



**AIRCRAFT ACCIDENT
FINAL REPORT
SI 11/17**

**Air Accident Investigation Bureau (AAIB) Ministry of
Transport Malaysia**

**Accident Involving Airbus A320-216
Registration 9M-AHM
at Subang Airport/Sultan Abdul Aziz Shah, Kuala Lumpur
on 30th November 2017**



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**AIR ACCIDENT INVESTIGATION BUREAU (AAIB)
MALAYSIA**

REPORT NO.: SI 11/17

OPERATOR : AIRASIA BERHAD
AIRCRAFT TYPE : AIRBUS A320-216
NATIONALITY : MALAYSIA
REGISTRATION : 9M-AHM
**PLACE OF OCCURRENCE : SUBANG AIRPORT/SULTAN
ABDUL AZIZ SHAH, KUALA LUMPUR**
DATE AND TIME : 30th NOVEMBER 2017 AT 0555 LT

The sole objective of the investigation is the prevention of accidents and incidents. In accordance with Annex 13 to the Convention on International Civil Aviation, it is not the purpose of this investigation to apportion blame or liability.

All-time in this report is Local Time (LT) unless stated otherwise. LT is UTC +8 hours.

INTRODUCTION

The Air Accident Investigation Bureau of Malaysia

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

The AAIB conducts the investigation in accordance with Annex 13 to the Chicago Convention and Civil Aviation Regulations of Malaysia 2016.

It is inappropriate that AAIB reports should be used to assign fault or blame or determine liability since neither the investigation nor the reporting process has been undertaken for that purpose.

Unless otherwise indicated, recommendations in this report are addressed to the investigating or regulatory authorities of the State having responsibility for the matters with which the recommendations are concerned. It is for those authorities to decide what action is taken.

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GLOSSARY OF ABBREVIATIONS

A

AAIB	:	Air Accident Investigation Bureau
AAL	:	Above Aerodrome Level
AD	:	Aerodrome
ADIRU	:	Air Data Inertial Reference Unit
AE	:	Authorized Examiner
AFRS	:	Airport Fire Rescue Services
AIP	:	Aeronautical Information Publication
APU	:	Auxiliary Power Unit
ATC	:	Air Traffic Control
ATCO	:	Air Traffic Control Officer
ATIS	:	Automated Terminal Information Service
ATPL	:	Airline Transport Pilot License
ATS	:	Air Traffic Services
AXM	:	IATA Code for AirAsia Berhad

C

CAPT	:	Captain
CAR	:	Civil Aviation Regulations
CAS	:	Calibrated Air Speed
CAT	:	Category
CG	:	Centre of Gravity
CLB	:	Climb
CONFIG	:	Configuration
CPL	:	Commercial Pilot License
CRC	:	Continuous Repetitive Chime
CVR	:	Cockpit Voice Recorder

D

D1L	:	Door One Left
D1R	:	Door One Right
D2L	:	Door Two Left

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D2R : Door Two Right
DAME : Designated Aviation Medical Examiner
DCA : Department of Civil Aviation
DIIC : Deputy Investigator-in-Charge

E

ECAM : Electronic Centralized Aircraft Monitor
ELAC : Elevator Aileron Computer
ESLD : ECAM System Logic Data
EWD : Engine/Warning Display

F

FCOM : Flight Crew Operating Manual
FCTM : Flight Crew Techniques Manual
FDIMU : Flight Data Interface Management Unit
FDR : Flight Data Recorder
FFS : Full Flight Simulator
FLX/MCT : Flex/Maximum Continuous Thrust
FO : First Officer
FOD : Flight Operations Directives
FT : Feet
FWC : Flight Warning Computer

G

GND : Ground
GS : Ground Speed

H

HDG : Heading
HIALS : High Intensity Approach Lighting System
HIRL : High Intensity Runway Edge Lights

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I

ICAO	:	International Civil Aviation Organisation
IIC	:	Investigator-in-Charge
ILS	:	Instrument Landing System

K

KG	:	Kilogram
KLIA 2	:	Kuala Lumpur International Airport 2
KTS	:	Knots
KUL	:	Kuala Lumpur International Airport

L

LAT	:	Latitude
LH	:	Left Hand
LONG	:	Longitude

M

M	:	Metres
MAA	:	Malaysia AirAsia
MAHB	:	Malaysia Airports Holdings Berhad
MCDU	:	Multipurpose Control and Display Unit
METAR	:	Meteorological Terminal Aviation Routine Weather Report
MHz	:	Mega Hertz
MLG	:	Main Landing Gear
MOR	:	Mandatory Occurrence Report
MR 1 / 2	:	Maintenance Record 1 / 2
MRO	:	Maintenance, Repair and Overhaul
MSN	:	Manufacturer Serial Number

N

N/A	:	Not applicable
ND	:	Navigation Display
NLG	:	Nose Landing Gear

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NM : Nautical Mile

O

OM-D : Operations Manual Part D

OR : Organisation Requirements

P

PAPI : Precision Approach Path Indicator

PIC : Pilot-in-Command

PF : Pilot Flying

PFD : Primary Flight Display

PFR : Post Flight Report

PM : Pilot Monitoring

Q

QAR : Quick Access Recorder

R

RA : Radio Altimeter

RESA : Runway End Safety Area

RET : Retracted

RH : Right Hand

RTO : Rejected Take-off

RWY : Runway

S

SEC : Spoiler Elevator Computer

SOP : Standard Operating Procedures

SPD BRK : Speed brakes

STD : Standard Time of Departure

SZB : Sultan Azlan Shah, Subang Airport

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T

TLA	:	Thrust Lever Angle
TRE	:	Type Rating Examiner
TO	:	Take-off
TOGA	:	Take-Off – Go-Around

U

U/S	:	Unserviceable
UTC	:	Universal Time Coordinated

V

V1	:	Decision Speed
Vapp	:	Approach Speed
VHF	:	Very High Frequency

W

WMKK	:	Kuala Lumpur International Airport
WMSA	:	Subang / Sultan Abdul Aziz Shah Airport
W/O	:	Workorder

SYNOPSIS

On 30th November 2017, an Airbus A320-216 aircraft with the registration 9M-AHM was being operated by AirAsia Berhad as an Aircraft Base Training (Endorsement) flight, performing Touch and Go exercises at Subang International Airport (WMSA/SZB) in Kuala Lumpur with three crew on-board. Aircraft departed from Kuala Lumpur International Airport (WMKK/KUL) and was performing its Touch and Go training on Runway 15. At 0555 LT, upon touchdown on its third Touch and Go exercise, the Pilot-in-Command rejected the take-off after setting take-off thrusts. The aircraft did not manage to stop before the end of the runway and departed the runway surface into an open muddy field. The aircraft came to a complete stop at approximately 62 metres from the end of the runway and approximately 15 metres from the ILS Localizer Antenna Array. None of the 3 crew members were injured. Evacuation was not deemed necessary however the crew deplaned the aircraft via the escape slides and was transported to the AFRS facility in SZB.

1.0 FACTUAL INFORMATION

1.1 History of the Flight

On 30th November 2017, an Airbus A320-216 aircraft with the registration 9M-AHM was being operated by AirAsia Berhad as an **AirAsia Endorsement Flight Policy / Touch and Go Procedure (Appendix C)**. For endorsement flights, the trainee will be flying the actual aircraft for the first time, under supervision of a type rating examiner, after completing his ground-based training.

This particular flight was performing Touch and Go exercises at Subang Airport (WMSA) in Kuala Lumpur with three crew on-board. Aircraft departed from Kuala Lumpur International Airport (WMKK) approximately 25NM southeast of Subang and the training involves performing visual circuit patterns for the trainee to complete at least 6 landings, as per the Operator's training manual (MAA Operations Manual Part D).

1.2 Injuries to Persons

Injuries	Crew	Passenger	Others
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor	Nil	Nil	Nil
None	3	Nil	Nil

Figure 1: Injuries to persons

1.3 Damage to Aircraft

Aircraft was secured and initial assessment was carried out on the aircraft condition and position. The aircraft removal process started at 12:00 LT on 30th November 2017. Aircraft was successfully removed from the unpaved area at 15:00 LT on the 1st of December. At 17:20 LT on the 1st of December, the aircraft was already towed to a nearby MRO hangar in SZB for **Engineering Initial Assessment Report as per Appendix D**.

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Initial Aircraft Damage Assessment	
Airframe	Fuselage-sign of long cut on LH aft lower belly fairing
	Both LH landing gear mainwheel found deflated
Engine no 1	Signs of mud and soil ingestion into engine. 2 fan blades found with bent and cut respectively.
Engine no 2	Signs of mud and soil ingestion into engine

Figure 2: Damage to aircraft



Figure 3: Long cut on LH Aft Lower Belly Fairing



Figure 4: Left main landing gear



Figure 5: Right main landing gear



Figure 6: Engine 2



Figure 7: Engine 1

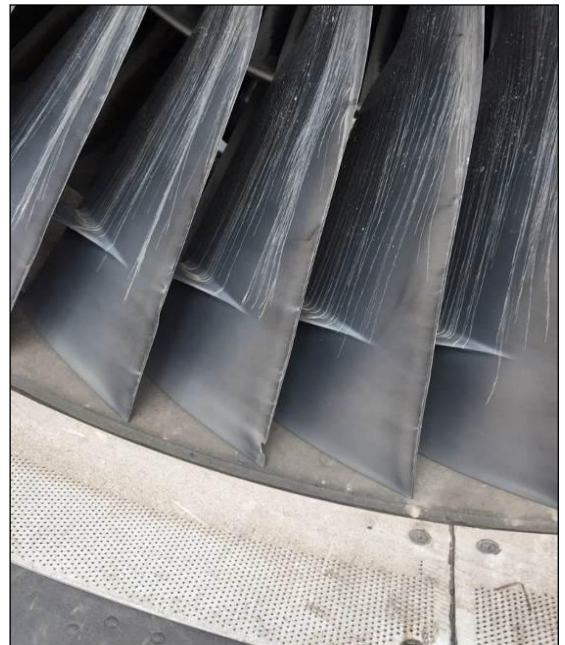


Figure 8: Engine Fan Blades

1.4 Other Damages

Initial Assessment of Other Damages

During the issuance of this report, only the initial **Assessment Of Other Damages as per Appendix E** is available because the final assessment involves numerous other parties outside the purview of the investigation team. Final assessment of the damages shall be supplemented to this report if deemed necessary in the future.

Other Damage Assessment (Initial)	
Telekom Malaysia	- Damaged Near Field antenna and cabling system
MAHB Engineering	- Cabling System – 1-unit concrete light canister - 1unit approach light pole - Soil and Slope Contour

Figure 9: Other Damage Assessment

1.5 Personal Information

All crew had sufficient rest according to their roster analysis and did not experience any significant issues on the day of the flight

1.5.1 Pilot-in-Command (PIC/CAPT)

Status	PIC/Capt
Nationality	Malaysian
Age	57 years old
Gender	Male
Licence Type	ATPL 1656
Licence Validity	Valid until 31 March 2018
Total Hours Operating on Type	8,897
Total Flying Hours	17,697
Rest Period Since Last Flight	> 24 hours
Medical Expiry Date	31 March 2018

Figure 10: Pilot-in-Command

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The CAPT is a DCA Authorized Examiner (AE) and a Type Rating Examiner (TRE) with 21 years of experience in AirAsia. He has been an AE since 2007. Under this capacity, he has significant experience in conducting endorsement flights. On this flight, the CAPT was occupying the left seat as the TRE and Pilot Monitoring (PM) but was also responsible for all the critical actions and procedures apart from conducting the training for the Co-Pilot.

The CAPT was diagnosed as a diabetic 3 years ago and was on prescription medication but is certified as fit to fly with a Class 1 Medical License with which the medication for his diabetic was also prescribed by a Designated Aviation Medical Examiner (DAME).

1.5.2 Co-Pilot (Trainee)

Status	Co-Pilot (Trainee)
Nationality	Malaysian
Age	27 years old
Gender	Male
Licence Type	CPL 6558
Licence Validity	Valid until 31 April 2018
Total Hours Operating on Type	N/A
Total Flying Hours	170
Rest Period Since Last Flight	> 24 hours
Medical Expiry Date	23 March 2018

Figure 11: Co-Pilot

The Trainee was on his first flight on an actual A320 and was occupying the right seat as the Pilot Flying (PF). He had just cleared his initial Type Rating Skill Test on the 23rd of November 2017 (7 days prior to incident) and was to complete this endorsement flight for the issuance of his A320 Type Rating. He was previously a Cabin Crew with AirAsia and had received his Commercial Pilot's

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License (CPL) on the 08th of August 2017. His record shows that he had very good progress during his training period. Apart from requiring corrective lenses, the Trainee had no significant medical histories

1.5.3 Safety Pilot

Status	Safety Pilot
Nationality	Malaysian
Age	23 years old
Gender	Male
Licence Type	CPL 6119
Licence Validity	Valid until 31 March 2018
Total Hours Operating on Type	1040.58
Total Flying Hours	1211.28
Rest Period Since Last Flight	> 24 hours
Medical Expiry Date	31 March 2018

Figure 12: Safety Pilot

The safety pilot is a First Officer with 3 years of flying experience and was a CPL holder. He joined AirAsia in 2016 and received his A320 Type Rating on the 7th of October 2016. This was his first time as a safety pilot on an endorsement flight. He had done one previous safety pilot duty on a line training flight. The Safety Pilot is long-sighted and was not wearing his reading glasses at the time of the event.

1.6 Aircraft Information

1.6.1 General

Aircraft Manufacturer	Airbus Industries, France
Aircraft Model / Type	A320-216
Aircraft MSN	3536
Date of Manufacture	1 July 2008
Aircraft Registration	9M-AHM
Certificate of Registration Valid till	22 June 2019
Certificate of Airworthiness till	30 June 2018
Aircraft Owner	Parilease SAS 41, Avenue De L'Opera 75002 Paris, France
Aircraft Operator	AirAsia Berhad
Time Since New	33980:30
Cycle Since New	22334

Figure 13: Aircraft Information

1.6.2 Engine & APU

Engine Type	Turbofan	
Manufacturer	SNECMA	
Model	CFM56-5B6/3	
	Engine No. 1	Engine No. 2
Serial No.	697874	699198
Time Since New	28109:22	29838:51
Cycle Since New	18488	20073

Figure 14: Engine information

APU	GTCP 131-9(A)
Serial No.	P-5681
Time Since New	9114
Cycle Since New	11126
APU cycle	22367

Figure 15: APU information

1.6.3 Defects

Based on the report from the operator for the previous one year, no outstanding defects were found. There are also no significant recurring defects. Analysis of the Post Flight Report (PFR) for this flight indicated no significant faults or failures of aircraft systems at the time preceding, during and after the incident (see figure 16).

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Figure 16: PFR printout after the flight

1.6.4 Aircraft Load

Refer to **Appendix F for Flight Documents**

Maximum Take-off Weight	73500 kg
Actual Take-off Weight / CG	52897.97 kg / 24.6%
Maximum Landing Weight	66000 kg
Actual Landing Weight / CG	51464.85 kg / 28.0%
Fuel On Board at Departure	10147.46 kg

Figure 17: Aircraft load and balance

Aircraft load and balance did not indicate anything abnormal. During the incident, all the aircraft's weight and trim were within the normal parameters.

1.6.4 Operational Procedures

a. Touch and Go Procedure

A Touch and Go involves landing the aircraft and immediately continuing with the next take-off without stopping the aircraft. After the touchdown, the crew will immediately set the aircraft's configuration for the take-off and set take-off power again. Speeds are very high during a Touch and Go and time is critical as distance of the runway is used significantly. The Touch and Go procedure adopted by the Operator (figure 18) in the training manual are consistent with the recommended procedures from Airbus in the Flight Crew Techniques Manual.

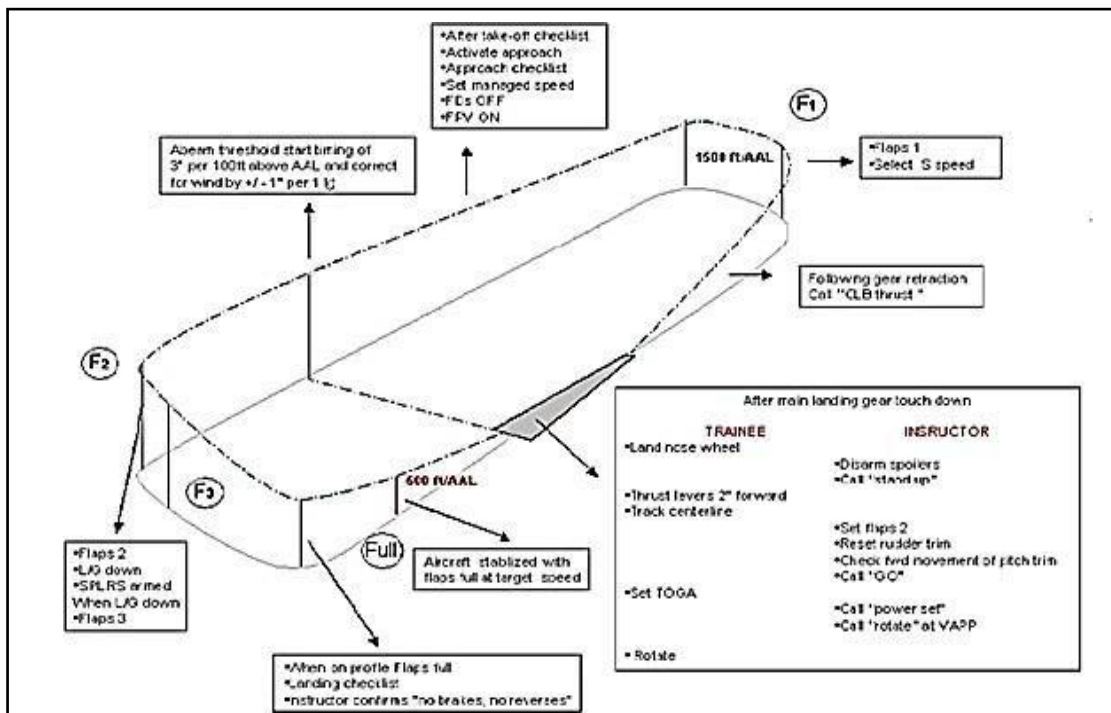


Figure 18: AirAsia Touch and Go procedure (Operations Manual - Part D: 1.2E Aircraft Base Training (Endorsement))

One of the procedures required that is pertinent to this incident is the disarming of the ground spoilers upon touchdown by the „Instructor“. This procedure is intended to expedite the retraction of the spoiler surfaces¹¹. It was found that on this flight, the speed brake levers were inadvertently extended after this disarming action was done (see 1.6.5.a).

(i). Aircraft performance on Touch and Go

Apart from the manufacturer's guidance for procedures of the Touch and Go, there is no other available guidance on the performance data of the aircraft during a Touch and Go, such as performance speeds and Accelerate/Stop distance calculations. Airbus has stated under the same documentation that on a touch and go, rotation of the aircraft can be done at Vapp but no guidance is given with regards to the runway length considerations in the event of a discontinued touch and go.

There are no V1 or decision speeds available during a Touch and Go and Airbus has recommended that the crew be "Go-Minded" especially after TOGA power has been set (see figure 19) but setting of TOGA power may occur at any speed and does not directly determine the accelerate/stop distances of the aircraft. Critical failures may still occur at low speeds (before Vapp or recommended rotation speed) after application of TOGA on a Touch and Go. Likewise, if TOGA application is delayed for any reason, critical failure may occur at high speed before application of TOGA and there are no calculations to ensure that the runway will be sufficient for the abort. On a normal rejected take-off, the manufacturer is very clear that after decision speed (V1) take-off must be continued under any circumstances due to possibility of insufficient runway.

The flight crew should pay attention to the following remarks when they perform a touch and go:

- The decision speed (V1) does not apply to touch and go. The PFD does not display V1 during the roll phase of a touch and go. Therefore, the flight crew should be go-minded.
- If the instructor wants to abandon the touch and go, the instructor calls "STOP – I HAVE CONTROL". Simultaneously the instructor takes control and stops the aircraft, with the use of maximum braking and reverse. When the aircraft stops, the instructor calls for any applicable ECAM actions. The decision to discontinue a touch and go after the application of TOGA must only be taken if the instructor is sure that the aircraft cannot safely fly.

Figure 19: A320 Flight Crew Techniques Manual PR-NP-SP: Touch and Go

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• **Above 100 kt, and below V1:**
Rejecting the takeoff at these speeds is a more serious matter, particularly on slippery runways. It could lead to a hazardous situation, if the speed is approaching V1. At these speeds, the Captain should be "go-minded" and very few situations should lead to the decision to reject the takeoff.

1. Fire warning, or severe damage
2. Sudden loss of engine thrust
3. Malfunctions or conditions that give unambiguous indications that the aircraft will not fly safely
4. Any red ECAM warning
5. Any amber ECAM caution listed below:
 - F/CTL SIDESTICK FAULT
 - ENG FAIL
 - ENG REVERSER FAULT
 - ENG REVERSE UNLOCKED
 - ENG 1(2) THR LEVER FAULT

Exceeding the EGT red line or nose gear vibration should not result in the decision to reject takeoff above 100 kt. In case of tire failure between V1 minus 20 kt and V1, unless debris from the tires has caused serious engine anomalies, it is far better to get airborne, reduce the fuel load, and land with a full runway length available. The V1 call has precedence over any other call.

• **Above V1:**
Takeoff must be continued, because it may not be possible to stop the aircraft on the remaining runway.

Figure 20: A320 Flight Crew Techniques Manual PR-AEP-SP-MISC: Rejected Take-off

(ii) Discontinuing Touch and Go after TOGA

The Operator has stated in its training manual that the decision to discontinue the Touch and Go after application of TOGA must only be taken if the instructor is certain that the aircraft cannot fly safely (see figure 21), consistent with the manufacturer's recommendation. Maximum braking and reverse must be used. The title "take off abort after touch and go" is also written as a reminder for the instructor to discuss.

• **Emergencies :**

If the instructor wishes to abandon the touch and go, he/she will call "STOP" simultaneously taking control of the aircraft and bring it to a halt using maximum braking and reverse. Once the aircraft has stopped he will call for any appropriate ECAM actions. The decision to discontinue a touch and go after the application of TOGA must only be taken if the instructor is certain that the aircraft cannot fly safely. Remember there is no V_1 on a touch and go.

Note: The take-off configuration warning may sound if the application of TOGA is made while the flaps or pitch trim are resetting but still outside of the takeoff range.

Figure 21: MAA Operations Manual - Part D: 1.2E Aircraft Base Training (Endorsements)

1.6.5 Aircraft Systems with Bearing on the Incident

All reference of flight data in this subchapter shall be read together with the flight data parameters and timeline in **Flight Data Recording as per Appendix G.**

a. Take-off Configuration (TO Config) Warning Triggered

It was initially suspected that during the application of take-off power, at the time of incident, a “TO Config Warning” was triggered. This is a warning that would be triggered if the aircraft is not in the correct take-off configuration, when either the TO CONFIG TEST is done or when take-off power (above CLB detent) is applied.

The investigation found that there was in fact a TO Config Warning that was triggered 3 seconds after the thrust’s levers were set to take-off power setting at time 05:44:43 LT. The TO Config Warning appeared at 05:44:46 LT while the aircraft was already at 136kts, 6kts above its Vapp speed of 130kts.

It was also found that the warning was due to the speed brakes lever which was not in retracted position when take-off power was applied. CVR audio during and after the incident also indicates that the crew was not sure what was happening when the warning was triggered, but knew that it was something to do with the speed brakes.

(i). Flight Warning Computer and TO Config Warning

This warning is given by the Flight Warning Computer (FWC) when one of the conditions listed in the Flight Crew Operating Manual occurs and its triggering logic is dependent upon the FWC Software Standard and Modification status. The aircraft’s FWC information is as follows:

Hardware / Software	H2/F9D
PN Number	350E053021818
Modification Number	161832

Figure 22: Aircraft Flight Warning Computer information

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If the warning is triggered, the flight crew will be alerted with a Continuous Repetitive Chime (CRC) in the cockpit accompanied by a “MASTER WARN” flashing red light on both the CAPT and FO side of the glare shield. A red Warning Message indicating the system which is not in the correct TO Config will also be displayed on the E/WD (see figure 23).

Flight data shows that a Master Warning event was recorded on the FDR at 05:55:46 LT, approximately 2 seconds after both thrust levers were above CLB detent (see figure 24 and 25). It was extinguished at 05:55:55 LT, after 11 seconds and it was simultaneous with the initiation of the rejected take-off.

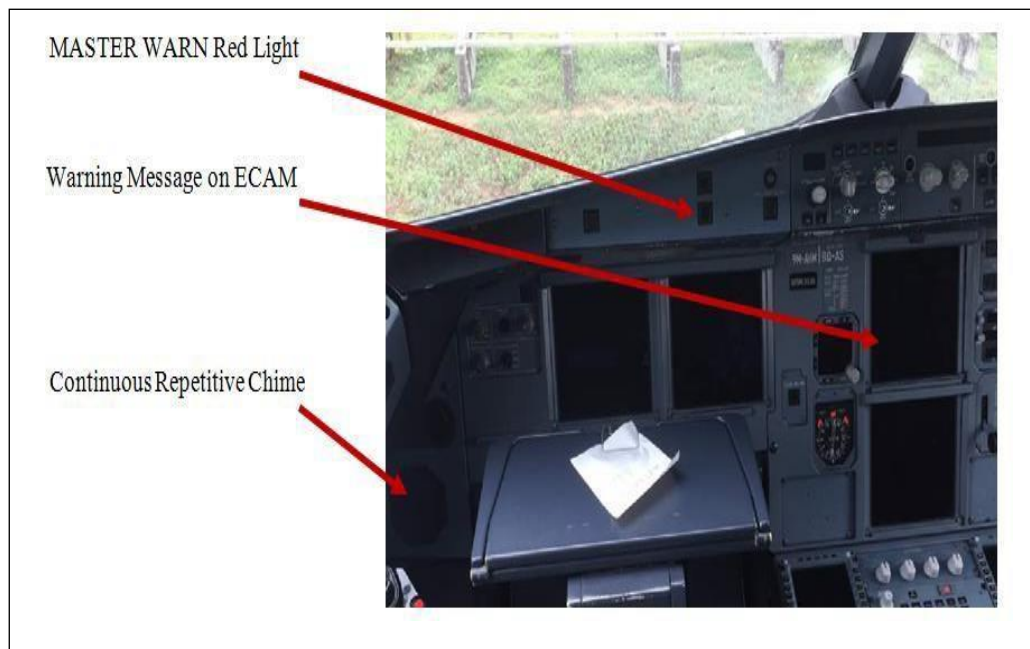


Figure 23: "TO Config Warning" indications in the flight deck

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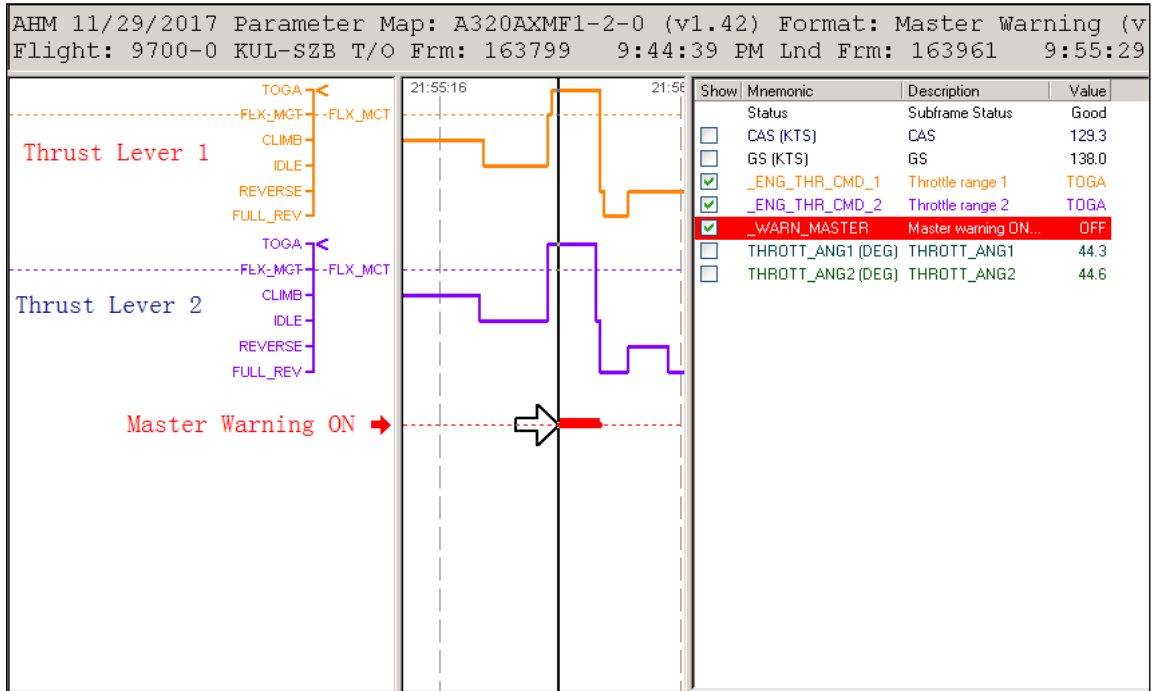


Figure 24: FDR (A Master Warning event was recorded on the FDR at 21:55:46 UTC, approximately 2 seconds after both thrust levers were set at above CLB detent)

AHM 11/29/2017 Parameter Map: A320AXMF1-2-0 (v1.42) Format: Master Warning (v1.00) Parameters: 7 Flight: 9700-0 KUL-SZB T/O Frm: 163799 9:44:39 PM Lnd Frm: 163961 9:55:29 PM

Frame-St	SfCount	Time St	CAS KTS	GS KTS	Throttle range 1 _ENG_THR_CMD_1	Throttle range 2 _ENG_THR_CMD_2	Master warning ON/OFF _WARN_MASTER	THROTT_ANGLE1 DEG (a)	THROTT_ANGLE2 DEG (b)
163962-4	655851	21:55:35	116.5	130.0	IDLE	IDLE	OFF	11.3	10.9
163963-1	655852	21:55:36	115.1	129.0	IDLE	IDLE	OFF	11.3	10.9
163963-2	655853	21:55:37	113.4	128.0	IDLE	IDLE	OFF	11.3	10.9
163963-3	655854	21:55:38	114.1	128.0	IDLE	IDLE	OFF	11.3	10.9
163963-4	655855	21:55:39	115.5	128.0	IDLE	IDLE	OFF	11.3	10.9
163964-1	655856	21:55:40	117.6	129.0	IDLE	IDLE	OFF	11.3	10.9
163964-2	655857	21:55:41	117.4	129.0	IDLE	IDLE	OFF	11.3	10.9
163964-3	655858	21:55:42	116.6	130.0	IDLE	IDLE	OFF	11.3	14.8
163964-4	655859	21:55:43	121.4	132.0	FLX MCT	TOGA	OFF	31.6	44.6
163965-1	655860	21:55:44	125.8	134.0	TOGA	TOGA	OFF	44.3	44.6
163965-2	655861	21:55:45	129.3	138.0	TOGA	TOGA	OFF	44.3	44.6
163965-3	655862	21:55:46	135.8	142.0	TOGA	TOGA	ON	44.3	44.6
163965-4	655863	21:55:47	139.6	150.0	TOGA	TOGA	ON	44.3	44.6
163966-1	655864	21:55:48	144.0	154.0	TOGA	TOGA	ON	44.3	44.6
163966-2	655865	21:55:49	149.4	158.0	TOGA	TOGA	ON	44.3	44.6
163966-3	655866	21:55:50	153.5	161.0	TOGA	TOGA	ON	44.3	44.6
163966-4	655867	21:55:51	157.5	169.0	TOGA	TOGA	ON	44.3	44.6
163967-1	655868	21:55:52	162.9	172.0	TOGA	TOGA	ON	44.3	44.6
163967-2	655869	21:55:53	166.8	176.0	TOGA	TOGA	ON	44.3	44.6
163967-3	655870	21:55:54	171.8	179.0	TOGA	TOGA	ON	44.3	44.6
163967-4	655871	21:55:55	174.4	185.0	TOGA	IDLE	ON	44.3	-0.4
163968-1	655872	21:55:56	170.4	187.0	REVERSE	FULL_REV	OFF	-10.2	-20.0
163968-2	655873	21:55:57	159.4	185.0	FULL_REV	FULL_REV	OFF	-20.4	-20.0
163968-3	655874	21:55:58	150.8	180.0	FULL_REV	FULL_REV	OFF	-20.4	-20.0
163968-4	655875	21:55:59	144.3	170.0	FULL_REV	FULL_REV	OFF	-20.4	-20.0
163969-1	655876	21:56:00	139.9	164.0	FULL_REV	FULL_REV	OFF	-20.4	-20.0
163969-2	655877	21:56:01	133.0	159.0	FULL_REV	FULL_REV	OFF	-20.4	-20.0

Application of Takeoff Power (TOGA or FLEX MCT) →

MASTER WARNING TRIGGERED →

Figure 25: FDR (Master Warning triggered after application of take-off power)

ii. Spoilers / Speed Brakes

The aircraft has 5 spoiler surfaces on each wing, used as speed brakes as well as to assist in roll control in flight or as spoilers on the ground. These spoiler surfaces are controlled by a lever on the centre pedestal which sends electrical signals to the Spoiler Elevator Computer (SECs) and are actuated hydraulically. Movement of the speed brake lever aft-ward will command the extension of number 2, 3 and 4 spoiler surfaces to act as speed brakes. The levers are free moving with no detents. Any movement of the speed brake levers by more than 0° will trigger an extension command to the SECs (see figure 26).

LEVER POSITION	SPEEDBRAKE ANGLE (deg)
ARMED	-3
RET	0
1/2	+28.5
FULL	+57

Figure 26: A320 Aircraft Maintenance Manual 27-60-00: Spoiler (Speed Brake Lever Position / Angle)

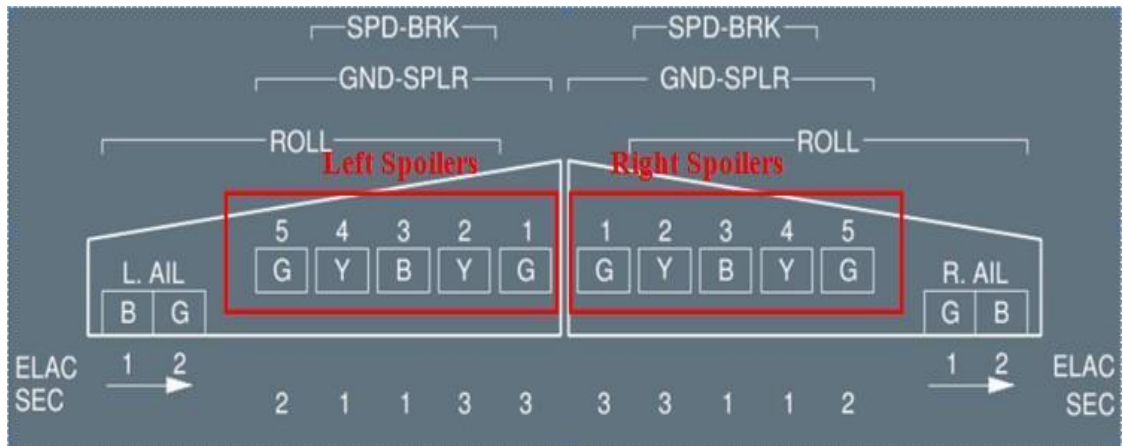


Figure 27: A320 Flight Crew Operating Manual DSC 27-10-20: Speed Brakes and Ground Spoilers (General Architecture of the A320 spoiler surfaces)

Note:

G – Green Hydraulics, Y – Yellow Hydraulics, B – Blue Hydraulics

The ground spoiler's system on the other hand involves the automatic deployment of all spoiler surfaces on the ground when the aircraft touches down and this system can be armed by pulling the speed brake lever UP into the armed position. Disarming is either automatic under certain conditions or manually by pushing the speed brake lever DOWN into the disarmed position (see figure 28).

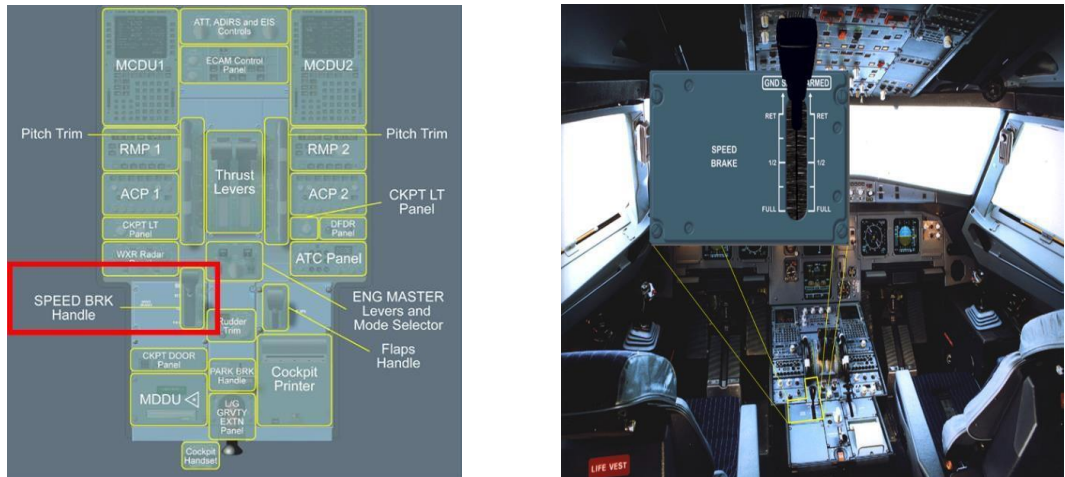


Figure 28: Speed brake lever location in flightdeck

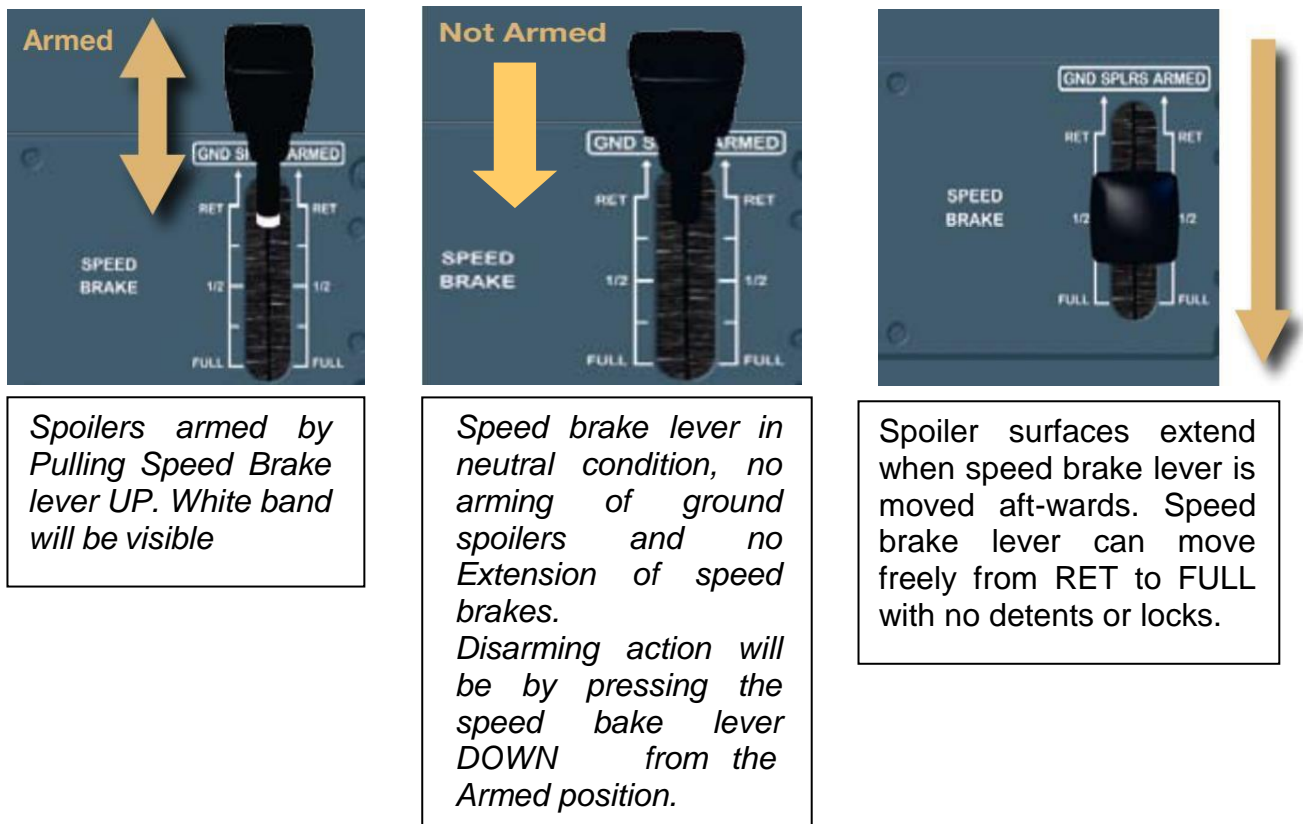


Figure 29: Speed brake lever arming, disarming and extension mechanism

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Due to the free movement of the speed brake levers and the same direction of physical force application to disarm and move the speed brake lever, an accidental movement of the lever may occur during the disarming. Airbus has already documented this risk of accidental extension in its recommended Touch and Go procedures, and has advised for caution to be applied (see figure 30). This risk is however not given similar emphasis or reference in the Operator’s training manual.

1. At nosewheel touchdown, the instructor pushes on the SPEED BRAKE lever to disarm the ground spoilers. The objective is to initiate the immediate retraction of the ground spoilers, and not to wait for their automatic retraction while the thrust levers are advanced.
Carefully disarm the ground spoilers, so that the SPEED BRAKE lever is not moved. If the SPEED BRAKE lever is not in the fully-retracted position, the **CONFIG SPEED BRAKES NOT RETRACTED** alert will appear and the SPEED BRAKE lever will possibly command speed brakes extension. As per aircraft design, ground spoilers automatically retract when thrust levers are set above CLB detent.

Figure 30: A320 Flight Crew Techniques Manual PR-NP-SP: Touch and Go (caution for accidental movement of the speed brakes during the disarming action)

iii. Speed Brake Lever Handling on Touch and Go

The manufacturer’s documented Touch and Go procedures shows that the aircraft would land with the speed brake levers in ARMED position. After touchdown, the Ground Spoilers will automatically deploy. The CAPT will then disarm the spoilers by pushing on the speed brake levers before commencing the take-off. On this flight however, the speed brake lever did not return to retracted position (0°) after the disarming, compared to the previous Touch and Go, instead the lever went to a slightly extended position of +3° **(See Flight Data Recording as per Appendix G)**

PHASE	SPEED BRAKE LEVER		
	On Touchdown	After Disarming	At Take-off Power
First Touch and Go	ARMED / -3°	RETRACTED / 0°	RETRACTED / 0°
Second Touch and Go	ARMED / -3°	RETRACTED / 0°	RETRACTED / 0°
Third Touch and Go	ARMED / -3°	EXTENDED / +3°	EXTENDED / +3°

Figure 31: Comparison of speed brake lever parameter after disarming action with the preceding Touch and Go

iv. **“CONFIG Spd Brk Not Retracted” Configuration Warning**

The specific TO Config Warning that was triggered on this flight and the actual warning message displayed on the EWD could not be determined as the message itself is not recorded on the FDR or FDIMU, however the investigation found that at the specific time when the Master Warning was triggered, all other parameters were normal except for the ground spoilers/speed brake.

When take-off power is applied (thrust levers are above CLB detent), the spoilers/speed brake lever must be fully retracted and any speed brake extension command will trigger the TO Config warning.

FDR data showed that on this flight, when take-off power was set, the speed brake lever was at +3° (extended) deflection instead of 0° (retracted) (see figure 33) At the same time, the actual angles of the spoiler surfaces were also showing that they were partially extended. This was found to be the cause that had triggered the TO Config warning and was not due to any faults or system failures which was corroborated with the aircraft’s Post Flight Report which did not receive any fault messages.

At Take-off Power Application (21:55:43 UTC)		
Thrust Lever 1 Detent / TLA	FLXMCT / 31.6°	
Thrust Lever 2 Detent / TLA	TOGA / 44.7°	
Speed Brake Lever Angle	+3°	
Spoiler Angles	Left Spoilers	Right Spoilers
Spoiler 2 Angle	+0.1°	+0.2°
Spoiler 3 Angle	-0.2°	-0.2°
Spoiler 4 Angle	-0.4°	-0.4°
Spoiler 5 Angle	0.0°	0.0°

Figure 32: Speed brake lever and spoiler angles at application of take-off power (21:55:43 UTC)

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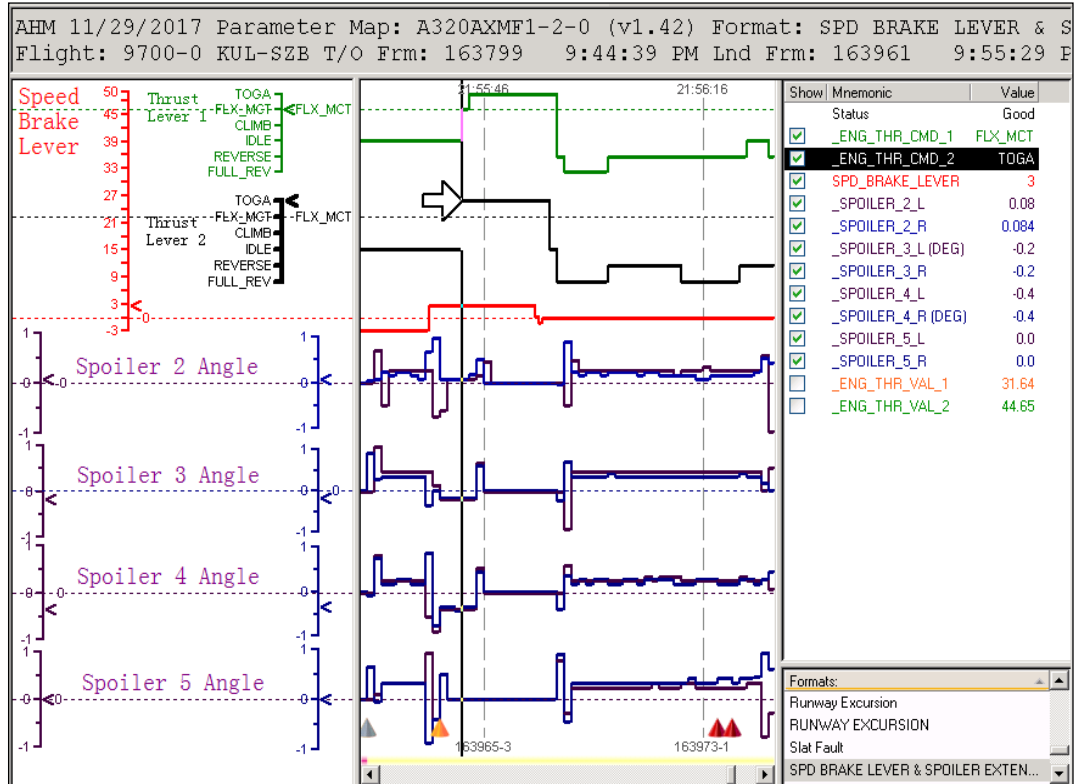


Figure 33: Speed brake lever and corresponding spoiler surface angle at application of take-off power (21:55:44 UTC)

b) Auto Retraction of Spoilers at Take-off Thrusts

Despite the triggering of the TO Config warning, all documentations by the manufacturer indicates that the aircraft was still safe for take-off. As per Airbus, when thrust levers are advanced to take-off power setting which is above FLX/MCT detent, or more than 20° during a Touch and Go, all spoiler surfaces will automatically retract fully regardless of what the speed brake lever is set at. Flight Data confirms that this feature did not fail on this flight where 4 seconds after thrust levers were set above MCT Detent, all spoiler surfaces had fully retracted automatically at while the speed brake lever remained at extended position (see figure 34).

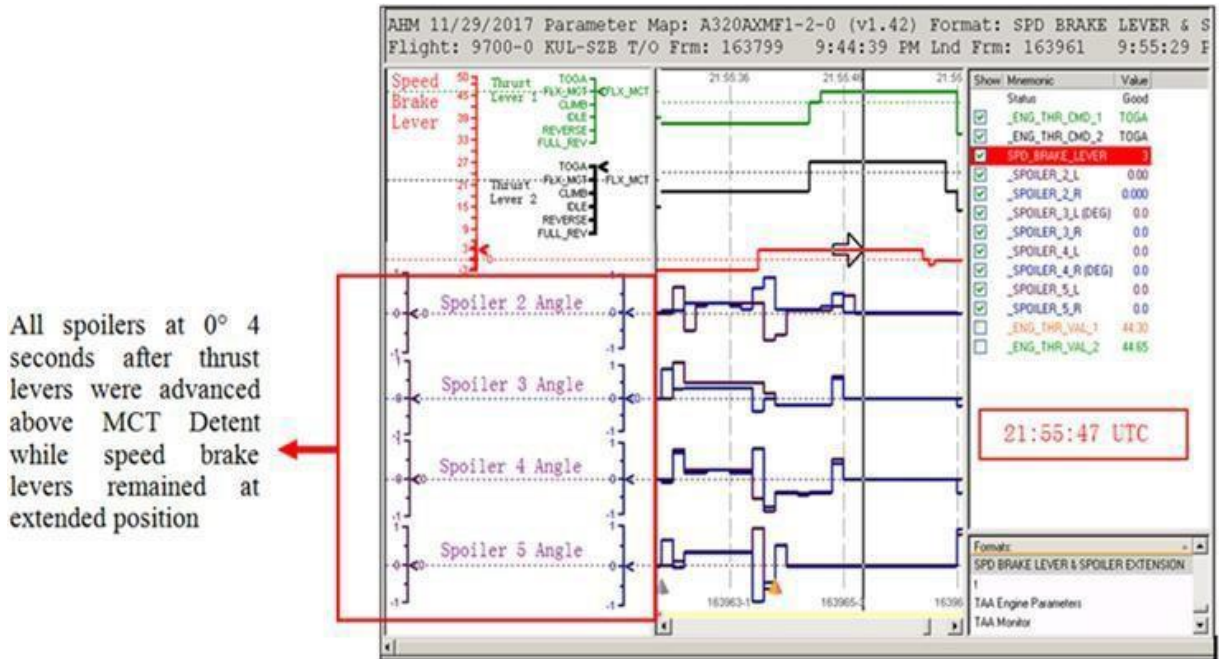


Figure 34: L FDR (Speed brake lever and corresponding spoiler surface angle at application of take-off power 21:55:44 UTC)

This safety feature is described in detail for Touch and Go Exercises in the manufacturer’s Flight Crew Techniques Manual as an assurance that even if the “CONFIG Speed Brake Not Retracted” Warning is triggered, the aircraft design ensures that the spoiler surfaces will retract automatically after thrusts are increased above CLB detent as a safety feature.

The Operator’s training manual does mention the automatic retraction of spoiler surfaces at take-off power but not within the context similar to the caution given by the manufacturer. (See figure 35 and 36). It is also listed as a topic to discuss under item 16 of the “Topics to be discussed” but is only briefly mentioned with no other details such as an FCTM reference for that specific situation.

- The detailed procedure is explained in item “e. Touch and Go”. To summarize, upon landing, at nose wheel touch down, the TRI will disarm the spoilers by pushing on the speed brake lever to initiate the retraction sooner. The purpose of this procedure instead of waiting for the automatic retraction while advancing the thrust levers is due to the physical position of the thrust levers. Depending on the Fly-By-Wire aircraft, the automatic retraction will start between a TLA ranging from 20° up to 35°, which is well above the setting for spool up of the engines.

Figure 35: MAA Operations Manual - Part D 1.2E: Aircraft Base Training (Endorsement)

1. At nosewheel touchdown, the instructor pushes on the SPEED BRAKE lever to disarm the ground spoilers. The objective is to initiate the immediate retraction of the ground spoilers, and not to wait for their automatic retraction while the thrust levers are advanced.
Carefully disarm the ground spoilers, so that the SPEED BRAKE lever is not moved. If the SPEED BRAKE lever is not in the fully-retracted position, the **CONFIG SPEED BRAKES NOT RETRACTED** alert will appear and the SPEED BRAKE lever will possibly command speed brakes extension. As per aircraft design, ground spoilers automatically retract when thrust levers are set above CLB detent.

Figure 36: A320 FCTM PR-NP-SP: Touch and Go

c) Speed Brake Lever Stowed before Rejected Take-off

Based on the flight data, after the master warning was triggered, simultaneous with the confusion recorded in the CVR, the crew had tried to disarm / move the speed brake lever again and again to try and extinguish the master warning. This happened within the 9 seconds lapse between the TO Config warning and the rejected take-off initiation. The speed brake lever was eventually retracted back to 0° at 05:55:56 LT, 3 seconds before the CAPT announced “I have controls”, however the spoiler surfaces were already fully retracted 5 seconds before that at 05:55:47 LT. Rejected take-off was initiated at 05:55:55 LT. At the time the rejected take-off was performed, the spoilers had fully retracted and the speed brake lever was already back to 0° (retracted) position

Crew's Attention on the Speed Brake Lever		
TIME	EVENT	SPEED BRAKE LEVER
21:55:43	TOGA power was set	+3°
21:55:46	TO Config warning was triggered	+3°
21:55:47	All spoiler surfaces fully retracted automatically due to application of take-off power	+3°
21:55:52	Speed brake lever moved	0°
21:55:55	Rejected take-off simultaneous with end of TO Config warning	0°

Figure 37: Crew moved the speed brake lever back to retracted position

d) Braking and Reversers

Flight data showed that all the brakes and both reversers were fully functional and serviceable during the deceleration after the reject take-off

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was initiated at 05:55:55 LT. Examination of the brake pressures, brake pedals and reverser engagement parameters were satisfactory.

In a Touch and Go procedure, Airbus has recommended that maximum braking and reverse be used (see figure 38). This recommendation is also incorporated into the Operator's training manual. Consistent with that, under a normal reject take-off procedure, airbus recommends that Full Reversers may be used until the aircraft comes to a complete stop during a rejected take-off, but if there is enough runway available at the end of the deceleration, idle reversers can be used when passing 70 kts. (See figure 39).

If the instructor wants to abandon the touch and go, the instructor calls "STOP – I HAVE CONTROL". Simultaneously the instructor takes control and stops the aircraft, with the use of maximum braking and reverse. When the aircraft stops, the instructor calls for any applicable ECAM actions. The decision to discontinue a touch and go after the application of TOGA must only be taken if the instructor is sure that the aircraft cannot safely fly.

Figure 38: Flight Crew Techniques Manual PR-NP-SP: Touch and Go (recommendation for use of maximum braking and reverse after rejecting a take-off roll on a Touch and Go)

Full reverse may be used until coming to a complete stop. But, if there is enough runway available at the end of the deceleration, it is preferable to reduce reverse thrust when passing 70 kt

Figure 39: Flight Crew Techniques Manual PR-AEP-MISC: Rejected Take-off

Flight data for this incident showed that the Full Reversers were used from initiation of reject take-off (05:55:55 LT) only until passing 114kts or groundspeed of 137kts (05:56:03 LT). It was then retarded to Idle Reverse for 10 seconds before full reversers were applied again (05:56:13 LT) approximately 10 seconds until aircraft has stopped at 05:56:23 LT. **(See Flight Data Recording as per Appendix G).**

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AHM 11/29/2017 Parameter Map: A320AXMF1-2-0 (v1.42) Format: Master War
 Flight: 9700-0 KUL-SZB T/O Frm: 163799 9:44:39 PM Lnd Frm: 163961

Frame-Sf	SfCount	Time	St	CAS CAS KTS	GS GS KTS	Throttle range 1 _ENG_THR_CMD_1	Throttle range 2 _ENG_THR_CMD_2
163967-2	655869	21:55:53		166.8	176.0	TOGA	TOGA
163967-3	655870	21:55:54		171.8	179.0	TOGA	TOGA
163967-4	655871	21:55:55		174.4	185.0	TOGA	IDLE
163968-1	655872	21:55:56		170.4	187.0	REVERSE	FULL REV
163968-2	655873	21:55:57		159.4	185.0	FULL_REV	FULL_REV
163968-3	655874	21:55:58		150.8	180.0	FULL_REV	FULL_REV
163968-4	655875	21:55:59		144.3	170.0	FULL_REV	FULL_REV
163969-1	655876	21:56:00		139.9	164.0	FULL_REV	FULL_REV
163969-2	655877	21:56:01		133.0	159.0	FULL_REV	FULL_REV
163969-3	655878	21:56:02		122.9	152.0	FULL_REV	FULL_REV
163969-4	655879	21:56:03		113.9	137.0	REVERSE	REVERSE
163970-1	655880	21:56:04		104.0	129.0	REVERSE	REVERSE
163970-2	655881	21:56:05		96.9	121.0	REVERSE	REVERSE
163970-3	655882	21:56:06		87.8	114.0	REVERSE	REVERSE
163970-4	655883	21:56:07		82.8	100.0	REVERSE	REVERSE
163971-1	655884	21:56:08		73.1	95.0	REVERSE	REVERSE

Figure 40: Flight Data showing full reversers were cancelled at 114kts

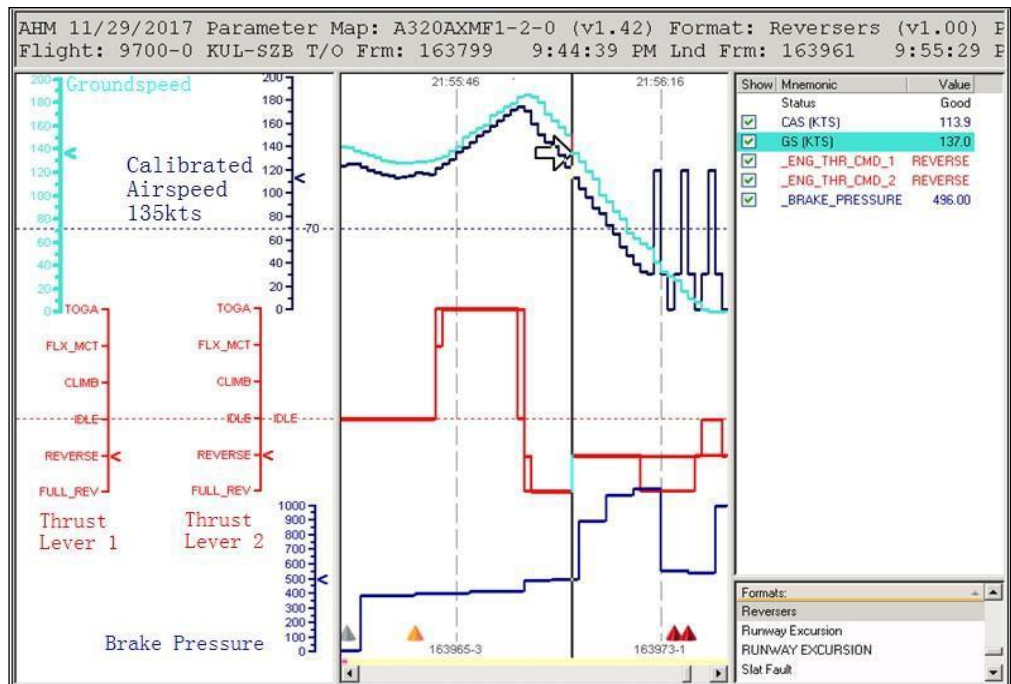


Figure 41: Flight Data showing full reversers were cancelled at 114kts

1.7 Meteorological Information

1.7.1 General

Aircraft conducted the approach in tailwind conditions and in darkness. The tailwind condition was not made aware to the crew by the ATCO based on the CVR recordings. ATIS indicated minimal tailwind, however all Touch and Go indicated presence of strong tailwind.

1.7.2 Meteorological Reports

Weather report for Sultan Abdul Aziz Shah - Subang METAR at 0500 LT as per **Appendix H: Meteorological Reports (METAR)**

Surface wind	310/04 knots Direction Variable from 260 to 010
Visibility WMSA METAR	8000 meters
Present weather	Slight Rain
Cloud	Few 1700 feet Cumulonimbus, Scattered 14000 feet, Broken 26000 feet
Temperature	24 degrees
Dew point	23 degrees
QNH	1006 Milibar

Figure 42: WMSA METAR

The weather reported on the ATIS, recorded at 0500 LT as per **Appendix F: Flight Documents**

Information	Yankee
Runway in Use	Runway 15
Surface wind	310/04 knots Direction Variable from 260 to 030
Visibility	7000 meters
Present weather	Slight Rain
Cloud	Few 500 feet Cumulonimbus, Scattered 14000 feet, Overcast 26000 feet
Temperature	24 degrees
Dew point	23 degrees
QNH	1006 Milibar

Figure 43: WMSA ATIS

1.7.3 Wind Conditions

It was found that the Touch and Go exercise was conducted in tailwind conditions (**Appendix B and Appendix G**) and that on the third Touch and Go, the aircraft landed with a recorded wind data of 336/14, which is a 14 knots tailwind

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component. It was also identified in the CVR readout that mentions of strong winds and tailwind conditions were made on the first two circuits and were in fact a concern to the flight crew.

Phase of Flight	CVR Recorder Time (HH:MM:SS)	Actual Time (flight data) (UTC)	Extract of CVR Read-out	Data from FDR
First Final Approach	01:35:39	21:35:27	<i>Voice 1 : "Wind..oh 30 knots! (**).."</i> <i>Voice 2: "30 knots tailwind..."</i> <i>Voice 3 : "(**)..on ground it should be okay.."</i>	316/30 kts (29 kts tailwind) At 1700 ft
	01:37:00	21:36:48	<i>Voice 1 : "Biar betul 22 knots..."</i> <i>Voice 2 : "Tailwind 22 knots."</i> <i>Voice 1: "Nevermind just (unintelligible)..Reported 4 knots, isn't it?"</i> <i>Automatic Callout : "500"</i> <i>Voice 1 and 2 : "Check"</i> <i>Voice 3 : "Ya"</i> <i>Voice 1 : "Okay (**) manually, visually.."</i> <i>Voice 3 : "4 knots (**)"</i> <i>Automatic Callout : "100"</i> <i>Voice 1 : "It's okay, runway is long..tak apa"</i>	336/22 kts (22 kts tailwind) At 760 ft
Second Final Approach	01:43:52	21:43:40	<i>Voice 1 : "Ala wind la..(**)...strong wind man"</i>	346/19 kts (18 kts tailwind) At 520 ft
Third Final Approach (Incident)	01:54:47	21:54:35	<i>Voice 1 : oh very strong wind, I think the most we can do is one only after that (**) no worry (**)</i>	331/20 kts (20 kts tailwind) At 780 ft

Figure 44: Extract of pertinent CVR read-out regarding wind conditions on landing

Note:

- a. The excerpt above is only extracts of the CVR recording audio which are pertinent to the wind data chapter above. It does not in any way represent the whole context of the conversation and atmosphere within the cockpit

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Height (AAL)	Wind	Longitudinal Wind Component
At 1000 feet	322/22	Tailwind 22 knots
At 500 feet	332/19	Tailwind 19 knots
At touchdown	336/14	Tailwind 14 knots
At Rejected Take-off	331/9	Tailwind 9 knots

Figure 45: Wind values and tailwind components immediately prior to Incident

WMSA is fully equipped with 24-hour Wind and Runway Visual Range System measurement for wind and visibility adjacent to runway touchdown zones and stop-end. The investigation found that no updated surface wind information was given to the crew on all three approaches when significant changes in the wind value are present and likewise, no updated information of the surface conditions were requested by the crew

1.7.4 Natural Light Condition

All interviews conducted with the Crew and ATCO (refer to 2.2.4) indicated that the natural light condition was total darkness. Examination of the sunrise times also showed that incident occurred 1 hour and 9 minutes before apparent sunrise for the location. The ATCO informed investigators that he was only able to see the aircraft's navigational lights throughout their circuit practice and he was also unable to see the aircraft at its final position due to the darkness.

Reference Lat / Long (WGS84)	AD Reference Point N 3° 07' 52.00" E 101° 32' 53.00"
Apparent Sunrise	23:04 UTC
Time of Incident	21:55 UTC

Figure 46: AIP Malaysia (AMDT 01/2017) GEN 2.7-51: Sunrise/Sunset Table WMSA (Table 10: Sunrise)

1.8 Aid to Navigation

There was no reported malfunction or abnormality reported.

1.9 Communication

Aircraft was employing the use of VHF radio to communicate with the ATC. After departure, the crew was transferred from Lumpur controller to Subang controller on frequency 118.2 MHz until the point of incident. All communications

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were as per recommended practices however the investigation found out that the crew were never updated with the aerodrome surface condition from the point of transfer until the incident happened (1.7.3).

1.10 Aerodrome Information

1.10.1 General

Refer to **Appendix I for Jeppesen Chart and AIP WMSA.**

Aerodrome Code	WMSA / SZB
Airport Name	Subang/Sultan Abdul Aziz Shah Airport
Airport Address	Sultan Abdul Aziz Shah Airport 47200 Subang, Selangor Darul Ehsan
City	Kuala Lumpur
Airport Operator	Department of Civil Aviation Malaysia
ATC Services	Department of Civil Aviation Malaysia
Types of traffic permitted (IFR/VFR)	IFR/VFR
AD Administration	H24
AD Reference Point Coordinates (WGS84)	N 3° 07" 52.00" E 101° 32" 53.00"
Elevation / Reference Temperature	89 feet / 32°C
Runways	15/33

Figure 47: WMSA Aerodrome information

1.10.2 Incident Runway Characteristics

Runway 15 was a CAT I rated runway

Threshold Reference Coordinate (WGS84)	N 3° 08" 43.27" E 101° 32" 26.72"
Runway 15 Length	3780 metres / 12402 feet
Runway Landing Distance Available	3780 metres / 12402 feet
Stopway Dimensions	61m x 45 m (Stopway not to be used)
Runway Width	45 M
Runway Bearing	149°T
Strength (PCN) / Surface of RWY and SWY	PCN 59/F/B/X/U Asphalt
Slope of RWY-SWY	0.137 %

Figure 48: Runway 15 information

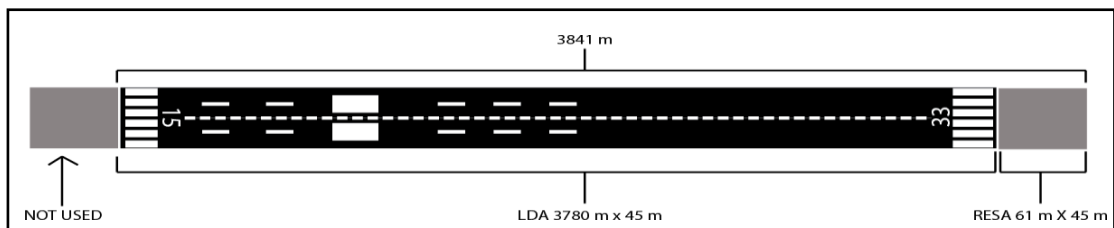


Figure 49: Runway 15 dimensions (not to scale)

1.10.3 Inspections

The runway inspection was done immediately prior to the incident and runway was found to be in satisfactory condition.

1.10.4 Visual Aids and Aerodrome Ground Lighting

Runway markings were found to be satisfactory and in compliance to regulatory standard. According to crew and ATCO interview (refer to 2.2.4), WMSA did not have any centre line lightings as per recommended standard. The runway is equipped with High Intensity Approach Lighting System (HIALS), High Intensity Runway Edge Lights (HIRL) and vertical guidance is provided by a 3° precision approach path indicator (PAPI) on both sides of the runway. All were serviceable at the time.

1.11 Flight Recorders

The aircraft was equipped with FDR and CVR units. The FDR and CVR were removed and handed over to the Air Accident Investigation Bureau (AAIB) for the purpose of the data download. This was performed on the 7th of December 2017 at the AAIB Flight Recorder Laboratory facility by AAIB personnel.

1.11.1 Flight Data Recorder

Manufacturer	L-3 Aviation Recorders
Model	FA2100
Part Number	2100-4043-02
Serial Number	000 494 630
Number of Parameters Recorded	855
Recording Medium	Solid State Flash Memory
Recording Duration	Approximately 25 Hours

Figure 50: Flight Data Recorder information

1.11.2 Cockpit Voice Recorder

Manufacturer	L-3 Aviation Recorders
Model	FA2100
Part Number	2100-1020-02
Serial Number	000 442 665
Number of Channels	4
Recording Duration	2 Hours

Figure 51: Cockpit Voice Recorder information

1.11.3 Flight Data Interface Management Unit

Manufacturer	Teledyne Controls
Model	-
Part Number	2234320-01-01
Serial Number	QA02865
Number of Parameters Recorded	994
Recording Duration	Approximately 60-120 Hours

Figure 52: Flight Data Interface Management Unit

1.12 Wreckage and Impact Information

Refer to **Flight Data Recording as per Appendix G.**

1.12.1 General

The aircraft stopped in an intact condition and no wreckage is involved. The final stopping position of the aircraft is hereby regarded as the “impact area”.

1.12.2 Distances

The aircraft touched down 564 metres from the Threshold of Runway 15, The touchdown point is approximately 1850 ft and is also lesser than one third of the 3780 m runway length, well within the regulatory requirement for touchdown distance (see figure 53). There was no abnormality with the aircraft’s touchdown

<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">FOD No. : 60OR-16</td> <td style="padding: 2px 5px;">Issue : 1</td> </tr> </table>	FOD No. : 60OR-16	Issue : 1
FOD No. : 60OR-16	Issue : 1	
Page : 130 of 232		
<p>(vii) As the aircraft crosses the runway threshold it should be:</p> <ul style="list-style-type: none"> (A) Stabilized on target airspeed to within + 10 knots until arresting descent rate at flare. (B) On a stabilized flight path using normal manoeuvring. (C) Positioned to make a normal landing in the touchdown zone (i.e., first 3,000 feet or first third of the runway, whichever is less) <p style="text-align: center;">Initiate a go-around if the above criteria cannot be maintained.</p>		

Figure 53: Flight Operations Directive - Organisation Requirements for Air Operations - 21.9.19 (regulatory requirement for touchdown zone)

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TOGA was applied at approximately 1525 meters which was still at less than half of the runway. Aircraft then rolled for another 939 meters before the Rejected Take-off was initiated (total travelled 2464 meters). With a paved runway length of 3841 meters (Runway + RESA), this was approximately two thirds of the runway. The aircraft then took 1454 meters to decelerate to zero velocity. In total the aircraft travelled for 3918 metres from its position over threshold of runway 15 to the position that it stopped, exceeding the total paved surface of the runway including the RESA

by 77 meters. The ground distance measured on-site from the end of the RESA to the aircraft main landing gears were 62 metres.

Aircraft stopped at a muddy open field area with the nose measured to be approximately 15 metres away from the Runway 15 Localizer Antenna Array ahead of it. Aircraft did not veer off laterally and remained on the extended runway centreline

Impact Area Coordinates (WGS84)	N 3° 6' 53.27" E 101° 33' 30.55"
Type of Surface	Grass and Soil (unpaved)
Measured Distance from Runway	62 meters

Figure 54: Aircraft impact area information

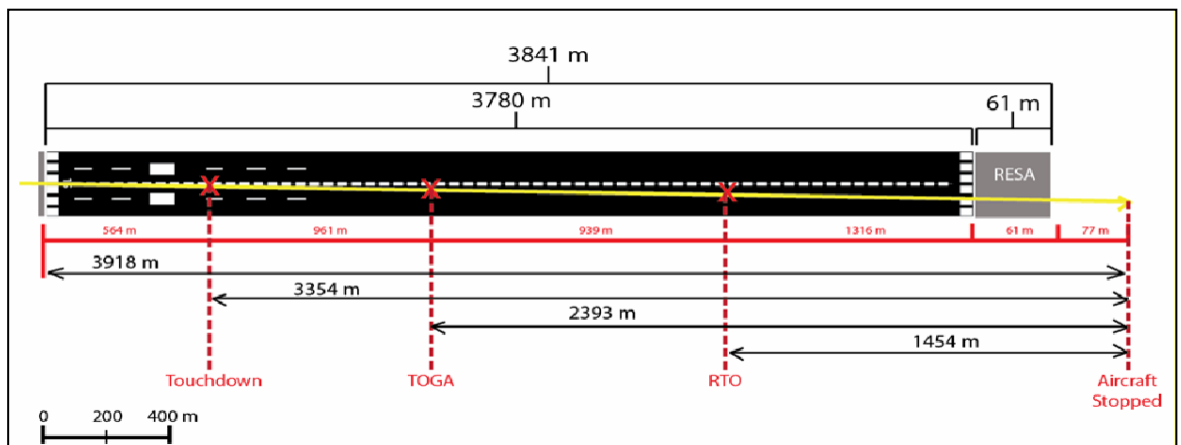


Figure 55: Distances Travelled by Aircraft from Threshold to Aircraft Stopped

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In accordance to ICAO Annex 13, the investigation team had requested assistance from the Manufacturer for more accurate analyses of the distances, especially the actual braking and stopping distance which are very complex due to changing aerodynamics, propulsion and rolling friction forces. The result of these analyses shall be complemented to this report if deemed necessary, at a later date.



Figure 56: Overview of aircraft trajectory on the runway until incident



Figure 57: Zoom in of impact area at the end of runway 15



Figure 58 : Aerial Photo of Aircraft at Impact Area



Figure 59: Aircraft View from the Starboard Side



Figure 60: Aircraft Stopped 15 m from ILS Localizer Antenna Array



Figure 61: Aircraft Stopped View from Cockpit

1.13 Medical and Pathological Information

1.13.1 Crew Performance and Toxicology

All the crew was fit for the flight and medical examination immediately after the incident indicated no abnormalities. There was no evidence that physiological factors or incapacitation affected the performance of flight crew members.

1.13.2 Medical Results

In accordance to Annex 13, Chapter 5, only medical results which has significant effect to the human performance of the crew shall be included in the report. In view that no such factor was found, crew medical reports shall remain protected and release of such information will only be with the appropriate authority of the law.

1.14 Fire

There was no trace of fire found at the site and no explosions

1.15 Survival Aspects

The AFRS was informed by the ATCO approximately 19 seconds after the mayday call was acknowledged at time 05:56:48 LT via telephone. AFRS was mobilized at 05:57:57 LT within 12 seconds.

The crew deplaned the aircraft via the Escape Slide on Door 1 Left approximately after 06:10:00 LT when APU was shut down. The door was initially disarmed as the commander was satisfied that there was no urgency for an emergency evacuation. Slide was deployed successfully when the AFRS arrived and all three crew vacated the aircraft safely. Before leaving the aircraft, the crew performed the Parking and Securing the Aircraft checklists.



Figure 62: Aircraft Escape Slide Deployed from Door 1L



Figure 63: Escape Slide View from Door 1L

1.16 Test and Research

1.16.1 General

In view of the all the available data and tools, no testing was found to be necessary. The investigation board however reserves the option of conducting such tests if the necessity arises, results of which shall be supplemented to this report in the future.

1.16.2 Research

The investigation team appointed a team of representatives from the aircraft manufacturer Airbus as participants/observers to the investigation in order to obtain the best specialist knowledge for the purpose of data analysis.

The Manufacturer has finalized their analysis and the result of their investigation is supplemented in this Report as per **Appendix P (Airbus Handling Quality Analysis)**. It is important to note that the findings of the Manufacturer are entirely consistent with the findings in this Report and does not result in any amendments or revision to the outcome of this Report

a. TO Config Warning

The Manufacturer's analysis of the data (**refer Appendix P - Airbus Handling Quality Analysis**) results in the same findings with regards to the TO Config Warning that was triggered due to the accidental extension of the speed brake lever by 2.7°, exceeding the Speed Brake Command alert triggering threshold of 2° during the disarming action. The analysis further verifies that the triggering of the warning was not due to any system failures or faults.

b. Distance Required Computation

The Manufacturer's Handling Quality Analysis (**Appendix P - Airbus Handling Quality Analysis**) also includes a theoretical stopping distance computation using the actual aircraft and environmental conditions based on recommended rejected take-off procedure in the FCTM.

The result of this calculation is a theoretical required distance of 940 meters from the initiation of the RTO. The actual distance travelled by the aircraft from initiation of RTO was 1454 meters (see 1.12.2) and the aircraft overshot the paved surface of the runway by approximately 77 meters (see 1.12.2). This would mean that theoretically, with the recommended rejected take-off procedure, the aircraft would have reached zero velocity with a margin of 437 meters of runway still available.

It must be noted that there is only a difference of 8 meters between the calculation of the actual total distance travelled by the aircraft from the Manufacturer (of 3910 meters, and **Appendix O - Final Assessment of Damages**) and the 3918 meters calculation by the investigation team in this report (refer 1.12.2).

1.17 Organisational and Management Information

Operator	AirAsia Berhad
Address	Jalan Pekeliling 5 Kuala Lumpur International Airport (KLIA 2) 64000 Sepang, Selangor Darul Ehsan
Air Traffic Service	DCA Malaysia
Aerodrome Administration	Malaysia Airports Sdn. Bhd. Terminal 3 Sultan Abdul Aziz Shah Airport 47200 Subang, Selangor Darul Ehsan

Figure 64: Organisational information

1.17.1 Aircraft Base Training (Endorsement)

a. Operator Policy

The Endorsement flight was conducted to satisfy DCA Malaysia requirement for the Trainee’s flight crew licensing and type rating. The requirement also states that this type of training conducted must be conducted by day in aeroplane in flight (see figure 65) which includes 20 minutes before sunrise until 20 minutes after sunset. This requirement is clearly reflected on the Training form as per **Appendix C (AirAsia Endorsement Flight Policy / Touch and Go Procedure)** that is used by the CAPT to conduct the flight as well as the Operator’s dispatch planning minima for endorsement (see figure 66).

5.1	By day in aeroplane in flight
5.1.1	Normal take-off and climb to circuit (See Note 2.0)
5.1.2	Visual circuit, approach without visual or radio glideslope guidance, autothrust system disengaged, and go-around from 100ft AGL. (See Note 2.0)
5.1.3	Visual circuit, approach without visual or radio glideslope guidance, autothrust system in operation, and fullstop landing using reverse thrust and wheelbrakes. (See Note 2.1)

Figure 65: DCA Borang A320 APPLICATION FOR THE INCLUSION OF THE AIRBUS A320 IN THE AIRCRAFT RATING OF A PILOT’S LICENSE (AEROPLANES), Section 5.1 (requirement for flight to be conducted by day only)

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WEATHER	Dispatch Considerations for Base Training A. Planning Minima <ol style="list-style-type: none">1. Weather limitations – Destination and Alternate: 5000 and clear of clouds2. Wind limitations – Destination and Alternate: Maximum x-wind 20 knots3. Day/Night limitations – Dest. and Alt: No night Visual Approaches allowed4. Take-off alternate – if required: Not applicable5. Runway condition – Dry6. Runway Length Minimum – 2700 m.7. Braking action – Good8. A320 fuel – 15.0 tons plus positioning fuel, (may be adjusted to suit the detail).9. Aerodrome ATC facilities – Standard CAT A airport.10. Weight and Balance – As per FOVE B. Dispatch Information <ol style="list-style-type: none">a. Standard AirAsia briefing package – Wx, Notams, OFP, Base Training Formsb. Minimum Equipment List – As per OMA C. Crew Qualification <p>Licenses and Type Ratings – DCAM CPL/ATPL with A320 validation as applicable.</p>
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Figure 66: AirAsia Operations Manual - Part D: 1.2E Aircraft Base Training (Endorsement) (no night visual approaches allowed)

The flight was however rostered and planned as per **Appendix J (Flight/Roster Planning)** for a STD of 0430 LT. The actual departure time was 0510 LT. The overrun incident itself occurred at 0555 LT which was approximately 1 hour and 9 minutes before the local sunrise time of 0704 LT.

1.17.2 Safety Pilot

Investigation found that there are no guidance or policy for the duties of the Safety Pilot that is specific for the procedures employed in a Touch and Go training, in particular the items that should be monitored which are different than the standard operating procedures of a normal flight. There is also currently no requirement for minimum level of experience for safety pilots on endorsement flights.

There is also no guidance or policy on the briefing for the duties of the Safety Pilot that is specific for the procedures employed in a Touch and Go training. The current policy adopted in the Operator's training manual states that "The safety pilot shall be briefed by the instructor on all relevant requirements, prior to first flight of the duty".

1.18 Additional Information

Nil

1.19 Useful or Effective Investigation Techniques

Investigation Team conducted the investigation in accordance to the Standards and Recommended Practices of Annex 13 to the Chicago Convention

2.0 ANALYSIS

In this section of the report, the relevant evidence and factual information will be discussed and analysed to determine the cause and contributing factors to the accident. The conclusions will provide the answer to why the accident occurred.

2.1 General

The Endorsement flight was planned to depart and conduct its visual pattern exercises before the hour of sunrise, contrary to the regulator and Operator's own policy.

These training flight leads to a possibility of a pre-existing latent condition in which such flights are continuously being planned and continuously being accepted despite the irregularity of the timing against the Operator's own policies.

The entire flight itself, including the first two Touch and Go practices were uneventful, however the two preceding approaches should have been sufficient to warn the crew that their safety margins were being reduced with the presence of a strong tailwind. The CAPT did indicate that they might not be able to continue for any more circuits after the third Touch and Go due to the strong winds. The strong tailwind was also evident during the incident itself which may have contributed significantly in extending the stopping distance of the aircraft.

The risk of this flight significantly increases by the fact that there are no performance calculations for Touch and Go that would give the crew a reference of the accelerate/stop distances or decision speeds. Added to that, it was an Aircraft Base Training in which the Trainee is not expected to perform to the standards of normal

operations, significantly increasing the CAPT's workload by many folds. The presence of a safety pilot does not reduce this hazard as the safety pilot does not have any exact set of procedure or duties to comply with such as a checklist or specific briefings for them to adhere to unless prescribed by the instructor prior to the flight.

2.2 The Incident

On the third Touch and Go, a master warning was triggered after the application of take-off thrusts by the Trainee. This warning was in fact a TO Config warning which had triggered due to the accidental extension of the speed brake lever after the disarming action by the CAPT. Flight data confirms this with the indication of an extended speed brake lever by 3° when TOGA was being selected. The crews were all caught off guard and were unable to process what was going on based on the CVR audio. It is evident that the crew were all distracted as evidence and crew interview statements indicated that the crew's attention was diverted to the speed brake lever immediately after the triggering of the TO Config warning, in which the crew were continuously trying to "disarm" the spoilers thinking that the spoilers had not retracted after the initial disarming.

The aircraft continued to accelerate for the take-off while the crew was still trying to find the source of the warning. The manufacturer has made sufficient cautions in their documentations regarding the possibility of this TO Config situation happening. This was not reflected in the Operator's training manual which was used as guidance by the instructors in conducting such flights.

As the speed was increasing past 175kts, the CAPT discontinued the touch and go simultaneous with the end of the TO Config warning. Although the manufacturer and the Operator has stated in its manuals that after application of TOGA, "decision to reject should only be made if the instructor is sure that the aircraft cannot safely fly", no references or guidance are given with regards to the runway length remaining. For a normal reject take-off, the manufacturer has stated very clearly that after V1, take-off must continue due to runway length considerations but this is very ambiguous for a Touch a Go as application of TOGA does not determine the length of runway remaining. If a reference point for the crew to be committed to the take-off is available, such as a certain speed or the application of take-off power itself, there would be no hesitation and ambiguity on whether to abort or continue.

On that note, the aircraft was in fact safe for the take-off because spoiler surfaces had retracted automatically after the application of take-off power, as documented by the manufacturer. The speed brake lever was also eventually stowed back to 0° 3 seconds before the rejected take-off. The Operator's training manual does mention about the auto retraction of the spoilers, however it was not written in the context of the TO Config warning but more of a note explaining a separate procedure during the Touch and Go. This effectively disassociates the auto-retraction of the spoilers from being a safety feature for the crew to take note of.

Post incident CVR recording indicated that the CAPT was not sure what had happened and that the Safety Pilot saw the indication but was not sure what it meant (he was confused between the arming/disarming of the spoilers with the extension of the speed brake). Pilot statements and crew interview also indicated that the crew was not sure what had happened and believed that the warning was triggered because the ground spoilers were not properly disarmed.

At critical situations such as this incident, the crew should not be made to recall system logics and mechanisms as time is critical. The information displayed to them should be able to be quickly understood in order for a decision to be made effectively. The quick identification of the abnormality, the level of preparedness by the crew and the understanding of aircraft systems and safety features of the aircraft would have stood as effective barriers to the incident.

2.2.1 Flight Data Analysis

Refer to **Flight Data Recording as per Appendix 7.**

Analysis of the flight data establishes the facts and circumstances as described above in Part 1 of the report.

- 1) There were no abnormalities with the aircraft's landing. It touched down within the nominal and regulated touchdown zone.
- 2) A TO Config Warning was triggered on the third Touch and Go during the application of take-off power due to the inadvertent extension of the speed brake levers during the disarming action. The possibility of this happening is documented

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by the manufacturer under Touch and Go procedures, but was not adopted in the Operator's training manual used as a guide for the instructors.

3) Despite the extension of the speed brake and the triggering of the TO Config, the aircraft was safe to take-off as the aircraft design ensures that all spoiler surfaces are automatically thrusts levers are advanced to above CLB detent. This safety feature functioned correctly during the incident. This feature is also stated clearly in the Flight Crew Techniques Manual but is ambiguously stated in the Operator's training manual.

4) Crew was distracted with trying to disarm the spoilers repeatedly. The speed brake lever was eventually stowed back to 0° 3 seconds before initiation of rejected take-off.

5) Rejected take-off was done at high speed (174 kts) and was initiated at approximately 1/3 of the runway remaining. The speed at reject take-off was also approximately 45 knots above Vapp (130kts). There are no available accelerate/stop distance references for the crew to act on. The manufacturer's recommendation which was also adopted by the crew regarding discontinuing a Touch and Go after application of TOGA is not as definitive as the caution for a normal reject take-off which gives a decision speed for take-off to be continued under any circumstances.

6) Use of full reversers was not maximized. Both manufacturer and Operator procedures are streamlined in recommending the maximum usage of braking and reversers in a discontinued touch and go. The change from full reversers to idle reversers during the abort occurred at a high speed of 114kts. Manufacturer and Operator procedures are streamlined in recommending 70kts as the preferred speed at which maximum reversers be cancelled, subject to the availability of remaining runway. Manufacturer's Handling Quality Analysis has found that there would be sufficient runway remaining with the recommended usage of thrusts reversers.

7) There were no system failures.

2.2.2 CVR Analysis (See Appendix 2)

Analysis of the CVR confirms the facts and circumstances established from the flight data. CVR analysis also points to significant findings:

- 1) That the flight was conducted in strong tailwind condition and no wind report was received by the crew requested from the ATC on all three landings.
- 2) There were no abnormalities during the touchdown.
- 3) The TO Config Warning was heard and seen by the crew and the warning message displayed on the E/WD was related to the speed brakes. The CAPT and the Safety Pilot both knew that the warning was a TO Config warning and was with regards to the speed brakes / spoilers. Crew were however confused during the period of the warning being triggered and it took the CAPT 7 seconds to call for controls and another 2 seconds to initiate the reject. This indicated that the crew was distracted with the master warning, and distracted with disarming the lever.
- 4) The CAPT took over controls and rejected the take-off while the warning was still heard. The warning ended simultaneously with the CAPT retarding the thrusts levers.

2.2.3 Reports

A **Mandatory Occurrence Report (MOR)** was submitted to the Department of Civil Aviation Malaysia as per **Appendix K**.

2.2.4 Interview and Statements

Written statements in the form of Air Safety Reports were gathered from all the crew involved. The crew were also interviewed by the Investigation team at the Emergency Operations Centre (EOC) Room, AirAsia Safety Department. All of the crew involved had also submitted a written statement to be included in this report as follows:

- a. **Written statement for Pilot-in-Command (PIC/CAPT) as per Appendix L.**
- b. **Written statement for Co-Pilot (Trainee) as per Appendix M.**
- c. **Written statement for Safety Pilot as per Appendix N**

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d. Additional Statements by crew

An Air Safety Report (ASR/12459) was filed as a joined statement from all three crew before the crew interview was conducted

Report Info							
Report Title		RUNWAY EXCURSION			asr/12459		
Report Status		Under Investigation		Date of Occurrence		*****	
Reported Event Descriptor		Airport Operations- Incursion / excursion- Runway excursion		Investigation Due Date		-	
Initial ERC score		0		Investigation Close Date		-	
Final ERC score		0		MOR Sent to		-	
Reported by		*****		Opened by		*****	
For Info Alert Groups				Lead Investigator		-	
Report flagged Confidential	N	Red flag Alert	N	Recommendations	N	Peer Review	N

Event Description	
Principal Safety Report	asr/12459
<p>IT WAS AN ENDORSEMENT TRAINING FLIGHT. WEATHER CONDITION WAS VMC WITH VISIBILITY REPORTED OF 8 KM, SURFACE WIND OF 320/4 KNOTS, TEMPERATURE 24 DEGREES CELCIUS AND DRY RUNAWAY. AFTER THE THIRD TOUCH AND GO, DURING THE ROLLING STAGE, THE FLAPS WERE SELECTED TO 2 AND THE SPEED BRAKE DISARMED. FULL POWER (TOGA) WAS APPLIED WITH NORMAL INDICATIONS.</p> <p>AT 110 KTS, THE TAKE OFF CONFIGURATION WARNING CAME OUT WITH SPOILER INDICATED ON THE ECAM. THE INSTRUCTOR RECHECKED THE SPEEDBRAKES IN DISARMED MODE BUT THE WARNING STILL PERSIST. REJECTED TAKE-OFF WAS CARRIED OUT BY THE INSTRUCTOR WITH FULL REVERSERS AND BRAKING. THE AIRCRAFT ENDED OVERRUN THE THRESHOLD RUNAWAY 33.</p>	

Figure 67: Air Safety Reports (ASR/12459)

2.3 Flight Operations

2.3.1 Operational Analysis

a) Time of Flight

It was found that the conduct of the flight at the scheduled departure time of 0430 LT was not in accordance to the Operator’s own policy of “no night visual

approaches allowed". It was also ultimately not in accordance to the state regulation for the specific training being conducted which allows only flights in day time. Conduct of endorsement flights at this time also increases the risk of an accident considering the amount of workload that the instructor would have to bear and the limited visibility due to the lack of natural lighting while conducting a Visual Pattern.

b) Safety Pilot

Safety Pilots for Endorsement flights should be required to know the specific procedures for Touch and Go in order for them to be able perform the duties satisfactorily. There are very significant differences in the procedures during the Touch and Go compared to normal day to day operations such as the immediate actions required to be done by the instructor after touchdown, the safety margins and also the risks involved such as possibility of the TO Config warning and the lack of any speed references for accelerate/stop considerations. The safety pilot will not be able to know what to monitor unless he has extensive experience as a pilot and understands the touch and go procedures well enough.

2.3.2 Weather

The flight was conducted in strong tailwind conditions. This was not relayed to the crew on all approaches and crew were assuming that the surface wind conditions would be lower, or closer to the reported wind from the ATIS.

2.3.3 Aerodrome

There were no centre line lights for the runway. The crew's early cancellation of the Full Reversers indicates a possible misjudgement of the distance remaining during the Reject Take-off. Centre Line light availability would have aided the crew in their judgement.

2.4 Aircraft

2.4.1 Aircraft System

a) Manuals and Documentations

Although the TO Config Warning did cause the crew to initiate the take-off abort, Airbus has documented this possibility adequately. This includes the possibility of accidental extension of the speed brake, as well the subsequent safety feature of the aircraft that will retract the spoiler surfaces at application of take-off power. These items should be reflected clearly in all Operator manuals that are used as reference for flights conducting Touch and Go exercises to increase the awareness of the instructor / safety pilot and highlights all the risks involved to the crew. Inclusion of the FCTM reference may be sufficient as a guide for the instructor to conduct discussions/briefing on without missing out any important items.

b) System Failures

The aircraft systems worked as it was designed to and no failures were found to be a factor in this incident. All present procedures available as per recommended by the manufacturer with regards to operation of the speed brake lever and ground spoilers are sufficient and did not in any way contribute to the incident.

The aircraft brakes and reversers functioned without any failures.

2.4.2 Aircraft Performance

There are no specific performance calculations for Touch and Go exercise which will give the accelerate/stop distances for a Touch and Go. Airbus references also only indicate Vapp as the equivalent of a rotation speed on a Touch and Go. This is also why airbus has recommended that after the application of TOGA, crew should be "Go-minded". Nevertheless, there is an obvious lack of guideline for the decision point a crew needs to have with regards to rejecting the take-off on a Touch and Go as there are no V1 or decision speeds, but setting of TOGA power may occur at any speed and does not directly determine the accelerate/stop distances of the aircraft. Critical failures may still

occur at low speeds (before V_{app} or recommended rotation speed) after application of TOGA on a Touch and Go. Likewise, if TOGA application is delayed for any reason, critical failure may occur at high speed before application of TOGA and there are no calculations to ensure that the runway will be sufficient for the abort. On a normal rejected take-off, the manufacturer is very clear that after decision speed (V_1) take-off must be continued under any circumstances due to possibility of insufficient runway. The investigation finds that this area of ambiguity and uncertainty may present contextual conditions for accidents to occur.

2.5 Human Factors

Analysis of the crew's medical and pathological report, as well as their duty and rest patterns do not indicate any impairment of their performance standards physiologically. All duty and rest policies employed are in accordance to recommended practices and safety standards.

3.0 CONCLUSIONS

3.1 Findings

3.1.1 All Significant Conditions / Events

The investigation concludes these conditions, events or circumstances as having significant bearing on the incident.

TIME (UTC)	EVENT / CONDITION	BEARING
N/A	Endorsement Flight was scheduled not in accordance to Operator and Regulator's requirement for day operations only.	Inconsistency with policies
21:10	Endorsement Flight was accepted and departed despite not satisfying regulatory requirements for daylight operations only.	Policy had failed as a barrier
21:38	No updated surface wind report was given to crew despite the <i>significant change</i> between the MET Report and actual winds. This is also taking into account that it was an endorsement flight, and that no accelerate/stop distance calculations are available for Touch and Go.	Possible longer runway length used during landing and take-off roll in strong tailwind conditions.
21:55:3	The disarming of the spoilers inadvertently caused the speed brake lever to be slightly extended.	Caused TO Config Warning to be triggered
21:55:46	TO Config Warning for " CONFIG Spd Brk Not Retracted " was triggered. Crew identified the warning correctly but could not determine the cause, and the system safety feature.	Caused the crew to initiate the rejected take-off
21:55:47 to 21:55:52	Crew were distracted with : <ul style="list-style-type: none"> • The TO Config warning, which had confused them • Trying to disarm the speed brake lever repeatedly 	Late decision to reject the take-off.
21:55:55	Reject Take-off at High Speed. RTO was also initiated with approximately one third of runway length left. At the time of reject take-off, aircraft was safe to continue, as documented in the manuals.	Insufficient Runway Length remaining resulting in a Runway Overrun.
21:56:03	Use of Full Reversers were not maximised due to <i>possible</i> misjudgment of distance remaining caused by lack of center line lighting and dark natural light conditions. Cancellation of full reverse thrusts were arbitrary and is not at recommended values by the manufacturer	Increase in braking distance.

Figure 68: Findings

3.1.2 Other Findings

- a). The flight crew members were licensed and qualified for the flight in accordance with existing regulations.
- b). The maintenance records indicated that the aircraft was equipped and maintained in accordance with existing regulations and approved procedures.
- c). Safety Pilot was unable to assist in this incident and did not have any contributing effect to the safety of the flight. This is likely caused by the lack of guidelines or tools to aid the safety pilot in performing his duties on a Touch and Go flight, which is not a normal routine flight that he would be used to. As such, investigation also finds that there is also no inclusion of the Touch and Go procedure in the Operator's standard operating procedure (SOP) for safety pilots to be familiar with. At this point, the requirement in the Operator's training manual for what to brief the safety pilot on, remains upon the discretion of the TRE.

3.1.3 Eliminated Factors

- a). Flight crew fatigue and medical background was not a factor in the incident.
- b). There was no evidence of airframe failure or system malfunction that has led to the incident.

3.1.4 Ambiguities

- a). The investigation was unable to establish the actual runway surface condition at the time of the incident due to mixed precipitation information from the Met reports, crew statement and ATCO interview. Wet runway conditions, if present, may have contributed to the prolonged braking distance of the aircraft due to reduced braking co-efficient.

b). The investigation was initially unable to establish the exact braking and deceleration performance of the aircraft and how it affects the distance travelled during the rejected take-off due to the limited availability of the correct tools in measuring such dynamics. New information from the Manufacturer was received and shows a result of the aircraft's braking and deceleration performance analysis. This information is supplemented into this report under 1.16.2 and **Appendix P (Airbus Handling Quality Analysis)**

c). The investigation was initially unable to determine the actual stopping distances required at all the given conditions due to the unavailability of such tool and expertise to the investigators. Determination of such performance figures will give a more definitive finding with regards to the sufficiency of the remaining length of runway at the time of RTO. As such, the investigation was also unable to determine if a continuous use of full reversers would have prevented the overrun.

New information from the Manufacturer based on their Handling Quality Analysis was received which gives the approximate stopping distance required in this event. This new information is supplemented into this report under 1.16.2 and **Appendix P (Airbus Handling Quality Analysis)**.

3.2 Causal / Contributory Factors

3.2.1 Causes of the Incident

- a). Distraction of the pilot due to TO config warning during the take-off roll.
- b). Distraction of the pilot with the speed brake lever arming and disarming.
- c). Uncertainty by the crew regarding the safety of the aircraft to continue the take-off.
- d). The rejected take-off at a non-recommended speed with insufficient runway length remaining.

- e). Insufficient use of reverse thrust.
- f). Possible increase of braking distance due to strong tailwind.

3.2.2 Contributing Factors to the Incident

a). Insufficient emphasis or reference by Operator in their guideline used for Touch and Go, of known and documented systemic characteristics vital to the safe conduct of the Touch and Go exercise, such as:

- i). The high possibility of accidental extension of the speed brake levers during disarming action and the possibility for the TO Configuration warning for Speed Brakes to be triggered as described in the manufacturer's flight crew techniques manual.

- ii). The manufacturer's note on the safety feature related to the auto-retraction of the spoilers, which means that the take-off was safe to be continued with.

b). The items above (a) had likely caused a possible confusion of aircraft systems and warnings with regards to the TO Config warning and the auto-retraction of the spoiler surfaces at application of take-off thrusts and led to the CAPT being uncertain of the safety of the aircraft for take-off. It had also directly caused the distraction experienced by the crew which also caused the rejected take-off to be initiated very late.

c). The dark environment at the time of incident, likely causing the misjudgement of distance remaining resulting in the insufficient use of reverse thrusts. It is verified that correct usage of the reverse thrusts during the RTO would have stopped the aircraft with sufficient margin without overrunning the runway.

d). Lack of communication between ATCO and flight crew regarding known environmental risks on landing such as the strong tailwind. This had directly led to the crew continuing to operate the Touch and Go exercise in strong tailwind condition. The lack of performance data calculations

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availability for Touch and Go also causes the crew to operate in ambiguity regarding the accelerate/stop distances.

e). Safety Pilot was unable to assist in this incident and did not have any contributing effect to the safety of the flight.

4.0 SAFETY RECOMMENDATION

In accordance with Annex 13, the sole objective of the investigation of an occurrence shall be the prevention of accidents and incidents. One very important tool to achieve this objective is the issuance of timely safety recommendations. A safety recommendation is defined as a proposal of an accident investigation authority based on information derived from an investigation. The intended purpose of a safety recommendation is the prevention of accidents or incidents and the reduction of the consequences of such occurrences. It, in no case, has the purpose of creating a presumption of blame or liability for an accident or incident.

4.1 It is recommended that the manufacturer make a review of the probable need for performance calculations for Touch and Go, such as considerations for decision speed, accelerate/stop distances, minimum runway distance requirement and/or other related factors.

4.2. It is recommended that the Operator reflect or insert a reference to the manufacturer's note regarding accidental speed brake extension as well as the auto-retraction safety feature from the Flight Crew Techniques Manual into the Operator's training manual used for Touch and Go reference as a reminder and emphasis to the instructor.

4.3 It is recommended that the current Operator's training manual be enhanced to include a specific safety/reject briefing to be used regarding the procedures and considerations for a discontinuation of Touch and Go after TOGA.

4.4 It is recommended that the Operator review the need for a more detailed guideline or brief for the Safety Pilot which incorporates the specific procedures, differences then normal SOP and specific parameters for the safety pilot to monitor in a touch and go. The

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safety pilot is to be selected from experienced co-pilot with a minimum of hours and experience as may be determine by the operator where suitable.

4.5 It is recommended that the Operator emphasizes the recommended procedures for the use of full reversers in the event of a discontinued Touch and Go.

4.6 It is recommended that all Aircraft Base Training (Endorsement) is conducted during the day time as required by DCA *Borang* A 320 APPLICATION FOR THEINCLUSION OF THE AIRBUS A 320 IN THE AIRCRAFT RATING OF A PILOT'S LICENSE (AEROPLANES, Section 5.1)

4.7 It is recommended that that the ATC shall update all surface condition or weather reports to flights under their control sufficiently as per ICAO Annex 3 Appendix 3 Paragraph 2.32 requirement for weather update when there is significant change.


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Appendix A: AAIB Accident/Incident Notification

APPENDIX A

		AAIB (Malaysia) Accident/Incident Notification		Ref No MOT/BSKU(S)600												
Ministry of Transport Malaysia (Air Accident Investigation Bureau) No 26, Jalan Tun Hussein, Presint 4, 62100 Putrajaya, Malaysia		Telephone: +603 8892 1071 Facsimile: +603 8888 0163 Website: www.mot.gov.my Email: yahaya@mot.gov.my														
A. Classification accident / Incident (Serious) / Incident (Minor)	ACCID <input type="radio"/>	INCID (Serious) <input checked="" type="radio"/>	INCID (Minor) <input type="radio"/>													
B. Detail of Aircraft / Flight	<table border="0"> <tr><td>Manufacturer</td><td>: AIRBUS</td></tr> <tr><td>Model</td><td>: A320-216</td></tr> <tr><td>Nationality</td><td>: MALAYSIA</td></tr> <tr><td>Registration</td><td>: 9M-AHM</td></tr> <tr><td>Flight Number</td><td>: AXM9700</td></tr> <tr><td>Serial Number</td><td>: 3536</td></tr> </table>				Manufacturer	: AIRBUS	Model	: A320-216	Nationality	: MALAYSIA	Registration	: 9M-AHM	Flight Number	: AXM9700	Serial Number	: 3536
Manufacturer	: AIRBUS															
Model	: A320-216															
Nationality	: MALAYSIA															
Registration	: 9M-AHM															
Flight Number	: AXM9700															
Serial Number	: 3536															
C. Detail of Owner / Operator / Lessee (If applicable)	<table border="0"> <tr><td>Owner</td><td>: PARILEASE SAS</td></tr> <tr><td>Lessee (if Applicable)</td><td>:</td></tr> <tr><td>Operator</td><td>: AIR ASIA BERHAD</td></tr> </table>				Owner	: PARILEASE SAS	Lessee (if Applicable)	:	Operator	: AIR ASIA BERHAD						
Owner	: PARILEASE SAS															
Lessee (if Applicable)	:															
Operator	: AIR ASIA BERHAD															
D. Date and Time (Local / UTC) of the event i.e. accident or serious incident	<table border="0"> <tr><td>Date</td><td>: 30 NOVEMBER 2017</td></tr> <tr><td>Time</td><td>: 0555H</td></tr> </table>				Date	: 30 NOVEMBER 2017	Time	: 0555H								
Date	: 30 NOVEMBER 2017															
Time	: 0555H															
E. Last point of departure and point of intended landing of the aircraft	<table border="0"> <tr><td>Last point of departure</td><td>: WMSA</td></tr> <tr><td>Point of intended landing</td><td>: WMKK</td></tr> </table>				Last point of departure	: WMSA	Point of intended landing	: WMKK								
Last point of departure	: WMSA															
Point of intended landing	: WMKK															
F. Last known position	<table border="0"> <tr><td>Latitude</td><td>:</td></tr> <tr><td>Longitude</td><td>:</td></tr> <tr><td colspan="2">Descriptions</td></tr> <tr><td colspan="2">END OF RUNWAY 15 WMSA</td></tr> </table>				Latitude	:	Longitude	:	Descriptions		END OF RUNWAY 15 WMSA					
Latitude	:															
Longitude	:															
Descriptions																
END OF RUNWAY 15 WMSA																

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<p>G. No of crew and passengers; aboard, killed and seriously injured</p>	<p>Total occupant on board:</p> <ul style="list-style-type: none"> • Pilot :NIL • Passengers :NIL <p>Conditions</p> <p>(Example : Pilot managed to vacate during fire.) ALL 3 CREW EVACUATED VIA EMERGENCY SLIDE AT DOOR 1 LEFT</p>												
<p>H. Qualification of the pilot in command and nationality of the crew and passengers</p>	<p>Pilot in Command qualification :AUTHORISED EXAMINER Pilot in Command nationality :MALAYSIAN First Officer nationality :MALAYSIAN Passengers nationality :NIL</p>												
<p>I. Description of the accident or serious incident and the extent of damage to the aircraft so far as is known:</p>	<p>AIRCRAFT WAS ON ENDORSEMENT FLIGHT AND WAS PERFORMING CIRCUIT AND LANDING. ON THE THIRD TOUCH AND GO, THE CREW REJECTED THE TAKE-OFF. AIRCRAFT OVERRUN RUNWAY 15 INTO THE GRASS AREA.</p>												
<p>J. An indication to what extent the investigation will be conducted or is proposed to be delegated by the State of Occurrence</p>	<p>Note : To be filled up by the Bureau</p>												
<p>K. Presence and description of dangerous goods on board the aircraft</p>	<p>No <input checked="" type="radio"/> Yes (Please describe) <input type="radio"/> Unknown <input type="radio"/></p>												
<p>L. Operation Type</p>	<table border="0"> <tr> <td>Commercial Aviation <input type="radio"/></td> <td>Scheduled <input type="radio"/></td> <td>Passenger <input type="radio"/></td> </tr> <tr> <td>General Aviation <input type="radio"/></td> <td>Non Scheduled <input checked="" type="radio"/></td> <td>Cargo <input type="radio"/></td> </tr> <tr> <td>Others <input checked="" type="radio"/></td> <td></td> <td>Others <input checked="" type="radio"/></td> </tr> <tr> <td colspan="2">TRAINING FLIGHT</td> <td>CREW UNDER TRAINING</td> </tr> </table>	Commercial Aviation <input type="radio"/>	Scheduled <input type="radio"/>	Passenger <input type="radio"/>	General Aviation <input type="radio"/>	Non Scheduled <input checked="" type="radio"/>	Cargo <input type="radio"/>	Others <input checked="" type="radio"/>		Others <input checked="" type="radio"/>	TRAINING FLIGHT		CREW UNDER TRAINING
Commercial Aviation <input type="radio"/>	Scheduled <input type="radio"/>	Passenger <input type="radio"/>											
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Others <input checked="" type="radio"/>		Others <input checked="" type="radio"/>											
TRAINING FLIGHT		CREW UNDER TRAINING											
<p>M. Level of damage to aircraft (if information is available)</p>	<p>Destroyed <input type="radio"/> Substantial <input type="radio"/> Minor <input checked="" type="radio"/> None <input type="radio"/> Unknown <input type="radio"/></p>												

The State of Occurrence shall forward a notification of an accident or serious incident with a minimum of delay and by the most suitable and quickest means available to: a) the State of Registry b) the State of the Operator c) the State of Design d) the State of Manufacture and e) the International Civil Aviation Organisation, when the aircraft involved is of a maximum mass of over 2250 kg.


APPENDIX B

Appendix B: CVR Transcript

Flight Data Time	CVR Time	Ambient Sounds	System Sounds	Voice 1 (CAPT)	Voice 2 (Trainee)	Voice 3 (Safety Pilot)	ATC
21:55:18	1:55:29		One hundred	check...go down a bit	ok		
21:55:21	1:55:32			centreline			
21:55:23	1:55:34		Fifty				
21:55:24	1:55:35		Forty	eyy centreline			
21:55:25	1:55:36		Thirty				
21:55:25	1:55:36		Twenty	oo aaa....			
21:55:27	1:55:38		Retard				
21:55:29	1:55:40		Dual Input				
21:55:30	1:55:41		Retard				
21:55:33	1:55:44			Centreline, standup	ok		
21:55:42	1:55:53			Okay go..			
21:55:44	1:55:55	Engine spool up			MAN TOGA SRS Go around Track....		
21:55:46	1:55:57		Master Warning Continous Repetitive Chime (CRC)		autothrust..blue		
21:55:48	1:55:59			(**) (**) ?		(**)	
21:55:52	1:56:03			hah?		(**)	
21:55:54	1:56:05	Engine spool down		My control!			
21:55:54	1:56:05				You have control		
21:56:00	1:56:11			Red cap 9700 stopping!			
21:56:13	1:56:24	Sounds of aircraft entering rough surface and tire screech			Oh shh...		
21:56:14	1:56:25				ooww		
21:56:18	1:56:29				sir...sir		
21:56:19	1:56:30				sir.		
21:56:22	1:56:33				sir..		
21:56:23	1:56:34				sir		
21:56:25	1:56:36			ah shit...	oh my god sir		
21:56:27	1:56:38			Red Cap 9700 Mayday Mayday Mayday stopping!	sir..		
21:56:33	1:56:44						Red Cap 9700 roger your mayday
21:56:41	1:56:52			adoi shit...			
21:56:45	1:56:56				oh my god sir		
21:56:47	1:56:58			ahh....			
21:56:50	1:57:01			okay...we shut down engine...shut down engine....			
21:56:55	1:57:06			start APU (**)			
21:56:58	1:57:09			oh my god		standby standby	
21:57:00	1:57:11				I cannot believe this		
21:57:05	1:57:16		Single chime	okay nevermind nevermind..			

21:57:06	1:57:17			do the after landing checklist			
21:57:07	1:57:18			(**) checklist ..one by one aah			
21:57:12	1:57:23			ground red cap...tower red cap 9700			
21:57:17	1:57:28						red cap 9700 go ahead
21:57:19	1:57:30			ah we have overrun the runway sir, stopping at present position sir. request assistance	(**)	(**) its not your fault	
21:57:24	1:57:35						Roger REDCAP9700 a copy that. Our ARFS on the way.
21:57:30	1:57:41			9700 copied...			
21:57:32	1:57:43					oh my god sir	
21:57:35	1:57:46			aduhhh....		im so sorry sir	
19:59:49				(**) its okay			
21:57:40	1:57:51		Single chime	(**)...what happened just now ah?			
21:57:42	1:57:53					The speedbrake didn't retract..just now the speedbrake...I saw it I then call (**) the speedbrake retract (**) back already	
21:57:49	1:58:00			(**) was retract or not? Was retract or not?			
21:57:53	1:58:04					not retract aah (**) its aa..(**)	
19:59:49				(**)		so means this one is not up..this one is down..	
21:58:07	1:58:18			(**)			redcap 9700 check your situation
21:58:14	1:58:25					red cap 9700 aircraft just overrun the runway sir, we are at the, stopped at the ditch, we are going to shut down the aircraft and then need the aircraft be towed from preent position	
21:58:25	1:58:36						roger redcap 9700 copy that

Appendix C: AirAsia Endorsement Flight Policy / Touch and Go Procedure

	<p align="center">Operations Manual Part D – Section II Base Training – Aeroplane</p>	<p>Issue Date 01 Aug 16 Issue 03 Rev 0 1.2E Endorsement Page 1</p>
<p>GENERAL INFORMATION</p>		
Course Title & Code	Base Training – Aeroplane (Endorsement)	
Course Nomination	Chief Pilot Training & Standards	
Participants' Profile	Pilots not meeting AirAsia ZFTT requirements	
Instructors' Profile	DCAM and AirAsia approved TRE	
Course Purpose	For the issuance of DCAM license and A320 rating	
Course Objectives	Upon completion of the course, candidate will be able to Line Flying Under Supervision as a flight crew member on AirAsia aircraft incorporating AirAsia Standard Operating Procedures	
Course Parts	Aircraft Base Training	
Course Footprint		
Aircraft Base Training		
2 hours	2 hours	30 min
Pre-flight briefing	Base Training	Debriefing
<hr/> <p align="center">Authority: Director of Flight Operations, AirAsia Berhad</p>		



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Airbus A320 Base Training (A320 Endorsement)

TRAINING OBJECTIVE	<ul style="list-style-type: none">• Aircraft base training objective is intended to confirm the "transfer of knowledge" from the FFS to the aircraft. Additionally it gives the trainee the opportunity to experience for the first time the real aircraft behavior in basic maneuvers such as landing, flare, de-rotation, etc. Therefore, we do recommend arming the spoilers during landing exercises in Base Training.• This procedure was extensively tested by the manufacturer's Flight Test Division and the Training Division proved to be very realistic from the point of view of aircraft behaviour and has no safety related impact.• The detailed procedure is explained in item "e. Touch and Go". To summarize, upon landing, at nose wheel touch down, the TRI will disarm the spoilers by pushing on the speed brake lever to initiate the retraction sooner. The purpose of this procedure instead of waiting for the automatic retraction while advancing the thrust levers is due to the physical position of the thrust levers. Depending on the Fly-By-Wire aircraft, the automatic retraction will start between a TLA ranging from 20° up to 35°, which is well above the setting for spool up of the engines.• Trainees should read the briefing to understand the content and requirements of the session.• A full briefing will be given by the TRI prior to the flight. <p>Note: <i>When transitioning from another Fly-By-Wire aircraft, following points will be highlighted during the base training briefing:</i></p> <ul style="list-style-type: none">• overhead panel layout• one engine taxi• rotation, pitch attitude target (light weight)
SCHEDULE	<ul style="list-style-type: none">• Pre-flight briefing duration = 1:00 hr• The TRI will ensure that the trainee has reviewed the walk around.
GENERAL	<ul style="list-style-type: none">• Training flights must be conducted in accordance with AirAsia training procedures and regulations.
CREW REPORTING PROCEDURE	<ul style="list-style-type: none">• Trainees are normally required to report 2 hours before scheduled departure time where they will meet their instructor.
CARRIAGE OF PASSENGERS	<ul style="list-style-type: none">• The carriage of passengers is limited to technical observers from AirAsia and other specifically approved by the Chief Pilot Training & Standards or his nominee, and with the agreement of the instructor. The number of passengers may not exceed four.

Authority: Director of Flight Operations, AirAsia Berhad



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Airbus A320 Base Training (A320 Endorsement)

E. Touch and Go

- Touch and go are used to reduce the amount of training time wasted in taxiing the aircraft back to the holding point and awaiting take-off clearance. In order to maintain a high level of safety they must be conducted in a properly disciplined manner. The following technique is to be used:
- *Prior to EVERY touch and go, the INSTRUCTOR will confirm with the trainee that:*
 - Reverse thrust will not be used
 - Brakes (auto or manual) will not be used
- *The TRAINEE will:* land the nose wheel after main gear touchdown (Which also allows pitch trim reset)
 - track the runway centreline using rudder pedal inputs only
- *The INSTRUCTOR will:* disarm spoilers
 - call "STAND UP"

The trainee will: advance the thrust levers approximately 2" (5 cm) forward (to prevent engines reducing to ground idle).

- *The INSTRUCTOR will:* move the flap handle to position 2 detent and confirm the flaps are running
 - reset the rudder trim if necessary
 - monitor the forward movement of the pitch trim
 - place one hand behind the thrust levers ensuring they are advanced approximately 2" (5 cm)
 - call "GO" when aircraft is in the correct configuration.
- *The TRAINEE will:* advance the thrust levers to the TOGA detent
 - Maintain the runway centreline.
- *The INSTRUCTOR will:* - monitor engine acceleration
 - check FMA annunciation (when appropriate)
 - check TOGA thrust obtained and call "POWER SET"
 - call "ROTATE" at VAPP
 - maintain his hand behind the thrust levers to ensure no inadvertent reduction of power or no unwanted stop
- *The TRAINEE will:* rotate the aircraft to the pitch attitude commanded by the SRS or 15° if no FD is available.

(SEE FOLLOWING DIAGRAM)

- Following gear retraction the instructor will call for CLB thrust
- The trainee will move the thrust levers to the CLB detent (the FMA will read THRCLB | SRS | GA TRK).
- At acceleration altitude or ALT*, whichever occurs first, and F speed: select FLAP 1 and S speed. Approach may be activated at this stage.

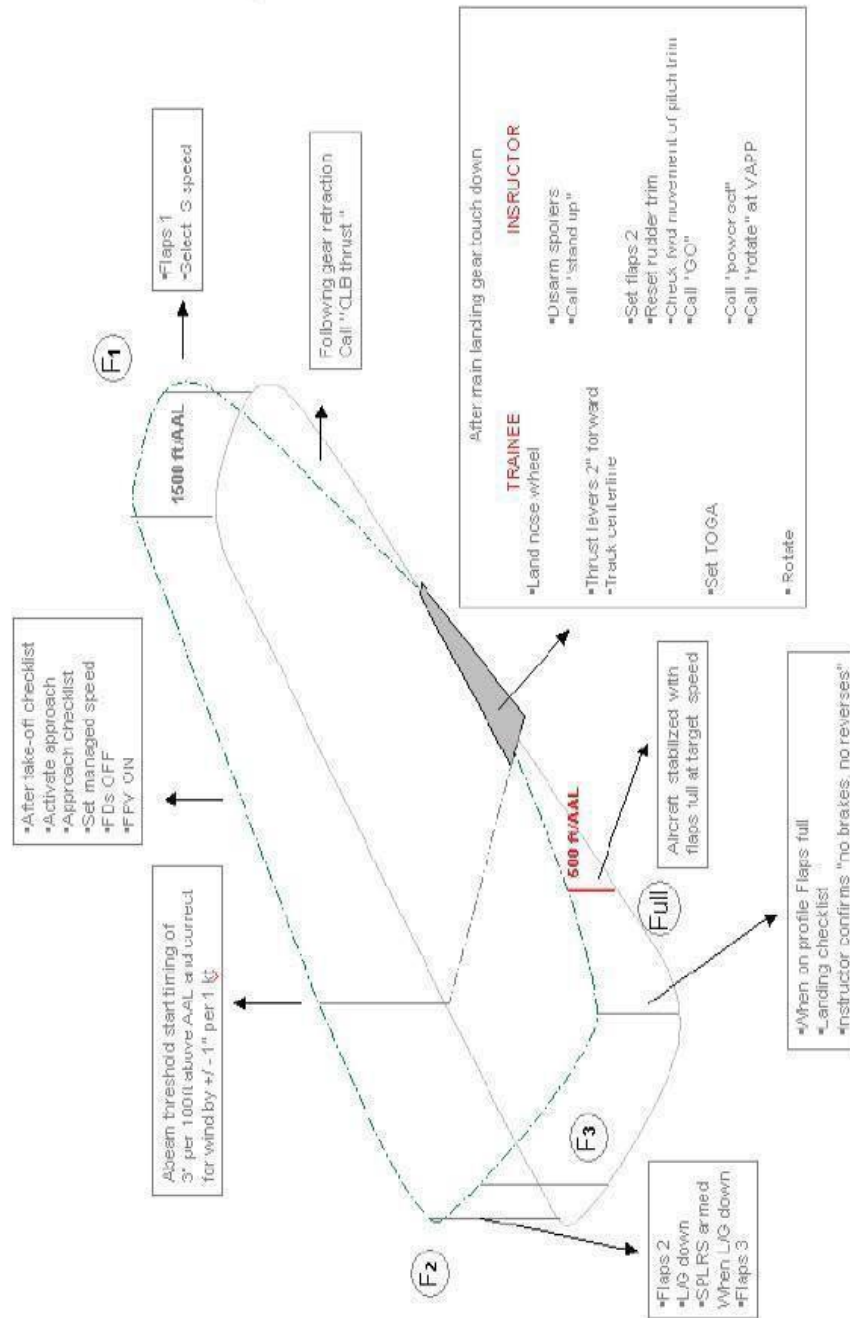


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FLIGHT TRAINING POLICY (CONT'D)

• **Emergencies :**

If the instructor wishes to abandon the touch and go, he/she will call "STOP" simultaneously taking control of the aircraft and bring it to a halt using maximum braking and reverse. Once the aircraft has stopped he will call for any appropriate ECAM actions. The decision to discontinue a touch and go after the application of TOGA must only be taken if the instructor is certain that the aircraft cannot fly safely. Remember there is no V_1 on a touch and go.

Note: The take-off configuration warning may sound if the application of TOGA is made while the flaps or pitch trim are resetting but still outside of the takeoff range.

F. Radio Communications/External Lookout

- The instructor is responsible for all radio communications and maintaining a visual lookout for conflicting air traffic. Trainees (including the observer in the jump seat) should be encouraged to back up the instructor in this regard and to immediately inform him of any potential conflict.

G. Next Exercise

- The instructor will inform the trainee of the next exercise to be performed during the downwind leg, and he will confirm the trainees' understanding of this exercise. During each approach, the instructor will remind the trainee whether a full stop, a touch and go, or a go around will be performed.

H. Instructor Take-over

- **In Flight :**
On the A320 there is no intermediate step for corrections between voice recommendations (oral guidance) and total take-over by pressing the push-button on the sidestick. Because of the nature of the "fly by wire" system, additive control inputs by the instructor may be of negative value for instruction purposes and can generate confusion in the handling of the trajectory. This should be emphasized and reviewed with the trainees during the pre-flight briefing. If take-over becomes necessary during the flight, instructor will clearly call "I HAVE CONTROL" and press sidestick priority pushbutton. The trainee will acknowledge by calling "YOU HAVE CONTROL", release the sidestick and observe the red arrow on the sidestick priority panel on the glareshield. Instructor will keep his side priority pushbutton depressed until the aircraft is under full control and it is safe to return control to the trainee. However there may be cases where it is necessary to apply back stick without warning in case of a very late flare. It must be emphasized that a take-over is a very rare occurrence and that if a take-over is necessary the trainee should not regard this as a negative development but the normal take-over method for an A320.

- **On Ground :**

It should be emphasized that the nosewheel steering tiller should NOT be used at high speeds (GS > 30 kt) because of over controlling. Steering inputs from both tillers are additive, and corrective inputs by the instructor can be confusing and potentially dangerous. Should a take-over be necessary, the instructor will immediately call out "I HAVE CONTROL", and if necessary, be prepared to use differential braking to regain control or bring the aircraft to a stop.

I. Fuel Management

For normal flight training sessions, the normal fuel load should be such that the first landing would be performed at approximately MLW – 10,000 kg. Estimated average consumption is 3000kg per hour.

J. Automatic Landings

For demonstration purposes, instructors may carry out automatic landings provided the weather and the ILS meet CAT 1 criteria or better. The instructor should be prepared to take manual control immediately if the flight path or roll out deviate. Trainees should be reminded of all the conditions and limitations required prior to conducting an automatic landing during low visibility procedure.

Note: See FCOM references for limitations on the use of the automatic landing system.



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K. FMGS Use

- The FMGS should be initialised for the intended flight either by data base company route or by waypoint and PBD. Managed lateral navigation may be used to intercept the first ILS assisted approach and when weather makes visual flight impossible. All visual circuits should be flown with FDs off and FPV selected. The fact that the approach and runway will remain displayed is of considerable assistance for positioning the aircraft on final approach.

L. Cockpit Preparation and Engine Start

- The trainee crew will occupy the left and right seat for cockpit preparation with the instructor supervising from the jumpseat. Just prior to engine start the instructor will occupy either the right or the left seat.

M. Taxi

- Little if any power above idle thrust will be required to get the aircraft moving at training weights. Thrust should be used symmetrically. Avoid high thrust settings at low ground speeds due to the risk of ingestion (FOD). The wing mounted engines are close to the ground; this is a particular point to note for ex DC9, BAC 1-11 and B727 pilots. Avoid placing engines over unconsolidated or unprepared ground e.g. over the edge of taxiways. Brakes may be checked once the aircraft is moving and thereafter the normal maximum taxi speed should be 30 kts in a straight line, 10 kts for a sharp turn. As pilot eye height at 15 feet is higher than many other aircraft monitor ND ground speed displays to help assess taxi speed. Do not "ride" the brakes, as 30kts is exceeded, apply brakes smoothly and decelerate to 10kts, release the brakes and allow the aircraft to accelerate again.

Note: Use of engine anti-ice increases ground idle thrust. Care must be taken on slippery surfaces. Nose wheel steering is also fly by wire. The inputs of the nose wheel steering tillers are additive (just like the side stick). Care is needed to steer the aircraft smoothly with small tiller inputs. Sharp turns particularly need care as the rate of response of the nose wheel to tiller input is not linear.

N. Take off

- Half forward stick is used at the commencement of the take-off run. For crosswind takeoff, routine use of into-wind aileron is not recommended. In strong crosswind conditions, small amounts of lateral control may be used to maintain wings level, but the pilot should avoid using excessive amounts. This causes excessive spoiler deployment, which increases the aircraft tendency to turn into wind. A two stage power application to TOGA or FLEX is made and the aircraft is kept straight by use of the rudder. At 150 kts the connection between the nose wheel steering and the rudder pedals is removed (the nose wheel now centralized).
- The down elevator input may be gently removed by 100 kts.
 - At V_R , use a constant pitch rate of about 3°/sec and rotate to a typical all-engine attitude of about 15° (A320).
 - If some lateral control has been applied on the ground, center the side stick during rotation so that the aircraft gets airborne with a zero roll rate demand.
 - After lift off, follow the SRS pitch command bar.
 - If one engine has failed, at V_R , rotate the aircraft smoothly, using a continuous pitch rate to an initial pitch attitude of 12.5°.

O. Initial Climb

- Having confirmed a positive rate of climb, the gear is retracted and the aircraft climbs away following the FD commands. Care should be taken to restrict control inputs to those necessary to change or correct the flight path only i.e. avoid over controlling. At thrust Reduction Altitude "CLB" will flash on the upper left portion (ATHR) of the PFD. Move the thrust levers to the CLB detent (two "clicks" from TOGA or one "click" from FLEX). Do not do this too slowly or there is a risk that the ATHR may disconnect. The autothrust is now active. At acceleration altitude or ALT*, whichever occurs first, and F speed: select FLAP 1 and S speed. Approach may be activated at this stage.

Authority: Director of Flight Operations, AirAsia Berhad



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P. Circuit Handling

- Remember that in pitch the sidestick is demanding "g load" and that in roll it is demanding roll rate. All visual circuits MUST be flown with FDs off and FPV selected, bank angle should be limited to 30°. It is usual to switch FDs off at the beginning of the downwind leg. Use of managed speed is normal procedure as well as use of autothrust. The standard timing of 3 sec per 100 ft above AAL and corrected for wind by 1 sec per 1 kt may be used from abeam the end of the runway prior to turning base leg. Turning base leg (end of timing), select F2, gear down and spoilers armed. The most useful PFD display is the raw FPV symbol to assist in setting the aircraft up on the correct downwind, approach path, to maintain altitude and to avoid gross errors.

Note: With the FDs off the speed target remains magenta VAPP target.

Q. Final Approach and Landing

- ILS guidance may be used, if available, for the first ILS assisted visual approach, after this the use of the ILS should be restricted. Trainees are required to demonstrate their ability to fly a visual approach without ILS or VASI guidance. The FDs are not to be used for visual approaches. The FPV symbol is the most useful aid to establish the correct approach path. Autothrust is normally used, again however, trainees must demonstrate their ability to fly the approach using both manual and automatic thrust. The speed trend arrow is particularly useful for achieving timely and correct thrust response. Care should be exercised to avoid descent through the correct approach path with idle thrust. Late recognition of this situation without prompt thrust increase may lead to considerable speed decay and altitude loss. Endeavour to have the aircraft "stabilized" by 500' AGL, that is on the correct approach path at VAPP (and correct configuration) with the appropriate thrust applied; if stabilization is not achieved, a go around should be considered. Avoid any tendency to "duck under" in the later stages of the approach. One dot below the glide at 50' is 14' below the ideal glide path. 2 dots is 28'. When the aircraft's glide slope antenna is at 50', the main gear is at 32' AGL and at threshold, the main gear is at 28'. In any event, avoid destabilization of the approach in the last 100' to give the best chance of achieving a good touchdown at the required position.

R. Flare and Landings

- Standard Landings:
 - The pilot's view from the cockpit during approach and landing is particularly good. The cockpit cut off angle is 20° which gives a superb view of the runway close to the aircraft. Students must make sure that they look well ahead during the flare and landing to enhance their ability to judge the position of the aircraft relative to the ground. At 20' "Retard" will be called. Reduce the thrust levers promptly to idle. Commence a gentle progressive flare and allow the aircraft to touch down without a prolonged floating flare. Do not attempt to "hold the aircraft off" as considerable float may be followed by a hard touchdown.
- Crosswind Landings:
 - Either the "forward slip" or the "decrab" technique may be used. The preferred technique is the decrab method; allow the aircraft to point into wind, pushing it straight with gentle use of rudder during the flare. If the decrab is gentle, little use of into wind aileron will be required if any. For rapid decrab using large or fast rudder inputs, the aircraft will roll conventionally and aileron sidestick inputs will be required. REMEMBER the sidestick demands roll rate, once the wings are level centre the sidestick.

CAUTION: *Avoid flaring high and prolonged "hold offs". Tailstrike will occur if the pitch attitude exceeds the value given in SOP Vol. 3 "Normal Operations" - Chapter "Landing" - ground clearance diagram and in FCOM Bulletin.*



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WEATHER	<p>Dispatch Considerations for Base Training</p> <p>A. Planning Minima</p> <ol style="list-style-type: none"> 1. Weather limitations – Destination and Alternate: 5000 and clear of clouds 2. Wind limitations – Destination and Alternate: Maximum x-wind 20 knots 3. Day/Night limitations – Dest. and Alt: No night Visual Approaches allowed 4. Take-off alternate – if required: Not applicable 5. Runway condition – Dry 6. Runway Length Minimum – 2700 m. 7. Braking action – Good 8. A320 fuel – 15.0 tons plus positioning fuel, (may be adjusted to suit the detail). 9. Aerodrome ATC facilities – Standard CAT A airport. 10. Weight and Balance – As per FOVE <p>B. Dispatch Information</p> <ol style="list-style-type: none"> a. Standard AirAsia briefing package – Wx, Notams, OFF, Base Training Forms b. Minimum Equipment List – As per OMA <p>C. Crew Qualification Licenses and Type Ratings – DCAM CPL/ATPL with A320 validation as applicable.</p>
Instructor Support	<p>TOPICS TO BE DISCUSSED:</p> <ol style="list-style-type: none"> 1. Seat and pedal adjustment 2. PM: Position of hand during the Approach 3. Visual Targets <ul style="list-style-type: none"> • Correct height over the App. Lights • Touchdown point • Visual perception, target point on final • Utilization of visual references to assist scan • Utilization of PAPI (when to stop) • Optical Illusions • Marginal Visibility 4. FMGS calculation of V app and V app target 5. Flare Mode 6. Screen Height (50 feet) 7. Corrections for vertical and lateral offsets 8. PIO (Pilot Induced Oscillation) on final/Instructors response 9. Landing Configuration Height (latest) 10. Maximum sink rate 11. Crosswind Landing technique 12. Tailwind Landings (peculiarities/risks) 13. Contaminated Runways 14. Maximum Pitch and Bank Limits for Touchdown 15. Engines Spool up time 16. Importance of THR LVR IDLE at Touchdown/Spoiler logic 17. Configuration 3 Landings 18. Pitch and Power values 19. Bounced Landings: Cause/Recovery <p>ADDITIONAL TOPICS FOR THE INSTRUCTOR :</p> <ul style="list-style-type: none"> • Take off abort after touch and go • Who is doing what • Thrust lever take over after touch down • Centreline control responsibility • A/C never slows down • Always over V_{MCA}

Authority: Director of Flight Operations, AirAsia Berhad

Appendix D: Engineering Initial Assessment Report

9M-AHM Overshoot Runway Incident Report

Initial damage assessment on aircraft	
Airframe	Fuselage-sign of long cut on LH aft lower belly faring
	Both LH landing gear mainwheel found deflated
Engine no 1	Signs of mud and soil ingestion into engine. 2 fan blades found with bent and cut respectively.
Engine no 2	Signs of mud and soil ingestion into engine

Secondary damage caused on ac during ac pull back process	
Airframe	LH nose wheel blown during ac pull back due to hitting steel plates
Engine no 1	LH lower fan cowl damage due to hitting ground light fixture during ac pull back

Aircraft was towed by pulling it backwards using two tug masters. A combination of strap and cable were installed on each main gear cylinder. During ac pull back, steel plates were positioned at areas where the soil were extremely soft and muddy in order to assist with aircraft towing.

Tug master (x2); Cable assembly (x2); Straps (x2); Excavator; Tractor; 2” thick steel plates (x6); Generators; Ground Power Unit; Flood lights; Passenger steps

Agencies/Organization/Operator	Services provided
MAB	Airport Manager/Rescue coordinator
DCA Malaysia	Airport status/ATC
Telekom Malaysia	Equipment maintenance for ATC
Police	Provide incident side access control; escort service
Airport Fire & Rescue Services	On standby during ac defueling and ac pull back
Claudera Aviation Services Sdn Bhd	Provides equipment and manpower support
Sapura Aero Sdn Bhd	Provides equipment, manpower and transport support
Asia Aero Technologies Sdn Bhd	Provides manpower and transport support during initial stage

Chronology of events		
Date	Time	Event
30 th Nov 2017	0930	AirAsia team arrived at Emergency and Operations Centre meeting room. Various other agencies were already in the meeting room.
	1000	Briefing and coordination meeting with various agencies; chaired by SZB Airport Manager
	1130	AirAsia team arrived at the scene of the incident. Assessment carried

		out on aircraft condition and position
	1230	Aircraft defueling started
	1330	Parts & equipment arrived from AirAsia store
	1400	Ground assessment and preparation in progress
	1600	Still waiting for equipment to arrive
	1700	Cables and straps for ac towing arrived
	1900	Tug masters arrived at scene of incident
	1930	Excavator arrived at scene of incident
	1945	Cables for towing being laid out form runway pavement to the aircraft
	2100	Steel plates being put into position
	2330	Aircraft towing started
1 st December 2017	0010	Aircraft towing in progress and both main wheel on perimeter road
	0030	LH landing gear main wheel change started
	0400	Aircraft towing still in progress. Towing hampered by soft soil and ac sliding off during towing process
	0830	Attended meeting with rescue coordination team
	0930	Aircraft towing resumed and nose wheel on perimeter road
	1000	JCB tractor arrived due to excavator unserviceable
	1030	LH nose wheel replacement in progress
	1200	Further ground preparation work in progress
	1300	Steel plates being repositioned for ac to continue being towed
	1500	Aircraft towing from grass area completed and nose wheel on runway pavement
	1520	Nose wheel replacement in progress
	1640	Aircraft washing (gears only) by AFRS
	1720	Aircraft towing and arrived at Sapura Aero hangar
	1800	CVR & FDR removed

Appendix E: Assessment of Other Damages

Dear all,

A **post mortem** meeting was held just now between all parties concerned wrt the rescue of this plane on.

Meeting was chaired by En Basha (MAB's SZB Airport Manager) and attendees were as follow:

1. Police (Airport)
2. AFRS
3. Telekom Malaysia
4. DCA Malaysia (for ATC)
5. MAB Engineering
6. Claudera Aviation Services Sdn Bhd

A. Reported damages were as follow:

1. Telekom Malaysia: Damaged 'Near Field' antenna and cabling system. (Note-The maintenance of this unit falls under Telekom Malaysia but end user is DCA).
2. MAB Engineering: Damaged cabling system, 1 unit approach light pole and 1 unit concrete light canister.
3. MAB Engineering: Soil and slope contour.

B. Damages claim and other claims:

1. Telekom (DCA) and MAHB shall provide quotation for repair on above damages.
2. AFRS will provide claims for standby near the plane during defuelling process and also for wheels/tyre cleaning after ac have been pulled.
3. As for soil and slope contour repair, Claudera shall wait for further instruction from AAB wether to proceed or AAB wish to engage MAHB or any other party to do the work.

C. Feedback from other parties concerning AAB:

1. MAHB-Ideally there should be another person from AAB stationed at Emergency Operation Centre to assist with feedback and co-ordination work apart from those involved directly in doing rescue work.
2. Police (Airport) request for AAB to provide its own transport within the airport to shuttle its own staff as their transport are rather limited within the airport itself.

(Note-for item C2 above, I have clarified that none of AAB security staff contacted me to request for transport to pick up from Skypark staff entrance point . AAB transport was available through out (that was used by AirAsia Corporate Charter team), plus Sapura Aero also provided transport for us to use. Perhaps in future all important AAB contact point to be notified to all HODs during an incident).

D. Suggestions to the committee:

I suggested to the team to have emergency medical team to be on standby at site in case of any mishaps/injury to anyone involved in the rescue work. I noticed there wasn't any medical team on standby.

E. Action item for AAB:

To provide focal point of contact for damages claim submission by relevant parties.

Best regards,
Kamsul

Appendix F: Flight Documents

Page: 1

LOCAL DATE: 30/11/17	VOYAGE REPORT	
ID:	<input checked="" type="checkbox"/> Endorsement <input type="checkbox"/> Ferry <input type="checkbox"/> Training <input type="checkbox"/> Test Fit <input type="checkbox"/> Revenue <input type="checkbox"/> Charter	
(NMC USE ONLY)		

#	AIMS ID	POS	NAME	REPORT
1	10053	CP*	TAIB, OMAR BIN	19:30
2	114168	FO	KON, CHEN YI BRIAN	19:30
3	15641	FO	YEO, ZONE HEE	19:30
4				:
5				:
6				:
7				:
8				:
9				:
10				:
11				:
12				:
13				:
14				:
15				:

All Time in UTC

#	FLT NO.	REG.	FROM	TO	STD	STA	BLK	OFF	CHK	T/O	LDG	ON	ACT	BLK	PF
1	9700	9M-AHM	KUL	SZB	20:30	21:00	0:30	21	10	21:20	21:27	21:30	0	20	15341
2	9700A	9M-AHM	SZB	SZB	21:01	22:00	0:59	21	30	21:33	21:52	21:55	0	25	15641
3	9701	9M-AHM	SZB	KUL	23:01	23:30	0:29	:	:	:	:	:	:	:	:
4					:	:	:	:	:	:	:	:	:	:	:
5					:	:	:	:	:	:	:	:	:	:	:
6					:	:	:	:	:	:	:	:	:	:	:
7					:	:	:	:	:	:	:	:	:	:	:

#	OFF BLOCK	PLAN TOW	ACT TOW	UPLIFT (LTR)	DEP (FOB)	ARR (FOB)	BURN OFF	OFF AB + TAXI	SAVE (-) EXCEED(+)	Reports Submitted:
1	-	-	-	8109	10150	7000	-	-	-	<input type="checkbox"/> MOR <input type="checkbox"/> INCIDENT REPORT <input type="checkbox"/> TCAS <input type="checkbox"/> BIRD STRIKE <input type="checkbox"/> AIR TRAFFIC INCIDENT <input type="checkbox"/> FDP/FT EXTN FORM
2										
3										
4										
5										
6										
7										

#	Departure				Arrival				Delay Comments
	TIME	CODE	TIME	CODE	TIME	CODE	TIME	CODE	
1									
2									
3									
4									
5									
6									
7									

ADDITIONAL COMMENTS: 1. ENDORSEMENT TRAINING FLIGHT.
2. FO BRIAN KOY AS SAFETY PILOT

Extn / Rest FDP/FT Hours: Minutes:	FDP/FT Extension / Rest Reduction Statement I certify that the Crew were fit for extension (as required).	SIGNATURE
--	--	-------------------

Use opposite side for additional comments.
Version: 15/01

30/11/17
CAPTAIN'S SIGNATURE AND DATE



**GENERAL DECLARATION
(OUTWARD / INWARD)**

Operator **Air Asia - Malaysia**


Marks of Nationality and Registration **9M-AHM** Flight **AK9700** Date **30/Nov/17**

Departure from **KUALA LUMPUR INTL, KLIA2(MALAYSIA)** Arrival at **SUBANG SULTAN ABDUL(MALAYSIA)**

FLIGHT ROUTING

(*Airport.* Column always to list origin, every en-route stop and destination)

AIR PORT	PS	NAME*	GEN DER	PASSPORT NUMBER	PASSP EXPIRY	BIRTH DATE	NTLY	NO. OF PASSENGERS ON THIS STAGE*
KUL to SZB	CP	OMAR BIN TAIB	M	A39971527	09/09/22	21/06/60	MYS	Departure Place: KUL
	FO	BRIAN KON CHEN YI	M	K35579431	20/07/20	03/03/94	MYS
	FO	YEO ZONE HEE	M	A31762485	08/07/19	04/03/90	MYS	Embarking:
							
								Through on same flight
							
								Arrival Place: SZB
							
								Disembarking:
							
								Through on same flight
							

<p>DECLARATION OF HEALTH Name and seat number or function of persons on board with illnesses other than airsickness or the effects of accidents, who may be suffering from a communicable disease (a fever-temperature 38°C/100°F or greater-associated with one or more of the following signs or symptoms, e.g. appearing obviously unwell; persistent coughing; impaired breathing; persistent diarrhea; persistent vomiting; skin rash; bruising or bleeding without previous injury; or confusion of recent onset, increases the likelihood that the person is suffering a communicable disease) as well as such cases of illness disembarked during a previous stop:.....</p> <p>Details of each disinsecting or sanitary treatment (place, date, time, method) during the flight. If no disinsecting has been carried out during the flight, give details of most recent disinsecting:.....</p> <p>Signed, if required, with time and date:..... Crew Member concerned</p>	<p align="center">FOR OFFICIAL USE ONLY</p> <div align="center">  </div>
<p>I declare that all statements and particulars contained in this General Declaration and in any supplementary forms required to be presented with this General Declaration are complete, exact and true to the best of my knowledge and that all through passengers will continue/have continued on the flight.</p> <p align="center">Signature..... Authorized Agent or Pilot-In-Command Delete as necessary</p>	

* To be completed when required by the State.

** Not to be completed when passenger manifests are presented and to be completed only when required by the State.

1

AXM9700 KUL/WMKK - SZB/WMSA ALTN:KUL/WMKK A320/AHM - KGS - PF/ 4.7%

CORTE/ R1 FMGS RTE/WMKKWMSA01 CRZ/CI024 DISPATCHER MAA 2886

REF 61466 - COMPUTED AT 18.09Z FOR ETD 20.30Z 29/11/17
- PLAN VALID UNTIL 30/11/17 02.30Z

WMKK RWY-32 AGOSAY AGOSA R467 GOBA6 CEL RWY-15 WMSA

WMKK/FL180[OPT]

ESAD : 0105 W/C : P000 TTL DIST : 0104 EET : 00:27

	PLAN	MAX	TIME	FUEL
PAX 0	0	180	00:27	1124
CARGO WT	0		00:05	179
PAYLOAD	0		00:30	1054
Z F WT 43090	43090	62500	00:37	1434
NET FUEL 12320	12320		00:00	0
T O WT 55410	55410	73500	00:00	0
BURN OFF 1124				
LDG WT 54286	54286	66000	01:39	3791
ARR FUEL 11196	11196			
			00:00	0
			03.04	8529
FUEL PRICE RATIO : 0.93				
TANKERING : NO				180
ZFW CHG M1000 KGS BURN LESS 16 KGS			04:43	12500
ZFW CHG P1000 KGS BURN MORE 16 KGS				
FL DIST W/C TIME FUEL				
2ND 160 0104 P000 00:27 1125				
3RD 140 0104 M001 00:27 1130				
				2488
TAKEOFF ALTN : NOT REQD				
FEA : NOT APPLICABLE				
ETOPS ALTN : NON ETOPS				
ALTN W/C DIST FL TIME FUEL MDF				
WMKK M004 0165 F250 00.37 01434 02488				
WMKP P009 0181 F280 00.39 01496 2550				
WMKJ M009 0200 F290 00.41 01581 2635				

9700

9M-A11M

ALPACIS BERKAS SHEET PAGE 10 OF 14

STD	20:30	OFF CHK	2102	T/OFF		LDG		OFF CHK F	10140
STA	21:00	ON CHK		EET	00:27	END		ON CHK F	
BLK	00:30	ACT BLK		ETA		POB	3		

DRY/OFF

E0 866

Fm

0-190

ZFW	ZFW CG	TOW	TOW CG	RWY	V1	VR	V2	FLAP	THS	FLEX
41.8	26.3	52.7	24.5	32R	117	177	128	14F	0-90P	84

DEPARTURE ATIS

ATC CLEARANCE

(X)

>10 Fw SCT 8km
300 1400 RWY

6000 SB 14 6000 0371

25/32 Q1006 NO SIG

200 22R 350/3

± HAW
32R 93 QF QS P1 32L

WMKK AGOSA1F AGOSA R467 GOBAS CE1 WMSA

ARRIVAL ATIS

DESTINATION ALTN ATIS

ATC CLEARANCE

Y 10km
2100 -RA
D/A15 F500
320/4 24
23
260/30 100G

END OF PLAN 61466

PAGE 10 OF 14

A320 TRANSIT CHECK & FUEL/OIL RECORD

AC REGN 9M AHM	DATE (LOCAL) 30/11/2017	STATION KUL	FLIGHT NO. AK700	AC TAKE-OFF WT+ 52700	MIN. SECTOR FUEL+ 3791	S/NO: B 011769	-A
ARRIVAL FUEL	FROM GAUGE 1750	LH TANK	CTR TANK	RH TANK 2010	TOTAL 3760	OIL UPLIFT TO BE RECORDED IN MAINTENANCE REPORT 1	
REFUELLER	UPLIFT/ DEFUEL 8109	LITRES X	SPECIFIC GRAVITY 0.793		KGS 6430	REFUEL & TRANSIT/DEPARTURE CHECK CARRIED OUT BY: RADASEE LANI	
DEPARTURE FUEL	(CALC) 5120	ADD ARRIVAL FUEL (G) TO BOWSER UPLIFT	DEPARTURE (CALC) TO DEPARTURE (GAUGE) 5030		KGS 10190	LIC/A/H. NO. 309 DAPT. SIGN	
DISCREPANCY					KGS 10150	LIC. NO. 02168	

FORM NO : AAM1022
ISS 01 REV 01
CAPT. TO ENTER
DATE : 01 AUG 2017

33482210
30/11/2017

DELIVERY TICKET

Kuala Lumpur (KUL)
(COMPANY NO: 88222 - D)

Customer : AirAsia Berhad - MYS
ACN No : 80045398
Supplier : Petronas Dagangan Berhad

Service : Fuelling
Flight Number: AK9700
Arrive From : KUL Flight Type : D
Next Dest : SZB Final Dest : SZB
Aircraft Type: 320 Aircraft Reg: 9MAHM

Plant Code : 80
PI NO : 1013915
Vehicle : DJ124
Stand : J004 HP No : JHP 38
Product : JETA1 Unit : LT

Task	Equipment	Fuel Order	Equipment
Start	Position	Received (X)	Cleared (Y)
04:00	04:06	04:06	04:21

Fuelling Time (Y-X) : 14.083333 MIN

Meter	9710136UE	18TB-105115
Tot. after :	51810399	0
Tot. before:	51802290	0
Meter Total:	8109	0

Quantity 8109 LT

Payment Type : Contract

Comments :

CERTIFIED SEDIMENT AND WATER FREE, CLEAR AND BRIGHT IN

CERTIFIED THAT THE PRODUCT DETAILED HEREON CONFORM TO THE RELEVANT SPECIFICATION AND HAVE BEEN HANDLED ACCORDING TO HDB PROCEDURES.

[Signature]

HEREBY CERTIFY THAT THE ABOVE QUANTITIES OF PETROLEUM PRODUCT HAVE BEEN SUPPLIED AS INDICATED SUBJECT TO THE CONDITIONS THEREIN SPECIFIED AND THAT I AM RESPONSIBLE FOR THE OPERATION AND SAFETY OF THE AIRCRAFT FUEL SYSTEM AND FURTHER I HAVE VERIFIED AS FAR AS POSSIBLE THAT THE GRADE QUALITY AND QUANTITY OF THE FUEL DELIVERED ARE AS REQUESTED.

[Signature]

CUSTOMER

29/11/17

Flight No	Aircraft		Airport		
	A/C Type	Tail No	Departure	Arrival	
AXM9700	A370	9M-AHM	KUL	SZB	
Configuration	Crew				
	3/0				
Loading	No. of Pax			Cargo + Baggage (kg)	
	A	C	I	CP1	CP3
	CP4	CP5			
	OA	OB	OC	Total Cargo + Compartment	
Fuel	FOB (Take off + taxi) (kg)				
	10000				
	Taxi Fuel (kg)				
	180				
Trip Fuel (kg)					
1124					

Last Minute Changes		
Specification	CL	Weight
	Cpt	
Total LMC		

AirAsia	
Less Paper Cockpit - Weight & Balance	
DOW: 47800	Weight (kg) 76.3
Payload: + 0	
ZFW: 47800	76.3
T/O Fuel: + 9800	
TOW: 57600	74.5
Trip Fuel: - 1100	
Landing: 56500	74.6
THS 24.5 / 0.9UP	

Prepared by	: BRIAN
Licence No	: C6119
Approved by	: OMAR BIN TUB
Licence No	: 572/1652/19307

①

FUEL CHIT

FLIGHT NO	AK 9700	BAY NO	J4
ACFT REGN	9M-AHM	ETD	2030
SECTOR	KUL / SZB	B/O	1124
DATE	29/11/17	NO. PAX	0

REGULATED LDG WT	66000
ADD BURN OFF	1124
REGULATED T/OFF WT	67124

FORECAST WIND	FLAP
TEMP	RWY
REGULATED T/OFF WT	QNH
	73500

LOWER RTOW A OR B	67124
ESTIMATED ZFW	43090
MAX FUEL AVAILABLE	19005
MIN SECTOR FUEL	3791
EXCESS FUEL AVAILABLE	15214

LOADSHEET	9820
PLUS TAXI FUEL	180
FUEL IN TANKS (KG)	10000

SIGNATURE _____ (CAPTAIN)

Appendix G – Flight Data Recording

List of parameters FDR – FAP A320AXMF1-2-0

No	Parameter Description	Mnemonic
1	Barometric Altitude	_ALT_BARO
2	Radio Height	_ALT_RADIO
3	Vertical speed	_IVV
4	Heading	_HEADING
5	Wind direction	_WINDIR
6	Wind speed	_WIND_SPD
7	Auto Throttle Mode	_ATS_MODE
8	Lateral FMA	_FMA_LAT
9	Longitudinal FMA	_FMA_LONG
10	DH_MDAMDH	DH_MDAMDH
11	Auto Pilot status	_AP_STATUS
12	Flight Director status	_FD_STATUS
13	Auto Throttle Status	_ATS_STATUS
14	Landing gear selection	_LDG_SEL
15	Flaps/Slats configuration	_CONF
16	LEVER_POS	LEVER_POS
17	GD_SPOIL_ARM	GD_SPOIL_ARM
18	SPD_BRAKE_LEVER	SPD_BRAKE_LEVER
19	Speed brake	_SPD_BRAKE
20	N1 Eng 1	_N1_1
21	N1 Eng 2	_N1_2
22	PITCH	PITCH
23	ROLL	ROLL
24	PITCH_CAPT	PITCH_CAPT
25	PITCH_FO	PITCH_FO
26	ROLL_CAPT	ROLL_CAPT
27	ROLL_FO	ROLL_FO
28	LDG_RH	LDG_RH
29	LDG_NOSE	LDG_NOSE
30	LDG_LH	LDG_LH
31	VRTG	VRTG
32	VAPP	_VAPP
33	Calibrated Air Speed	_CAS
34	Ground Speed	_GS
35	Throttle range 1	_ENG_THR_CMD_1
36	Throttle range 2	_ENG_THR_CMD_2
37	THROTT_ANG1	THROTT_ANG1
38	THROTT_ANG2	THROTT_ANG2
39	Master warning ON/OFF	_WARN_MASTER
40	Spoiler 2 left angle	_SPOILER_2_L

41	Spoiler 2 Right angle	_SPOILER_2_R
42	Spoiler 3 Left angle	_SPOILER_3_L
43	Spoiler 3 Right Angle	_SPOILER_3_R
44	Spoiler 4 Left angle	_SPOILER_4_L
45	Spoiler 4 Right angle	_SPOILER_4_R
46	Spoiler 5 Left angle	_SPOILER_5_L
47	Spoiler 5 Right angle	_SPOILER_5_R
48	Left Brakes Angle	_BRAKE_PED_LH
49	Right Brakes Angle	_BRAKE_PED_RH
50	Brakes Pressure	_BRAKE_PRESSURE
51	BRK_PRESS_1	BRK_PRESS_1
52	BRK_PRESS_2	BRK_PRESS_2
53	BRK_PRESS_3	BRK_PRESS_3
54	BRK_PRESS_4	BRK_PRESS_4
55	BRK_PRESS_5	BRK_PRESS_5
56	BRK_PRESS_6	BRK_PRESS_6
57	BRK_PRESS_7	BRK_PRESS_7
58	BRK_PRESS_8	BRK_PRESS_8
59	Latitude	_LATITUDE
60	Longitude	_LONGITUDE
61	ENG1 MASTER LEVER SELECTED OFF	ENG1_MASTER_LEVER
62	ENG2 MASTER LEVER SELECTED ON	ENG2_MASTER_LEVER
63	Gross Weight of aircraft	_GROSS_WEIGHT

List of parameters FDIMU - FAP A320AXMT2-3-9

No	Barometric Altitude	_ALT_BARO
1	Radio Height	_ALT_RADIO
2	Auto Pilot status	_AP_STATUS
3	Flight Director status	_FD_STATUS
4	Auto Throttle Mode	_ATS_MODE
5	Auto Thrust Status	_ATS_STATUS
6	Lateral FMA	_FMA_LAT
7	Longitudinal FMA	_FMA_LONG
8	Ground speed corrected	_GS
9	Calibrated Air Speed	_CAS
10	Approach target speed	_VAPP
11	Vertical speed	_IVV
12	Landing Gear Sel Up/Down	_LDG_SEL
13	Flap Lever Command	FLAP_LEVER
14	Flaps/Slats configuration	_CONF
15	Vertical accel corrected	_VRTG
16	SPEED BRAKE COMMAND	SPD_BRK
17	LDG LH COMPRESSED HI	LDGLHHI
18	LDG NOSE COMPRESSED HI	LDGNOSEHI
19	LDG RH COMPRESSED HI	LDGRHHI
20	Throttle range 1	_ENG_THR_CMD_1
21	Throttle range 2	_ENG_THR_CMD_2
22	Throttle angle 1	_ENG_THR_VAL_1
23	Throttle angle 2	_ENG_THR_VAL_2
24	N1 ACTUAL SYS1	N1_1
25	N1 ACTUAL (LOW ROTOR	N1_2
26	Pitch angle	_PITCH
27	Roll angle	_ROLL
28	CPT stick pitch order	_PITCH_CAPT_SSTICK
29	FO stick pitch order	_PITCH_FO_SSTICK
30	CPT stick roll order	_ROLL_CAPT_SSTICK
31	FO stick roll order	_ROLL_FO_SSTICK
32	Wind Speed corrected	_WIND_SPD
33	Wind direction	_WINDIR
34	Master warning ON/OFF	_WARN_MASTER
35	Spoiler 1 Left Angle	_SPOILER_1_L
36	Spoiler 1 Right Angle	_SPOILER_1_R
37	Spoiler 2 Left Angle	_SPOILER_2_L
38	Spoiler 2 Right Angle	_SPOILER_2_R
39	Spoiler 3 Left Angle	_SPOILER_3_L
40	Spoiler 3 Right Angle	_SPOILER_3_R
41	Spoiler 4 Left Angle	_SPOILER_4_L
42	Spoiler 4 Right Angle	_SPOILER_4_R
43	Spoiler 5 Left Angle	_SPOILER_5_L
44	Spoiler 5 Right Angle	_SPOILER_5_R

45	Left Brakes Angle	_BRAKE_PED_LH
46	Right Brakes Angle	_BRAKE_PED_RH
47	BRAKE PRESS 1 NORM	BRK_PRESS_1
48	BRAKE PRESS 2 NORM	BRK_PRESS_2
49	BRAKE PRESS 3 NORM	BRK_PRESS_3
50	BRAKE PRESS 4 NORM	BRK_PRESS_4
51	BRAKE PRESS 5 NORM	BRK_PRESS_5
52	BRAKE PRESS 6 NORM	BRK_PRESS_6
53	BRAKE PRESS 7 NORM	BRK_PRESS_7
54	BRAKE PRESS 8 NORM	BRK_PRESS_8
55	MASTER LEVER OFF ENGINE 1	SW3B111
56	MASTER LEVER OFF ENGINE 2	SW3B112
57	LATITUDE acquired param	_LATITUDE_ACQ
58	LONGITUDE acquired param	_LONGITUDE_ACQ
59	GROSS WEIGHT (KGS.)	GW

Flight data recording (FDR)

a. 1000ft AAL to GS Zero (21:54:08 UTC – 21:56:23 UTC)

AHM 11/29/2017 Parameter Map: A320AXNF1-2-0 (v1.45) Format: AHM (v1.00) Parameters: 63		Flight: 9700-0 KUL-S2B T/O Frm: 163799 21:44:39 Lnd Frm: 163961 21:55:29																			
Frame-Sf	SfCount	Time St	Barometric Altitude ALT BARO ft	Radio Height ALT RADIO feet	Vertical speed IVV	Heading HEADING Degree	Wind direction WINDIR DEG	Wind speed WIND SPD Kts	Auto Throttle Mode_ATS_MODE	Lateral FHA FHA_LAT	Longitudinal FHA FHA_LONG	DH NDANDH DH NDANDH FEET	Auto Pilot status AP_STATUS	Flight Director Status FD_STATUS	Auto Throttle Status ATS_STATUS	Landing gear selection Ldg_SEL	Flaps/Slats configuration_CNF	LEVER_POS LEVER_POS	VAPP VAPP kts	Calibrated Air Speed CAS KTS	Ground Speed GS Knots
163941-1	655764	21:54:08	1094	1045	-720	93.9	322.0	22.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	130.8	151.0
163941-2	655765	21:54:09	1078	1046	-736	95.3	319.9	22.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	130.8	151.0
163941-3	655766	21:54:10	1066	1053	-752	96.7	322.0	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.4	151.0
163941-4	655767	21:54:11	1050	1047	-752	98.4	320.6	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	130.6	152.0
163942-1	655768	21:54:12	1042	1039	-720	100.2	319.2	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.0	152.0
163942-2	655769	21:54:13	1026	1036	-688	102.3	322.0	20.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	130.5	152.0
163942-3	655770	21:54:14	1018	1011	-688	105.1	319.9	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.1	152.0
163942-4	655771	21:54:15	1006	992	-688	108.3	317.1	20.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	129.8	153.0
163943-1	655772	21:54:16	998	962	-672	111.1	315.0	20.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	129.9	153.0
163943-2	655773	21:54:17	986	951	-624	113.6	315.0	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	129.9	153.0
163943-3	655774	21:54:18	978	924	-560	115.0	317.8	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	129.3	153.0
163943-4	655775	21:54:19	970	918	-544	116.7	320.6	22.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	129.1	153.0
163944-1	655776	21:54:20	962	901	-576	118.1	322.7	22.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	130.1	154.0
163944-2	655777	21:54:21	950	896	-640	119.5	324.8	22.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	130.9	154.0
163944-3	655778	21:54:22	942	875	-800	120.9	326.3	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.1	154.0
163944-4	655779	21:54:23	926	867	-912	122.0	326.3	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.4	155.0
163945-1	655780	21:54:24	910	828	-1056	122.7	327.0	22.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.6	155.0
163945-2	655781	21:54:25	886	814	-1104	122.7	328.4	22.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.3	156.0
163945-3	655782	21:54:26	874	799	-1136	122.0	332.6	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	133.1	156.0
163945-4	655783	21:54:27	850	799	-1168	121.6	333.3	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	133.1	156.0
163946-1	655784	21:54:28	834	755	-1200	121.3	332.6	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	133.4	156.0
163946-2	655785	21:54:29	810	730	-1216	120.9	332.6	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	134.0	156.0
163946-3	655786	21:54:30	794	702	-1232	120.9	331.9	20.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	133.8	156.0
163946-4	655787	21:54:31	770	702	-1232	120.6	332.6	21.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	134.5	155.0
163947-1	655788	21:54:32	754	672	-1216	120.6	333.3	20.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	134.3	155.0
163947-2	655789	21:54:33	730	669	-1184	120.6	333.3	20.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	133.6	155.0
163947-3	655790	21:54:34	714	667	-1136	120.9	331.9	20.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	133.9	155.0
163947-4	655791	21:54:35	694	649	-1088	121.3	331.2	20.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	134.0	155.0
163948-1	655792	21:54:36	682	627	-1024	121.3	331.9	19.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	134.3	155.0
163948-2	655793	21:54:37	662	620	-950	121.3	332.6	19.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	133.6	155.0
163948-3	655794	21:54:38	650	598	-928	121.6	331.9	19.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.5	154.0
163948-4	655795	21:54:39	630	589	-896	122.0	331.2	20.0	SPEED	OFF	OFF	284.0	NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.9	154.0
163949-1	655796	21:54:40	622	562	-848	122.7	331.9	20.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.4	153.0
163949-2	655797	21:54:41	606	554	-816	123.4	331.9	20.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.4	153.0
163949-3	655798	21:54:42	594	525	-720	124.5	331.9	19.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.0	153.0
163949-4	655799	21:54:43	582	518	-672	125.5	331.9	19.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.4	152.0
163950-1	655800	21:54:44	574	528	-624	126.2	331.2	19.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.3	152.0
163950-2	655801	21:54:45	562	517	-608	127.6	332.6	18.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.6	152.0
163950-3	655802	21:54:46	554	506	-592	128.7	333.3	18.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	130.4	151.0
163950-4	655803	21:54:47	542	499	-608	130.1	331.9	19.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.4	151.0
163951-1	655804	21:54:48	534	491	-608	131.5	335.4	16.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	130.4	151.0
163951-2	655805	21:54:49	522	486	-624	133.2	333.3	18.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	129.8	151.0
163951-3	655806	21:54:50	510	484	-672	135.0	334.7	17.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.3	151.0
163951-4	655807	21:54:51	498	499	-672	137.5	334.0	16.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.3	151.0
163952-1	655808	21:54:52	490	462	-688	139.6	331.9	17.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	130.6	151.0
163952-2	655809	21:54:53	478	461	-720	142.0	329.1	18.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	129.9	151.0
163952-3	655810	21:54:54	466	459	-752	143.8	329.1	18.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.3	151.0
163952-4	655811	21:54:55	450	410	-720	145.2	332.6	15.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.9	151.0
163953-1	655812	21:54:56	442	422	-736	146.2	336.8	13.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	133.0	151.0
163953-2	655813	21:54:57	426	414	-832	147.7	338.2	15.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.1	150.0
163953-3	655814	21:54:58	414	396	-1008	149.1	335.4	16.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.1	150.0
163953-4	655815	21:54:59	394	386	-1040	149.4	336.1	15.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.8	150.0
163954-1	655816	21:55:00	378	360	-1040	149.4	338.9	16.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	134.5	150.0
163954-2	655817	21:55:01	358	347	-1024	148.7	345.2	14.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	133.5	150.0
163954-3	655818	21:55:02	342	342	-1024	148.4	345.9	15.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	134.0	150.0
163954-4	655819	21:55:03	322	314	-992	148.7	345.9	14.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	133.6	150.0
163955-1	655820	21:55:04	310	289	-912	149.1	344.5	13.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.8	150.0
163955-2	655821	21:55:05	294	277	-864	148.4	339.6	14.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	132.4	149.0
163955-3	655822	21:55:06	282	261	-768	147.0	343.8	13.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	131.5	149.0
163955-4	655823	21:55:07	270	256	-784	145.5	346.6	15.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	130.1	148.0
163956-1	655824	21:55:08	258	238	-800	145.2	346.6	15.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	129.4	147.0
163956-2	655825	21:55:09	242	226	-800	144.8	345.2	15.0	SPEED	OFF	OFF		NO AP ON	NO FD ON	ACTIVE	DOWN	3	POS_3	129.6	130.8	147.0
163956-3	655826	21:55:10	234	216	-752	145.5	342.4</														

163973-2	655893	21:56:17	60	66			128.0		128.0		64.0		0.0	3.115139	101.558144	NOT SELECT OFF	SELECT ON	51.37415
163973-3	655894	21:56:18	60	66										3.115139	101.558144	NOT SELECT OFF	SELECT ON	51.37415
163973-4	655895	21:56:19	70	66						3200.0		0.0		3.114968	101.558319	NOT SELECT OFF	SELECT ON	51.37415
163974-1	655896	21:56:20	70	66	544.00	192.0		640.0						3.114968	101.558319	NOT SELECT OFF	SELECT ON	51.37415
163974-2	655897	21:56:21	70	66			64.0		1216.0		0.0		0.0	3.114796	101.558319	NOT SELECT OFF	SELECT ON	51.37415
163974-3	655898	21:56:22	70	66										3.114796	101.558319	NOT SELECT OFF	SELECT ON	51.37415
163974-4	655899	21:56:23	64	64						3072.0		0.0		3.114625	101.558319	NOT SELECT OFF	SELECT ON	51.37415
163975-1	655900	21:56:24	60	66	*****	1664.0		1984.0						3.114625	101.558319	NOT SELECT OFF	SELECT ON	51.37415
163975-2	655901	21:56:25	58	66			1472.0		1984.0		0.0		0.0	3.114625	101.558319	NOT SELECT OFF	SELECT ON	51.37415
163975-3	655902	21:56:26	56	66										3.114625	101.558319	NOT SELECT OFF	SELECT ON	51.37415
163975-4	655903	21:56:27	56	66						3072.0		0.0		3.114625	101.558319	NOT SELECT OFF	SELECT ON	51.37415
163976-1	655904	21:56:28	56	66	*****	1344.0		1984.0						3.114625	101.558319	NOT SELECT OFF	SELECT ON	51.37415
163976-2	655905	21:56:29	56	66			1344.0		1984.0		0.0		0.0	3.114625	101.558487	NOT SELECT OFF	SELECT ON	51.37415
163976-3	655906	21:56:30	56	66										3.114625	101.558487	NOT SELECT OFF	SELECT ON	51.37415
163976-4	655907	21:56:31	56	66						3136.0		0.0		3.114625	101.558487	NOT SELECT OFF	SELECT ON	51.37415
163977-1	655908	21:56:32	56	66	*****	1344.0		1984.0						3.114625	101.558487	NOT SELECT OFF	SELECT ON	51.37415
163977-2	655909	21:56:33	56	66			1280.0		1984.0		0.0		0.0	3.114796	101.558487	NOT SELECT OFF	SELECT ON	51.37415

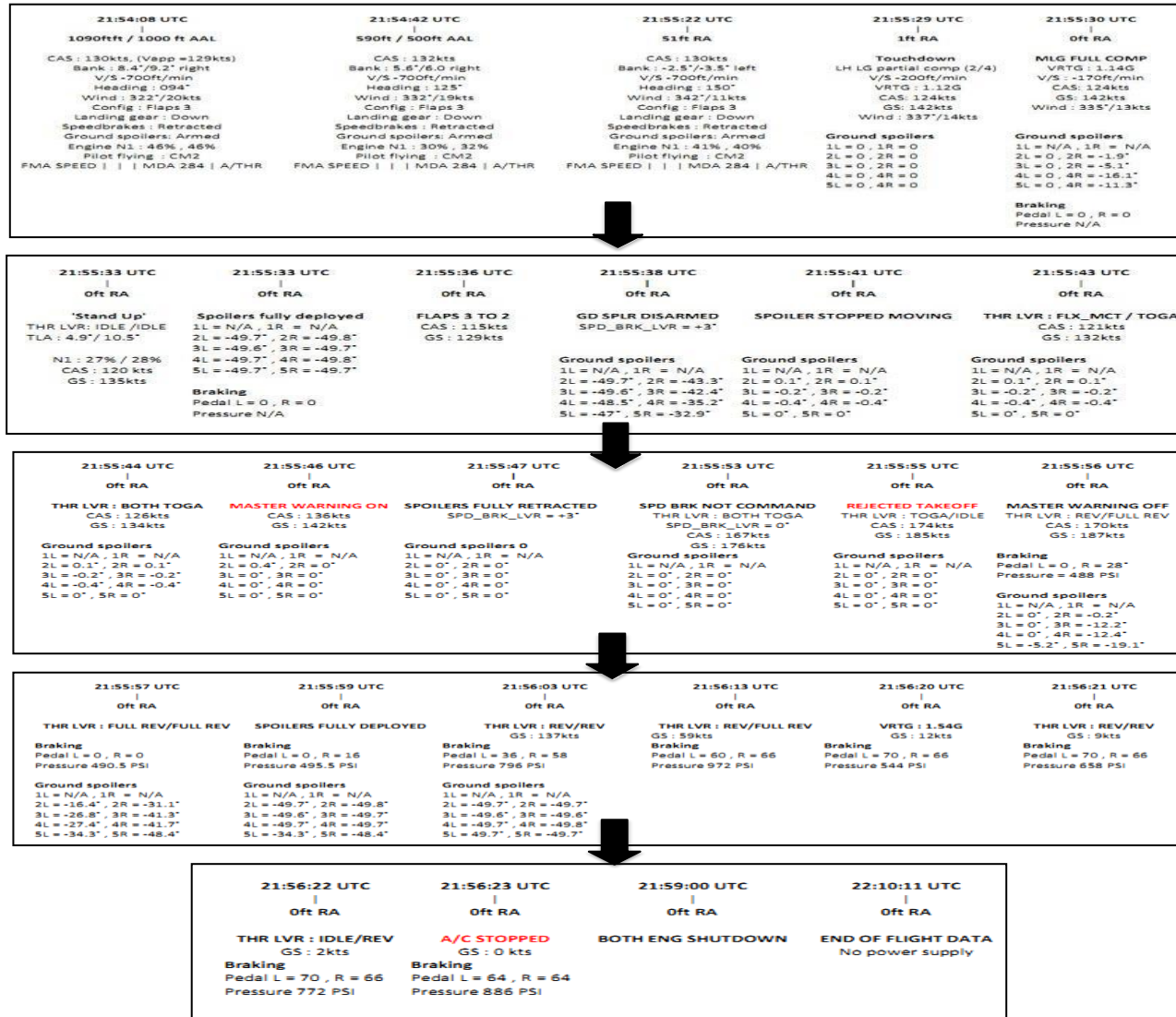
b. Engines shutdown (21:58:48 UTC – 21:59:00 UTC)

Frame-Sf	SfCount	Time	St	DAY DAY	DATEO DATEO	UTC_HOUR UTC_HOUR	UTC_MIN UTC_MIN	UTC_SEC UTC_SEC	FLINUM FLINUM	ENG1 MASTER LEVER SELECTED OFF ENG1_MASTER_LEVER	ENG2 MASTER LEVER SELECTED ON ENG2_MASTER_LEVER	N1_1 N1_1 %	N1_2 N1_2 %
164010-4	656043	14:14:03								NOT SELECT OFF	SELECT ON	19.5	19.4
164011-1	656044	14:14:04					58	48	9700	NOT SELECT OFF	SELECT ON	19.5	19.3
164011-2	656045	14:14:05								NOT SELECT OFF	SELECT ON	19.6	19.3
164011-3	656046	14:14:06								NOT SELECT OFF	SELECT ON	19.6	19.3
164011-4	656047	14:14:07								NOT SELECT OFF	SELECT ON	19.6	19.4
164012-1	656048	14:14:08				21	58	52		NOT SELECT OFF	SELECT ON	19.8	19.5
164012-2	656049	14:14:09								NOT SELECT OFF	SELECT ON	20.0	19.6
164012-3	656050	14:14:10								NOT SELECT OFF	SELECT ON	20.1	19.7
164012-4	656051	14:14:11								NOT SELECT OFF	SELECT ON	20.2	19.8
164013-1	656052	14:14:12		29			58	56		NOT SELECT OFF	SELECT ON	20.3	19.7
164013-2	656053	14:14:13								NOT SELECT OFF	SELECT ON	20.3	19.7
164013-3	656054	14:14:14								NOT SELECT OFF	NOT SELECT ON	20.3	19.6
164013-4	656055	14:14:15								NOT SELECT OFF	NOT SELECT ON	20.3	16.5
164014-1	656056	14:14:16	A		2911		59	0		SELECT OFF	NOT SELECT ON	20.2	15.2
164014-2	656057	14:14:17	A							SELECT OFF	NOT SELECT ON	16.6	14.1
164014-3	656058	14:14:18	A							SELECT OFF	NOT SELECT ON	15.3	13.1

Flight data recording (FDIMU)

9M-AHM 11/29/2017 Parameter Map: A320AXMT2-3-9 (v1.01) Format: AHM (v1.00) Parameters: 59 Flight: AXM9700-0 KUL-KUL T/O Frm: 711 9:44:44 PM Lnd Frm: 874 9:55:33 PM															
Frame-Sf	SfCount	Time	St	Barometric Altitude ALT_BARO ft	Radio Height ALT_RADIO ft	Ground speed corrected _GS kts.s	Calibrated Air Speed CAS kts.s	LATITUDE acquired param LATITUDE_ACQ	LONGITUDE acquired param LONGITUDE_ACQ	Throttle range 1 _ENG_THR_CMD_1	Throttle range 2 _ENG_THR_CMD_2	Throttle angle 1 _ENG_THR_VAL_1	Throttle angle 2 _ENG_THR_VAL_2	SPEED BRAKE COMMAND SPD_BRK DISCRETE	Master warning ON/OFF WARN_MASTER
853-4	3415	21:54:09		1094	1053	151.0	131.4	3.178654	101.504929	CLIMB	CLIMB	22.5	22.5		OFF
854-1	3416	21:54:10		1082	1053	151.0	130.4	3.178483	101.505615	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
854-2	3417	21:54:11		1066	1046	152.0	131.1	3.178311	101.506302	CLIMB	CLIMB	22.5	22.5		OFF
854-3	3418	21:54:12		1054	1044	152.0	130.8	3.178139	101.506989	CLIMB	CLIMB	22.5	22.5		OFF
854-4	3419	21:54:13		1042	1041	152.0	130.4	3.177968	101.507675	CLIMB	CLIMB	22.5	22.5		OFF
855-1	3420	21:54:14		1030	1029	152.0	131.5	3.177796	101.508362	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
855-2	3421	21:54:15		1018	1014	153.0	131.1	3.177453	101.509048	CLIMB	CLIMB	22.5	22.5		OFF
855-3	3422	21:54:16		1010	993	153.0	130.3	3.177281	101.509735	CLIMB	CLIMB	22.5	22.5		OFF
855-4	3423	21:54:17		998	967	153.0	130.3	3.176938	101.510254	CLIMB	CLIMB	22.5	22.5		OFF
856-1	3424	21:54:18		990	951	153.0	129.6	3.176594	101.510941	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
856-2	3425	21:54:19		978	924	153.0	129.3	3.176251	101.511627	CLIMB	CLIMB	22.5	22.5		OFF
856-3	3426	21:54:20		970	922	154.0	129.3	3.175908	101.512138	CLIMB	CLIMB	22.5	22.5		OFF
856-4	3427	21:54:21		962	904	154.0	129.1	3.175564	101.512825	CLIMB	CLIMB	22.5	22.5		OFF
857-1	3428	21:54:22		954	891	154.0	129.9	3.175221	101.513344	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
857-2	3429	21:54:23		942	877	155.0	130.9	3.174706	101.514030	CLIMB	CLIMB	22.5	22.5		OFF
857-3	3430	21:54:24		930	853	155.0	130.8	3.174363	101.514542	CLIMB	CLIMB	22.5	22.5		OFF
857-4	3431	21:54:25		914	829	156.0	131.0	3.173848	101.515228	CLIMB	CLIMB	22.5	22.5		OFF
858-1	3432	21:54:26		894	815	156.0	132.0	3.173504	101.515747	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
858-2	3433	21:54:27		874	802	156.0	133.0	3.172989	101.516258	CLIMB	CLIMB	22.5	22.5		OFF
858-3	3434	21:54:28		854	800	156.0	133.4	3.172646	101.516945	CLIMB	CLIMB	22.5	22.5		OFF
858-4	3435	21:54:29		834	742	156.0	133.4	3.172303	101.517464	CLIMB	CLIMB	22.5	22.5		OFF
859-1	3436	21:54:30		818	728	155.0	133.1	3.171788	101.518150	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
859-2	3437	21:54:31		794	703	155.0	133.6	3.171444	101.518661	CLIMB	CLIMB	22.5	22.5		OFF
859-3	3438	21:54:32		774	703	155.0	134.4	3.170929	101.519348	CLIMB	CLIMB	22.5	22.5		OFF
859-4	3439	21:54:33		754	674	155.0	134.3	3.170586	101.519867	CLIMB	CLIMB	22.5	22.5		OFF
860-1	3440	21:54:34		734	672	155.0	134.4	3.170071	101.520554	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
860-2	3441	21:54:35		718	668	155.0	134.1	3.169728	101.521065	CLIMB	CLIMB	22.5	22.5		OFF
860-3	3442	21:54:36		698	646	155.0	133.9	3.169384	101.521584	CLIMB	CLIMB	22.5	22.5		OFF
860-4	3443	21:54:37		682	630	154.0	134.0	3.168869	101.522270	CLIMB	CLIMB	22.5	22.5		OFF
861-1	3444	21:54:38		666	617	154.0	134.3	3.168526	101.522781	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
861-2	3445	21:54:39		650	600	154.0	133.3	3.168011	101.523468	CLIMB	CLIMB	22.5	22.5		OFF
861-3	3446	21:54:40		634	585	153.0	132.1	3.167668	101.523987	CLIMB	CLIMB	22.5	22.5		OFF
861-4	3447	21:54:41		622	566	153.0	131.9	3.167153	101.524498	CLIMB	CLIMB	22.5	22.5		OFF
862-1	3448	21:54:42		606	554	153.0	132.6	3.166810	101.525185	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
862-2	3449	21:54:43		594	542	152.0	132.4	3.166295	101.525703	CLIMB	CLIMB	22.5	22.5		OFF
862-3	3450	21:54:44		582	527	152.0	132.0	3.165951	101.526215	CLIMB	CLIMB	22.5	22.5		OFF
862-4	3451	21:54:45		574	527	152.0	131.3	3.165436	101.526733	CLIMB	CLIMB	22.5	22.5		OFF
863-1	3452	21:54:46		566	516	151.0	131.3	3.164921	101.527245	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
863-2	3453	21:54:47		554	506	151.0	131.1	3.164578	101.527931	CLIMB	CLIMB	22.5	22.5		OFF
863-3	3454	21:54:48		546	499	151.0	130.0	3.164063	101.528450	CLIMB	CLIMB	22.5	22.5		OFF
863-4	3455	21:54:49		538	492	151.0	132.1	3.163548	101.528969	CLIMB	CLIMB	22.5	22.5		OFF
864-1	3456	21:54:50		526	492	151.0	129.6	3.163033	101.529305	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
864-2	3457	21:54:51		514	484	151.0	132.1	3.162518	101.529823	CLIMB	CLIMB	22.5	22.5		OFF
864-3	3458	21:54:52		502	484	151.0	132.6	3.162003	101.530334	CLIMB	CLIMB	22.5	22.5		OFF
864-4	3459	21:54:53		490	466	151.0	131.1	3.161488	101.530678	CLIMB	CLIMB	22.5	22.5		OFF
865-1	3460	21:54:54		482	463	151.0	129.9	3.160973	101.531197	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
865-2	3461	21:54:55		470	451	151.0	129.8	3.160286	101.531540	CLIMB	CLIMB	22.5	22.5		OFF
865-3	3462	21:54:56		454	424	151.0	132.4	3.159771	101.531883	CLIMB	CLIMB	22.5	22.5		OFF
865-4	3463	21:54:57		442	424	150.0	133.9	3.159085	101.532394	CLIMB	CLIMB	22.5	22.5		OFF
866-1	3464	21:54:58		430	405	150.0	132.9	3.158570	101.532738	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
866-2	3465	21:54:59		414	400	150.0	131.9	3.157883	101.533081	CLIMB	CLIMB	22.5	22.5		OFF
866-3	3466	21:55:00		398	390	150.0	132.4	3.157368	101.533424	CLIMB	CLIMB	22.5	22.5		OFF
866-4	3467	21:55:01		382	362	150.0	131.8	3.156682	101.533768	CLIMB	CLIMB	22.5	22.5		OFF
867-1	3468	21:55:02		362	346	150.0	134.3	3.156167	101.534111	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
867-2	3469	21:55:03		346	342	150.0	132.4	3.155480	101.534454	CLIMB	CLIMB	22.5	22.5		OFF
867-3	3470	21:55:04		326	312	150.0	133.9	3.154965	101.534798	CLIMB	CLIMB	22.5	22.5		OFF
867-4	3471	21:55:05		310	286	149.0	134.4	3.154278	101.535141	CLIMB	CLIMB	22.5	22.5		OFF
868-1	3472	21:55:06		298	275	148.0	132.5	3.153763	101.535484	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
868-2	3473	21:55:07		286	262	148.0	132.5	3.153077	101.535828	CLIMB	CLIMB	22.5	22.5		OFF
868-3	3474	21:55:08		270	259	147.0	130.9	3.152562	101.536171	CLIMB	CLIMB	22.5	22.5		OFF
868-4	3475	21:55:09		258	237	147.0	129.8	3.151875	101.536514	CLIMB	CLIMB	22.5	22.5		OFF
869-1	3476	21:55:10		246	219	147.0	130.0	3.151360	101.537033	CLIMB	CLIMB	22.5	22.5	NO COMMAND	OFF
877-1	3508	21:55:42		50	0	130.0	117.0	3.133336	101.547676	IDLE	IDLE	11.3	8.4	COMMANDED	OFF
877-2	3509	21:55:43		50	0	131.0	117.1	3.132821	101.547844	TOGA	TOGA	42.2	42.2		OFF
877-3	3510	21:55:44		58	0	134.0	118.8	3.132306	101.548187	TOGA	TOGA	42.2	42.2		OFF
877-4	3511	21:55:45		66	0	139.0	122.5	3.131791	101.548531	TOGA	TOGA	42.2	42.2		OFF
878-1	3512	21:55:46		66	0	144.0	127.1	3.131104	101.548874	TOGA	TOGA	42.2	42.2	COMMANDED	OFF
878-2	3513	21:55:47		66	0	149.0	132.4	3.130589	101.549217	TOGA	TOGA	42.2	42.2		ON
878-3	3514	21:55:48		66	0	154.0	136.8	3.130074	101.549561	TOGA	TOGA	42.2	42.2		ON
878-4	3515	21:55:49		66	0	159.0	140.9	3.129387	101.549904	TOGA	TOGA	42.2	42.2		ON
879-1	3516	21:55:50		62	0	164.0	145.9	3.128701	101.550247	TOGA	TOGA	42.2	42.2	COMMANDED	ON
879-2	3517	21:55:51		66	0	168.0	151.3	3.128014	101.550766	TOGA	TOGA	42.2	42.2		ON
879-3	3518	21:55:52		62	0	172.0	155.5	3.127327	101.551277	TOGA	TOGA	42.2	42.2		ON
879-4	3519	21:55:53		66	0	177.0	160.4	3.126641	101.551620	TOGA	TOGA	42.2	42.2		ON
880-1	3520	21:55:54		62	0	181.0	165.1	3.125954	101.551964	TOGA	TOGA	42.2	42.2	NO COMMAND	ON
880-2	3521	21:55:55		74	0	185.0	168.4	3.125268	101.552483	IDLE	IDLE	2.8	0.0		ON
880-3	3522	21:55:56		66	0	187.0	172.0	3.124581	101.552994	FULL_REV	FULL_REV	-22.5	-22.5		OFF
880-4	3523	21:55:57		-32	0	183.0	175.6	3.123723	101.553337	FULL_REV	FULL_REV	-22.5	-22.5		OFF
881-1	3524	21:55:58		-38	0	177.0	164.9	3.123036	101.553856	FULL_REV	FULL_REV	-22.5	-22.5	NO COMMAND	OFF
881-2	3525	21:55:59		-34	0	170.0	155.4	3.122349	101.554199	FULL_REV	FULL_REV	-22.5			

Flight Data Timeline



Appendix H: Meteorological Reports (METAR)

WMSA 291700Z 33005KT 240V050 9000 -RA FEW008 SCT140 OVC260 24/23 Q1009

WMSA 291800Z 35005KT 300V030 9000 -RA FEW008 SCT140 OVC260 24/23 Q1008

WMSA 291900Z 30005KT 280V350 9000 -RA FEW008 SCT140 OVC260 24/23 Q1007

WMSA 292000Z 30005KT 8000 -RA FEW008 SCT140 OVC260 24/23 Q1007

WMSA 292100Z 32004KT 260V030 7000 -RA FEW005 SCT140 OVC260 24/23 Q1006

WMSA,2017-11-29 22:00,WMSA 292200Z 32005KT 280V010 7000 -RA FEW005
SCT140 BKN260 24/23 Q1007

WMSA,2017-11-29 23:00,WMSA 292300Z 32003KT 280V030 9999 FEW003 SCT140
BKN260 24/23 Q100

Appendix I: Aeronautical Information Publication (AIP) and Jeppesen Charts

APPENDIX I

AIP MALAYSIA		WMSA AD 2 - 1
WMSA AD 2.1 AERODROME LOCATION INDICATOR AND NAME		
WMSA - SUBANG/SULTAN ABDUL AZIZ SHAH		
WMSA AD 2.2 AERODROME GEOGRAPHICAL AND ADMINISTRATIVE DATA		
1	ARP coordinates and site at AD	LAT 030752 N LONG 1013253 E Site: Centre of Rwy - 1356 M, brg 309° fm Twr.
2	Direction and distance from city	15 KM (8 NM) brg 202° fm Kuala Lumpur Railway Station
3	Elevation / Reference temperature	88 FT (27 M) / 32° C
4	Geod Undulation (ARIP)	-2.878 M
5	MAG VAR / Annual change	07 min (D) sec West (2012)
6	AD Administration, address, telephone, telefax, telex, AIP :	Operator : Malaysia Airports Sdn. Bhd. Terminal 3 Sultan Abdul Aziz Shah Airport 47200 Subang Selangor Darul Ehsan. Tel : 603 - 78453251 Fax : 603 - 78463679 ATC Services : Department of Civil Aviation Malaysia Block B, Air Traffic Control Complex Sultan Abdul Aziz Shah Airport 47200 Subang Selangor Darul Ehsan. Tel : 603-78473573 / 78465233 (Control Centre) 603-78455502 (Control Tower) Fax : 603-78473572 (Control Centre) 603-78471089 (Control Tower) AFTN : WMFCZQZX
7	Types of traffic permitted (IFR/VFR)	IFR / VFR
8	Remarks	Nil
WMSA AD 2.3 OPERATIONAL HOURS		
1	AD Administration	H24
2	Customs and immigration	2300 - 1500
3	Health and sanitation	Nil
4	AIS Briefing Office	H24 Location: Subang Control Tower. Tel : 603 - 78465602 / 78465233 ext 119 Fax : 603 - 78471089
5	ATS Reporting Office (ARO)	H24
6	MET Briefing Office	NA
7	ATS	H24
8	Fuelling	PETRONAS Refuelling - H24 Tel : 603 - 78461733 / 78473726 Fax : 603 - 78461687
9	Handling	By arrangement with handling agent.
10	Security	H24
11	De-icing	Nil
12	Remarks	Terminal bldg opr btn 2300 - 1500, Outside this time, terminal bldg avbl on 24 hr PPR fm Malaysia Airport Sdn. Bhd.
DEPARTMENT OF CIVIL AVIATION MALAYSIA		08 MAR 2012 AIP AMDT 1/2012

WMSA AD 2 - 4

AIP MALAYSIA

WMSA AD 2.11 METEOROLOGICAL INFORMATION PROVIDED

1	Associated MET Office	SUBANG / Sultan Abdul Aziz Shah
2	Hours of service MET Office outside hours	H24
3	Office responsible for TAF preparation Periods of validity	Subang Meteorological Office and KLIA Meteorological Office 24
4	Type of landing forecast Interval of issuance	METAR/SPECI and TRFNO (0000UTC - 0900UTC) Hourly
5	Briefing / consultation provided	Provided
6	Flight documentation Language(s) used	Charts, Tabular Form and Abbreviated Plain Language Text English
7	Charts and other information available for briefing or consultation	Flight Level Wind/Temp FL50, FL100, FL140, FL180, FL250, FL320 and FL360, SIGWX, Volcanic Ash/Tropical Cyclone Advisory, SIGMET, AIRMET, Aerodrome Warning, METAR Bulletin, TAFOR Bulletin, Radar and Satellite Pictures.
8	Supplementary equipment available for providing information	Self-Briefing Terminals
9	ATS units provided with information	Subang Control Tower
10	Additional information	Tel : 603 - 76461441 Fax : 603 - 76464082

WMSA AD 2.12 RUNWAY PHYSICAL CHARACTERISTICS

Designation RWY NR	TRUE and MAG BRG	Dimensions of RWY (M)	Strength (PCN) Surface of RWY and SWY	THR Coordinates	THR elevation and highest elevation of TDZ of precision AI/T RWY
1	2	3	4	5	6
15	148° T	3780 x 45	PCN 59/F/B/X/U Asphalt	030843.27N 1013226.72E	70 FT (21.39 M)
33	329° T	3780 x 45	PCN 59/F/B/X/U Asphalt	030657.17N 1013328.89E	90 FT (26.59 M)

Slope of RWY - SWY	SWY Dimensions (M)	CWY Dimensions (M)	Strips Dimensions (M)	DI /	Remarks
7	8	9	10	11	12
0.137 %	61 X 45	Nil	3902 x 304	Nil	Swy not to be used.
0.137 %	61 X 45	Nil	-	Nil	Swy not to be used.

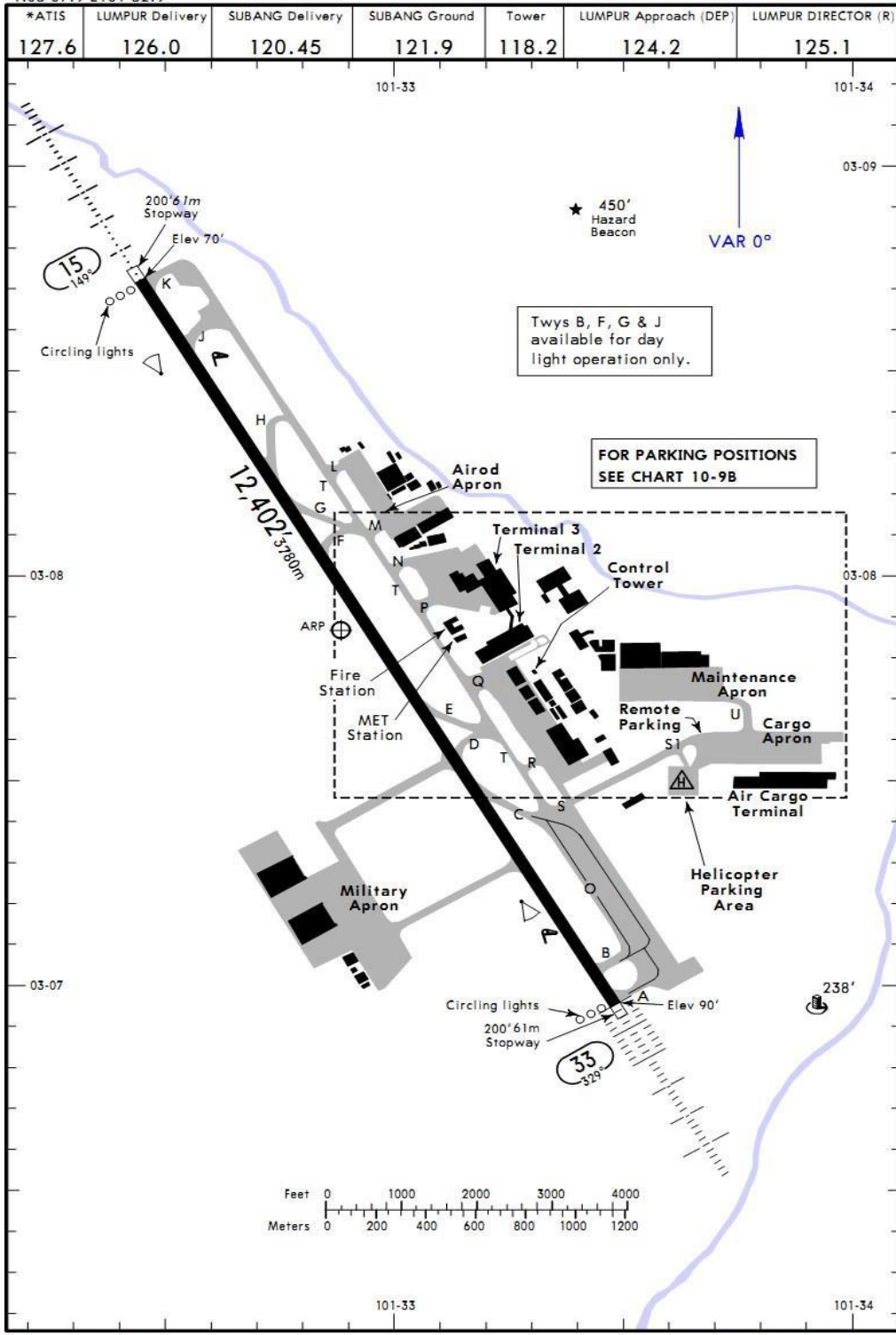
WMSA AD 2.13 DECLARED DISTANCES

RWY Designator	TCDA (M)	LODA (M)	ASDA (M)	DDA (M)	Remarks
1	2	3	4	5	6
15	3700	3841	3841	3700	Nil
33	3780	3841	3841	3780	Nil

15 NOV 2012
AIP AMDT 3/2012

DEPARTMENT OF CIVIL AVIATION MALAYSIA

WMSA/SZB  **JEPPESSEN** KUALA LUMPUR, MALAYSIA
 Apt Elev **90'** 10 FEB 17 **10-9** SULTAN ABDUL AZIZ SHAH-SUBANG



CHANGES: Communication added.

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Appendix J: Flight / Roster Planning

Flight Schedule

AIR ASIA Tue ,26 Dec 2017	FLIGHT SCHEDULE: 29/11/17-29/11/17, ALL TIMES IN UTC							Page : 1 Time : 13:31
9M-AHM, AK, ALL CHARTERERS								
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
AK20			NOV29					
9M-AHM			5247	BTU 0200				
				KUL 0405				
				2:05				
			NOV29					
			824	KUL 0430				
				HKT 0600				
			825	HKT 0630				
				KUL 0800				
				3:00				
			NOV29					
			717	KUL 0850				
				SIN 1000				
			716	SIN 1025				
				KUL 1130				
				2:15				
			NOV29					
			5134	KUL 1200				
				BKI 1435				
			5133	BKI 1505				
				KUL 1735				
				5:05				
			NOV29					
			9700	KUL 2030				
				SZB 2100				
			9700A	SZB 2101				
				SZB 2200				
			9700B	SZB 2201				
				SZB 2300				
			9701	SZB 2301				
				KUL 2330				
				2:57				

Appendix K: Mandatory Occurrence Report

To be sent to: Flight Operations Division Department of Civil Aviation Malaysia NO 27 Persiaran Perdana Level 2, Block Podium B, Percinct 4 62618 PUTRAJAYA		OCCURRENCE REPORT DEPARTMENT OF CIVIL AVIATION MALAYSIA			(DCA Borang 9 - OR) Fax to: +603 8871 4334 or e mail to safety.MOR@dca.gov.my			
Complete all sections where information is relevant. For multi-choice boxes, indicate which entry is appropriate.				Date received by DCA 30/11/2017		DCA Occurrence No MOR/17/28		
Aircraft Type and Series		Registration	Operator		Date Of Occurrence		Flight Phase	Nature Of Flight
A320		9M-AHM	AIR ASIA		30/11/2017		PARKED <input type="checkbox"/> TAXI <input type="checkbox"/> TAKE OFF <input checked="" type="checkbox"/> INIT CLIMB <input type="checkbox"/> CLIMB <input type="checkbox"/> CRUISE <input type="checkbox"/> DESCENT <input type="checkbox"/> HOLDING <input type="checkbox"/> APPROACH <input type="checkbox"/> LANDING <input type="checkbox"/> CIRCUIT <input type="checkbox"/> PERUBAHAN <input type="checkbox"/> HOVER <input type="checkbox"/>	FAX <input type="checkbox"/> FREIGHT <input type="checkbox"/> SURVEY <input type="checkbox"/> PI PASIR <input type="checkbox"/> AGRICULTURAL <input type="checkbox"/> BUSINESS <input type="checkbox"/> CLUB/GROUP <input type="checkbox"/> PRIVATE <input type="checkbox"/> POSITIONING <input type="checkbox"/> FERRY <input type="checkbox"/> TEST <input type="checkbox"/> TRAINING <input checked="" type="checkbox"/> PARACHUTING <input type="checkbox"/> TOWING <input type="checkbox"/>
FLIGHT AND WEATHER DETAILS								
Flight No	DAY <input type="checkbox"/>	Wind	Runway Used	Precipitation	Icing	Turbulence		
AK9700	NIGHT <input checked="" type="checkbox"/>	320/4	15	RAIN <input type="checkbox"/>	LIGHT <input type="checkbox"/>	LIGHT <input checked="" type="checkbox"/>		
From	TWILIGHT <input type="checkbox"/>	IAS	State	SNOW <input type="checkbox"/>	MOD <input type="checkbox"/>	MOD <input type="checkbox"/>		
KUL	Time	110		SLEET <input type="checkbox"/>	HEAVY <input type="checkbox"/>	SEVERE <input type="checkbox"/>		
To	0550LT	HUAH/L	DRY <input checked="" type="checkbox"/>	WET <input type="checkbox"/>	ICE <input type="checkbox"/>	LIGHT <input type="checkbox"/>		
SZD	Visibility	GND	SLUSH <input type="checkbox"/>	SNOW <input type="checkbox"/>	MOD <input type="checkbox"/>	HEAVY <input type="checkbox"/>	EXTREME <input type="checkbox"/>	
Geog. Position	8KM	OAT	ICE <input type="checkbox"/>	SNOW <input type="checkbox"/>	MOD <input type="checkbox"/>	HEAVY <input type="checkbox"/>		
		24						
				Cloud Type		F1700		PERUBAHAN <input type="checkbox"/>
				Height / Ft		1700		HOVER <input type="checkbox"/>
				Amount / 30s				TOWING <input type="checkbox"/>
NARRATIVE								
It was an endorsement training flight. Weather condition was VMC with visibility reported of 8 km, surface wind of 320/4 knots, temperature 24 degrees Celsius and dry runway. After the third touch and go, during the rolling stage, the flaps were selected to 2 and the speed brake disarmed. Full power (TOGA) was applied with normal indications. At 110 knots, the take-off configuration warning came out with spoiler indicated on the ECAM. The instructor rechecked the speedbrakes in disarmed mode but the warning still persist. Rejected take-off was carried out by the instructor with full reversers and braking. The aircraft ended overrun the threshold runway 33.								
Occurrence Category RF								
ENGINEERING DETAILS								
Component / Part	Aircraft Constructor's No	Engine Type & Series	Maintenance Organisation		Maintenance <input type="checkbox"/> Ground Handling <input type="checkbox"/> Taxy <input type="checkbox"/> Unattended <input type="checkbox"/>			
	Location on aircraft	Manual Reference	Tel No		Maintce Prog O C <input type="checkbox"/> C M <input type="checkbox"/> H I <input type="checkbox"/>			
Manufacturer	Part No	Serial No	HOURS	TOTAL	Since O/H or repair	Since Inspection	Manufacturer Adviser	
							YES <input type="checkbox"/> NO <input type="checkbox"/>	
			CYCLES					
			LANDINGS					
Is there any published Airworthiness Information or control procedures (e.g. AD, SB etc) relevant to occurrence				YES <input type="checkbox"/>	Reference No and Compliance Status of Aircraft or Equipment			
				NO <input type="checkbox"/>				

Appendix L: Interview Written Statement – Pilot-in-Command (PIC/CAPT)

CREW WRITTEN STATEMENT

DATE: 30/11/17
PLACE: REDQ, AIR ASIA BERHAD
FLIGHT NUMBER: AK 9700
FLIGHT DATE: 30/11/17
CREW (CM1/CM2): [REDACTED]

STATEMENT: I WAS AN ENDORSEMENT TRAINING FLIGHT. VMC CONDITION WITH VISIBILITY OF 8KM, SURFACE WIND 320/04KTS, TEMPERATURE 25°C AND DRY RUNWAY.

AFTER THIRD TOUCH AND GO, DURING THE ROLLING STAGE WITH FLAPS SELECTED TO 2 AND SPEED BRAKE DISARMED, FULL POWER (TOGA) WAS APPLIED WITH NORMAL INDICATIONS. AT 100KTS THE TAKE-OFF CONFIG WARNING CAME ON AND SPOILER INDICATED.

THE INSTRUCTOR DISARMED (PUSHED IN) THE SPEED BRAKE TO CONFIRM THE SPEED BRAKE BEING DISARM BUT THE WARNING STILL PERSISTED.

REJECTED TAKE OFF WAS CARRIED OUT BY THE INSTRUCTOR WITH FULL REVERSES AND BRAKING AND THE AIRCRAFT OVERRAN THE RUNWAY 33 THRESHOLD



Appendix M: Interview Written Statement – Co-Pilot (Trainee)

CREW WRITTEN STATEMENT

DATE: 30/11/2017
 PLACE: RED Q
 FLIGHT NUMBER: AXM 9700
 FLIGHT DATE: 30/11/2017
 CREW (CM1/CM2): [REDACTED]

STATEMENT: ENDORSEMENT TRAINING FLIGHT AT WMCA RIGHT HAND
 CIRCUIT RWY 15. WEATHER IS FINE, VISIBILITY > 8km, SURFACE WIND
 320/04 AND RUNWAY DRY. IT WAS THE THIRD TOUCH & GO
 ON RWY 15.

- CHRONOLOGICAL:
- ① MAINWHEEL TOUCH DOWN
 - ② PM: DISARMED SPOILERS & ANNOUNCED "STAND UP"
 - ③ PF: SET 2" THROTTLE LEVERS FORWARD AFTER
 MAINWHEEL TOUCHDOWN
 - ④ PM: SET FLAPS 2 & CALL "GO"
 - ⑤ PF: SET TOGA THRUST
 - ⑥ SPEED BUILDS UP > 100 KTS BEFORE VAPP
 - ⑦ ECAM WARNING DISPLAY TAKE OFF CONFIG SPLAS
 - ⑧ SPEED BRAKE LEVER ^{RECHECKED} ~~RECHECKED~~ AT DISARMED POSITION
 - ⑨ CM1 REJECT TAKE OFF WITH FULL REVERSE THRUST &
 MANUAL BRAKING.
 - ⑩ A/C OVERRUN AT RWY 28 THRESHOLD.

Appendix N: Interview Written Statement – Safety Pilot

CREW WRITTEN STATEMENT

DATE : 30/11/17 _____
PLACE : REDG _____
FLIGHT NUMBER : AXM 9700 _____
FLIGHT DATE : 30/11/17 _____
CREW (CM1/CM2) : _____

STATEMENT : IT WAS A ENDORSEMENT FLIGHT . THE WEATHER REPORTED GOOD . IT'S VMC .
VISIBILITY 8KM TEMPERATURE 25C DEWPOINT 24 WIND REPORTED 320/4 Rwy DRY . AFTER THIRD TOUCH
& GO DURING THE ROLLING STATE FLAPS 2 & SPEED BRAKES DISARMED . TOGA WAS APPLIED , WITH
NORMAL INDICATION . AT A AROUND 100KTS THE ECAM WARNING CAME OUT (~~SPEED~~ SPOILERS INDICATION) .
CAPT TOOK OVER CONTROL & REJECTED T/O . A/C COULDN'T STOP & OVERRUN THE RUNWAY . 33 THRESHOLD
* SPOILERS ~~ARE~~ CONFIRMED IN DISARMED

Appendix O: Final Assessment of Damages

1. Final Assessment of Damages to Aircraft

The final assessment of damages is a list of final major maintenance action that was carried out on the aircraft 9M-AHM in order to allow the aircraft to be operational again. These maintenance action amounts to the replacement of several components or parts of the aircraft that was directly impacted during the incident and also parts which were damaged during the aircraft recovery process from the impact area.

This final list does not in any way alter the course of the investigation, however for purpose of consistency and finality, the preliminary report is amended to reflect this new information under paragraph 1.3: Damage to Aircraft.

a. Parts / Components damaged during the runway overrun incident (see Attachment 1):

FINAL ASSESSMENT OF DAMAGES TO AIRCRAFT			
SECTION	PART	REMARK	WORKORDER REF
Airframe	Fuselage Skin	Scratch on LH Lower Side Fuselage - temporary repair instructed.	W/O 12822264
Landing Gear	RH Main Landing Gear	1 – Strut and Dressings replaced due to axle damage 2 – Complete Sidestay replaced due to axle damage 3 – Rear Pintle Pin Nut Assembly replaced 4 – RH MLG Assembly replaced	W/O 12949340 W/O 12949459 W/O 12949494 W/O 12951995
	LH Main Landing Gear	1 – Leg, Strut and Dressings replaced 2 – Complete Sidestay replaced 3 – Rear Pintle Pin Nut Assembly replaced 4 – LH MLG Assembly replaced	W/O 12949757 W/O 12950020 W/O 12949768 W/O 12951989
	Nose Landing Gear	1 – NLG Leg Assembly replaced 2 – NLG Forestay replaced 3 – NLG Assembly replaced	W/O 12949683 W/O 12949722 W/O 12951985

	Wheels and Tyres	<p>1 – #1 Main Wheel Tyre burst</p> <p>2 - # 2 Main Wheel Tyre burst</p> <p>3 – LH Nose Wheel Tyre burst</p> <p>4 – Main Wheel Assembly No.2 removed due to dirt contamination and made U/S</p> <p>5 - #3 Wheel removed due to dirt contamination and made U/S</p> <p>6 - #4 Wheel removed due to dirt contamination and made U/S</p>	<p>W/O 12930490</p> <p>W/O 12930766</p> <p>W/O 12930854</p> <p>W/O 12938188</p> <p>W/O 12938239</p> <p>W/O 12949076</p>
	Brakes	<p>1 – MLG Brake Assembly #1 replaced due to dirt contamination</p> <p>2 – MLG Brake Assembly #2 replaced due to dirt contamination</p> <p>3 – Brake Fan Motor Assembly No.1 removed due to brake fan motor unable to rotate</p> <p>4 – Brake #4 removed and made U/S due to dirt contamination</p> <p>5 – Brake #3 removed and made U/S due to dirt contamination</p>	<p>W/O 12938633</p> <p>W/O 12938768</p> <p>W/O 12949517</p> <p>W/O 12938942</p> <p>W/O 12938965</p>
Powerplant	Engines	<p>1 – Engine #1 replaced</p> <p>2 – Engine #2 replaced</p>	<p>W/O 12951969</p> <p>W/O 12961976</p>
Lights	Lights	<p>1 – Lower Strobe Light replaced</p> <p>2 – LH Landing Light Assembly broken and replaced</p>	<p>W/O 12951204</p> <p>W/O 12949734</p>
Doors	Door Slides	<p>1 – Door 1 Left Slide Deployed and replaced</p>	<p>W/O 12856445</p>

b. Parts / Components damaged during the aircraft recovery process (see Attachment 1) :

FINAL ASSESSMENT OF DAMAGES TO AIRCRAFT			
SECTION	PART	REMARK	WORKORDER REF
Landing Gear	Wheel	1 – RH Nose Wheel and Hub Cap replaced due to damage during recovery	W/O 12822264

2. Final Assessment of Other Damages


The final assessment of other damages (see Attachment 2) is a list of damages unto other equipment, fixture or structure that had occurred as a direct consequence from the incident.

This final list does not in any way alter the course of the investigation, however for purpose of consistency and finality, the preliminary report is amended to reflect this new information under paragraph 1.4: Other Damages.

FINAL ASSESSMENT OF OTHER DAMAGES	
Assessment	PART
MAHB	1 – One CAT 1, Calvert Approach (Type A) Lighting System unit

Attachments

a. Attachment 1 : Airasia Workorder Summary

 WO-Summary													GRS	11.Jun.2018
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No	W/O	A/C	State	Issue-Date	Due-/C.-Date	ATA	Type	Parts	Ref.	Mel	DD	Iss	Workorder-description and/or complaint	
633	12950294	JPR	Closed	29.Nov.2017	07.Jan.2018	05-51	M					AXM410	D3. TO C/OUT RUNWAY LEAVING INSPECTION AS PER D1/A1 A3. TASK C/OUT AS PER AMM 05-21-24. REFER RUNWAY LEAVING INSPECTION	
634	12951909	JPR	Closed	07.Jan.2018	07.Jan.2018	05	S					AXM410	D2. 36 HOURS CHECK DUE A2. 36 HOURS CHECK C/OUT AS PER TSF 7002R13. FOUND SATIS	
635	12951914	JPR	Closed	07.Jan.2018	07.Jan.2018	71-13	M					AXM486	D1. TO C/OUT OPENING AND CLOSING OF ENG 1 FAN COWL A2. TASK C/OUT AS PER AMM 71-13-00. FOUND SATIS.	
636	12951924	JPR	Closed	07.Jan.2018	07.Jan.2018	71-13	M					AXM410	D2. TO C/OUT OPENING AND CLOSING OF ENG 2 FAN COWL A2. TASK C/OUT AS PER AMM 71-13-00. FOUND SATIS.	
637	12951969	JPR	Closed	07.Jan.2018	07.Jan.2018	71-00	M					AXM486	D1. WRT MR1 AB320759 TO C/OUT REPLACEMENT OF ENG #1. A1. TASK C/OUT AS PER AMM 71-00-00-000-042A.	
638	12951976	JPR	Closed	07.Jan.2018	07.Jan.2018	71-00	M					AXM410	D2. WRT MR1 AB320759 TO C/OUT REPLACEMENT OF ENG #2 A2. TASK C/OUT AS PER AMM 71-00-00-000-042A. REFER CHECK PACKAGE	
639	12951985	JPR	Closed	07.Jan.2018	07.Jan.2018	32-21	M					AXM410	D3. WRT MR1 AB320759 TO C/OUT REPLACEMENT OF NOSE LANDING GEAR ASSY. A3. TASK C/OUT AS PER AMM 32-21-11. REFER CHECK PACKAGE RUNWAY	
640	12951989	JPR	Closed	07.Jan.2018	07.Jan.2018	32-11	M					AXM486	D1. WRT MR1 AB320759 TO C/OUT REPLACEMENT OF L/H MAIN LANDING GEAR ASSY.	
641	12951995	JPR	Closed	07.Jan.2018	07.Jan.2018	32-11	M					AXM410	D2. WRT MR1 AB320759 TO C/OUT REPLACEMENT OF R/H MAIN LANDING GEAR ASSY.	
642	1994419	JPR	Closed	17.Dec.2017	06.Jan.2018	71	S					MDY	EI-15-058-A322 REV.B INSPECTION OF LH AFT ENGINE MOUNT INNER RETAINER BRACKET	
643	10335879	JPR	Closed	17.Dec.2017	06.Jan.2018	72-21	S					MDY	EI-15-067-A322 REV.C DETAILED INSPECTION OF THE FORWARD ENGINE MOUNT OF THE LH ENGINE	

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No	W/O	A/C	State	Issue-Date	Due-/C.-Date	ATA	Type	Parts	Ref.	Mel	DD	Iss	Workorder-description and/or complaint
644	12310838	JPR	Closed	15.Dec.2017	06.Jan.2018	72-00	S					MDI	CR-AHM-001 REMOVE: > ENGINE
645	12704269	JPR	Closed	16.Dec.2017	06.Jan.2018	72-00	S					MDY	RUNAWAY EXCURSION AT SZB. ENGINE REMOVE DUE TO MUD FOUND STUCK AT BOOSTER AREA AFTER A FEW TIMES
646	12782751	JPR	Closed	15.Dec.2017	06.Jan.2018	24	S					MDI	IC-AHM-002 OPERATIONAL CHECK OF THE INTEGRATED DRIVE GENERATOR (IDG) DISCONNECT
647	12786566	JPR	Closed	17.Dec.2017	06.Jan.2018	24	S					MDY	OPERATIONAL CHECK OF THE INTEGRATED DRIVE GENERATOR (IDG) DISCONNECT AND RECONNECT FUNCTION ON ESN 729406
648	12786568	JPR	Closed	17.Dec.2017	06.Jan.2018	72	S					MDY	SURVEILLANCE INSPECTION OF TURBINE FRAME AFT ENGINE MOUNT LUGS ON ESN 729406 AS PER AMM 71-22-12-210-001
649	12786570	JPR	Closed	17.Dec.2017	06.Jan.2018	72	S					MDY	TO INSPECT FANBLADE CONDITION AS PER AMM 72-21-00-210-009-A ON ESN 729406
650	12786572	JPR	Closed	17.Dec.2017	06.Jan.2018	71	S					MDY	TO PERFORM FIRST INSPECTION ON ENGINE MOUNTING AFTER ENGINE INSTALLATION OF ESN 729406 AS PER SINGLE CRITICAL TASK INSPECTION IN
651	12786573	JPR	Closed	17.Dec.2017	06.Jan.2018	71	S					MDY	TO PERFORM SECOND INSPECTION ON ENGINE MOUNTING AFTER ENGINE INSTALLATION OF ESN 729406 AS PER SINGLE CRITICAL TASK INSPECTION IN
652	12786576	JPR	Closed	17.Dec.2017	06.Jan.2018	72	S					MDY	TO PERFORM DEPRESERVATION OF ESN 729406 AFTER ENGINE INSTALLATION AS PER AMM 72-00-00-600-027-A
653	12786577	JPR	Closed	17.Dec.2017	06.Jan.2018	29	S					MDY	TO INSPECT RESERVOIR PRESSURIZATION HOSE P/N: D0001037900000 IS INSTALLED ON HIGH PRESSURE BLEED LINE. IPC REFERENCE 29-14-06-01 ITEM

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No	W/O	A/C	State	Issue-Date	Due-/C.-Date	ATA	Type	Parts	Ref.	Mel	DL	Iss	Workorder-description and/or complaint
654	12786579	JPR	Closed ;>	17.Dec.2017	06.Jan.2018	31	S					MDV	QDF 0008 EGR RECORDING
655	12790733	JPR	Closed	19.Dec.2017	06.Jan.2018	71	S					MDI	IC-AHM-001 TO PERFORM ENGINE RUN ON ENGINE #2 AT HIGH POWER IN DEPENDENTLY FROM
656	12790805	JPR	Closed j	19.Dec.2017	06.Jan.2018	71	S					MDV	TO PERFORM ENGINE RUN ON ENGINE #1 AT HIGH POWER IN DEPENDENTLY FROM EACH OTHER AS PER AMM TASK 71-00-00-710-008-8 WITH ASSOCIATED CHECKS
657	12938650	JPR	Closed 7	06.Jan.2018	06.Jan.2018	53-45	S					NID	MANDATORY: PERFORM TSF2016R00 SRC-18-005-T322 (STURC TURAL RECTIFICATION CARD) REV. A
658	12951621	JPR	Closed 7	06.Jan.2018	06.Jan.2018	33-51	M					AXM486	D1. TO C/OUT IN STALLATION OF CABIN WALL MOUNTED EMERGENCY EXIT MARKERS LENS (90WL1), (90WL2), (90WL3), (90WLA), (90WL5), (90WL6), (90WL7) AND
659	12951717	JPR	Closed ;	06.Jan.2018	06.Jan.2018	30-71	M					AXM410	D2. DURING INSPECTION FOUND FWD DRAIN MAST DENTED. A2. INSPECTION C/OUT AS PER AMM 30-71-51-200-001-A. FOUND DAMAGE IS
660	12986066	JPR	Closed 7	06.Jan.2018	06.Jan.2018	71-00	M g.			gj		AXM486	TO COUT INSTALLATION OF ENGINE #1 LH FAN COWL DOOR ON ENGINE ESN 697773 TASK COUT AS PER AMM: 71-31-11 TORQUE AND SECURITY CHK COUTFOUND
661	13279761	JPR	Closed 7	27.Dec.2017	06.Jan.2018	72	S					MDV	PERFORM TSFI 001 ROS E I-10-038-N322 COMPONENT (ENGINEERING INSTRUCTION) REV. B
662	12876322	JPR	Closed	02.Jan.2018	04.Jan.2018	00	S					SDA	TO INSERT NEW RADIO STATION LICENSE (RSL) IN TO CERT FILE & REMOVE THE OLD ONE
663	12901828	JPR	Closed 7	03.Jan.2018	04.Jan.2018	00	S					MI P	TO REMOVE OLD RADIO STATION LICENSE (RSL) FROM CERT FILE DONE

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GRS	WO#	Issue-Date	Due-/C-Date	ATA	Type	Parts	Ref	Mel	DD	Iss	Worker-description and/or complaint	
	12951398	JPR	Closed	04-Jan-2018	04-Jan-2018	52-10	M /)				AXM410	D2. WRT MR I AB320760 DI / A L TO C/OUT RE PLACEMENT OF DIA PHRAGM IN THE PERCUSSION MECHANISM OF THE DOOR LEFT DAMPER.
	12951430	JPR	Closed	04-Jan-2018	04-Jan-2018	52-10	M /)				AXM410	D3. WRT MR I AB320772 D2/A2, TO C/OUT CHARGING OF THE DOOR DAMPER CYLINDER
	12786564	JPR	Closed	17-Dec-2017	03-Jan-2018	73	S				MDV	TO PRINT OUT CLASS 3 REPORT ON ENGINE I ESN 697874 BEFORE REMOVAL. REFER TO AMM 73-21-60-740-026-A FOR PROCEDURE TO ACCESS THE CLASS 3
	12134137	JPR	Closed	04-Nov-2017	02-Jan-2018	22	S				MFC	PERFORM TSFJ001 ROSE I-07-148-N322 (ENGINEERING INSTRUCTION) REV.K AUTO FLIGHT - FLIGHT MANAGEMENT (FM) NAVIGATION DATABASE LOADING*
	12951204	JPR	Closed	02-Jan-2018	02-Jan-2018	33-48	M 0/)				AXM624	D1. LOWER STROBE LIGHT FOUND INOP. A1. LOWER STROBE LIGHT REPLACED AND SECURED. OPS TEST SATIS.
	12951247	JPR	Closed	02-Jan-2018	02-Jan-2018	25-32	M /)				AXM486	D2. TO C/OUT IN STALLATION OF DOOR LEFT SLIDE AFTER BEING DEPLOY AS PER <u>MRI-A</u> B320760DI A I.
	12951388	JPR	Closed	02-Jan-2018	02-Jan-2018	25-33	M III				AXM486	D3. FOUND AFT GALLEY WATER LEAKING A3. T/S FOUND AFT GALLEY WATER FILTER ASSY VALVE LEAKING. VALVE
	3410545	JPR	Closed	24-Dec-2017	29-Dec-2017	26-21	S Gil				IMH	CR-AHM-170984 TO REPLACE ENG FIREX DUE TO WORKSHOP CARTRIDGE REPLACEMENT
	3410548	JPR	Closed	22-Nov-2017	29-Dec-2017	26-21	S				IMH	CR-AHM-171080 TO REPLACE ENG FIREX DUE TO WORKSHOP CARTRIDGE REPLACEMENT
	12784959	JPR	Closed	15-Dec-2017	29-Dec-2017	72	S				MDI	IC-AHM-007 TO PERFORM DEPRESERVATION OF ESN 577561 AFTER ENGINE INSTALLATION AS
	12784965	JPR	Closed	15-Dec-2017	29-Dec-2017	29	S				MDI	IC-AHM-008 TO INSPECT BLANK CAP IS INSTALLED ON ESN 577561 HIGH PRESSURE BLEED

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No	W/O	A/C	State	Issue-Date	Due-/C.-Date	ATA	Type	Parts	Ref.	Mel	DD	la	Workorder-descriptions and/or complaint
67	1278497	JPR	Closed	15.Dec.2017	29.Dec.2017	7-1	S					MDI	QDF 0008 A320 CFM56-5B
67	1295079	JPR	Closed	29.Dec.2017	29.Dec.2017	33-51	M I)		ill				D1. TO ROB CABIN WALL MOUNTED EMERGENCY EXIT MARKERS LENS (90WL1) TO FIT ON 9M-AGT.
67	1295081	JPR	Closed	29.Dec.2017	29.Dec.2017	33-51	M /		gi				D2. TO ROB CABIN WALL MOUNTED EMERGENCY EXIT MARKERS LENS (90WL 2) TO FIT ON 9M-AGT.
67	1295089	JPR	Closed	29.Dec.2017	29.Dec.2017	33-51	M I)		gi				D3. TO ROB CABIN WALL MOUNTED EMERGENCY EXIT MARKERS LENS (90WL3) TO FIT ON 9M-AGT.
67	1295090	JPR	Closed	29.Dec.2017	29.Dec.2017	33-51	M /		gi				D4. TO ROB CABIN WALL MOUNTED EMERGENCY EXIT MARKERS LENS (90WL4) TO FIT ON 9M-AGT.
68	1295095	JPR	Closed	29.Dec.2017	29.Dec.2017	33-51	M I)						D2. TO ROB CABIN WALL MOUNTED EMERGENCY EXIT MARKERS LENS (90WL5) TO FIT ON 9M-AGT.
68	1295102	JPR	Closed	29.Dec.2017	29.Dec.2017	33-51	M D		iff				D3. TO ROB CABIN WALL MOUNTED EMERGENCY EXIT MARKERS LENS (90WL2) TO FIT ON 9M-AGT.
68	1295115	JPR	Closed	29.Dec.2017	29.Dec.2017	33-51	M /						D1. TO C/OUT ROB CABIN WALL MOUNTED EMERGENCY EXIT MARKERS LENS (90WL7) TO FIT ON 9M-AGT.
68	1295118	JPR	Closed	29.Dec.2017	29.Dec.2017	33-51	M /						D2. TO C/OUT ROB CABIN WALL MOUNTED EMERGENCY EXIT MARKERS LENS (90WL 8) TO FIT ON 9M-AGT.
68	1294934	JPR	Closed	17.Dec.2017	28.Dec.2017	32	S						TO REPLACE RH MAIN STRUT AND DRESSINGS DUE TO AXLE DAMAGE DUE TO RUNWAY EXCURSION
68	1294975	JPR	Closed	18.Dec.2017	28.Dec.2017	32	S						TO REPLACE LH MLG LEG& DRESSING DUE TO RUNWAY EXCURSION POSN: LH MLG

WO Summary

No	WO	A/C	State	Issue-Date	Due-(C-Date)	At	Time	Category	DD	Iss	Workorder-description and/or complaint
686	12949816	JPR	Closed	19. Dec. 2017	28. Dec. 2017	32				MFC	TO REPLACE REAR PINTLE PIN DUE TO RUNWAY EXCURSION POSN: LH MLG
687	12949820	JPR	Closed	18. Dec. 2017	28. Dec. 2017	32				MFC	TO REPLACE LH MLG COMPLETE SIDESTAY DUE TO RUNWAY EXCURSION POSN: LH MLG
688	1996778	JPR	Closed	15. Dec. 2017	27. Dec. 2017	71				MDI	EI: 15-059- A322 REV B INSPECTION OF RH AFT ENGINE MOUNT INNERRETAINER BRACKET
689	2398436	JPR	Closed	15. Dec. 2017	27. Dec. 2017	72-21				MDI	EI: 15-088- A322 REV A DETAILED INSPECTION OF THE FORWARD ENGINE MOUNT OF THE RH ENGINE
690	12782773	JPR	Closed	15. Dec. 2017	27. Dec. 2017	72				MDI	IC-AHM-004 TO INSPECT FANBLADE CONDITION AS PER AMM 72-21-00-2 10-009-A ON ESN
691	12782856	JPR	Closed	15. Dec. 2017	27. Dec. 2017	71				MDI	IC-AHM-005 TO PERFORM FIRST INSPECTION ON ENGINE MOUNTING AFTER ENGINE
692	12116216	JPR	Closed	16. Nov. 2017	26. Dec. 2017	23				MFC	PERFORM TSFI 001 ROS EI-17-230-N 322 COMPONENT (ENGINE ERING INSTRUCTION) REV.A
693	12782761	JPR	Closed	15. Dec. 2017	26. Dec. 2017	72				MDI	IC-AHM-003 SURVEILLANCE INSPECTION OF TURBINE FRAME AFTENGINE MOUNT LUGSON ESN
694	12781768	JPR	Closed	15. Dec. 2017	25. Dec. 2017	73				MDI	IC-AHM-001 TO PRINT OUT CLASS 3 REPORT FOR ENGINE #2 ESN 699198 BEFORE REMOVAL.
695	12949326	JPR	Closed	25. Dec. 2017	25. Dec. 2017	24-38				AX M051	DI: MAIN BATTERY 2PB2 FOUND LOW VOLTAGE AI: MAIN BATTERY 2PB2 REPLACED AND SECURED OPS CHECK C/OUT FOUND
696	12949883	JPR	Closed	24. Dec. 2017	25. Dec. 2017	32				MFC	TO REPLACE NLG LEG ASSY DUE TO RUNWAY EXCURSION POSN : NLG

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No	W/O	A/C	State	Issue-Date	Due-/C.-Date	ATA	Type	Parts	Ref.	Mel	DD	Iss.	Workorder-descriptions and/or complaint
697	12942722_JPR		Closed	04.Dec.2017	25.Dec.2017	35	S (iii)					MEC	TO REPLAC E NLG FORESTA Y DUE TO RUNWAY EXCURSION POSN: NLG
698	3410662_JPR		Closed	08.Dec.2017	22.Dec.2017	35-00	S (ii)		iii			IMH	CR-AHM- 171 113 TO REPLACE PBE DUE TO LIFE LI MIT
699	3410664_JPR		Closed	08.Dec.2017	22.Dec.2017	35-00	S (ii)		ii			IMH	CR-AHM - 171 114 TO REPLACE PBE DUE TO LIFE LI MIT
700	12775348_JPR		Closed	22.Dec.2017	22.Dec.2017	54-51	S (ii)					NID	REVISION DETAIL: INITIAL REVISION.
701	12812564_JPR		Closed	23.Dec.2017	23.Dec.2017	54-51	S					NID	REVISION DETAIL: INITIAL REVISION.
702	12949459_JPR		Closed	17.Dec.2017	22.Dec.2017	32	S (Gii)					MEC	TO REPLACE RH MLG COMPLETE SIDESTA Y DUE TO AXLE DAMAGE DUE TO RUNWAY EXCURSION
703	12949485_JPR		Closed	17.Dec.2017	22.Dec.2017	32	S (ii)					MEC	TO REPLACE REAR PINTLE PIN DUE TO THREAD NOT SMOOTH DUE TO RUNWAY
704	12949484_JPR		Closed	17.Dec.2017	22.Dec.2017	32	S (ii)					MEC	EXCURSION TO REPL ACE REAR PINTLE PIN NUT ASSY DUE TO RUNWAY EXCURSION
705	12822264_JPR		Closed	21.Dec.2017	21.Dec.2017	32	S (iii)					HIN	POSN: RHMLG RJH 7-543-T322REPAIR IN STRUCTIONATEM PORA RY REPAIR ON LH LOWER SID E STA Y - SCRATCH
706	12822633_JPR		Closed	21.Dec.2017	21.Dec.2017	32-41	S					AXM486	TO C/OUT INSTALLATION OF MLG # 1 WHEEL ASSY TASK C/OUT AS PER AMM 32-41-11. FOUND SATIS.
707	12938230_JPR		Closed	18.Dec.2017	21.Dec.2017	32-41	S					AXM410	TO C/OUT INSTALLATION OF M A IN WHEEL ASSY NO.2 TASK C/OUT AS PER AMM 32-41-11. FOUND SATIS.

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No	W/O	A/C	State	Issue-Date	Due-/C.-Date	ATA	Type	Parts	Ref.	Mel	DD	Iss	Workorder-description and/or complaint
700	1292005	JPR	Closed	15 Dec 2017	21 Dec 2017	32-41	S		gi			AXM410	TO C/OUT INSTALLATION OF WHEEL #3 TASK C/OUT AS PER AMM 32-41-11 SATIS
700	1292005	JPR	Closed	15 Dec 2017	21 Dec 2017	32-41	S		iii			AXM410	TO C/OUT INSTALLATION OF WHEEL NO.4 TASK C/OUT AS PER AMM 32-41-11
710	1292002	JPR	Closed	21 Dec 2017	21 Dec 2017	32-48	S		gi			AXM480	TO C/OUT REPLACEMENT OF MLG BRAKE ASSY #1 DUE TO DIRT CONTAMINATION AFTER RUNWAY EXCURSION.
710	1292002	JPR	Closed	21 Dec 2017	21 Dec 2017	32-48	S		gi			AXM480	TO C/OUT REPLACEMENT OF MLG BRAKE ASSY #2 DUE TO DIRT CONTAMINATION AFTER RUNWAY EXCURSION.
710	1292008	JPR	Closed	21 Dec 2017	21 Dec 2017	32-42	S		gi			AXM410	TO C/OUT INSTALLATION OF NO.4 BRAKE ASSY TASK C/OUT AS PER AMM 32-42-27
710	1292002	JPR	Closed	15 Dec 2017	21 Dec 2017	32-42	S	Gi				AXM410	TO C/OUT INSTALLATION OF BRAKE #3 TASK C/OUT AS PER AMM 32-42-27 SATIS
710	12949109	JPR	Closed	15 Dec 2017	21 Dec 2017	32-41	S		ii			AXM410	TO C/OUT INSTALLATION OF WHEEL #3 TASK C/OUT AS PER AMM 32-41-11 SATIS
710	12949120	JPR	Closed	15 Dec 2017	21 Dec 2017	32-41	S		iii			AXM410	TO C/OUT INSTALLATION OF WHEEL #4 TASK C/OUT AS PER AMM 32-41-11
710	12949517	JPR	Closed	21 Dec 2017	21 Dec 2017	32-48	S					AXM601	TO REMOVE NO.1 BRAKE FAN MOTOR ASSY DUE TO BRAKE FAN MOTOR UNABLE TO ROTATE.
710	12949686	JPR	Closed	21 Dec 2017	21 Dec 2017	32-48	S					AXM601	TO INSTALL NEW BRAKE FAN ASSY DUE TO NO. 1 BRAKE FAN ASSY U/S.
710	12949734	JPR	Closed	21 Dec 2017	21 Dec 2017	33-42	S					AXM410	TASK CARRIED OUT AS PER AMM 32-48-51 FOUND SATIS. TO C/OUT REPLACEMENT OF LH LANDING TIGHT ASSY DUE TO BROKEN AFTER RUNWAY EXCURSIONS.

Appendix P: Airbus Handling Quality Analysis

1. Introduction

a. General

During the course of investigation, the Investigation Team had appointed a team of representatives from the aircraft manufacturer, Airbus as participants/observers to the investigation in order to obtain the best specialist knowledge for the purpose of data analysis.

A specific request (Tech Request) for a Handling Quality Analysis was made by the Investigation Team on the 30th of November 2017. The HQA is mainly focused on technical interpretation, analysis and findings from the FDR and may provide additional information to the Investigation Team.

The findings of the manufacturer are based solely on analysis of the Flight Data Recorder (FDR) and any additional information provided by the Investigation Team. The manufacturer did not conduct any separate investigations on the incident

b) HQA Details

HQA TITLE	9M-AHM RUNWAY EXCURSION INCIDENT
REQUESTOR	AIRASIA BERHAD
SUBMITTED DATE	30 TH NOVEMBER 2017 04:13 UTC+1 DST
REQUESTOR REFERENCE	TDR-322-AZC-17-025-01
AIRBUS REFERENCE	80389852/001

c) Amendments to the Preliminary Report

As per paragraph 1.16.1 of the Preliminary Report, all results of tests or research done to verify the findings of the investigation shall be supplemented to the report. As such, paragraph 1.16 of the Preliminary Report is amended to reflect the results of the HQA.

It must be noted that all findings of the HQA are consistent with the findings of the Preliminary Report and does not in any way alter the final outcome of the investigation.

d) Handling Quality Analysis

AIRBUS



A320-216, MSN 3536 (9M-AHM)

RUNWAY OVERRUN DURING ABORTED TOUCH AND GO AT SUBANG SULTAN ABDUL AZIZ SHAH AIRPORT (WMSA)

November 29th 2017

Airbus Report

AIRBUS REFERENCE: TechRequest 80389852

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1. INTRODUCTION

As part of our Customer Support activity, this report provides the analysis of the Flight Data Recorder (FDR) data and any additional information provided by AIR ASIA following a runway overrun during an aborted touch and go experienced by the A320-216 MSN 3536 (9M-AHM) at Subang Sultan Abdul Aziz Shah airport (WMSA) on November 29th 2017.

While AIR ASIA remains solely responsible for the operation of their aircraft fleet, the objective of this report is to identify the causes of the event and its potential consequences, as well as to provide operational documentation, current at time of report publication, which may assist the customer to prevent re-occurrence of this type of event.

Airbus will gladly update the report if additional information becomes available.

Note: The Flight Data Recorder (FDR) provided by AIR ASIA for this event is a Quick Access Recorder (QAR).

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2. EVENT DESCRIPTION

2.1. DESCRIPTION

The AIR ASIA A320-216 MSN 3536 (9M-AHM) experienced a runway overrun during an aborted touch and go on November 29th 2017 at Subang Sultan Abdul Aziz Shah airport (WMSA) – Malaysia.

2.2. ADDITIONAL CONTEXT

AIR ASIA provided to Airbus the following report of the event:

QUOTE

Narrative of Event

It was an endorsement training flight. Weather condition was VMC with visibility reported of 8km, surface wind of 320/4kt, Temperature 24°C and dry runway. After the third Touch and Go, during the rolling stage, the Flaps were selected to 2 and the speed brake disarmed. Full power (TOGA) was applied with normal indications.

At 110kt, the Take-Off Configuration Warning came out with spoiler indicated in the ECAM. The instructor rechecked the speed brakes in disarmed mode but the warning still persist. Rejected Take-Off was carried out by the instructor with Full Reversers and braking. The aircraft ended overrun the threshold runway 33.

UNQUOTE

Figure 1 – Extract of Air Safety Report

3. AIRCRAFT INFORMATION

MSN: 3536

A/C Registration: 9M-AHM

Operator: AXM

Operator Name: AIR ASIA

A/C Series: A320-216

Engine Series: CFM56-5B6/3

Engine Supplier: CFMI

AIRBUS

4. ENVIRONMENT INFORMATION

4.1. SUNRISE AND SUNSET INFORMATION

Event occurred on November 29th 2017 around 21:55 UTC, corresponding to November 30th 2017 around 05:55 Local Time (UTC+8): it was before civil twilight.

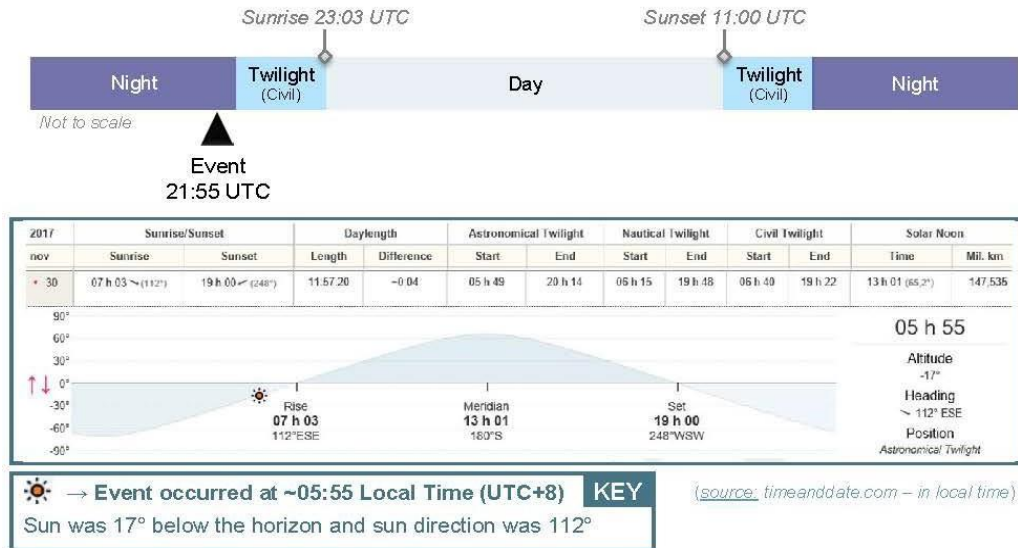


Figure 2 – Day / Night information

4.2. APPROACH AND RUNWAY INFORMATION

Based on AIR ASIA information and flight raw data, flight crew proceeded for a visual approach to runway 15 at Subang Sultan Abdul Aziz Shah airport (WMSA)

➤ Visual approach



Figure 3 – Visual approach - trajectory

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> Runway:

Based on flight raw data, the runway 15 was used at Subang Sultan Abdul Aziz Shah airport (WMSA).

Runway 15 characteristics are:

- QFU 149°
- Length 3780m with 61m of stop way
- Width 45m
- Elevation 70ft

4.3. WEATHER INFORMATION

4.3.1. METAR

WMSA, Subang/Sultan Abdul Aziz Shah Airport (Malaysia).
WMO index: -----, Latitude 03-07N, Longitude 101-32E, Altitude 27 m.

METAR/SPECI from WMSA, Subang/Sultan Abdul Aziz Shah Airport (Malaysia).

SA 29/11/2017 23:00-> METAR WMSA 292300Z 32003KT 280V030 9999 FEW003 SCT140 BKN260 24/23 Q1007=
SA 29/11/2017 22:00-> METAR WMSA 292200Z 32005KT 280V010 7000 -RA FEW005 SCT140 BKN260 24/23 Q1007=
SA 29/11/2017 21:00-> METAR WMSA 292100Z 32004KT 260V030 7000 -RA FEW005 SCT140 OVC260 24/23 Q1006=

Figure 4 – METAR around time of event

Analysis:

The METAR published ~5min after the event provides the following information:

- Wind direction 320° (variable 280° to 010°), wind speed 5kt.
- Visibility 7000m
- Few cloud layer (between 1/8 and 2/8 of the sky covered with clouds) with its base at 500ft.
- Temperature +24°C with a dew point at +23°C.
- QNH 1007 hPa
- Light rain

The METAR published 55min before the event reported no significant changes.

The report provided by AIR ASIA highlighted the following weather information:

QUOTE

[...]

Weather condition was VMC with visibility reported of 8km, surface wind of 320/4kt, Temperature 24°C and dry runway.

[...]

UNQUOTE

AIRBUS

4.3.2. ZOOM ON THE WIND EVOLUTIONS DURING FINAL APPROACH

In short final approach, the wind information computed by the Air Data Inertial Reference Unit (ADIRU) and recorded by the FDR was as follows:

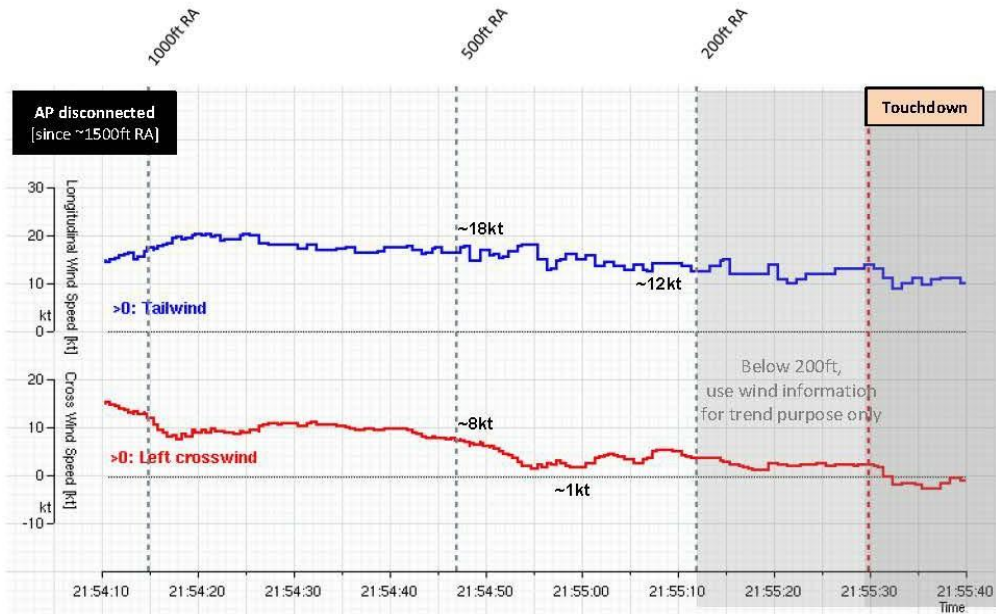


Figure 5 – Wind evolution computed by the ADIRU

Analysis:

The recomputed longitudinal and lateral wind evolutions (based on the raw wind data recorded by the FDR) highlighted:

Between 500ft RA (21:54:47 UTC) and 200ft RA (21:55:12 UTC), the average wind recorded by the FDR comes from 338° at 15kt (tailwind component decreased from 18kt to 12kt and left crosswind component varied between 8kt and 1kt).

Between 200ft RA and touchdown, the tailwind was stable (around 12kt¹) and the left crosswind was stable (around 2kt).

¹ Since wind trend is here stable, FDR recorded value can thus be considered below 200ft RA.

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4.3.3. WIND CONDITIONS SUM-UP

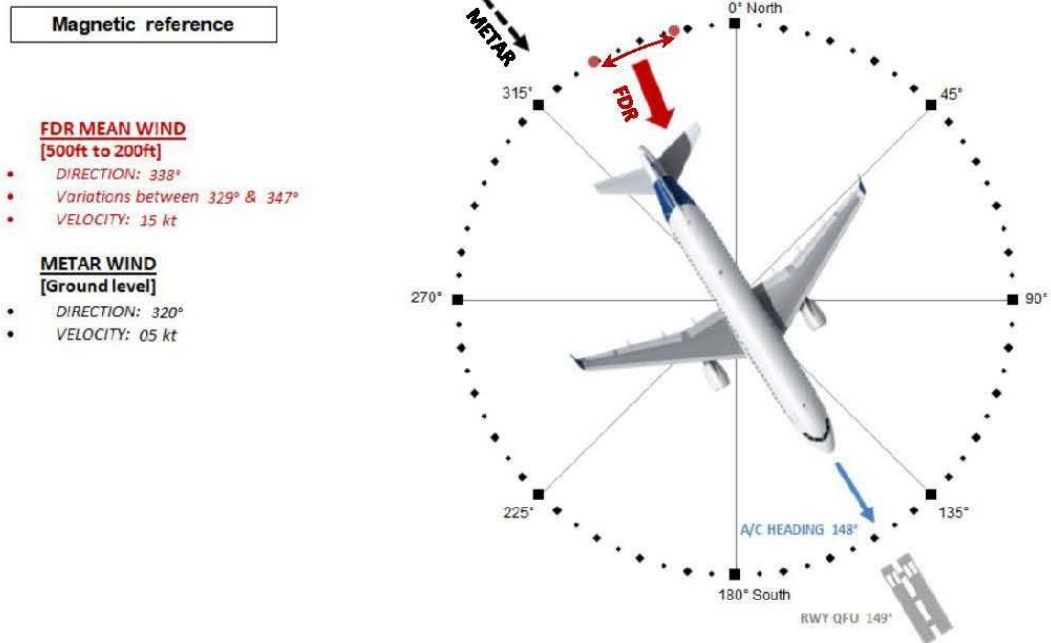


Figure 6 – Wind condition sum-up

Analysis

All available weather information sources are consistent in direction during final approach and landing.

However, METAR highlighted a 5kt tailwind whereas FDR recorded wind was around 15kt.

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5. FLIGHT DATA READOUT AND ANALYSIS

The following analysis is based on the data extracted from the FDR.
The parameters, sign convention and list of abbreviations are available in Annex 1.
The associated plots are available in Annex 2.

> Definition

In the report:



Airbus refers to two different types of AP disengagement:

'Voluntarily' means disengagement:

- Through the instinctive side stick push button (by SOP)

'Involuntarily' means disengagement:

- By FCU push button
 - or
- With side stick or rudder pedal input
 - or
- Due to a failure

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5.1. FINAL APPROACH AND TOUCHDOWN

On November 29th 2017, the AXM A320-216 MSN 3536 (9M-AHM) flying to Subang Sultan Abdul Aziz Shah airport (WMSA) proceeded for a visual approach to runway 15 (149°). The aircraft was performing a third Touch and Go. Both previous Touch and Go were performed in CONF 3.

- **At the beginning of final turn at 650ft RA (21:54:37 UTC) the aircraft was in the following configuration:**

Aircraft configuration

- Gross weight was 51.5T < MLW (= 66.0T).
- CG was 28.0%.
- Aircraft was in CONF 3 (Slats/Flaps 22°/20°).
- Landing gear was selected down.
- Ground spoilers were armed.
- Autobrake was not armed.

AP/FD engagement status

- Both APs and Flight Directors (FDs) were not engaged
Sidestick inputs were recorded on both CM1 and CM2 sides.

Speed

- Autothrust (A/THR) was engaged and active in "SPEED" mode.
- VLS was estimated at 124kt.
- Speed target was managed at 129kt (VAPP=VLS+5kt).
- CAS was 134kt (=VAPP+5kt).

Attitude and trajectory


- Rate of descent was approximately 1000ft/min decreasing.
- Pitch angle was +2° (nose up).
- Heading was 121° (QFU 149°).
- Drift angle was +3° (aircraft nose toward the left of the track).

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Analysis:

The flight crew voluntarily disengaged AP1 around 1500ft RA (21:50:57 UTC), then during final approach CM1 and CM2 sidestick inputs were recorded with the A/THR engaged and active in "SPEED" mode. The speed target was managed.

As the takeover priority pushbutton was not pressed, the sidestick orders were algebraically added (refer to the following **FCTM extract**). It is recommended to avoid dual inputs.

 A318/A319/A320/A321 FLIGHT CREW TECHNIQUES MANUAL	AIRBUS OPERATIONAL PHILOSOPHY DESIGN PHILOSOPHY FLY-BY-WIRE - UTILIZATION PRINCIPLES
USE OF SIDESTICK	
<p>Only one pilot flies at a time.</p> <p>If the PM wants to act on the sidestick, he/she must:</p> <ul style="list-style-type: none"> - Clearly announce "I have control" - Press and maintain his/her sidestick pushbutton, in order to get full control of the Fly-By-Wire system. <p><u>The flight crew should keep in mind that sidestick inputs are algebraically added. Therefore dual inputs must be avoided, and will trigger aural and visual alerts.</u></p> <p>Either pilot can make an input on their sidestick at any time.</p> <p>Either pilot can deactivate the other pilot's sidestick by pressing on their sidestick pb.</p>	
Extract 1 : AOP-10-30-20- USE OF SIDESTICK	

The aircraft was in short final to perform a third Touch and Go. Autobrake was not armed as recommended in following **FCTM extract**.

 A318/A319/A320/A321 FLIGHT CREW TECHNIQUES MANUAL	PROCEDURES NORMAL PROCEDURES SUPPLEMENTARY PROCEDURES - TOUCH AND GO
TOUCH AND GO	
<p><u>DURING FINAL APPROACH</u></p> <p>Before each touch and go, the instructor confirms with the trainee that both of the following apply:</p> <ul style="list-style-type: none"> - Reverse thrust will not be selected - <u>Brakes (auto or manual) will not be used.</u> 	
Extract 2 : PR-NP-SP-40- TOUCH AND GO	

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> From 650ft RA (21:55:00 UTC) to touchdown (21:55:29 UTC):

Dual sidestick inputs occurred during approach: sidestick inputs were simultaneously recorded on Pilot Flying side and Pilot Monitoring side without activation of the takeover priority pushbutton.

On the longitudinal axis:

- CM1 and CM2 sidestick input varied between ~1/4 of full nose down and ~1/3 of full nose up deflection.
 - o Pitch angle varied between +4° and +2° before increasing up to +6° (nose up) during flare phase.
- CAS varied between 134kt (=VAPP+5kt) and 127kt (=VAPP-2kt).
- Rate of descent varied between 1050ft/min and 600ft/min.
- Vertical load factor varied between +0.85G and +1.2G.
- At ~15ft RA, thrust levers were retarded to the "IDLE" detent leading to A/THR disengagement as expected.

On the lateral axis:

- CM1 sidestick input varied between half of full right and left deflection. At the same time, CM2 sidestick input varied between ~1/5 of full right and ~1/3 of full left deflection.
 - o A right turn was performed between 650ft RA and 350ft RA.
 - o Then roll angle varied between -7.5° (left wing down) and +7° (right wing down).
- No significant rudder pedal input was recorded.
- After the final turn, heading varied between 145° and 150° (QFU 149°).
- Drift angle varied between +4° and +1° (aircraft nose toward the left of the track).
- No significant lateral load factor was recorded.

Analysis:


At 500ft RA (stabilization height recommended in Visual Meteorological Conditions):

- The aircraft was not yet on the correct lateral and vertical flight path
- The aircraft was in landing configuration
- The thrust was stabilized, and the aircraft was at target speed for approach

From 500ft RA to touchdown, as per the following **FCOM extract**, several parameters exceeded their callout value:

- The rate of descent reached 1050ft/min: higher than its callout value (1000ft/min) for ~5 seconds between 400ft RA and 300ft RA.
- After final turn, roll angle reached its callout value (+/-7°) at 270ft RA (left) and at 170ft RA (right).

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 A318/A319/A320/A321 FLIGHT CREW OPERATING MANUAL	PROCEDURES NORMAL PROCEDURES STANDARD OPERATING PROCEDURES - STANDARD CALLOUTS
FLIGHT PARAMETERS	
APPROACH During approach, the PM announces: <ul style="list-style-type: none">- "SPEED" if the speed decreases below the speed target -5 kt or increases above the speed target +10 kt- "SINK RATE" when the descent rate exceeds 1 000 ft/min- "BANK" when bank angle becomes greater than 7 °- "PITCH" when pitch attitude becomes lower than -2.5 ° or higher than +10 °	

Extract 3 : SOP-90-STANDARD CALLOUTS - FLIGHT PARAMETERS

Consequently, as per **FCOM-PRO-NOR-SOP-18-STABILIZATION CRITERIA** and **FCTM-PR-NP-SOP-190 - CONF - FINAL APPROACH-TRAJECTORY STABILIZATION**, considering the brief exceedances above callout values, final approach can still be considered as stabilized.

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> At 21:55:29 UTC: Touchdown

The aircraft touched down with:

On the longitudinal axis:

- +4° of pitch angle.
- -2ft/s (± 2 ft/s) of recalculated aircraft vertical speed.
- +1.15G of vertical load factor.
- CAS 126kt.
- Ground spoilers started to extend.

On the lateral axis:

- -2° of roll angle (left wing down).
- 147° of heading (QFU 149°).
- +1° of drift angle (nose toward the left of the track).
- +0.05G of lateral load factor.

Analysis:

According to the roll angle recorded at touchdown (-2°), the left main landing gear touched down first followed by the right main landing gear.

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5.2. TOUCH AND GO (DECELERATION THEN ACCELERATION)

> From touchdown (21:55:29 UTC) to ~1275m after runway threshold (21:55:39 UTC): Deceleration phase

- Nose up sidestick input was released by CM2 at touchdown.
 - o Pitch angle decreased toward 0°.
 - o Nose landing gear was recorded compressed ~2s after touchdown.
- Ground spoilers were fully extended.
- Thrust levers were pushed between "IDLE" and "MCL" ~7s after touchdown.
- CONF 2 (Slats/Flaps 22°/15°) was selected ~7s after touchdown.
- No braking:
 - o Manual braking was not applied
 - o Autobrake not armed

Analysis:

After performing usual flare and landing technique, the thrust levers were moved forward and a Slat/Flap configuration for Take-Off was selected (CONF 2) as recommended in following FCTM extract.

 A318/A319/A320/A321 FLIGHT CREW TECHNIQUES MANUAL	PROCEDURES NORMAL PROCEDURES SUPPLEMENTARY PROCEDURES - TOUCH AND GO
TOUCH AND GO	
DURING TOUCH AND GO	
Trainee	Instructor
<ul style="list-style-type: none"> - Perform usual flare and landing technique - Maintain the runway centerline. 	
[...]	
<u>Move forward the thrust levers approximately 5 cm (2 in.) in order to prevent the reduction of engines to ground idle.</u>	
[...]	
	<ul style="list-style-type: none"> - <u>Set flaps configuration for takeoff ⁽²⁾</u> - If necessary, reset the rudder trim - Monitor/adjust the pitch trim movement towards the green band - Place one hand behind the thrust levers to ensure that they are advanced to approximately 5 cm (2 in) - Order "GO" when the aircraft is in the correct configuration (pitch trim, rudder trim and flaps).
⁽²⁾ Flap settings are as follows: <ul style="list-style-type: none"> - Landing configuration: CONF FULL - <u>Takeoff configuration: CONF 2.</u> 	

Extract 4 : PR-NP-SP-40- TOUCH AND GO

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➤ **From ~1275m (21:55:39 UTC) to ~2600m after runway threshold (21:55:56 UTC): Acceleration phase**

- Ground Spoilers were disarmed and Speed Brakes lever was pushed to +2.7°.
 - o Ground spoilers retracted.
- Thrust levers were pushed to "TOGA" ~6 seconds after action on speed brakes lever.
 - o Master Warning triggered ~2 seconds later.
- Around 21:55:53 UTC, Speed Brakes lever was set in the fully-retracted position (+0°).
 - o Master Warning stopped triggering ~3s later.

Note: Extract from AMM 27-60-00-00 CONF 00 - SPOILER - DESCRIPTION AND OPERATION

The speedbrake lever positions and the equivalent angles are given in the following table:

LEVER POSITION	SPEEDBRAKE ANGLE (deg)
ARMED	-3
RET	0
1/2	+28.5
FULL	+57

Analysis:

Speed brakes lever was involuntary pushed to +2.7° most probably following the ground spoiler disarming by the flight crew.

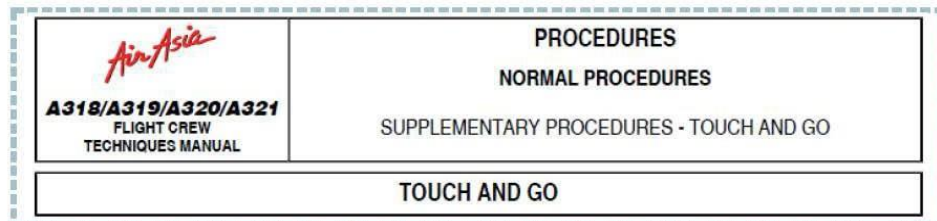
CONFIG SPEED BRAKES NOT RETRACTED alert triggered as consequence.

This alert triggers when:

- the speed brake lever deflection is greater than 2° ("SBC" parameter in DFDR).
- Flight Warning computer (FWC) is in flight phase 3 or 4 (Take off power applied)

Note: DFDR parameter "SBC" (Speed Brake Command) is the same FCDC parameter used by the FWC to trigger the TAKE OFF CONFIG warning "CONFIG SPD BRK NOT RETRACTED". This Boolean parameter is set at "1" when the speed brake lever deflection is greater than 2°.

As recommended in following **FCTM extract**, the ground spoilers should be carefully disarmed, so that the speed brakes lever is not moved. As the lever was not in the fully-retracted position, the **CONFIG SPEED BRAKES NOT RETRACTED** alert appeared and a Master Warning triggered then disappeared when speed brakes lever was set in the fully-retracted position.



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DURING TOUCH AND GO	
	[...]
	<ul style="list-style-type: none"> - <u>Disarm the ground spoilers ⁽¹⁾</u> - Order "STAND UP".
	[...]
<u>Set TOGA thrust.</u>	
Remove the hand from the thrust levers.	<ul style="list-style-type: none"> - Check engine parameters and announce "THRUST SET" - Order "ROTATE" at VAPP - Maintain the hand behind the thrust levers to ensure that the trainee does not perform an inadvertent reduction of thrust or unwanted stop.
<p>⁽¹⁾ <i>At nosewheel touchdown, the instructor pushes on the SPEED BRAKE lever to disarm the ground spoilers. The objective is to initiate the immediate retraction of the ground spoilers, and not to wait for their automatic retraction while the thrust levers are advanced.</i></p> <p><i>Carefully disarm the ground spoilers, so that the SPEED BRAKE lever is not moved. If the SPEED BRAKE lever is not in the fully-retracted position, the CONFIG SPEED BRAKES NOT RETRACTED alert will appear and the SPEED BRAKE lever will possibly command speed brakes extension. As per aircraft design, ground spoilers automatically retract when thrust levers are set above CLB detent.</i></p>	
Extract 5 : PR-NP-SP-40- TOUCH AND GO	

According to FDR data, the master warning corresponding to the **CONFIG SPEED BRAKES NOT RETRACTED** ECAM alert was recorded OFF around 3 seconds after the recording of the speed brakes lever retraction.

These 3 seconds observed on the FDR data can be explained:

- For 1second by the recording rates of both parameters in the FDR (i.e. 2pps for the speed brake lever parameter "SBC" and 1pps for the Master Warning "CPTMW1"),
- For 2seconds by the acquisition and processing time of the FWC.

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5.3. ABORTED TOUCH AND GO AND RUNWAY OVERRUN

> From ~2600m after runway threshold (21:55:56 UTC) to aircraft stop (21:56:23 UTC): Deceleration phase and runway overrun

- Around 21:55:56 UTC (ground speed 185kt), thrust levers were pulled to "MAX REV".
 - o Ground spoilers extended.
- Around 21:55:59 UTC (ground speed 171kt) manual braking was progressively applied to reach maximum braking ~13 seconds later (while ground speed was 95kt).
- Around 21:56:03 UTC, thrust levers were pushed to "REV IDLE" then a differential reverse thrust was applied (thrust lever 2 was pulled to "MAX REV" again while thrust lever 1 was pulled to an intermediate reverse position (between "MAX REV" and "IDLE REV").
- From 21:56:15 UTC to aircraft stop, runway overrun happened (at a ground speed of 55kt):
 - o Pitch sharply decreased to -6° before stabilizing around -3°
 - o Longitudinal load factor² increased up to +0.8G before decreasing to 0G.
 - o Vertical load factor varied between +0.4G and +1.7G.

Analysis:

Around 21:55:56 UTC (remaining runway ~1180m), at CAS of 174kt, the Touch and Go procedure was aborted: thrust levers were pulled to "MAX REV" leading to ground spoilers' extension.

Note: When ground spoilers are not armed and in retracted position, the full ground spoiler extension occurs when:

- *Ground condition detected:*
 - o *Both main landing gears seen on ground during 30s after touch down)*
 - Or*
 - o *Wheels speed above 72 knots*

AND

- *Reverse is selected on at least one engine (the other thrust lever must be below the Maximum Continuous - MCT – notch)*


Then ~3 seconds later (remaining runway ~860m), a manual braking order was progressively applied to reach maximum braking ~13 seconds after the start of braking application.

Around 21:56:03 UTC (remaining runway ~530m), at CAS of 123kt, thrust levers were pushed to "REV IDLE" for 8 seconds then a differential reverse thrust was applied.

As recommended in following **FCTM extract**, to perform a RTO the crew should:

- Apply "MAX REV" thrust until complete stop (reduce reverse thrust only if there is enough runway available)
- Apply maximum pressure on both pedals until complete stop (the aircraft will stop in the minimum distance, only if the brake pedals are maintained fully pressed)

² A positive longitudinal load factor means « deceleration »

 A318/A319/A320/A321 FLIGHT CREW TECHNIQUES MANUAL	PROCEDURES ABNORMAL AND EMERGENCY PROCEDURES MISC														
REJECTED TAKEOFF															
RTO TECHNIQUE															
Should a RTO procedure is initiated, the following task sharing will be applied.															
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">CAPT</th> <th style="text-align: center;">F/O</th> </tr> </thead> <tbody> <tr> <td>"STOP".....ANNOUNCE</td> <td></td> </tr> <tr> <td>Simultaneously:</td> <td></td> </tr> <tr> <td>THRUST LEVERS.....IDLE</td> <td></td> </tr> <tr> <td>REVERSE THRUST.....<u>MAX AVAIL</u></td> <td>REVERSERS.....CHECK/ANNOUNCE (1)</td> </tr> <tr> <td></td> <td>DECELERATION...CHECK/ANNOUNCE (2)</td> </tr> <tr> <td></td> <td>ANY AUDIO.....CANCEL</td> </tr> </tbody> </table>	CAPT	F/O	"STOP".....ANNOUNCE		Simultaneously:		THRUST LEVERS.....IDLE		REVERSE THRUST..... <u>MAX AVAIL</u>	REVERSERS.....CHECK/ANNOUNCE (1)		DECELERATION...CHECK/ANNOUNCE (2)		ANY AUDIO.....CANCEL	
CAPT	F/O														
"STOP".....ANNOUNCE															
Simultaneously:															
THRUST LEVERS.....IDLE															
REVERSE THRUST..... <u>MAX AVAIL</u>	REVERSERS.....CHECK/ANNOUNCE (1)														
	DECELERATION...CHECK/ANNOUNCE (2)														
	ANY AUDIO.....CANCEL														
[...]															
(1) : <u>Full reverse may be used until coming to a complete stop.</u> But, if there is enough runway available at the end of the deceleration, it is preferable to reduce reverse thrust when passing 70 kt															
[...]															
- If the autobrake is inoperative or if the takeoff is rejected prior to 72 kt (autobrake not active and no deployment of spoilers), the captain simultaneously reduces thrust and applies maximum pressure on both pedals. The aircraft will stop in the minimum distance, only if the brake pedals are maintained fully pressed until the aircraft comes to a stop.															
[...]															
Extract 6 : PR-AEP-MISC- REJECTED TAKEOFF															

As explain in the safety report:

Weather condition was VMC with visibility reported of 8km, surface wind of 320/4kt, Temperature 24°C and dry runway.

The theoretical stopping distance was calculated by Airbus design office using the following hypothesis (conditions of the event):

- Aircraft configuration → A320-216 / Weight 51.5T / CG 28% / CONF 2
- Runway configuration → WMSA RWY15 / Elevation 70ft / Slope 0.16%
- Weather conditions → Tailwind ~15kt / OAT 24°C / DRY Runway
- RTO at 174kt CAS with **MAX REV, maximum manual braking** from start of braking to stop and full ground spoilers extension

The theoretical stopping distance at RTO initiation would have been 940m.

Around 21:56:15 UTC, at a ground speed of 55kt, pitch sharply decreased to -6° before stabilizing around -3° and longitudinal load factor increased up to +0.8G: the runway

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overrun happened at this moment. The increase of deceleration was most probably induced by changes of the ground surface.

During the runway overrun, several obstacles were hit leading to multiples load factors peaks: vertical load factor varied between +0.4G and +1.7G.

At 21:56:23 UTC, around 3910m after runway threshold (~130m after the end of runway), the aircraft stopped.

End of description.

6. SYNTHESIS

On November 29th 2017, the A320-216 MSN 3536 (9M-AHM) operated by AIR ASIA experienced a runway overrun during an aborted touch and go after a visual approach to runway 15 at Subang Sultan Abdul Aziz Shah airport (WMSA).

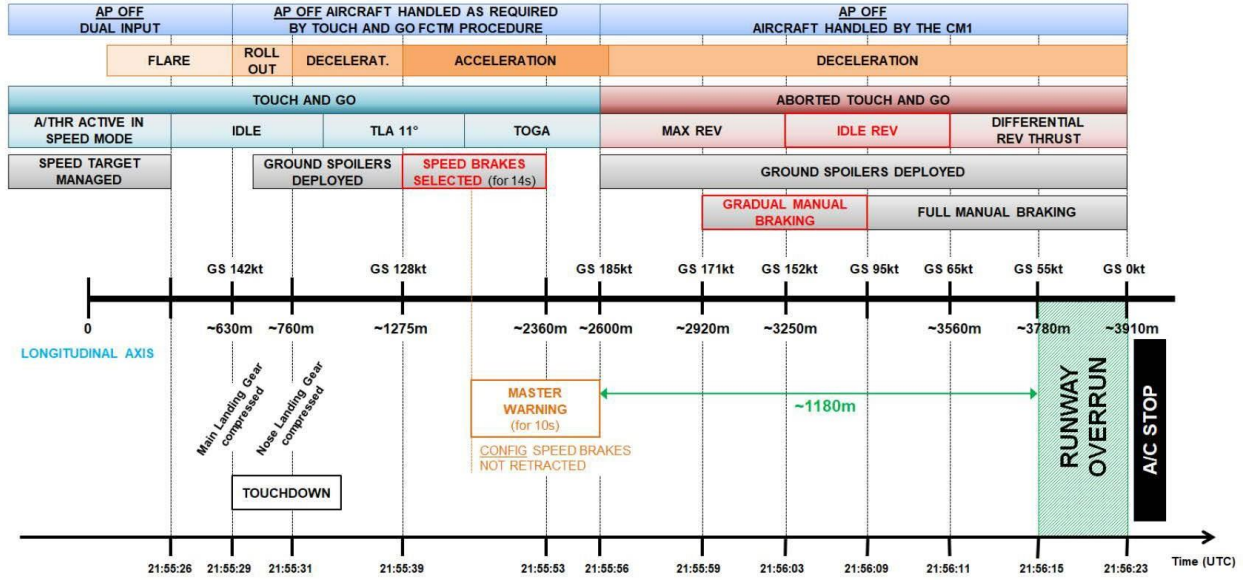
Weather Condition

During final approach, the aircraft experienced a significant tailwind (15kt) during final approach and landing.

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Key points

The FDR analysis indicates the following key points:



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7. CONCLUSION

The Airbus Handling Quality analysis highlights the following contributing factors of the event:

Aborted Touch and Go:

- During the Touch & Go manoeuvre, when disarming the ground spoilers, speedbrake lever was involuntarily set to +2.7°. When the thrust levers were pushed to TOGA, this resulted (as per design) in the triggering of the "CONFIG SPEED BRAKES NOT RETRACTED" ECAM Warning.

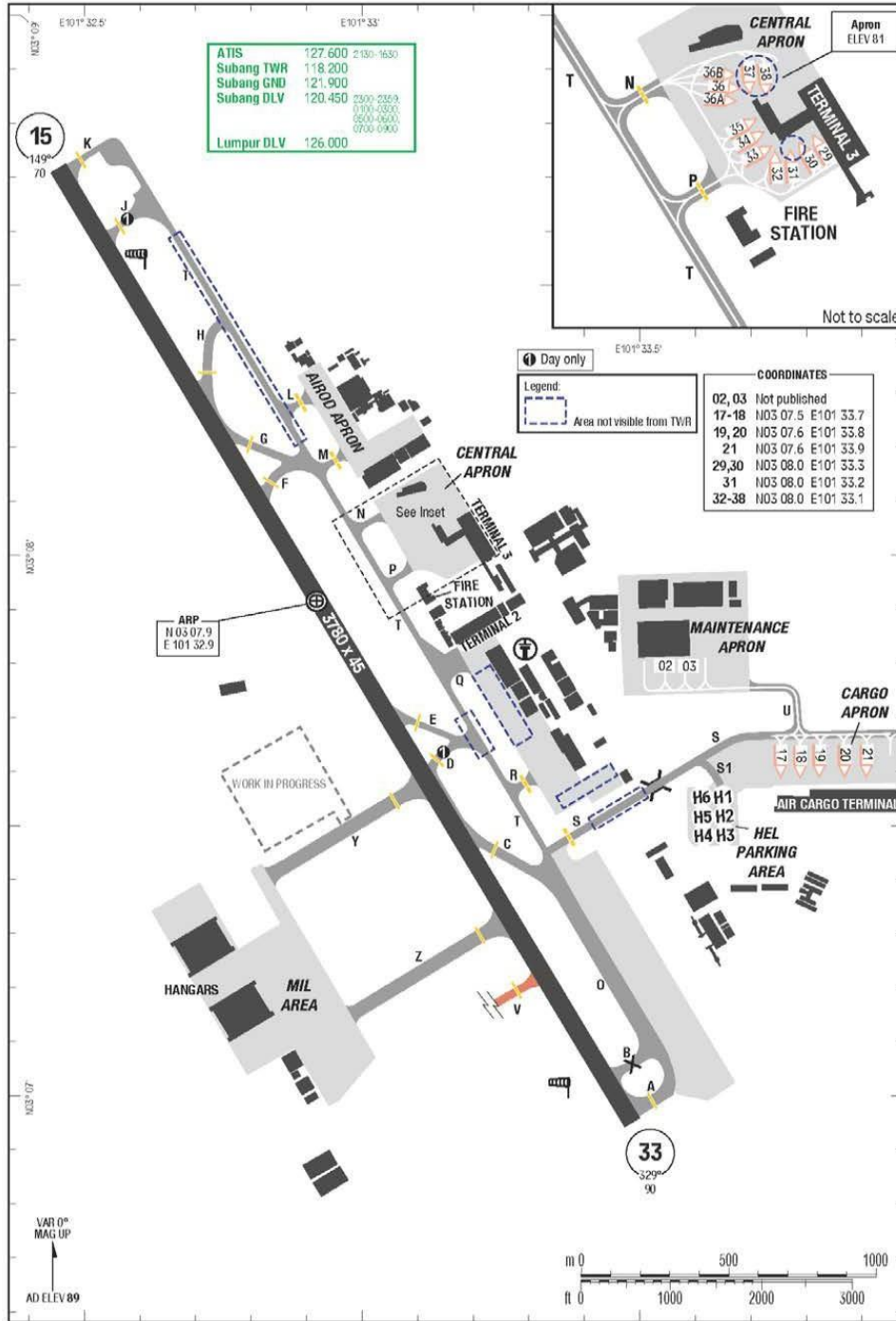
Note: The master warning "CONFIG SPEED BRAKES NOT RETRACTED" is recorded OFF around 3 seconds after the speed brakes lever was set back to 0° (fully retracted position). This is explained by the recording rates of both parameters in the FDR and by the internal acquisition and processing time of the alert in the FWC.

Runway overrun:

- "MAX REV" thrust was not applied until complete stop: thrust levers were pushed to "REV IDLE" for 8 seconds at a ground speed of 152kt then a differential reverse thrust was applied until complete stop.
- Maximum pressure on both pedals was not quickly applied: delay of ~3 seconds between "MAX REV" thrust application and manual braking orders, then ~13 seconds to reach maximum manual braking application.
- The tailwind component increased the stopping distance.

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8. AIRPORT INFORMATION



13-JUL-2017
 SZB-WMSA
 Malaysia Kuala Lumpur Subang/Sultan Abdul Aziz Shah
 3-20
 AGC
 AGC
 AGC
 AGC
 Subang/Sultan Abdul Aziz Shah Kuala Lumpur Malaysia

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9. APPROACH CHART

Malaysia Kuala Lumpur Subang/Sultan Abdul Aziz Shah

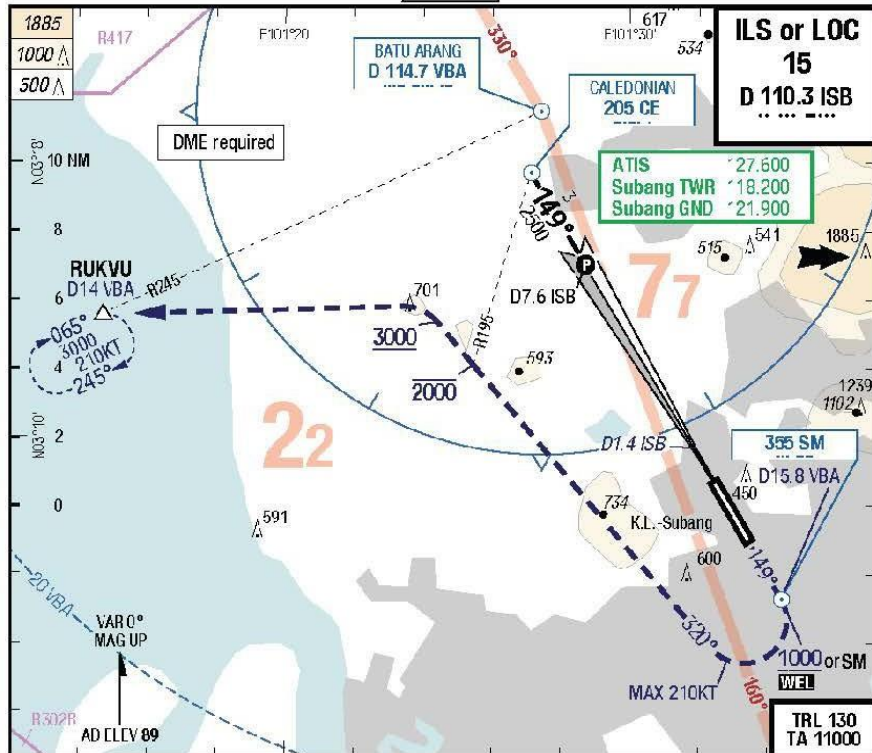
IAC

13-JUL-2017

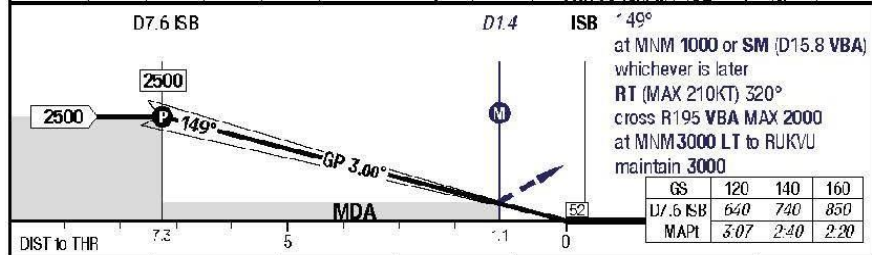
SZB-WMSA

7-10

ILS or LOC 15



LOC 3.00° D ISB	7.6	6	5	4	3	2	
	2500	1940	1620	1300	990	670	



C	ft - m/km ft	Cat 1 DME	LOC DME	Circling
		220 - 550 290	430 - 1.3 500	
D	ft - m/km ft	230 - 550 300	430 - 1.3 500	1610 - 3.6V 1700

1) FD, AP or HGS required, else RVR 750m

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10. ADDITIONAL INFORMATION

10.1. POST FLIGHT REPORT (PFR)

A/C ID	DATE	GMT	FLTN	CITY PAIR
.9M-AHM	30NOV	0604	AXM9700	WMKK WMSA

MAINTENANCE
POST FLIGHT REPORT

DB/N

A/C ID	DATE	GMT	FLTN	CITY PAIR
.9M-AHM	29NOV	2108/2156	AXM9700	WMKK WMSA

WARNING/MAINT. STATUS MESSAGES

NO WARNING MESSAGE

FAILURE MESSAGES

GMT	PH	ATA	SOURCE	IDENT.
2108	02	23-28-34	NO SDU DATA	CFDS

Analysis:

The PFR did not record any system failure that might have been involved in the runway overrun.

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10.2. AVAILABLE PICTURE



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11. UPGRADE AND ENHANCEMENT: MAINTENANCE RECOMMENDATIONS

Maintenance recommendations were separately sent to AIR ASIA by Airbus Customer Support Department. All the exchanged messages are available in TechRequest (dossier 80389852).

12. OPERATIONAL CONSIDERATIONS: FCOM, FCTM, QRH

The following is a synthesis of the general guidelines and procedures that are provided by Airbus in the Operational Documentation available on Airbus-World and valid at the date of this Handling Qualities Analysis report publication:

USE OF SIDESTICK (FCTM AOP-10-30-20 USE OF SIDESTICK)

Only one pilot flies at a time.

If the PM wants to act on the sidestick, he/she must:

- Clearly announce "I have control"
- Press and maintain his/her sidestick pushbutton, in order to get full control of the Fly-By-Wire system.

The flight crew should keep in mind that sidestick inputs are algebraically added. Therefore dual inputs must be avoided, and will trigger aural and visual alerts.

Either pilot can make an input on their sidestick at any time.

Either pilot can deactivate the other pilot's sidestick by pressing on their sidestick pb.

DURING FINAL APPROACH (FCTM PR-NP-SP-40 TOUCH AND GO)

Before each touch and go, the instructor confirms with the trainee that both of the following apply:

- Reverse thrust will not be selected
- Brakes (auto or manual) will not be used.

DURING TOUCH AND GO (FCTM PR-NP-SP-40 TOUCH AND GO)

Trainee	Instructor
<ul style="list-style-type: none"> • Perform usual flare and landing technique • Maintain the runway centerline. 	
	<ul style="list-style-type: none"> • Disarm the ground spoilers ⁽¹⁾ • Order "STAND UP".
Move forward the thrust levers approximately 5 cm (2 in), in order to prevent the reduction of engines to ground idle.	
	<ul style="list-style-type: none"> • Set flaps configuration for takeoff ⁽²⁾ • If necessary, reset the rudder trim • Monitor/adjust the pitch trim movement towards the green band • Place one hand behind the thrust levers to ensure that they are advanced to approximately 5 cm (2 in)

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	<ul style="list-style-type: none"> Order "GO" when the aircraft is in the correct configuration (pitch trim, rudder trim and flaps).
Set TOGA thrust.	
Remove the hand from the thrust levers.	<ul style="list-style-type: none"> Check engine parameters and announce "THRUST SET" Order "ROTATE" at VAPP Maintain the hand behind the thrust levers to ensure that the trainee does not perform an inadvertent reduction of thrust or unwanted stop.
Rotate the aircraft and target takeoff pitch attitude, then follow SRS.	

⁽¹⁾ At nosewheel touchdown, the instructor pushes on the SPEED BRAKE lever to disarm the ground spoilers. The objective is to initiate the immediate retraction of the ground spoilers, and not to wait for their automatic retraction while the thrust levers are advanced. Carefully disarm the ground spoilers, so that the SPEED BRAKE lever is not moved. If the SPEED BRAKE lever is not in the fully-retracted position, the CONFIG SPEED BRAKES NOT RETRACTED alert will appear and the SPEED BRAKE lever will possibly command speed brakes extension. As per aircraft design, ground spoilers automatically retract when thrust levers are set above CLB detent.

⁽²⁾ Flap settings are as follows:

- Landing configuration: CONF FULL
- Takeoff configuration: CONF 2.

RTO TECHNIQUE (FCTM PR-AEP-MISC REJECTED TAKEOFF)

Should a RTO procedure is initiated, the following task sharing will be applied.

CAPT	F/O
"STOP".....ANNOUNCE	
Simultaneously:	
THRUST LEVERS.....IDLE	
REVERSE THRUST.....MAX AVAIL.	REVERSERS.....CHECK/ANNOUNCE (1)
	DECELERATION...CHECK/ANNOUNCE (2)
	ANY AUDIO.....CANCEL
Aircraft stopped	
Consider positioning the aircraft to keep any possible fire away from the fuselage.	
REVERSERS.....STOWED	ATC.....NOTIFY
PARKING BRAKE.....ON	EMER EVAC Procedure (QRH).....LOCATE
CABIN CREW.....ALERT	
ECAM ACTIONS.....ORDER	ECAM ACTIONS.....PERFORM
The aircraft should remain stationary while the crew evaluates the situation.	

⁽¹⁾ : Full reverse may be used until coming to a complete stop. But, if there is enough runway available at the end of the deceleration, it is preferable to reduce reverse thrust when passing 70 kt

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(2) :

- *Announcing the deceleration means that the deceleration is felt by the crew, and confirmed by the VC trend on the PFD. The deceleration may also be confirmed by the DECEL light (if the autobrake is on). However, this light only comes on when the actual deceleration is 80 % of the selected rate, it is not an indicator of the proper autobrake operation. For instance, the DECEL light might not appear on a contaminated runway, with the autobrake working properly, due to the effect of the antiskid.*
- *If a rejected takeoff is initiated and MAX auto brake decelerates the aircraft, the captain will avoid pressing the pedals (which might be a reflex action).*
- *If the autobrake is inoperative or if the takeoff is rejected prior to 72 kt (autobrake not active and no deployment of spoilers), the captain simultaneously reduces thrust and applies maximum pressure on both pedals. The aircraft will stop in the minimum distance, only if the brake pedals are maintained fully pressed until the aircraft comes to a stop.*
- *If the brake response does not seem appropriate for the runway condition, FULL manual braking should be applied and maintained. If IN DOUBT, TAKE OVER MANUALLY.*
- *If normal braking is inoperative, immediately apply the Loss of Braking procedure (Refer to FCOM/PRO-ABN-BRAKES [MEM] LOSS OF BRAKING)*

After a rejected takeoff, if the aircraft comes to a complete stop using autobrake MAX, release brakes prior to taxi by disarming spoilers.

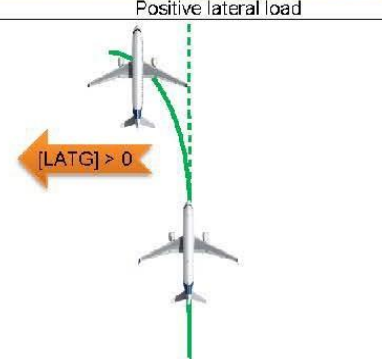
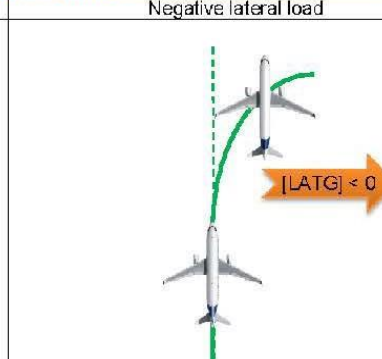


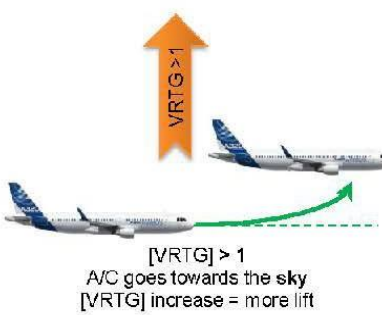

Do not attempt to vacate the runway, until it is absolutely clear that an evacuation is not necessary and that it is safe to do so.

Please refer to the following Airbus Operational Documentation available on AirbusWorld and valid at the date of this Handling Qualities Analysis report publication:

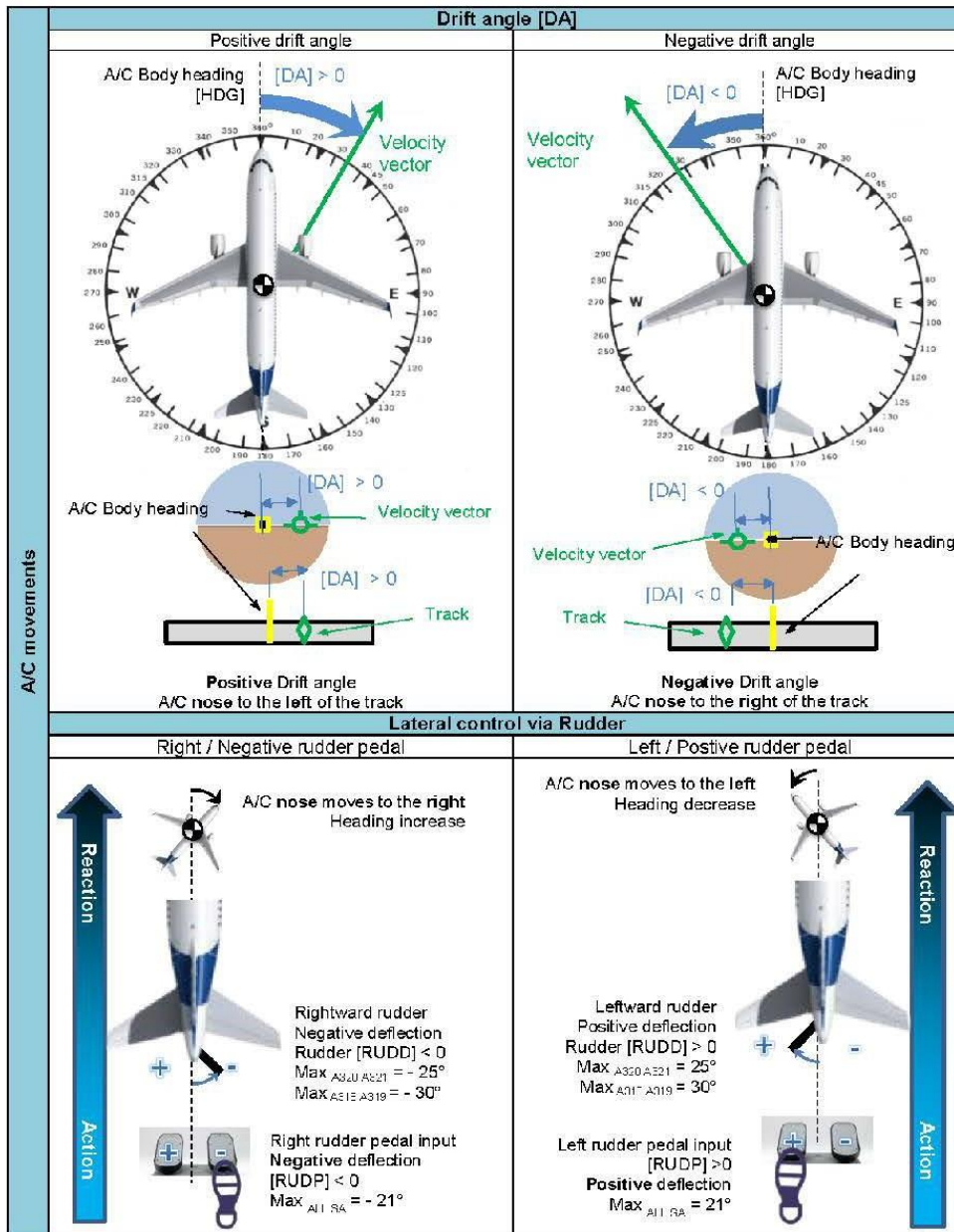
- **Flight Crew Operating Manual (FCOM)**
 - PRO-NOR-SOP-18-STABILIZATION CRITERIA
- **Flight Crew Training Manual (FCTM)**
 - AOP-10-30-20 USE OF SIDESTICK
 - PR-NP-SP-40 TOUCH AND GO
 - PR-AEP-MISC REJECTED TAKEOFF

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13. ANNEX 1: SIGN AND CONVENTION

Load factor	Lateral load factor [LATG]	
	Positive lateral load	Negative lateral load
	 <p>Positive [LATG] A/C goes to the left of the track (pilots bodies are attracted to the right of the airframe)</p>	 <p>Negative [LATG] A/C goes to the right of the track (pilots bodies are attracted to the left of the airframe)</p>
	Longitudinal load factor [LONG]	
	Positive longitudinal load	Negative longitudinal load
	 <p>Positive [LONG] A/C decelerates Ground speed decrease</p>	 <p>Negative [LONG] A/C accelerates Ground speed increase</p>
Vertical Load factor [VRTG]		
Positive vertical load	Negative vertical load	
 <p>[VRTG] > 1 A/C goes towards the sky [VRTG] increase = more lift</p>	 <p>[VRTG] < 1 A/C goes towards the ground [VRTG] decrease = loss of lift</p>	

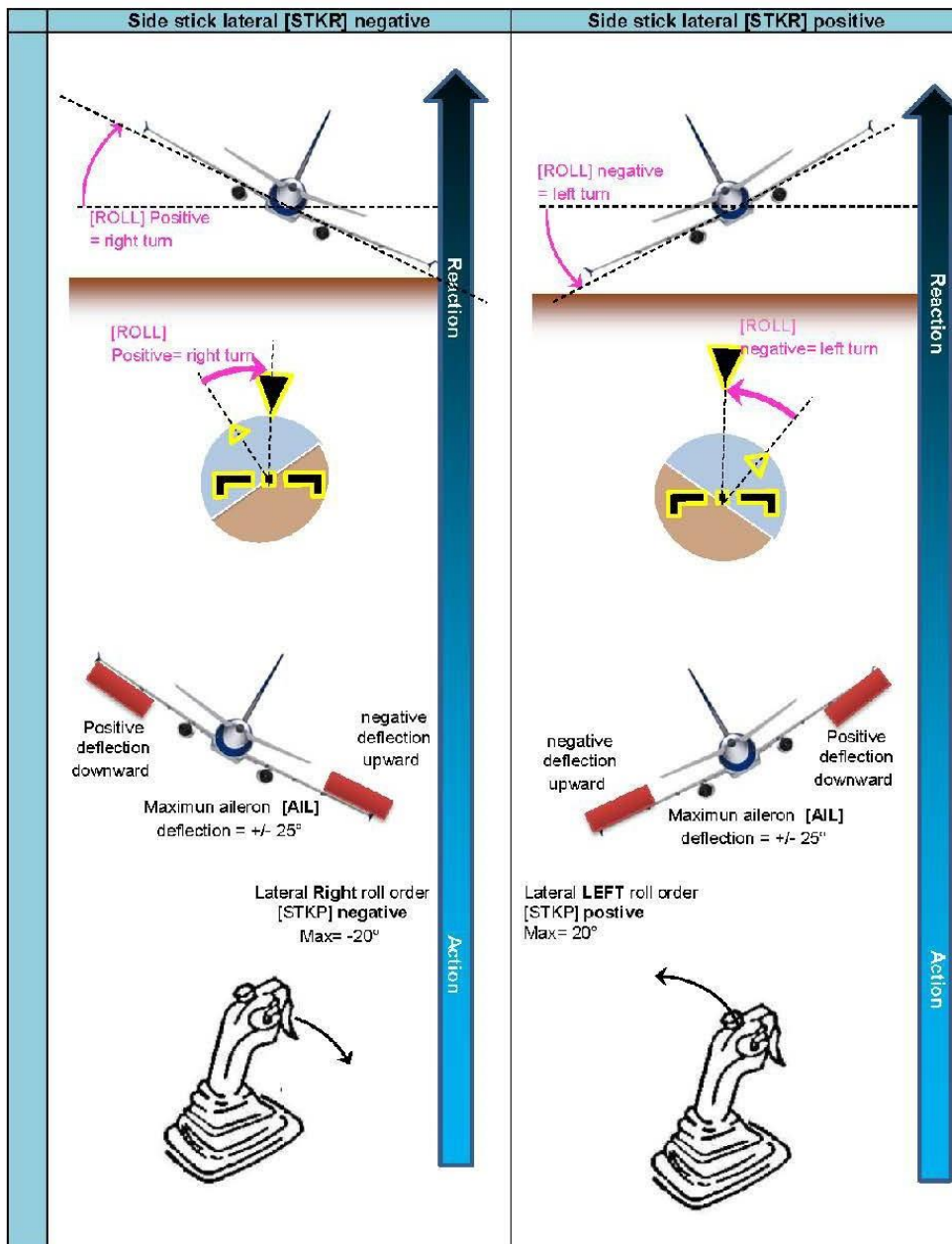
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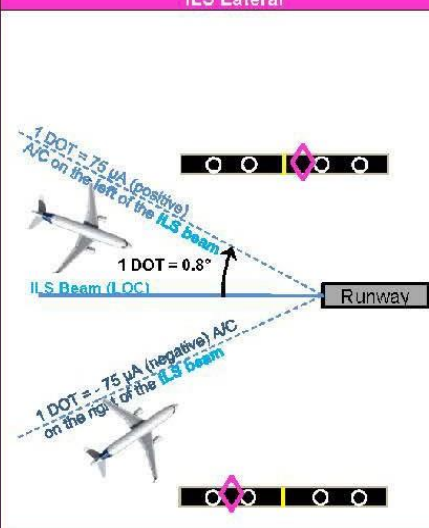
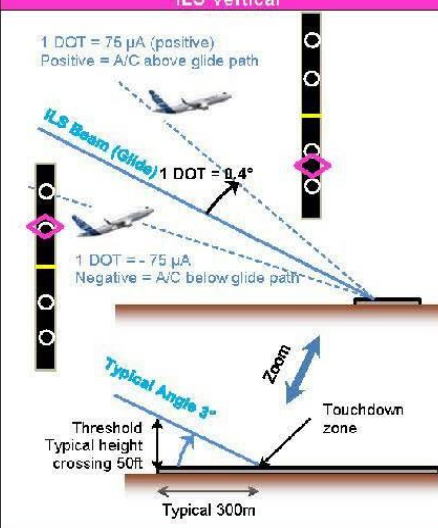
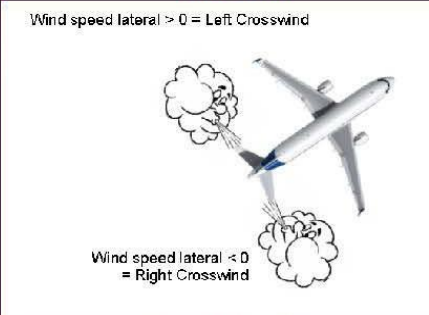
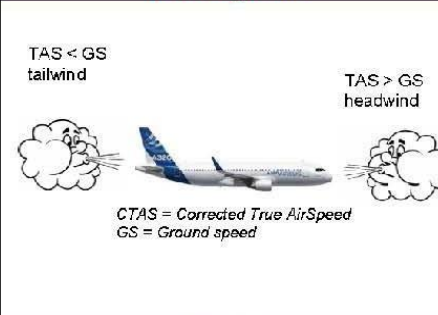
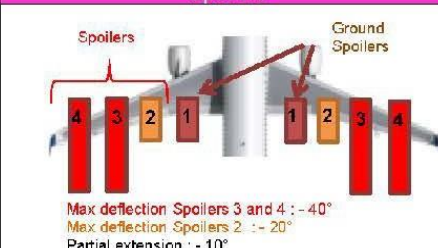
A/C movements	Pitch angle A/C climbing	Pitch angle A/C in approach
	Side stick longitudinal [STKP] negative	Side stick longitudinal [STKP] positive
	 Negative Side stick [STKP] < 0 Max -16° Elevators upwards Negative elevators [ELV] Elevator < 0 Max -30° Nose up Pitch increase <div style="display: flex; justify-content: space-between; align-items: center;"> Action → Reaction </div>	 Positive side stick [STKP] > 0 Max -16° Elevators downwards [ELV] Elevator > 0 Max 15° Nose down Pitch decrease <div style="display: flex; justify-content: space-between; align-items: center;"> Action → Reaction </div>

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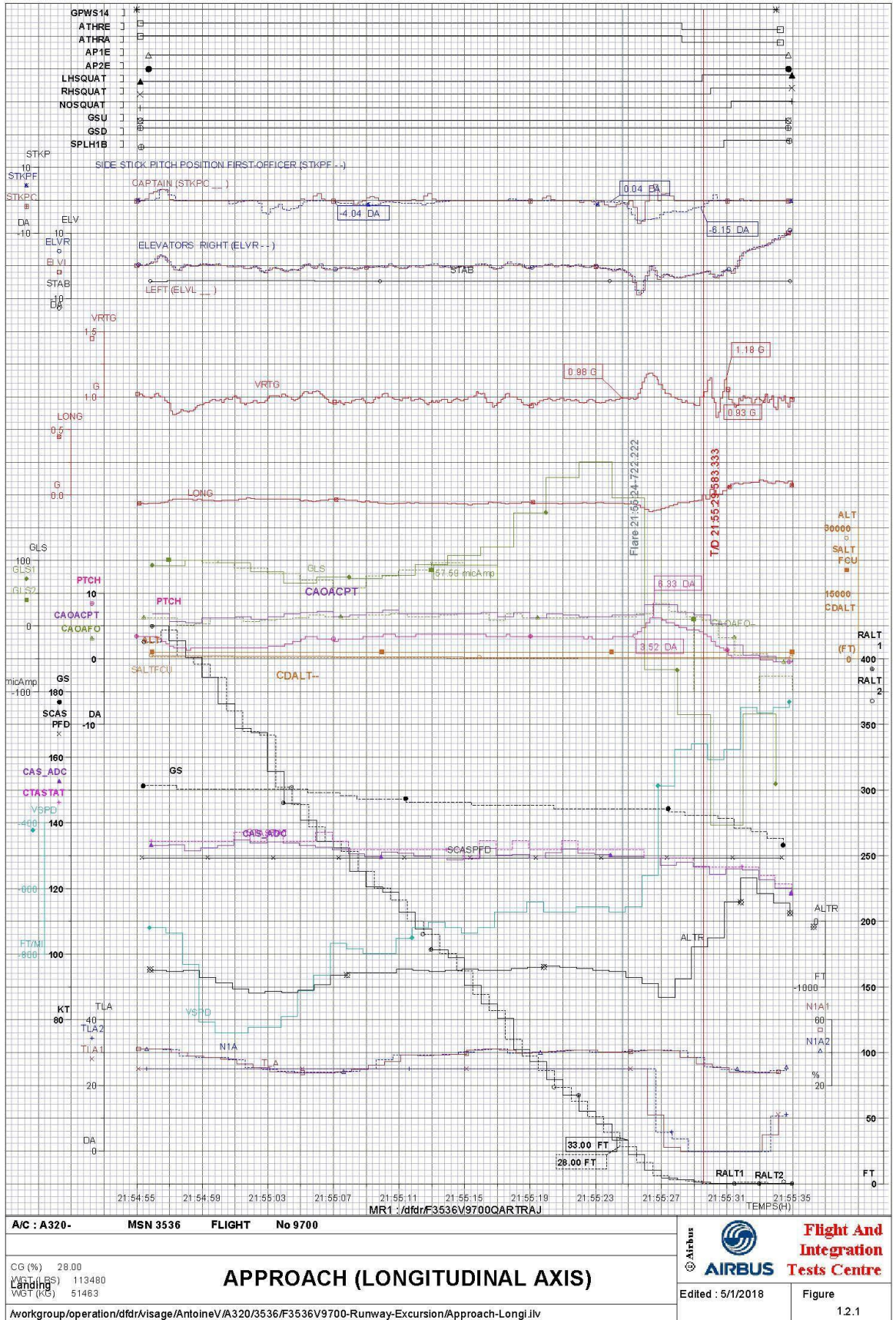
Approaches

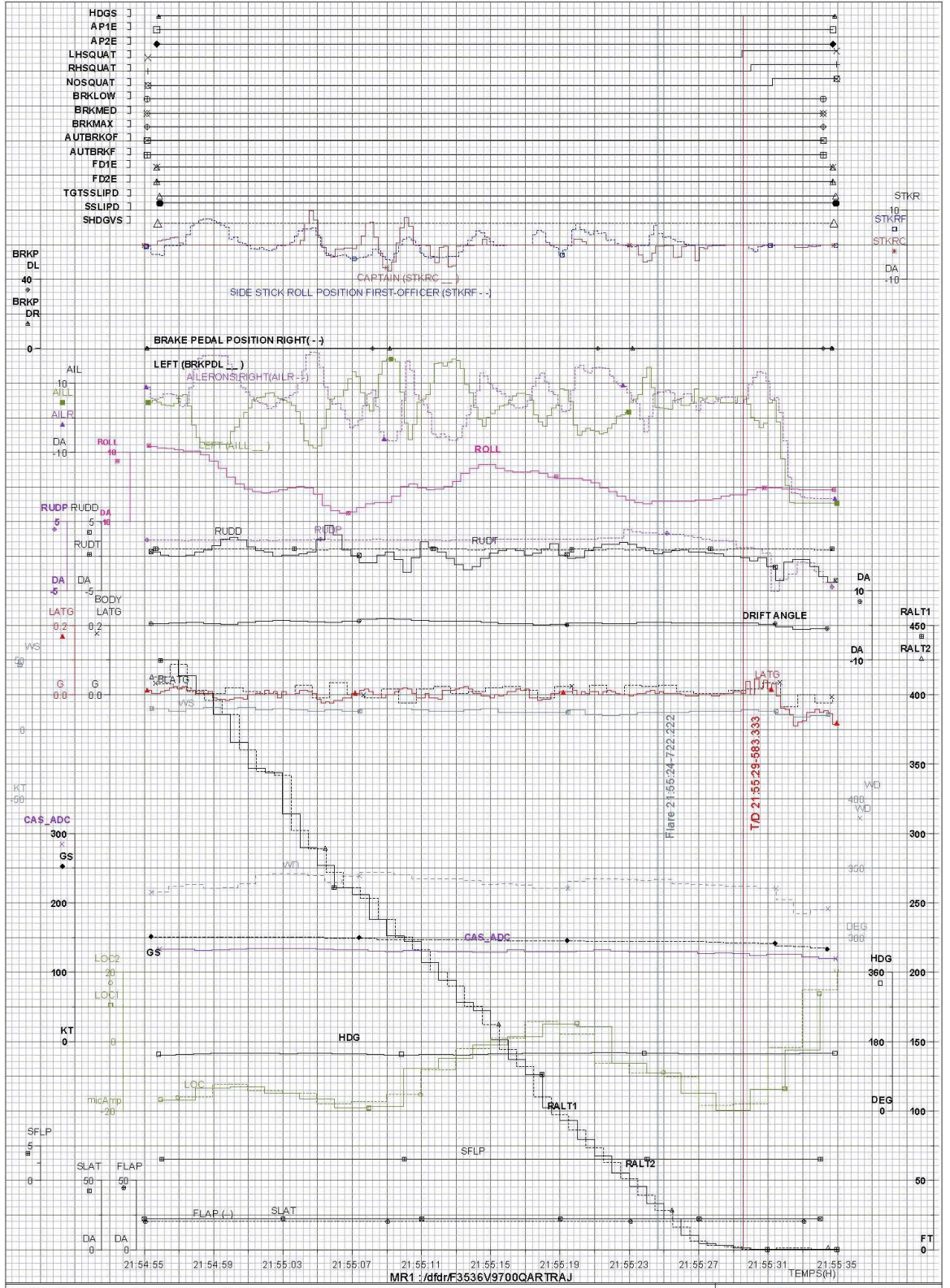
<p style="text-align: center; background-color: #FF00FF; color: white; margin: 0;">ILS Lateral</p> 	<p style="text-align: center; background-color: #FF00FF; color: white; margin: 0;">ILS Vertical</p> 																						
<p style="text-align: center; background-color: #FF00FF; color: white; margin: 0;">Wind lateral</p> 	<p style="text-align: center; background-color: #FF00FF; color: white; margin: 0;">Wind longitudinal</p> 																						
<p style="text-align: center; background-color: #FF00FF; color: white; margin: 0;">Slats Flaps [SA]</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Levers</th> <th>Conf</th> <th>Flaps [°]</th> <th>Slats [°]</th> </tr> </thead> <tbody> <tr> <td rowspan="2">1</td> <td>1</td> <td>0</td> <td rowspan="2">18</td> </tr> <tr> <td>1+S</td> <td>10</td> </tr> <tr> <td>2</td> <td>2</td> <td>15</td> <td rowspan="2">22</td> </tr> <tr> <td>3</td> <td>3</td> <td>20</td> </tr> <tr> <td rowspan="2">4</td> <td rowspan="2">Full</td> <td>35 CFM</td> <td rowspan="2">27</td> </tr> <tr> <td>40 AL</td> </tr> </tbody> </table>	Levers	Conf	Flaps [°]	Slats [°]	1	1	0	18	1+S	10	2	2	15	22	3	3	20	4	Full	35 CFM	27	40 AL	<p style="text-align: center; background-color: #FF00FF; color: white; margin: 0;">Spoilers</p>  <p style="font-size: small;"> Max deflection Spoilers 3 and 4 : -40° Max deflection Spoilers 2 : -20° Partial extension : -10° </p>
Levers	Conf	Flaps [°]	Slats [°]																				
1	1	0	18																				
	1+S	10																					
2	2	15	22																				
3	3	20																					
4	Full	35 CFM	27																				
		40 AL																					

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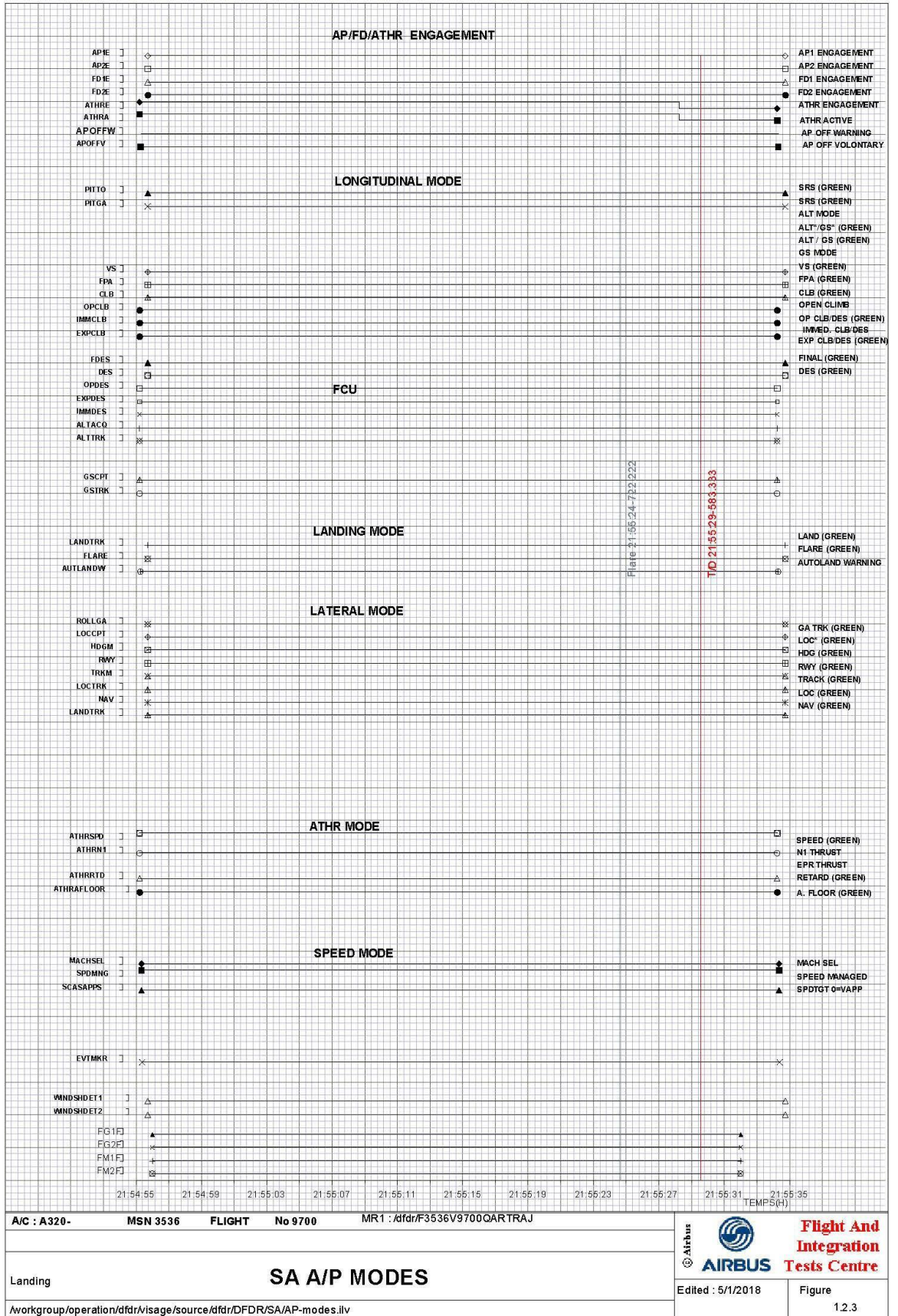
14. ANNEX 2: PLOTS OF FLIGHT RAW DATA

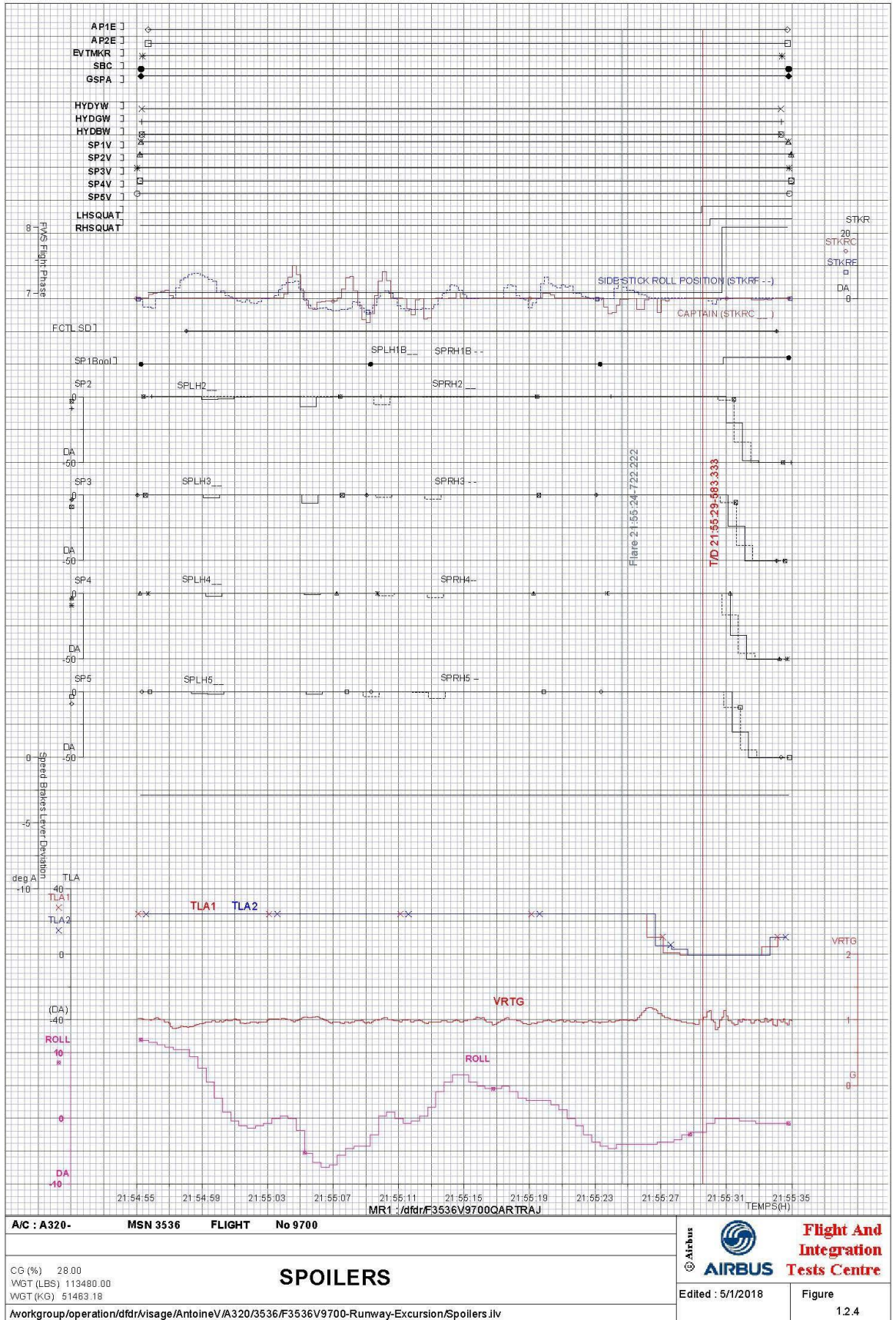
PART I: FLIGHT DATA FROM 21:54:55 UTC TO 21:55:35 UTC Zoom on approach and landing

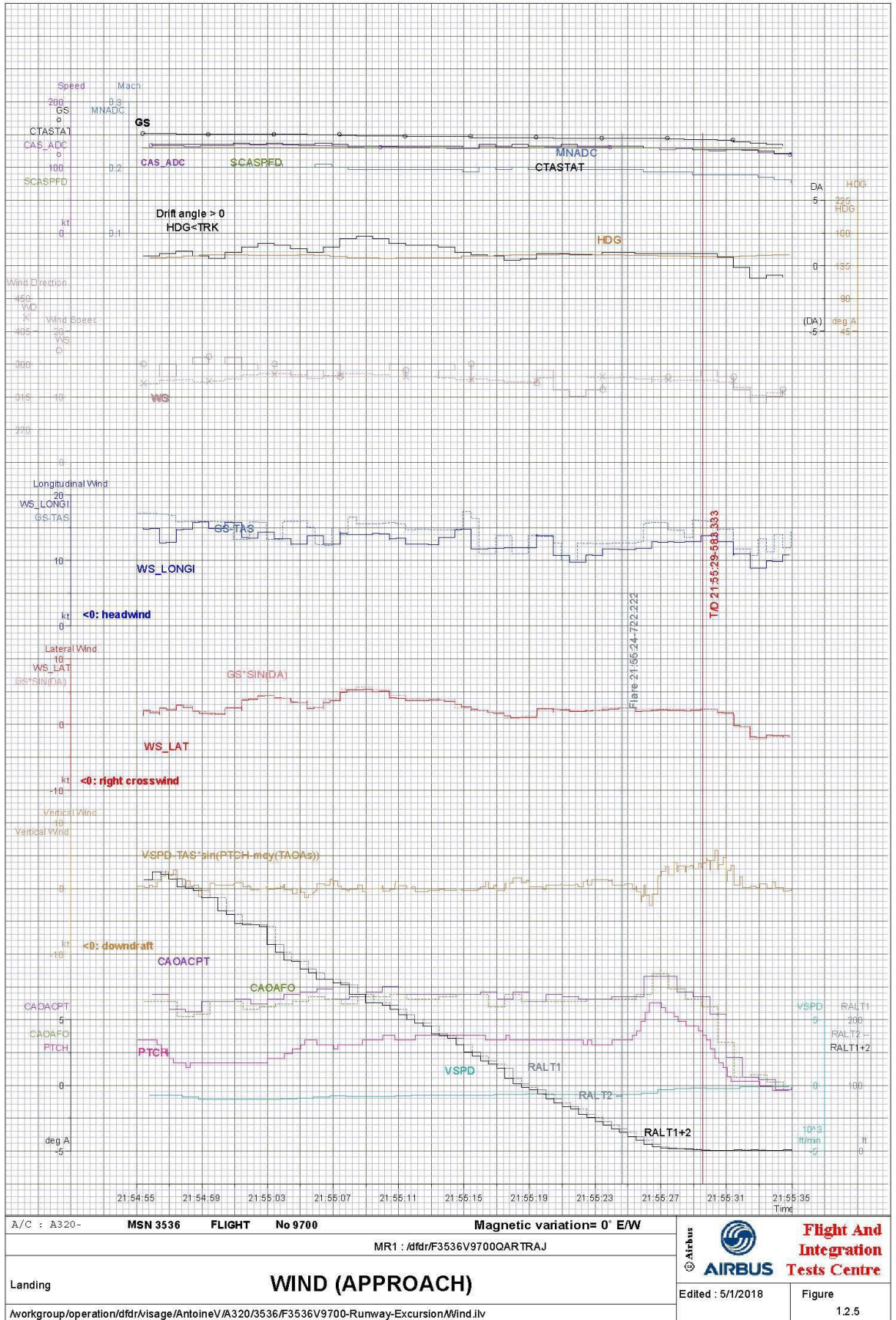


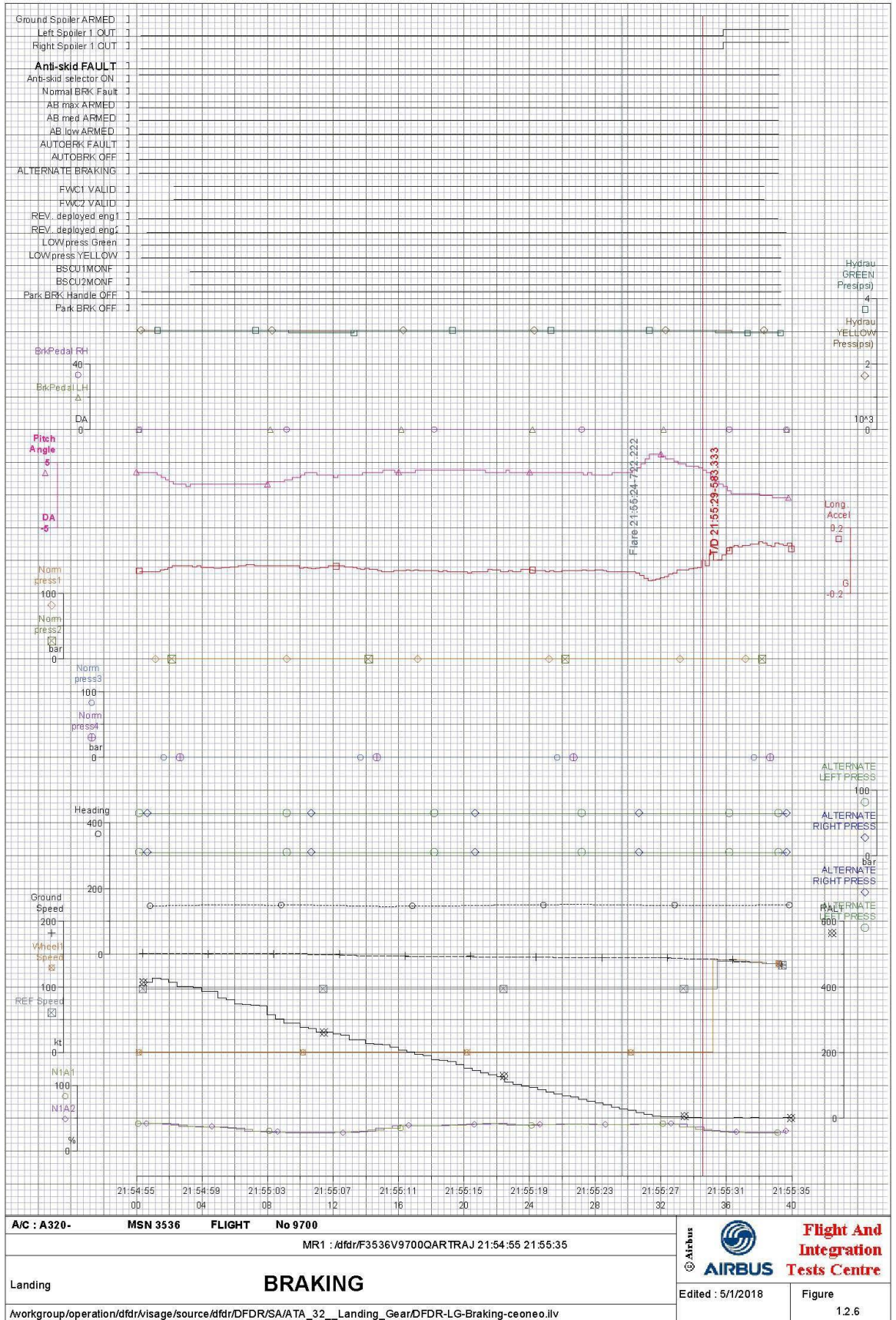


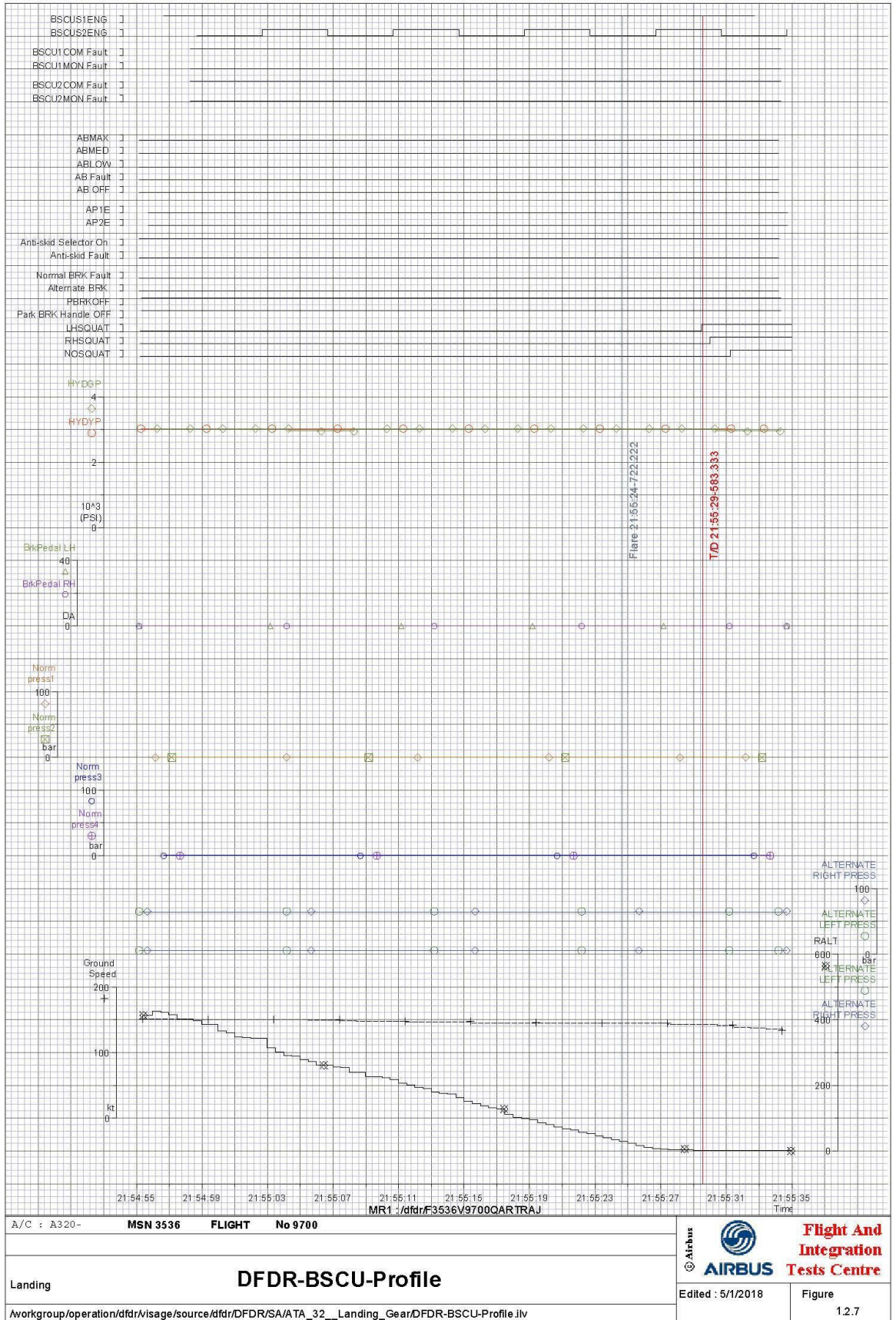
A/C : A320-	MSN 3536	FLIGHT No 9700	MR1 : /dfdr/F3536V9700QARTRAJ
CG (%) 28.00	WGT (LBS) 113480	APPROACH (LATERAL AXIS)	
Landing WGT (KGS) 51463			
workgroup/operation/dfdr/visage/source/dfdr/DFDR/SA/approach-lat-ceoneo.jlv			 Flight And Integration Tests Centre Edited : 5/1/2018 Figure 1.2.2

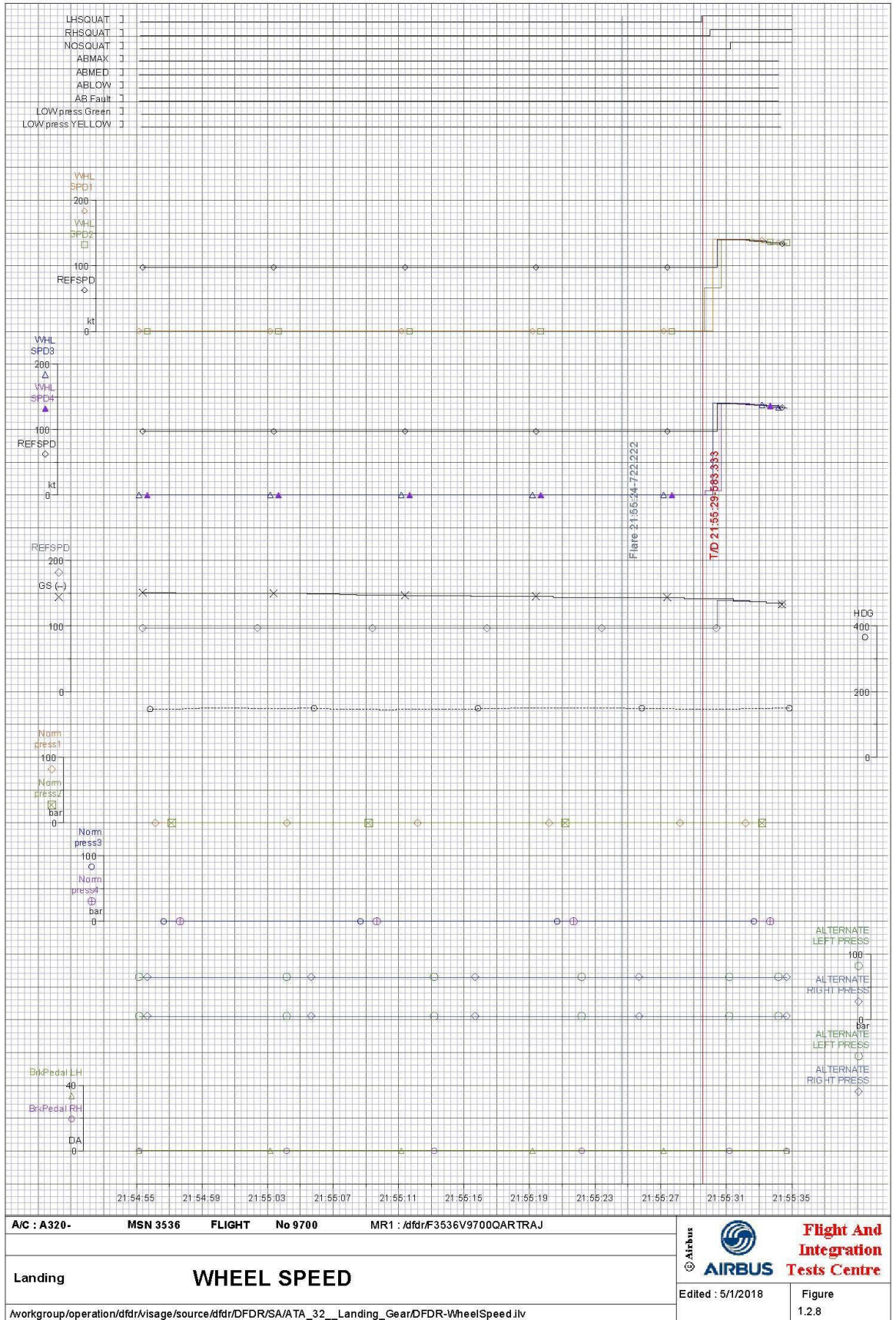


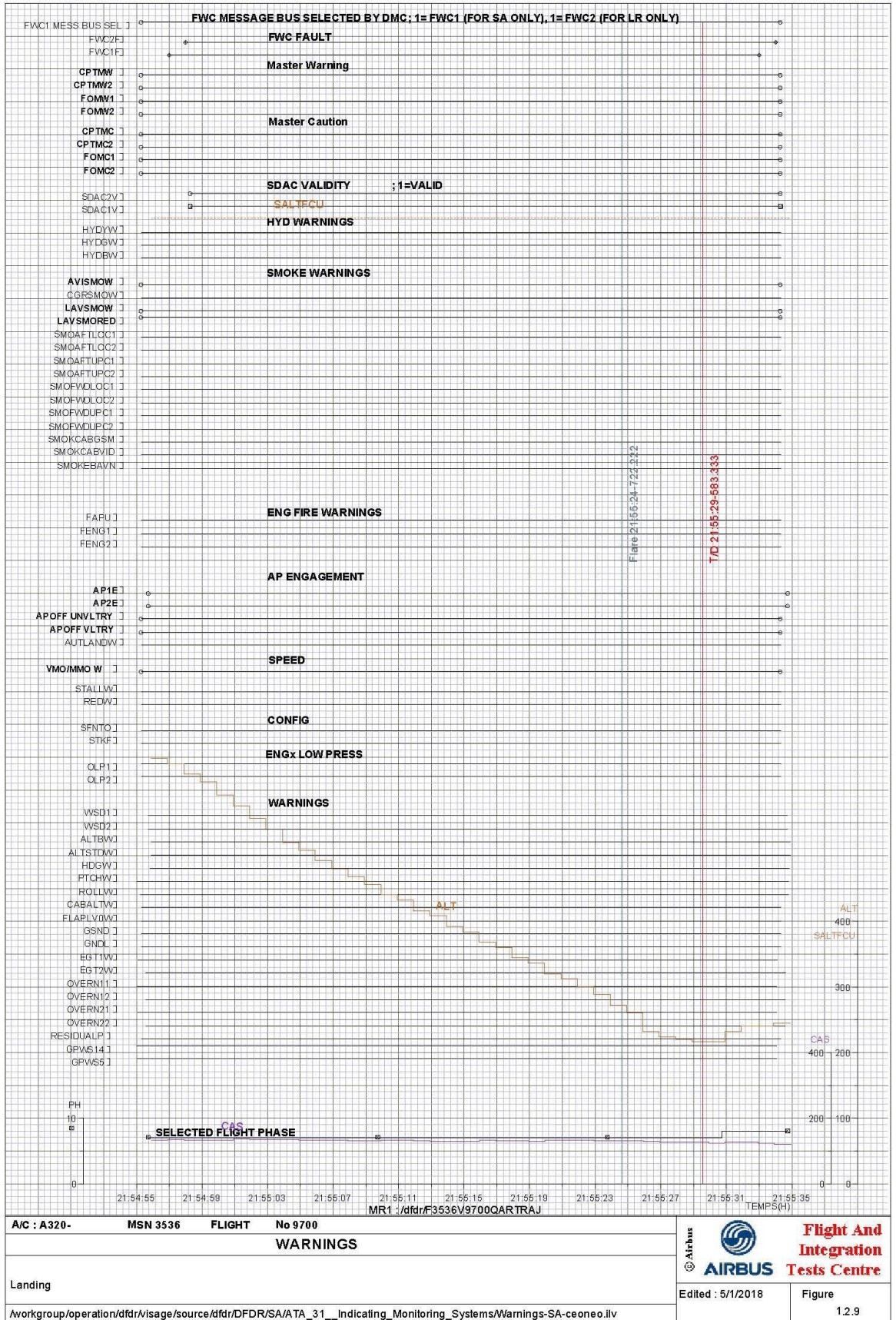


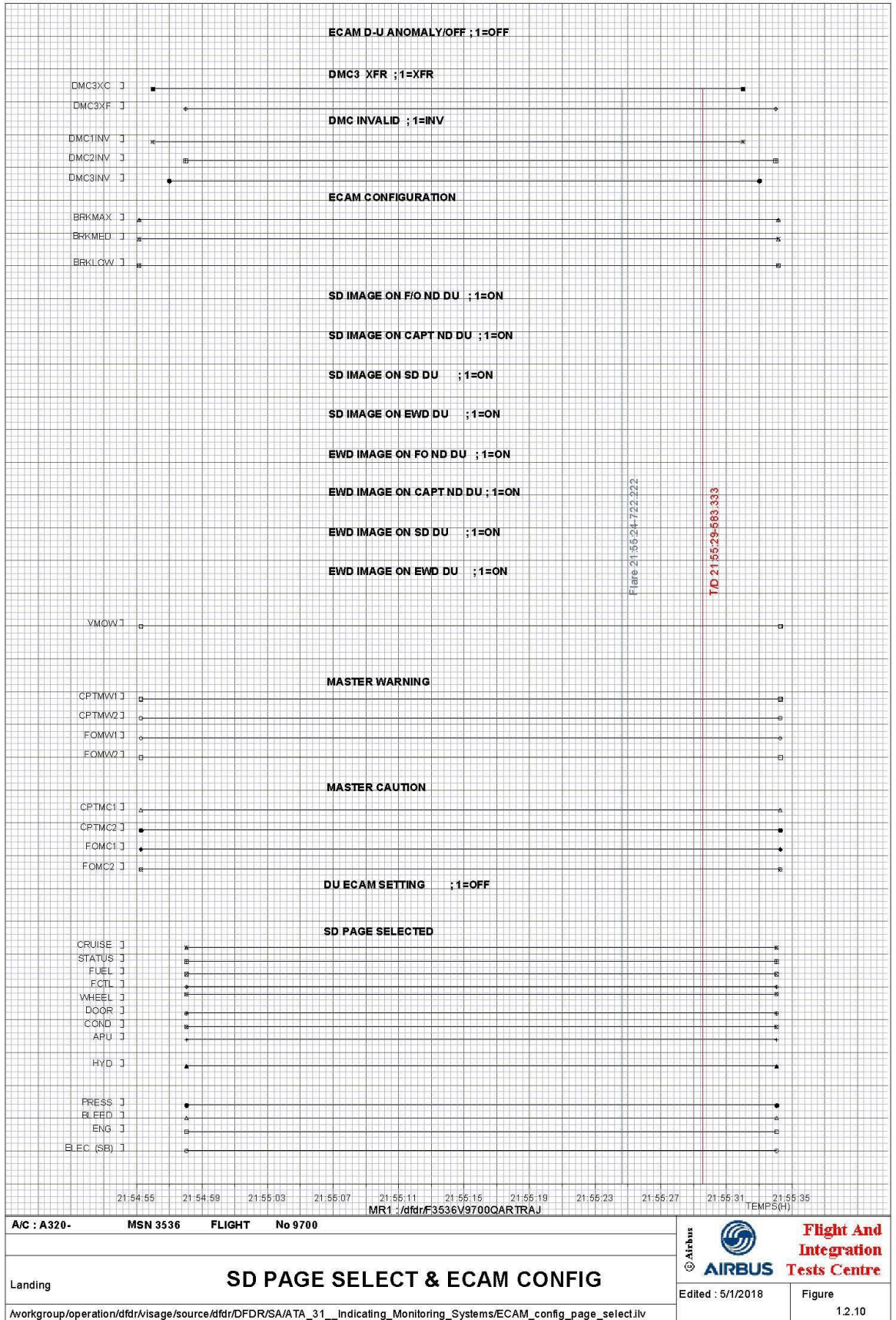












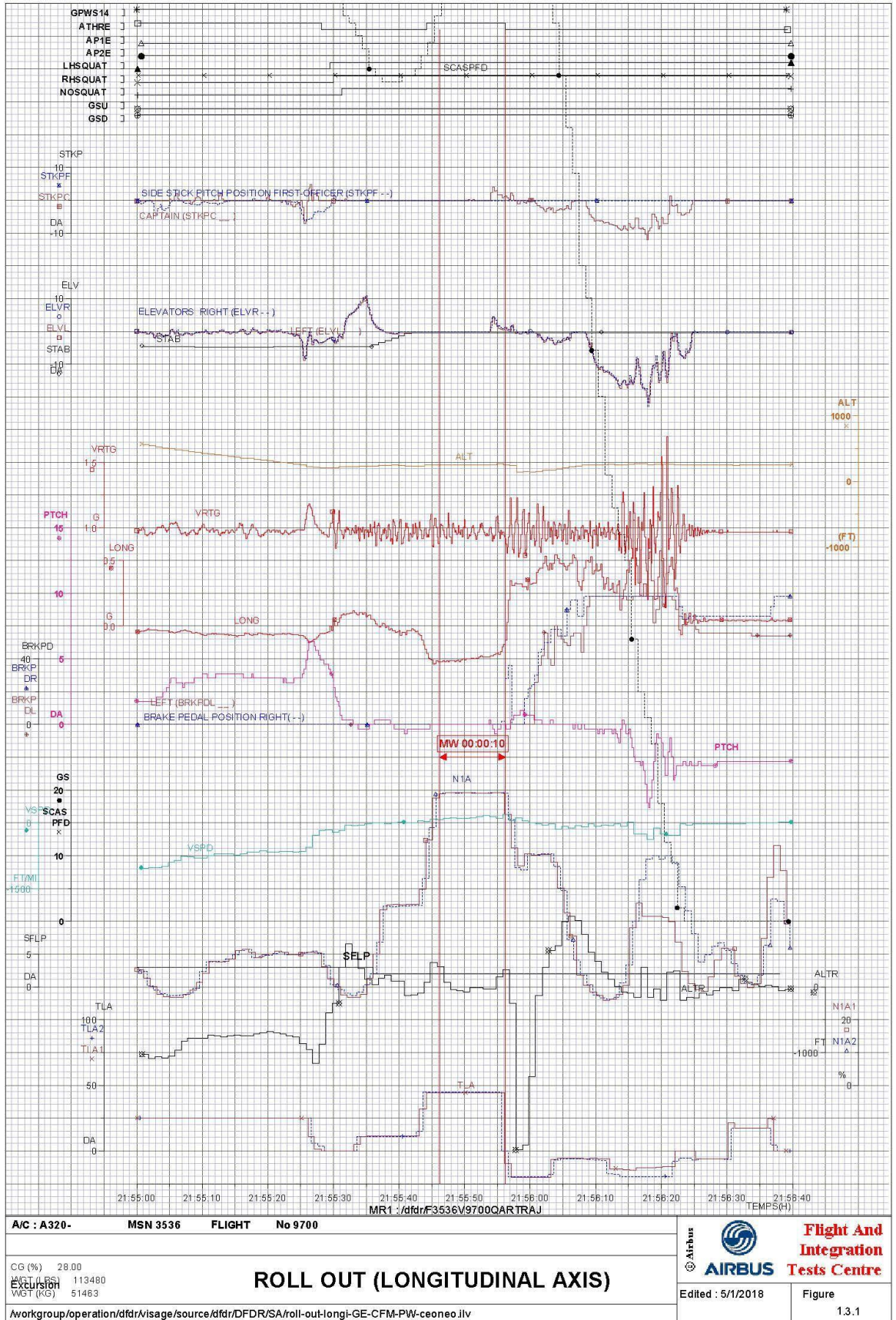
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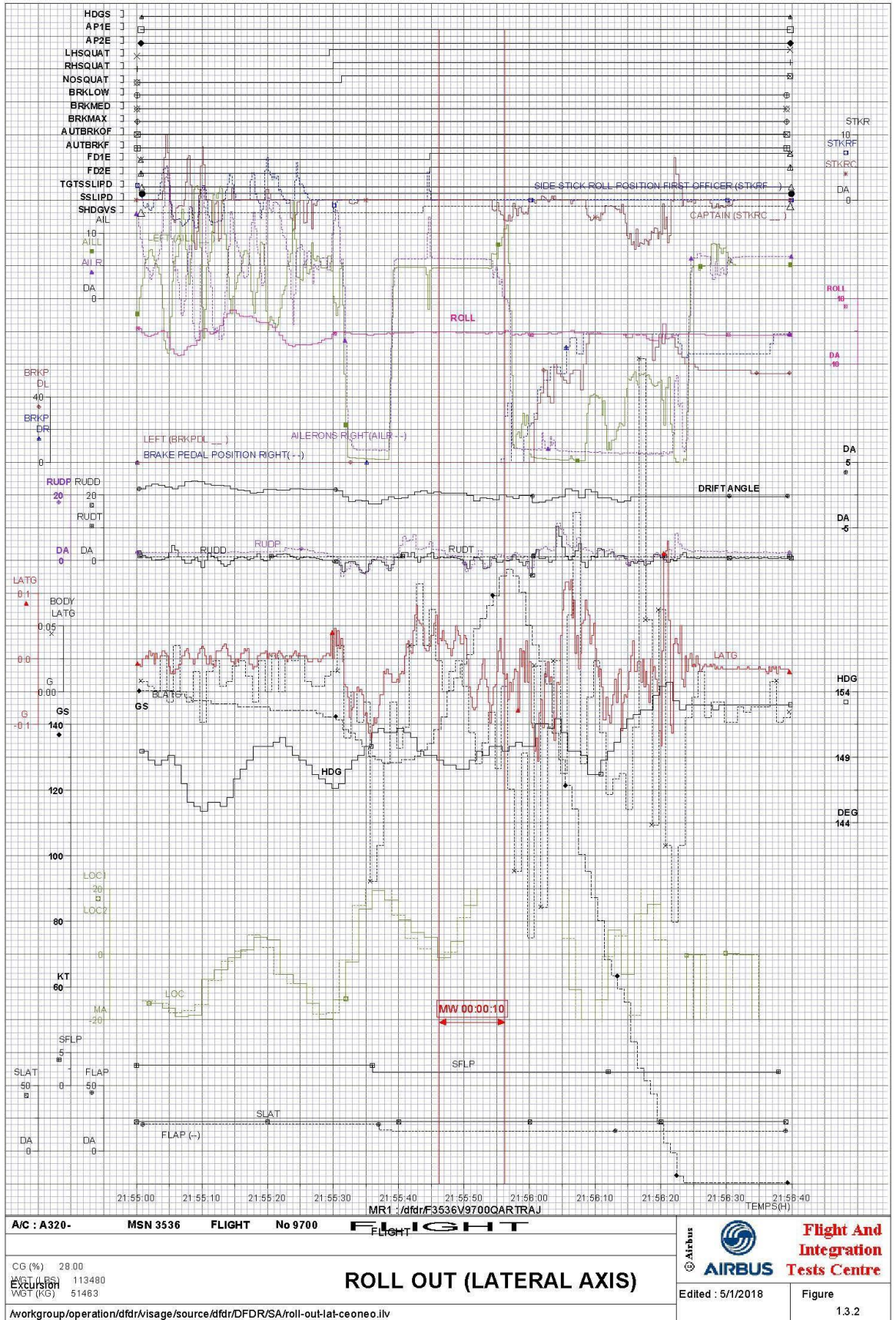
PART II: FLIGHT DATA FROM 21:55:00 UTC TO 21:56:40 UTC
Zoom on roll out and runway excursion

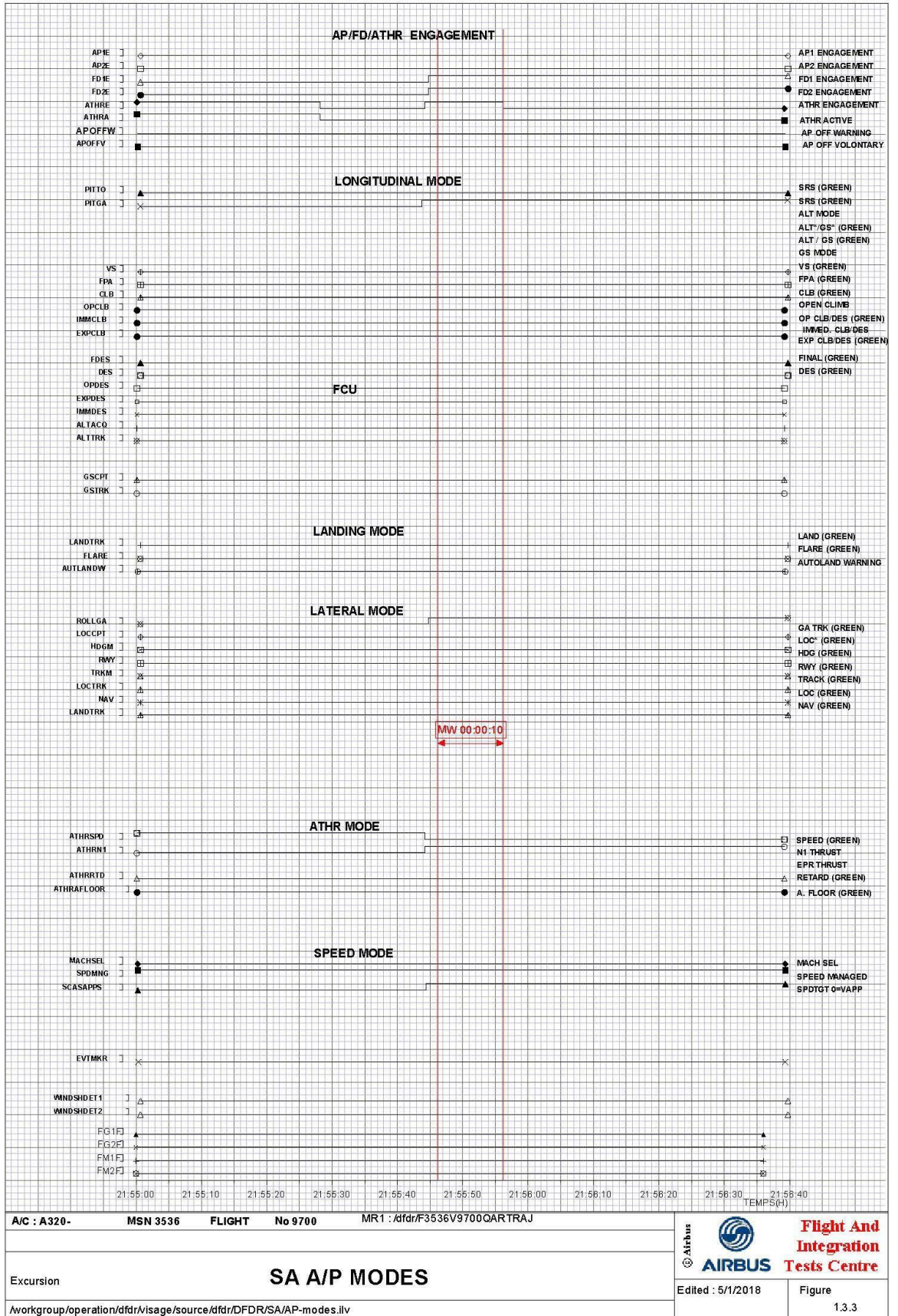
REFERENCE: TechRequest 80389852

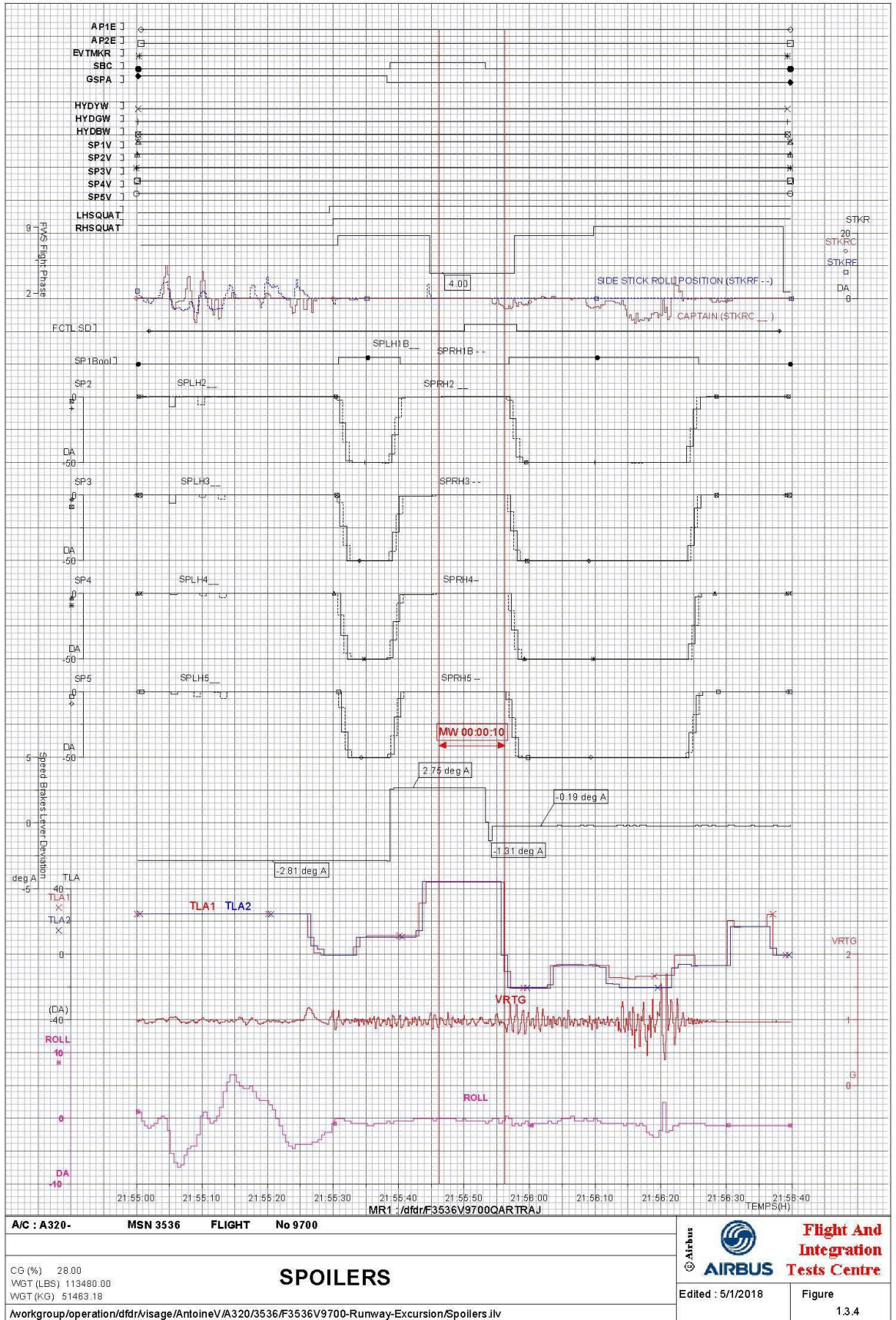
DATE : November 29th
2017

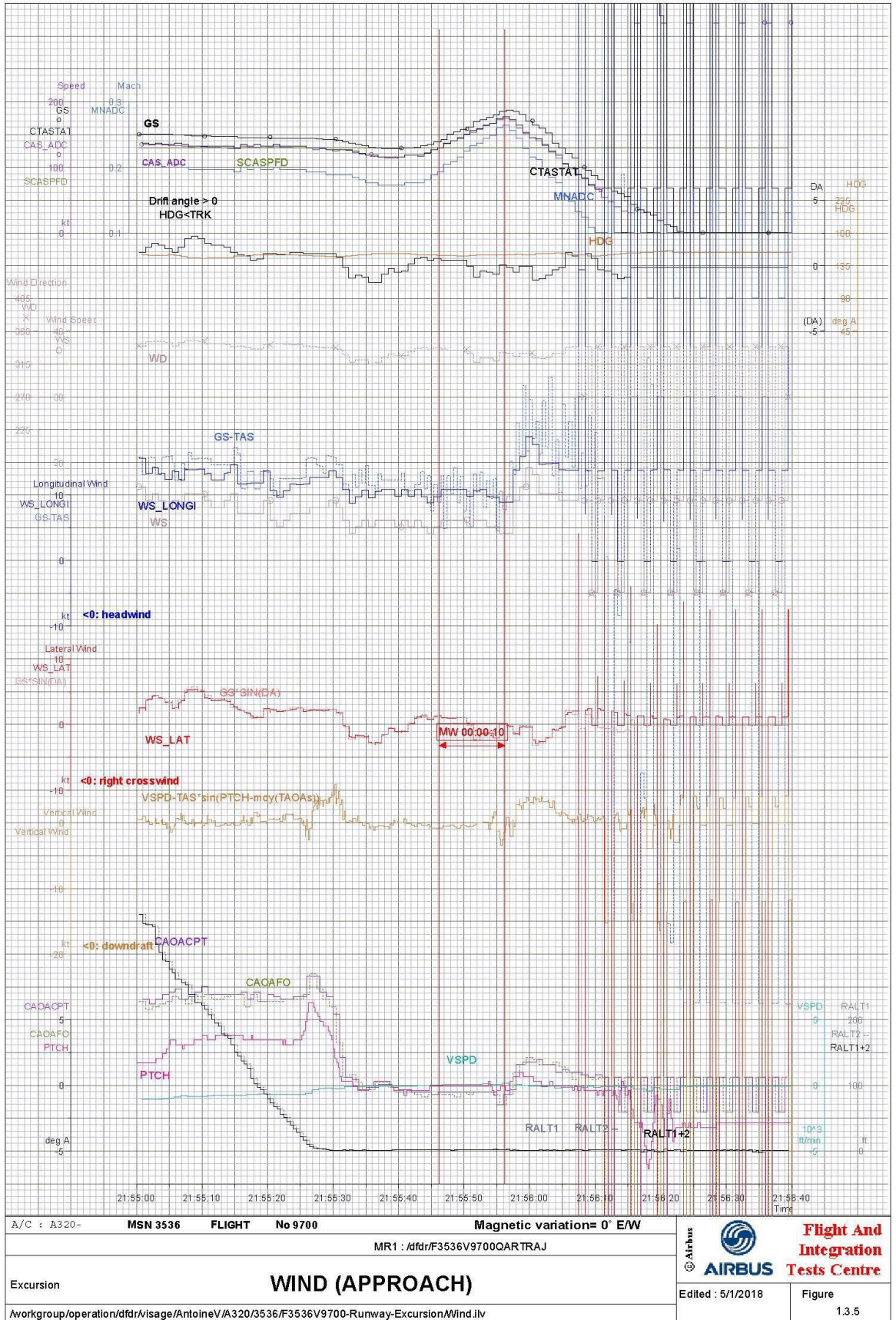
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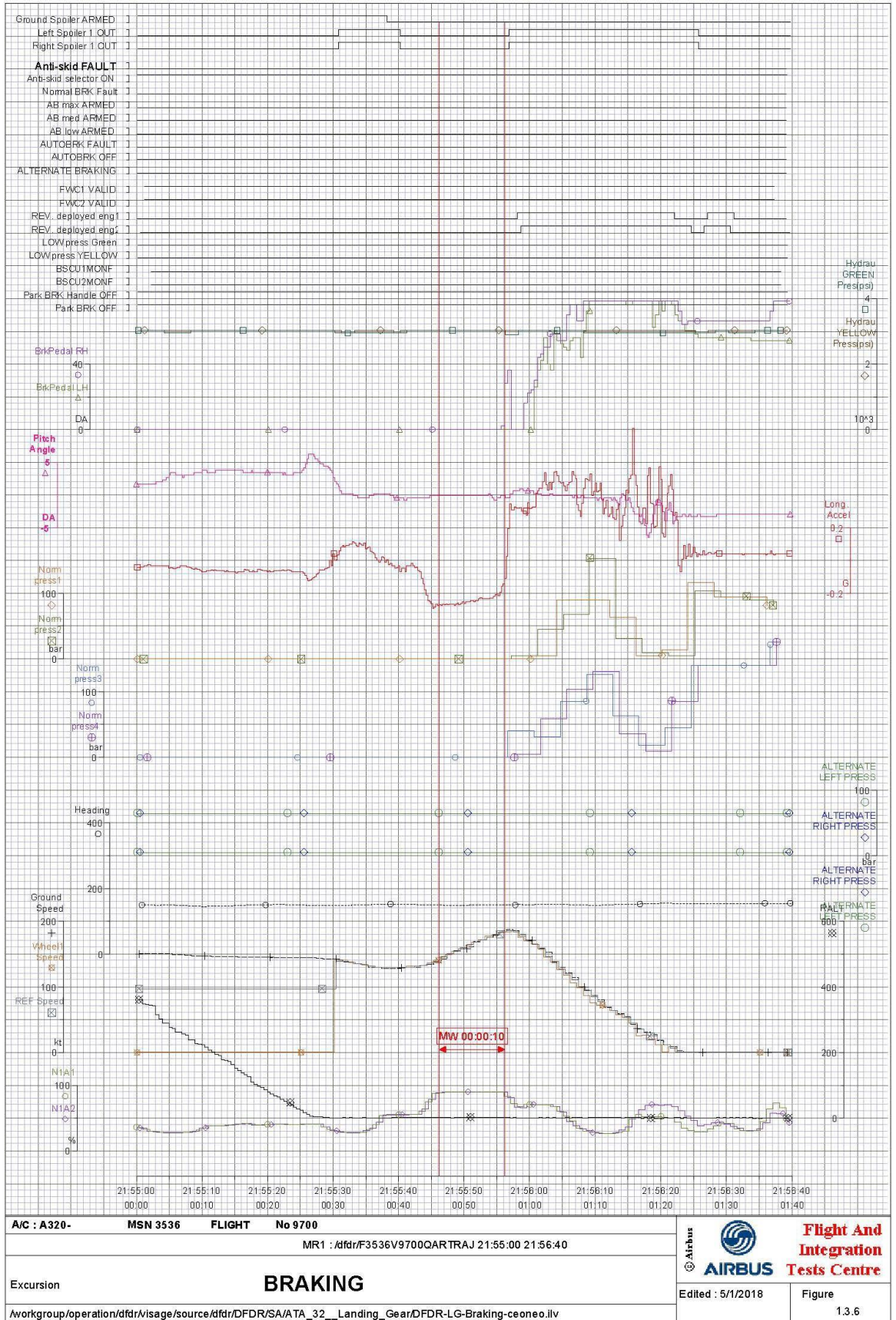


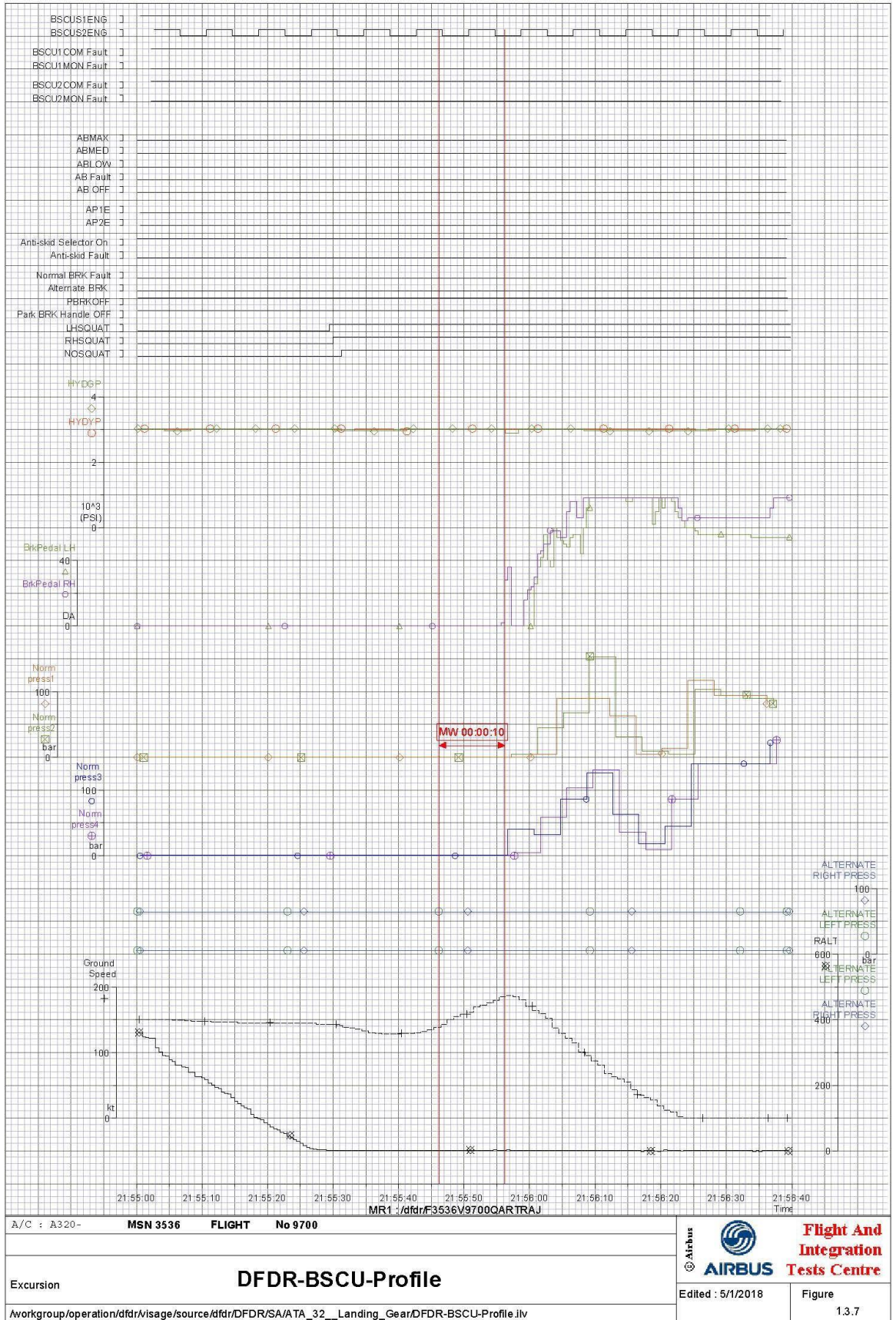




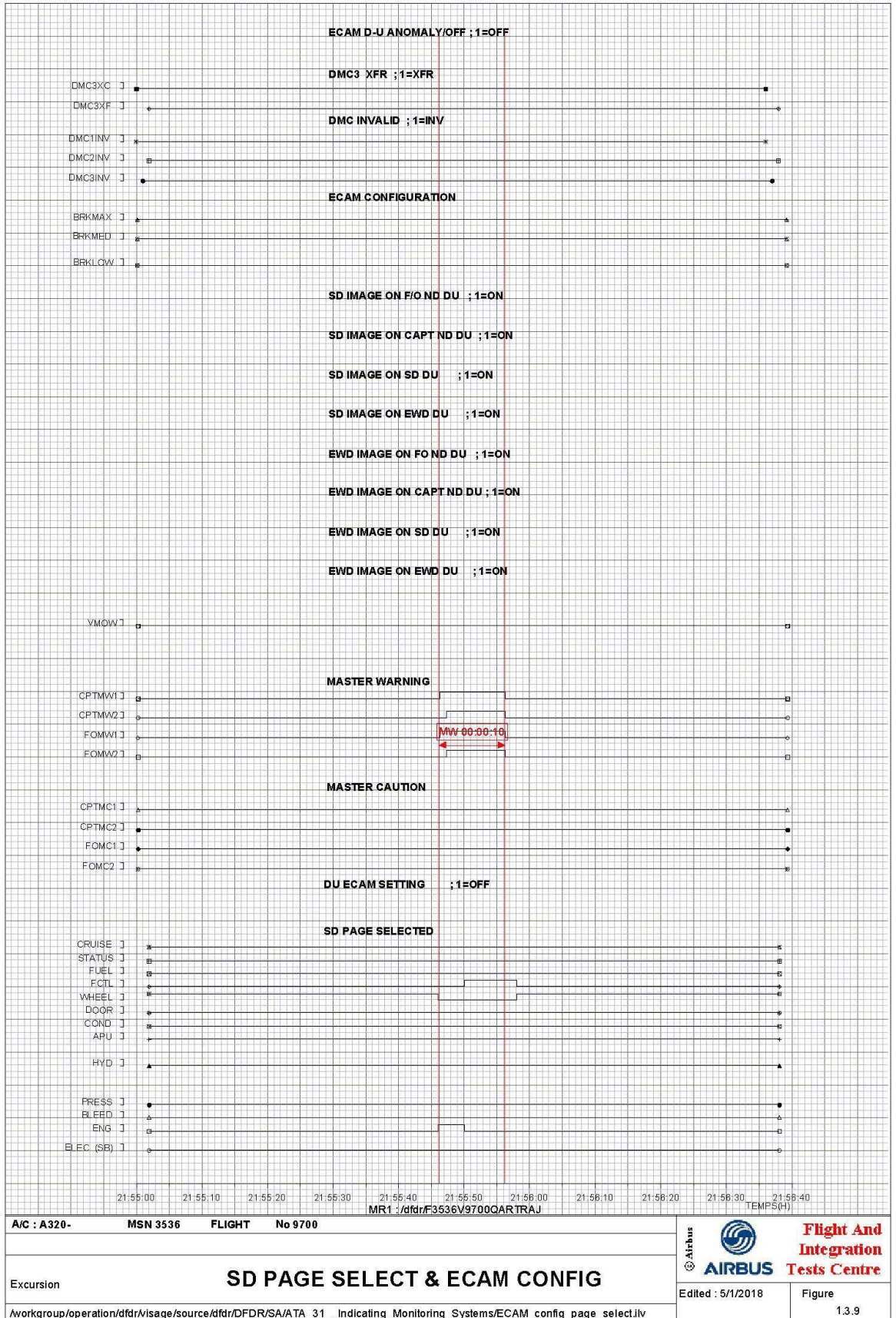


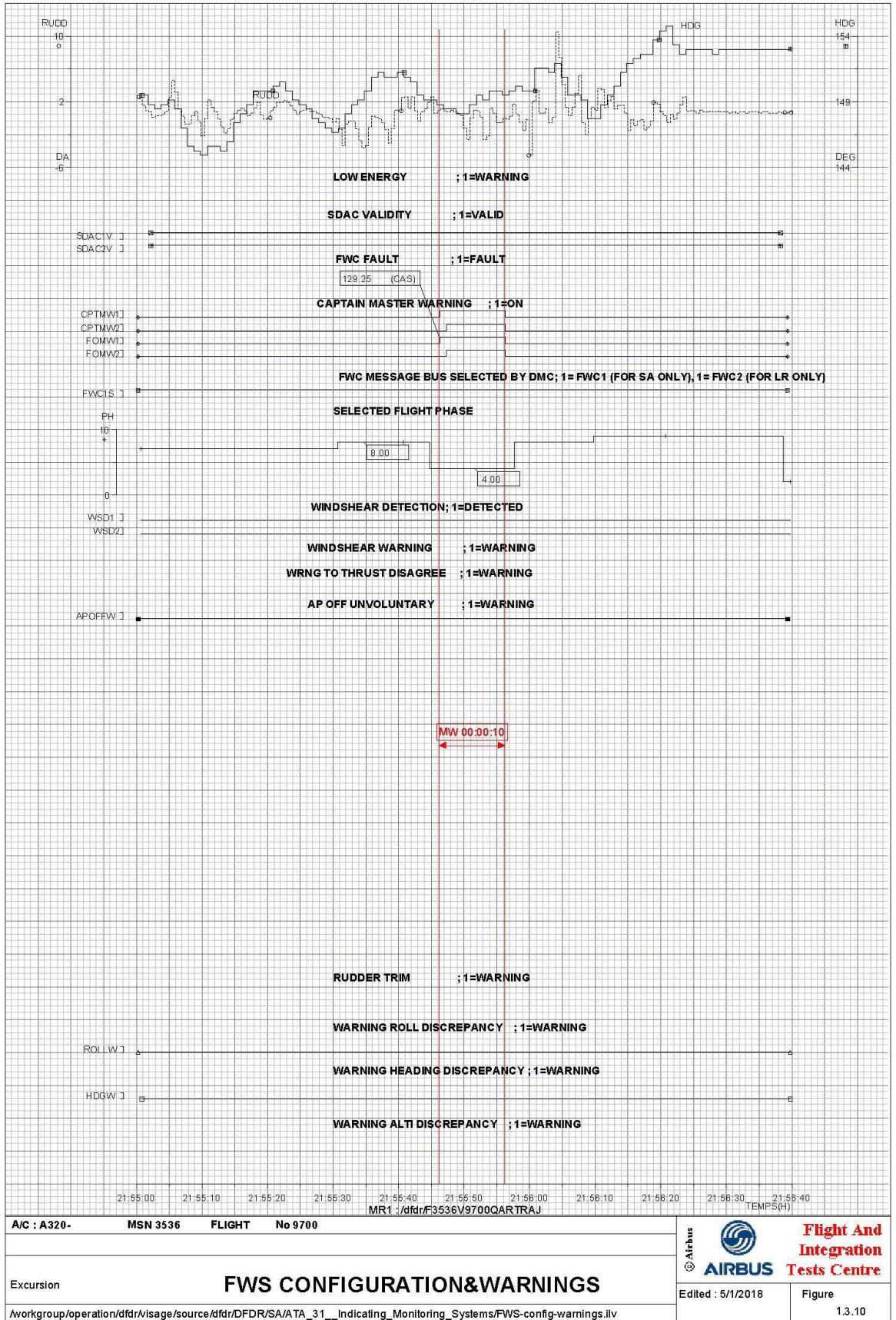












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15. ANNEX 3: RECORDED PARAMETERS

REFERENCE: TechRequest 80389852

DATE : November 29th
2017

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M/NEWD	LIBELLE	UNIT	SOURCE	LABEL	PPS	RESOL	INFO	SIGN	CONVY
POPSF	OPS PRIMARY F/O SIDE	NA	FMSG C DMC	307.23	1A	NA	1*	INSTALLED AND ACTIVE	NA
PH	FLIGHT PHASE	NA	FMC	130	1	1	1	NA	NA
PITCA	PITCH AUTO/REMD	NA	FMSG C DMC	307.09	1	NA	1*	ACTIVATED	NA
PITCH	PITCH MODE OFF	NA	FMSG C DMC	307.05	1	NA	1*	ACTIVATED	NA
PLANC	PLAN MODE CAPT	NA	DMC 1	273.01	1A	NA	1*	SELECTED	NA
PLANK	PLAN MODE F/O	NA	DMC 2	273.01	1A	NA	1*	SELECTED	NA
PLAYBACKF	PLAYBACK FAIL	NA	NA	NA	NA	NA	1*	SELECTED	NA
PLAW	PITCH NORMAL LAW	NA	ELACS/SEC FDC	040.01	4	NA	1*	ENGAGED	NA
PR1	ENG 1 PRESSURE REGULATED	NA	BMC SDAC	143	1/2	0.5	NA	NA	NA
PR2	ENG 2 PRESSURE REGULATED	NA	BMC SDAC	142	1/2	0.5	NA	NA	NA
PREBS	PRESS PAUSE SELECTED	NA	DMC 2	270.04	1A	3	1*	SELECTED	NA
PREVENT	TCAS COMBATED CONTROL PREVENTIVE	NA	TCAS DMC	308	1	NA	NA	NA	NA
PROBEFB	PROBE WINDOW HEAT FB	NA	SDAC	005.04	1A	NA	1*	FB ON	NA
PRV1	PRESS REG. VALVE N/C ENG1	NA	BMC SDAC	007.07	1A	NA	1*	NOT FULLY CLOSED	NA
PRV2	PRESS REG. VALVE N/C ENG2	NA	BMC SDAC	006.07	1A	NA	1*	NOT FULLY CLOSED	NA
PS31	PS3 Eng 1	PS3	FADEC/FCU DMC	227	1	0.5	NA	NA	NA
PS32	PS3 Eng 2	PS3	FADEC/FCU DMC	227	1	0.5	NA	NA	NA
PTCH	PITCH ATTITUDE	DA	ADIRS DMC	324	4	0.352	30*	NOISE UP	NA
PTCHW	WARNING PITCH DISCREPANCY	NA	FMC	124.03	4	NA	1*	DISCREPANCY	NA
PVOT	PARAVISUAL DISPLAY	NA	PUS DMC	005.09	1	NA	1*	OFF	NA
PWSEF	PREDICTIVE WINDSHEAR EXTERNAL FAILURE	NA	DMC	350.05	1	NA	1*	EXTERNAL FAILURE	NA
PWSF	PREDICTIVE WINDSHEAR INTERNAL FAILURE	NA	DMC	350.06	1	NA	1*	INTERNAL FAILURE	NA
PWSFF	PREDICTIVE WINDSHEAR OFF	NA	DMC	350.04	1	NA	1*	OFF	NA
PWSPP	PREDICTIVE WINDSHEAR IN PROG	NA	FMC	16.03	1	NA	1*	NOT INSTALLED	NA
PYLEAK1	ENG 1 PYLON LEAK MEMORIZED	NA	BMC SDAC	065.04	1A	NA	1*	LEAK	NA
PYLEAK2	ENG 2 PYLON LEAK MEMORIZED	NA	BMC SDAC	064.04	1A	NA	1*	LEAK	NA
QART	QART FAIL	NA	NA	NA	NA	NA	NA	NA	NA
QARTAPELW	QART TAPE LOW	NA	NA	NA	NA	NA	NA	NA	NA
QARTFT	QART TRANSMITTER FAIL	NA	NA	NA	NA	NA	NA	NA	NA
QFEC	ALT BARO OF ESSEL CAPTAIN (H+H 4444)	NA	DMC	276	1A	NA	1*	OFF	NA
QFEP	ALT BARO OF ESSEL F/O (H+H 4444)	NA	DMC	276	1A	NA	1*	OFF	NA
QDMC	ALT BARO ONNH SEL CAPTAIN (H+H 4444)	NA	DMC	276	1A	NA	1*	ONNH	NA
QDNH	ALT BARO ONNH SEL F/O (H+H 4444)	NA	DMC	276	1A	NA	1*	ONNH	NA
ONHMCDO	ONH AT DESTINATION ENTERED ONMCDU	MB	RM SUPPLIED BY DMC	160	1A	1	NA	NA	NA
RALT1	RADIO HEIGHT HD1 SENSE ET CORRIGEE (90 TO 4000 FT)	FT	RAM DMC	164	1	NA	1	NA	NA
RALT1+2	RADIO HEIGHT 1+2 SENSE ET CORRIGEE (90 TO 4000 FT)	FT	RAM DMC	164	1	NA	1	NA	NA
RALT2	RADIO HEIGHT HD2 SENSE ET CORRIGEE (90 TO 4000 FT)	FT	RAM DMC	164	1	NA	1	NA	NA
RAMOSTD	TCAS RAMOST DANGEROUS (TAI)	NA	TCAS DMC	307.04	1	NA	1*	RAMOST DANGEROUS	NA
RAWONLDCV	RAW ONLY MESSAGE DISPLAYED CAPT SIDE	NA	FMC AND FMSG C SUPPLIED BY DMC	330.01	1	NA	1*	MESSAGE DISPLAYED	NA
RAWONLDF	RAW ONLY MESSAGE DISPLAYED F/O SIDE	NA	FMC AND FMSG C SUPPLIED BY DMC	330.01	1	NA	1*	MESSAGE DISPLAYED	NA
RLAW	ROLL DIRECT LAW	NA	ELACS/SEC FDC	040.07	4	NA	1*	ENGAGED	NA
REDW	RED WARNING	NA	FMC	120.28	1	NA	1*	WARNING	NA
REF SPD	REFERENCE SPEED	KT	BSCU	332	1	1	NA	NA	NA

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M/NEWD	LIBELLE	UNIT	SOURCE	LABEL	PPS	RESOL	INFO	SIGN	CONVY
RESIDUALP	CAB PR - ECES RESIDUAL PR	NA	FMC	124.21	1	NA	1*	CAB PR - ECES RESIDUAL PR	NA
REVERSAL	TCAS VERTICAL CONTROL REVERSAL	NA	TCAS DMC	308	1	NA	NA	NA	NA
RHSOL	RH DEBAR DOWN LOCKED	NA	LOCUR FWC	003.04	2	NA	1*	LOCKED DOWN	NA
RHOLN	RH DEBAR NOT LOCKED UP	NA	LOCUR FWC	002.02	2	NA	1*	NOT UP LOCKED	NA
RHSQUAT	LEG SQUAT SWITCH RR	NA	LGCC FWC	021.04	4	NA	1*	COMP	NA
RHSLEAK	RIGHT WING LEAK MEMORIZED	NA	BMC FWC	054.05	1A	NA	1*	LEAK	NA
RHSLS	ROSE LS CAPT	NA	DMC 1	273.05	1A	NA	1*	SELECTED	NA
RHSF	ROSE LS F/O	NA	DMC 2	273.05	1A	NA	1*	SELECTED	NA
RHIDNG	RIGHT INNER TANK FUEL QUANTITY	KG	NA	NA	NA	NA	NA	NA	NA
RHOLB	RHLS QUANTITY RIGHT INNER CELL	LBS	NA	NA	NA	NA	NA	NA	NA
RHNAV	ROSE NAV CAPT	NA	DMC 1	273.03	1A	NA	1*	SELECTED	NA
RHNF	ROSE NAV F/O	NA	DMC 2	273.03	1A	NA	1*	SELECTED	NA
RHLAW	ROLL NORMAL LAW	NA	ELACS/SEC FDC	040.09	4	NA	1*	ENGAGED	NA
RNFPEEN	RNF F/B ON	NA	DMC	332	1	NA	NA	NA	NA
ROLL	ROLL ATTITUDE	DA	ADIRS DMC	325	2	0.352	30*	RH WING DOWN	NA
ROLLGA	ROLL GO AROUND ACTIVE	NA	RMCC DMC	316	1	NA	1*	ACTIVATED	NA
ROLLW	WARNING ROLLS DISCREPANCY	NA	FMC	124.01	2	NA	1*	WARNING	NA
ROTFO	RIGHT OUTER TANK FUEL QUANTITY	KG	NA	NA	NA	NA	NA	NA	NA
ROTLB	RIGHT OUTER TANK FUEL QUANTITY	LBS	NA	NA	NA	NA	NA	NA	NA
RTLACT1	RTL ACTUATOR POS FAC1	DA	FAC1 DMC	187	1	0.0079	NA	NA	NA
RTLACT2	RTL ACTUATOR POS FAC2	DA	FAC2 DMC	187	1	0.0079	NA	NA	NA
RUDO	RUDDER POSITION	DA	SDAC	312	2	0.008	30*	TURN LEFT	NA
RUDP	RUDDER PEDAL POSITION (A200 w/ 2AP)	DA	FDC	304	2	0.008	30*	TURN LEFT	NA
RUDPF	RUDDER PEDAL INPUT FORCE	I	FDC	309	1	1	1	NA	NA
RUDTR	RUDDER TRIM POSITION	DA	FMC	313	1	0.008	30*	TURN LEFT	NA
RVROR	ROSE VOR CAPT	NA	DMC 1	273.04	1A	NA	1*	SELECTED	NA
RVRFB	ROSE VOR F/O	NA	DMC 2	273.04	1A	NA	1*	SELECTED	NA
RWS22	RED WARNING SPARE#20	NA	FMC	124.29	1	NA	1*	WARNING	NA
RWSPARBM10	Red warning spare 10	NA	FMC	127	1	NA	NA	NA	NA
RWSPARBM11	Red warning spare 11	NA	FMC	127	1	NA	NA	NA	NA
RWSPARBM7	Red warning spare 7	NA	FMC	127	1	NA	NA	NA	NA
RWSPARBM8	Red warning spare 8	NA	FMC	127	1	NA	NA	NA	NA
RWSPARBM9	Red warning spare 9	NA	FMC	127	1	NA	NA	NA	NA
RWY	RUNWAY MODE ACTIVE	NA	RMCC DMC	301.01	1	NA	1*	ACTIVATED	NA
RWYLOC	LOC SUB MODE RWY ENGAGED	NA	FMSG DMC	301.09	1	NA	1*	ACTIVATED	NA
RWYTRK	TRACK SUB MODE RWY ENGAGED	NA	FMSG DMC	301.03	1	NA	1*	ACTIVATED	NA
SALTCU	SELECTED ALTITUDE (MANUAL)	FT	FDC	102	1	64	NA	NA	NA
SAV	ENG1 STARTER VALVE NOT CLOSED	NA	BMC SDAC	087.01	1A	NA	1*	NOT CLOSED	NA
SAV2	ENG2 STARTER VALVE NOT CLOSED	NA	BMC SDAC	088.01	1A	NA	1*	NOT CLOSED	NA
SBAROC	BARO SETTING CAPT ELAS COARSE	MB	FDC DMC	222	1A	160	NA	NA	NA
SBAROCF	BARO SETTING CAPT FINE	MB	FDC DMC	222	1A	0.1	NA	NA	NA
SBAROF	BARO SETTING F/O ELAS	MB	FDC DMC	222	1A	0.1	NA	NA	NA
SBAROCF	BARO SETTING F/O ELAS COARSE	MB	FDC DMC	223	1A	160	NA	NA	NA
SBAROFF	BARO SETTING F/O FINE	MB	FDC DMC	223	1A	0.1	NA	NA	NA
SBC	SPEED BRAKE COMMAND	NA	SEC DMC	445.09	2	NA	1*	COMMAND	NA
SCASAPPS	APPROACH CONTROL	NA	DMC	103	1	1	1*	PF SELECTED	NA
SCASRF	PROBES/RETRACT	NA	DMC	103	1	1	1*	PF SELECTED	NA
SCRSV	SELECTED COURSE VOR 1	DA	VOR DMC	100	1	0.703	NA	NA	NA
SCRSV2	SELECTED COURSE VOR 2	DA	VOR DMC	100	1	0.703	NA	NA	NA
SDACT	SDACT FAIL	NA	DMC	350.29	1A	NA	1*	FAIL	NA
SDACTV	SDACT VALID	NA	FMC	126.01	1A	NA	1*	VALID	NA
SDACT2	SDACT 2 FAIL	NA	FMC	350.28	1A	NA	1*	FAIL	NA
SDACTV2	SDACT 2 VALID	NA	FMC	126.02	1A	NA	1*	VALID	NA
SDUC1HS	SDU CHANNEL 1 HS	NA	SATCOM - ATSU - FMC	040.28	1	NA	1*	CHANNEL 1	NA
SDUC1LS	SDU CHANNEL 1 LS	NA	ACARS - U	370.28	1	NA	1*	CHANNEL 1	NA
SDUC2HS	SDU CHANNEL 2 HS	NA	SATCOM - ATSU - FMC	040.27	1	NA	1*	CHANNEL 2	NA

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M/NEWD	LIBELLE	UNIT	SOURCE	LABEL	PPS	RESOL	INFO	SIGN	CONVY
SDUC2LS	SDU CHANNEL 2 LS	NA	SATCOM - ACARS - U - FMC	270.07	1	NA	1*	CHANNEL 2	NA
SDUHSINST	SDU HS INSTALLED	NA	SATCOM - ATSU - FMC	016.01	1	NA	1*	NO SATCOM HS	NA
SECF1	SEC 1 FAULT	NA	FDC	040.25	1A	NA	1*	FAULT	NA
SECF1B	SEC 1 B SWITCH OFF	NA	FDC	040.27	1A	NA	1*	YES	NA
SECF2	SEC 2 FAULT	NA	FDC	040.26	1A	NA	1*	FAULT	NA
SECF2B	SEC 2 B SWITCH OFF	NA	FDC	040.28	1A	NA	1*	YES	NA
SECF3	SEC 3 FAULT	NA	FDC	040.29	1A	NA	1*	FAULT	NA
SECF3B	SEC 3 B SWITCH OFF	NA	FDC	040.29	1A	NA	1*	YES	NA
SFCR	CYCLES COMPUTEUR FOR SUPERFRAMES 23+4	NA	NA	NA	NA	NA	NA	NA	NA
SFLP	SLAT/FLAP LEVER POSITION	NOTCH	SFDC SDAC	046.7.21	1/2	NA	NA	NA	NA
SFRAT0	SURFACES NOT IN T/O CONFIGURATION	NA	FMC	120.09	1	NA	1*	NOT IN T/O CONF	NA
SFFA	SELECTED FPA	DA	FDC DMC	175	1	0.309	NA	NA	NA
SHOO	SELECTED HEADING	DA	FCU DMC	101	1	0.703	NA	NA	NA
SHOVS	HDOGS SELECTION	NA	FCU DMC	276.08	1	NA	1*	HDOGS	NA
SLAT	SLAT SURFACE ANGLE	DA	RPL FMC	127	1	0.303	NA	NA	NA
SLDQANT1	SELECT LANDING ANTENNA CAPT	NA	MMR DMC	001.09	1/2	NA	1*	SELECTED	NA
SLDQANT2	SELECT LANDING ANTENNA F/O	NA	MMR DMC	001.09	1/2	NA	1*	SELECTED	NA
SLT	SLAT FAIL	NA	FMC	120.03	1A	NA	1*	FAULT	NA
SMACH	SELECT ED MACH	NA	FDC DMC	106	1	0.002	NA	NA	NA
SMALT	SMALT ALTITUDE SELECTED	NA	ADIRS FCU	250.02	1	NA	1*	SELECTED	NA
SMOAF1LOC1	SMOKE AFT LOWER CARGO 1	NA	FMC	051.02	1	NA	1*	SMOKE	NA
SMOAF1LOC2	SMOKE AFT LOWER CARGO 2	NA	FMC	051.02	1	NA	1*	SMOKE	NA
SMOAF1UP1	SMOKE AFT UPPER CARGO 1	NA	FMC	051.03	1	NA	1*	SMOKE	NA
SMOAF1UP2	SMOKE AFT UPPER CARGO 2	NA	FMC	051.03	1	NA	1*	SMOKE	NA
SMOAF2LOC1	SMOKE FWD LOWER CARGO 1	NA	FMC	051.04	1	NA	1*	SMOKE	NA
SMOAF2LOC2	SMOKE FWD LOWER CARGO 2	NA	FMC	051.04	1	NA	1*	SMOKE	NA
SMOAF2UP1	SMOKE FWD UPPER CARGO 1	NA	FMC	051.05	1	NA	1*	SMOKE	NA
SMOAF2UP2	SMOKE FWD UPPER CARGO 2	NA	FMC	051.05	1	NA	1*	SMOKE	NA
SMOICABS3M	Smoke CAB 3SM smoke	NA	FMC	124.08	1	NA	1*	WARNING	NA
SMOICABV3D	Smoke CAB V3D smoke								

M/NBR	LABELLE	UNIT	SOURCE	LABEL	PPS	RESOL	RESOL	RESOL	RESOL	SIGN	SIGN
						INFO	INFO	INFO	INFO	CONV	CONV
TGTSSLPD	TARGET SIDE SLIP DISPLAYED	NA	DMC	350/29	1	NA	1*	DISPLAYED			
THRABVLD1	ENG1 THR LEVER ABV/DLE	NA	FWC	124/24	1	NA	1*	ENG1 THR LEVER ABV/DLE			
THRABVLD2	ENG2 THR LEVER ABV/DLE	NA	FWC	124/25	1	NA	1*	ENG2 THR LEVER ABV/DLE			
THSMAN	THIS MANUAL (CONFIRMED BY COMPUTER)	NA	THS FCDC	046/27	1	NA	1*	YES			
THSMANW	THIS MANUAL SWICH (NOT CONF. BY COMPUTER)	NA	THS FCDC	046/74	1	NA	1*	YES			
TLA1	THRUST LEVER ANGLE ENG1	DA	ECU DMC	133	1	0.35	NA				
TLA2	THRUST LEVER ANGLE ENG2	DA	ECU DMC	133	1	0.35	NA				
TLU1	TLU FUNCTION ENGAGED FAC1	NA	FAC1 DMC	07/21	1	NA	1*	ENGAGED			
TLU2	TLU FUNCTION ENGAGED FAC2	NA	FAC2 DMC	07/21	1	NA	1*	ENGAGED			
TO	CITY PAIR TO C14	NA	NA	NA	NA	NA	NA				
TOC1	CITY PAIR TO C1	NA	NA	NA	NA	NA	NA				
TOC2	CITY PAIR TO C2	NA	NA	NA	NA	NA	NA				
TOC3	CITY PAIR TO C3	NA	NA	NA	NA	NA	NA				
TOC4	CITY PAIR TO C4	NA	NA	NA	NA	NA	NA				
TOODC	BEARING TO GO CAPTAIN	DA	FMG21	115	1	0.35	NA				
TOODF	BEARING TO GO FIRST OFFICER	DA	FMG22	116	1	0.35	NA				
TOWAYPNT1	TO WAYPOINT CAPT SIDE (1st CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT2	TO WAYPOINT CAPT SIDE (2nd CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT3	TO WAYPOINT CAPT SIDE (3rd CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT4	TO WAYPOINT CAPT SIDE (4th CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT5	TO WAYPOINT CAPT SIDE (5th CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT6	TO WAYPOINT CAPT SIDE (6th CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT7	TO WAYPOINT CAPT SIDE (7th CHAR)	LBELL	FM SUPPLIED BY DMC	53	14	NA	NA				
TOWAYPNT8	TO WAYPOINT CAPT SIDE (8th CHAR)	LBELL	FM SUPPLIED BY DMC	53	14	NA	NA				
TOWAYPNT9	TO WAYPOINT F/D SIDE (1st CHAR)	LBELL	FM SUPPLIED BY DMC	53	14	NA	NA				
TOWAYPNT10	TO WAYPOINT F/D SIDE (2nd CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT11	TO WAYPOINT F/D SIDE (3rd CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT12	TO WAYPOINT F/D SIDE (4th CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT13	TO WAYPOINT F/D SIDE (5th CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT14	TO WAYPOINT F/D SIDE (6th CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT15	TO WAYPOINT F/D SIDE (7th CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT16	TO WAYPOINT F/D SIDE (8th CHAR)	LBELL	FM SUPPLIED BY DMC	56	14	NA	NA				
TOWAYPNT17	TO WAYPOINT F/D SIDE (9th CHAR)	LBELL	FM SUPPLIED BY DMC	53	14	NA	NA				
TOWAYPNT18	TO WAYPOINT F/D SIDE (10th CHAR)	LBELL	FM SUPPLIED BY DMC	53	14	NA	NA				
TOWAYPNT19	TO WAYPOINT F/D SIDE (11th CHAR)	LBELL	FM SUPPLIED BY DMC	53	14	NA	NA				
TRM	TRACK MODE ACTIVE	NA	FMG2 DMC/R REVS - LIGNE 8	301/27	1	NA	1*	ACTIVATED			
UNLOCK1	REVERSE UNLOCK ENG1	NA	ECU DMC	270/71	1	NA	1*	UNLOCKED			
UNLOCK2	REVERSE UNLOCK ENG2	NA	ECU DMC	270/72	1	NA	1*	UNLOCKED			
UPADUVCOR	TCAS COMBINATED CONTROL UP ADVISORY CORRECTIVE	NA	TCAS DMC	309	1	NA	NA				
UTC	GMT ED05F2	NA	CLOCK	125	NA	1	NA				
UTCH	HOURS	NA	CLOCK	125	1/4	3600	NA				
UTCM	MINUTE GMT ED05F2	NA	CLOCK	125	1/4	60	NA				
UTCSE	SECONDIE GMT ED05F2	NA	CLOCK	125	1/4	1	NA				
VDVDC	V/DV DISPLAY ON PFD FROM CPT	NA	DMC	350/27	1/2	NA	1*	DISPLAYED			

M/NBR	LABELLE	UNIT	SOURCE	LABEL	PPS	RESOL	RESOL	RESOL	RESOL	SIGN	SIGN
						INFO	INFO	INFO	INFO	CONV	CONV
VDE0FF	V/DV DISPLAY ON PFD FROM F/D	NA	DMC	350/27	1/2	NA	1*	DISPLAYED			
VH1	V/R1 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH2	V/R2 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH3	V/R3 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH4	V/R4 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH5	V/R5 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH6	V/R6 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH7	V/R7 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH8	V/R8 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH9	V/R9 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH10	V/R10 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH11	V/R11 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH12	V/R12 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH13	V/R13 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH14	V/R14 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH15	V/R15 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH16	V/R16 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH17	V/R17 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH18	V/R18 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH19	V/R19 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH20	V/R20 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH21	V/R21 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH22	V/R22 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH23	V/R23 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH24	V/R24 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH25	V/R25 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH26	V/R26 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH27	V/R27 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH28	V/R28 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH29	V/R29 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH30	V/R30 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH31	V/R31 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH32	V/R32 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH33	V/R33 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH34	V/R34 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH35	V/R35 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH36	V/R36 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH37	V/R37 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH38	V/R38 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH39	V/R39 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH40	V/R40 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH41	V/R41 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH42	V/R42 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH43	V/R43 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH44	V/R44 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH45	V/R45 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH46	V/R46 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH47	V/R47 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH48	V/R48 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH49	V/R49 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH50	V/R50 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH51	V/R51 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH52	V/R52 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH53	V/R53 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH54	V/R54 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH55	V/R55 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH56	V/R56 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH57	V/R57 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH58	V/R58 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH59	V/R59 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH60	V/R60 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH61	V/R61 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH62	V/R62 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH63	V/R63 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH64	V/R64 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH65	V/R65 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH66	V/R66 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH67	V/R67 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH68	V/R68 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH69	V/R69 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH70	V/R70 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH71	V/R71 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH72	V/R72 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH73	V/R73 ENG	NA	SDAC	032/29	1	NA	0*	EMITTING			
VH74	V/R74 ENG	NA	SDAC	032							

AIRBUS

END