HELLENIC REPUBLIC
MINISTRY OF INFRASTRUCTURE AND TRANSPORT

AIR ACCIDENT INVESTIGATION
AND
AVIATION SAFETY BOARD
(AAIASB)

SERIOUS INCIDENT INVESTIGATION REPORT

AIRCRAFT SX-ODS AIRBUS A320-232
AT MUSCAT INTERNATIONAL AIRPORT OF OMAN
ON JANUARY 28, 2019

E03 / 2021

SERIOUS INCIDENT INVESTIGATION REPORT

E03 / 2021

Serious incident of Aircraft SX-ODS at Muscat International Airport

This serious incident investigation was carried out by the Air Accident Investigation and Aviation Safety Board according to:

- **Annex 13 of the Chicago Convention**
- **EU regulation (EU) 996/2010**
- **Law 2912/2001**

"According to Annex 13 of the Chicago Convention of the International Civil Aviation, EU Regulation 996/2010 and Law 2912/2001 Accidents and Incidents Investigation is not intended to attribute blame or liability. The sole purpose of this investigation and the findings is to prevent accidents and incidents.

Therefore, the use of this report for any purpose other than to prevent future accidents and incidents could lead to misinterpretations."

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Contents List

List of abbreviations

ACMI	:	Aircraft Crew Maintenance Insurance
A/C	:	Aircraft
ADIRS	:	Air Data Inertial Reference System
ALT	:	Altitude
ATIS	:	Automatic Terminal Information Service
CL	:	Center Line
CM1	:	Pilot occupying the left-hand seat
CM2	:	Pilot occupying the right-hand seat
CRM	:	Crew Resource Management
ECAM	:	Electronic Centralized Aircraft Monitor
FAC	:	Flight Augmentation Computer
FADEC	:	Full Authority Digital Engine Control
FCU	:	Flight Control Unit
FD	:	Flight Director
FDM	:	Flight Data Monitoring
FDT	:	Flight Duty Time
FG	:	Flight Guidance
FMA	:	Flight Mode Annunciator
FMGS	:	Flight Management Guidance System
F/O	:	First Officer
FOM	:	Flight Operations Manager
FG	:	Flight Guidance
GA	:	Go Around
GNSS	:	Global Navigation Satellite System
G/S	:	Glide Slope

IAS	:	Indicated air Speed
LGCIU	:	Landing Gear Control Interface Unit
ILS	:	Instrument Landing System
IMC	;	Instrument Meteorological Conditions
LOC	:	Localizer
LT	:	Local Time
MCT	:	Maximum Continuous Thrust
METAR	:	Meteorological Terminal Air Report
O2F	:	Orange2fly Airline S.A.
PF	:	Pilot Flying
PFD	:	Primary Flight display
PM	:	Pilot Monitoring
RA	:	Radio Altitude
RWY	:	Runway
SCCM	:	Senior Cabin Crew Member
SMS	:	Safety Management System
SOP	:	Standard Operating Procedures
SRS	:	Speed Reference System
TAF	:	Terminal Aerodrome Forecast
TRK	:	Track
UTC	:	Universal Time Coordinated
VAPP	:	Approach speed (Landing Configuration)
VMC	:	Visual Meteorological Conditions
V/S	:	Vertical Speed
VFE	:	Velocity Flap Extended

TITLE

OPERATOR	ORANGE2FLY
OWNER	AERCAP
MANUFACTURER	AIRBUS SAS
A/C TYPE	A320-232
COUNTRY OF CONSTRUCTIONN	FRANCE
NATIONALITY	GREECE
REGISTRATION	SX-ODS
LOCATION OF SERIOUS INCIDENT	Muscat international Airport, Oman
DATE & TIME	January 28, 2019 / 19:00 - 19:11 UTC
Note	All times are UTC (LT = UTC + 4h)

SYNOPSIS

On January 28, 2019 “Orange2fly” operated ACMI Flight OMS 104 on behalf of Salam Air from OMDB to OOMS.

The Aircraft departed Dubai OODB at 18:34 UTC, the Commander CM1 was PM and the First Officer CM2 was Pilot Flying PF.

At the end of initial approach, being radar vectored Flaps 1 was selected. At 2260 ft IAS 186kts the Commander disconnected the Auto pilot and took over control of the Aircraft.

During right turn of the A/C on final at 1840 ft the Commander selected idle thrust and the auto thrust was disconnected. On final the controls of the A/C were handed over to the F/O.

With auto thrust disconnected the speed of the A/C was decreasing and at 290 ft (256 ft RA) with IAS 116 kts, TOGA applied and at the same time Alpha Floor Activated. Minimum recorded altitude was 210 ft. The Aircraft recovered and landed at Muscat OOMS at 19:11 UTC. The A/C was landed normally by the Commander.

On February 06, 2019 the AAIASB received initially an occurrence report from the Operator which did not contain any evidence of a Serious incident.

On March 28, 2019 the AAIASB received from the Operator its internal investigation report and after reviewing it, AAIASB categorized the event as a serious incident.

On April 9,2019 the AAIASB contacted for the first time the state of occurrence, notifying about the serious incident. Due to difficulties in communication with the state of occurrence, on April 16, 2019 AAIASB had the first contact with the state of occurrence.

On April 22,2019 the state of occurrence requested from the AAIASB more details about the serious incident and on the same day AAIASB provided the requested information to the state of occurrence.

On May 28,2019 the state of occurrence informed the AAIASB for the intention not to investigate the serious incident due to lack of adequate information and on July 12,2019 there was the last contact of AAIASB with the state of occurrence.

On November 4, 2019 the AAIASB notified as per Annex 13, all the involved parties and the State of Design and Manufacture appointed an Accreditive Representative to this investigation.

1 FACTUAL INFORMATION

1.1. History of Flight

On January 28, 2019 Flight OMS 104 departed from Dubai International OMDB Airport at 18:34 UTC destination Muscat International OOMS Airport and landed at 19:11 UTC.

The Commander CM1 was PM and the First Officer CM2 was PF.

The Flight was under radar vectors for an ILS approach RWY 26R and entered the downwind leg in open descent descending to a selected altitude 2000 ft in clean configuration with Auto Pilot 2, FD 1+2 and Auto Thrust engaged in speed mode, open descent and HDG mode. At 3100 ft the A/C started turning to the right, still in clean configuration and an IAS of 198 kts.

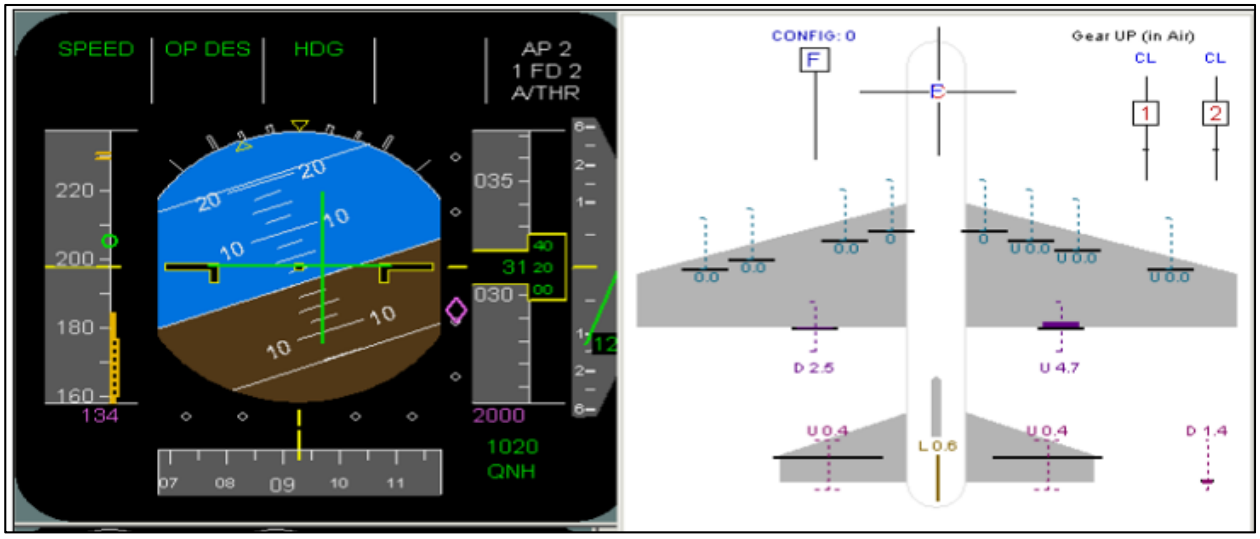


Fig.: 1

At 2540 ft Config 1 was selected.

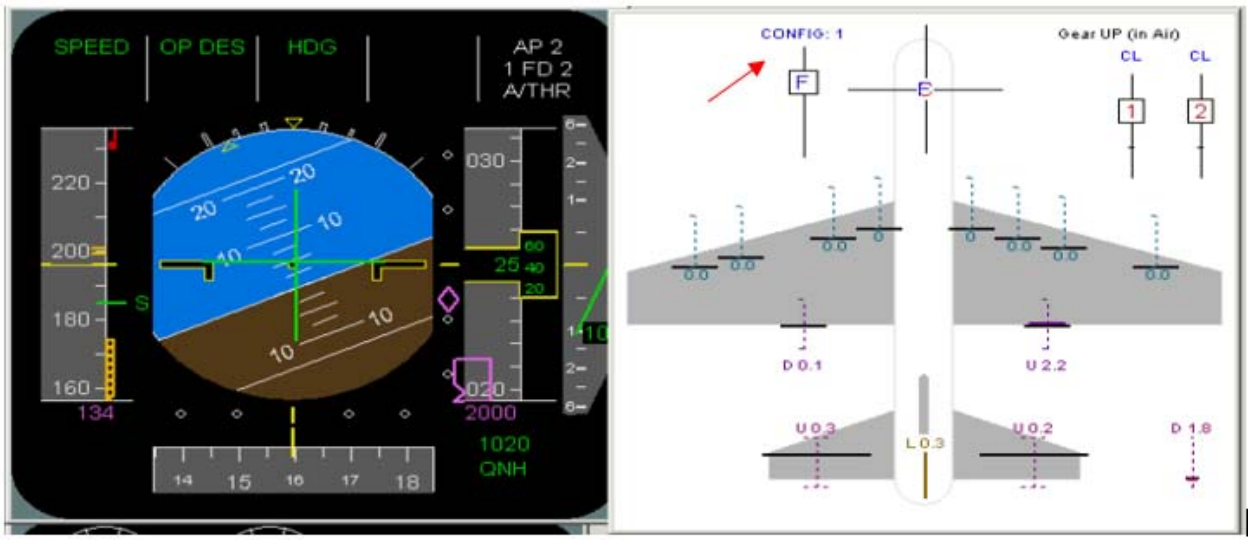


Fig.: 2

At 2260 ft the CM1 took over control by disconnecting the Auto Pilot, becoming PF, and turned left and continued descending disregarding the **ALT** selected altitude of 2000 ft and descending.

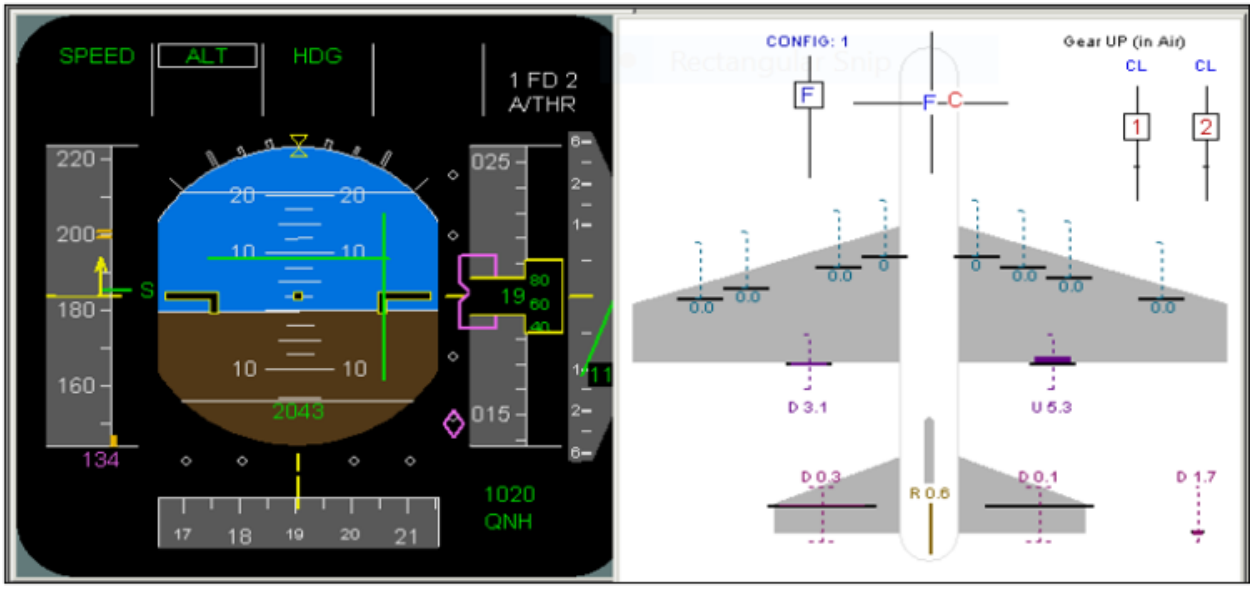


Fig.: 3

At 1810 ft, IAS 185 kts, CM1 as PF disconnected the Auto Thrust, by selecting the thrust levers to idle detent and landing Gear was extended and started turning to the right to intercept final approach with V/S at -2100 ft/min.

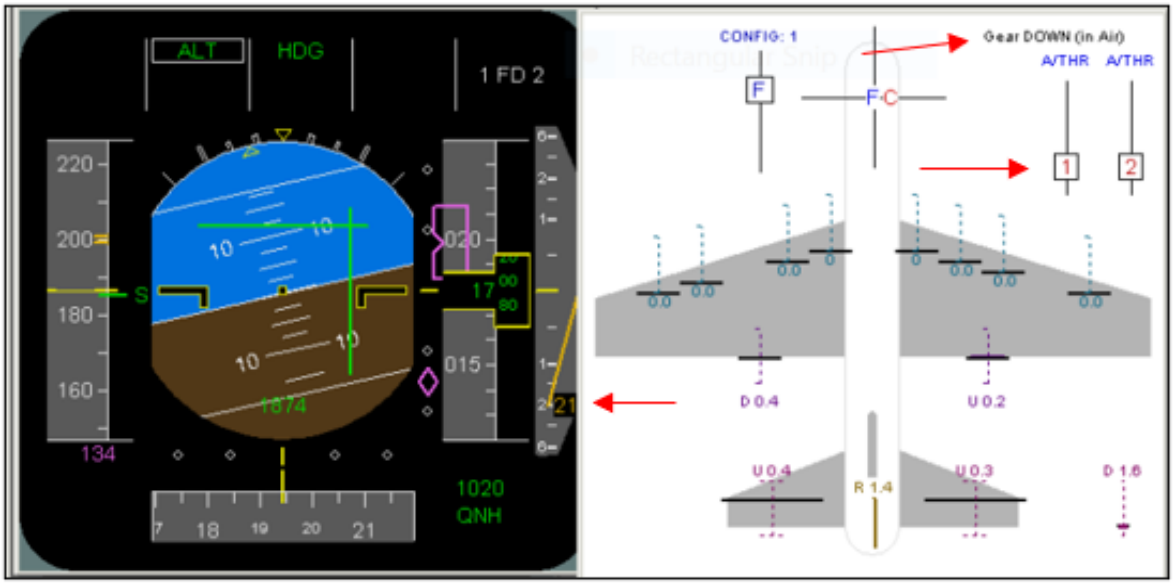


Fig.: 4

At 1480 ft the banc angle reached 37.62^0.

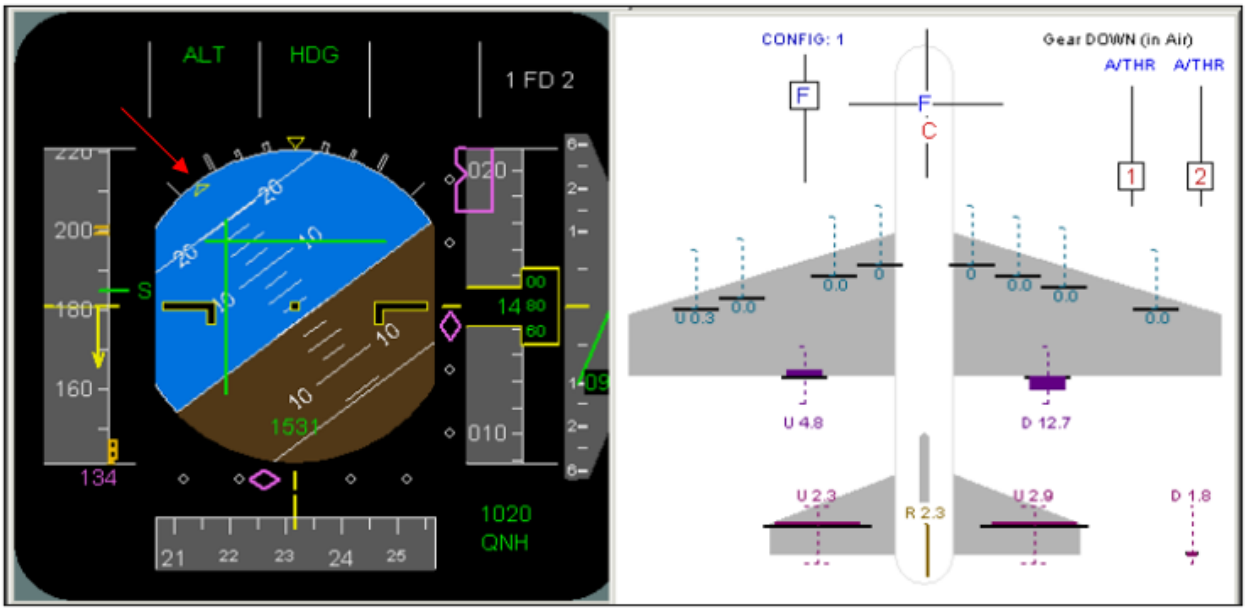


Fig.: 5

At 1340 ft 6 NM from touch down, FMA **GS*/LOC***, with the A/C one dot left of LOC on the G/S with V/S -1080 ft/min. Flaps 2.

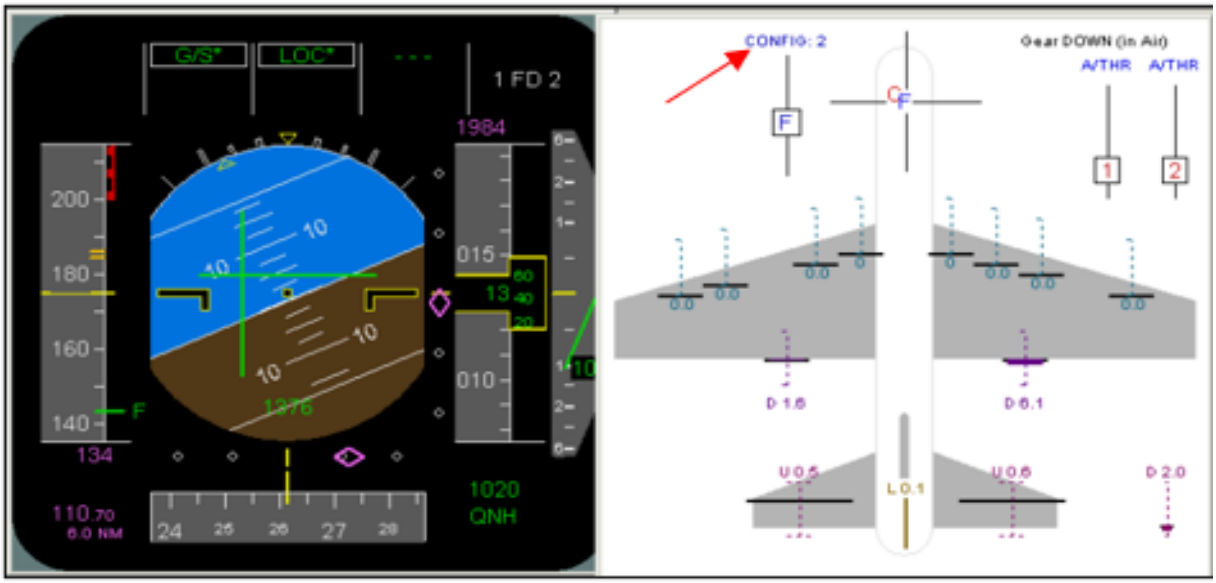


Fig.: 6

At 1070 ft, IAS 167kts, V/S -1200 ft/min Full Flaps was selected on **LOC* & G/S***.

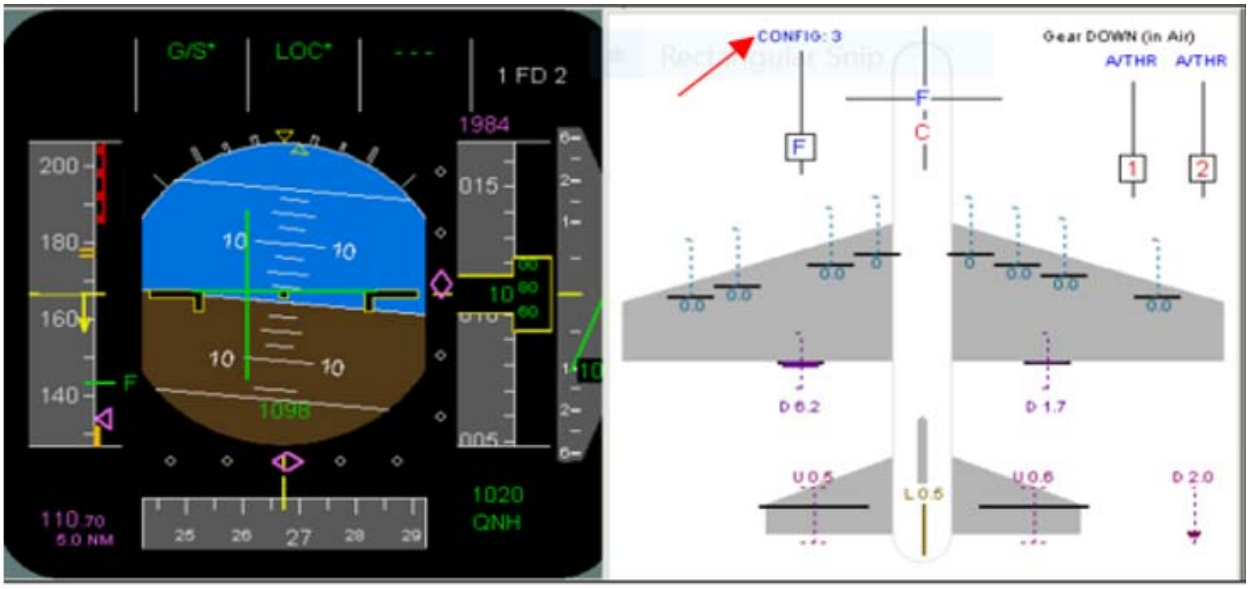


Fig.: 7

At 920 ft 4 NM from touch down, IAS 145 kts, on **LOC*** and one dot above **G/S**, V/S -700 ft/min, thrust levers at idle detent, CM1 gave back the control of the A/C to the CM2.

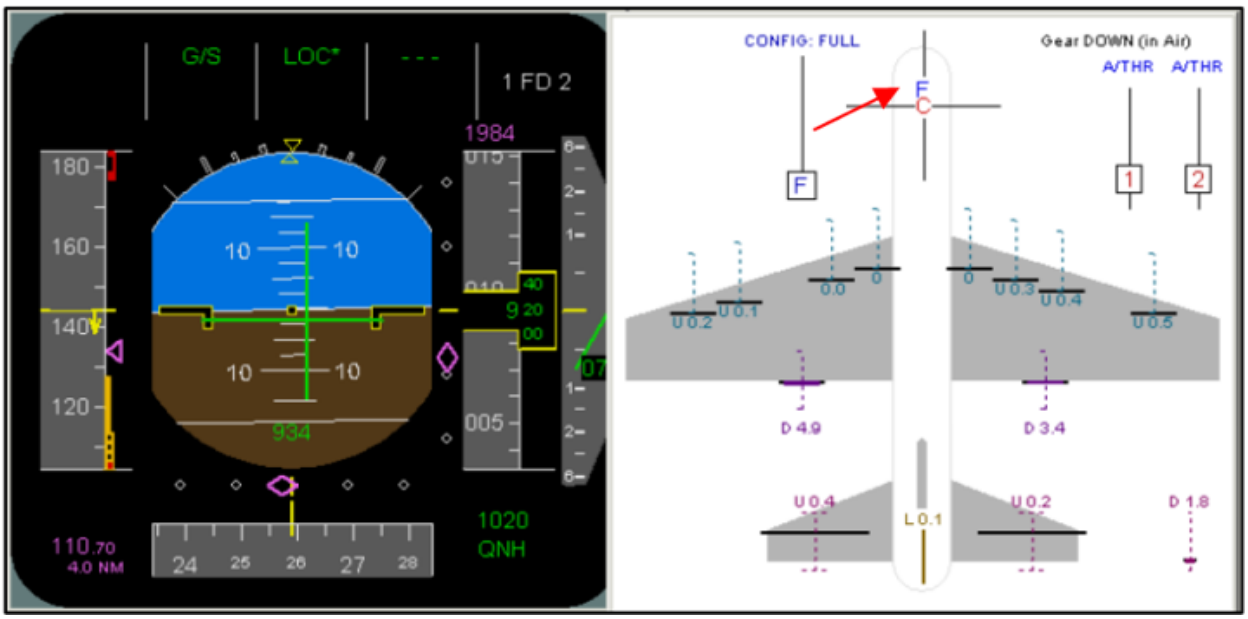


Fig.: 8

At 730 ft AC on **LOC** & **G/S**, IAS 140 kts with trend decreasing, thrust levers at idle detent.

At 570 ft IAS speed trend decreasing at IAS 134 kts (selected speed), on LOC & one dot below G/S, thrust levers at idle detent.

At 490 ft, IAS 128 kts, ‘’DUAL INPUT’’ CM1 stick forward, CM2 stick upward. One dot below G/S. End of ‘’DUAL INPUT’’ at 350 ft.

At 320 ft IAS 116 kts, speed trend full scale down, V/S -1200 ft/min, thrust levers idle detent.

At 290 ft, IAS 117, 256 ft RA, FMA reading **LAND**

At 270 ft , 227 ft RA, IAS 116 kts, V/S -1200 ft/min, G/S full scale up. **LAND**

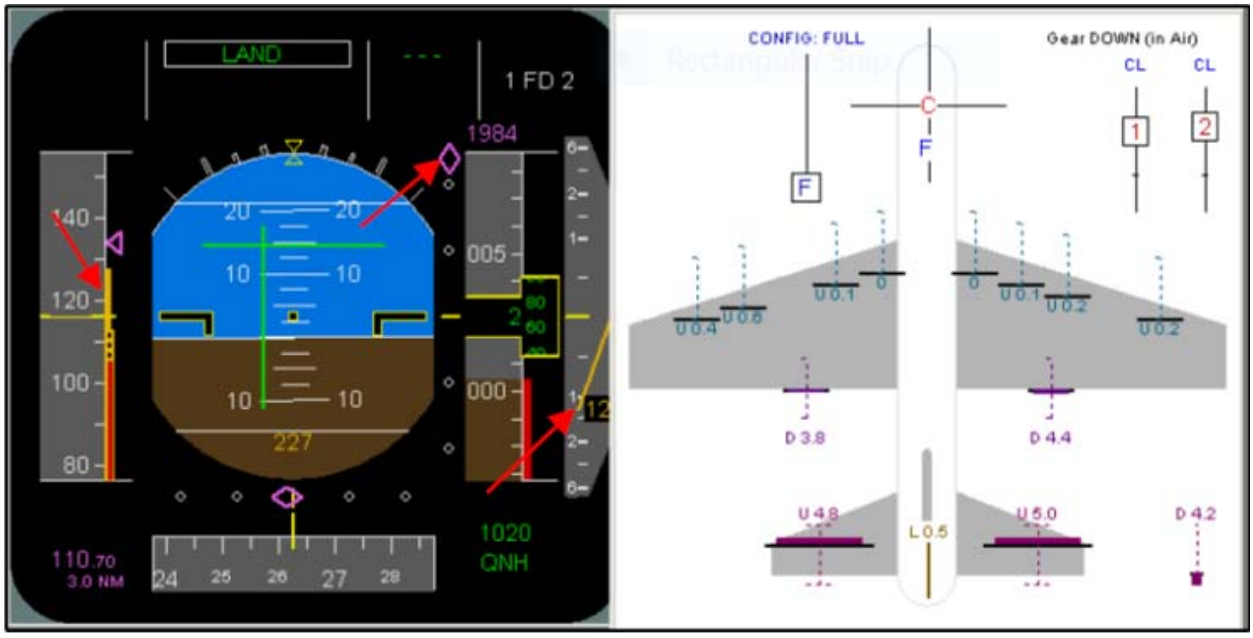


Fig.: 9

At 210 ft 149 ft RA, IAS 118kts FMA: **TOGA SRS GA TRK, A/THUST blue.** 11^0 pitch up.

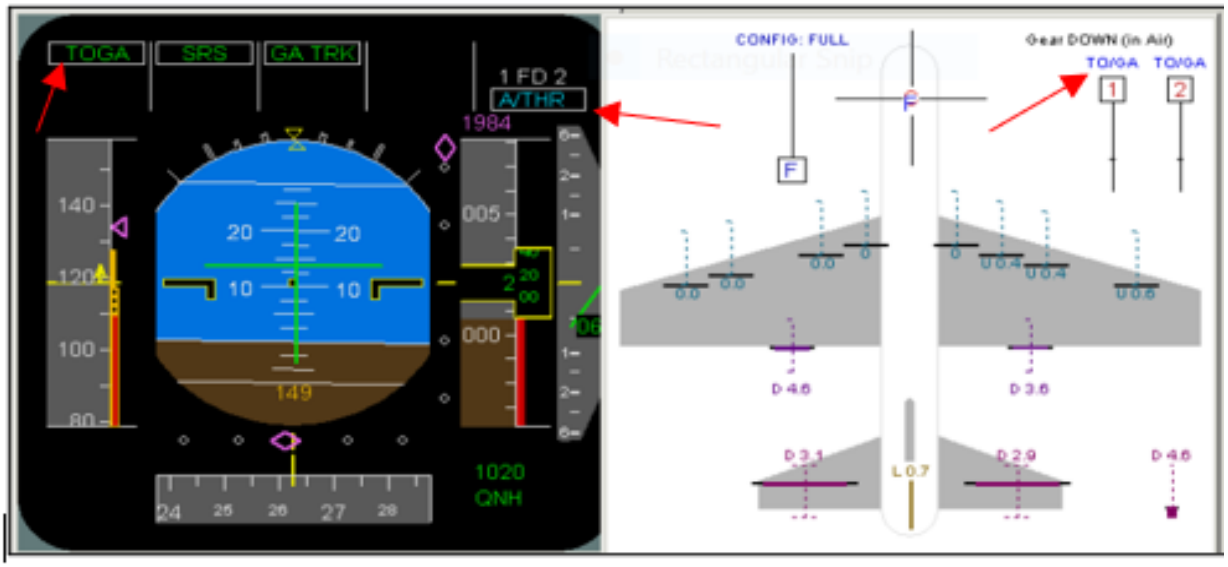


Fig.: 10

At 220 ft, 140 ft RA, FMA: **A FLOOR SRS GA TRK A/THRUST** white. $15,47^0$ pitch angle up.

At 230ft, 163 ft RA, FMA: **A FLOOR SRS GA TRK A/THRUST** white. $16,52^0$ pitch angle up.

At 240 ft, 170 ft RA, IAS 127kts, FMA: **A FLOOR SRS GA TRK A/THRUST** white. ''DUAL INPUT''. Both side stick forward. 16.17^0 Pitch angle up.

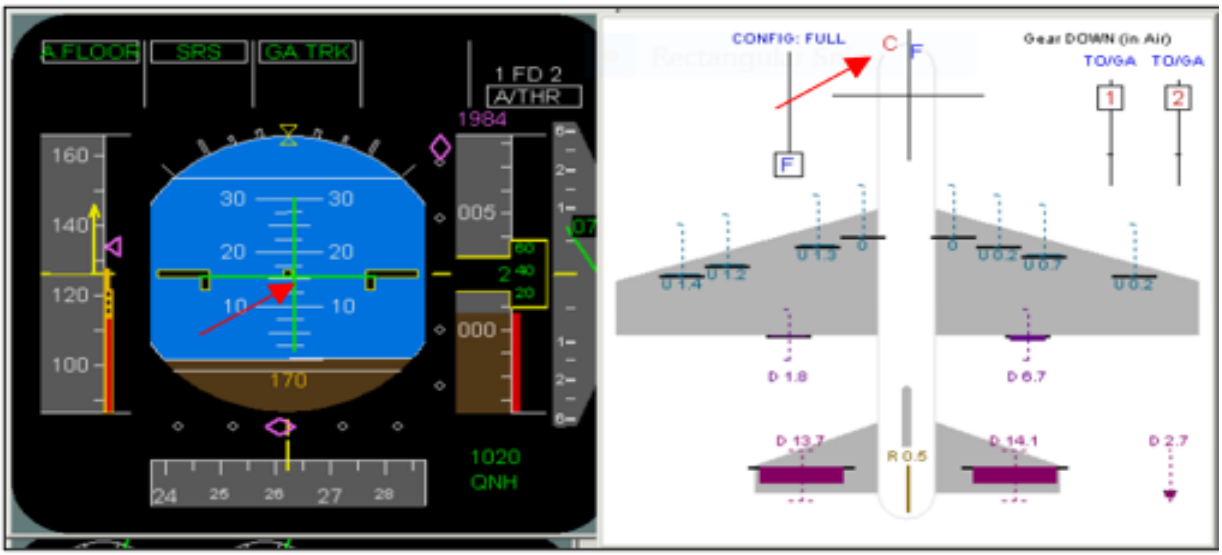


Fig.: 11

At 260 ft, 207ft RA A/THRUST disconnected, IAS 134 kts V/S 0, thrust levers idle detent.

The A/C crossed the RWY threshold at 70 ft RA, IAS 132, V/S -600 ft/min and landed normally.

1.2 Flight crew and SCCM interviews

The Flight Crew & SCMM have submitted written reports as well as personal verbal testimonies received during personal interviews.

CM1: During the personal interview, on February 07, 2019, the Commander, that was PM, he testified that he had to take over control of the A/C, at the end of initial approach, because the Pilot flying (PF) was not complying with ATC HDG vectoring.

CM2: During the personal interview, on February 07, 2019, the F/O, that was PF, testified that the Commander took over control of the A/C, at the end of initial approach, and that he never realised that the Auto Thrust was Disconnected as there was no FMA read out from the Commander and neither from him. Also, he testified that he never previously flown the A/C with no Auto Thrust.

SCCM: During the personal interview, on February 18, 2019, with the Senior Cabin Crew Member, she testified that she noticed that the aircraft was very close to the ground, loud noises were heard from the cockpit (beeping), the engine speeded up and the aircraft gained height immediately and touched down after 30sec approximately.

1.3 Injuries to persons

No injuries were reported.

1.4 Damages to Aircraft

Not Applicable.

1.5 Other damages

Not Applicable.

1.6 Personnel information

1.6.1 Flight Crew

1.6.1.1 The Captain (CM1)

Employed Since	December 27,2018
Total Flight Hours with O2F at date of incident	73:33 Hrs
Total Flight Hours at date of incident	13.522:32 Hrs
Last recurrent Check at date of incident	November 15, 2018
Last OPC at date of incident	November 16, 2018
Last Line Check at date of incident	December 27, 2018
Last Medical at date of incident	December 31, 2018
Total time off duty before flight	43:00 Hrs

1.6.1.2 The First Officer (CM2)

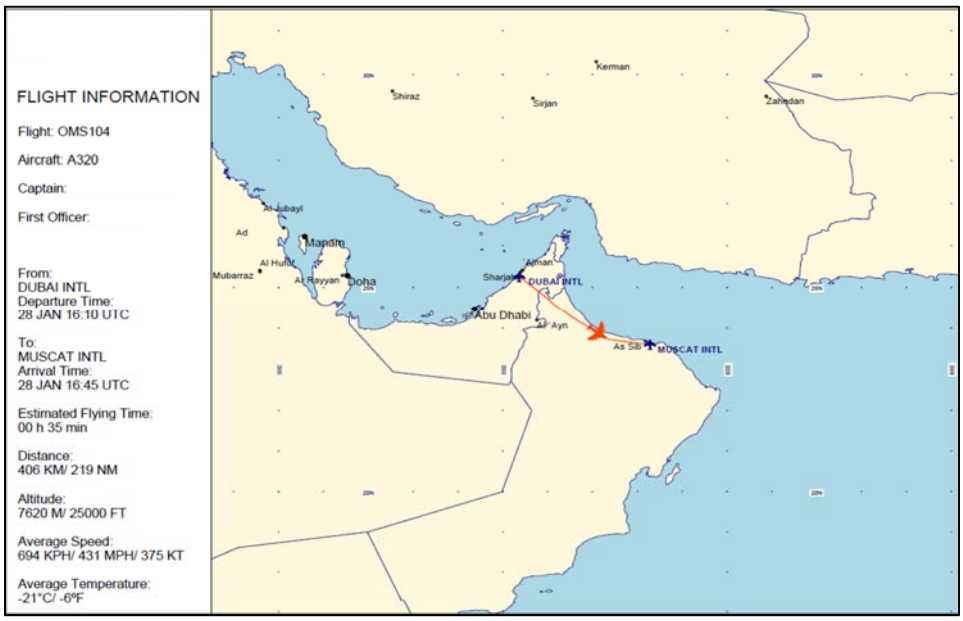
Employed Since	August 18,2018
Total Flight Hours with O2F at date of incident	328.52 Hrs
Total Flight Hours on date of incident	1489:52 Hrs
Last recurrent Check at date of incident	November 24, 2018
Last OPC at date of incident	November 25, 2018
Last Line Check at date of incident	August 17, 2018

Last Medical at date of incident	March 01, 2018
Total time off duty before flight	43:00 Hrs

1.7 Aircrafts Information

Aircraft Type	Airbus A320-232
Engines	IAE V2500
MSN	2724
Registration	SX-ODS
Airframe Hours	42.059:51
Certificate of Airworthiness	EASA Standard C of A

1.8 Flight Information



1.9 Meteorological Information

OOMS Airport

METAR: 281050Z 06013KT CAVOK 28/14 Q1018 NOSIG=

TAF: 281100Z 2812/2918 07014KT 8000 NSC BECMG 2817/2819 22012KT BECMG 2907/2909 34012KT BECMG 2915/2917 09008KT=

1.10 AIDS to navigation

Not applicable.

1.11 Communications

Not Applicable

1.12 Aerodrome Information

1.12.1 MUSCAT Intl AIRPORT OOMS

CATEGORY "B" AIRFIELD	**DATE**: January 2018	
NAME: MUSCAT Intl	**COUNTRY**: OMAN	
RWYYS: 08L/26R	**AIRFIELD CODES**	
AIDS: See **ARRIVAL** below	**IATA**: MCT	**ICAO:** OOMS
Lat/Long: N23^{0}36'00''/E058^{0}17'00''	**Elevation:** 25 ft	**Magnetic Variation:** 1^{0}E
Daylight Savings: Not Observed	**UTC Convert:** + 4 Hrs	**Fuel Types:** JET A1
Repair Types: Oman Air Support AVBL	**RFF:** CAT 10	**Security:** H24
NOTE: According to ICAO categorization OOMS is CAT B as circling approach is not authorized.		

1.12.2 Approach and Runway Lighting

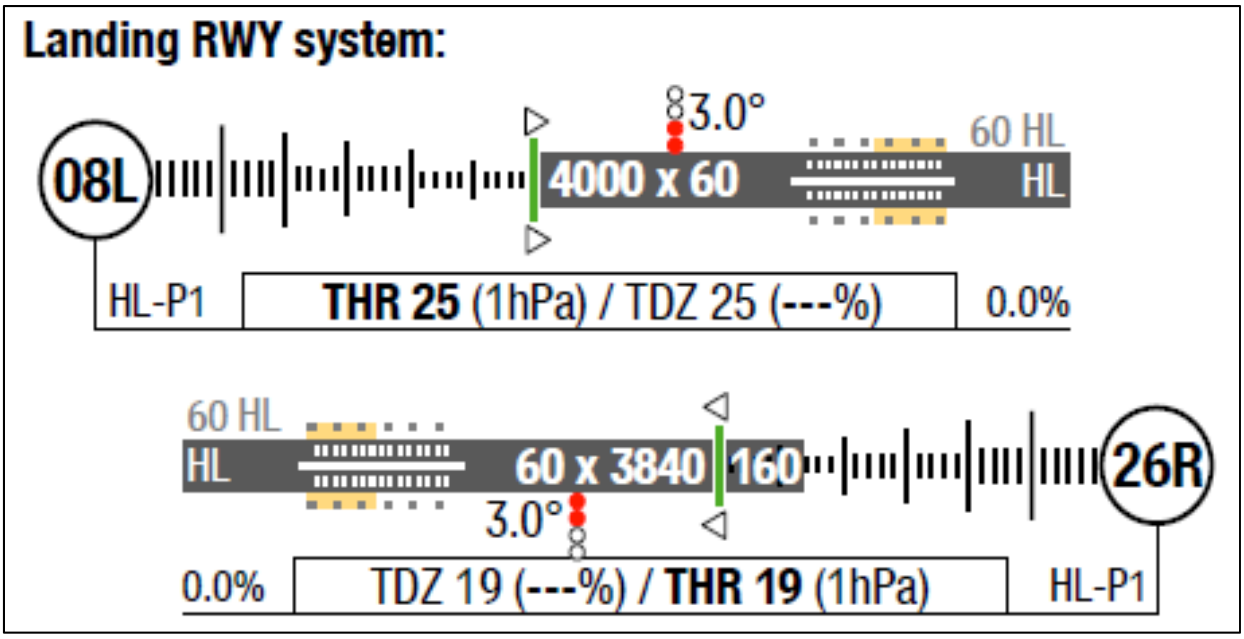
RWY	**APCH LGT Type LEN Intensity**	**THR LGT colour WBAR**	**PAPI**	**TDZ LGT LEN**	**RWY Center Line Length Spacing Colour Intensity**	**RWY Edge Spacing Colour Intensity**	**RWY End**
08L	LIH VRB white 900 M Coded centreline with 5 cross bars at 150 M intervals	Green, With WBAR	3° L	900 M from THR Uni-Directional VRB LIH White Spacing 30 M	AVBL	Uni- Directional LIH White Bi- Directional LIH last 600 M yellow 60M Spacing	Red LIH No WBAR
26R	LIH VRB white 900 M Coded centreline with 5 cross bars at 150 M intervals	Green, With WBAR	3° L	900 M from Uni-Directional VRB LIH White Spacing 30 M	AVBL	Uni- Directional LIH White Bi- Directional LIH last 600 M yellow 60M Spacing	Red LIH No WBAR

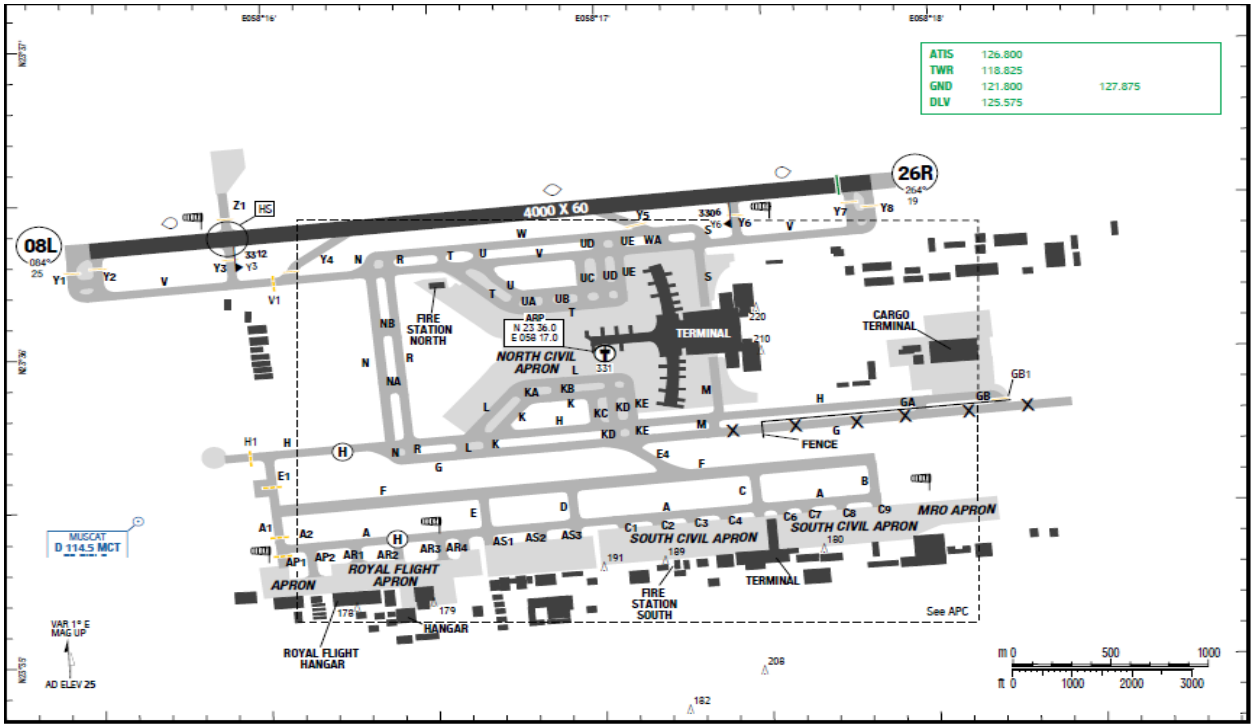
1.12.3 Declared Distance/ PCN

RWY	TORA(m)	TODA(m)	ASDA(m)	LDA(m)	PCN
08L	4000 X 60	4000	4000	4000	91/F/A/W/T
26R	4000 X 60	4000	4000	3840	91/F/A/W/T

Remarks: SWY, CWY: Nil, OFZ: AVBL, RESA: 240 x 150

1.12.4 Landing RWY System





1.12.5 RWY Restrictions

Unless otherwise notified by ATC, only land on RWY in use that is indicated by flashing white RTIL. CLSD RWY will be marked by an illuminated white X and should not be used for LDG under any circumstances.

1.12.6 WARNINGS

Laser light pointing northwest will be operating at N23 37.8 E058 11.9 (AL KHUDH) from SFC to 500ft AMSL daily between 1300-1700.

Bird concentration in the vicinity of the airport.

Large solitary predatory birds (eagles, vultures etc.) present a hazard to air navigation at all times on the coastal plain near the vicinity of the airport. Pilots are advised to exercise extreme caution when approaching or departing, particularly below 3000 FT QNH. ATC will endeavour to keep pilots advised of bird concentrations, but single birds circling at any height are very difficult to observe by ATC. Pilot reports of bird concentrations are requested. These reports are very useful in planning a programme to attempt a reduction of bird strike hazards.

1.12.7 ARRIVAL

Speed

MAX IAS 250KT below FL100 in airspace classes C, D and G.

1.12.8 Arrival Procedure

TFC entering the MUSCAT FIR should try to cross TARDI at MNM FL210 for the cleared level.

VFR Traffic Pattern: RWY 26R right-hand circuit.

Non-Standard G/S Intercept Position on :

RWY 08L

G/S intercept RWY 08L at 320m / 1049ft after landing threshold. Remaining DIST beyond GP is 3680m / 12074ft.

RWY 26R

G/S intercept RWY 26R at 332m / 1088ft after landing threshold. Remaining DIST beyond GP is 3508m / 11510ft.

1.12.9 ARRIVAL AIDS

ILS 08L: VOR and DME or Radar required. **Circling Not authorized**.

ILS 26R: VOR and DME or Radar required. **Circling Not authorized**.

LOC 08L: VOR and DME or Radar required. **Circling Not authorized.**

LOC 26R: VOR and DME or Radar required. **Circling Not authorized.**

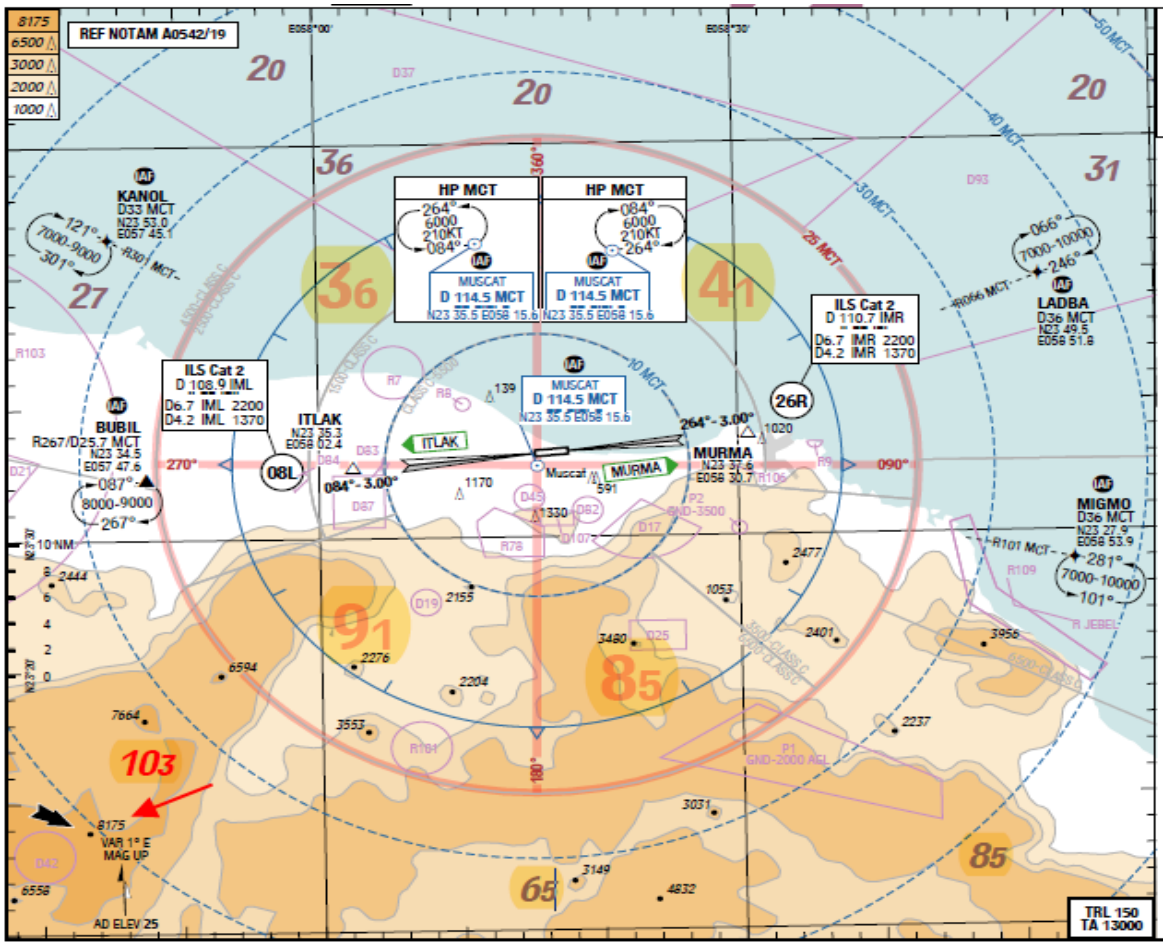
RNP 08L: RNP APCH GNSS required. **Circling Not authorized.**

RNP 26R: RNP APCH GNSS required. **Circling Not authorized.**

VOR 08L: VOR and DME or Radar required. **Circling Not authorized. OR 26R:** DME or Radar required. **Circling Not authorized**

1.12.10 TERRAIN WITHIN 25 NM

Caution: Hight terrain from South East Clockwise to West South West.



1.13 Flight Recorders

1.13.1. FDR

Event ID	Event Name	Value	Units	Severity	Context
6147	Pitch High (approach)	14.77	o	Major	RALT=139 AIRSPEED=123.8 FLAP HANDLE (GATED)=4.0
6148	Unstable approach (roll)	36.56	o	Major	RALT=1538 PITCH=U 2.46 AIRSPEED=181.6
6149	Dual Sidestick Input (Pitch)	90.96	0	Critical	CONTROL COLUMN POSN (PITCH) - CAPT=D 13.8 CONTROL COLUMN POSN (PITCH) - F/O=D 6.6
6150	ALPHA FLOUR	1.00	0	Critical	AIRSPEED=125.6 PALT=32 RALT=162
6144	Deviation below glideslope	-1.49	d	Minor	RALT=294
6143	Late Acquisition (ILS)	252.00	ft	Major	0
6146	High power on approach	89.88	%	Minor	AIRSPEED=127.3 RALT=186 VERTICAL SPEED=960
6145	Late Acquisition (ILS)	944.00	ft	Minor	0
6142	Unstable approach (speed variation <500ft)	8.06	kt	Minor	AIRSPEED=115.8 RALT=235

6136	Excessive bank	37.62	o	Minor	PALT=1300 FLAP HANDLE (GATED)=1.0 AIRSPEED=181.6
6137	Un-stabilised at Low Altitude (Ht AAL)	0.00	ft	Critical	RALT=186 AIRSPEED=127.3 GROUNDSPEED=124
6138	Low Percent Stabilised	63.01	0	Minor	RALT=375 AIRSPEED=117.1 GROUNDSPEED=117
6139	Approach Speed High (<1000ft)	34.88	kt	Major	AIRSPEED=169.1 RALT=1221
6140	Approach Speed Low (<1000ft)	-18.88	kt	Critical	AIRSPEED=115.4 PALT=160 RALT=324
6141	Approach Speed Low (<1000ft)	-11.88	kt	Critical	AIRSPEED=115.4 PALT=160 RALT=324

VAOAM - Alpha Max Speed	ATS Alpha Floor Mode	Air / Gnd	Stall Warn	Computed Airspeed	Ground Speed	PFD Selected Speed	Altitude (1013.25 mB)	Radio Altitude (1+2)	Roll Angle	Pitch Angle	Sidestick Pos Pitch - F/O	Sidestick Pos Pitch - Capt	Vertical Speed (derived)	EPR Actual Eng 1	EPR Actual Eng 2
113	Active (1)	Air (0)	Normal (0)	123,8	121	134	20	139	L 1.4	U 15.47	D 2.4	0	240	1,418	1,416
										U 16.17					
									L 1.1	U 16.52	D 8.9	0			59983
										U 16.88					
114	Active (1)	Air (0)	Normal (0)	125,6	122	134	32	162	L 0.4	U 16.52	D 11.5	0		1,418	1,418
										U 16.17					
									R 0.4	U 15.47	D 6.6	D 13.8			
										U 14.77					
113	Active (1)	Air (0)	Normal (0)	127,3	124	134	52	186	L 0.4	U 13.36	D 0.6	D 16.3	960	1,418	1,42
										U 11.95					
									L 2.5	U 10.20	0	D 11.4			
										U 8.79					
110	Active (1)	Air (0)	Normal (0)	130,1	128	134	64	201	L 3.5	U 7.03	U 0.5	D 1.6		1,416	1,42

1.13.2.CVR

CVR had been erased by the time of downloading.

1.14 Wreckage and Impact information

Not applicable.

1.15 Medical and Pathological Information

Not Applicable.

1.16 Fire

Not Applicable.

1.17 Survival Aspects

Not Applicable.

1.18 Tests and Research

Not applicable.

1.19 O2F Organizational and Management Information

ORO.GEN.200 Management system

A. **"orange2fly"** has established, implement and maintain a management system that includes:
   1) Clearly defined lines of responsibility and accountability throughout the operator, including a direct safety accountability of the accountable manager.
   2) A description of the overall philosophies and principles of the operator with regard to safety, referred to as the safety policy;
   3) The identification of aviation safety hazards entailed by the activities of the operator, their evaluation and the management of associated risks, including taking actions to mitigate the risk and verify their effectiveness.
   4) Maintaining personnel trained and competent to perform their tasks.
   5) Documentation of all management system key processes, including a process for making personnel aware of their responsibilities and the procedure for amending this documentation.
   6) A function to monitor compliance of the operator with the relevant requirements. Compliance monitoring shall include a feedback system of findings to the accountable manager to ensure effective implementation of corrective actions as necessary; and
   7) Any additional requirements that are prescribed in the relevant subparts of this Annex or other applicable Annexes.

B. The management system corresponds to the size of **"orange2fly"** and the nature and complexity of its activities, taking into account the hazards and associated risks inherent in these activities.

Management System – General concept

"orange2fly" has established a management system that has continuity throughout the organisation and ensures control of operations and management of safety and security outcomes. The management system ensures compliance with all applicable standards and regulatory requirements.

Considered Domain

The concept of management system can be applied to several "domains", such as:

- "Safety" (Safety Management System - SMS);
- "Crew fatigue" (Fatigue Risk Management System - FRMS);
- "Environment";
- "Financial".

The concept that can be applied to all domains is Safety.

Framework

ICAO has defined a framework for the Management System which includes 5 main components:

1. Policy and objectives

- Commitment of the CEO/Accountable Manager on the considered "domain" (Safety commitment);
- Maintain the "Domain" risks (Such as: Safety risks …) at an acceptable level;
- Assurance to reach and maintain the "Domain" objectives (Such as: Safety objectives …).

2. Risk Management

- Identification of hazards for the considered domain.
- Assessment of the associated "Domain" Risks.
- Mitigating actions to reduce and to maintain "Domain" risk at an acceptable level.

3. Assurance

- Assurance aims to reach and to maintain objectives and targets;
- Performance monitoring aims to measure the gaps with the objectives/targets;
- Continuous improvement aims to enhance the overall performance of the considered management system by improving objectives and targets;
- Management of operational and/or organisational changes.

4. Promotion

- Training programmes.
- Communication plan.

5. Scope of Activity

"orange2fly" is a public transport air carrier for passengers, cargo and mail. The area of operation is clearly defined in the Operation Specifications section of the AOC under which conducts its operation, as well as, all special authorisations (B/P-RNAV). It operates the following types of passenger aircraft A-320F On Schedule, Charter and ACMI Flights.

1.20 Additional Information

Auto Thrust (orange2fly FCOM)

Use of Auto Thrust (A/THR)

It is recommended to always use the A/THR (even if autopilot is not engaged), unless abnormal or emergency procedures dictate the opposite.
If A/THR fails, try engaging the other A/P to recover the associated A/THR channel.

GENERAL

The autothrust (A/THR) is a function of the FMGS, it includes two independent A/THR commands, one per FMGC. Each one is able to control the thrust of both engines simultaneously through two Engine Interface Units and two Electronic Engine Controls (IAE engines) or two Engine Control Units (CFM engines). Only one FMGC controls the active A/THR, it is called the master FMGC.

Thrust is controlled:

- Automatically when the A/THR is active
- Manually by the flight crew.

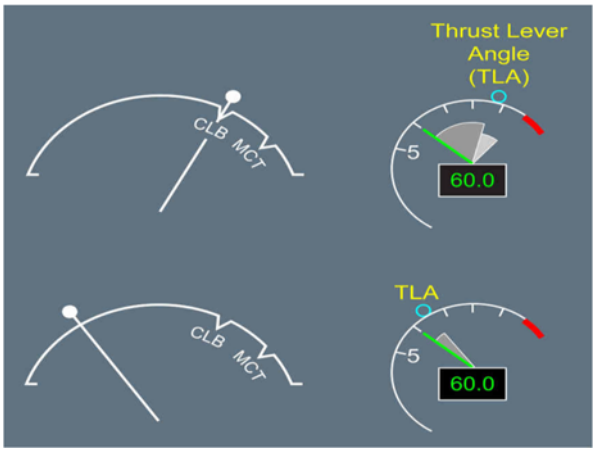
The autothrust is active when the A/THR pb of the FCU is lighted green and A/THR is displayed white in the FMA 5th column.
The position of the thrust levers determines whether A/THR is armed, active, or disconnected.
The autothrust system, when active:

- Maintains a specific thrust in THRUST mode
- Controls the aircraft speed or Mach in SPEED/MACH mode
- Uses ALPHA FLOOR mode to set maximum thrust when the aircraft angle of attack exceeds a specific threshold.

The autothrust system can operate independently or with the AP/FD:

- When performing alone, A/THR always controls the speed
- If the autothrust system is working with the AP/FD, the A/THR mode and AP/FD pitch modes are linked together.

When autothrust is active, the FMGS commands the thrust according to the vertical mode logic, but uses a thrust not greater than the thrust commanded by the position of the thrust lever. For example, when the thrust levers are set at the CL (climb) detent, FG can command thrust between idle and max climb.
The autothrust system, when armed, automatically activates if the thrust levers are moved into the active range sector. Outside of this range, thrust levers control thrust directly.



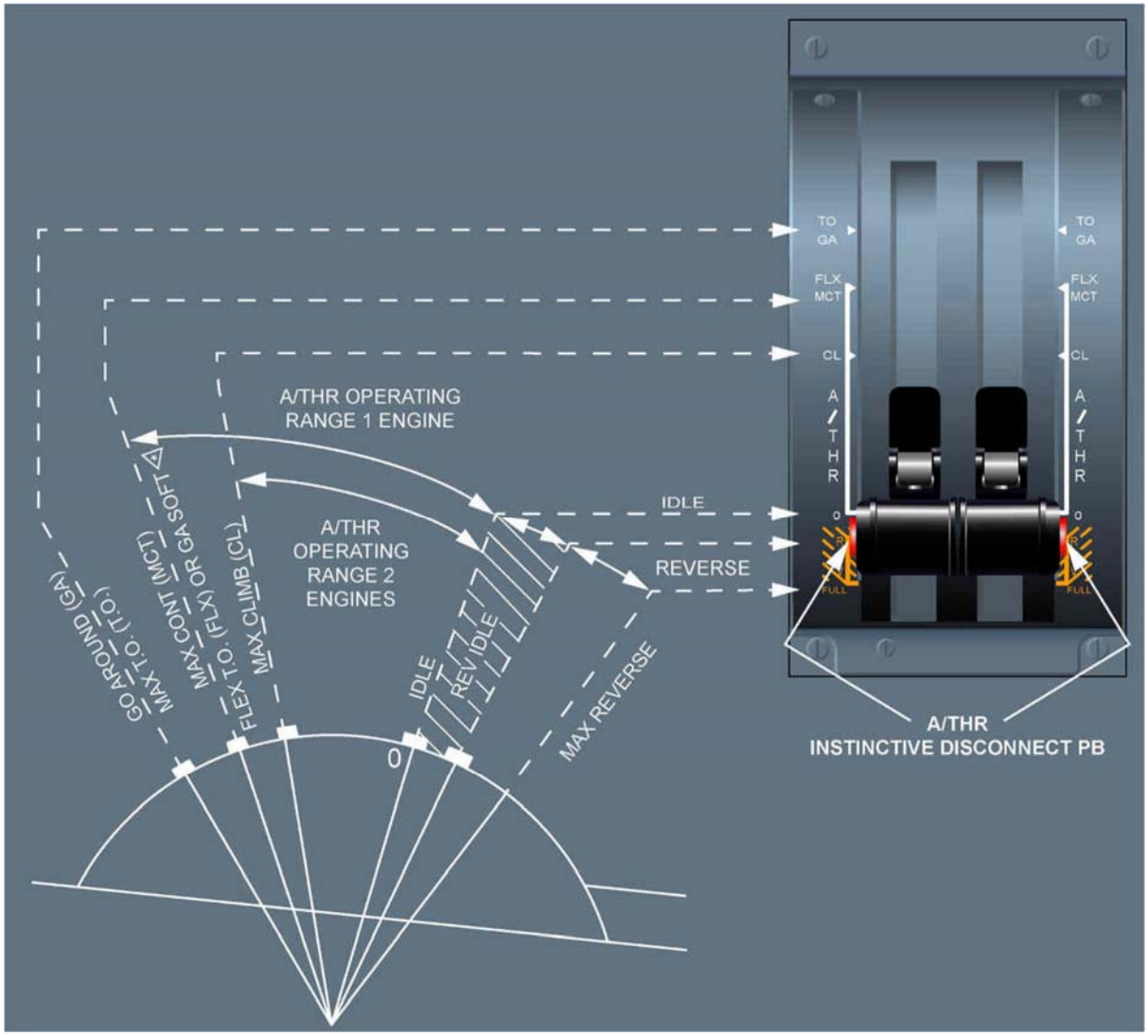
THRUST LEVERS

The flight crew uses the thrust levers to do the following:
- Manually select engine thrust
- Arm and activate autothrust (A/THR)
- Engage reverse thrust
- Engage the take-off and go-around modes.

When autothrust is disconnected, the thrust levers control thrust directly: each lever position corresponds to a given thrust.

Five detents divide each of the thrust lever sectors into four segments. The detents are:
TOGA : Max take-off thrust
FLX MCT : Max continuous thrust (or FLX at take-off) or GA SOFT at go-around
CL : Maximum climb thrust
IDLE : Idle thrust for both forward and reverse thrust
MAX REV : Maximum reverse thrust.

When the thrust levers are at the IDLE position, the flight crew can pull them up to clear the IDLE stop and select reverse thrust. (There is no reverse detent as such).



A/THR ARMING CONDITIONS

Arming conditions of the A/THR are numerous. The following is a list of the most important ones:

- One FMGC operative
- One FAC operative
- Two ADIRS operative
- Two FADECs operative
- One channel of the FCU operative
- One LGCIU operative
- A/THR is not manually disabled (instinctive disconnect pb has not been pressed for more than 5 s).

The flight crew arms A/THR:

→ On ground

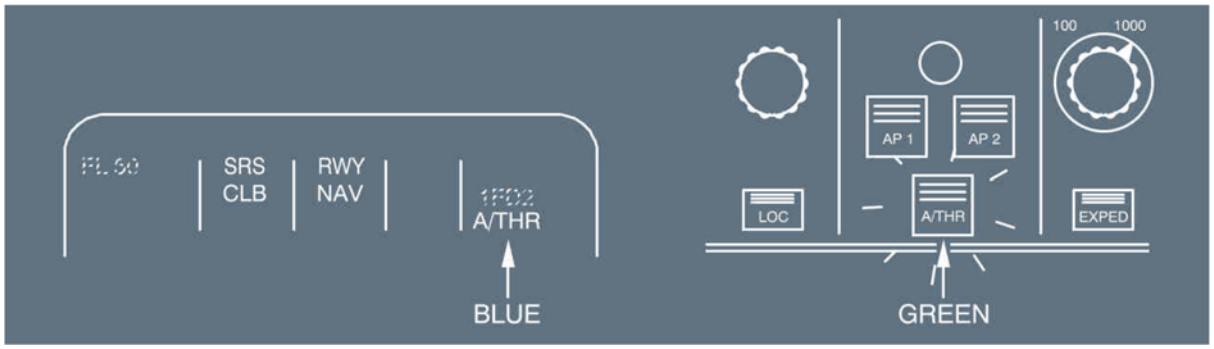
- By pushing the A/THR pb on the FCU when the engines are not running, or
- By setting the thrust levers at the FLX or TOGA detent when the engines are running.

→ In flight

- By pushing the A/THR pb on the FCU while the thrust levers are out of the active range, or

- While A/THR is active ("A/THR" white on the FMA), by setting all thrust levers beyond the CL detent or at least one lever above the MCT detent, or
- By engaging the go around mode.

When the A/THR is armed:
- The FCU's A/THR pb light comes on
- "A/THR" is displayed in blue on the FMA.



Note: At take-off, if the thrust levers are set back to idle, the A/THR disengages and cannot be rearmed until the aircraft becomes airborne.

A/THR ACTIVATION

GENERAL

The A/THR is active when it controls thrust or speed. The position of the thrust lever determines the maximum thrust that the A/THR system can command (except in α-floor condition).

The A/THR being armed, is activated:
- When the flight crew sets both thrust levers between the CL and IDLE detents (two engines operative), or
- When the flight crew sets one thrust lever between the MCT and IDLE detents (one engine inoperative).

The A/THR being disconnected, is activated when the flight crew pushes the A/THR pb on the FCU while the thrust levers are within the active range, including IDLE position.

Note: When the flight crew sets both thrust levers to IDLE position, the A/THR disconnects but, if the flight crew pushes the A/THR pb of the FCU, they will simultaneously arm and activate the autothrust. Due to the thrust levers position, IDLE thrust will be maintained.

When ALPHA FLOOR is activated, regardless of the initial status of A/THR and the position of the thrust levers, the A/THR activates.
When A/THR is active:
- The A/THR pb on the FCU lights up
- The FMA displays A/THR mode in green in the first column and "A/THR" in white in the fifth column.

EFFECTS OF THRUST LEVER MOVEMENT DURING A/THR ACTIVATION

While A/THR is active:

- When both thrust levers are set above the CL detent (both engines operative) or one thrust lever is set above MCT (one engine operative), the A/THR reverts from active to armed. “A/THR” turns to blue on the FMA and the thrust levers control thrust directly. The FMA displays "MAN THR” in white in its first column. The thrust levers provide the flight crew with an immediate increase of thrust when both thrust levers are pushed above the CL detent (two engines) or the active thrust lever above the MCT detent (one engine operative).
- When both thrust levers are set below the CL detent (both engines operative) or one thrust lever is set below MCT (one engine operative), a repeating warning (amber caution, single chime, “A/THR LIMITED” ECAM message) is activated every 5 s until the flight crew moves the lever back into the detent. “LVR CLB” (both engines operative) or “LVR MCT” (one engine operative) flashes white in the first column of the FMA. This device reminds the flight crew that the normal operating position of the thrust levers, when A/THR active, is the CL detent (two engines) or the MCT detent (one engine operative).
- When one thrust lever is in the CL detent and the other one out of detent, the “LVR ASYM” amber message comes up until both levers are set in the CL detent (only with both engines operative).

A/THR DISCONNECTION

GENERAL

When the A/THR is disconnected, it is neither armed nor active.

The A/THR can be disconnected in two ways:

→ Standard disconnection:

- The flight crew pushes the instinctive disconnect pb on the thrust levers, or
- The flight crew sets both thrust levers to IDLE detent.

→ Non-standard disconnection:

- The flight crew pushes the A/THR pb on the FCU while A/THR is active/armed, or
- The system loses one of the arming conditions.

CAUTION: If the flight crew pushes and holds one instinctive disconnect pb for more than 15s the A/THR system is disconnected for the remainder of the flight. All A/THR functions including ALPHA FLOOR are lost, and they can be recovered only at the next FMGC power-up (on ground).

THRUST LOCK FUNCTION

The Thrust Lock function is activated when the thrust levers are in the CL detent (or the MCT detent with one engine out), and:

- The flight crew pushes the A/THR pb on the FCU, or
- The A/THR disconnects due to a failure.

The thrust is locked at its level prior to disconnection. Moving the thrust levers out of CL or MCT suppresses the thrust lock and gives the flight crew manual control with the thrust levers.

When the Thrust Lock function is active:

- "THR LK" flashes amber on the FMA
- ECAM "ENG THRUST LOCKED" flashes every 5s
- ECAM displays "THR LEVERS.....MOVE"
- A single chime sounds and the Master Caution light flashes every 5 s.

All warnings cease when the flight crew moves the thrust levers out of the detent.

A/THR DISCONNECTION CAUTION

		A/THR DISCONNECTION	
		BY INSTINCTIVE DISCONNECT pb OR SETTING TWO LEVERS TO IDLE (if above 50 ft RA)	**BY OTHER MEANS**
CONSEQUENCE	**MASTER CAUTION light**	Illuminated 3 s maximum	Illuminated
	ECAM MESSAGE	A/THR OFF amber message 9 s maximum	Flashing ENG THRUST LOCKED amber caution, AUTO FLT A/THR OFF amber caution, blue "THR LEVERS.....MOVE"
	AUDIO	Single chime	Single chime
	CLR pb on ECAM CONTROL PANEL	Extinguished	Illuminated
ACTION	**MASTER CAUTION light**	- Extinguishes MASTER CAUTION light - Erases ECAM message	Extinguishes MASTER CAUTION light
	CLR pb on ECAM CONTROL PANEL	No effect	- Extinguishes MASTER CAUTION light and CLR pb - Erases ECAM message -Calls status
	INSTINCTIVE DISCONNECT pb	- Extinguishes MASTER CAUTION light -Erases ECAM message	Extinguishes MASTER CAUTION light
ECAM STATUS MESSAGE		NO	YES

The standard disconnection triggers temporary ECAM message and caution light. Single chime sounds.

The nonstandard disconnection triggers caution light and ECAM message removed only by a flight crew action. Single chime sounds.

A/THR MODES

GENERAL

Except in take-off and go-around situations, normal operation of the A/THR system requires the thrust levers to be:

- In the CL detent for the two-engine configuration. If they are not set in the CL detent, “LVR CLB” flashes white on the FMA.
- In MCT detent when in the one-engine-out configuration. If the appropriate lever is not set in the MCT detent, “LVR MCT” flashes white on the FMA.

The A/THR modes are selected automatically in conjunction with the AP/FD modes (except for ALPHA FLOOR):

A/THR in THRUST mode	AP/FD pitch mode maintains the speed: OP CLB - OP DES - CLB - EXP CLB - EXP DES - SRS - FLARE and DES (IDLE path)
A/THR in SPEED/MACH mode	If neither AP nor FD is engaged
	f AP/FD controls a vertical path: V/S - FPA - ALT* - ALT CST* - ALT - ALT CRZ - G/S* - G/S - FINAL and DES (geometric path)
A/THR in RETARD mode	AP/FD engaged in LAND mode during an automatic landing

THRUST MODE

In THRUST mode, autothrust commands a specific thrust level in conjunction with the AP/FD pitch mode. This thrust level is limited by thrust lever position.

FMA Display	Meaning
THR MCT	Single engine thrust in climb. The live engine is at maximum continuous thrust (thrust lever in MCT detent)
THR CLB	Climb thrust in two engine configuration (at least one thrust lever in the CL detent, the other one below CL)
THR LVR	Undetermined thrust (neither CLB nor MCT thrust)
THR IDLE	Minimum thrust (both engines at IDLE thrust)

Note: When the A/THR is armed for take-off or go-around, the FMA displays “MAN TOGA” (or “MAN FLX”, or "MAN GA SOFT") in white to remind the flight crew that the thrust levers are properly positioned.

RETARD MODE

The RETARD mode is only available during automatic landing (AP engaged in LAND mode). At approximately 40 ft RA, the RETARD mode engages and remains engaged after touchdown. The A/THR commands IDLE thrust during the flare, and the FMA and engine warning display “IDLE”. If the autopilot is disengaged during the flare before touchdown, the SPEED mode replaces the RETARD mode, and the flight crew has to manually reduce thrust.

Note: In an automatic landing, the system generates a “RETARD” callout at 10 ft RA, which prompts the flight crew to move the thrust levers to IDLE in order to confirm thrust reduction. In manual landing conditions, the system generates this callout at 20 ft RA, as a reminder.

ALPHA FLOOR

ALPHA FLOOR is a protection that commands TOGA thrust, regardless of the thrust levers' positions. This protection is available from lift-off to 100 ft RA on approach.
ALPHA FLOOR calls up the following indications:

- "A FLOOR" in green, surrounded by a flashing amber box on the FMA, and in amber on the engine warning display, (as long as α-floor conditions are met)
- "TOGA LK" in green, surrounded by a flashing amber box on the FMA, when the aircraft leaves the α-floor conditions. TOGA thrust is frozen.

To cancel ALPHA FLOOR or TOGA LK thrust, the flight crew must disconnect the autothrust.

SPEED/MACH MODE

In SPEED/MACH mode, the A/THR adjusts the thrust in order to acquire and hold a speed or Mach target.
The speed or Mach target may be:

- Selected on the FCU by the flight crew
- Managed by the FMGC.

When in SPEED/MACH mode, the A/THR does not allow speed excursions beyond the following limits, regardless of the target speed or Mach number:

- For a selected speed target, the limits are VLS and VMAX (VMO-MMO, VFE-VLE, whichever applies)
- For a managed speed target, the limits are manoeuvring speed (Green Dot, S, F, whichever applies) and maximum speed (340/0.80-VFE-VLE, whichever applies).

The changeover from SPEED to MACH mode is either automatic, performed by the FMGC, or manual, with the flight crew pushing the SPD/MACH pb.
The FMA displays "SPEED" or "MACH".

APPROACH AUTOTHRUST:

Below 3200 ft RA, with at least CONF 1, the A/THR logic is modified to be more responsive to speed variation. This is referred to as approach autothrust.

SPEED MODE IN APPROACH PHASE

When the aircraft flies an approach in managed speed, the managed speed target, displayed by the magenta triangle on the PFDs, is variable. This managed speed target is the VAPP, displayed on the PERF APPR page, corrected by the Ground Speed Mini function.

ACTIVATION CONDITIONS OF THE GROUND SPEED MINI FUNCTION

The GS mini function is active when:

- The speed is managed and,
- The FMS flight phase is the approach phase.

GROUND SPEED MINI FUNCTION PRINCIPLE

The objective of the Ground Speed Mini function is to take advantage of the aircraft inertia, when the wind varies during the approach. This objective is achieved by providing the adequate indicated speed target (i.e. the managed speed target represented by the magenta triangle). When

the aircraft flies this indicated air speed target, the energy of the aircraft is maintained above a minimum level ensuring aerodynamic margins versus stall.
During the approach, the FG continuously computes the managed speed target in order to take into account the gusts or wind changes.

MANAGED SPEED TARGET

The computation of the managed speed target uses the tower headwind component, the current headwind component, and the VAPP.

TOWER HEADWIND COMPONENT

The tower wind is the average wind provided by the ATIS or the tower. The flight crew enters the tower wind in the MAG WIND field on the PERF APPR page.
The tower headwind component is the projection of the MAG WIND on the runway axis. This computation is based on the runway inserted in the FMS active F-PLN.

CURRENT HEADWIND COMPONENT

The projection of the current wind measured by the ADIRS on the aircraft longitudinal axis is the current headwind component (instantaneous headwind).

VAPP COMPUTATION

The FMS computes the VAPP and displays it on the PERF APPR page. The VAPP computation takes into account the tower headwind component. VAPP is computed as follows:

- VAPP = VLS+1/3 of the TWR HEADWIND COMPONENT, or
- VAPP = VLS +5 kt, whichever is the highest.

Note: "1/3 of the TWR HEADWIND COMPONENT" has two limits:
- 0 kt as the minimum value (no wind or tailwind)
- +15 kt as the maximum value.

The flight crew can manually modify the VAPP and MAG WIND values on the PERF APPR page.

MANAGED SPEED TARGET COMPUTATION

The FG continuously computes the managed speed target that is equal to VAPP plus an additional increment. This increment takes into account the headwind variation during the final approach. Managed speed target = VAPP + (current headwind component - tower headwind component). The managed speed target has the following limits:

- VAPP, as the minimum value
- VFE next in CONF 0, 1, 2 or 3, VFE -5 kt in CONF FULL, as the maximum value.

NORMAL PROCEDURES

GENERAL INFORMATION INTRODUCTION

The procedures contained in this chapter are recommended by Airbus and "O2F" and are consistent with the other chapters of this manual. The Authorities do not certificate Standard Operating Procedures. The manufacturer presents them herein as the best way to proceed, from a technical and operational standpoint. They are continually updated, and the revisions take into account "O2F" input, as well as manufacturer experience. This chapter contains expanded information on normal procedures. Standard Operating Procedures consist of inspections, preparations, and normal procedures. All items of a given procedure are listed in a sequence that follows a standardized scan of the cockpit panels, unless that sequence goes against the action priority logic, to ensure that all actions are performed in the most efficient way. Standard Operating Procedures are divided into flight phases and are performed by memory. These procedures assume that all systems are operating normally, and that all automatic functions are used normally. Pilots may decide to deviate from these Standard Operating Procedures in the interest of SAFETY and OPERATIONAL ADVANTAGES provided both pilots agree to the deviation from Standard Operating Procedure. In this case it is imperative that the wording 'NON-STANDARD' is used. Some normal procedures that are non-routine will be found in the PRO-SUP Supplementary Procedures, and in the PRO-SPO - Special Operations. The Commander will decide the duties (PF/PM) for the sector. When the Co-pilot is acting as PF, he/she is P1 under supervision and as such should be encouraged to exercise his/her "Command" ability. The Commander of course has the final authority

CREW MEMBER DEFINITION

The terms Pilot Flying (PF) and Pilot monitoring (PM) are terms describing an individual's role on a specific flight.
In "O2F" the Commander always starts the engines and taxi the aircraft.
The Co-Pilot will obtain departure and push/start clearance as the Commander will be PF from this point until handing over the controls to the Co-Pilot on the runway if the Co Pilot has been allocated PF duties for the sector, after landing and when the speed is below 70 kts the commander will take over the controls and act as PF.
PF during the flight will be responsible for:

✓ Normal flight procedures (i.e. manipulation of flight controls etc.)
✓ Thrust Levers
✓ Flight path
✓ Navigation.

PM will be responsible for:

✓ Monitoring PF
✓ Normal flight procedures
✓ Checklist reading and actions
✓ Communication
✓ Tasks requested by PF.

These operating procedures have been designed to be applicable to all normally operated flights. At the Aircraft Commander's discretion, the duties and tasks of PF and PM may be exchanged between pilots assigned to the flight. For example, the commander will be able to delegate the take-off to the Co-pilot (PF) but then swap roles for the approach and landing, commander becomes PF.

GENERAL STANDARDS CALL OUTS

Standard phraseology is essential to ensure effective crew communication. The phraseology should be concise and exact. The following Paragraph lists the callouts that should be used as standard. They supplement the callouts identified in the SOP. These standard Airbus callouts are also designed to promote situational awareness, and to ensure crew understanding of systems and their use in line operation.

PF/PM DUTIES TRANSFER

To transfer control, flight crewmembers must use the following callouts:

- ✓ **To give control:** The pilot calls out "YOU HAVE CONTROL". The other pilot accepts this transfer by calling out "I HAVE CONTROL", before assuming PF duties.
- ✓ **To take control:** The pilot calls out "I HAVE CONTROL". The other pilot accepts this transfer by calling out "YOU HAVE CONTROL", before assuming PM duties. Note: Call FMA, altitude, speed and position whenever you give the controls to the other pilot

FMA

- ✓ The PF should call out any FMA change. Therefore, the PF should announce: All armed modes with the associated color (blue, magenta): "G/S blue", "LOC blue".
- ✓ All active modes without the associated color (e.g. green, white): "NAV", "ALT" The PM should check and respond, "CHECKED" to all FMA changes called out by the PF.

Use of Auto Thrust (A/THR)

It is recommended to always use the A/THR (even if autopilot is not engaged), unless abnormal or emergency procedures dictate the opposite. If A/THR fails, try engaging the other A/P to recover the associated A/THR channel.

1.21 Useful or Effective Investigation Techniques

Not applicable.

2 ANALYSIS

2.1 Aircraft

The aircraft was airworthy. Valid ARC with due date 25.06.2019.

2.2 Flight Management

No events are reported or recorded from Pre-Flight to the start of the initial Approach.

2.2.1 Initial Approach.

The PF was CM2 and the CM1 was PM. At the end of initial approach, being radar vectored, at 2560 ft and IAS 196 kts Flaps 1 was selected. At 2260 ft IAS 186kts the Commander disconnected the Auto pilot and took over control of the Aircraft.

2.2.2 Final Approach

At 1840 ft turning right on final for RW 26R the Commander selected idle thrust and thus the Auto Thrust was disconnected.

At 1810 ft the landing gear was selected down.

At 1470 ft IAS 182kts Flaps 2 was selected.

At 1080 ft on final on the ILS flaps 3 was selected at 167 kts.

At 1000ft IAS 154kts full flaps was selected.

At 930ft IAS 144kts the control of the Aircraft was handed over to the F/O.

Thereafter with the thrust levers at idle and auto thrust disconnected:

At 800 ft (800 RA) with IAS 142 kts (VAPP + 8), V/S - 1080ft/min on G/S on LOC. Speed trend Decreasing.

At 700 ft (700 RA) with IAS 138 kts (VAPP + 4), V/S -1080ft/min on G.S. on LOC. Speed trend Decreasing.

At 600 ft (600 RA) with IAS 137 kts (VAPP + 3), V/S -900ft/min 1dot below G/S on LOC. Speed trend Decreasing.

At 500 ft (500 RA) with IAS 130 kts (VAPP - 4), V/S -720ft/min 1 dot below G/S ½ dot right of LOC. Speed trend Decreasing.

At 400 ft (377 RA) with IAS 117 kts (VAPP – 17), V/S - 840ft/min 1 dot below G/S ½ dot right of LOC. Speed trend Decreasing.

At 300 ft (282 RA) with IAS 116 kts (VAPP – 18), V/S -1300ft/min full scale deflection below G/S ½ dot right of LOC.

At 290 ft (256 RA) with IAS 116 kts (VAPP – 18), V/S - 1300ft/min. TOGA thrust was applied. Minimum recorded altitude was 210 ft and pitch at 14.77^0 up. At that time ALPHA FLOOR was activated and FMA was reading TOGA SRS GA TRK. The initial pitch up is recorded with the righthand side stick and the aircraft started climbing and the speed picking up. The CM1 intervened on his side stick at 240 ft (162 RA) IAS 127 kts (DUAL SIDE STICK ACTIVATED) the Aircraft levelled off and the thrust went back to idle with indication 1 dot below G/S and on the LOC.

2.2.3 Landing

The threshold was crossed at 70 ft and a normal landing was performed by the Commander on RW 26R with no further events reported or recorded.

2.2.4 Landing roll

No events reported or recorded.

3 CONCLUSIONS

3.1 Findings

→ CM1 as PM and becoming PF had no real reason to disconnect the Auto Pilot to manage the flight.

→ CM1 as PF had no real reason to disconnect Auto Thrust to manage the speed.

→ No FMA readout and no confirmation from both pilots.

→ The CM2 as PF, as testified, had never operated the A/C with Manual Thrust.

→ No SOP's were followed regarding, takeover control, banc angle, vertical speeds, speed management and G/S deviation during initial and final approach.

→ Fatigue was not a factor according to FDT and rest limitations.

3.2 Root Cause(s)

→ Poor CRM on the part of both Pilots is the root cause.

→ Non-complying with SOP's on all phases of the initial and final approach and verbal confirmation from both Pilots.

→ The handover of controls below 1000 ft without the a/c being fully stabilized (IDLE THRUST).

→ CM2, as testified, not being trained to control the speed with Auto Thrust disconnected.

3.3 Contributing Factors

→ Loss of situation awareness is the main contributing factor.

→ No or poor CRM as CRM encompasses a wide range of knowledge, skills and attitudes including, communication, situational awareness, problem solving, decision making and teamwork. CRM is concerned with the cognitive and interpersonal skills to manage the flight within an organised system. Cognitive skills are defined as the mental process used for gaining and maintaining situational awareness for solving problems and for making / taking decision.

4 SAFETY RECOMMENDATIONS

The Airline (ORANGE2FLY) must review its training program regarding the following items:

2021/06 Emphasis, during initial, recurrent, ground school and flight training, on the following items before being released to responsible duties. There after close monitor through FDM program Flight and Simulator checks:

→ CRM
→ Human factors
→ Crew communication according to SOP's
→ Crew Cooperation
→ Leadership and Managerial skills
→ The importance of FMA callouts according to SOP's
→ Contributing factors to the loss of Situation awareness
→ Decision Making
→ Case study on low level approach to stall
→ Go Around decision and actions according to SOP's

2021/07 SMS review

2021/08 Simulator training to include the above items plus:

→ Vectors for ILS approach, in VMC and IMC conditions, in Manual Approaches with Auto thrust disengaged.
→ Emphasise on FMA callout according to SOP's
→ Go Around decision and actions according to SOP's

2021/09 The Flight Operations and Training Department to:

→ Review and incorporate procedures and criteria for hand over control of the Aircraft at low altitude.

Nea Philadelphia, 11th February 2021

THE CHAIRMAN

Ioannis Kondylis

THE MEMBERS

Akrivos Tsolakis

Grigorios Flessas

Christos Valaris

Charalampos Tzonos-Komilis

Exact Copy

THE SECRETARY

Kyriakos Katsoulakis

5 APPENDIX

5.1 CM1 Captain: Flight, Duty, Rest time Period

Date	Duty Type	FTL day off	Duty Start	Duty End	Split off	Split on	Time zone	Rest Facility	Rest before duty		Early late night duty	Block hours	Sectors	Duty time
									Actual	Min				
21-01-2019	MCT-DOH (flight) DOH-... (flight)		18:10	00:15 (22 Jan)	-	-	+04:00	None	26:22	10:00	night	03:30	2	06:05
22-01-2019	...-MCT (flight)		18:10 (21 Jan)	00:15	-	-	+04:00	None	26:22	10:00	night	03:30	2	06:05
23-01-2019	MCT (Standby afternoon)		12:00	17:59	-	-	+04:00	None	35:45	10:00	-	00:00	0	05:59
24-01-2019	REST	-												
25-01-2019	MCT-DXB (flight) DXB-MCT (flight) MCT-DOH (flight) DOH-MCT (flight)		03:30	13:15	-	-	+04:00	None	33:31	10:00	-	05:25	4	09:45
26-01-2019	MCT-DXB (flight) DXB-MCT (flight)		13:10	18:10	-	-	+04:00	None	23:55	10:00	-	02:35	2	05:00
27-01-2019	Day Off	-												
28-01-2019	MCT-DXB (flight) DXB-MCT (flight)		13:10	19:35	-	-	+04:00	None	43:00	10:00	-	02:20	2	06:25

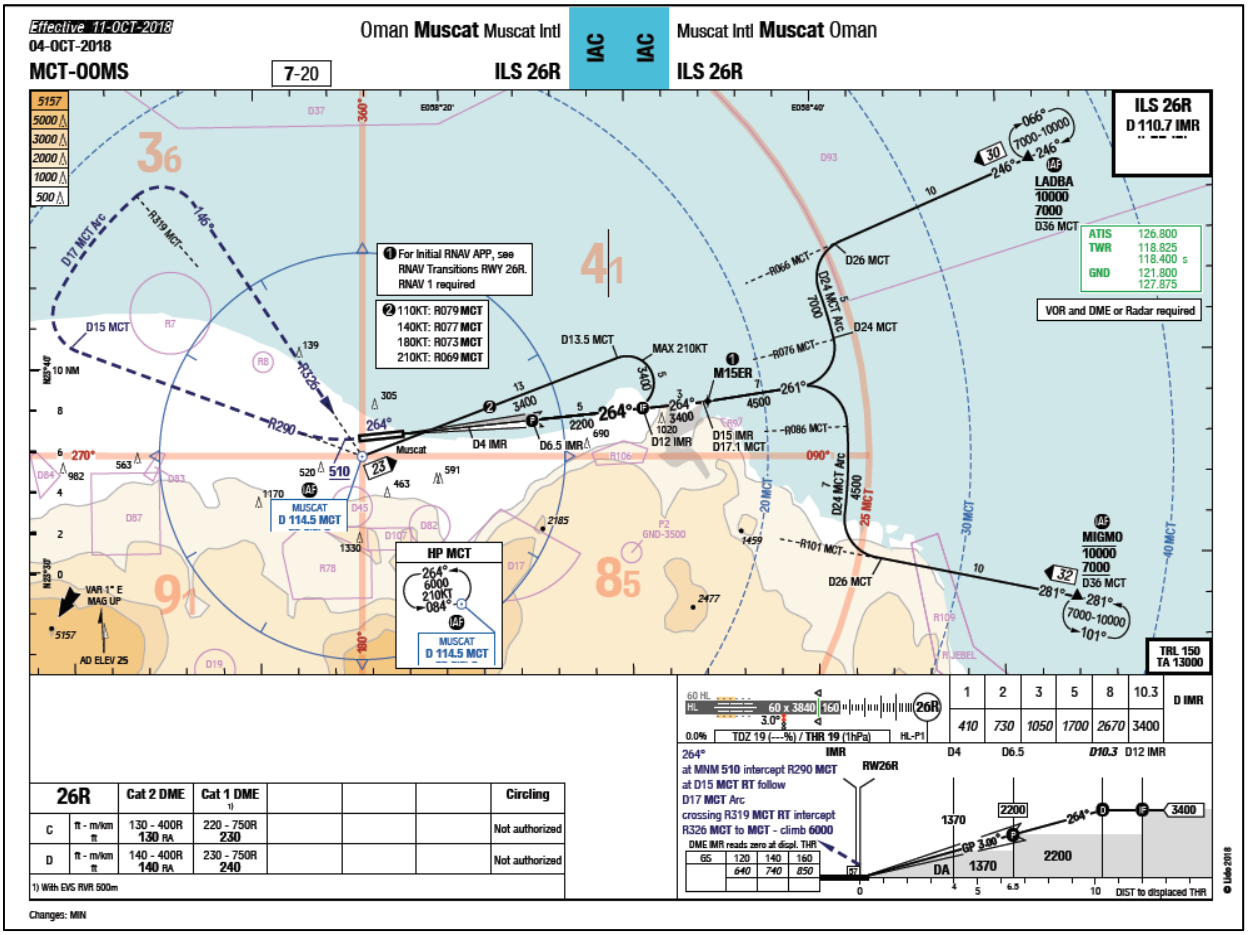
FDP			Take off	Lnd	ICAO	FDP Ext.	Duty hours			Block hours			2 days off	Rest
						7 d	7 d	14 d	28 d	28 d	1 Y	12 M	1 m	36 h
Actual	Max	CD	[no]	[no]	type	2 MAX	60 h MAX	110 h MAX	190 h MAX	100 h MAX	900 h MAX	1000 h MAX	2 MIN	168 h MAX
05:50	11:00	-	1	1	N N	0	11:38	58:46	92:46	38:31	30:10	58:05	5	38:00
05:50	11:00	-	1	1	N	0	11:53	59:01	93:01	38:31	30:10	58:05	5	38:15
00:00	-	-			N	0	11:53	57:42	86:54	34:25	30:10	58:05	5	79:59
						0	11:53	43:28	80:11	30:10	30:10	58:05	5	110:00
09:30	12:00	-	1	1	N N N N	0	21:38	52:08	89:56	35:35	35:35	63:30	5	123:15
04:45	11:00	-	0	0	N N	0	26:38	49:58	92:06	38:10	38:10	66:05	5	152:10
						0	20:50	42:38	92:06	38:10	38:10	66:05	5	00:00
06:10	11:00	-	1	1	N N	0	25:50	33:03	98:31	40:30	40:30	68:25	5	06:25

5.2 CM2 First Officer: Flight, Duty, Rest time Period.

FDP			Take off	Lnd	ICAO	FDP Ext.	Duty hours			Block hours			2 days off	Rest
						7 d	7 d	14 d	28 d	28 d	1 Y	12 M	1 m	36 h
Actual	Max	CD	[no]	[no]	type	2 MAX	60 h MAX	110 h MAX	190 h MAX	100 h MAX	900 h MAX	1000 h MAX	2 MIN	168 h MAX
05:50	11:00	-	1	1	N N	0	11:38	11:38	11:38	03:30	03:30	334:24	5	38:00
05:50	11:00	-	1	1	N	0	11:53	11:53	11:53	03:30	03:30	334:24	5	38:15
05:10	11:00	-	1	1	N N	0	17:18	17:18	17:18	06:49	06:49	337:43	5	80:35
						0	17:18	17:18	17:18	06:49	06:49	337:43	5	110:00
09:30	12:00	-	3	3	N N N N	0	27:03	27:03	27:03	12:14	12:14	343:08	5	123:15
04:45	11:00	-	1	1	N N	0	32:03	32:03	32:03	14:49	14:49	345:43	4	152:10
						0	26:15	32:03	32:03	14:49	14:49	345:43	4	00:00
06:10	11:00	-	1	1	N N	0	31:15	38:28	38:28	17:09	17:09	348:03	4	06:25

FDP			Take off	Lnd	ICAO	FDP Ext.	Duty hours			Block hours			2 days off	Rest
						7 d	7 d	14 d	28 d	28 d	1 Y	12 M	1 m	36 h
Actual	Max	CD	[no]	[no]	type	2 MAX	60 h MAX	110 h MAX	190 h MAX	100 h MAX	900 h MAX	1000 h MAX	2 MIN	168 h MAX
05:50	11:00	-	1	1	N N	0	11:38	11:38	11:38	03:30	03:30	334:24	5	38:00
05:50	11:00	-	1	1	N	0	11:53	11:53	11:53	03:30	03:30	334:24	5	38:15
05:10	11:00	-	1	1	N N	0	17:18	17:18	17:18	06:49	06:49	337:43	5	80:35
						0	17:18	17:18	17:18	06:49	06:49	337:43	5	110:00
09:30	12:00	-	3	3	N N N N	0	27:03	27:03	27:03	12:14	12:14	343:08	5	123:15
04:45	11:00	-	1	1	N N	0	32:03	32:03	32:03	14:49	14:49	345:43	4	152:10
						0	26:15	32:03	32:03	14:49	14:49	345:43	4	00:00
06:10	11:00	-	1	1	N N	0	31:15	38:28	38:28	17:09	17:09	348:03	4	06:25

5.3 OMMAN MUSCAT Intl ILS 26R



5.4 SX-ODS ARC

IRELAND

A Member of the European Union

AIRWORTHINESS REVIEW CERTIFICATE

ARC Reference: GGD/ARC15a/01

Pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council, the Irish Aviation Authority hereby certifies that the following aircraft:

Aircraft manufacturer: AIRBUS INDUSTRIE

Manufacturer's designation: A320-232

Aircraft registration: ~~EI-GGD~~ SX-ODS

Aircraft serial number: 2724

FH AT 28/6/2018 : 40.617:57

For HCAA AR3009

B. KASCHAS

is considered airworthy at the time of the review.

Date of issue: 26 JUN 2018 Date of expiry: 25 JUN 2019

Airframe Flight Hours (FH) at date of issue: 40617-57 hrs.

Signed: Liam Colgan Authorisation No: 0107

IRISH AVIATION AUTHORITY IAA

HELLENIC

1st Extension:

The aircraft has remained in a controlled environment in accordance with point M.A.901 of Annex I to Commission Regulation (EC) No 1321/2014 for the last year. The aircraft is considered to be airworthy at the time of the issue.

Date of issue: 18 JUN 2019 Date of expiry: 25 JUN 2020

Airframe Flight Hours (FH) at date of issue: 43.356:53

Signed: _____ Authorisation No:

Company Name: ORANGE2FLY Approval reference:

orange2fly George Kuroglorgakis CAMO A.M.

EL.M.G.0068

2nd Extension:

The aircraft has remained in a controlled environment in accordance with point M.A.901 of Annex I to Commission Regulation (EC) No 1321/2014 for the last year. The aircraft is considered to be airworthy at the time of the issue.

Date of issue: Date of expiry:

Airframe Flight Hours (FH) at date of issue:

Signed: _____ Authorisation No:

Company Name: Approval reference:

EASA Form 15a Issue 4

IAA SAFETY REGULATION DIVISION

5.5 SX-ODS C of A

ΠΙΣΤΟΠΟΙΗΤΙΚΟ ΑΞΙΟΠΛΟΪΑΣ
CERTIFICATE OF AIRWORTHINESS

	ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ **ΥΠΗΡΕΣΙΑ ΠΟΛΙΤΙΚΗΣ ΑΕΡΟΠΟΡΙΑΣ** HELLENIC REPUBLIC CIVIL AVIATION AUTHORITY	Αύξ. Αριθμός *No.* **1648**
1. Στοιχεία εθνικότητας και νηολόγησης *Nationality and registration marks* **SX-ODS**	2. Κατασκευαστής και ονομασία αεροσκάφους απο τον κατασκευαστή *Manufacturer and manufacturer's description of aircraft* **AIRBUS** **A320-232**	3. Αριθμός σειράς αεροσκάφους *Aircraft serial number:* **2724**

4. Κατηγορίες / *Categories:* **CS-25 Large Aeroplanes**

5. Το παρόν πιστοποιητικό πτητικής ικανότητας εκδίδεται σύμφωνα με τη Σύμβαση για τη Διεθνή Πολιτική Αεροπορία της 7η Δεκεμβρίου 1944 και του Κανονισμού (ΕΚ) αριθ. 216/08 Άρθρο 5, παράγραφος 2, στοιχείο (γ) για το ανωτέρω αεροσκάφος, το οποίο κρίνεται αξιόπλοο όταν υποβάλλεται σε συντήρηση και λειτουργεί σύμφωνα με τα ανωτέρω και τους σχετικούς περιορισμούς λειτουργίας.
This Certificate of Airworthiness is issued pursuant to the Convention on International Civil Aviation dated 7 December 1944 and Regulation (EC) No.216/08, Article 5(2)(c) in respect of the abovementioned aircraft which is considered to be airworthy when maintained and operated in accordance with foregoing and the pertinent operating limitations

Ημερομηνία έκδοσης: *Date of issue:* 26/6/2018

Υπογραφή: *Signature:*

Ευάγγελος Εύδας
Evangelos Xydas

Περιορισμοί/Παρατηρήσεις: *Limitations/Remarks:* None

Επιθεωρητής Πτητικής Ικανότητας Αέρος
Airworthiness Inspector

6. Το παρόν πιστοποιητικό αξιοπλοΐας είναι σε ισχύ εφόσον δεν έχει ανακληθεί από την αρμόδια αρχή του Κράτους μέλους νηολόγησης
Το ισχύον πιστοποιητικό επιθεώρησης αξιοπλοΐας επισυνάπτεται στο παρόν πιστοποιητικό
This Certificate of Airworthiness is valid unless revoked by the competent authority of the Member State of registry
A current Airworthiness Review Certificate shall be attached to this Certificate

Έντυπο 25 του EASA / *EASA Form 25 Issue 2*
Το παρόν πιστοποιητικό πρέπει να βρίσκεται στο αεροσκάφος σε όλες τις πτήσεις
This permit shall be carried on board during all flights

5.6 SX-ODS Certificate of Registration

ΑΡΙΘΜΟΣ ΝΗΟΛΟΓΙΟΥ Aircraft Register **15** ΤΟΜΟΣ Band: **A** ΣΕΛΙΔΑ Page: **29**	ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ **Hellenic Republic** ΥΠΟΥΡΓΕΙΟ ΜΕΤΑΦΟΡΩΝ & ΕΠΙΚΟΙΝΩΝΙΩΝ **MINISTRY OF TRANSPORT AND COMMUNICATION** ΥΠΗΡΕΣΙΑ ΠΟΛΙΤΙΚΗΣ ΑΕΡΟΠΟΡΙΑΣ Civil Aviation Authority	ΚΑΤΗΓΟΡΙΑ ΑΕΡ/ΦΟΥΣ Class of Aircraft **LARGE AIRPLANE CS-25**

ΠΙΣΤΟΠΟΙΗΤΙΚΟ ΝΗΟΛΟΓΗΣΗΣ
Certificate of Registration

1. ΣΤΟΙΧΕΙΑ ΕΘΝΙΚΟΤΗΤΑΣ & ΝΗΟΛΟΓΗΣΗΣ ή ΚΟΙΝΑ ΣΤΟΙΧΕΙΑ Registration and Nationality marks or common marks **SX - ODS**	2. ΚΑΤΑΣΚΕΥΑΣΤΗΣ Manufacturer **AIRBUS S.A.S.** ΤΥΠΟΣ ΑΕΡ/ΦΟΥΣ Manufacturer's designation **A 320-232**	3. ΑΡΙΘ. ΣΕΙΡΑΣ ΚΑΤΑΣΚΕΥΑΣΤΗ Serial Number **2724**

4. ΟΝΟΜΑ ΙΔΙΟΚΤΗΤΟΥ: Name of Owner: **GPFC IRELAND LIMITED**

5. Δ/ΝΣΗ ΙΔΙΟΚΤΗΤΟΥ : Address of Owner: **Two Park Place, Hatch Street Upper, Dublin 2, Ireland**

6. ΕΚΜΕΤΑΛΕΥΟΜΕΝΟΣ : Operator/ Lessee : **ORANGE2FLY AIRLINES S.A.**
64, Kifissias Avenue, 15125 Marousi, Athens, Greece

7. Με το παρόν πιστοποιείται ότι το πιο πάνω περιγραφόμενο α/φος έχει δεόντως εγγραφεί στο Νηολόγιο της Ελληνικής Δημοκρατίας σύμφωνα με την Σύμβαση περί Διεθνούς Πολιτικής Αεροπορίας, που υπογράφτηκε στις 7 Δεκεμβρίου 1944 και σύμφωνα με την Ελληνική νομοθεσία περί πολιτικής αεροπορίας.

It is hereby certified that the above described aircraft has been duly entered on the Register of the Hellenic Republic in accordance with the convention on International Civil Aviation dated 7 December 1944 and with the Greek legislation on civil aviation.

Ημερομηνία εκδόσεως
Date of Issue

Paris, June 28, 2018

Ο Νηολόγος
The Registrar

Dimitrios Psiachas
Third Secretary of Embassy

Το Πιστοποιητικό Νηολόγησης να συνοδεύει πάντα το αεροσκάφος
It is imperative for the aircraft to have on board the certificate of registration at all times.

5.7 SX-ODS Aircraft Station Licence

HELLENIC REPUBLIC
MINISTRY OF INFRASTRUCTURE AND TRANSPORT
CIVIL AVIATION AUTHORITY
ΑΔΕΙΑ ΣΤΑΘΜΟΥ ΑΕΡΟΣΚΑΦΟΥΣ
AIRCRAFT STATION LICENCE
No. 1301

Περίοδος ισχύος/Period of validity: Από/From 28-06-18 Έως/Till 27-06-21

Σύμφωνα με τις διατάξεις της Διεθνούς Σύμβασης Τηλεπικοινωνιών και του προσαρτημένου σε αυτήν ισχύοντος Κανονισμού Ραδιοεπικοινωνιών, τις διατάξεις του Ν. 3913/11 και την απόφαση υπ. αριθμ. 63142/44869/3-6-1949 Υπ. Αεροπορίας, παρέχουμε άδεια εγκατάστασης και εκμετάλλευσης των παρακάτω περιγραφομένων ραδιοσυσκευών:
In accordance with Law 3913/11 and Resolution No. 63142/4869/3-6-1949 and with the Radio Regulations annexed to the International Telecommunications Convention now in force, this authorization is herewith issued for the installation and use of the radio equipment described below:

ΕΘΝΙΚΟΤΗΤΑ ΚΑΙ ΑΡΙΘΜΟΣ ΝΗΟΛΟΓΙΟΥ AIRCRAFT NATIONALITY AND REGISTRATION MARK	ΧΑΡΑΚΤΗΡΙΣΤΙΚΟ ΚΛΗΣΗΣ CALL SIGN OR OTHER IDENTIFICATION	ΤΥΠΟΣ ΑΕΡΟΣΚΑΦΟΥΣ TYPE OF AIRCRAFT	ΙΔΙΟΚΤΗΤΗΣ ΑΕΡΟΣΚΑΦΟΥΣ OWNER OF AIRCRAFT
ΕΛΛΗΝΙΚΗ/HELLENIC - 15	**SX-ODS**	A320-200	GPFC IRELAND LTD

ΣΥΣΚΕΥΕΣ EQUIPMENT	ΤΥΠΟΣ TYPE	ΙΣΧΥΣ POWER (watts)	ΤΥΠΟΣ ΕΚΠΟΜΠΗΣ CLASS OF EMISSION	ΖΩΝΕΣ ΣΥΧΝΟΤΗΤΩΝ Η ΕΚΧΩΡΗΜΕΝΕΣ ΣΥΧΝΟΤΗΤΕΣ FREQUENCY BANDS OR ASSIGNED FREQUENCIES
ΠΟΜΠΟΔΕΚΤΕΣ TRANCEIVERS				
3.VHF.COM	BENDIX KING RTA 44D	25	AM	118.0-137.0 MHz, FM Imm, 8.33 KHz
2.HF.COM	HONEYWELL 964 0452 001	125	AM	2-29.99 MHz
ΠΟΜΠΟΙ ΣΩΣΤΙΚΩΝ ΣΚΑΦΩΝ SURVIVAL CRAFT TRANSMITTERS				
2 ELT (S)	ADT 406			121.5 / 243 / 406 MHz
ΑΛΛΕΣ ΣΥΣΚΕΥΕΣ OTHER EQUIPMENT				
ELT AF/AP	ADT 406			121.5 / 243 / 406 MHz
2.TNDR	BENDIX-KING TRA-67A			Tx 1090 Rx 1030 MHz
TCAS II 7.1	BENDIX-KING TPA-100B			Tx 1090 Rx 1030 MHz
2.DME	BENDIX-KING DMA-37B			1025-1150 MHz
Wx RADAR	BENDIX-KING RTA-4B			9.345 GHz
2.RADAR ALT	THALES 9599-607-14249			4200-4400 MHz
ULB	DK 120/90			

Ο Χειριστής των τηλεπικοινωνιακών συσκευών πρέπει να είναι κάτοχος πτυχίου ραδιοτηλεφωνητή.
Η παρούσα άδεια και το πτυχίο ραδιοτηλεφωνητή του υπεύθυνου του σταθμού πρέπει να βρίσκονται πάντοτε στο αεροσκάφος και να παρουσιάζονται όταν ζητηθούν στις αρμόδιες Αρχές
The service of an aircraft radiotelephone station shall be performed by an operator holding a Radiotelephone Operator's Certificate.
The operator or person responsible for the aircraft station shall facilitate the examination of the Licence which shall be kept in such a way that it can be produced upon request.

ΠΡΟΣΟΧΗ:
- ΙΣΧΥΟΥΝ ΠΕΡΙΟΡΙΣΜΟΙ ΣΤΙΣ ΠΤΗΣΕΙΣ ΑΕΡΟΣΚΑΦΩΝ ΜΗ ΕΞΟΠΛΙΣΜΕΝΩΝ ΕΙΤΕ ΜΕ ΡΑΔΙΟΣΥΣΚΕΥΕΣ VHF/COM ΔΙΑΥΛΟΠΟΙΗΣΗΣ 8,33KHz, ΕΙΤΕ ΜΕ ΣΥΣΚΕΥΕΣ VHF/COM/NAV ΜΕ ΑΤΡΩΣΙΑ FM, ΕΙΤΕ ΜΕ ΣΥΣΚΕΥΕΣ ELT.

CAUTION:
- RESTRICTIONS APPLY TO THE FLIGHTS OF AIRCRAFT NOT EQUIPPED EITHER WITH 8.33KHz CHANNEL SPACING VHF/COM RADIOS, OR WITH FM IMMUNE VHF COM/NAV RECEIVERS, OR WITH ELT DEVICES.

Αθήνα Athens	27-11-2018

OPERATOR: ORANGE2FLY

Εκδούσα Αρχή/For the issuing Authority
Αναπλ. Προϊστ. Δ/νσης Κανονιστικής Λειτουργίας
Υπηρεσιών Αεροναυτιλίας

G.Gliati