

FINAL REPORT

**RUNWAY TAKE-OFF INCIDENT INVOLVING
AIRBUS A340, REGISTRATION A40-LH
SINGAPORE CHANGI AIRPORT
30 MAY 2007**

AIB/AAI/CAS.039

**Air Accident Investigation Bureau of Singapore
Ministry of Transport
Singapore**

15 December 2008

The Air Accident Investigation Bureau of Singapore

The Air Accident Investigation Bureau (AAIB) is the air accidents and incidents investigation authority in Singapore responsible to the Ministry of Transport. Its mission is to promote aviation safety through the conduct of independent and objective investigations into air accidents and incidents

The AAIB conducts the investigations in accordance with the Singapore Air Navigation (Investigation of Accidents and Incidents) Order 2003 and Annex 13 to the Convention on International Civil Aviation, which governs how member States of the International Civil Aviation Organization (ICAO) conduct aircraft accident investigations internationally.

The investigation process involves the gathering, recording and analysis of all available information on the accidents and incidents; determination of the causes and/or contributing factors; identification of safety issues; issuance of safety recommendations to address these safety issues; and completion of the investigation report.

In carrying out the investigations, the AAIB will adhere to ICAO's stated objective, which is as follows:

"The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability."

CONTENT

	Pages
TABLES OF FIGURES	3
GLOSSARY OF ABBREVIATIONS	4
SYNOPSIS	5
AIRCRAFT DETAILS	6
1 FACTUAL INFORMATION	
1.1 History of flight	7
1.2 Injury to persons	10
1.3 Damage to aircraft	10
1.4 Other damages	11
1.5 Personnel information	11
1.6 Aircraft information	11
1.7 Meteorological information	12
1.8 Aids to navigation	12
1.9 Communications	12
1.10 Aerodrome information	13
1.11 Flight recorders	14
1.12 Medical and pathological information	14
1.13 Organisation information	14
1.14 Additional information	15
2 ANALYSIS	
2.1 Briefing by Flight Despatcher	18
2.2 Singapore Air Traffic Control	18
2.3 Flight Crew Action	19
2.4 Airport Movement Area Guidance Signs	20
2.5 Jeppesen Yellow Pages	20
3 CONCLUSION	
3.1 Significant factors	22
3.2 Other findings	22
4 SAFETY ACTIONS	23
5 SAFETY RECOMMENDATIONS	24

TABLE OF FIGURES

- Figure 1:** Runway 20C before temporary resurfacing works (picture from AIP)
- Figure 2:** Layout of the shortened Runway 20C showing the closed section and location of the movement guidance signs
- Figure 3:** Safety zone at the end of shortened Runway 20C
- Figure 4:** Distance-coded runway centre line lights and runway end lights near the shortened end of Runway 20C
- Figure 5:** Guidance sign at E1 taxiway holding position after the original inscription panel showing 4,000 m was replaced with one showing 2,500 m
- Figure 6:** Guidance sign at E2 taxiway holding position after the original inscription panel showing 3,850 m was replaced with one showing 2,230 m
- Figure 7:** Guidance sign facing E1, on the left side of Runway 20C
- Figure 8:** Positions of the guidance signs
- Figure 9:** Guidance Sign Control Circuitry

GLOSSARY OF ABBREVIATIONS

AAIB	Air Accident Investigation Bureau of Singapore
AIP SUP	Aeronautical Information Publication Supplement
ATCO	Air Traffic Control Officer
ATIS	Automated Terminal Information Service
DGCAM	Directorate General of Civil Aviation and Meteorology of the Sultanate of Oman
FDR	Flight Data Recorder
FO	First Officer
GTOW	Gross Take-off Weight
LDA	Landing Distance Available
mb	millibars (atmospheric pressure)
NOTAM	Notice To Airmen
oktas	Unit of measurement used to describe cloud cover (fraction of sky covered by clouds)
PIC	Pilot-in-Command
POB	Persons On-Board
RESA	Runway End Safety Area
SARPS	Standards and Recommended Practices
TOGA	Take-off Go Around
TORA	Take-off Run Available

SYNOPSIS

On 30 May 2007, at about 0555 hours local time, the pilot of an Airbus A340 (registration A40-LH), while taking off from Runway 20C at Singapore Changi Airport, had to apply TOGA (Take-off Go Around) power and rotate abruptly at a high rate to expedite the lift-off when he noticed the centreline lights indicating the runway's impending end. The crew had calculated the take-off performance based on the original TORA (Take-off Run Available) of 4,000 m as they were unaware of the temporary shortening of Runway 20C to 2,500 m due to resurfacing works.

This incident was not immediately reported to Singapore Air Traffic Control. The crew filed an incident report to their airline's headquarters after arrival at their destination. The Air Accident Investigation Bureau of Singapore (AAIB) was informed of the incident by the Directorate General of Civil Aviation and Meteorology of the Sultanate of Oman (DGCAM) which was the aviation regulator of the airline.

The AAIB classified the occurrence as an incident and instituted an investigation.

AIRCRAFT DETAILS

Aircraft type:	Airbus A340-313E
Aircraft registration:	A40-LH
Type of flight:	Scheduled passenger service
Date and time of incident:	30 May 2007, 0555 hrs local time
Place of incident:	Singapore Changi Airport
Runway in use:	20C
Phase of flight:	Take-off
Persons on board:	227, comprising: - 2 flight crew - 11 cabin crew - 214 passengers

1 **FACTUAL INFORMATION**

Unless otherwise stated, all times quoted in this report are based on Singapore local time, which is 8 hours ahead of Coordinated Universal time (UTC).

1.1 **History of the flight**

- 1.1.1 The crew reported for duty at the boarding gate D41 and was handed the flight documents and briefed by the flight dispatcher of the airline's handling agent in Singapore.
- 1.1.2 The flight documents consisted of the followings:
- Weather chart
 - Wind charts
 - Computerised Flight Plan
 - ATC Flight Plan
 - Airline's weekly Far East NOTAM
 - Daily Stop Press and Operational Notices
 - Extract of Changi Aeronautical Information Publication Supplement (AIP SUP) 48/07¹
- 1.1.3 The flight documents were prepared and sent over from the airline's flight operations department in its headquarters in Bahrain. The airline's Far East NOTAM did not contain any information on the reduced Take-off Run Available (TORA) of Runway 20C because the Changi NOTAM A1045/07 was not processed into the airline's NOTAM system (see 1.14.1 for additional information on the non-inclusion of the Changi NOTAM).
- 1.1.4 The flight dispatcher of the airline's handling agent stated that she informed the First Officer (FO) to disregard the Changi information in the Far East NOTAM as the information had expired.
- 1.1.5 The dispatcher also stated that she informed the FO of the shortened Runway 20C as indicated in the Changi AIP SUP 48/07 and that she highlighted the start and end dates of the shortening of Runway 20C. She advised the FO to listen to the ATIS for the specific runway in use before departure and included an extract of the Changi AIP SUP 48/07 in the flight documents. However, in the interview by the DGCAM after the incident, the FO stated that he did not receive any extract or briefing on the shortened runway.
- 1.1.6 The PIC also stated during the interview with DGCAM that he did not received any documents or briefing regarding the

¹ The extract of AIP SUP 48/07 provided information on the work in progress on Runway 20C and indicated the TORA and dates of the shortening of the Runway 20C.

shortened runway.

- 1.1.7 The airline said that the extract of Changi AIP SUP 48/07 was not found in the package of documents submitted by this flight crew.²
- 1.1.8 According to DGCAM's interview with the airline's flight operations manager, the airline's expectation of the flight operations services provided by the handling agent in Singapore was only as a courier of the flight documents. The dispatchers were not expected to provide any briefing³.
- 1.1.9 The Pilot-in-Command (PIC) was the Pilot Flying for the flight. The expected flight time was about 8 hours.
- 1.1.10 During pre-flight preparation, the FO listened to the Automated Terminal Information Service (ATIS) information "B". ATIS information "B" indicated that the runway in use was 20R and Runway 20C was closed due to work in progress.
- 1.1.11 The FO then proceeded to calculate the take-off performance data for take-off on Runway 20R.
- 1.1.12 ATIS information "B" was valid from 0441 hrs to 0501 hrs. All the subsequent ATIS updates from 0501 hrs onwards carried the information that Runway 20C was opened for departure and TORA was 2,500 m. It was ATIS information "E" at the time of take-off at 0555 hrs.
- 1.1.13 At 0533 hrs, the flight crew called Clearance Delivery to request for flight level (FL) 360. The flight crew also mentioned that they had ATIS information "B". The Clearance Delivery acknowledged their request and told them to standby for their clearance.
- 1.1.14 At 0535 hrs, the Air Traffic Control Officer (ATCO) of Clearance Delivery called the flight crew and cleared the flight crew to FL 340 and to take off from Runway 20C.
- 1.1.15 The FO read back the instruction and asked the ATCO to confirm Runway 20C for departure.
- 1.1.16 The ATCO replied: "20C is J8B, unless you are not able the shorter runway 20R".⁴
- 1.1.17 The FO then answered that they would use Runway 20C for

² After each flight and on return to base, flight crews would submit all the flight documents to the airline for records.

³ According to the Singapore handling agent, it had a standard IATA ground handling agreement with the airline. The agreement entailed delivery of flight documents and providing the flight crew with necessary briefing.

⁴ By this, the ATCO meant that Runway 20C was for the J8B Standard Instrument Departure route and that Runway 20C was the shorter runway. If the flight crew was unable to use the shorter runway then they would have to request for Runway 20R, which was longer.

departure but stated that according to ATIS information “B” Runway 20C was closed and wanted the ATCO to clarify again.

- 1.1.18 The ATCO replied that “20C is now opened” and added that she would check the ATIS transmission to ensure that it was being updated. The ATCO did not mention the runway’s reduced length and the current ATIS identifier, which was “E”. According to the ATC voice recording, the FO had replied to the ATCO that he would listen to the latest ATIS but did not do so subsequently.
- 1.1.19 According to the interview of the PIC by the DGCAM, the PIC stated that he could not recall hearing the ATCO mention about the “shorter runway” in 1.1.16 but he commented that the statement could be confusing and would imply that Runway 20R was the shorter runway.
- 1.1.20 The PIC added that he had the impression from the ATCO that the ATIS information “B” had not been updated and that she was going to see to it that the ATIS information was updated. He did not hear the FO telling the ATCO that he would check the ATIS again. He said that if he had heard it, he would have ensured that the FO checks the ATIS again.
- 1.1.21 In the interview with DGCAM, the FO stated that he did not remember hearing “shorter runway” and there was no mention of TORA. He felt that the ATCO was not certain about the ATIS status and expected her to revert to him on the ATIS status.
- 1.1.22 The PIC and FO also stated that there was no airline requirement for flight crews to check the ATIS prior to requesting for clearance. The FO was aware that ATIS information was generally updated every 30 minutes and he expected Changi ATIS to be updated similarly.
- 1.1.23 The ATCO commented to the investigation team that her instruction to the flight crew could have been made clearer to help the crew realise that Runway 20C was shortened. She added that after ensuring that the ATIS was actually updated and transmitting normally, she did not revert to the flight crew as she assumed that the FO would check the ATIS again.
- 1.1.24 After accepting Runway 20C for departure and during pushback of the aircraft, the FO re-calculated the take-off performance data using a TORA of 4,000 m. V_1 was calculated as 128 knots and V_r at 137 knots. The PIC cross-checked the figures after pushback. These calculations were immediately followed by the crew’s configuring the aircraft for take-off and a short taxi to the runway.
- 1.1.25 The Ground Controller then cleared the flight crew to follow the

green taxiway centreline lights that were lit up to guide them to Runway 20C for take-off. During the interview by DGCAM after the incident, the FO indicated that he remembered identifying the holding point but could not recall seeing the 2,500 m sign as depicted in **Figure 5** or the 'Shortened Runway' sign in **Figure 7**. The PIC stated that he did not notice any sign that indicated 2,500 m or the 'Shortened Runway' sign. Both the PIC and the FO stated that they were uncertain as to whether the airport movement area guidance signs were illuminated.

- 1.1.26 At the holding point on Taxiway E1, the flight crew was instructed by Singapore Tower to look out for a landing A320 and to line up on the runway after the A320 had landed.
- 1.1.27 During the take-off roll at about 120 knots, the PIC noticed that the centreline lights changed from white to alternate red and white⁵. The PIC subsequently applied Take-off Go Around (TOGA) power and abruptly made a higher than normal rate of rotation to avoid overrunning the runway. Both the PIC and FO reported that they saw the red runway centre lights upon rotation. Data from the flight recorder indicated that TOGA was applied at 125 knots with positive lift-off at 141 knots.
- 1.1.28 The crew subsequently checked the ATIS again after take-off (it was already ATIS "F") and discovered that the runway was shortened. The crew did not contact Singapore ATC to alert them of the incident.
- 1.1.29 The aircraft landed at Bahrain without further event and the crew submitted an Air Safety Report and a Commander's Voyage Report on the incident to the airline's headquarters and the airline submitted an Air Safety Report to the DGCAM. The DGCAM informed the Air Accident Investigation Bureau of Singapore (AAIB) on 3 June 2007.

1.2 Injuries to persons

- 1.2.1 Nil.

1.3 Damage to aircraft

- 1.3.1 Nil.

⁵ To conform to ICAO standards, the shortened Runway 20C was also distance-coded with centreline lights as follows:

- The lights were white from threshold to the point 900 m from runway end.
- The lights were alternate red and white from 900 to 300 m.
- The lights were red from 300m to runway end.

1.4 Other damage

1.4.1 Nil.

1.5 Personnel information

1.5.1 Pilot-in-Command: Male
Age: 45
Licence: Air Transport Pilot Licence
Medical certificate: Date of examination 23 March 2007
End of validity 31 July 2008
Class 1 medical, Limitation: Nil
Last Proficiency check: 13 April 2007
Rest period before accident: 48 hours
Total flying experience: 11,000 hours
Flying experience on type: 3,100 hours
Flying experience as
Commander on type: 2,000 hours
Flying past 12 months: 650 hours
Flying past 28 days: 60 hours

1.5.2 First Officer: Male
Age: 30
Licence: Air transport Pilot Licence
Medical certificate: Date of examination 15 March 2007
End of validity 31 March 2008
Class 1 medical, Limitation: Nil
Last Proficiency check: 25 January 2007
Rest period before accident: 48 hours
Total flying experience: 3,650 hours
Flying experience on type: 420 hours
Flying past 12 months: 570 hours
Flying past 28 days: 50 hours

1.6 Aircraft information

1.6.1 General

1.6.1.1 The weight limits of the aircraft as indicated in the Airplane Flight Manual were as follows:

Maximum zero fuel weight	178,000 kg
Maximum start of take-off weight	275,000 kg
Maximum landing weight	190,000 kg

1.6.2 Load sheet Information

1.6.2.1 The load sheet provided to the crew included the following

information:

Zero Fuel Weight (ZFW)	160,300 kg
Trip Fuel	55,000 kg
Take-Off Weight (TOW)	215,300 kg
MACZFW	34.8
MACTOW	32.4
Trim	3.1 Nose up

1.7 Meteorological information

1.7.1 Weather information was provided in Singapore by the Meteorological Services Division of the National Environment Agency. The weather information was incorporated in the broadcasts of Changi Airport's Automated Terminal Information Service (ATIS).

1.7.2 ATIS information "E" was current at the time of the incident and contained the following meteorological information:

- Wind calm
- Clouds Few (less than 1 to 2 oktas) at 1,600 ft
- Visibility 8,000 m
- Temperature 27°C
- Dew point 26°C
- QNH 1009

1.7.3 ATIS information "B" which the flight crew was last aware of contained the following information:

- Wind calm
- Clouds Scattered (3 to 4 oktas) at 1,600 ft
- Visibility 8,000 m
- Temperature 27°C
- Dew point 26°C
- QNH 1009

1.8 Aids to navigation

1.8.1 All navigation aids at Singapore Changi Airport required for aircraft operations were working normally at the time of the incident.

1.9 Communications

1.9.1 The aircraft was in contact with the Singapore Clearance Delivery on 121.65 MHz and then with Singapore Ground Control on 124.3. It was in contact with Changi Control Tower on 118.6 MHz at the time of the incident.

1.9.2 The crew did not report any communication problems with the air traffic control on these frequencies.

1.10 Aerodrome information

1.10.1 The declared distances for Runway 20C before the temporary resurfacing works were:

- TORA 4,000 m
- Landing Distance Available (LDA) 4,000 m
- Width 60 m
- Stopway 60 x 60 m
- Clearway 270 x 150 m
- Runway End Safety Area (RESA) 120 x 300 m

1.10.2 The resurfacing works at the time of the incident entailed a reduction of usable length of Runway 20C. The TORA and LDA were reduced to 2,500 m. The end of the shortened runway was marked by a row of embedded red runway end lights. There was a safety zone of 500 m after the runway end which included a 60 m clearway followed by 90 m of Runway End Safety Area (RESA). (**Figure 2** and **Figure 3**) There were two rows of marker boards with red lights placed in the safety zone, one located at 260 m and the other located at 500m from the runway end.

1.10.3 All the existing aircraft movement guidance signs affected by the shortening of Runway 20C were updated by the airport operator accordingly (See **Figure 5** and **Figure 6**). A new guidance sign (**Figure 7**) that indicated 'Shortened Runway' was put up facing taxiway E1, on the left side of Runway 20C, as a last reminder to flight crews before they move onto the runway. All these guidance signs were illuminated.

1.10.4 The guidance signs indicated in **Figure 5** and **Figure 6** conformed to the requirement in Annex 14 to the Convention on International Civil Aviation (Chicago Convention). The 'Shortened Runway' sign put up by the airport operator was not required by ICAO, but was placed there as an additional precaution.

1.10.5 The guidance signs as indicated in **Figure 5** and **Figure 6** were controlled by a single switch in the control tower. This switch controlled also the taxiway edge lights in the vicinity of the guidance signs (see **Figure 9**). The 'Shortened Runway' sign as indicated in **Figure 7** was controlled by a single switch in the tower that controlled also a segment of runway edge lights adjacent to the 'Shortened Runway' sign. There were records indicating that the airfield contractor had checked the lights and

ensured that they were functioning that morning before the opening of the shortened 20C Runway for operation.

1.11 Flight recorders

- 1.11.1 The Flight Data Recorder (FDR) was removed from the aircraft and the data was downloaded by the Flight Safety Department in the airline's headquarters for the purpose of investigation. The downloaded FDR data was provided to the investigation team for analysis.

1.12 Medical and pathological information

- 1.12.1 No medical or toxicological tests were carried out on both the pilots after their arrival at destination.

1.13 Organisation information

1.13.1 Safety Management System

- 1.13.1.1 As regards the shortening of Runway 20C, the airport operator carried out a safety assessment to identify and mitigate the hazards, as required in the airport operator's Safety Management System (SMS).
- 1.13.1.2 The airport operator had identified, among others, the following two risk scenarios:
- Pilots may mistake that the runway is still operating at 4,000 m.
 - An aircraft may overrun the shortened runway into the runway resurfacing work area.
- 1.13.1.3 To mitigate the two hazards, the airport operator implemented the following:
- Establishing a 500 m safety zone from the temporary runway end before the start of the work area
 - Placing marker boards with red lights at 260 m from temporary runway end to demarcate boundaries of closed runway
 - Installing runway end lights at the temporary runway end
 - Deactivating all airfield lights in the closed section of runway including PAPI, runway centreline and runway edge lights
 - Changing the distance-coded lighting configuration for

runway centreline lights and runway edge lights⁶ in accordance with the TORA available

- Covering guidance signs at runway closed area
- Replacing guidance signs showing runway distance available
- Installing runway information guidance sign “Shortened Runway”
- Installing taxiway edge lights across runway at E7 indicating it as the last runway exit taxiway for Runway 20C

1.13.1.4 In addition, the airport operator also published NOTAM and AIP Supplement to inform operators of the runway works and the shortening of Runway 20C.

1.13.1.5 After learning about of the incident, the air traffic services provider reviewed the ATC voice recording and immediately implemented procedure to require its ATCOs to highlight the shortened runway in their communication with flight crews. The ATCOs were also reminded to cross check with flight crews to ensure that they have up-to-date ATIS information.

1.14 Additional information

1.14.1 Airline’s NOTAM processing system

1.14.1.1 According to the DGCAM’s interview with the airline’s despatch manager in Bahrain, the airline receives NOTAM via:

- SITATEX system and SITA printer
- Airline’s computer server which would also pick up the received NOTAM and send them to the despatch office by email

1.14.1.2 At the Bahrain despatch office, the processing procedure involved the duty despatcher picking up the NOTAM from the SITA printer and assessing whether they are applicable to the airline’s operation. If they are applicable to the airline’s operation, the duty despatcher would use the SITATEX system to include the NOTAM into the airline’s Far East NOTAM accordingly.

1.14.1.3 According to the airline’s despatch manager in Bahrain, the Changi NOTAM A1045/07 did not arrive at the SITATEX or the printer but did arrive by email from the computer server.

⁶ It was this alternating lights that raise the attention of the PIC and caused him to apply TOGA and rotated the aircraft to lift off safely.

However, as the airline's procedure did not require the duty despatcher to check the email from the computer server, the NOTAM A1045/07 was missed by the despatch office.

- 1.14.1.4 The airline's despatch office would email the handling agent a weekly Far East NOTAM. On the flight day, the airline's despatch office would also email an update for the bulletin.

1.14.2 ATIS information

- 1.14.2.1 Paragraph 4.3.6.4 of Chapter 4 of Annex 11 to the Convention on International Civil Aviation (Chicago Convention) states that "If an aircraft acknowledges the receipt of an ATIS that is no longer current, any element of information that needs updating shall be transmitted to the aircraft without delay".
- 1.14.2.2 The ATCO told the investigation team that it was not a local ATC or ICAO requirement for ATCOs to ask flight crews for the ATIS information letter identifier that the flight crew was aware of when they called ATC for clearance. However, if the ATCOs were aware that the ATIS information the flight crew had was no longer current, they would inform the flight crew.
- 1.14.2.3 The local ATC procedure also did not require the ATCOs to include any special aerodrome information in their clearance instructions to flight crews as such information would be available in the ATIS.

1.14.3 Jeppesen charts

- 1.14.3.1 The Changi AIP SUPs that were issued between March and June 2007 were:
- AIP SUP 37/07 – issued on 26 March 2007 and effective for the period from 31 March 2007 to 30 June 2007
 - AIP SUP 48/07 – issued on 23 April 2007 and effective for the period from 6 May 2007 to 30 June 2007
- 1.14.3.2 The Jeppesen yellow pages⁷ 10-8, 10-8A, 10-8C, 10-8D and 10-8E (on information pertaining to Changi Airport) available on the aircraft at the time of the incident were dated 20 April 2007 and reflected information contained in Changi AIP SUP 37/07 which did not contain information relevant to the runway shortening. The AIP SUP current at the time of the incident was 48/07. As a result, the Jeppesen yellow pages did not indicate that Runway 20C was of a shortened length on the day of the

⁷ The purpose of the yellow pages in the Jeppesen documentation was to highlight to the pilots any temporary changes at an aerodrome due to activities such as construction or maintenance works which may affect aircraft operation. The yellow pages were revisions published by Jeppesen based on updates from ATS providers of the aerodromes.

incident as advised in AIP SUP 48/07.

1.14.4 Take-off incident on Runway 20C on 2 June 2007

1.14.4.1 A take-off incident happened on 2 June 2007 involving a Boeing B747 passenger aircraft. The aircraft took off from Runway 20C and hit the first row of marker boards and lights assembly positioned at 260 m from the temporary runway end. There was no injury to persons on board or damage to the aircraft.

1.14.4.2 The incident was of a different nature in that:

- The crew was well aware of the shortening of the runway through despatcher briefing and NOTAM.
- The ATCOs had reminded the flight crew of the shortened runway (see paragraph 1.13.1.5).
- The FO had made a mistake in his take-off performance computation which erroneously indicated that it was within performance limit for the aircraft to take off from the shortened runway.

2 ANALYSIS

The analysis covered the following areas:

- (a) Briefing by despatcher
- (b) Singapore air traffic control
- (c) Flight crew actions
- (d) Airport movement area guidance signs
- (e) Jeppesen yellow pages

2.1 Briefing by despatcher

2.1.1 The PIC and FO stated that they did not receive any briefing or extract of the Changi AIP SUP 48/07 on the shortening of Runway 20C as claimed by the despatcher. The airline said that the extract of AIP SUP 48/07 was not in the package of documents submitted to the airline by the flight crew after the flight.

2.1.2 Owing to the different accounts of the flight crew and the despatcher, the investigation team was unable to establish whether the information in AIP SUP 48/07 on the shortened runway was provided to the flight crew.

2.2 Singapore air traffic control

2.2.1 The FO in his communication with the ATCO⁸ repeated twice that he had ATIS information “B” which indicated that Runway 20C was closed. The ATCO reiterated that Runway 20C was open and took action to verify that the ATIS was being updated. The ATCO was uncertain of the ATIS information identification letter but knew that the FO did not have the current ATIS information.

2.2.2 As required by paragraph 4.3.6.4 of Chapter 4 of Annex 11 to the Chicago Convention, the ATCO should have immediately checked the ATIS information display available to her and revert to the FO with the latest ATIS letter identifier.

2.2.3 The ATCO did not revert to the flight crew because she assumed that the flight crew would have obtained the latest ATIS information as the FO had told her that he would listen to the ATIS again. By not reverting to the flight crew to close the loop, an opportunity of preventing the incident from happening was lost.

2.2.4 As regards the ATCO’s statement “20C is J8B, unless you are

⁸ This is the Ground Movement Planner (GMP) which the FO requested flight level clearance from.

not able the shorter runway 20R” (see paragraph 1.1.16), the investigation team found that there was no pause between “shorter runway” and “20R”. The lack of a pause could cause a person to misunderstand that 20R was the shorter runway. However, according to the interview of the flight crew by DGCAM, both PIC and FO did not recall hearing “shorter runway” during their communication with the ATCO. As such, the lack of a pause appears to be irrelevant as regards whether the flight crew was confused by the ATCO’s statement.

2.2.5 The flight crew had prepared their take-off on Runway 20R during their pre-flight preparation as they had learnt from the ATIS broadcast that Runway 20C was closed. On receiving clearance to take off from Runway 20C, the FO asked for confirmation. In the absence of any information regarding the shortening of Runway 20C, the flight crew might have assumed that Runway 20C was opened for full runway length operation.

2.2.6 The first part of the ATCO’s statement in paragraph 1.1.16 (“20C is J8B”) confirmed to the flight crew that Runway 20C was opened. This might have reinforced the flight crew’s assumption that full runway length was available and caused them to pay less attention to the second part of the ATCO’s statement (“unless you are not able the shorter runway 20R”).

2.2.7 The sentence structure used by the ATCO was not clear in identifying that 20C was a shorter runway. It might have been better if the ATCO had first stated the status of the runway before affirming the FO’s query, for example “**20C, TORA 2500, is J8B. Unless you are not able to take off from the shorter runway then 20R**”. This would have clearly indicated to the flight crew that Runway 20C was shortened.

2.3 Flight crew actions

2.3.1 The FO told the ATCO at the Clearance Delivery that he would listen to the ATIS again. The FO re-calculated the performance figures during pushback of the aircraft and the PIC cross-checked the figures after pushback. The flight crew then configured the aircraft for take-off while on a short taxi to the runway. The momentary increase in workload probably distracted the FO from his intention of listening to the ATIS for updates. Thus he missed an opportunity to update himself regarding the shortened runway.

2.3.2 As the incident was only made known three days after the occurrence, it was not possible to verify that the guidance signs were illuminated on the actual day of the occurrence. However, the investigation revealed (see paragraph 1.10.5) that the control of the guidance sign (**Figures 5**) was coupled to the edge lights of taxiway E1 and E2. If the sign was not switched on, then the E1 and E2 taxiway edge lights would

also not be switched on and this would have been obvious to the flight crew. The control of the 'Shortened Runway' sign (**Figure 7**) was coupled to a segment of runway edge lights adjacent to the 'Shortened Runway' sign. If it was not switched on, the segment of runway edge lights would also not be switched on and this would have been obvious to the flight crew. Thus it is unlikely that both signs were not switched on during the time of the incident.

- 2.3.3 Both the flight crew did not remember sighting the 2,500 m and the 'Shortened Runway' signs. This is probably because they were not expecting any change to the take-off length and hence did not register the information on the guidance signs.
- 2.3.4 The flight crew asked for clearance at 0533 hrs which was more than 30 minutes from the time that the FO last listened to the ATIS. The FO had the knowledge that ATIS would generally be updated every 30 minutes and it would be a good practice to check the ATIS again before requesting for clearance even if the airline did not have any procedure on this.
- 2.3.5 The PIC on seeing the alternating red and white centreline lights during the take-off roll reacted by selecting TOGA power on the engines and rotated as soon as possible to get the aircraft airborne. The PIC's timely and decisive action prevented a more serious outcome.

2.4 Airport movement area guidance signs

- 2.4.1 The crew did not notice the sign shown in **Figure 5** when they were at the Runway 20C holding point on Taxiway E1. The inscription panel on the guidance sign was replaced with a temporary inscription panel of the same size, font and colour indicating the shortened distance. The investigation team understands that the sign meets the requirements in Annex 14 to the Chicago Convention for normal operations. However, for abnormal operations such as taking off from a shortened runway, the sign did not contain any attention getter to draw the crew's attention to the reduced TORA shown on the guidance sign.
- 2.4.2 At the holding point on Taxiway E1 before turning onto Runway 20C to line up with the runway, the flight crew did not notice the sign that indicated 'Shortened Runway' (see **Figure 7**). The crew missed the sign probably because they had other tasks to handle, such as looking out for the incoming A320 aircraft and completing the checklist action before lining up on the runway.

2.5 Jeppesen yellow pages

- 2.5.1 The Changi Airport information in the Jeppesen yellow pages that were available on the aircraft contained information that was issued in AIP SUP 37/07. This information was already superseded by AIP SUP 48/07 at the time of the incident.
- 2.5.2 As the Jeppesen yellow pages cannot be relied upon as the sole source of information for the flight crews, the airline must have a robust system to ensure that its NOTAM contain up-to-date information for the flight crews even if the Jeppesen yellow pages were not updated.

3 CONCLUSIONS

3.1 Significant factors

- 3.1.1 The information on the shortening of Runway 20C was not incorporated into the airline's Far East NOTAM. The airline's NOTAM system was not robust enough to ensure important up-to-date information is not missed.
- 3.1.2 The flight crew listened to the ATIS during their pre-flight preparation but did not check the ATIS again for updates thus missing the information on the shortening of Runway 20C.
- 3.1.3 After becoming aware that the flight crew did not have the latest ATIS information, the ATCO did not positively identify to them the latest ATIS edition status. The ATCO also did not attempt to revert to the flight crew to ensure that they had the updated ATIS information.
- 3.1.4 The FO did not check the ATIS again even though he told the ATCO he would do so when seeking clearance from Clearance Delivery.
- 3.1.5 The guidance signs pertaining to the shortened Runway 20C positioned along the taxi route to the runway failed to draw the attention of the flight crew to its information.

3.2 Other findings

- 3.2.1 The FO and the despatcher have differing account on whether the despatcher had briefed the flight crew on the shortening of Runway 20C and provided the flight crew with an extract of AIP SUP 48/07.
- 3.2.2 The flight crew, on checking the ATIS after taking off realised that the runway was shortened but did not inform Singapore ATC that they had taken off without the knowledge of the shortened runway. However, the flight crew submitted an Air Safety Report to their airline after the flight.

4 SAFETY ACTION

- 4.1 The airline's flight despatch department implemented immediately after the incident a check system to ensure that all applicable NOTAM information received is processed by the airline's NOTAM system.
- 4.2 Immediate measures were taken by Singapore ATC to ensure that all aircraft assigned to Runway 20C were reminded of the reduced TORA by having ATCOs highlighting the information to them during flight crew's communications with both the Clearance Delivery and Runway Controller.
- 4.3 All ATCOs have been reminded that they have to provide flight crews with the current ATIS letter identifier when flight crews inform them of an outdated ATIS letter identifier.
- 4.4 The airline's flight operations department issued a notice to all their crews to require them to check the latest ATIS information prior to requesting engine start or pushback. When the flight crews are advised of any changes in ATIS information by ATC, the flight crews are required to update themselves of the changes by listening to the latest ATIS broadcast before lining up on the runway.
- 4.5 To prevent future dispute between flight crews and despatchers, a checklist was implemented by the airline's handling agent in Singapore to record the documents presented to the flight crews.

5 SAFETY RECOMMENDATIONS

It is recommended that:

- 5.1 The airport operator review the way important information is indicated on movement area guidance signs concerning any temporary runway length changes so that the signs can be effective in drawing flight crews' attention. [AAIB Recommendation R-2008-006]
- 5.2 The airline review its procedure and training of the pilots to improve flight crews' awareness of movement area guidance signs around airports. [AAIB Recommendation R-2008-007]
- 5.3 The airline require its flight crews to report any significant incident which they are aware of to the local air traffic control unit. [AAIB Recommendation R-2008-008]

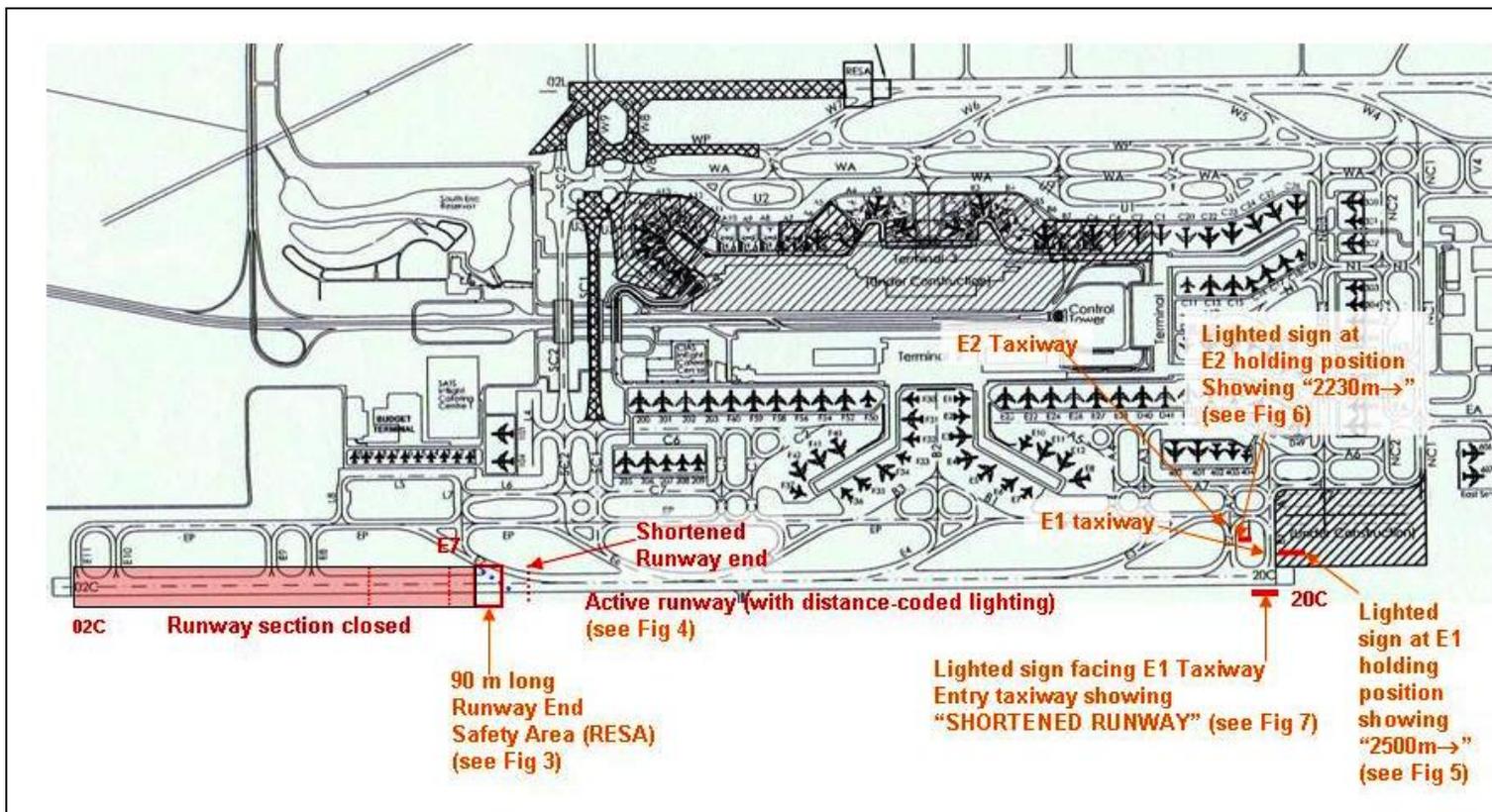


Figure 2. Layout of the shortened 20C showing the closed section and location of the movement guidance signs

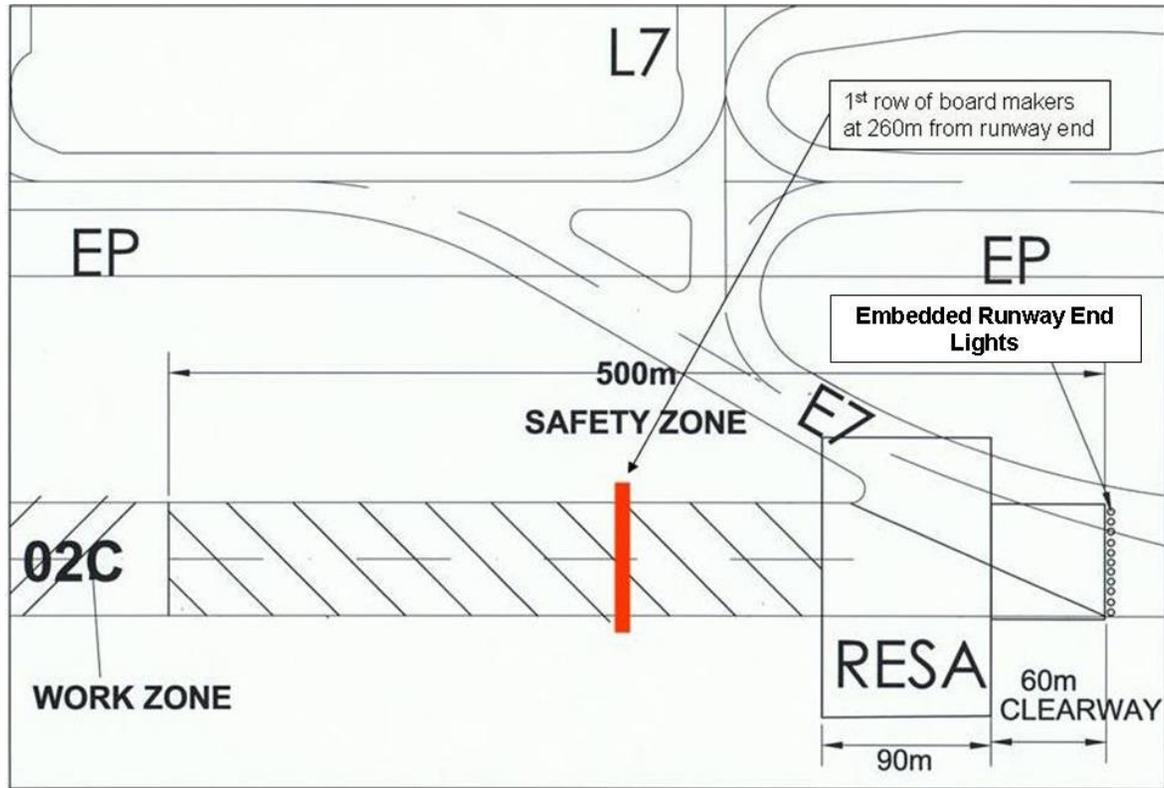


Figure 3. Safety zone at the end of shortened Runway 20C



Figure 4. Distance-coded runway centre line lights and runway end lights near the shortened end of Runway 20C

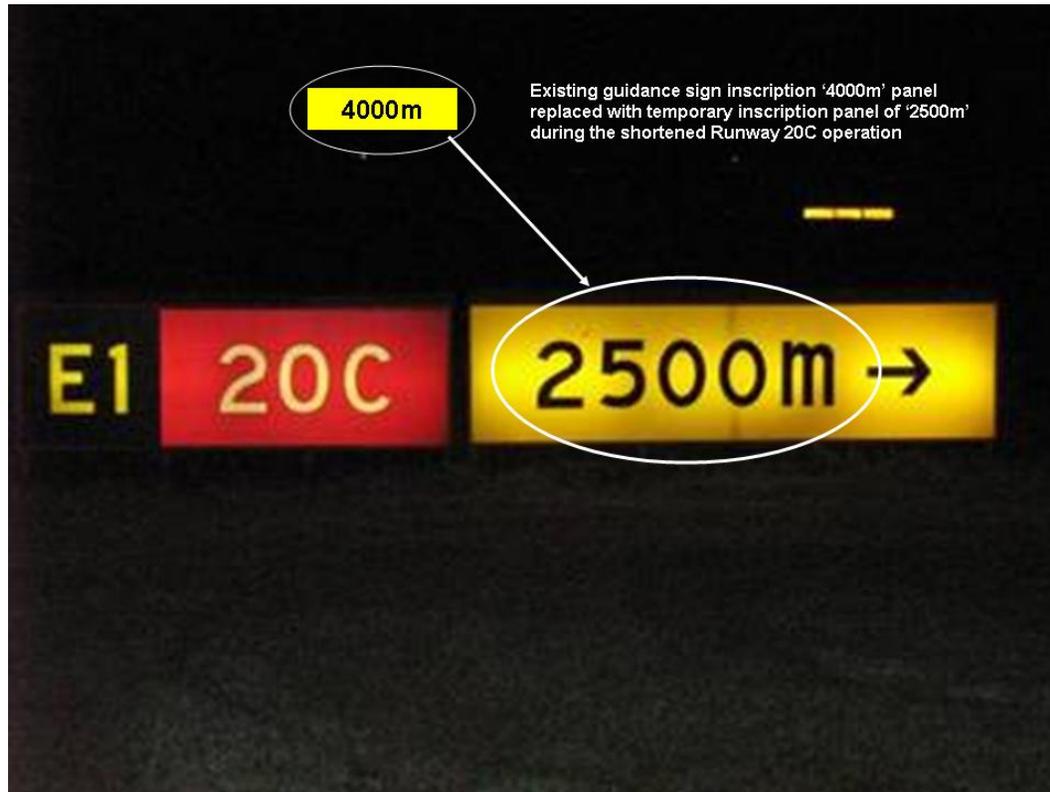


Figure 5. Guidance sign at E1 taxiway holding position after the original inscription panel showing 4000 m was replaced with one showing 2500 m



Figure 6. Guidance sign at E2 taxiway holding position after the original inscription panel showing 3850 m was replaced with one showing 2230 m



Figure 7. Guidance sign facing E1, on the left side of Runway 20C

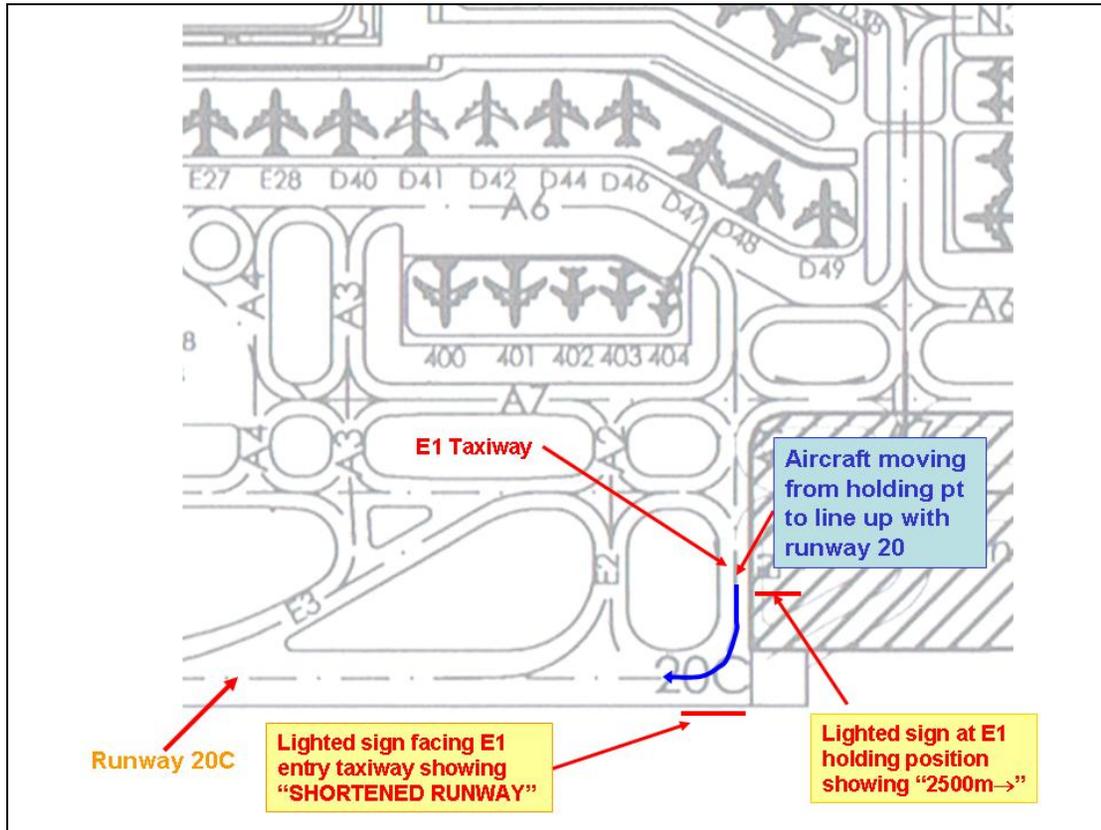


Figure 8. Positions of the guidance signs

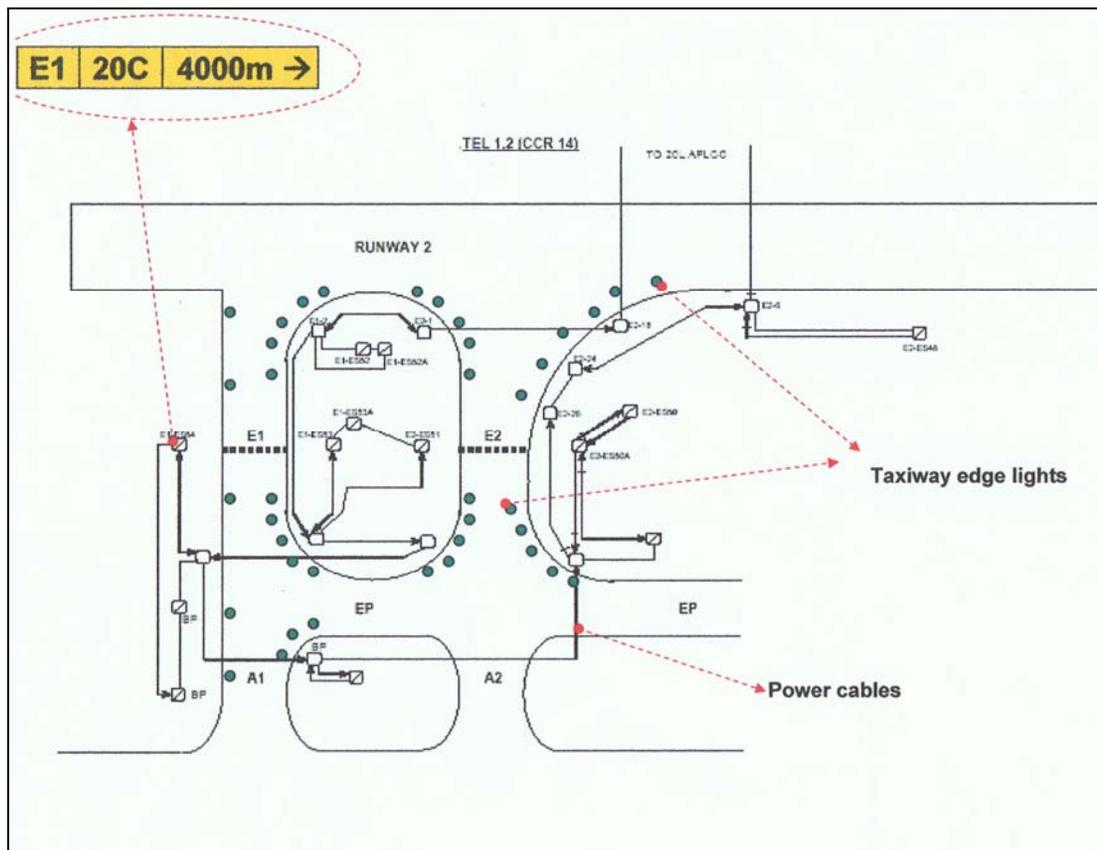


Figure 9. Guidance Signs Control Circuitry