الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY

United Arab Emirates

Air Accident Investigation Sector

Serious Incident

- Summary Report -

AAIS Case Nº AIFN/0011/2022

Runway Incursion

Operator:	Smart Aviation Company
Make and Model:	Cessna Citation Sovereign 680
Nationality and Registration:	Egypt, SU-SML
Place of Occurrence:	Abu Dhabi International Airport
State of Occurrence:	The United Arab Emirates
Date of Occurrence:	21 November 2022

This Investigation was conducted by the Air Accident Investigation Sector of the United Arab Emirates pursuant to Civil Aviation Law No. 20 of 1991, in compliance with Air Accident and Incident Investigation Regulations, and in conformance with the provisions of Annex 13 to the Convention on International Civil Aviation.

This Investigation was conducted independently and without prejudice. The sole objective of the investigation is to prevent future aircraft accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

The Air Accident Investigation Sector issued this Summary Report in accordance with national and international standards and best practice. Consultation with applicable stakeholders, and consideration of their comments, took place prior to the publication of this Report.

The Summary Report is publicly available at:

https://www.gcaa.gov.ae/en/departments/airaccidentinvestigation/Pages/InvestigationReports.aspx

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Investigation Process

The occurrence involved a Cessna 680 Citation Sovereign, registration marks SU-SML, owned by Smart Aviation Company. The occurrence was reported to the Air Accident Investigation Sector (AAIS) Duty Investigator by phone call to the Hotline Number +971 50 641 4667.

Based on the *Civil Aviation Regulations (CAR)* of the United Arab Emirates (UAE), Part VIII, Subpart 4, Attachment A to Appendix 4, and the analysis of the occurrence sequence of events, the incursion was determined to be categorized as 'Runway incursion – Category B[1]', accordingly the Investigation classified the occurrence as 'serious incident'.

The scope of this Investigation is limited to the events leading up to the occurrence and no in-depth analysis of non-contributing factors was undertaken.

Notes:

1. Whenever the following words are mentioned in this Report with the first capital letter, they shall mean the following:
   - (Aircraft) – the aircraft with call sign SME640 involved in this serious incident
   - (Commander) – the commander of the serious incident flight
   - (Copilot) – the copilot of the serious incident flight
   - (Incident) – this investigated serious incident
   - (Investigation) – the investigation into this serious incident
   - (Operator) – Smart Aviation Company
   - (Report) – this serious incident investigation Summary Report.
2. Unless otherwise mentioned, all times in this Report are given in 24-hour clock in Coordinated Universal Time (UTC), (UAE local time minus 4).
3. The structure of this Summary Report is an adaptation of the Final Report format incorporated in Annex 13 to the Chicago Convention.

Factual Information

History of the Flight

On 21 November 2022, at 0653 UTC (1053 local time), a Cessna Citation Sovereign 680, registration marks SU-SML, owned by Smart Aviation Company, was ready to depart for instrument flight rules (IFR) private commercial flight under call sign SME640, from Abu Dhabi International Airport (OMAA[2]) to Doha International Airport (OTBD[3]), Qatar. There were ten persons on board comprising six passengers, two flight crewmembers, one flight engineer, and one cabin crewmember.

The Commander was the pilot flying (PF) and the Copilot was the pilot monitoring (PM).

After requesting for taxiing out from Abu Dhabi Aviation apron, the flight crew was instructed by the Ground South Control to taxi the Aircraft at pilot's discretion[4] and hold short of taxiway Foxtrot (F) on Foxtrot 5 (F5).

The flight crew informed the Ground South Control that they will follow the follow-me-car as required and taxi the Aircraft via taxiway F5. The follow-me-vehicle vacated taxiway F5 after SME640 reported holding short of taxiway F.

After the flight crew changed the frequency from Ground South Control to Tower South Control, the Tower controller instructed to hold short Foxtrot 31 (F31)[5] and informed the flight crew that a helicopter (call sign A6HBN) is landing.

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1 Runway incursion − Category B is a runway incursion in which the separation decreases and there is a significant potential for collision, which may result in a time-critical corrective/evasive response to avoid a collision.

2 OMAA is the ICAO four letter airport code for Abu Dhabi International Airport

3 OTBD is the ICAO four letter airport code for Doha International Airport

4 Pilot's discretion phrase was used by the Ground controller offering the pilot the option of starting the Aircraft to taxi whenever the pilot wished. Based on the policy of the air navigation service provider for that apron, the pilot is granted the choice to commence taxi at his/her discretion.

5 F31 and F13 were used by the Tower Control for Final Approach and Take-off Area (FATO), which is the heliport

After A6HBN helicopter vacated F31 through taxiway Foxtrot 3 (F3), the Tower controller provided clearance to the crew of another helicopter (A6HBQ) that was on short final for F31, that they could land at pilot's discretion[6].

The Tower controller asked SME640 flight crew for confirmation whether A6HBQ helicopter (that was about to touch down) was in sight, and the flight crew confirmed.

About eight seconds later, the Tower controller instructed A6HBQ helicopter to go around since SME640 Aircraft was entering the taxiway F31, and A6HBQ helicopter went around.

The Tower controller then instructed SME640 flight crew to hold on to their current position and stand by for further taxi instructions. Later on, the controller instructed to continue taxiing through taxiway F and Echo 14 (E14). Thereafter, the controller granted take-off clearance from runway 31L, and the Aircraft took off uneventfully.

Personnel Information

The Commander held an air transport pilot license (ATPL) issued by the Egyptian Civil Aviation Authority (ECAA), and valid until 28 February 2023. The Class 1 medical certificate was valid until 31 July 2023. He had a total of 6.773 flight hours, which included 1,742 hours on Cessna CE680.

The Copilot held an ATPL issued by the ECAA and valid until 31 May 2023. His Class 1 medical certificate was valid until 25 July 2023. He had a total of 4.923 flight hours, which included 224 hours on Cessna CE680 as first officer.

Both flight crewmembers stated that they were well-rested and fit for the flight.

The Tower South controller held an air traffic control license (ATCL) issued by the General Civil Aviation Authority of the United Arab Emirates (GCAA), and valid until 30 September 2024. His Class 3[7] medical certificate was valid until 21 February 2024.

Aircraft Information

The Aircraft was a Cessna Citation Sovereign 680, with a maximum take-off weight of 13,744 kg.

The Cessna 680 Citation Sovereign is a super mid-size business jet airplane manufactured by Cessna and is fitted with two Pratt & Whitney Canada PW306C engines. It was designed to be operated by two flight crewmembers.

The moderately swept, high aspect ratio, wing supports the Cessna 680 Citation Sovereign's short-field performance.

The Aircraft was manufactured in 2007 under manufacturer serial number 680-0167.

At the time of the Incident, the Aircraft accumulated 4,555 flight hours and 2,507 flights. The last inspection was carried out on 15 September 2022 when the Aircraft had accumulated 4,451.5 hours, 2,468 flights.

The technical logbook provided showed no technical defects prior to the Incident, and there were no deferred defects. No technical anomaly was reported by the flight crew before or during the flight, and no post-flight fault maintenance message appeared.

Meteorological Information

The meteorological conditions of OMAA provided to the Investigation around the time of the Incident are illustrated in table 1.

Table 1. OMAA Meteorological Conditions

Time	0653 UTC (1053 LT)
Wind	Direction: 320 degrees, Speed: 9 knots
Visibility	More than 10 kilometers
Clouds	Few clouds (1-2 oktas) at 4,000 feet above ground level
Air temperature	29 degrees Celsius
Dew point	18 degrees Celsius
Pressure (altimeter)	1016 Hectopascal

used for helicopter operations and was located on taxiway F, respectively with a direction of 310 and 130 degrees.

6 Based on the policy of the air navigation service provider, this "pilot's discretion" phrase was used by the Tower controller for offering the flight crew the option to land. Operation to and from F31/13 is always at pilot's discretion.

7 Class 3 medical standard applies to holders of an air traffic control license.

Aerodrome Information

OMAA is located 16.5 kilometers east of Abu Dhabi city. The airport elevation is 83 feet.

OMAA is equipped with two asphalt runways: 13R/31L and 13L/31R. The distance between both runways' centerlines is 2,000 meters.

A defined area for the helicopter final approach and take-off area (FATO) is the heliport used for helicopter operations and is located on taxiway F between E15 and E14, also known as taxiway F13/F31. It is offset and parallel with runway 13R/31L, by approximately 460 meters (figure 1). It is restricted to daytime operations only.

Figure 1. FATO, the runway used for helicopters operations

The length of FATO is 300 meters. Parallel operations from FATO and the south runway (13R/31L) are allowed if traffic information has been passed to both aircraft.

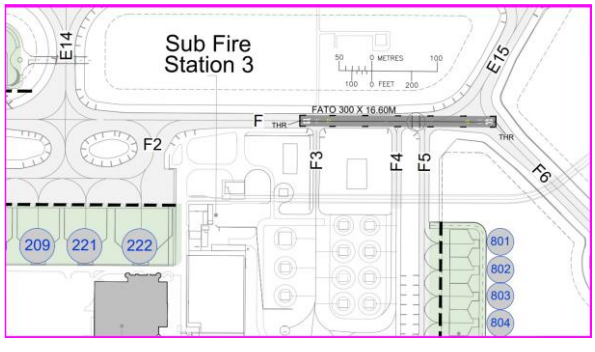

Figure 2. UAE *AIP* – Heliport chart of OMAA

FATO is located about 2,500 meters south-southeast (SSE) of the Tower.

The related heliport chart as per the *aeronautical information publication (AIP)* (figure 2) shows the FATO location and other information.

Figure 3 illustrates a screenshot of the stop bars on taxiways F3, 4, and 5, and the intermediate holding position (IHP[8]) locations surrounding the FATO. The chart shows the stop bars and IHPs F3P1, F4P1, and F5P1 of the taxiways.

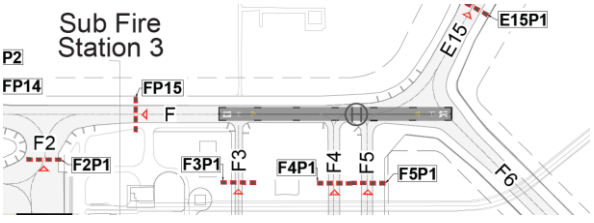

Figure 3. *AIP* – Stop bars and intermediate taxiway holding positions surrounding FATO

As per the *AIP*, the term H31 was used for the FATO, which was the defined area used for helicopter takeoff and landing operations with a direction of 310 degrees.

Among taxiways F3, 4, and 5, only taxiway F4 was marked with IHP (F4P1) (figure 4).

Stop bars lights were installed on taxiways F3, 4, and 5, which will illuminate in red when active.

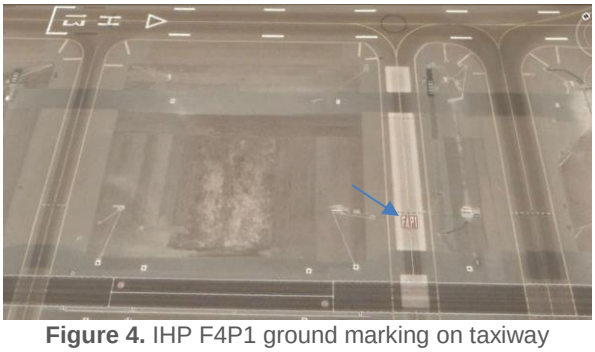

Figure 4. IHP F4P1 ground marking on taxiway F4

As per the *AIP*, the area on taxiways F3, 4, and 5 are declared as a hotspot[9] HS11[10] area (figure 5).

[8] Intermediate holding position (IHP) is a designated position intended for traffic control at which taxiing aircraft and vehicles shall stop and hold until further cleared to proceed when instructed by the Aerodrome Control Tower.

[9] Hot spot: A location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.

[10] HS11: A history of incidents between aircraft and ground service equipment due to vehicle crossing on taxiways F3, 4 and 5, pilots to exercise more caution and increase situational awareness.

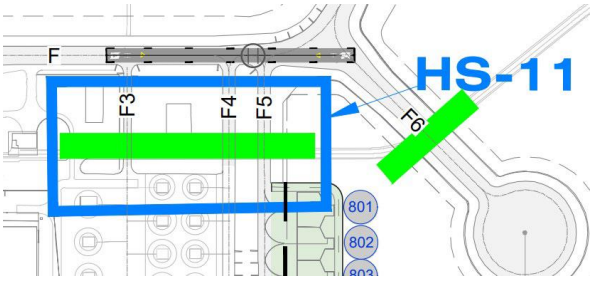

Figure 5. *AIP* – Hot spot HS11 area

The stop bars on the taxiways F3, 4, and 5, and the IHPs F3P1, F4P1, and F5P1, and hotspot HS11 area were projected in the Jeppesen charts that were available to the flight crew in the cockpit (Attachment A).

As shown in Figure 4, the IHP F4P1 on taxiway F4 was marked in white painted ground marking, while there were no IHP F3P1 and F5P1 markings for taxiways F3 and 5.

Communication and Recording Information

The Aircraft was equipped with a flight data recorder (FDR) part number 2100-2042-00 and a cockpit voice recorder (CVR) part number 2100-1020-02, manufactured by L3Harris. At the time the Investigation was instituted, the CVR had been overwritten.

All communications between the flight crew and Abu Dhabi ATC were generally clear and normal. The ATC communication and aircraft movement recordings were available for Investigation.

Based on the data, the flight crew of the Aircraft contacted Ground South Control at 0644:35 while the Aircraft was on Abu Dhabi Aviation apron reporting they were ready to copy ATC clearance for the OTBD destination.

The controller provided the clearance to use runway 31L, follow departure MEKRI 2K, climb to altitude 5,000 feet and maintain, set squawk to 1705, and after departure, when passing 1,000 feet, contact 128.100 MHz frequency (Abu Dhabi Radar West Control). The flight crew read back the provided clearance correctly, which was then confirmed by the controller.

At 0645:36, the controller approved the start-up on QNH 1017 hPa and instructed to report when the flight crew are ready for taxi, which the flight crew then read back the approval and instruction correctly.

At 0649:28, the flight crew reported ready for taxi.

At 0649:49, the controller instructed the flight crew to taxi at pilot's discretion and to report holding short of taxiway F on taxiway F5. The flight crew reported that the follow-me car is in sight followed by an incomplete read-back. Subsequently, the controller repeated the instruction "Sierra mike echo six four zero sir proceed via the with the follow me car and report foxtrot five hold short of foxtrot" and the flight crew read back by stating "Follow me car foxtrot five foxtrot sierra mike echo six four zero." The word, "holding short …" was not mentioned in the read-back.

At 0650:51, Tower South Control contacted the A6HBQ helicopter traffic with a callsign A6HBQ and instructed to report when it is on final approach for landing on F31 as number two in sequence behind the other A6HBN helicopter which was on the base leg. The controller also informed the A6HBQ helicopter flight crew that there was an Airbus A321 aircraft departing from runway 31L. The flight crew of A6HBQ helicopter read back correctly and informed that they will report when the helicopter is on final approach and will execute a full-stop landing.

At 0651:27, the SME640 flight crew reported holding short of taxiway F when the Aircraft was passing abeam stand 803 (figure 6). The Ground South Control instructed the flight crew to contact Tower South Control on 119.200 MHz frequency, and the flight crew read back, "Confirm one two nine two." Subsequently, the controller repeated the Tower South Control frequency, "One one niner decimal two Abu Dhabi tower south." According to the recordings, the flight crew read back the frequency unclearly and only the last three frequency characters were clearly spelled out, "[unreadable] nine decimal two."

Figure 6. SME640 position when flight crew reported holding short of taxiway F to Ground Control [Source: GANS]

At 0651:40, the Tower South Control contacted A6HBQ helicopter and provided traffic information about a military aircraft that was at a distance of two nautical miles from the threshold of runway 31L, which was then confirmed by the flight crew that the traffic was in sight.

At 0651:44, SME640 Aircraft stopped before reaching the stop bars which were active (switched on) and illuminated in red.

At 0651:49, the Tower South controller instructed A6HBQ helicopter to continue the approach on F31 which was then correctly read back by the flight crew. The controller also informed them that A6HBN helicopter was vacating FATO. At the same time, A6HBN was on a landing roll on F31 approximately in front of taxiway F5.

At 0651:55, the Tower controller contacted SME640 providing instruction to hold short of F31, and informing that A6HBN helicopter was landing on F31 (SME640 Aircraft's position is shown in figure 7). The flight crew read back by stating, "Hold short foxtrot three [unreadable] land sierra mike echo six four zero."

Figure 7. SME640 position when Tower South Control instructed the flight crew to hold short of F31 [Source: GANS]

At 0652:06, the Tower controller instructed A6HBN to expedite vacating FATO through taxiway F3. A6HBN was vacating FATO through taxiway F3, and the flight crew confirmed vacation at 0652:10.

At 0652:19, SME640 Aircraft started to move towards taxiway F.

Figure 8. SME640 position when Tower South Control instructed A6HBQ to land [Source: GANS]

At 0652:24, the Tower controller instructed A6HBQ to land (at pilot's discretion) on F31 and informed the surface wind of 360 degrees direction at 11 knots. At this time, SME640 was moving to approach the stop bars as shown in figure 8. A6HBQ flight crew correctly read back and stated that they will report when F31 would be clear (vacating of FATO) and the Aircraft position is at taxiway F3.

At 0652:35, SME640 Aircraft was crossing active stop bars on taxiway F5, which resulted in the activation of the safety net alarm "HP OVERRUN[11]" (figure 9). HP OVERRUN was activated since FATO was considered an active runway.

At this time, A6HBQ was on short final at approximately 200 feet above ground level and 130 meters from F31 touchdown zone.

Figure 9. SME640 Aircraft crossing the stop bars on taxiway F5 [Source: GANS]

At 0652:38, the Tower controller asked SME640 flight crew if they are visual with the helicopter touching down, and they responded, "Ahh affirmative". At the same time, A6HBN helicopter was taxiing to Abu Dhabi Aviation apron through taxiway F3 at a position of about 8 o'clock direction from SME640 Aircraft's flight deck sight

[11] Hold Position (HP) OVERRUN alarm is an alarm that will be generated when an aircraft has crossed an active runway holding position at a runway without clearance for any of the corresponding logical runways. In other instances when stop bars are crossed alarm STB OVERRUN will be activated.

whereas the position of A6HBQ helicopter was at about 2 o'clock position.

At 0652:46, when the Tower controller noticed that SME640 Aircraft was entering FATO, he immediately called A6HBQ and instructed them to go around.

At 0652:49, A6HBQ turned left moving away before reaching the touchdown zone.

The SME640 Aircraft entered taxiway F while A6HBQ was initiating a left turn go-around, and the distance was approximately 100 meters which was the closest distance between both aircraft (figure 10).

At 0652:52, the Tower controller repeated the go-around instruction to A6HBQ and instructed the flight crew to report when the helicopter is on the left downwind. The controller also informed them that SME640 was instructed to hold short taxiway F5. A6HBQ flight crew confirmed executing the go-around and reported SME640 Aircraft in sight.

Figure 10. SME640 Aircraft entered taxiway F while A6HBQ initiated a go-around [Source: GANS]

At 0653:02, the Tower controller contacted SME640 emphasizing that the granted clearance was to hold short of taxiway F and wait for the landing of A6HBQ, and it was not to cross the red stop bars. The flight crew expressed their apology.

At 0653:21, the Tower controller instructed SME640 flight crew to hold their position. The flight crew correctly read back and stopped the Aircraft on FATO whereas A6HBQ was on the go-around clear of FATO.

At 0653:40, the Tower controller instructed A6HBQ to orbit south of the field and stand by for landing instructions. The controller also informed the flight crew that taxiway F is occupied. A6HBQ flight crew replied with information indicating a full understanding of the instructions.

Organizational and Management Information

The Operator

The Operator was granted an air operator certificate (AOC) issued by the ECAA on 16 May 2007 to perform commercial air operations.

Volume 1 of the Operator's *Operations Manual − Part A (OM-A)*, provides information on VHF communication, as follows:

> "**8.10.3.8.5 VHF Communication**
>
> Flight Crew shall maintain radio listening watch on the frequencies appropriate for the area of operation, …"

The information regarding stop bars is provided in Volume 1 of the Operator's *Operations Manual − Part A (OM-A)*, as follows:

> "**8.3.2.1 Prevention of Runway Incursion**
>
> - It is mandatory to stop at red stop bars. Stop bars shall not be crossed under any circumstances without ATC clearance;
>
> …"
>
> "**8.10.4.3 Taxi-out**
>
> - Not crossing (red) stop bars during taxi;
>
> …"
>
> "**12.1.5.14 Surface Movement of Aircraft**
>
> …
> An aircraft taxiing on the maneuvering area shall stop and hold at all taxi-holding positions unless otherwise authorized by the aerodrome control tower.
> An aircraft taxiing on the maneuvering area shall stop and hold at all lighted stop bars, and may proceed further when the lights are switched off."

The air navigation service provider

Global Air Navigation Services (GANS) was contracted by Abu Dhabi Airports Company (ADAC) to provide air navigation services (ANS) for Abu Dhabi Airports and operates under the ADAC ANS Certificate as a service provider.

GANS operates under ANS provider certificate issued by the GCAA for the provision of approach and tower air traffic services.

The FATO (F13/F31) procedures are defined in Volume 2 of the OMAA *Air Traffic Services Operating Manual (ATSOM) − Tower,* Section 2 − *Operations,* Chapter 1, as follows:

"**20. Procedures for FATO (F13/F31)**

20.1 The FATO shall be treated as an active RWY [Runway] belonging to ADCS [Tower South Control] permanently, except when in LVO [Low Visibility Operation].

20.2 GMCS [Ground South Control] shall transfer any movement type intending to use the FATO to ADCS.

20.3 All movements on the FATO shall be approved by and in contact with ADCS.

20.4 GMCS should avoid giving aircraft taxi instructions via the FATO, if that is unavoidable GMCS [Ground South] shall transfer the aircraft to ADCS well before the FATO. In this case GMCS shall always instruct vehicles and Aircraft to hold short of the FATO.

…"

The stop bars requirements are defined in Chapter 2 − *Aerodrome Control ADC,* as follows:

"**3. Runway Stop bars**

3.1 In line with recommended measures to prevent possible runway incursions the use of runway Stopbars is mandatory H24 in all weather conditions and irrespective of the Status of the RWY (in use or not in use).

3.2 Active and illuminated Stopbars shall not be crossed by aircraft and/or vehicles with or without a verbal approval. Exception may apply when instructed by ATS [Air Traffic Service] and under FMV [Follow Me Vehicle] guidance.

…"

Chicago Convention

Paragraph 3.2.2.7.3 of Annex 2 to the Convention on International Civil Aviation (Chicago Convention) states the international standard as:

"**3.2.2.7 Surface movement of aircraft**

3.2.2.7.3 An aircraft taxiing on the manoeuvring area shall stop and hold at all lighted stop bars and may proceed further when the lights are switched off."

Additional Information

Flight crew interviews

In his interview, the Commander stated that the Tower controller's instruction to taxi through F5 and hold short on F3 was passed to him by the Copilot who also explained to him the taxi direction. According to the Commander, he was confident that he was following the right directions in-line with the controller's instructions. The Commander stated that he would have requested the pilot monitoring (the Copilot) to repeat the controller's instructions in case of any confusion.

The commander stated that the Tower controller informed SME640 about a traffic helicopter (A6HBQ) that was on short final, and he was aware of it which was on his right. However, he considered that the traffic will land at a location other than taxiway F. As he was certain about Tower control's instruction to taxi through F5 and hold short on F3, this made him continue the taxi towards taxiway F.

In his interview, the Copilot stated that the controller instructed him to taxi through F5 and hold short on F3. He then told the Commander to taxi out through F5 and turn left to taxiway F3 and hold short on F3, to which was then agreed by the Commander.

The Copilot stated when the Tower controller informed him about a traffic helicopter (A6HBQ) was on short final, he saw the traffic on his right and read back confirming the traffic is in sight. However, he was also certain about the instruction to taxi through F5 and hold short on F3. He did not attempt to stop the Commander since he agreed with the Commander's action to continue the taxi.

The Commander had operated previous flights from Abu Dhabi and taxied from Abu Dhabi Aviation apron more than once. This Incident flight was the first time the Copilot operated flights to and from OMAA.

Taxi in and out of Abu Dhabi Aviation apron procedures

The procedures for taxiing in and out of Abu Dhabi Aviation apron are described in the *AIP*, Part 3 − *Aerodromes*, as follows:

"**2.23.1.2.8.3 Procedures for FATO (F13/F31)**

2.23.1.2.8.3.1 Stand allocation-Parking as directed.

2.23.1.2.8.3.2 For fixed wing aircraft (Code C aircraft types or smaller) the entry and exit will be via TWY [taxiway]

F5. Helicopters will normally use TWY F3 and F4.

2.23.1.2.8.3.3 When instructed by ATC arriving aircraft shall contact Abu Dhabi Aviation Operations (ADA) on frequency 122.800 MHz and expect "Follow Me" service.

2.23.1.2.8.3.4 After receiving start up clearance from ATC, departures shall contact ADA for taxi guidance on the ABU DHABI Aviation Apron.

2.23.1.2.8.3.5 Whether instructed by ADA or not, all aircraft exiting ABU DHABI Aviation Apron shall hold short of TWY F and contact Abu Dhabi Ground for further taxi clearance.

Note: TWY F between F6 and E14 is used as a FATO for helicopter operations. Aircraft taxiing on adjacent TWY are cautioned to expect helicopter traffic on the FATO."

Taxiing guidance system

The taxiing guidance system of OMAA is described in the *AIP*, Part 3 − *Aerodromes*, as follows:

"**2.23.1.1 Taxiing Guidance System**

2.23.1.1.1 Abu Dhabi Airport is provided with A-SMGCS Level 4[12]. Taxiing guidance is provided by means of Follow the Greens with Floating Spacing between aircraft. Follow the Greens is not used during daytime and normal visibility conditions and Floating Spacing will only be applied during low visibility conditions.

a. The taxiing guidance system consists of selectable segments of green taxiway centre line lights, Stop bars, Marking and Signage.

b. ATC will control the A-SMGCS Level 4 and issue Follow the greens instructions to pilots. Pilots will follow ATC instructions to Follow the greens as indicated ahead of them. Extinguished green centre line lights or a lit Stopbar shall indicate that an aircraft is to hold and await either green lights for continued taxi or onward clearance from ATC.

c. All taxiing guidance lights on taxiways leading to the runways terminate with a RWY Stopbar. By default, red stop bar lights remain ON unless deselected by the Tower controller.

d. When following the directional guidance provided by the green taxiway centre line lights and red stop bar lights, pilots are advised to also navigate their taxi route with reference to information and mandatory signs/markings provided at the airport so as to maintain positional awareness of their location at all times.

…"

Stop bars lighting

The stop bars requirements are defined in ICAO *Document 4444,* Chapter 7 − *Procedure for aerodrome control service,* Section 7.16*,* as follows:

"**7.16.7. Stop bars**

Stop bars shall be switched on to indicate that all traffic shall stop and switched off to indicate that traffic may proceed.

Note.— Stop bars are located across taxiways at the point where it is desired that traffic stop, and consist of lights, showing red, spaced across the taxiway."

Analysis

Entering FATO without Clearance

During taxiing out through taxiway F5, and when SME640 Aircraft was passing abeam parking stand 803, the PM contacted Ground South Control reporting holding short of taxiway F. The Ground controller instructed to contact Tower South Control.

The Aircraft stopped before reaching the red illuminated stop bars on taxiway F5 as requested by the Ground controller to "… hold short of foxtrot." Thereafter, the flight crew changed the VHF from Ground South to Tower South Control.

Tower controller made the initial contact with SME640 and requested to hold short of F31 and informed about the landing A6HBN helicopter. At this time, SME640 was still at a halt position before the stop bars on taxiway F5 whereas A6HBN was on a landing roll on F31 and the other A6HBQ

[12] Advanced Surface Movement Guidance and Control System (A-SMGCS) is a system providing routing, guidance and surveillance for the control of aircraft and vehicles in order to maintain the declared surface movement rate under all weather conditions within the aerodrome visibility operational level (AVOL) while maintaining the required level of safety.

helicopter was on the base leg at approximately 55 seconds before reaching the beginning of F31.

There was an unreadable part of the read-back from SME640 flight crew to Tower Control "Hold short foxtrot three [unreadable] land sierra mike echo six four zero." However, the controller did not request for confirmation or repetition of the read-back, which most probably due to his relatively high workload and holding short taxiway F3 was not logical to him since taxiway F3 is parallel to taxiway F5 and would lead the Aircraft back to Abu Dhabi Aviation apron.

SME640 Aircraft commenced moving from the halt position even though there was no instruction from Tower controller to enter the taxiway F31. Five seconds later, Tower controller cleared A6HBQ helicopter to land on F31 at pilot's discretion. At this time, A6HBN helicopter had already vacated FATO via F3.

Despite SME640 was on Tower frequency, both flight crewmembers did not capture Tower Control's landing instruction to A6HBQ, and the Aircraft crossed the stop bars and rolled towards taxiway F. Since the CVR data was not available, the Investigation could not determine why SME640 flight crew overlooked the landing clearance given to A6HBQ.

Crossing taxiway F5 active stop bars triggered the safety net alarm "HP OVERRUN" on the controller's Tower Pad (TPAD) screen and speaker, which brought the attention of Tower controller to the traffic conflict situation of a runway incursion.

Therefore, he asked SME640 flight crew whether they were visual with the A6HBQ helicopter touching down and they confirmed that. A6HBQ was still in the air and about to land. The Tower controller intended to alert SME640 flight crew about the landing of A6HBQ and get confirmation from them that they had the traffic in sight and would remain clear of the landing helicopter.

The confirmation of seeing the traffic helicopter on final was given by the pilot monitoring in his readback to the controller. However, he and the Commander were certain about Tower's taxi instruction to hold short on taxiway F3. They were not aware that taxiway F3 is parallel to taxiway F5 and thought in order to hold short on taxiway F3, the Aircraft needs to turn left after reaching the end of taxiway F5. This revealed that both flight crew had insufficient knowledge about the taxiways around the helipad (FATO) despite using valid Jeppesen charts.

When the Aircraft almost reached taxiway F, A6HBQ was on short final for F31 (FATO). At the same time, despite the position of A6HBQ, both flight crew mistakenly expected that A6HBQ would land at a location other than taxiway F since they were certain about the given taxi instruction (expectation bias[13]).

Their expectation bias made both flight crew confident to continuously move the Aircraft towards taxiway F. If both flight crew were aware that A6HBQ helicopter was landing on the same taxiway F (FATO), they might have stopped the Aircraft before entering FATO. In order to avoid collision, the controller instructed A6HBQ to execute a go-around. The Investigation was not able to assess the SME640 flight crew communications inside the flight deck and to determine matters related to their CRM since the CVR data was unavailable.

A6HBQ flight crew initiated the go-around about the same time as when the Tower controller started providing the instruction to go around. This A6HBQ flight crew action was to avoid a collision, which indicated that they were aware of the SME640's movement entering taxiway F.

Confusion between Taxiways F31 and F3

The Investigation believes that Tower controller did not predict SME640 Aircraft movement since he did not yet issue the clearance to enter taxiway F. The workload of the controller at the time he instructed the Aircraft to hold short F31 was relatively high since he was involved in controlling traffic in the vicinity.

The Commander and Copilot stated that they followed the instructions of Tower controller during taxiing out to taxiway F. However, during the interview with the Investigation, there were indications of their confusion between taxiway F3 and F31 (FATO). When Tower controller instructed to hold short of F31, both flight crewmembers received the message to hold short on taxiway F3. Since the Aircraft was at a halt position on F5, both flight crews assumed that to hold short on taxiway

[13] Expectation bias: A psychological concept associated with perception and decision making that can allow a mistaken assessment to persist." (Bhattacherjee 2001). [Source Skybrary]

F3, they need to enter first the taxiway F and turn the Aircraft to the left.

The instruction given by the Ground controller as, *"*… report foxtrot five hold short of foxtrot…" did not mention the taxiway designation number. The instruction would mean that the Aircraft should stop before the stop bars of taxiway F while it is on taxiway F5 and the flight crew to report when reaching and stopping at that position. It revealed that the flight crew understood and complied with the instruction without any issues since the controller used the designation as per the *AIP* and Jeppesen chart.

The instruction given by the Tower controller mentioned the taxiway designation number "… hold short foxtrot three one …". This latter instruction would mean that the Aircraft should stop before the stop bars of taxiway F31 while it is on taxiway F5.

As per the *ATSOM* definition, the term taxiway F31 (called Foxtrot 31 by the controller) is the FATO with a direction of 310 degrees. FATO itself was located on taxiway F. This means that holding short of taxiway F is the same as holding short of taxiway F31.

The *ATSOM* was not available to the flight crew, hence, the similarity meaning of holding short of taxiways F and F31 was only for the controllers. F31/F13 was not defined as a taxiway or heliport on the *AIP* and Jeppesen aerodrome chart, instead, H31/13 definition was used for the Heliport.

The inconsistency between the FATO designation in the *AIP* and Jeppesen charts (H31) and terms used by Tower controller (F31), confused the flight crew who were unaware that both designations refer to the same place.

Both flight crews understood the instruction was to stop the Aircraft before the stop bars on F3, which was incorrect. In addition, the similarity between F31 and F3 designations, most probably, made the confusion between them uneasily detectable.

Ground Markings

Only taxiway F4 had a painted ground marking indicating an intermediate holding point and a hotspot white painted ground marking (figure 4). Although stop bars were installed on the three taxiways, taxiways F3 and F5 were not marked for intermediate holding points similar to F4.

The Investigation believes that the unavailable IHP ground marking on F5 did not contribute to the Incident. However, if both IHPs ground markings are available on taxiways F3 and F5, these may increase the pilot's awareness of the holding positions on both taxiways.

Conclusions

Based on the evidence available, the following findings, causes, and contributing factors were made with respect to this Incident. These shall not be read as apportioning blame or liability to any particular organization or individual.

Findings

(a) The Aircraft was certificated, equipped, and maintained in accordance with the requirements of the Egyptian civil aviation regulations.

(b) The Aircraft was airworthy when dispatched for the flight, and there was no defect or malfunction detected that could have contributed to the Incident.

(c) Both flight crewmembers were licensed and qualified for the flight in accordance with the requirements of the Egyptian civil aviation regulations.

(d) The Tower South controller was licensed and qualified for managing the Tower Control in accordance with the requirements of the *Civil Aviation Regulations* of the United Arab Emirates.

(e) Both flight crewmembers were well-rested and fit for the flight.

(f) The Commander was the pilot flying (PF) and the Copilot was the pilot monitoring (PM).

(g) The weather condition was not a contributing factor to the Incident, and the flight was a day flight.

(h) The Aircraft crossed illuminated stop bars on taxiway F5 and entered the helicopter final approach/take-off (FATO) without Tower Control clearance while a helicopter traffic was on short final and approaching to land on the FATO.

(i) FATO was designated as H31 in the *AIP* and the Jeppesen charts, while it was designated as F31 in *ATSOM*.

(j) The inconsistency between the FATO designation in Jeppesen charts and terms used by the Tower controller most probably, caused confusion to the flight crew.

(k) Similarity between F31 and F3 designations, most probably, made confusion between them uneasily detectable.

Causes

The Air Accident Investigation Sector determines the following causes of the runway incursion Incident:

a) The flight crew crossed the active stop bars and the Aircraft entered FATO, which was located on taxiway F, without clearance. Simultaneous to FATO entry, a helicopter was on short final for the landing where the flight crew mistakenly expected that the helicopter would land at a location other than taxiway F and had insufficient knowledge about the taxiways around the helipad (FATO).

b) The flight crew were confused by the similarity of taxiways F3 and F31 alphabetical and numerical characters.

c) The flight crew were not aware that the designation H31 in the Jeppesen charts refers to the taxiway which was designated as F31 in *ATSOM* and used by controllers in their communications which led them to assume that the Aircraft was clear to enter taxiway F31.

Safety Recommendations

Safety Actions Taken

GANS undertook the following measures following the Incident:

(a) To reduce possible confusion and prevent FATO incursions, GANS Operations Management reviewed the existing procedures and issued *Supplementary Instruction (SI)* 056/22 with the following procedures:

- All helicopters and fixed-wing traffic taxiing out of Abu Dhabi General Aviation (AGA) shall be instructed to hold at the IHP prior to entering the FATO.
- F5 to hold short of F5P1, F4 to hold short of F4P1, and F3 to hold short of F3P1
- Example: A6AWF taxi own discretion via F3 and hold at F3P1 or T7ACS taxi own discretion via F5 and hold at F5P1

(b) In reference to Hotspot HS11 area, as recommended by GANS to Abu Dhabi Airports, a project named 'Road Holding Position' was completed by Abu Dhabi Airports, and additional signage and flashing red lights have been installed in that location.

(c) Using the terms F13/F31 for FATO confused SME640's flight crew which was addressed by the AAIS during the consultation period of the draft Report. Thereafter, *SI* 007/23 was issued by GANS to amend the *ATSOM* aligning the naming convention of the FATO with the *AIP*. F31/F13 is no longer used by ATCOs, instead, FATO 31/FATO13 is used.

Investigation Safety Recommendations

The Air Accident Investigation Sector recommends that:

Smart Aviation Company

SR04/2023

During the Aircraft movement towards taxiway F without clearance, and when it was about to cross the activated stop bars on taxiway F5, both flight crewmembers were unaware of the active communication between Tower Control and A6HBQ helicopter on short final preparing for landing.

The flight crew's vigilance to these broadcasts was not in accordance with the *VHF Communication* policy stated in the *OM-A* which requires pilots to maintain radio listening watch on the frequencies appropriate for the area of operation.

Therefore, the Investigation recommends that Smart Aviation Company reinforces this policy among pilots especially in critical flight phases.

SR05/2023

Crossing active stop bars and entering FATO by the flight crew without clearance was not as per the Operator's procedures and international standards.

Therefore, the Investigation recommends that Smart Aviation Company reinforces among their pilots to adhere to the standard operating procedures (SOP) for taxiing aircraft, especially with active stop bars.

SR06/2023

Despite using the valid Jeppesen charts, both flight crews had insufficient knowledge about the taxiways around the helipad, FATO, and this resulted in their unawareness of the parallel position of taxiway F3 with taxiway F5.

The Investigation recommends that Smart Aviation Company reinforces among their pilots to study

and correctly understand the related charts before operating flight.

Global Air Navigation Services (GANS)

SR07/2023

GANS took safety action by issuing *Supplementary Instruction* 007/23 amending the *Air Traffic Services Operating Manual (ATSOM)* aligning the naming convention of the FATO with the *AIP*, whereas FATO 13/31 is now used by the air traffic controllers replacing F13/F31.

In order to have a standard and solid system of using the term FATO 13/31, it is recommended that GANS consider the practicability to include the contents of *Supplementary Instruction* 007/23 in the *Air Traffic Services Operating Manual* as SOPs for its air traffic controllers.

Abu Dhabi Airports

SR08/2023

Unlike taxiway F4, taxiways F3 and F5 were not marked for indicating intermediate holding points.

The Investigation recommends that Abu Dhabi Airports review the existing markings, and consider adding ground markings that indicate intermediate holding points on taxiways F3 and F5.

This Summary Report is issued by the:
Air Accident Investigation Sector
General Civil Aviation Authority
The United Arab Emirates

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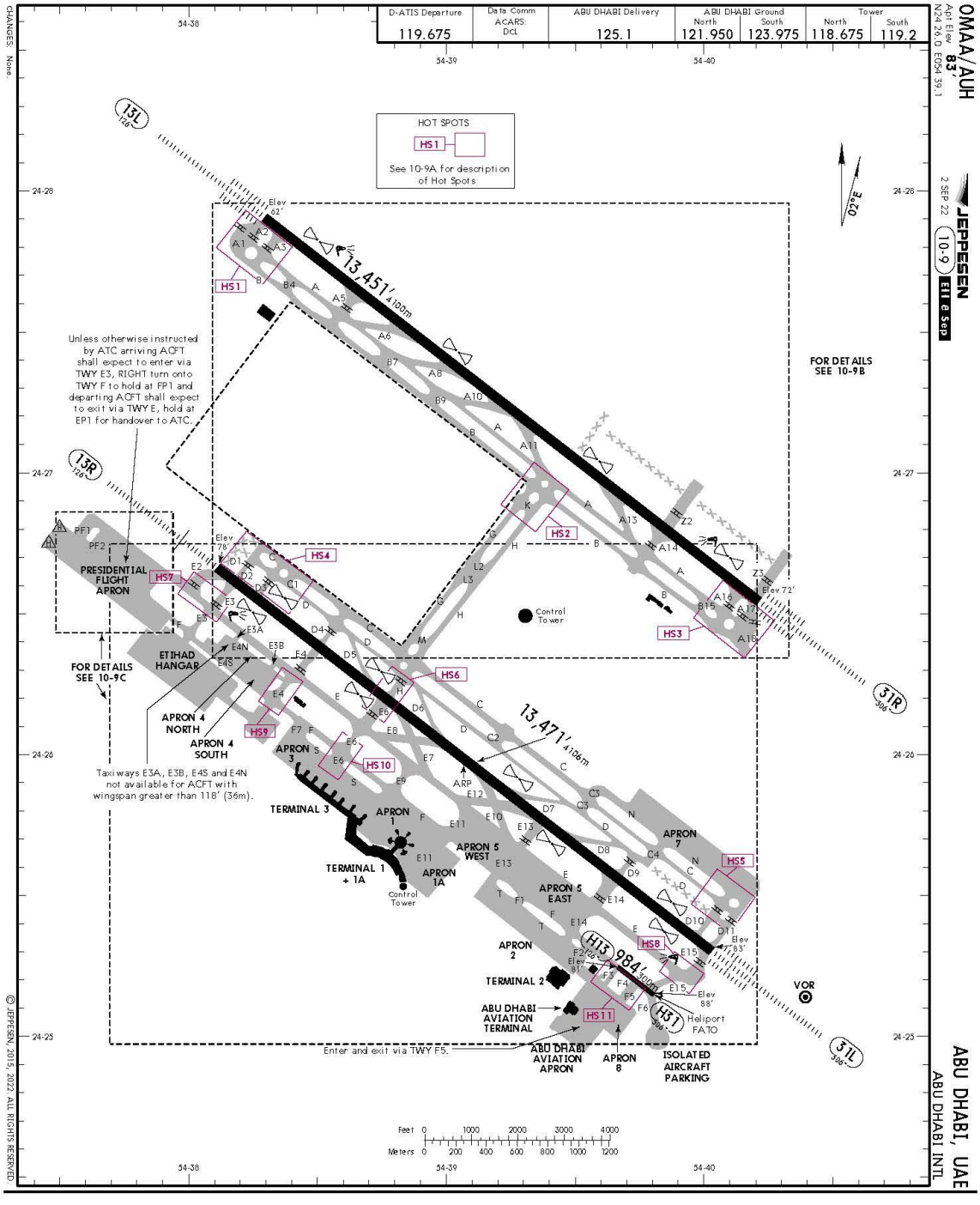
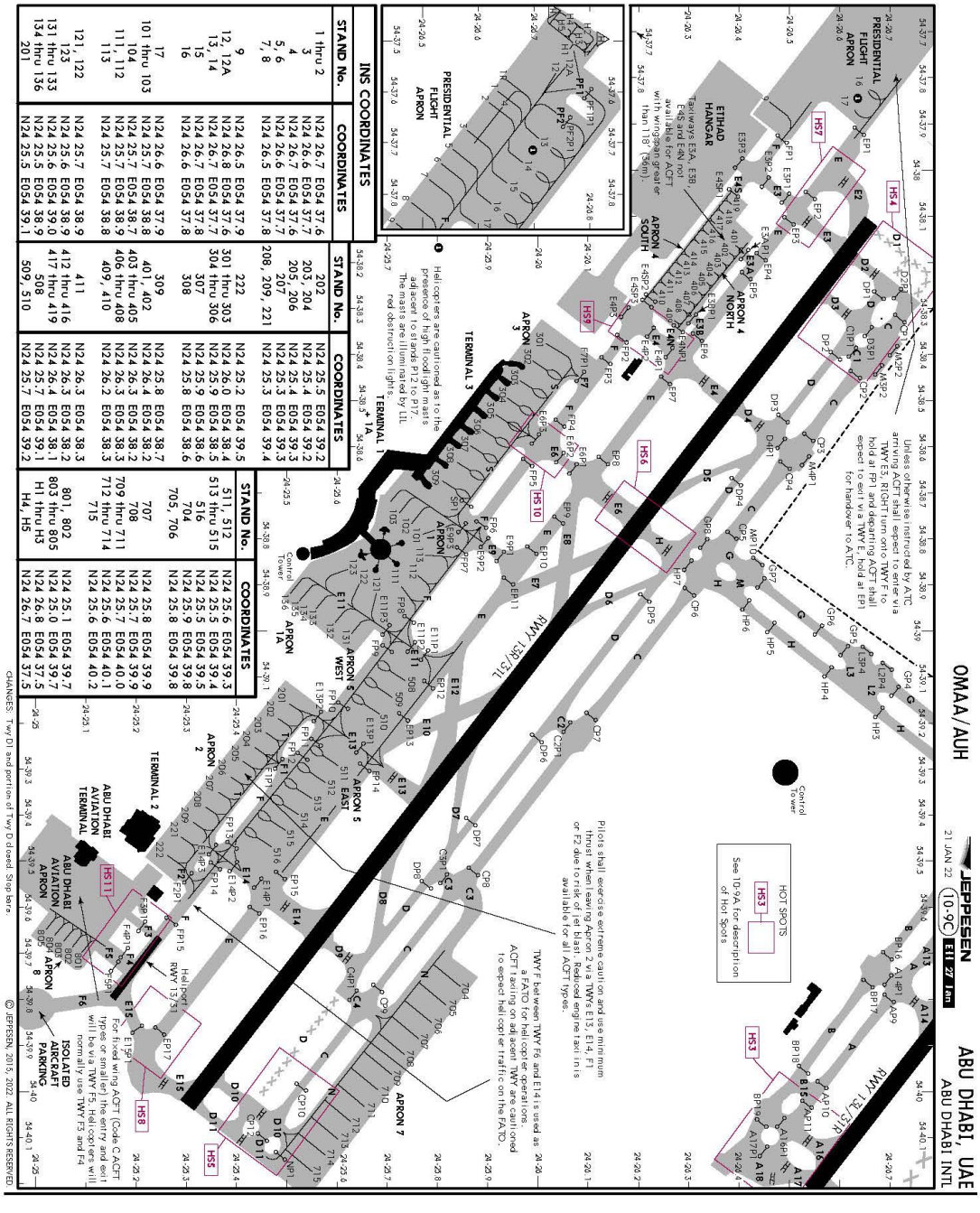
Attachment A: Jeppesen OMAA Airport Charts



Attachment A: Jeppesen OMAA Airport Charts (Cont.)



STAND No.	COORDINATES
1 thru 2	N24 26.7 E054 37.6
3	N24 26.6 E054 37.7
4	N24 26.7 E054 37.6
5, 6	N24 26.6 E054 37.7
7, 8	N24 26.5 E054 37.8
9	N24 26.5 E054 37.9
12, 12A	N24 26.8 E054 37.6
13, 14	N24 26.7 E054 37.7
15	N24 26.7 E054 37.8
16	N24 26.8 E054 37.8
17	N24 26.6 E054 37.9
101 thru 103	N24 25.7 E054 38.8
104	N24 25.7 E054 38.7
111, 112	N24 25.7 E054 38.9
113	N24 25.7 E054 38.8
121, 122	N24 25.7 E054 38.9
123	N24 25.6 E054 38.9
131 thru 133	N24 25.6 E054 39.0
134 thru 136	N24 25.5 E054 38.9
201	N24 25.5 E054 39.1

STAND No.	COORDINATES
202	N24 25.5 E054 39.2
203, 204	N24 25.4 E054 39.2
205, 206	N24 25.4 E054 39.3
207	N24 25.3 E054 39.3
208, 209, 221	N24 25.3 E054 39.4
222	N24 25.2 E054 39.5
301 thru 303	N24 26.0 E054 38.4
304 thru 306	N24 25.9 E054 38.5
307	N24 25.9 E054 38.6
308	N24 25.8 E054 38.6
309	N24 25.8 E054 38.7
401, 402	N24 26.4 E054 38.2
403 thru 405	N24 26.3 E054 38.2
406 thru 408	N24 26.3 E054 38.3
409, 410	N24 26.2 E054 38.3
411	N24 26.3 E054 38.3
412 thru 416	N24 26.3 E054 38.2
417 thru 419	N24 26.4 E054 38.1
508	N24 25.7 E054 39.1
509, 510	N24 25.7 E054 39.2

STAND No.	COORDINATES
511, 512	N24 25.6 E054 39.3
513 thru 515	N24 25.5 E054 39.4
516	N24 25.5 E054 39.5
704	N24 25.9 E054 39.8
705, 706	N24 25.8 E054 39.8
707	N24 25.8 E054 39.9
708	N24 25.7 E054 39.9
709 thru 711	N24 25.7 E054 40.0
712 thru 714	N24 25.6 E054 40.1
715	N24 25.6 E054 40.2
801, 802	N24 25.1 E054 39.7
803 thru 805	N24 25.0 E054 39.7
H1 thru H3	N24 26.8 E054 37.5
H4, H5	N24 26.7 E054 37.5

Attachment B: Transcript of Air Traffic Control Recordings [Source: GANS]

Time	Comm / Freq	Agency	Transcript
06:44:35	123.975	SME640	Abu Dhabi Ground sierra mike echo six four zero good morning
06:44:40	123.975	Ground South Control	Sierra mike echo six four zero abu dhabi ground very good morning pass your message
06:44:45	123.975	SME640	Sierra mike echo six four zero type of aircraft charlie six eight zero at abu dhabi aviation apron flight level two six zero ready to copy the A-T-C destination Oscar tango bravo delta
06:44:58	123.975	Ground South Control	Sierra mike echo six four zero cleared to oscar tango bravo delta runway three one left MEKRI two kilo departure climb maintain five thousand feet squawk one seven zero five when passing one thousand feet contact one two eight decimal one
06:45:14	123.975	SME640	Destination oscar tango bravo delta via MEKRI two kilo maintain five thousand feet squawk one seven zero five passing one thousand contact one two eight decimal one
06:45:24	123.975	Ground South Control	Sierra mike echo six four zero readback is correct to confirm MEKRI two kilo five thousand feet
06:45:30	123.975	SME640	MEKRI two kilo five thousand feet sierra mike echo six four zero
06:45:36	123.975	Ground South Control	Sierra mike echo six four zero readback is correct the start up is approved pilot discretion information x-ray Q-N-H one zero one seven report ready for taxi
06:45:44	123.975	SME640	Start up approve information x-ray next call you for taxi sierra mike echo six four zero
06:49:28	123.975	SME640	Sierra mike echo six four zero ready for taxi out
06:49:32	123.975	Ground South Control	Sierra mike echo six four zero please check transponder is on
06:49:40	123.975	SME640	One seven zero five transponder switch on
06:49:49	123.975	Ground South Control	Sierra mike echo six four zero taxi own discretion report foxtrot five holding short foxtrot
06:49:55	123.975	SME640	Uhh now follow me in sight follow follow me or ahh taxi via fox five
06:50:01	123.975	Ground South Control	Sierra mike echo six four zero sir proceed via the with the follow me car and report foxtrot five hold short of foxtrot
06:50:07	123.975	SME640	Follow me car foxtrot five foxtrot sierra mike echo six four zero
06:50:51	119.200	Tower South Control	Alpha six hotel bravo quebec report final approach foxtrot three one number two company turning final approach for foxtrot three one and there is airbus three twenty one departing
06:50:59	119.200	A6HBQ	Copied both traffic and will report finals for foxtrot three one fullstop
06:51:27	123.975	SME640	Sierra mike echo six four seven now hold short of foxtrot
06:51:33	123.975	Ground South Control	Sierra mike echo six four zero contact abu dhabi tower south one one nine decimal two

06:51:40	123.975	SME640	Confirm one two nine two
06:51:43	123.975	Ground South Control	One one niner decimal two abu dhabi tower south
06:51:45	123.975	SME640	(unreadable) nine decimal two
06:51:40	119.200	Tower South Control	Alpha six hotel bravo quebec traffic information casa two mile final for three one left
06:51:45	119.200	A6HBQ	Visual the traffic on final alpha six hotel bravo quebec
06:51:49	119.200	Tower South Control	Alpha six hotel bravo quebec company vacating continue approach foxtrot three one
06:51:53	119.200	A6HBQ	Continuing alpha six hotel bravo quebec
06:51:55	119.200	Tower South Control	Sierra mike echo six four zero hold short foxtrot three one helicopter landing
06:51:59	119.200	SME640	Hold short foxtrot three (unreadable) land sierra mike echo six four zero
06:52:06	119.200	Tower South Control	Hotel bravo November expedite foxtrot three to vacate
06:52:10	119.200	A6HBN	We are vacated foxtrot three one hotel bravo November thanks
06:52:24	119.200	Tower South Control	Hotel bravo quebec land pilot discretion foxtrot three one surface wind three six zero degrees one one knots report safe on ground
06:52:30	119.200	A6HBQ	Pilot discretion for foxtrot three one and clear at foxtrot three will call clear alpha six hotel bravo quebec
06:52:38	119.200	Tower South Control	Sierra mike echo six four zero are you visual with the helicopter touching down
06:52:43	119.200	SME640	Ahh affirmative
06:52:46	119.200	Tower South Control	Okay hotel bravo quebec go around go around I say again go around theres traffic on taxiway foxtrot
06:52:51	119.200	A6HBQ	(cross transmission) …was taxiing traffic
06:52:52	119.200	Tower South Control	Hotel bravo quebec go around go around foxtrot three one and report left downwind the traffic was instructed to hold short sir
06:52:58	119.200	A6HBQ	Understood alpha six hotel bravo quebec going around visual
06:53:02	119.200	Tower South Control	Sierra mike echo six four zero the clearance was to hold short of taxiway foxtrot sir for the landing helicopter sir you weren't instructed to cross the red bars
06:53:14	119.200	SME640	Okay you are apologise about that uhh we are we expect for that we uhh we are apologise
06:53:21	119.200	Tower South Control	Sierra mike echo six four zero hold your position hold your position sir
06:53:25	119.200	SME640	Ah hold position we are apologise about that ahh
06:53:40	119.200	Tower South Control	Alpha six hotel bravo quebec orbit south of the field south of the field and stand by landing there is etihad traffic on 5 mile finals runway three one left foxtrot is occupied
06:53:49	119.200	A6HBQ	Copied foxtrot occupied orbiting at current position and well clear of the active runway alpha six hotel bravo quebec
06:53:57	119.200	Tower South Control	Affirm and hotel bravo quebec sir that traffic was instructed to hold short