het S-platform niet meer toegestaan worden.
In dit verband wordt aanbevolen zo snel mogelijk de ICAO Annex 14 Standards op te volgen. (actie: Schiphol)

Aan verkeersleiders en platform personeel moeten herhalingscursussen worden gegeven op het gebied van procedures en radio communicatie. (actie: Schiphol & Verkeersleiding)

Aan de hoofdverkeersleider moeten naast zijn hoofdtaak geen extra verplichtingen worden opgelegd. (actie: Verkeersleiding)

Bij een uitvoering van een wijziging van de verantwoordelijkheden op de toren moet een checklist gebruikt worden. (actie: Verkeersleiding)

De bedieningspanelen voor stopbars en traffic lights moeten opnieuw ontworpen worden en geografisch zodanig worden samengesteld dat onduidelijkheid wordt voorkomen. (actie: Schiphol & Verkeersleiding)

De bestaande grondradar moet worden voorzien van een voorziening om de gegevens te kunnen registreren. (actie: Verkeersleiding)

De positie van de assistent verkeersleider moet worden uitgerust met een multi-mode beeldscherm. (actie: Verkeersleiding)

Team resource management training moet een vast onderdeel worden van de opleiding voor verkeersleider. (actie: Verkeersleiding)

De coördinatie en verbindingsprocedures tussen vliegveld en verkeersleiding moeten opnieuw bezien worden. (actie: Verkeersleiding & Schiphol)

GENERAL INFORMATION OF THE SERIOUS INCIDENT

Unless stated otherwise all times in this report are local times (UTC+1)

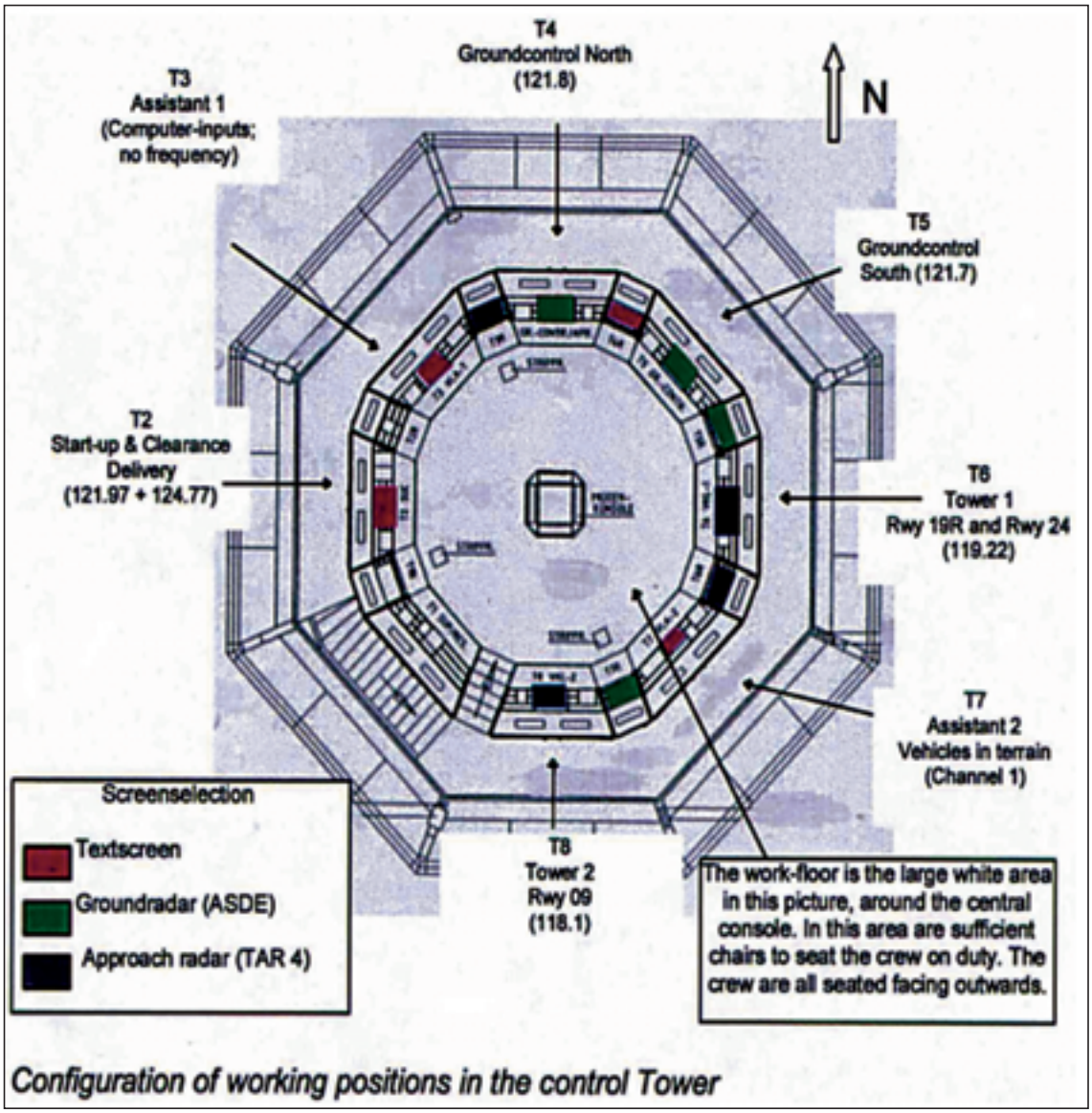
Place:	Amsterdam Airport Schiphol, runway 24
Date and time:	December 10th. 1998, 10:32
Aircraft:	Boeing 767-300
Aircraft registration:	N193DN
Aircraft operator:	Delta Air Lines
Flight crew:	12
Passengers:	126
Type of Flight:	Passenger transport
Phase of flight:	Take off
Type of occurrence:	Aborted take off due to obstructed runway

THE INVESTIGATION

The serious incident was notified to the Accident and Incident Investigation Bureau of the Netherlands Aviation Safety Board on December 10th 1998. Assistance in the investigation was rendered by Air Traffic Control the Netherlands.

SYNOPSIS

At the time of the serious incident low visibility and a low cloudbase made visual control from the tower impossible. Low visibility procedures were in force.
Delta Air Lines flight DAL 39 had been cleared for take-off from runway 24 at Amsterdam Airport Schiphol. Almost at the same time a KLM Boeing 747, being towed and accompanied by a yellow van was cleared to cross runway 24 at the position of exit 2. During the take-off roll the pilots of DAL 39 observed the towed Boeing 747 crossing the runway. The take off was aborted and the aircraft brought to a standstill before reaching the position of the tow.



Configuration of working positions in the control Tower

1 FACTUAL INFORMATION

1.1 Configuration and duties of control tower working positions

In the picture the working-positions of the Schiphol control tower are indicated by the character "T" (for Table), followed by a number. The coloured rectangles indicate the selected equipment at the working positions at the time of the incident.

Note: the textscreen at T7 (Assistant 2) is a permanent textscreen, while all other screens can be operated in three different modes. The text below the indication of a working-position refers to the use of the working-position at the time of the incident (type of control, responsibility and frequency).

Start-up Control (SUC) and Clearance Delivery (DEL) were combined at working-position T2 and operated by an Assistant Controller.

At position T3 another Assistant Controller was making computer-inputs to activate the internal electronic data-flow for departing aircraft, as well as inserting paper flightstrips of departures in stripholders.

Two Ground Control positions were active: at T4 one Ground Controller was responsible for ground-traffic on the northern side of the airport and at T5 a second Ground Controller was handling the ground-traffic on the southern side. At the time of the incident a colleague was just relieving the Ground Controller at T5 from duty.

There were also two Tower Control positions active at T6 and T8. At both positions on-the-job training (OJT) was taking place. Both T6 and T8 were occupied by a trainee, each with an OJT Coach (Instructor) monitoring their actions. The OJT Coach of the trainee at T6 was also the Tower Supervisor. At the time of the incident a third Controller had just entered the work-floor in order to relieve the trainee and OJT Coach at T8 from duty.

At T7 an Assistant Controller handled the communications with vehicles on the manoeuvring area. These communications take place on a dedicated radio-channel and the Dutch language is used.

In total there were eleven persons on the work-floor in the Tower when the incident occurred. Seven working-positions were in use, with OJT instruction at two of those. Two Controllers were in the process of taking over at T5 and T8.

1.2 Summary of events

On the day of the incident low visibility and a low cloudbase made visual control from the tower impossible. Radar had to be used to direct air-and ground traffic.

At approximately 10:18 Air Traffic Control had changed from two landing runways (19R and 01R) and one departure runway (09) to the so-called outbound mode with one landing runway (19R) and two departure runways (09 and 24).

After the mode change, position T6, from where landings on runway 01R and departures from runway 09 had been handled, became responsible for landings on runway 19R and departures from runway 24. Position T8 from where landings on 19R had been handled, became responsible for departures from runway 09.

At 10:27 the Controller at T6 cleared Martinair 629 to line up on runway 24. He then shifted his attention to runway 19R to observe the landing of an aircraft on that runway. This aircraft had to be positively on the ground before he could clear Martinair 629 for take-off from runway 24.

A few seconds later the Assistant Controller at T7 received a call via channel 1 (the dedicated frequency for vehicles etc.) from a yellow van of the Airport Authorities (callsign: Charlie 8). Charlie 8 reported that he was in front of runway 06/24, with a tow following him, and he requested to cross the runway at exit 2. Although the transmission from Charlie 8 was distorted, the Controller at T6 heard the request and told the Assistant Controller at T7 to instruct Charlie 8 to hold position. The Assistant Controller did so, and Charlie 8 acknowledged that he was holding position. The Controller subsequently asked the Assistant Controller what the position of Charlie 8 was, to which the Assistant Controller replied that Charlie 8 was waiting to cross towards the "S"-apron. From this the Controller derived that Charlie 8 had to be waiting on the western side of runway 24 (which is consistent with a movement towards the "S"-apron).

After he had cleared Martinair 629 for take-off and was positive that the aircraft was airborne, he authorised the Assistant Controller to give Charlie 8 permission to cross. While giving this authorisation to the Assistant Controller, he was called by Delta 39 who had just been transferred by Ground Control to the Tower-frequency. The Controller authorised Delta 39 to line up on runway 24 at almost the exact moment that the Assistant Controller told Charlie 8 that it was permitted to cross runway 06/24.

When Charlie 8 acknowledged the permission to cross, the driver immediately asked the Tower to extinguish the stopbar. This may have coincided with the action by the Controller to push the button that extinguishes the stopbar on the west side at exit 2 of runway 06/24, or the request may have triggered that same action. In any case, during the subsequent conversation between the Assistant Controller and Charlie 8 to repeat what was said, the Controller was already pushing the button on his control panel. (see paragraph 1.9.2: "Stopbar control panel)

The Controller then noticed that there was no result from pushing the button on his control-panel and realised that this panel was still configured for the previous set-up of the Tower. The panel at T6 only controlled the West-sector of the airport (i.e. runway 01L/19R), while the remaining three sectors were still allocated to the panel at T8. He immediately asked the Controller at T8 to extinguish the stopbar on the west side at exit 2 of runway 06/24, which this Controller did. The Controller then switched his attention to his Approach radar picture to monitor the inbound-sequence for runway 19R.

Meanwhile in the Tower, a discussion had developed between the Supervisor (who also was the Coach of the controller/trainee at T6) and a third Controller, who had arrived to relieve the controller/trainee and Coach at T8, about the stopbar control-panel allocation in relation to the respective responsibilities at T6 and T8. The Supervisor explained to the third Controller that the current situation was consistent with the previously

used runway-configuration. It was then agreed that in view of the current runway-configuration it would be preferable to allocate only the North-sector to T8 and the other three sectors to T6. This new allocation was instantly effected by the Coach of the controller/trainee at T8. The result of this was that now the controller at T6 had command of the stopbars at exit 2 of runway 06/24.

One minute and ten seconds after his previous call, Charlie 8 called the Tower again with the request to extinguish the stopbar. The Assistant Controller relayed this request to the Controller at T6, who once again pushed the button for the west side of exit 2 of runway 06/24. This action was reported by the Assistant Controller to Charlie 8, after which Charlie 8 reported that the stopbar was still activated. With the consent of his Coach the Controller then pushed the buttons for both sides of exit 2 of runway 06/24, thus extinguishing the stopbars on the west- and east side simultaneously.

Meanwhile the Controller had also been monitoring the inbound-sequence for runway 19R where Air UK 82S was approaching for landing. In his judgement there would be an opportunity for the departure of Delta 39 as soon as Air UK 82S was on the ground at runway 19R. The "departure window" was not overly large, for the next aircraft approaching for landing (callsign CSA 316) was already on the Tower-frequency. If he wanted to use this "departure window" he had to ensure that Delta 39 would have commenced its takeoff before CSA 316 would be 3 nm from touchdown runway 19R, as prescribed in the standing ATC procedures regarding separation between landing and departing aircraft. He therefore switched his attention to the groundradar-picture in order to watch for the landing of Air UK 82S.

When he saw on the groundradar-picture that Air UK 82S had landed on runway 19R, he was aware that he only could clear Delta 39 for take-off once the crossing car and tow would have vacated runway 06/24. He therefore looked at the bottom of his groundradar-picture, where exit 2 of runway 06/24 was visible (see paragraph 1.7 for a reconstruction of the groundradar-pictures"), and noticed a target on the exit, at the side of the "S"-apron, well clear of the runway. He then turned to the Assistant Controller with the intention to ask for confirmation that the car and tow had vacated the runway, and while turning he noticed that the indicator-lights at his stopbar control-panel had changed from green to red again. This meant that the stopbars at exit 2 of runway 06/24 were activated again, as required. Subsequently he heard an exchange between Charlie 8 and the Assistant Controller, which he assumed to be the report from Charlie 8 that the runway was vacated. He looked at the Assistant Controller for confirmation, but the Assistant Controllers back was turned to him for she was busy looking at the groundradar-picture at T7R (to her right, and to the left of the trainee at T8). He looked at his Approach-radar picture and noticed that the "window" for the departure of Delta 39 was still available but about to expire. In the belief that Charlie 8 and the tow had already crossed the runway, he cleared Delta 39 for take-off.

When some twenty seconds later Delta 39 reported aborting take-off , his first thought was that there had to be a technical problem with the aircraft and that the aircraft probably would require assistance. He said in a loud voice in the Tower that there was an "alert" because of an aborted take-off of a Boeing 767 on runway 24. He looked at the groundradar-picture and saw that Delta 39 had slowed down to an almost complete stop, somewhere in between exits 4 and 3 of runway 06/24. At that moment Delta 39 reported that they had "a KLM" in front of them, which caused him to think briefly

that maybe after all the landing aircraft on 19R had made a go-around (most Air UK aircraft are painted in KLM colours). Only when Delta 39 added that the KLM aircraft was being towed he realised what had caused the aborted take-off, and he noticed for the first time that the car and tow were crossing in the direction opposite to what he had been expecting.

The Supervisor and Coach of the Controller/trainee at T6 had not heard the take-off clearance given to Delta 39, possibly as a result of his involvement in the discussion about the allocation of the stopbar control panels. He therefore was completely surprised by the "alert" announcement. When he looked at the groundradar-picture he could see Delta 39 stopping and also the car and tow crossing the runway, coming from the "S"apron and moving to the centre of the airport. The tow was well across the runway but not yet clear.

The Assistant Controller had been looking at the groundradar-picture at T7R (to her right) a couple of times in order to spot Charlie 8, but had been unsuccessful.

Note: working-position T7 is equipped with a fixed textscreen only. The (multi-mode) screen at T7R was at the discretion of the controller at T8.

The screen at T7R was used by the Controller (working at T8) to monitor his traffic on runway 09. To that end he had, at the instigation of his Coach, adjusted the picture in a way that gave him a good view of the runway he handled. A side effect of this was that the southernmost boundary of the picture was just across exit 2 of runway 06/24, which made it difficult for the Assistant Controller to correctly assess the situation. She did not have another groundradar picture at her disposal, for the screen to her left (T6R) displayed an Approach-radar picture for the convenience of the Controller at T6. When the Controller announced the "alert" and aborted take-off, she was unaware that there had been a take-off in progress on runway 24.

1.3 Personnel information

Of the eleven Controllers on duty at the time the incident took place, three were directly involved with the incident: the Supervisor/Coach of the Controller/trainee at T6, the Controller at T6 himself and the Assistant Controller at T7.

Supervisor/Coach of the trainee at T6

Nationality	: Dutch, male.
Age	: 46 years.
License	: valid license for Air Traffic Controller at Schiphol Tower/Approach.
Medical check	: last medical check November1998, medically fit.
Experience	: Air Traffic Controller Schiphol Tower/Approach since 1987; Air Traffic Control instructor since 1990; Supervisor since 1996.

The Controller/trainee at T6

Nationality	: Dutch, male.
Age	: 31 years.
License	: valid license for Air Traffic Controller at Beek Approach.
Medical check	: last medical check April 1997, medically fit.
Experience	: 120 hours on the job training at Schiphol Tower/Approach since April 1998.

The Assistant Controller at T7

Nationality	: Dutch, female.
Age	: 30 years.
License	: valid license for Assistant Controller and Ground Controller.
Medical check	: last medical check February 1997, medically fit.
Experience	: Assistant Controller Schiphol Tower/Approach since 1995; Ground Controller since 1997.

1.4 Meteorological information

The weather conditions near runway 24 at the time of the incident:

– General visibility: 1700 meters in mist (br);
– Runway Visual Range (RVR) at runway 24:
– position A: 1600 meters, position B: 1800 meters, position C: 1800 meters;
– Clouds: overcast (7/8) at 100 ft, overcast (8/8) at 1200 ft

ATC working positions at Schiphol tower are at ± 87 m (±285 feet) above the ground. Due to the low cloudbase the visibility from the control tower was close to zero. Aprons, taxiways and runways were not visible.

1.5 Communications

See appendix 1 for ATC transmission transcript.

1.6 Aerodrome information

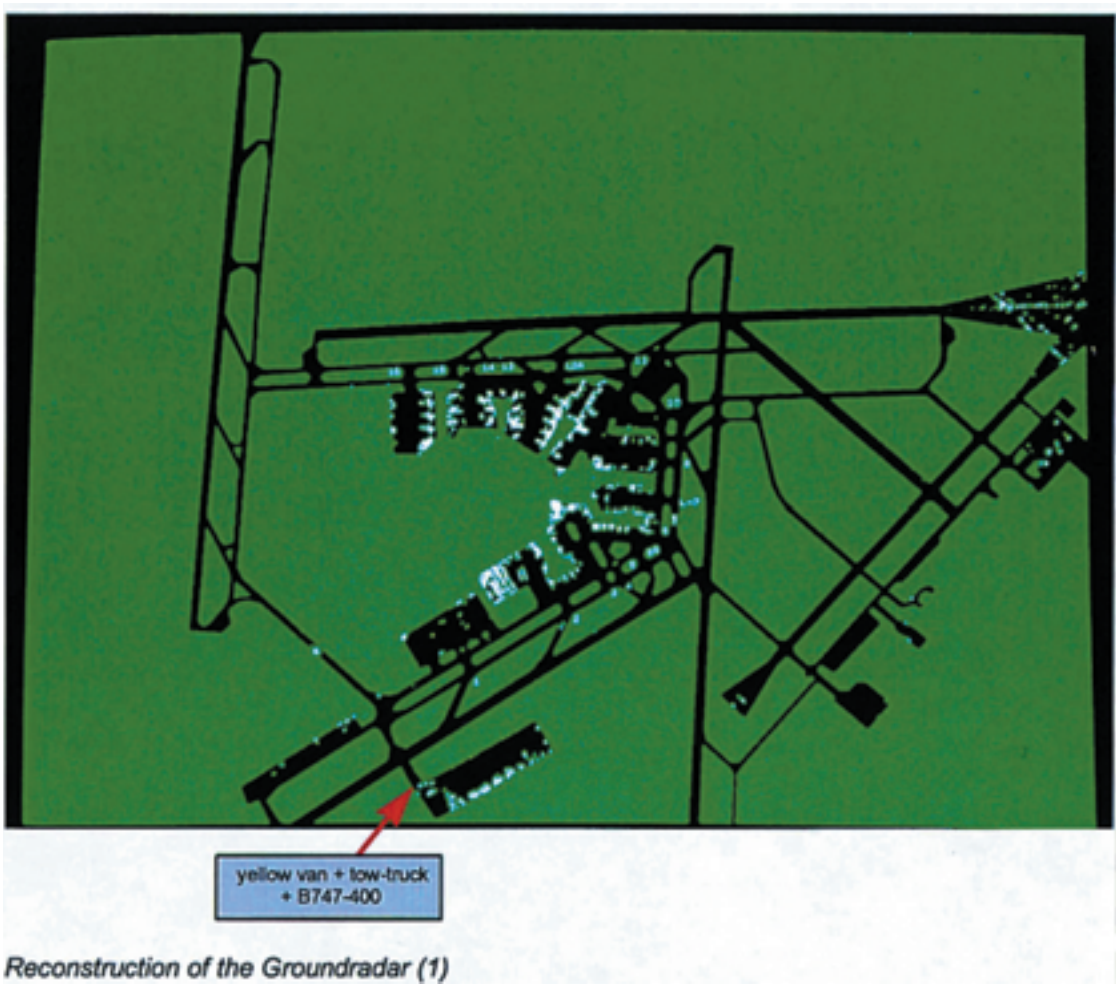
See appendix 2 and 3 for aerodrome lay-out and taxi route.

1.7 Tests and research

Due to the fact that groundradar pictures at Schiphol tower are not recorded, a reconstruction of the event was carried out.

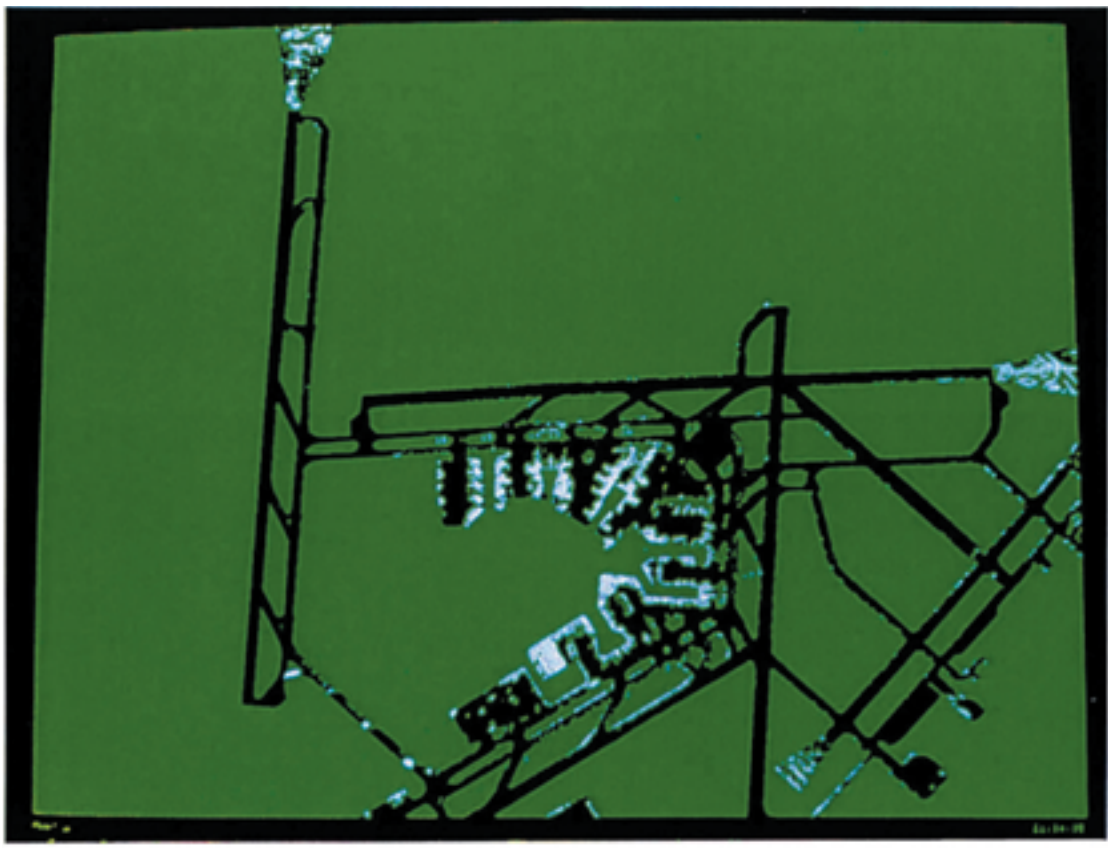
(Note: the movements of Delta 39 have not been included in the reconstruction, for they were considered to not be relevant for this part of the investigation.)

The groundradar-screens at T5R and T7R were adjusted by the Supervisor/Coach, both controllers and the Assistant Controller to match their memory of how those displays were adjusted at the time of the incident. An identical yellow van, tow-truck and towed aircraft (KLM Boeing 747-400) were used and where necessary manoeuvred at the instructions of the trainee and his Coach to positions that are considered relevant for understanding the event. Pictures were taken of the screens, with the yellow van and tow stationary at the indicated positions. The drivers in the yellow van and tow-truck were not the same persons as when the incident occurred. The reconstruction took place between 22:00 and 23:30 hours on Tuesday, 15 December 1998, i.e. five days after the incident.



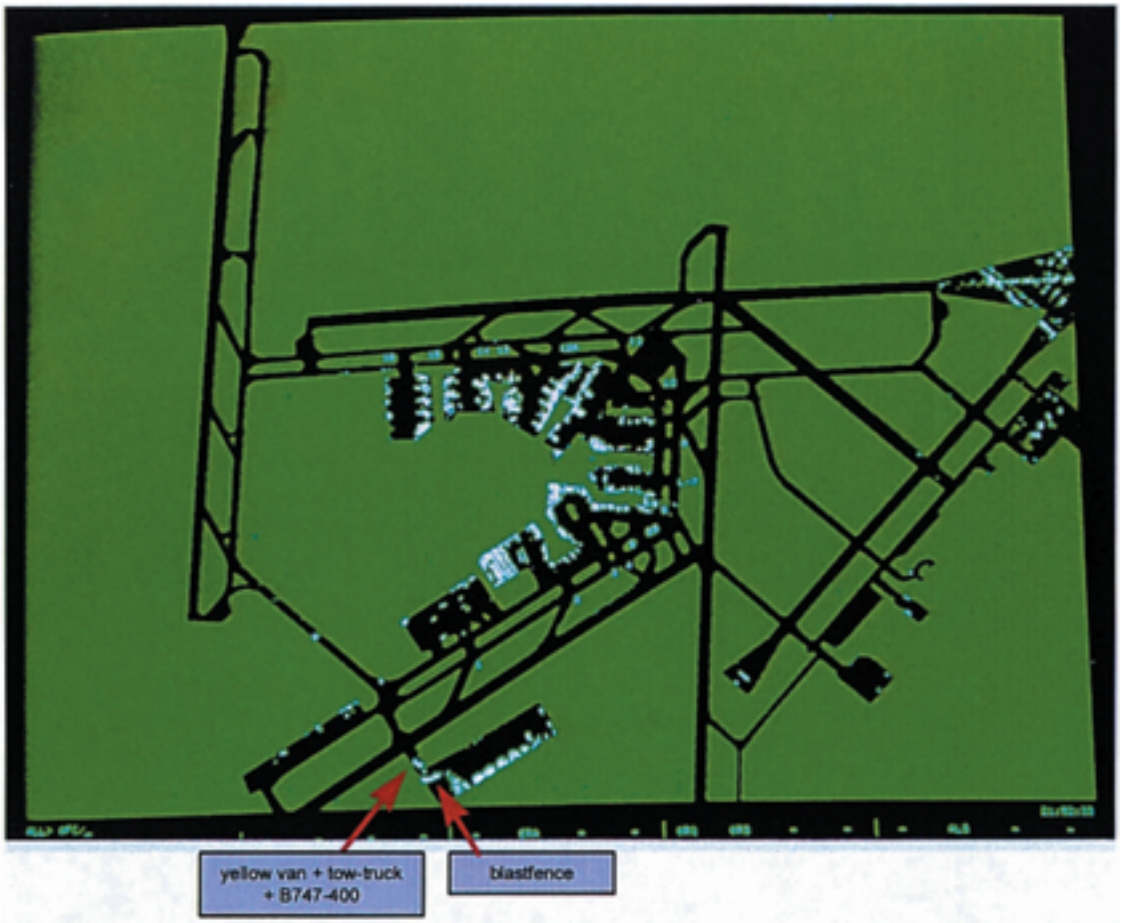
Reconstruction of the Groundradar (1)

This picture (number 1) above shows T5R with the yellow van and tow holding short at exit 2 of runway 06/24, in front of the stopbar, coming from the "S"-apron. The controller at T6 was expecting the yellow van and tow from the opposite side.



Reconstruction of the Groundradar (2)

The picture above (number 2) shows the same situation as in the picture number I, but now on the display at T7R. Notice that the lower limit of the screen is just on the north side of exit 2 of runway 06/24. The yellow van and tow are not visible. The screen was adjusted for observing runway 09.

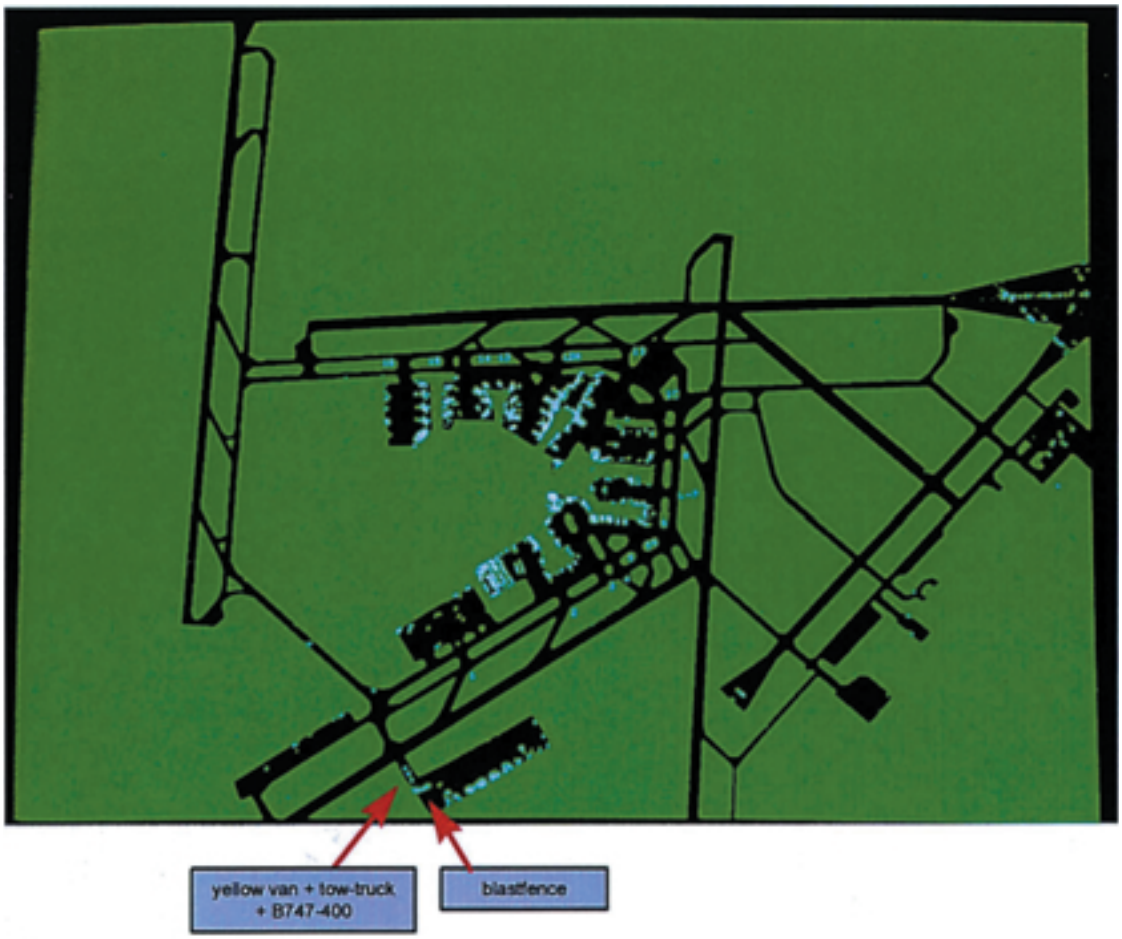


Reconstruction of the Groundradar (3)

For the picture above (number 3), taken of the screen at T5R, the investigators asked the controller to position the yellow van followed by the towed Boeing 747 the way he remembered seeing it just before he cleared Delta 39 for take-off. To get to this position, the yellow van and tow moved from the situation in picture number 1, i.e. from the "S"-apron. Just below (or south of) the yellow van and the tow the radar return of a blastfence at the entrance of the "S"-apron can be seen. This blastfence appears also in the first picture.

From picture number 2 it is evident that on the screen of T7R (the one to the right of the Assistant Controller) the yellow van and towed Boeing 747 were not visible in this position either.

The investigators also asked the yellow van and the towed Boeing 747 to cross exit 2 of runway 06/24 from the centre of the airport to the "S"-apron, i.e. in the direction as expected by the trainee. The car-driver was asked to stop the towed aircraft as soon as its tail was clear of the runway, or to be more exact, when the tail had crossed the yellow clearance-lines on the apron side of the crossing. After checking that the aircraft had reached the desired position, the car driver then resumed his position in front of the tow-truck.
This is the resulting picture 4 from the screen at T5R.



Reconstruction of the Groundradar (4)

1.8 Organization and management information

1.8.1 ATC responsibilities

In Regulations ATC part 2, Schiphol TWR/APP ('Voorschriften Dienst Verkeersleiding, deel 2, Schiphol TWR/APP'), General, Responsibilities a description is provided of the responsibilities of the different Air Traffic control functions at Schiphol Tower.

Summary of the relevant parts of this regulation:
The Tower Controller is responsible for the provision of Aerodrome Control Service at Schiphol Airport, except for those flights under control of a Ground Controller.
Aerodrome Control Service = Air Traffic Control Service for aerodrome traffic.
Aerodrome traffic = All traffic on the manoeuvring area of an aerodrome and all traffic flying in the vicinity of an aerodrome.
Manoeuvring area: That part of an aerodrome to be used for take-off, landing and taxiing of aircraft, excluding aprons.
The other specific responsibilities described are the responsibilities of a Ground Controller and the Start-up Controller / Clearance Delivery. The responsibilities of an Assistant Controller are not described in this document.

1.8.2 Working procedures

In 1997 a working-group, existing of several Controllers of Schiphol Tower/Approach, reviewed the standard working procedures for the Control Tower. The results, incorporated in a report, were meant to be a summary of the basic directives, to be used for the allocation of tasks. The summary was issued as "Quick Reference Charts". The QRC's, stored in a computer-system, are based on the different runway configurations. They contain basic directives with the standard working agreements for using specific runway combinations (including the recommended configurations for the stopbar control panel) and summarise relevant reminders for the Tower-crew. Although written procedures suggest a printout of the QRC's is made each time the runway combination changes, in practice this procedure is not followed anymore.

1.8.3 ATC Training

In a normal training schedule a trainee starts the training as Assistant Controller. After an undefined period working independently as Assistant Controller the next step will be the training for Ground Controller. Again after an undefined period working independent as Ground Controller the trainee starts the on the job training as Tower Controller.

Because of busy training schedules, the direct need for Tower Controllers and taken into account his former experience it was decided to let the Controller at T6 start with the on the job training as Tower Controller directly after serving his period as Assistant Controller.

It was noted that in the recent past, under pressure of the direct need for Tower Controllers and depending former ATC experience of the trainee, shortcuts in the training schedule were made.

1.8.4 Low visibility operations

The procedures which have to be applied when the visibility (from the Tower) is limited, are described in Regulations ATC part 2, Schiphol TWR/APP ('Voorschriften Dienst Verkeersleiding, deel2, Schiphol TWR/APP'), Procedures, Local procedures, Low visibility operations.

Low visibility procedures are in force when:
– visibility: (any) RVR (at the airport) is 1500 meters or less and/or:
– clouds: the cloudbase is at 300 feet or below.

The purpose of low visibility procedures is:
– To protect ILS and MLS protection area's.
– To prevent runway- and taxiway-incursions by aircraft and other vehicles.
– To reduce the "ground traffic" in order to enable Ground Controllers to provide positive guidance.

There are four different categories (phases) of low visibility conditions. Aim of this categorisation is to progressively implement the measures.

The Supervisor Approach is responsible to determine the applicable phase of low visibility operations, in co-ordination with the Supervisor Tower. The Supervisor Approach will pass the information about the applicable phase to the Supervisor Tower, the Supervisor Amsterdam ACC, The Airside Operations Manager, the Meteorological Office,

the Flight Information Office and the Apron tower. Informing the Apron tower can be delegated to the Supervisor Tower.

At the time of the incident low visibility procedures were in force and had been in force from 17.50 the previous day, the status was phase B.
There was no log entry at Air Traffic Control indicating that the implementation of the low visibility procedures was passed on to the above mentioned organizations.

When low visibility procedures are in force all tow movements at the aerodrome require prior permission from Ground Control, therefore the Apron tower has to co-ordinate these movements with the Ground Controller.
There are no indications that such prior co-ordination with regard to the subject tow movement took place.

1.8.5 Airport tow regulations

The procedures regarding tow-movements (including push-back and push-pull procedures) are described in Regulations Airside, Airport tow regulations.
Primarily these regulations are meant for drivers of tow-trucks.

Summary of the relevant parts of the regulations:

- Stopbars are activated when the visibility is below 1500 meters.
- Activated stopbars shall never be crossed.
- Tow-trucks shall be equipped with a radio to establish two-way radio contact with the Apron tower.
- When the visibility is less than 1500 meters all tow-movements require prior permission from Ground Control. Therefore these movements shall be co-ordinated in advance by the Apron tower to the ATC control tower.

1.9 Additional information

1.9.1 Technical facilities to guard against runway incursions

During night time and /or in low visibility weather conditions runway operations are in general protected against incursion by stopbars. The stopbars are activated by pressing a button at the central console in the Tower.

To allow aircraft or vehicles to cross a runway, stopbars at some crossing points can be switched off. Extinguishing individual stopbars is done by pushing a corresponding button at the control panel in the console, normally at the working positions T6 and/or T8.

After being extinguished, the stopbars will automatically switch on again when an aircraft or car passes vehicle/aircraft detection systems on both sides of the taxitrack or after a time interval of approximately 60 seconds, whichever comes first.

The majority of movements with towed aircraft at Schiphol involve the crossing of runways 04/22 and 01R/19L. At all positions at these runways where towed aircraft maybe crossing, there are traffic lights (runway 04/22) or a combination of traffic lights and stopbars (runway 01R/19L).

The traffic lights are connected to a build-in warning system in the Tower to alert Controllers that one or more runway(s) is/are occupied. This system consists of a visual and an aural alert. The visual alert will cause a yellow lit runway to blink on all panels in the Tower whenever a Controller switches a traffic light at that runway to "green". The aural alert is a clicking sound, activated automatically and simultaneously with the visual alert.

Note:

It should be noted that ICAO regulations as provided for in Annex 14 require the use of stop bars with regard to runway protection as a standard as from 1 January 2000. Consequently the use of traffic lights in this connection is no longer in accordance with international standardisation. Following this standard it is the intention that all relevant traffic lights at Schiphol are being replaced by stop bars.

1.9.2 Exit 2 of runway 06/24

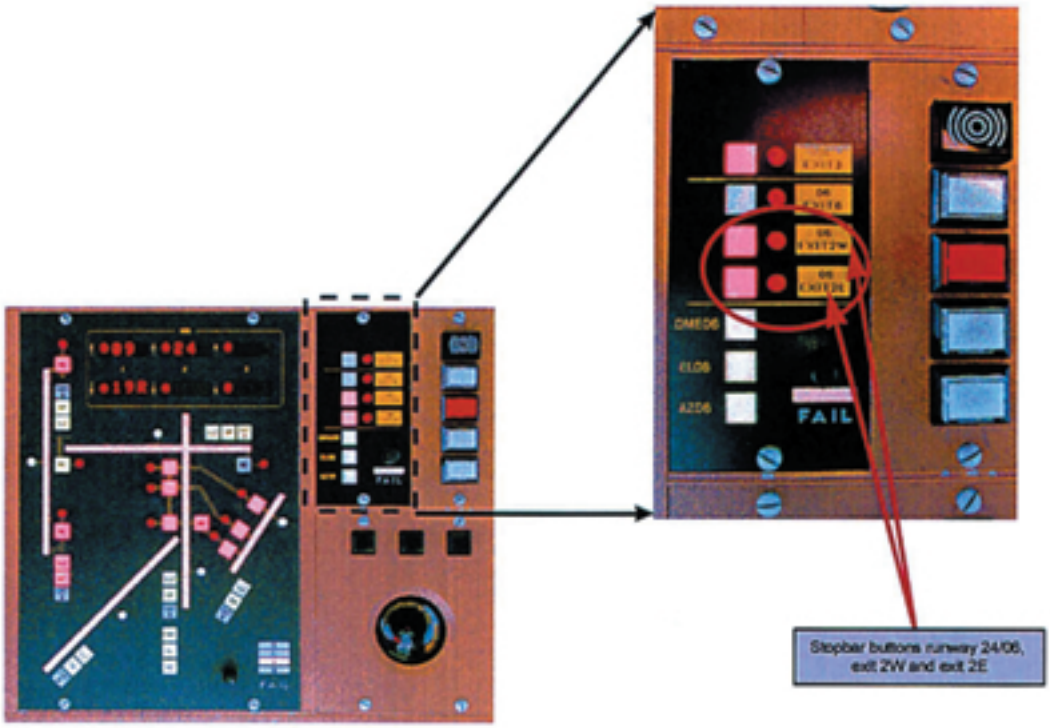
In 1990 the Airport Authorities decided to construct a new platform at the southern side of runway 06/24, designated S-apron. The intention was to create a freight platform for loading and unloading of cargo aircraft. The taxiways to/from the S-apron were supposed to be used by out- or in-taxiing aircraft only. Consequently the only technical facilities installed to protect runway operations during low visibility weather conditions were two remote controlled stopbars at exit 2 West and exit 2 East.

Because of the ever-growing air traffic the Airport Authorities found themselves faced with increasing aircraft parking problems and decided to use S-apron temporarily as a buffer platform (i.e. for the temporary parking of aircraft).This became effective in August 1997.

Although the nature of the movements to/from S-apron changed (i.e. aircraft were frequently towed to/from S-apron) the technical facilities were not adapted and as a consequence there is no automatic visual or aural alert when a crossing takes place at exit 2 of runway 06/24.

Tow movements had to be accompanied by a yellow car from Airside Operations and crossing of runway 06/24 at exit 2 was executed by using direct radio communication with the Tower and remote controlled stopbars.

1.9.3 Stopbar control panel



Control panel at working-position T8

The control panel comprises four sectors: North (runway 09/27), East (runway 04/22), South (runways 01 R/19L and 06/24) and West (runway 01 L/19R). The combination of the two runways in the South sector is a consequence of the permanently active stopbar at both sides of exit 1 of runway 01 R/19L (which point is also the far end of runway 06). Control of each sector may be allocated independently to any position in the control tower that is fitted with a control panel, but is usually restricted to T6 and/or T8.

The three small, round buttons, aligned vertically in the centre of the picture, are control-buttons for the stopbars at the exits of runway 01 R/19L. These stopbars are connected to the traffic lights at the intersections.

The two similar buttons at both ends of runway 01L/19R, at the left side of the picture, are examples of control-buttons for stopbars at the holding points.

The stopbars at exit 2 of runway 06/24 were constructed after the design and installation of this geographical control panel. Since it was technically impossible to add the control-buttons for those stopbars to the geographical panel, it was decided to create a separate control-panel for the stopbars at exit 2 of runway 06/24. This separate control panel would also include feedback lights for the new Microwave Landing System (MLS) of runway 06, which can be seen in the picture above as three square, green lights, aligned vertically at the lower end of the separate panel on the right.

As the control-buttons for the stopbars at exit 2 of runway 06/24 are not positioned geographically, there are printed labels adjacent to the buttons on which the stopbar they serve is indicated. The top button is labelled “06 EXIT2 W” and controls the stop-

bar on the north side of the runway, the lower button is labelled “06 EXIT2 E” and controls the stopbar on the south side of the runway.

1.9.4 Surface movement radar

The groundradar, also indicated as Surface Movement Radar (SMR) or Aerodrome Surface Detection Equipment (ASDE) is a technical ATC appliance available at the control tower. The antenna of the groundradar is placed at the top of the control tower. Although there are only few basic directives given for the use of this appliance, Ground- and Tower Controllers often use this facility, especially during low visibility weather conditions. Most of the working-positions in the control tower are equipped with computer-screens of the “Tower-system” by which three different selections can be made: 1. textscreen; 2. picture of the Terminal Approach Radar; 3. picture of the groundradar (for examples of the groundradar-pictures see paragraph 1.7 “Reconstruction of the groundradar-pictures”). At each working-position individual adjustments can be made for Range, Brightness and Gain. Furthermore, when in groundradar-mode the screen can be off centered to suit the needs of individual Controllers.

The groundradar is not equipped with a radar data recorder.

2. ANALYSIS

This serious incident happened because – on the assumption that the runway was clear – DAL39 was given take-off clearance while in reality a tow (Charlie 8) was still in the process of crossing the runway.

An important reason for this (wrong) assumption was the misinterpretation about the actual position and direction of crossing of Charlie 8.

The misinterpretation started when in the first call from Charlie 8 to the Assistant Controller no information was given about actual position, requested taxi route and destination. The call contained, conform existing procedures, only a request to cross runway 24 at the second exit. The Assistant Controller did not ask for further clarification and assumed for no specific reason that Charlie 8 was waiting at exit 2W of runway 24 with destination S-apron. This information was passed to the Controller responsible for runway 24.

Normally the Assistant Controller checks the position of vehicle(s) visually or uses the groundradar to establish the position. The visibility from the control tower was practically zero. The available multi-mode screens were in use by the two controllers responsible for the two active runways. The pictures were adjusted for their convenience. The Assistant Controller was therefore not able to check and monitor position and movement of Charlie 8 and the misinterpretation went undiscovered.

Because of the information received from the Assistant Controller, the Controller expected Charlie 8 to be holding at exit 2W of runway 24. Therefore, when he told the Assistant Controller that she could give Charlie 8 permission to cross, he pushed the

button to extinguish the stopbar at exit 2W.
The stopbar control panels were however still configured for the previous set-up of the control tower and his action had no effect. When the following actions to extinguish the stopbar for which Charlie 8 was waiting, failed, the Controller, with the consent of the Supervisor/Coach, pushed the buttons to extinguish the stopbars on both sides i.e. 2W and 2E. The possibility of a wrong interpretation of the position of Charlie 8 was not considered.

During this whole episode approximately 2 valuable minutes were lost and the available time to let DAL39 depart was about to expire. The Controller, realising this, checked his groundradar picture and observed an echo at the exit 2E position. This was the position where he expected the echo of Charlie 8 after crossing. He turned to the Assistant Controller for confirmation., heard she was talking to Charlie 8 and assumed that Charlie 8 was reporting clear of runway.
He did not wait for further confirmation and cleared DAL39 for take-off.

Instead of reporting clear of runway, Charlie 8 was informing the Assistant Controller that he was beginning to cross the runway. This message coincided with the message from the Controller clearing DAL39 for take-off. Both controllers therefore missed information, vital for a last minute corrective action.

The Supervisor/Coach was aware that a vehicle was about to cross runway 24. Because of the discussion about the stopbar control panel however he probably missed the Take off Clearance being transmitted to DAL39. Thus an overall picture of the traffic situation was missing and he did not intervene.
All possible defence lines for ATC had now been crossed. DAL39 started the take-off roll while Charlie 8 was crossing the runway from the S-apron to the taxitracks on the westside of the active take-off runway (from exit 2E towards exit 2W).

Only due to a reasonable actual visibility at the take-off runway and quick and proficient action by the flightcrew, who aborted the take-off, a catastrophic accident was avoided.

3. CONCLUSIONS

3.1 Low visibility and a low cloudbase at the airport made visual control from the control tower impossible. Low visibility procedures were effective for air- and ground traffic;

3.2 There are no indications that prior co-ordination of the tow movement between Apron Control and Tower, as required under low visibility conditions, took place;

3.3 Exit 2 of runway 06/24 was not equipped with traffic lights;

3.4 The crossing clearance request was inadequate as it did not mention position and intended movement;

3.5 No further information was asked by the Assistant Controller to clarify the runway crossing request. This caused a misinterpretation resulting in a false hypothesis with regard to the position of the tow;

3.6 As a consequence the wrong position of the tow was passed to the Tower Controller which eventually led him to misinterprete the groundradar picture;

3.7 The working position of the Assistant Controller was not equipped with a radar screen. She was therefore not able to positively monitor the tow movement;

3.8 The Tower Controller based his decision to clear Delta Airlines flight 039 for take-off on his interpretation of the groundradar picture and the indication of the stop-bar control panel. He did not verify with the Assistant Controller to positively confirm that the tow was clear of the runway;

3.9 The alertness of the cockpit crew of Delta Air Lines flight 39 prevented the occurrence of a catastrophic accident;

3.10 Design and position of the control panels for stopbars and traffic lights are not unambiguous and therefore prone to human error;

3.11 The non-use of checklists during the change-over from inbound- to outbound mode resulted in an initially wrong set-up for the stopbar control panel in relation to the Controller duties. This reinforced their doubt about the correct functioning of the system instead of realising their misunderstanding in the position and movement of the tow;

3.12 The Supervisor/Coach failed to adequately supervise the tower operations in general and did not timely intervene to prevent the incident;

3.13 The staff on duty was not working as a team.

4 PROBABLE CAUSE

The following causal factors were identified:

(i) Low visibility weather conditions which prevented Air Traffic Control to visually identify vehicles on the ground;

(ii) Inadequate information during the radio communications between tow (yellow van) and Tower;

(iii) Misinterpretation of position and movement of the tow;

(iv) Take-off clearance without positive confirmation that the runway was unobstructed;

(v) Insufficient teamwork and supervision.

5 RECOMMENDATIONS

5.1 Technical facilities with regard to the protection of runway exits at Amsterdam Airport Schiphol should be identical to allow standard procedures for all runway crossings (in particular so with regard to exit 2 of runway 06/24). In the meantime movements to/from S-apron other than by taxiing aircraft should not be allowed during low visibility weather conditions (Amsterdam Airport Schiphol);
In this connection it is recommended to follow up ICAO Annex 14 Standards as soon as possible.

5.2 Refresher training of procedures and radio communication should be provided to ATC Tower staff and platform employees (Air Traffic Control & Amsterdam Airport Schiphol);

5.3 A Tower Supervisor should not have additional duties (Air Traffic Control);

5.4 Checklists should be used when changing the Tower configuration (Air Traffic Control);

5.5 The control panels for stopbars and traffic lights should be redesigned and integrated geographically to avoid any ambiguity (Amsterdam Airport Schiphol & Air Traffic Control);

5.6 Add a logging device to the existing groundradar (Air Traffic Control);

5.7 Assistant Controller positions should be equipped with a multi-mode screen (Air Traffic Control);

5.8 Team resource management training should be implemented for Air Traffic Control staff (Air Traffic Control);

5.9 Re-evaluate present co-ordination and communication procedures between Air Traffic Control and Amsterdam Airport Schiphol (Air Traffic Control & Amsterdam Airport Schiphol);

REPORT 98-85/S-14

APPENDIX 1

ATC Transcript

Bureau Operationele Zaken
Luchtverkeersleiding Nederland
Schiphol Oost

Luchtverkeersleiding Nederland
Air Traffic Control the Netherlands

Reference : BOZ 99/032

Date : 16 February 1999

Audiotape number. : DAT-cassette number 17

Channel : 62, 67, 81, 82 & 83.

Frequencies : 121.975, 124.77, 121.8, 121.7, 119.225 & 448.675 MHz

Subject : Incident Delta 39 (N-193DN, B767) - Tow KLM B747 d.d. 10 December 1998

Details : DAL39 aborting take off due to KLM Boeing 747, being towed, crossing active runway

R/T TRANSCRIPT

DEL = Schiphol Delivery	GN7 = SPL Ground 121.7	TWR = Schiphol Tower	D39 = Delta 39	C8 = Combi 8
SUC = SPL Start-up Control	GN8 = SPL Ground 121.8	TWV = SPL Tower Assistant	MPH = MPH 629	UKA = UKA 820
AP1 = Airport Duty Manager		CSA = CSA 616	UK5 = UKA 55E	RGI = RGI 411T

Time (UTC):	Between	Text:	Time (UTC):	Between:	Text:
084919	D39-DEL	Schiphol Clearance, DAL39 going to Atlanta, Information "P", gate G-3			
084927	DEL-D39	DAL39 the clearance is not yet in, you can expect a BERGI-departure of runway 24			
084933	D39-DEL	Okay, BERGI-departure off runway 24 now, for DAL39 and you say our clearance is not in yet			
084940	DEL-D39	That is correct, that's because of your slot: you have a			

* *Text in italics stands for a garbled or hardly readable transmission*

APPENDICES 1

DEL = Schiphol Delivery	GN7 = SPL Ground 121.7	TWR = Schiphol Tower	D39 = Delta 39	C8 = Comb 8	
SUC = SPL Start-up Control	GN8 = SPL Ground 121.8	TWV = SPL Tower Assistant	MPH = MPH 629	UKA = UKA 620	
AP1 = Airport Duty Manager		CSA = CSA 616	UK6 = UKA 55E	RGI = RGI 411T	

Time (UTC):	Between:	Text:	Time (UTC):	Between:	Text:
084948	D39-DEL	Okay we figured it was 20 minutes prior to our slot			
090100	D39-DEL	Schiphol Delivery, DAL039			
090104	DEL-D39	DAL39 good morning, go ahead			
090106	D39-DEL	.....			*- transmission unreadable -*
090113	DEL-D39	DAL39 this transmission was not readable sir			
090118	D39-DEL	DAL39 we are at G-3, information "P", destination Atlanta			
090127	DEL-D39	DAL39 airway clearance: Atlanta, BERGI-departure runway 09 for the time being and squawk 0166			
090137	D39-DEL	Okay... BERGI-departure runway 09 now, 0166, DAL39			
090147	DEL-D39	That is correct sir, and report ready on 124.77 and the departure runway can change into runway 24, but I keep you informed			
090155	D39-DEL	Okay, you get back on this point runway 09 and 124.77 for the push			
091110	D39-SUC	Start-up, DAL39,.. like to push out of gate 3			
091118	SUC-D39	DAL39 start-up approved after the push-pull, contact now 121.8 for push-instructions			
091124	D39-SUC	121.8, DAL39			
091155	D39-GN8	Start-up, DAL39, like to push from G-3			
091200	GN8-D39	DAL39 standby for the push			
091202	GN8-D39	DAL39 standby for the push			
091205	D39-GN8	DAL39 standing by			
091310	GN8-D39	DAL39 push-pull approved			

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SUC = SPL Start-up Control	GN8 = SPL Ground 121.8	TWV = SPL Tower Assistant	MPH = MPH 629	UKA = UKA 820
AP1 = Airport Duty Manager		CSA = CSA 616	UK5 = UKA 55E	RGI = RGI 411T

Time (UTC):	Between:	Text:	Time (UTC):	Between:	Text:
091315	D39-GN8	Push-pull approved, DAL39			
091339	D39-GN8	Ground, DAL39 what runway we got			
091342	GN8-D39	DAL39 say again ?			
091346	D39-GN8	What runway can we anticipate ?			
091349	GN8-D39	09, BERGI-departure			
091350	D39-GN8	Okay thank you			
091706	UK5-GN8	Ground the UKA55E D-31 for the push			
091710	GN8-UK5	UKA55E push approved			
091712	UK5-GN8	Push approved UKA55E			
091917	GN8-D39	D39 ?			
091919	D39-GN8	Go ahead DAL 39			
091920	GN8-D39	Changing runways: reclearad BERGI-departure runway 24			
091923	D39-GN8	BERGI-departure 24, DAL39			
091927	GN8-D39	Correct			
092004	UK5-GN8	Ground UKA55E request taxi			
092019	UK5-GN8	Ground UKA55E request taxi			
092036	GN8-UK5	eh.. UKA92I. are you calling			
092039	UK5-GN8	Negative, UKA55E request taxi			
092042	GN8-UK5	UKA55E taxi runway 24 and monitor 121.7			
092050	UK5-GN8	Taxi runway 24 and 121.7, UKA55E, byo			
092053	GN8-UK5	Bye			
092114	D39-GN8	Ground, DAL39 taxi			
092117	GN8-D39	DAL39 taxi runway 24, first right			

DEL = Schiphol Delivery	GN7 = SPL Ground 121.7	TWR = Schiphol Tower	D39 = Delta 39	C6 = Combi 6
SUC = SPL Start-up Control	GN8 = SPL Ground 121.8	TWV = SPL Tower Assistant	MPH = MPH 629	UKA = UKA 820
APT = Airport Duty Manager		CSA = CSA 615	UK5 = UKA 55E	RGI = RGI 411T

Time (UTC):	Between:	Text:	Time (UTC):	Between:	Text:
092122	D39-GN8	First right to runway 24, DAL39			
092126	MPHGN8	MPH 629 taxi please			
092129	GN8MPH	MPH 629 to taxi to runway 24 first right			
092134	GN8MPH	First right, MPH 629			
092226	GN7-UK5	UKA55E you have the holdingsign of 24?			
092230	UK5-GN7	Affirm UKA55E			
092232	GN7-UK5	Roger contact Tower on 119.22, bye			
092236	UK5-GN7	119.22, UKA55E, doei			
092237	GN8-D39	DAL39 Fokker 100 from the left giving way to you			
092241	D39-GN8	DAL39 roger			
092244	UK5 TWR	Schiphol, UKA55E towards holding 24			
092247	TWR UK5	Roger, UKA55E, hold short of runway 24			
092250	UK5TWR	Hold short of runway 24, UKA55E			
092257	TWR UK5	UKA55E line-up runway 24			
092300	UK5 TWR	Line-up runway 24, UKA55E			
092302	TWR UK5	Yeah prepare for immediate departure in half a minute			
092306	UK5 TWR	Roger			
092400	TWR UK5	UKA55E cleared for take-off runway 24			

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SUG = SPL Start-up Control	GN8 = SPL Ground 121.8	TWY = SPL Tower Assistant	MPH = MPH 629	UKA = UKA 820
AP1 = Airport Duty Manager		CSA = CSA 616	UK5 = UKA 55E	RGI = RGI 411T

Time (UTC):	Between:	Text:	Time (UTC):	Between:	Text:
092402	UK5 TWR	Cleared take-off runway 24 UKA55E			
092431	RGI TWR	Tower, good morning, RGI 411T, 8 NM final			
092439	TWR RGI	RGI 411T cleared to land 01R the wind 170 degrees with 6 knots			
092442	RGI TWR	Landing 01R 411 T			
092454	GN8MPH	And MPH 629 give way to a KLM 737 out of entry 9 from the right			
092503	MPGN8	Roger the 737 out of entry 9, MPH 629			
092547	GN8MPH	MPH 629 monitor 121.7			
092551	MPHGN8	121.7 MPH 629, doei			
092648	GN7MPH	MPH 629 contact Tower on 119.22, goede morgen			
092651	MPHGN7	119.22 MPH 629, goede morgen			
092716	MPHTW R	Toren goede morgen MPH heavy ready for departure 24			
092720	TWRMP H	MPH 629 line up for 24			
092723	MPHTW R	lining up 24 MPH 629			
092736	RGI GN7	Ground good morning RGI 411 T exit 1			
092742	GN7 RGI	RGI 411T hello, taxi via inner track to B-8			
092748	RGI GN7	Via the inner to B-8 411T			

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SUC = SPL Start-up Control	GN8 = SPL Ground 121.8	TWV = SPL Tower Assistant
AP1 = Airport Duty Manager		CSA = CSA 616

D39 = Delta 39	C8 = Combi 8	
MPH = MPH 629	UKA = UKA 820	
UK5 = UKA 55E	RGI = RGI 411T	

Time (UTC):	Between:	Text:	Time (UTC):	Between:	Text:
			092811	C8-TWV	Toren, Charlie 8? *(translation: Tower, Charlie 8?)*
			092820	C8-TWV	Charlie 8, Toren, ik sta voor de 06/24 we wouden met gevolg baan eh.. kruisen op de 2e exit *(translation: Charlie 8, Tower, I am in front of 06/24 , we would like to cross, with tow, at the 2nd exit)*
			092826	TWV- C8	En uw roepnaam was ? *(translation: And your call-sign was ?)*
			092828	C8 -TWV	Charlie 8 *(translation: Charlie 8)*
			092832	TWV-C8	U moet wachten voor de 06/24 *(translation: You have to wait in front of 06/24)*
			092833	C8-TWV	Wij wachten *(translation: We wait)*
092846	D39-GN7	1922, DAL 39, good day			
092902	TWRMPH	MPH 629 prepare for immediate departure			
092905	MPHTWR	MPH 629 ready			
092947	TWRMPH	MPH 629 cleared take off 24			
092950	MPHTWR	Cleared take off 24 MPH 629			
093017	UKATWR	UKA 820 goede morgen			

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SUC = SPL Start-up Control	GN8 = SPL Ground 121.8	TWV = SPL Tower Assistant	MPH = MPH 629
AP1 = Airport Duty Manager		CSA = CSA 616	UK5 = UKA 55E

C8 = Combi 8		
UKA = UKA 620		
RGI = RGI 411T		

Time (UTC):	Between:	Text:
093019	TWR/UKA	UKA 820 you are number 2 ..correction number 1 for 19R
093023	UKA/TWR	Number 1 19R UKA 820 ????? information RVR please
093026	TWR/UKA	UKA 820 is cleared to land 19R RVR for 19R: A 1600 meter, B and C 1500 meter
093035	UKA/TWR	Copied, thanks and cleared to land 19R UKA 820
093051	D39-TWR	DAL39 holding short runway 24
093055	TWR-D39	Roger, DAL39 line-up runway 24
093058	D39-TWR	Line-up wait runway 24, DAL39
093144	TWR-D39	DAL39 prepare for immediate departure
093146	D39-TWR	DAL39 Roger

Time (UTC):	Between:	Text:
093056	TWV-C8	Charlie 8, 06/24 2* exit met gevolg kruisen toegestaan *(translation: Charlie 8, crossing 06/24 2nd exit with tow approved)*
093101	C8-TWV	Baan 06/24 kruisen toegestaan, *[wilt u voor mij de stopbars doven ?]* *(translation: Crossing 06/24 approved, [can you extinguish the stopbars for me ?])*
093105	TWV-C8	Charlie 8 wilt u dat bericht herhalen ? *(translation: Charlie 8, please repeat you message ?)*
093109	C8-TWV	Kunt u voor mij de stopbars doven ? *(translation: Can you extinguish the stopbars for me ?)*
093110	TWV-C8	Ja *(translation: Yes)*
093216	C8-TWV	Toren, Charlie 8 ?

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SUC = SPL Start-up Control	GN8 = SPL Ground 121.8	TWV = SPL Tower Assistant	MPH = MPH 629
AP1 = Airport Duty Manager		CSA = CSA 616	UK5 = UKA 556

DEL = Schiphol Delivery	GN7 = SPL Ground 121.7	TWR = Schiphol Tower	D39 = Delta 39	C8 = Combi 8				
SUC = SPL Start-up Control	GN8 = SPL Ground 121.8	TWV = SPL Tower Assistant	MPH = MPH 629	UKA = UKA 820				
AP1 = Airport Duty Manager		CSA = CSA 616	UK5 = UKA 556	RGI = RGI 411T				

Time (UTC):	Between:	Text:	Time (UTC):	Between:	Text:
					(translation: Tower, Charlie 8 ?)
093206	CSATWR	Schiphol, CSA 616 good morning ILS runway 19R	093218	TWV-C8	Charlie 8, Toren *(translation: Charlie 8, Tower)*
093210	TWR CSA	616 is no2 19R	093220	C8-TWV	*Kunt u voor mij de stopbarverlichting doven vanwege het kruisen 06/24 ?* *(translation: Can you extinguish the stopbars so we can cross 06/24 ?)*
093212	CSA TWR	616	093225	TWV-C8	Ja Charlie 8, als het goed is hebben we dat net gedaan, moment *(translation: Yes Charlie 8, we just did that, standby)*
			093229	C8-TWV	Noe, ze staan nog steeds aan *(translation: No, they are still on)*
			093232	C8-TWV	*[Ze zijn uit, bedankt]* *(translation: They are extinguished, thank you)*
			093234	TWV-C8	Charlie 8, wilt u dat bericht herhalen ? *(translation: Charlie 8, please say again ?)*
			093238	C8-TWV	De stopbarverlichting is nu uit, we gaan nu kruisen *(translation: The stopbars are now extinguished, we are crossing now)*
093240	TWR-D39	DAL39 cleared take-off runway 24	093240	TWV-C8	*[Da's mooi]*, Charlie 8
093242	D39-TWR	DAL39 cleared take-off runway 24			*(translation: [That's nice], Charlie 8*
			093315	UKAGN7	UKA 820, goede morgen we just vacated runway 19R
093319	D39-TWR	DAL39 is aborting take-off	093320	GN7UKA	UKA 82 S taxi via the south and inner track to B-23

DEL = Schiphol Delivery | GN7 = SPL Ground 121.7 | TWR = Schiphol Tower | D39 = Delta 39 | C8 = Comal 8
SUC = SPL Start-up Control | GN8 = SPL Ground 121.8 | TWV = SPL Tower Assistant | MPH = MPH 629 | UKA = UKA 820
APT = Airport Duty Manager | CSA = CSA 616 | UK5 = UKA 55E | RGI = RGI 41 T

Time (UTC):	Between:	Text:	Time (UTC):	Between:	Text:
093321	TWR-D39	Roger DAL39 aborting take-off			
			093325	UKAGN7	South and the inner to B-23, UKA 820
093331	D39-TWR	DAL39 had a KLM in front of us.... being towed			
			093353	C8-TWV	Charlie 8 met gevolg vrij van de 06/24, welbedankt (*translation: Charlie 8 and tow are clear of 06/24, thank you*)
			093355	TWV-C8	Charlie 8 is vrij van de 06/24 (*translation: Charlie 8 is clear of 06/24*)
093357	D39-TWR	DAL39 is exiting at exit 3			
093400	TWR-D39	Roger... And you need any assistance DAL39 ?			
093404	D39-TWR	Well we probably need to eh... there is a posibility we need to taxi back to the gate			
093409	TWR-D39	Roger DAL39			
093413	TWRCSA	CSA 616 is cleared to land 19R			
093415	CSATWR	Cleared to land 19R, CSA 616	093418	GN7UKA	UKA 82 S to be sure inner approved
			093420	UKAGN7	Inner approved, dank u wel UKA 820
093436	TWR-D39	DAL39 you may.. well contact Ground on 121 7, hold short over there please			
093442	D39-TWR	121 7, DAL39			
093501	D39-GN7	Ground, DAL39 is eh... DAL39 we just cleared the runway 24 and we are on exit 3 holding short temporarily			
093510	GN7-D39	DAL39, that is copied the firebrigade is on its way sir			
093513	D39-GN7	DAL39 roger			
093610	D39-GN7	Okay Ground DAL39 we're gonna need eh... we're gonna, just got pretty warm brakes right now, we're not gonna be			

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SUC = SPL Start-up Control	GN8 = SPL Ground 121.8	TWV = SPL Tower Assistant
AP1 = Airport Duty Manager		CSA = CSA 616

D39 = Delta 39	C8 = Compl 8	
MPH = MPH 629	UKA = UKA 629	
UK5 = UKA 55E	RGI = RGI 411T	

Time (UTC):	Between:	Text:
		able to eh... we're gonna need to tug the aircraft
093622	GN7-D39	DAL39 you need to tow the aircraft back to the stand?
093631	GN7-D39	39 Ground, you need a towtruck to tow you out of the place to another stand
093635	D39-GN7	Yes, DAL39, we would appreciate a towtruck to tow us back to the standarea
093642	GN7-D39	DAL39 the towtruck is being arranged at this moment
093646	D39-GN7	DAL39 thank you
093752	GN7-D39	DAL39 for the information for the firebrigade, what is the brake-temperature at this moment ?
093758	D39-GN7	We're looking at 600 and 500 for all of our brakes, DAL39
093805	GN7-D39	600 and 500 that is copied
093825	GN7-D39	DAL39 for my information was that a normal or a very hot temperature ?
093829	D39-GN7	That is very hot temperature, we're looking at 700 right now for DAL39
093834	GN7-D39	700 that's copied, we will pass it on to the firebrigade, thank you
093836	D39-GN7	DAL39 roger
093905	GN7-D39	DAL39 to talk to the firebrigade and the Airport Authorities, contact 121.9 on the other set please
093912	D39-GN7	121.9 on the other set, DAL39

- [the conversation between the DAL39 and the Airport Authorities is not enclosed in this transcript, beecuse it is not relevant for the incident]-

DEL = Schiphol Delivery	GN7 = SPL Ground 121.7	TWR = Schiphol Tower	D39 = Delta 39
SUC = SPL Start-up Control	GN8 = SPL Ground 121.6	TWV = SPL Tower Assistant	MPH = MPH 629
AP1 = Airport Duty Manager		CSA = CSA 616	UK5 = UKA 55E

C8 = Combi 8					
UKA = UKA 820					
RGI = RGI 41 1T					

Time (UTC):	Between:	Text:	Time (UTC):	Between:	Text:
095344	D39-GN8	Schiphol ground DAL 39 we are back up on your frequency			
095506	GN8-D39	DAL 39 thank you, you need any assistance from my side?			
095512	D39-GN8	Negative			
095533	GN8-D39	DAL 39 they gonna tow you to Romeo 83 spot to cool down your engines, ehh to cool down the brakes there			
095539	D39-GN8	Understood Romeo 83 DAL 39 roger			
100056	GN8-D39	DAL 39 are you still on this frequency?			
100058	D39-GN8	That is affirmative, is this ground or is this....?			
100101	GN8-D39	DAL 39 for the firebrigade, what is your brake temperature at this moment?			
100104	D39-GN8	Okay, we still showing one eh one of our eight brakes has 600degrees but it is cooling down			
100124	GN8-D39	So your hottest brake is 600			
100126	D39-GN8	That is correct, that is on the rightside. One of the brakes has 600 and eh.. we have got three at 500 and four at 400			
100137	GN8-D39	Okay thank you for the info sir			
100139	D39-GN8	Thanks for your help			

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APPENDIX 2

Aerodrome Lay-out


LEGENDA
Baanstations
Kanthengen
Klaringlijn
Lima
AEHMST Velden
DOORLAATPOSTEN
Elektrisch hek t.b.v.
Belangrijk hek t.b.v.
0 0,5
AIRSIDE OPERATIONS

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APPENDIX 3

Route DAL 039/KLM B747

APPENDICES 3