BAAI

BUREAU OF AIR ACCIDENT INVESTIGATION

This investigation has been conducted in accordance with *Annex 13 to the ICAO Convention on International Civil Aviation*, *EU Regulation No 996/2010* and *The Civil Aviation (Investigation of Air Accidents and Incidents) Regulation; Legal Notice 16 of 2013*.

Under these Regulations, the sole objective of the investigation of an accident or incident is the prevention of accidents and incidents in the future. It is not the purpose of this investigation to assign fault or blame and the reporting process should not be used to determine liability.

Serious Incident Report

LOSS OF SEPARATION IN FLIGHT

BETWEEN

AIRBUS A321-271NX HA-LVH

AND

TECNAM P2002JF SIERRA 9H-VLT

ON THE APPROACH OF RUNWAY 31

MALTA INTERNATIONAL AIRPORT

18TH JULY 2020

TABLE OF CONTENTS

TABLE OF FIGURES

1. General Information

Location: On the approach path of RWY 31 at Malta International Airport, 1.5nm from the threshold.	**Report Number:** BAAI/180720
Date & Time: 18th July 2020, 1230hrs (Local)	
Defining Event: Loss of separation in the air.	
Aircraft 1: **Type:** Airbus A321-271NX **Registration:** HA-LVH **Aircraft Damage:** None **Injuries:** NIL **Flight Conducted Under:** IFR	**Aircraft 2:** **Type:** Tecnam P2002JF Sierra **Registration:** 9H-VLT **Aircraft Damage:** None **Injuries:** NIL **Flight Conducted Under:** VFR

2. Synopsis

A light aircraft, Tecnam P2002JF Sierra registration 9H-VLT, was on a right hand circuit Runway 05 during a first solo flight. During the downwind leg, the pilot was instructed by Air Traffic Control to proceed and orbit over the Blue Grotto area, situated on the South East coast of Malta. On arrival over the coast, the aircraft initiated a wide left orbit and then proceeded to fly onto the approach path of Runway 31 whilst Airbus A321-271NX Registration HA-LVH was on the final approach to Runway 31 to land. The two aircraft flew on reciprocal tracks along the approach path of Runway 31, crossing each other with an estimated vertical separation of about 200 feet. The Airbus A321 and Tecnam P2002JF Sierra then proceeded to land on Runways 31 and 05 respectively without further incident. A TCAS Resolution Advisory was triggered on the Airbus A321 during the incident.

3. Factual Information

History of the Event

Tecnam P2002JF Sierra registration 9H-VLT was conducting a dual training flight[1] from Malta International Airport (ICAO Code LMML) on the morning of the 18th July 2020 under the call sign Falcon 8H. The flight landed on RWY 05 at approximately 1200hrs (local time) and proceeded to Apron 3 where the flight instructor requested from Ground Control clearance for the student pilot to "go for one circuit to land"[2]. This was approved.

At 1211hrs the student pilot of 9H-VLT, using the call sign Falcon 8H, requested clearance to taxi on Ground ATC frequency (121.600MHz). The Tower controller at the time was a trainee undergoing on-the-job training under the supervision of a qualified On-The-Job Training Instructor (OJTI). Tower approved taxi and 9H-VLT commenced taxiing for departure on RWY 05. At this time there were 3 other light aircraft in the circuit of RWY 05 and commercial traffic, a Boeing 737-800, ready for departure RWY 31 holding at TWY C.

At 1220hrs Tower cleared 9H-VLT for takeoff and to proceed to the Grand Harbour area.

9H-VLT departed RWY 05 and proceeded as instructed. In the meantime, one of the light aircraft in the circuit of RWY 05 conducted a touch-and-go on RWY 05 behind 9H-VLT and other commercial traffic, an Airbus A321-271NX, registration HA-LVH, operating under call sign WZZ8973, was on the right hand downwind leg on the approach to RWY 31 for landing, approximately 6 nautical miles off the Eastern coast of Malta. HA-LVH was under Approach Control (128.150MHz).

At 1223hrs 9H-VLT reported over Grand Harbour and Tower cleared the aircraft to join right hand cross-wind for RWY 05. 9H-VLT joined the cross-wind leg approximately 3 nautical miles beyond RWY 05 at an altitude of 1,400 feet. Tower then cleared the aircraft that had conducted the touch-and-go after the takeoff of 9H-VLT, and was now proceeding upwind, to join left hand downwind RWY 05.

[1] A dual training flight is a training flight in which the flight instructor and student pilot will be on board.
[2] As per radio communication of the flight instructor to Ground Control at 1206hrs.

Tower was then busy communicating with aircraft in the circuit and on the ground. At the end of the communications, 9H-VLT, which had arrived abeam the threshold of RWY 31 on the cross-wind leg, requested to join the downwind leg. The OJTI, who, at this time, replaced the trainee controller as the Tower controller, promptly cleared 9H-VLT to join the downwind leg and to report ready to turn onto the base leg.

9H-VLT turned downwind as instructed. At this time, HA-LVH, still under Approach Control, was about to turn onto the base-leg of the approach to RWY 31, approximately 14 nautical miles from the runway.

At 1226:45 HA-LVH was 9.5 nautical miles from the threshold of RWY 31 and its crew contacted Tower to report established on the ILS of RWY 31. In the meantime, 9H-VLT was crossing the threshold of RWY 31 on the right hand downwind leg for RWY 05. The light aircraft that had conducted the touch-and-go behind 9H-VLT was now ahead of 9H-VLT in the left hand circuit (Figure 1, Point C).

At 1227:07 Tower instructed 9H-VLT, which was still on the downwind leg, to proceed to Blue Grotto and orbit there until advised. 9H-VLT acknowledged. Blue Grotto is a published Visual Reporting Point (VRP) situated on the South East coast of Malta. Soon after, Tower instructed the light aircraft on the left hand downwind leg of RWY 05, which was by now approaching the coast still ahead of 9H-VLT, to proceed to orbit over the Temples Holding Area, situated on the South-East coast of Malta, close to the approach path of RWY 05. Another light aircraft was on final approach of RWY 05.

At 1228:51 9H-VLT arrived over the coast at an altitude of 1,400 feet and started a wide orbit to the left. In the meantime, at 1228:56 the other light aircraft on the left hand downwind leg started turning towards the Temples Holding Area at an altitude of 1,100 feet (Figure 1, Point D).

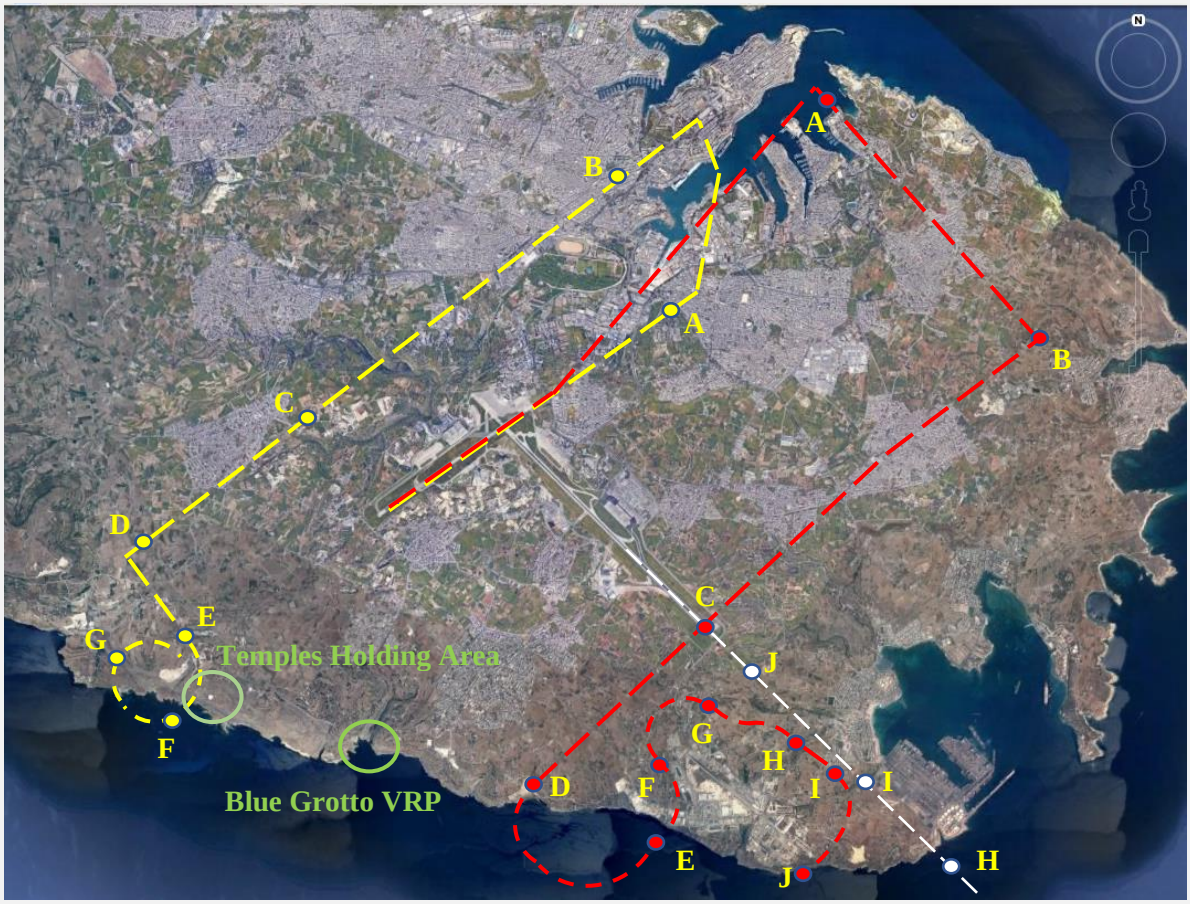


Figure 1: The paths flown by HA-LVH, 9H-VLT on the other aircraft in the circuit.

Legend: 9H-VLT Light Aircraft HA-LVH

Time (±5 seconds):

A: 1223:32	B: 1225:00	C: 1226:48	D: 1227:48
E: 1228:21	F: 1228:41	G: 1229:07	H: 1229:22
I: 1229:42	J: 1230:13		

The wide orbit brought 9H-VLT close to the Hal Far area and at 1228:15 Tower instructed 9H-VLT to execute a right hand orbit at its present position. At this moment 9H-VLT was in the vicinity of the coast heading inland in an easterly direction at an altitude of 1,300 feet. 9H-VLT requested Tower to repeat the instruction whilst continuing the wide left orbit. The Tower controller did not repeat the instruction but instead instructed 9H-VLT to proceed to Blue Grotto immediately via the coast:

1228:15

Tower: " *Falcon 8H right hand orbit present position*"

9H-VLT: "*Falcon 8H say again*"

Tower: "*Falcon 8H you were cleared to proceed to Blue Grotto – nowhere else – proceed to Blue Grotto now, via the coast*"

9H-VLT did not read back the instruction to proceed to Blue Grotto via the coast. Tower did not ask for a read back.

During and after the communication, 9H-VLT proceeded with the wide left orbit over land, until heading approximately parallel to RWY 31. It then reversed the turn to the right, flying towards the approach path of RWY 31, descending in the process.

At 1229:00, when HA-LVH had arrived at 3 nautical miles from the threshold of RWY 31 at an altitude of 1,200 feet and descending on the ILS Glide Slope, Tower instructed HA-LVH to continue with the approach. At this time, 9H-VLT was south of the threshold of RWY 31 and still turning onto the approach path of RWY 31.

At 1229:06 (which coincided with the end of the read-back communication of HA-LVH in response to the ATC instruction to proceed with the approach), 9H-VLT stopped turning and was now nearly on a heading reciprocal to the approach path at 1,000 feet altitude and to the west of the approach path, approximately 0.5 nautical miles from the threshold of RWY 31 (Figure 1, Point G).

At 12:29:22 Tower gave HA-LVH clearance to land. At this moment, 9H-VLT was at 1,000 feet, approaching HA-LVH, which was at 1,100 feet and descending (Figure 1, Point H):

1229:22

Tower: "*Wizz air eight nine seven three the wind is zero two zero degrees less than five runway – correction … niner knots, runway three one clear to land vacate via echo or foxtrot*"

HA-LVH: "*Vacate via echo or foxtrot, wizz air eight nine seven three*"

As HA-LVH approached 1,000 feet, the TCAS equipment on board the aircraft triggered a 'Monitor Vertical Speed' Resolution Advisory (RA).

The two aircraft continued on reciprocal tracks, crossing each other at 1229:45 when 1.5 nautical miles from the threshold of RWY 31, with 9H-VLT passing approximately 200 feet above and to the left of HA-LVH.

As soon as the two aircraft crossed each other, HA-LVH requested confirmation for clearance to land:

1229:46

HA-LVH: "*<unintelligible> for information please landing clearance wizz air eight nine seven three*"

Tower: "*That is correct, cleared to land runway three one wind zero two zero degrees niner knots*"

HA-LVH proceeded to land on RWY 31 without further incident. 9H-VLT continued to the Temples Holding Area and landed on RWY 05 as instructed by ATC.

At the time of the incident the sun was high over the horizon and there was few cloud (1-2 octas) at 2,600 feet.

Injuries to Persons

9H-VLT

Crew: None reported

Passengers: N/A

Other: N/A

HA-LVH

Crew: None reported

Passengers: None reported

Other: N/A

Damage to Aircraft

9H-VLT: None reported

HA-LVH: None reported

Other Damage

N/A

Pilot Information

9H-VLT – Student Pilot

Certificate: N/A

Age: 19

Seat Occupied: Left

Restraint Used: Seat harness

Second Pilot Present: No (Instructor on the ground)

Toxicology Performed: No

Medical Certification: Class 1/2/LAPL, issued by Transport Malta

Last Medical Exam: 3rd February 2020

Last Flight Review or Equivalent: 18th July 2020

Flight Time: 48.5 hours dual flight training

HA-LVH – Captain

Certificate: EU FCL ATPL (A) issued by CAA (Poland)

Age: 46

Limitations: None

Instrument Rating(s): Instrument, IMC, Night

Seat Occupied: Left

Restraint Used: Seat harness

Second Pilot Present: Yes

Toxicology Performed: No

Medical Certification: Class 1

Last Medical Exam: 17th January 2020

Limitations: None

Occupational Pilot: Yes

Last Flight Review or Equivalent: Instrument, IMC, night ratings: 17th July 2020

Total Flight Time: 9591 hours

Flight Time on type: 4680 hours

Flight Time on type as PIC: 3065 hours

Total Flight Time previous 90 days: 36 hours

Total Flight Time previous 30 days: 36 hours

Total Flight Time previous 24 hours: 5.25 hours

HA-LVH – 2nd Pilot

Certificate: EU FCL CPL (A) issued by CAA (Poland)

Age: 26

Limitations: VDL
Instrument Rating(s):
Seat Occupied: Right
Restraint Used: Seat harness
Toxicology Performed: No
Medical Certification: Class 1
Last Medical Exam: 10th January 2020
Limitations: VDL
Occupational Pilot: Yes
Last Flight Review or Equivalent: A320 Type Rating: 13th May 2020
Total Flight Time: 2079 hours
Flight Time on type: 1828 hours
Flight Time on type as PIC: N/A
Total Flight Time previous 90 days: 25 hours
Total Flight Time previous 30 days: 25 hours
Total Flight Time previous 24 hours: 0 hours

Aircraft and Owner/Operator Information

9H-VLT

Aircraft Make: Tecnam
Model/Series: P2002 JF Sierra
MSN: 212
Registration: 9H-VLT
Aircraft Category: Single engine Land Airplane
Year of Manufacture: 2012
Landing Gear Type: Tricycle
Seats: 2
Engine Manufacturer: BRP-Rotax GmbH & Co. KG
Engine Model/Series: Rotax 912-S2
TCAS Equipment: Not Installed
Transponder Equipment: Garmin GTX328 (Mode C)
Certificate of Airworthiness: Issued by Transport Malta – Civil Aviation Directorate (MT) on 23rd November 2018
Airframe Total Time: 2368 hours
Registered Owner: European Pilot Academy Ltd.
Operator: European Pilot Academy Ltd.

HA-LVH

Aircraft Make: Airbus

Model/Series: A321-271NX

MSN: 9164

Registration: HA-LVH

Aircraft Category: Multi-engine Land Airplane (Part 25 certified)

Landing Gear Type: Tricycle

Year of Manufacture: 2020

Engine Manufacturer: Pratt and Whitney

Engine Model/Series: PW1133GA-JM

TCAS Equipment: Honeywell TPA-100B

Certificate of Airworthiness: Issued by the Hungary Ministry of Innovation and Technology on 28th February 2020

Airframe Total Time: 641 hours

Registered Owner: Hortobagy Leasing Co. Ltd.

Operator: Wizz Air Hungary Ltd.

Meteorological Information

Conditions at Accident Site: Visual Meteorological Conditions

Condition of Light: Day, sun high over the horizon

Lowest Cloud Condition: few (1-2 octas) at 2,600 feet

Lowest Ceiling: N/A (no overcast)

Wind Speed/Gusts: / Turbulence Type/Severity *(if applicable)***:** -- 7 kts

Forecast/Actual: -- Actual (METAR)

Wind Direction: -- Variable - 330◦ to 080◦

Forecast/Actual: -- Actual (METAR)

QNH: 1013mb

Temperature/Dew Point: 28◦C / 21◦C

Precipitation and Obscuration: Nil

METAR LMML 181015Z 04007KT 330V080 9999 FEW026 28/21 Q1013 NOSIG=
METAR LMML 181045Z VRB07KT 9999 FEW026 29/21 Q1013 NOSIG=

4. Findings

4.1 – Collection of Evidence

The collection of evidence was based on:

- The recordings of communications via VHF radio on Tower and Ground frequencies (135.100MHz and 121.600MHz respectively) from the relevant controller's intercom
- The recordings of the radar display at the Tower controller station
- Evidence given by the Tower controllers and pilots of HA-LVH and 9H-VLT (including the flight instructor of 9H-VLT)
- Documentation submitted by the flying school operating 9H-VLT
- Flight data recordings from the Quick Access Recorders (QARs) on board HA-LVH
- Documentation submitted by the operator of HA-LVH
- METAR information

The recordings of communications and radar display were made available by the air navigation service provider (ANSP) for Luqa Airport.

The evidence given by the controllers and the pilot and flight instructor of 9H-VLT was conveyed through interview.

The evidence given by the pilots of HA-LVH was through detailed pilot's written report.

The Flight data recordings from HA-LVH and other evidence was provided by the operators of the aircraft.

The Meteorological Report (METAR) was made available by the ANSP for Luqa Airport.

DFDR and CVR data was not available as this was not withheld by the operators of HA-LVH. 9H-VLT was not equipped with a DFDR or CVR.

4.2 – The Airfield

Luqa Airport (ICAO Code LMML) is the only aerodrome in Malta and has two asphalt runways arranged in a 'T' configuration – RWY 23/05 of length 2376m long and 45m wide to the north; and RWY 13/31 of length 3542m/3355m and 60m wide to the south. The aerodrome is at an elevation of 300ft.

Being the only aerodrome, Luqa Airport has to cater for all the aviation needs of the country, which range from private flying to commercial and military operations. It handles a wide variety of aircraft, from ultra-light, propeller-driven fixed-wing aeroplanes, to the largest jet transports and helicopters.

The Aerodrome is surrounded by the Luqa Aerodrome Traffic Zone (ATZ) that extends to a radius of 4 nautical miles from the Aerodrome Reference Point (ARP) and to an altitude of 2,000 feet above mean sea level (AMSL); and further by the Luqa control zone (CTR) that extends 20 nautical miles from the Aerodrome Reference Point and to an altitude of 2,000 feet AMSL. The airspace within these zones is classified as Class D, which allows flights to be carried out under both Visual Flight Rules (VFR) and Instrument Flight Rules (IFR). In Class D airspace, all flights are subject to Air Traffic Control (ATC) service. However, ATC provides for traffic separation between IFR flights only, whilst also providing flight information about other traffic to all flights (VFR and IFR). Speed is restricted to 250kts IAS below Flight Level 100, as is the case for the Luqa CTR and ATZ. The air navigation service provider (ANSP) providing air traffic control at Luqa is Malta Air Traffic Services (MATS).

Section ENR 1.2 – Visual Flight Rules of the Malta Aeronautical Information Publication (AIP) requires VFR flights forming part of Luqa Aerodrome traffic to comply with the provisions of air traffic control.

Preferential runway schemes are adopted at LMML under the appropriate weather conditions. In the weather conditions of the day and time of the incident, RWY 31 was in use for IFR flights and RWY 05 for VFR flights.

4.3 – The Circuit Pattern on RWY 05

The standard visual circuit pattern on RWY 05 published in the Malta AIP is the right hand circuit, although variable (right or left) direction circuit patterns are applicable to light aircraft as instructed by ATC (Figure 2). Circuit altitude is restricted to 1,500 feet above

mean sea level (AMSL) or below unless otherwise instructed by ATC. In addition, the Grand Harbour and Temples designated circuit holding areas (Figure 3) are designed for holding light aircraft operating in the Luqa ATZ. Aircraft instructed by ATC to hold over these areas are considered as forming part of the aerodrome circuit traffic.

The designated circuit holding areas are used by ATC to provide for separation between departures and arrivals at LMML and, in particular, to facilitate sequencing when both Runways (05/23 and 31/13) are in use, since the two runways are dependent.

Other tools are available for ATC to provide the necessary separation. These include instructing aircraft to perform one or more orbits in the circuit and to operate outside the Luqa ATZ.

The circuit patterns of RWY 05 are constrained by their proximity to open sea. The extension of the upwind or downwind legs of the circuit are commonly used tools to insert separation between aircraft in the circuit, but in the case of RWY 05 this would involve aircraft to fly out towards open waters without any visual references and this is not preferred due to the risk of loss of positional awareness by the pilot flying under VFR.

Traffic in the circuit pattern of RWY 05 need to be sequenced between arrivals and departures on runways 13 and 31. Approach paths to RWY 31 are well clear of the circuit pattern of RWY 05, but arrivals need to be correctly sequenced to assure adequate separation from the RWY 05 circuit traffic in the event a missed approach is executed.

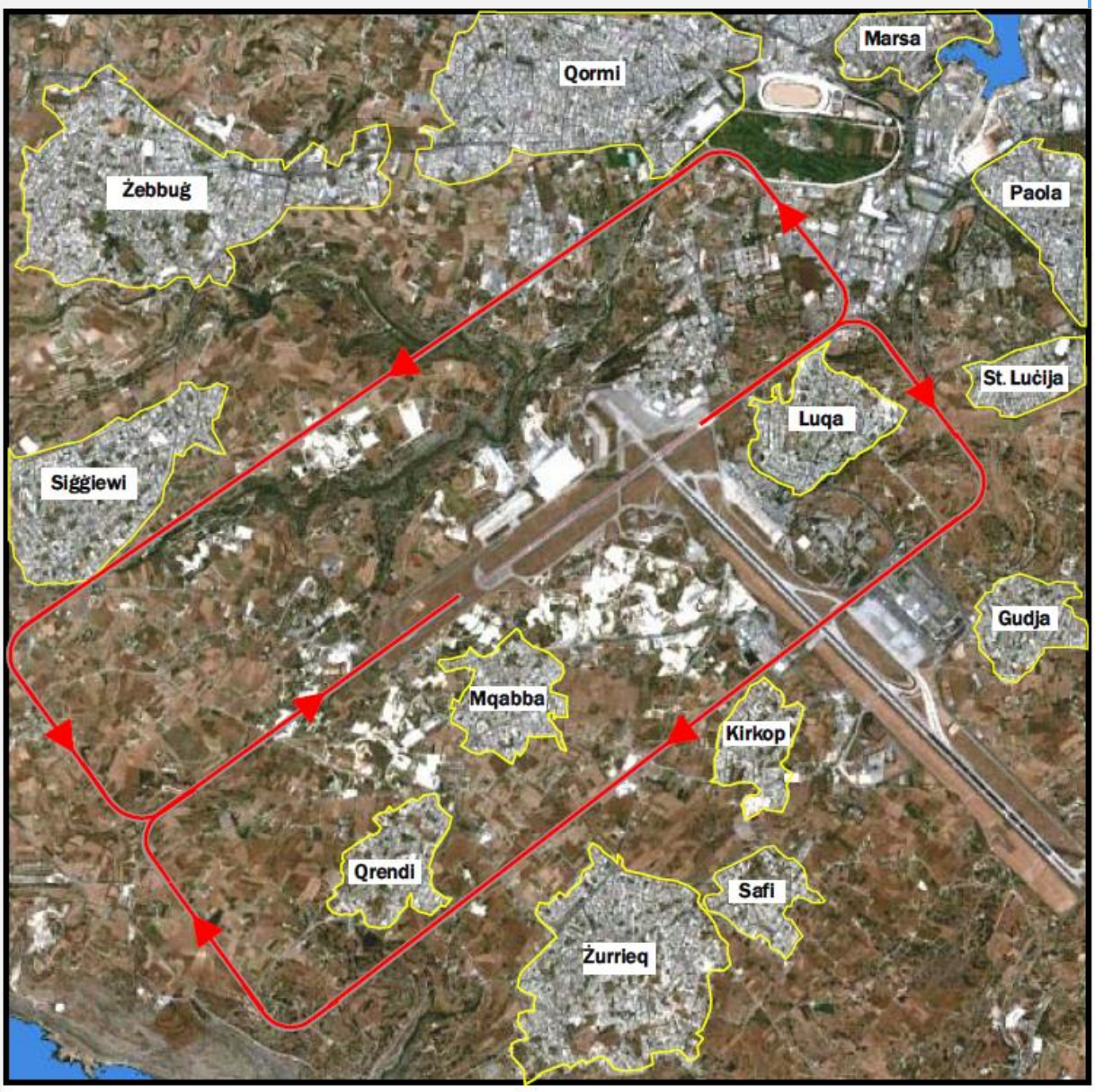


Figure 2: The circuit patterns on RWY 05 at LMML [Source: Malta AIP, AD2-LMML-MISC-VC1-1 03 APR 2014]

Figure 3: The Grand Harbour (GH) and Temples (TP) circuit holding areas [Source: Malta AIP, AD2-LMML-MISC-CHA1-1 03 APR 2014]

4.4 – The Visual Reporting Points (VRPs)

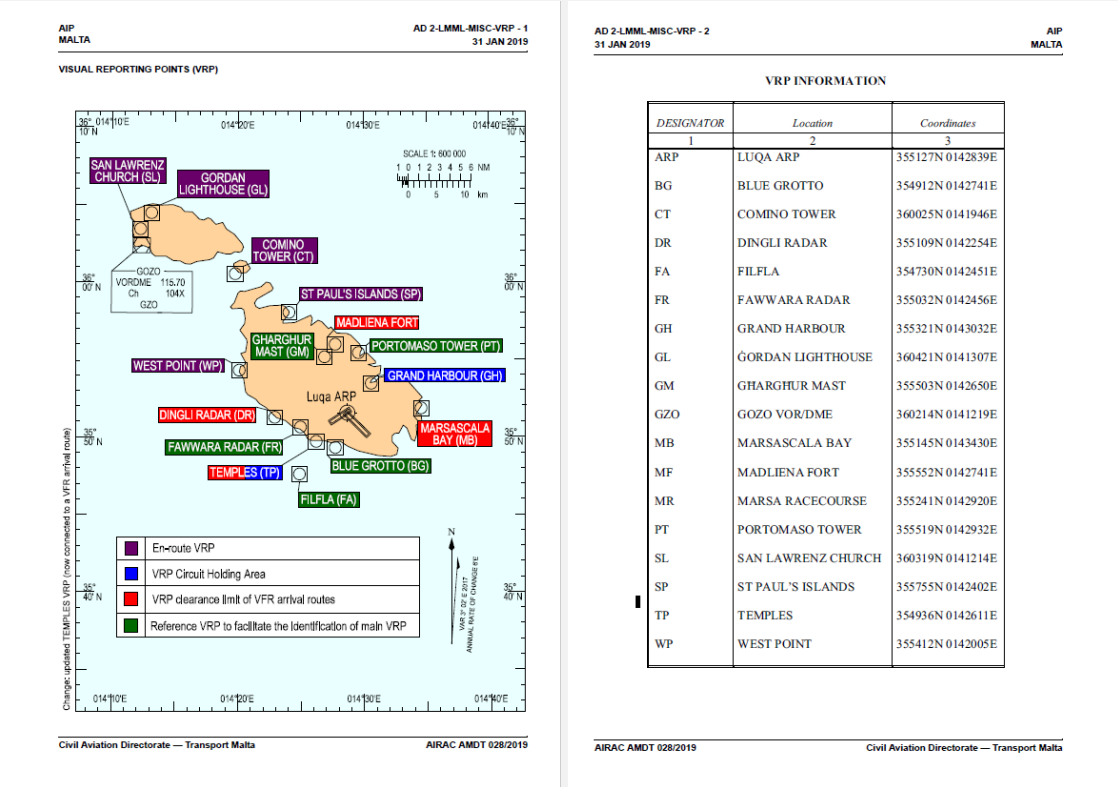
Visual reporting points (VRPs) are points on land that are used by pilots flying under VFR to report their position. The VRPs around Malta are published in the Malta AIP (Figure 4).

Pilots are expected to know where the published VRPs are. These VRPs should be easily recognisable from the air on referencing the Malta AIP, even if the pilot will have never flown over Malta before and will be approaching the relevant VRP for the first time. This underlines the importance of the unique features of the VRPs being easily and unambiguously identifiable.

The Blue Grotto VRP is not easily and unambiguously identifiable from the air. The grotto itself is hidden from nearly all angles and the distinguishing features of the

surrounding area are not easily and unambiguously identifiable unless the pilot is familiar with the area.

Several VRPs published in the Malta AIP (such as, for example, Gordan Lighthouse and Filfla) are easily and unambiguously identifiable, but others are no as so.



DESIGNATOR	Location	Coordinates
1	2	3
ARP	LUQA ARP	355127N 0142839E
BG	BLUE GROTTO	354912N 0142741E
CT	COMINO TOWER	360025N 0141946E
DR	DINGLI RADAR	355109N 0142254E
FA	FILFLA	354730N 0142451E
FR	FAWWARA RADAR	355032N 0142456E
GH	GRAND HARBOUR	355321N 0143032E
GL	GORDAN LIGHTHOUSE	360421N 0141307E
GM	GHARGHUR MAST	355503N 0142650E
GZO	GOZO VOR/DME	360214N 0141219E
MB	MARSASCALA BAY	355145N 0143430E
MF	MADLIENA FORT	355552N 0142741E
MR	MARSA RACECOURSE	355241N 0142920E
PT	PORTOMASO TOWER	355519N 0142932E
SL	SAN LAWRENZ CHURCH	360319N 0141214E
SP	ST PAUL'S ISLANDS	355755N 0142402E
TP	TEMPLES	354936N 0142611E
WP	WEST POINT	355412N 0142005E

Figure 4: The VRPs as published on the Malta AIP [Source: Malta AIP, AD2-LMML-MISC-CHA1-1 03 APR 2014].

4.5 – The Operational Environment on the Day

The operational environment on the day of the incident was busy with VFR and IFR traffic. The measures introduced in Malta in the first quarter of 2020 in response to the COVID-19 pandemic restricted flight training in local flying schools. This may have contributed to a backlog in flight training on the easing of the measures in July and, consequently, a relatively high volume of training flights as experienced on the day. On the morning of the day of the incident, there were several light aircraft flying in the Luqa CTR and, just

preceding the incident, there were four aircraft in the circuit of RWY 05, with a fifth requesting clearance for circuit training.

There is no evidence that the handling of the four aircraft under VFR in the circuit of RWY 05 and the commercial traffic operating on RWY 31 under IFR constituted a risk to safety. Whilst this level of traffic increases workload to the Air Traffic Control Officer (ATCO), the handling of the operational scenario leading to the time of the incident is considered well within a controller's ability and there are adequate tools available to ensure safe operation and sequencing at the possible expense of lower efficiency and longer delays.

RWY 05 was operational with a displaced threshold, but this posed no significant reduction in safety margins for light aircraft operations and was not considered a factor in the incident.

The weather, visibility and time-of-day (including the position of the sun relative to all players in the incident) was not considered a factor in the incident.

4.6 – Luqa Aerodrome ATC Tower and its Operation on the Day

The ATC Tower of Luqa Aerodrome is situated between runways 05/23 and 31/13, to the west of the 'T' intersection and stands at a height that places the eye point of the Tower officers at 14 to 15 metres above the ground. During the day, it is normally manned by three officers, a Ground controller, a Tower controller and a Tower Coordinator. The Ground controller handles movements (aircraft and vehicles) on the ground; the Tower controller handles aircraft on the runway and in the air on the approach to land and after take-off; and the Tower Coordinator is an air traffic controller licenced to operate as a Tower and Ground controller who aids the Tower controller in planning the sequencing of arrivals, departures and aircraft in the circuit, primarily during periods of high workload. The three officers work in unison as a team and liaise with the approach controller for hand-over of aircraft that are approaching or leaving the airfield general area and beyond visual contact for the Tower controller. At night, when the workload in the Tower is relatively low, the activities of the Coordinator are normally absorbed by the Ground controller, and only two officers – the Ground and Tower controllers – will be operating in the tower.

The Tower controller, whilst operating with a wired head-set plugged into the control station, may stand up and look around the airfield. The view from the Tower provides a 360◦ unobstructed view of aircraft flying at circuit height and above. Visual reporting points

in the vicinity of the airfield and the approaches to the runways are easily identifiable. The Tower is equipped with retractable tinted screens (shades) towards the south and west to protect the controllers from glare.

Whilst the operation of the Tower controller relies on visual contact with all traffic under the officer's control, the controller is provided with a fused radar data display of traffic in the Luqa CTR. This data is collated from the primary and secondary surveillance radars located on different parts of the island. This display is not intended to be used as the main tool to sequence and ensure separation between aircraft, but as an aid to the visual monitoring by the controller.

On the day, Tower was operating without a Coordinator. Measures introduced by MATS to mitigate the risks the COVID-19 pandemic poses on operations included the reduction of the complement in the tower, with the Ground controller taking over the tasks of the Coordinator. This measure was still in force on the day of the incident.

The responsible Tower controller was an experienced controller who is also qualified as an On-the-job-training-instructor (OJTI). A trainee controller was operating as Tower controller under the supervision of the OJTI. The training process for controllers involves ab-initio training, followed by simulator training and pre-on-the-job training. On completion of these phases, the student obtains a student licence and carries out on-the-job training under the supervision of assigned OJTIs. On the day of the incident, the student was in possession of a student licence and was approximately half way through the on-the-job training phase. The OJTI was the second OJTI the student worked with. It is normal for a student to have more than one OJTI throughout the on-the-job training phase.

The trainee controller was operating as Tower controller during the dual training flight of 9H-VLT and continued as controller to clear 9H-VLT as solo flight for departure and to join the cross-wind leg of the right hand circuit for RWY 05 (1223hrs). The trainee then addressed other traffic before leaving the station, with the OJTI taking over to clear 9H-VLT to join down-wind.

Detailed analysis of the recordings and interviews with the trainee controller and OJTI indicate that the ATC operational context involving the trainee did not contribute to the incident.

4.7 – Ab-initio Flight Training and the First Solo

Ab-initio flight training leading to the first solo is governed by a flight training programme which flying schools that train students for a pilot's licence are required to follow. Prescribed exercises are completed by the student pilot in the presence of a flight instructor during dual flight instruction to ensure adequate proficiency prior to the flight instructor allowing the student to safely conduct a first solo flight. This flight is intended to consist of one circuit, involving the student taxiing the aircraft to the runway, taking off, flying a complete circuit to land and taxi back to a parking point. The first solo is a major milestone in the training of a student, as it will be the first time the student is flying alone. It is normal practice for the flight instructor to first carry out a dual training flight to ensure that the student has achieved the necessary proficiency to safely fly solo before releasing the student on the first solo flight.

There is no prescribed time by which a student should carry out a first solo flight and it is only when the flight instructor considers the student ready will the student be released to conduct the flight. When training in busy and commercial airports such as LMML, a higher level of proficiency is required than when flying from small airfields. For example, according to the Malta AIP, traffic in the circuit can expect instructions from ATC deviating them from the standard pattern. This may even include instructions to fly outside the Luqa ATZ or to contact Approach Control. Student pilots are therefore required to be capable of handling such deviations at LMML. Furthermore, it is common for delays to be experienced in the exercises due to air traffic control constraints. This may result in higher number of logged hours before going solo. In the experience of the flight instructor of 9H-VLT, it is normal for students to go solo after around 30 hours whilst training in Malta.

From a proficiency perspective, there will not be much difference in the abilities of the student pilot between a first and second or third solo flight. Consequently, the student pilot flying at LMML needs to have the skills to deviate from the standard pattern as stated in the Malta AIP before performing the first solo flight. However, the first solo flight involves the significant additional challenge of being the first and, to ensure safety, student pilots performing such a flight should be protected from the need to deviate from the prescribed plan of a single, simple circuit. It is therefore relevant that ATC be informed that a student pilot is about to perform a first solo flight. This will allow the controller to take the context of the flight into account in the planning and delivery of clearances and to provide an additional level of protection to the student pilot in the air traffic environment. This may, for example, include priority to the student pilot in the circuit. Without this explicit

information, the controller would not be able provide any additional protection, thus depriving the flight of this benefit.

4.8 – The 9H-VLT solo flight and air-ground communications

On Apron 3, at the end of the dual training flight, the flight instructor contacted Ground Control to request the student pilot conduct one solo circuit:

1206:33

9H-VLT (Instructor): "*Ground, falcon 8 hotel*"

Ground: "*Falcon 8 hotel*"

9H-VLT (Instructor): "*Eh we are currently at Apron 3 ehm intentions are for the student to go for one circuit to land … eh runway zero five and ah student will call you ah in a few seconds for taxi*"

Ground: "*Falcon 8 hotel stand-by*"

(6 second lapse)

Ground: "*Falcon 8 hotel unable to approve circuit however if he'll stand by I will let him know when it's there's a vacancy <unintelligible>*"

9H-VLT (Instructor): "*eh the intention is just takeoff and landing <unintelligible> no circuits … ehm can that be approved?*"

(17 second lapse)

Ground: "*Falcon 8 hotel… that's ehm eh approved report when ready for starting*"

9H-VLT (Instructor): "*eh she will call you in a few seconds for taxi thank you*"

In the communication, the flight instructor made the intentions of the solo flight clear but did not explicitly inform ATC that the flight would be a first solo. This omission denied ATC the awareness of the precise status of the flight.

Following departure, 9H-VLT proceeded to Grand Harbour and at 1222:56 reported overhead. ATC Tower immediately cleared 9H-VLT to join the right hand circuit for RWY 05:

1223:00

Tower (Trainee): "*Falcon 8 hotel join right cross wind runway zero five*"

9H-VLT followed the instruction and proceeded on an extended cross-wind leg, as it was not cleared by ATC to turn onto the down-wind leg.

In the meantime, the controller (trainee) was busy continuously communicating with other traffic (4 aircraft) in the air and on the ground. At the end of these communications 9H-VLT immediately requested clearance to turn onto the downwind leg. The OJTI now took over as Tower controller:

1224:33 <end of ATC Tower (trainee) instruction>

1224:37 <end of aircraft reply>

1234:38

9H-VLT: "Luqa ground falcon 8 hotel eh can I join eh le-right downwind?"

1234:43

Tower (OJTI): "*Falcon 8 hotel join right downwind runway zero five report when ready for base*"

The continuous communication between ATC and other traffic whilst 9H-VLT was flying on the crosswind leg resulted in 9H-VLT flying a wide circuit, outside that defining the formal pattern (Figure 2). The extension of the cross-wind leg is, in itself, a manoeuvre that should not be a concern to the continued safety of a flight. In this context, however, it set in motion a chain of events that led to the incident.

The ATC response to the request for 9H-VLT to join downwind was immediate, indicating that the OJTI had already taken over as Tower controller. The change of controller was quick and seamless from an ATC service perspective and was not found to be a contributing factor to the extension of the cross-wing leg of 9H-VLT or to the incident.

The extension of the cross-wind leg for 9H-VLT resulted in the aircraft that was behind 9H-VLT in the left hand circuit getting slightly ahead of 9H-VLT. This required ATC to

introduce a time separation between the two aircraft before joining final approach on RWY 05. At 1227.07 the Tower Controller (OJTI) instructed 9H-VLT to proceed to orbit over Blue Grotto until advised. The student pilot reported knowing where Blue Grotto was to the investigation, but was not sure of its identification on approaching it[3]. A normal right hand circuit pattern would bring the aircraft north of the Blue Grotto VRP, so the VRP would be on the port side of the aircraft (Figure 5). The instructor of 9H-VLT stated that circuits are often flown wider than published but not as wide as 9H-VLT flew on the day. The path flown by 9H-VLT brought the aircraft to the south of the Blue Grotto VRP, so the VRP was the aircraft's starboard side. The approach to Blue Grotto from a different, possibly unfamiliar, angle and the inherent feature of the VRP that it is not easily recognisable from the air may have contributed to the student failing to correctly identify the VRP. The student reported that a left turn was initiated on arriving at the coast because of concern that the other aircraft in the left hand circuit was proceeding towards the Temples Holding Area at the same altitude. A left turn would keep 9H-VLT away from the Temples Holding Area.

The combination of instructions by ATC leading to two aircraft to orbit simultaneously at Blue Grotto and Temples Holding Area at the same altitude raises concern on whether adequate separation would have been assured. Figure 6 illustrates the same circuit area allocated to Temples Holding Area being allocated to the Blue Grotto VRP. The figure suggests that an inadequate buffer zone would exist. In addition, whilst Mnajdra Temple forms the published centre of the holding area, there is a risk that aircraft orbit over Hagar Qim Temple (which features a similar tent to Mnajdra Temple and forms part of the Hagar Qim – Mnajdra temple complex) instead, further to the East within the holding area. This, in turn, would result in the aircraft exiting the published zone during an orbit, coming closer to Blue Grotto.

[3] During the downwind leg, the student pilot acknowledged the instruction to proceed and orbit at Blue Grotto. However, after the incident, Tower asked the student pilot if the pilot knew where Blue Grotto was. The student pilot replied in the negative. This response is also indicative that the student pilot lost confidence in identifying Blue Grotto after approaching the area.

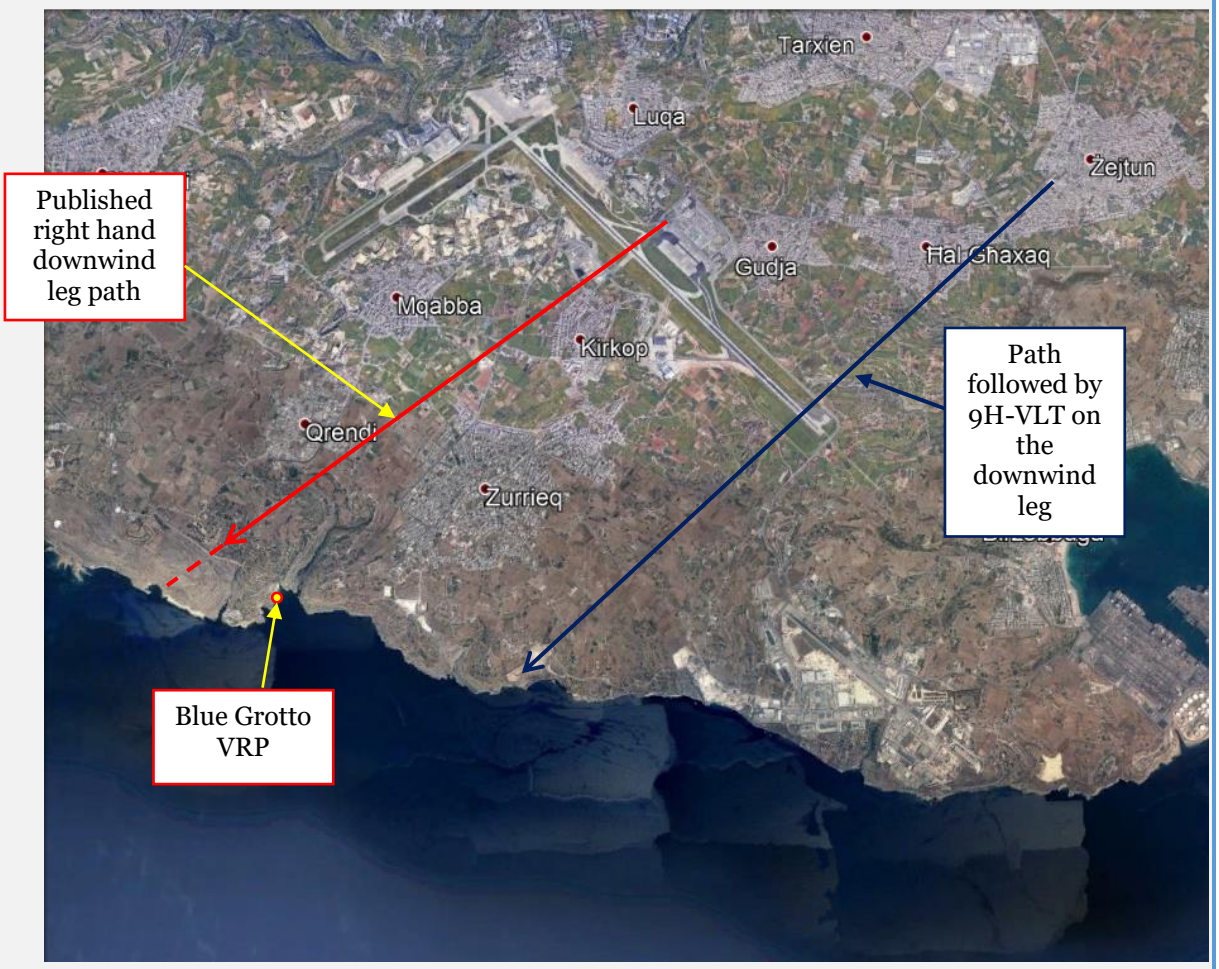


Figure 5: The published right hand downwind leg to RWY 05 and the path followed by 9H-VLT with respect to Blue Grotto VRP.

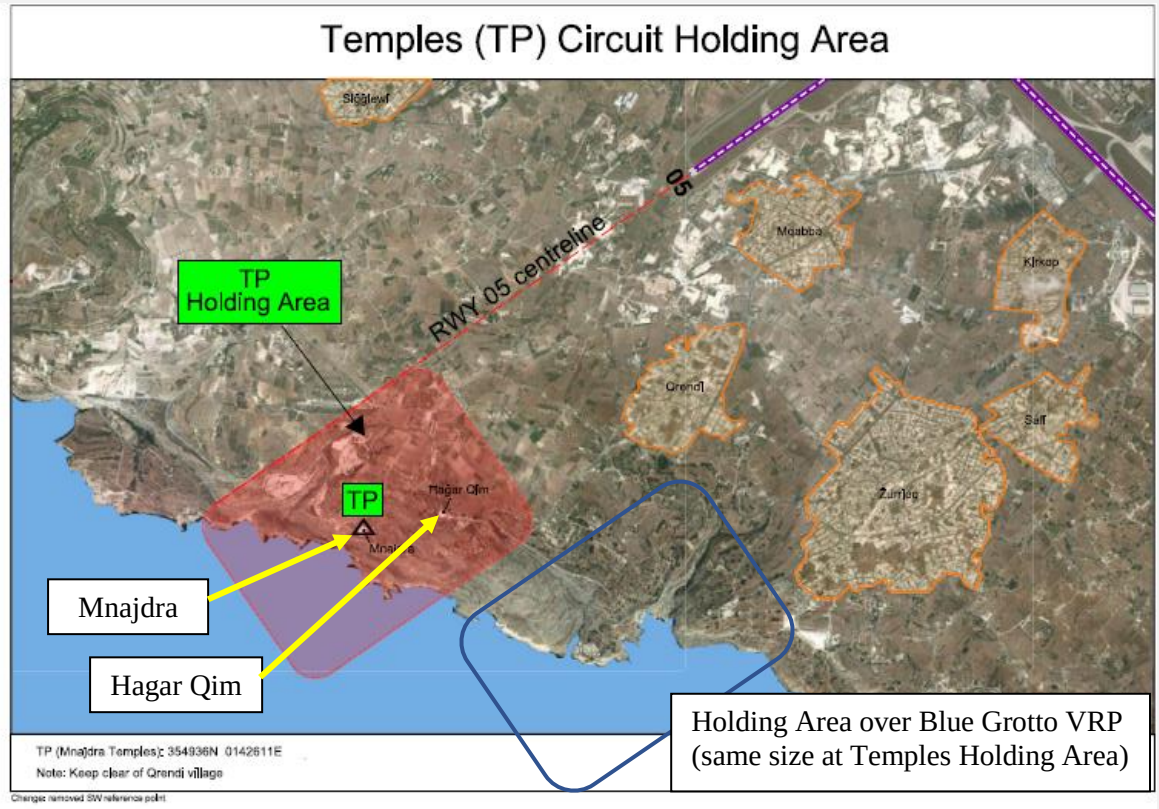


Figure 6: The Temples (TP) circuit holding area with the same area size placed over the Blue Grotto VRP to illustrate proximity of the two circuit areas [Adapted from: Malta AIP, AD2-LMML-MISC-CHA3-1 31 Jan 2019].

In turning left and flying down the coast, 9H-VLT left the circuit and proceeded to fly within the Luqa ATZ (Class D airspace). In the meantime, Tower was tending to other traffic and HA-LVH was on final approach to land on RWY 31. The Tower controller reported that when he saw 9H-VLT approaching the approach path of RWY 31 (which corresponds to the aircraft approaching the Hal Far area from the sea – Figure 1 just prior to Point E) his intentions were to instruct 9H-VLT to orbit right in order to maintain separation. However, during the instruction the situation from his viewpoint changed, prompting the change of instruction for 9H-VLT to fly to Blue Grotto. An aircraft of the size of the Tecnam P2002JF in the prevailing lighting conditions is visible when in the Hal Far area but its precise attitude and heading may be difficult to judge from the control tower (Figure 7).

Figure 7: View of the approach to RWY 31 and the South-East coast from the Luqa Aerodrome tower, also showing the approximate position of 9H-VLT at 1228:15hrs [Adapted from source: MATS]

In the last communication between ATC and 9H-VLT before the incident (1228:15hrs), 9H-VLT did not read back the instruction and the controller did not challenge this omission. The controller reported to the investigation that at this point it was clear that 9H-VLT was not responding to the instructions.

The continued left turn of 9H-VLT following this communication with ATC is consistent with an intent to proceed to Blue Grotto. The reversal of the turn towards RWY 31 would not normally be expected. This turn lasted only about 12 seconds, by which time, 9H-VLT was flying on a general reciprocal heading to HA-LVH. This short time limited the window of opportunity for ATC to react in a timely and effective manner. During this manoeuvre, ATC instructed HA-LVH to continue with the approach. Such an instruction is given when it is not yet possible to give a clearance to land.

The radio communications between the student pilot and ATC on the day of the incident indicate that the student pilot was proficient in radio transmissions and communicated with ATC in a satisfactory manner in all instances except for the communication of 1228:15hrs. The failure to read back the ATC instruction once in the event is consistent with disorientation in the air.

The investigation identified that at about the time of the 1228:15hrs communication between the Tower controller and 9H-VLT and later, FDSU[4] was requesting to communicate with Tower personnel via a visual alert that is triggered at the Tower and Ground controller stations simultaneously. A few seconds later, whilst the two aircraft were flying towards each other on reciprocal paths, FDSU called Tower on the intercom asking for a response to the request. Although the Tower controller did not respond to the request, this request may have distracted the Tower controller momentarily whilst 9H-VLT was in the turn. The extent of this distraction, however, could not be ascertained. The developing situation led the controller to direct his attention to HA-LVH.

The reason for 9H-VLT continuing to turn left, which is towards Blue Grotto, and then reversing the turn to the right to flying alongside the approach path of RWY 31 in a shallow descent also could not be ascertained. The path followed by 9H-VLT is consistent with pilot spatial (directional/heading) and positional disorientation, which can be easily experienced by ab-initio pilots conducting sustained turns, especially at an early stage in flying training. The student pilot reported to the investigation that the charts of the area were at hand on the right hand seat and were referred to during this stage of the flight. However, the pilot was unaware that HA-LVH was on final approach RWY 31. In the dynamics of the event, with the Airbus A321 on generally a head-on course for over 30 seconds whilst having the landing light on, failure for the student pilot to visually acquire the other aircraft is consistent with failure to keep a good look-out whilst trying to determine one's position. It is probable that spatial and positional disorientation also contributed to this failure to keep a good lookout.

[4] The Flight Data Support Unit (FDSU) is a unit within MATS that handles flight plans and planning, NOTAMS, etc. It is located within an operational room beneath the Tower.

4.9 – HA-LVH on final approach

The operator of HA-LVH filed an occurrence report with Hungary TSB, stating that the crew received a TCAS Resolution Advisory (RA) alert 'Monitor Vertical Speed' during ILS approach on RWY 31 to LMML. The alert occurred at approximately 1,100 feet and lasted 2 to 3 seconds. The crew followed the RA and identified the VFR traffic visually.

HA-LVH was conducting an ILS approach on RWY 31 with autopilot engaged (full automation). The aircraft was equipped with TCAS II Version 7.1 as mandated by EC 1332/2011. The approach was normal and met stabilisation criteria above 1,000 feet. Crew Member 2 (CM2) was Pilot Flying (PF), with Crew Member 1 (CM1) acting as Pilot Monitoring (PM).

The crew reported that they were aware of VFR traffic in the vicinity during descent. This was indicated via the TCAS traffic display on the Navigation Display (ND) and ATC traffic information. The crew also reported that, on final approach, they became aware that Tower had instructed VFR traffic to proceed to a holding area away from the approach to RWY 31, which the aircraft acknowledged. The aircraft was identified on the TCAS traffic display on the Navigation Display (ND) at the same altitude of HA-LVH. However, no visual contact was established. CM1 was familiar with the operational environment at LMML, reporting that it was common to encounter training aircraft in Malta.

The crew reported that, during final approach, the aural alert 'Monitor Vertical Speed' sounded momentarily at about 1200 feet (AMSL). This was accompanied by the display of red sectors (TCAS advisories) on the Instantaneous Vertical Speed Indicator (IVSI) that lasted for about 2 seconds. There were no other aural alerts and it is concluded that the 'Monitor Vertical Speed' alert sounded only once. CM2 (PF) monitored the rate of descent to ensure the autopilot maintained the required rate of descent. CM1 reported that the red sectors appeared above the indicated vertical speed at the time. The intruder aircraft (9H-VLT) was visually identified above, to the left of HA-LVH and in a right turn during the TCAS alert. At this time the TCAS display indicated the intruder aircraft to be 200 feet above HA-LVH.

After the TCAS warning ceased and with the intruder aircraft (9H-VLT) identified visually as turning away, the crew decided to continue the approach. An Aviation Safety Report (ASR) was filed with the airline.

The crew of HA-LVH did not report the TCAS alert to ATC. CM1 reported that no report to ATC was made because of the critical phase of flight during which the incident occurred, because of the radio communication between ATC and the intruder aircraft (9H-VLT), and because HA-LVH made no deviation from the clearance given by ATC. The company Standard Operating Procedures (SOPs) stipulate that flight crew are to report to ATC when there is a deviation from any ATC clearance or instruction. The SOPs require the filing of an ASR.

QAR data indicated that, at the time of the incident, the landing light of HA-LVH was on. QAR data also confirmed that no pilot input on the flight inceptor (sidestick) was made.

The crew of HA-LVH therefore complied with standard SOPs and ATC instructions during the incident and TCAS alert. HA-LVH is not considered to cause or contribute to the incident other than through its correct presence on the glidepath of RWY 31 during final approach.

5. Conclusion

This is an occurrence in which multiple events in sequence and factors in conjunction precipitated it, through the domino effect, into a serious incident. Most of these events and factors would have been, on their own, recoverable or insignificant. However, in unison, they led to the loss of separation. Only one safety net remained – that of TCAS on board HA-LVH, which allowed the crew of the A321 to become the only party in a position to take avoiding action if it were necessary.

In conclusion, the cause of the incident was identified to be:

> The failure to identify the Blue Grotto VRP and 9H-VLT straying off course onto the approach path of an active runway whilst HA-LVH was on final approach to land;

The major contributing factors to the incident are identified to be:

1) ATC was not made aware that 9H-VLT was on a *first* solo flight
2) The level of experience and ability of a pilot on the first solo flight

6. Recommendations

Two recommendations were made in the preliminary report, namely:

To local flying schools:

1. Prior to a first solo flight the flying instructor to inform ATC that it will be a **First Solo Flight**.

2. The call sign of a first solo flight to explicitly include the term '**First Solo**' for the duration of the flight.

These recommendations were adopted by the flying schools but nevertheless remain valid.

The follow additional recommendations are being made:

To the local ANSP:

3. To ensure that a safe separation is maintained when instructing multiple aircraft to execute orbits in close proximity to each other, ATC should instruct aircraft to orbit at different altitudes and/or secify the direction of the turns.

To the local authorities:

4. To review all VRPs published in the Malta AIP and ensure that they are easily and unambiguously identified from the air.

ABBREVIATIONS

ACCREP	-	Accredited Representative
AIP	-	Aeronautical Information Publication
AMSL	-	Above Mean Sea Level
ANSP	-	Air Navigation Service Provider
ARP	-	Aerodrome Reference Point
ATC	-	Air Traffic Control
ATZ	-	Aerodrome Traffic Zone
BAAI	-	Bureau of Air Accident Investigation
CTR	-	Control Zone
CVR	-	Cockpit Voice Recorder
DFDR	-	Digital Flight Data Recorder
EASA	-	European Union Aviation Safety Agency
EC	-	European Commission
FDSU	-	Flight Data Support Unit
IAS	-	Indicated Airspeed
ICAO	-	International Civil Aviation Organization
IFR	-	Instrument Flight Rules
ILS	-	Instrument Landing System
LMML	-	Malta International Airport ICAO Code
MATS	-	Malta Air Traffic Services
OJTI	-	On-The-Job Training Instructor
QAR	-	Quick Access Recorder
RA	-	Resolution Advisory
RWY	-	Runway

SIA	-	Safety Investigation Authority
TCAS	-	Traffic Collision Avoidance System
TM-CAD	-	Transport Malta – Civil Aviation Directorate
TWY	-	Taxiway
VFR	-	Visual Flight Rules
VHF	-	Very High Frequency
VRP	-	Visual Reporting Point