Aviation Safety Council

Taipei, Taiwan

GE235 Occurrence Investigation
Factual Data Collection
Group Report

Flight Operations Group

July 2, 2015

ASC-FRP-15-07-002

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Contents

I. Team Organization

Chairman:
Wen-huan Chang Aviation Safety Council (ASC), Taiwan ROC
Members:
1. Captain Yen-Ping Chang Aviation Safety Council (ASC), Taiwan ROC
2. Captain Hung-Ching Mei Civil Aeronautics Administration (CAA), Taiwan ROC
3. Captain Jeng-Jiun Sheu Civil Aeronautics Administration (CAA), Taiwan ROC
4. Captain Jerome Pfeiffer ATR, France
5. Captain Herve Bathe ATR, France
6. Capt Shih-fan Liu TransAsia Airways
7. Danny Cheng Aviation Safety Council (ASC), Taiwan ROC
8. Morris Yang Aviation Safety Council (ASC), Taiwan ROC

II. History of Activities

Date	Activities
2/04/15	1. Conducted the preliminary on scene investigation, including the preliminary examination of initial impact point, the flight track and major wreckage site. Checked the wreckages and took photo, the first impact point could be the fence and an electrical pole on the elevated bridge. The main wreckages are in the middle of the Keelung River. 2. Visited TNA FLT OPS Dept. for information: including dispatch file, load sheet, manifest, briefing materials (NOTAM, METAR, FLT Plan…) roster, crew information, dispatched schedules. 3. Interviewed dispatcher. 4. Got the occurrence aircraft flight path and review it 5. Conducted interview with one dispatcher 6. Got the crew's previous flight information 7. Reviewed ATR-600's FCOM and SOP 8. On scene wreckages recovery monitoring, negotiated with the prosecutor and rescue commander.
2/05/15	1. Checked the wreckage and took photo 2. Inspected the wreckage cockpit and gathered the information from instrument panel, the control column, power control quadrant and switch. 3. Interviewed Air Traffic controller. 4. Reviewed the preliminary FDR data. 5. Supported the wreckage transport. 6. Secured the relevant documents of flight records.
2/06/15	1. Organized the FLT OPS group include ASC, ATR, BEA, TNA 2. Briefed and discussed the FLT OPS work items. 3. Checked the wreckage with advisers from ATR and took photos. 4. Inspected the wreckage cockpit included instrument panel, throttle quadrant and discussed the cockpit rebuild

Date	Activities
	planning with TNA personnel. 5. Interviewed the standard training manger. 6. Interviewed the ATR-600 flight crew 7. Provided the FLT OPS data for the press conference. 8. Reviewed ATR-600 SOP. 9. Reviewed the required documents from CAA, TNA and ATR. 10. Collaborated with BEA, ATR representatives in confirming contents integrity of FDR (Flight Data Recorder) read-outs and rationalize the history of flight profile. 11. Reviewed the function of ATPCS system. Logic, normal and abnormal operations, technical description, history.
2/07/14	1. Finalized the FLT OPS Group advisers of CAA, TNA. 2. Integrated and documented the materials. 3. Wrote the field notes and interview notes. 4. Final rationalization of the history of flight profile with BEA, ATR. 5. Group members listened to CVR including ASC, CAA, and TNA. 6. Group meeting: discussed the work assignments. 7. Reviewed ATR-600 SOP including before T/O & after T/O 8. Sorted and reviewed the abnormal & emergency procedures at T/O and after T/O. 9. Received ECL software and related information. 10. Clarified the chime sound happened on ground for the occurrence flight.
2/08/15	1. Checked and reviewed the transient training program from ATR72-500 to ATR72-600. 2. Clarified the standard callout of engine flameout in SOP or FCTM. 3. Reviewed and studied the use of ECL. 4. Reviewed and studied the ATR ‘mini-trainers software’.

Date	Activities
	5. Asked TNA or the ATR training center requested to provide more flight crew difference training records. 6. Engine out ECL procedures presentation and discussion. 7. Simulator test requirements discussion 8. ATR72-600 Training syllabus discussion 9. ATR72-600 Cockpit warning system discussion 10. Reviewed the ATR fleet flight crew interview plan. 11. Reviewed the occurrence crew training records 12. Discussed the crew operations after takeoff 13. Discussed the operation of ATPCS fault procedures. 14. Discussed the Check Pilot interview who conducted the CM1 flight check 15. Prepared the documents need for CRM data factual. 16. Assisted to work on the CVR transcript. 17. Wrote the interview notes.
2/09/15	1. Completed the simulator test plan outline and budget requirements. 2. Studied the TNA FLT OPS new organization. 3. Discussed the CAA policy(or background) for issuing the ATR type rating between 500 and 600 4. Discussed the detailed TNA training program and approved process for ATR72-600 5. Studied the AC-120-010A, flight operations training spec. published by CAA. 6. Discussed the organization & function of technical review board of TNA 7. Checked if the occurrence flight crew experienced the engine problem while they flew ATR72-600 8. Reviewed and studied FOD Operations Manual of TNA 9. Checked if there is any OEB related to retard both throttle to idle during single eng. flameout 10. Checked if the crew who received the ATR72-600 difference training has any comments to the training program

Date	Activities
	11. Reviewed the type rating issuance and procedures of CAA 12. Checked if TNA had the letter to ATR ask about difference training program 13. Accomplished the crew interview plan 14. Reviewed CM1's and CM2's flight time & schedule. There was no work time violation and high flight time issue. 15. Confirmed that CM1 and CM2 arranged sleep location by themselves. So we need to interview with their family if we want to have sleep data last 72 hrs before occurrence. 16. Reviewed the FDR data about crew response right after no.2 engine anomalies occurred. 17. Assisted the CVR transcript. 18. Finished the interview notes: 1 dispatcher and 1 training supervisor.
2/10/15	1. Conducted the CVR transcript verification. 2. Reviewed the emergency procedures "engine flameout at takeoff" on FCOM paragraph 03.02.03 3. Sorted out "Engine no.2 flameout at takeoff" procedure on ECL. 4. Reviewed the OEB 14: procedure display in case of engine flame out 5. Reviewed the difference training program from ATR500 to 600 in FTMM.(2.18) 6. Finished the draft" History of flight". 7. Interviewed the senior IP/CP in TNA ATR fleet (4) 8. Wrote up the preliminary sequence of events 9. Reviewed and discussed the AC-120-010A:" Flight operation spec" issued by CAA. 10. Turned in the document requirements list. 11. Reviewed the action log 12. Finished the interview notes: 1 flight crew.

Date	Activities
2/11/15	1. Reviewed FOM & FCOM which related to this occurrence. 2. Reviewed the detailed sequence of events. 3. Checked crew training related information 4. Continued to interview the TNA flight crew 5. Planned OBS flight for ATR-600 6. Reviewed the detailed crew training records and selection process, including: selection, oral, simulator and flight. 7. Reviewed the FOM： 7.1 Chapter 3 Duties and Responsibilities 7.2 Chapter 4 Crewmembers Operational Regulations 7.3 Chapter 5 Crew Resource Management 8. Acquired the ATR-72-600 runway analysis manual. 9. Explained the brief history of flight to the AR from CAAC 10. Reviewed the detailed ATPCS function 11. Reviewed and discussed the difference training program from ATR500 to 600 12. Interviewed two flight crew in TNA ATR fleet 13. Reviewed and updated the action log 14. Wrote up the interview notes. 15. Assisted the CVR transcript 16. Confirmed the recorded gross weight (parameter Gross Weight 1): 20,340 kg at take off. End of the flight: 20,300 kg.
2/12/15	1. Group meeting to discuss the MEL of ATPCS system. 2. Reviewed and discussed FOM CH 6, CH 7, CH8, CH 9 and CH11. 3. Attended the CVR verification. 4. Checked and reviewed crew training related information 5. Continued to interview the TNA flight crew

Date	Activities
	6. Planned and negotiated the OBS flight.
2/13/15	1. Preliminary group discussion about CVR (Cockpit Voice Recorder) transcript. 2. Discussed the detailed flight crew training related issues. 3. Interviewed two flight crews in TNA ATR fleet. There were totally 11 flight crew interview task have been completed up to date 4. Reviewed and updated the action log, 23 action items have been logged on the action log. 5. Wrote up the interview notes, 4 interview notes have been done up to date 6. Attended the CVR transcript verification, the required CVR transcript has been completed today. 7. Discussed the contents of OEB 14
2/16/15	1. Group meeting to discuss the CVR transcript. 2. Wrote up the interview notes, 3 more interview notes have been done today 3. Preliminary FDR study. 4. Reviewed and discussed the FCTM and FTMM
2/24/15 To 3/08/15	1. Acquired the crew's activities on the occurrence day and the crew's families contact information. 2. Provided the FDR data to group members for them to review. 3. Worked out the required document list for the FLT OPS. 4. Conducted the preliminary review of the crew training records and found some anomalies. 5. Found the cockpit sterile policy which is in FOM 7.5.8 Sterile Cockpit Environment 6. Sorted out the before T/O SOP 7. Phone interviewed with the spouse of CM1 & CM2. 8. Reviewed and discussed the draft sequence of events
3/09/15	1. Wrote up the interview notes.

Date	Activities
	2. Initialized the detailed sequence of events
3/13/15	1. Group meeting to discuss the factual status 2. Reviewed the sequence of events 3. Initialized potential safety factors of GE235
3/18/15	1. Group meeting to discuss the factual status 2. Reviewed the sequence of events and potential safety factors. 3. Discussed the detailed SIM test requirements and scenario.
3/23/15	1. Attended the progress meeting 2. Studied the SID procedures and runway analysis data of Songshan airport and compare it with the flight track. 3. FCOM and SOP review and comparison
3/25/15	1. Group meeting to discuss the factual report outline. 2. Defined the work assignment of FLT OPS group factual report. 3. Reviewed the crew's 72 hours activities.
3/27/15	1. Reviewed and discussed the flight crew training manual 2. Reviewed the OEB on Feb. 15
4/14/15	1. Group meeting to discuss the factual report and the detailed requirements of simulator test. 2. Continually reviewed the sequence of events and potential safety factors. 3. Mapped out the safety factors map
4/17/15	Reviewed the FDR data and discussed the flight track with FDR group.
4/20/15	1. Wrote up the factual data report. 2. Prepared the interview question to the training department of TNA
4/21/15	Wrote up the factual data report.
4/23/15	1. Wrote up the factual data report.

Date	Activities
	2. Interviewed with the training manager of TNA
4/24/15	1. Wrote up the factual data report. 2. Discussed the factual progress and follow on task
4/29/15	1. Group meeting for the progress 2. Conducted the cockpit display test
4/30/15	1. Progress meeting to review the draft factual report and potential safety factors.
5/05/15	1. Conducted the cockpit display test
5/06/15 To 5/15/15	1. Wrote up the functions and the displays of ATPCS paragraph and added in to the factual report 2. Prepared for the TNA PT/PC SIM training observation task; included OBS plan, data requirements, detailed procedures and ATR72-600 SOP study
5/20/15 To 5/23/15	1. Conducted the TNA PT/PC SIM observation task in BKK. 2. Wrote the observation notes of BKK PT/PC/training
5/25/15 To 6/18/15	1. Discussed and wrote up the SIM test plan to TLS 2. Negotiate ATR for the SIM test task 3. Reviewed and discussed the draft factual report

III. Factual Description

1.1 History of Flight

On February 4, 2015, an ATR72-212A(600 version) aircraft, registered B-22816, was operating as a TransAsia Airways (TNA) flight GE235 with 58 occupants on board, including 2 captains, 1 first officer, 2 cabin crews and 53 passengers. At 1054 [1] Taipei Local Time, approximately 3 minutes after taking off from runway 10 of Songshan Airport (RCSS), the flight crashed into Keelung River approximately 3 nautical miles east of RCSS. The airplane was destroyed on impact and more than half of the main wreckage was immersed in the middle of the river (Figure 1.1-1). Forty-three occupants, including 3 flight crewmembers, 1 cabin crew and 39 passengers, were fatally injured. The other 13 passengers and 1 cabin crew sustained serious injuries and 1 passenger received minor injuries. When GE235 flew over an overpass before crashing into water, its left wing hit a taxi with two occupants. The taxi driver sustained serious injuries and the passenger sustained minor injuries.

Figure 1.1-1 GE235 main wreckage

[1] Unless otherwise noted, all time in this report are Taipei Local Time (UTC+8 hours) based on a 24-hour clock.

On the date of occurrence, the flight crew was assigned to fly 2 round trips from RCSS to Kinmen Airport (RCBS) dispatched with two captains and one observer for a total of 4 flights with the B-22816. The flight legs began at RCSS as flight GE231, departed at 0744 and arrived in RCBS at 0850. The turnaround flight GE232 departed at 0917 and arrived in RCSS at 1012. There was no anomaly reported for the previous 2 flights.

The third flight, GE235, the occurrence flight, was scheduled to depart at 1045 from RCSS for RCBS. Captain A, who was the pilot-in-command (PIC), occupied the left seat and was the pilot flying (PF) for the takeoff, while the Captain B occupied the right seat and was the pilot monitoring (PM). The first officer occupied the observer seat as an observer pilot (OBS). The flight track was shown in figure 1.1-2.

Figure 1.1-2 GE235 departure flight track

According to Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR) data[2], GE235 took off from RCSS runway 10 at 1052, and followed MUCHA 2 Quebec Standard Instrument Departure (SID) procedure bound for RCBS. The airplane started to takeoff rolling at 1051:39, 4 seconds latter (1051:43), the PM mentioned that the Automatic Take-off Power Control System (ATPCS) was not armed. The PF responded with "*really*" and then said "*ok continue to take off*". PM followed "*we will continue*". Seven seconds later the PM stated "*oh there it is ATPCS armed*", then the aircraft reached V1 (107 knots[3]) and became airborne at 1052:01. The landing gear was retracted after achieving a positive rate of climb, the airplane accelerated and continued to climb. The selected altitude was 5,000 feet (ALT SEL 5,000) and the speed selected was 115 knots. The left coupling autopilot was engaged with

[2] Some of CVR transcript is in Chinese and has been translated into English in this report.

[3] The speed described in this report is computed air speed.

LNAV and IAS mode. At 1052:34 the tower informed GE235 to contact Taipei approach while the airplane was climbing through an altitude[4] of 1,000 feet and started turning to the right.

At 1052:38, the airplane was climbing through 1,200 feet and continued turning to the right, FDR recorded parameters indicating that number 1 engine (ENG1) was in up-trim condition and its bleed valve was closed, which corresponded to the beginning of ATPCS sequence, that also included the auto feathering of number 2 engine (ENG2) propellers. Master Warning sounded in the cockpit and ENG2 propeller pitch angles started to increase to feather position after the beginning of the ATPCS sequence. "ENG 2 FLAME OUT AT TAKE OFF" procedure was displayed on the Engine and Warning Display (EWD).

At 1052:41, the airplane climbed through an altitude of 1,300 ft and the autopilot was manually disconnected. Three seconds later at 1052:44 the ATPCS sequence ended, ENG2 propeller was fully feathered. At 1052:43 PF said "*i will pull back engine one throttle*", PM responded "*wait a second cross check*", but ENG1 power lever Angle (PLA[5]) was already retarded from 75 degrees to 66 degrees. PF and PM then announced heading mode, and continued the flight. At 1052:51, the airplane was climbing through 1,485 feet at 106 knots, and the heading was 131 degrees, the Automatic Flight Control System (AFCS) modes showed HDG SEL and IAS mode. At 1052:57 the selected heading was 092 degrees, the airplane then started turning to the left, and the speed was 106 knots.

At 1053:00, PM stated "*okay engine flame out check*", PF responded "*check"* and PM continually stated "*check uptrim yes, auto feather yes*". At 1053:05 PF responded "*okay*", almost at the same time PM stated "*watch the speed*", the speed at that moment was 101 knots, and then PF stated "*pull back number one*", the ENG1 PLA was retarded to 49 degrees. While the ENG1 PLA was retarded, almost simultaneously PM said "*okay now number two engine flameout confirmed*", and PF responded "*okay*" but the ENG1 PLA still remained at 49 degrees.

At 1053:09, the airplane reached 1,630 ft. It was the highest altitude recorded in this flight, and the speed was 102 knots. AFCS IAS mode reverted into PITCH HLD mode, one second later the stall warning

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[4] The altitude described in this report is radio altitude.

[5] The PLA signal is from Mechanical Fuel Control Unit(MFCU) angle on airplane and is recorded on FDR, rather than the pedestal angle.

sounded in the cockpit for 1 second, then the PF stated "*terrain ahead*", PM stated " *okay lower…*" and the OBS said "*you are low*". At 1053:13 the stall warning sounded for 4 seconds with the stick shakers and in that time periods, PM stated "*okay push, push back*", PF stated "*shut*", PM responded "*wait a second…throttle throttle*". During the time period between 1053:13 and 1053:15, the ENG2 PLA was advanced to 86 degrees and the ENG1 PLA was retarded to around 34.5 degrees (idle position). At 1053:18, the speed was 101 knots and the altitude was 1,526 ft and continually descending, the heading was 087-degrees, and continuously turned to the left with 10 to 20 degree bank. At 1053:19 PF said "*number one*" and followed "*feather shut off*", in the mean time PM called *"number feather*", then the stick shaker and stick pusher warnings were triggered several times until 1053:27. At 1053:24, the FDR indicated the ENG1 condition lever was at fuel shut off position, and 6 seconds later the ENG1 propeller reached the feather position, the speed was 110 knots at 1,165 ft descending.

At 1053:35, PM declared mayday to ATC, the airplane heading was 050 degrees and started to bank to the right. At the time period of 1053:46 to 1054:04, the flight crew tried to engage the AP twice, but did not succeed. At 1053:53, OBS said "*how come it becomes like this*". At 1054:05, PM stated "*we lost both sides*", two seconds later, PM realized and stated "*both engines were flameout*". At 1054:09, PF stated "*restart the engine*", and the altitude was 545 ft with speed of 105 knots, he repeated "*restart the engine*" 8 times in total after then. From that time on, the airplane entered stall conditions until the end of the flight.

At 1054:20, the ENG1 condition lever was moved out of shut off position, at 1054:25,the ENG1 high pressure speed (NH1) rose to 30 % and the speed at that moment was 106 knots, the altitude was 400 ft, and the airplane started to bank to the left. At 1054:27, PF said "*wow pulled back the wrong side throttle*".

At 1054:34, Enhanced Ground Proximity Warning System (EGPWS) "Pull-up" warning sounded in the cockpit. At 1054:35 the airplane increased bank from 10 to 80 degree left side, made first impact with a taxi driving on the overpass, then hit the fence and a light pole at the edge of the overpass located southwest of the crash site near Keelung river (Figure 1.1-3), and continued to bank left after impact, then crashed into the river with an upside down attitude.

Figure 1.1-1 GE235 lost control and first impact picture

1.5 Personnel Information

1.5.1 Flight Crew's Background and Experience

1.5.1.1 Captain A

Captain A had the nationality of the Republic of China, and served in the Air Force as a pilot. He joined other Airlines in September 2009 after retired from the Air Force and left that Airline in March 2010.

Captain A joined TNA in August 2010, completed initial training in February 2011, and served as a first officer in the ATR72-500 fleet. In August 2014, he completed ATR72-500 upgrade training and was promoted as a captain. In November 2014, he completed differences training and transferred to the ATR72-600 fleet as a captain.

As of the date of the occurrence, he accumulated 4,914 total flight hours, including 3,151 hours in the ATR72-500, and around 250 hours in the ATR72-600 respectively.

Captain A held an Air Transport Pilot License (ATPL) issued by the Civil Aeronautics Administration (CAA) of the Republic of China with Multi-Engine Land rating, type rating in both ATR72-500 and ATR72-600, endorsed with privileges for operation of radiotelephone on board an aircraft with no limitation, and remarked with "English Proficient: ICAO Level 4 Expiry Date 2017-01-02".

1.5.1.2 Captain B

Captain B had the nationality of the Republic of China. He joined TNA on June 5, 2006, completed his first officer training on August 14, 2007, and served as a first officer in the ATR72-500 fleet. On September 3, 2011, captain B completed his upgrade training and was promoted as a captain. On February 25, 2014, captain B completed ATR72-600 differences training and transferred to the ATR72-600 fleet as a captain.

As of the date of occurrence, he accumulated 6,922 total flight hours, including 5,687 hours in the ATR72-500, and 795 hours in the ATR72-600 respectively.

Captain B held an Air Transport Pilot License (ATPL) issued by the CAA of the Republic of China with ratings of Multi-Engine Land, Instrument Aero plane, type ratings on the ATR72-500 and ATR72-600, and endorsed with privileges for operation of radiotelephone on board an aircraft with no limitation, and remarked with "English Proficient: ICAO Level 6 with Perpetual valid."

1.5.1.3 First Officer

The first officer had the nationality of the Republic of China. He had the flight experience in MD-80S in his previous company, and joined TNA on October 4, 2008. He completed his transition training on November 18, 2009 and served as a first officer in the ATR72-500 fleet. On January 12, 2015, he began to receive ATR72-600 differences training, and was still under training on the date of occurrence.

As of the date of occurrence, he accumulated 16,121 total flight hours, including 7,911 hours in the MD-80S, 5,306 hours in the ATR72-500, and 8 hours in the ATR72-600 respectively.

The first officer held an Air Transport Pilot License (ATPL) issued by the CAA of the Republic of China with ratings of Multi-Engine Land, Instrument Aeroplane, type ratings on the ATR72-500 and ATR72-600, MD-80S, and endorsed with privileges for operation of radiotelephone on board an aircraft with limitations of “ATR72-500 F/O; ATR72-600 F/O”, and remarked with “English Proficient: ICAO Level 4 Expiry Date 2016-09-13”.

Table 1.5-1 Flight crew's basic information

Item	Captain A	Captain B	First officer
Gender	Male	Male	Male
Age	42	45	63
Date of hiring in TNA	16 August 2010	5 June 2006	4 October 2008
License issued	ATPL – Aeroplane	ATPL – Aeroplane	ATPL– Aeroplane
Type rating Date of expiry	ATR72-600 04 November 2019	ATR72-600 29 December 2018	ATR72-600 22 June 2017
Medical certificate issued Date of expiry	First class 31 March 2015	First class 31 March 2015	First class 28 February 2015
Total flight time	4,914 hrs and 51 min.	6,922 hrs and 58 min.	16,121 hrs and 57 min.
Total flight time of ATR 72-600	250 hrs and 44 min.	794 hrs and 55 min.	8 hrs and 6 min.
Total flight time last 12 months	877 hrs and 29 min.	788 hrs and 27 min.	888 hrs and 16 min.
Total flight time last 90 days	246 hrs and 30 min.	202 hrs and 23 min.	165 hrs and 51 min.
Total flight time last 30 days	82 hrs and 38 min.	68 hrs and 21 min.	9 hrs and 52 min.
Total flight time last 7 days	18 hrs and 15 min.	22 hrs and 42 min.	8 hrs and 6 min.
Total flight time last 24 hours	2 hrs and 23 min.	2 hrs and 23 min.	0 hrs and 0 min.
Rest period before occurrence	16 hrs 35 min	16 hrs 35 min	20 hrs 30min.

1.5.2 Flight Crew Training Record

1.5.2.1 Captain A

Initial Training in Previous Airlines

Captain A received the A330 initial transition training form September 2009 to March 2010. The detailed records and summary referred to Attachment 1-1.

Initial Training in TNA

Captain A received his ATR72-500 initial training from 16 August 2010 to 18 February 2011. He completed the initial training and passed the first officer line check on 4 March 2011.

Upgrade Training

Captain A received his upgrade training of ATR72-500 from 14 April 2014. He passed ground school and simulator sessions, but failed in simulator check on 31 May 2014 with unsatisfactory items of "ABNORMAL ENG START", "BOTH HYD SYS LOSS", and "S/E APP GO AROUND". The check airman's comments were as follows:

- Incompletion in procedure check and execution;
- Insufficient knowledge of QRH (ENG FLAME OUT AT T/O, BOTH HYD SYS LOSS);
- Did not fully advanced power levers to ramp position during the SINGLE ENGINE APP GO AROUND;
- Did not follow SOP of ENG FIRE operation while on short final and altitude below 400 ft;
- Cockpit management and flight planning should be improved.

After a TRB held on 19 June 2014, the flight operations division decided to provide Captain A one more simulator session plus one more simulator check on 29 to 30 June 2014, conducted with the Assistant Vise-President (AVP), Flight Operations Department (FOD) serving as an Instructor Pilot (IP) and the ATR chief pilot serving as a Check Pilot (CP). He completed that additional session and passed the simulator check afterward, and was qualified as a captain on 1 July 2014.

He then completed line training from 2 July to 10 August 2014. During the process, the comments addressed by the instructors were summarized as follows:

- Prone to be nervous and may make oral errors during the engine start procedure;
- Insufficient knowledge leading to hesitations in “Both EEC Failure” and “Engine Failure after V1” situation during the oral test;
- Lack of confidence and being nervous while answering the Smoke procedure during the oral test;
- Incompletion in certain procedure check and execution;
- Prone to be hesitated when facing situation that requires making decisions;
- Flight planning should be improved.

Differences Training

Captain A received a one-week ATR72-500/600 difference training from ATR Training Center in Singapore from 27 to 31 October 2014. The training syllabus referred to Appendix 1-1.

The results of the VHP[6] sessions in the first 4 days were “*Progress is Normal*” with instructors’ comments of “*Good Job*”.

The result of the FFS session in the final day was “*May Need extra training*” with instructor’s comment of “*Check EFATO[7] call out and task sharing and GA single engine*”.

Captain A passed the session check and was qualified as a captain of ATR72-600 on 2 November 2014; All described weak items have been checked again during this session with positive result. "Satisfactory" - "all STD". He then passed the line check on 11 November 2014.The certificate was issued on 14 November 2014 by the ATR Training Center.

Captain A then passed the line check on 11 November 2014 and started to serve as a captain of ATR72-600.

Recurrent Training

The latest two annual proficiency trainings and checks for Captain A were consolidated with his Upgrade and Differences Training in 2014 addressed above respectively. The results showed in the records were both “passed”.

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[6] VHP: Virtual Hardware Platform Trainer.

[7] EFATO: Engine Flame Out at Take Off.

1.5.2.2 Captain B

Initial Training

Captain B received his ATR72-500 first officer initial training from 22 March 2007, including phase one “basic ground training”, phase two “airplane type ground training”, phase three “observation flights”, phase four “simulator training”, phase five “local training”, and phase six “Initial Operating Experience (IOE) line training”. He completed the initial training successfully on 14 August 2007, and was qualified as an ATR72-500 first officer; there were no significant comments regarding checks of these training.

Upgrade Training

Captain B received his ATR72-500 upgrade training from 27 June 2011, including ground training, simulator training, and line training. He completed upgrade training successfully on 03 September 2011 and was qualified as an ATR72-500 captain; there were no significant comments regarding these checks.

Differences Training

Captain B received his ATR72-600 differences training from 16 December 2013, including ground training, simulator training, and line training. The ground training and simulator training were conducted in the ATR Singapore training center. He completed the check for difference simulator training on 21 December, 2013, and the comment from the JAA certified examiner was “Standard Session”. Line check was conducted successfully on 25 February 2014, and the comment from the JAA certified examiner was “Good Job, Satisfactory”. There were no other significant comments regarding these checks.

Recurrent Training

The annual recurrent ground training was conducted on 4 December, 2014 for eight hours in total. The syllabus included adverse weather operations, normal/abnormal procedure, such as PF/PM and other flight crew task sharing, positive transfer of aircraft control, consistent checklist philosophy, emphasis on an "aviate, navigate, communicate" priority, proper use of all levels of flight automation, proper crew response to system malfunction, and aircraft type systems and limitations.

The latest proficiency training (PT) was conducted on 6 December, 2014. The syllabus included stall recovery, unusual attitude recovery, and engine flame out at takeoff. The result of training was “Satisfactory”; the

JAA certified IP comment was “Satisfactory, Good Job”.

The latest proficient check (PC) was conducted on 7 December, 2014. The result of check shows on the proficiency check records was “pass”, and the comment for the captain B was “aircraft maneuvering and procedures are conducted in accordance with standards, general handling of emergency, general CRM. The result of check was “pass.”

The latest proficiency line check was completed on 25 February 2014, same as the line check of difference training.

1.5.2.3 First Officer

Transition Training

The first officer had experience as an MD-82 captain with his previous company. After joining TNA, he was hired as a first officer in accordance with the Civil Aviation Law.

He began his ATR72-500 transition training from 16 June, 2008. The training syllabus included ground training 254 hours, line observation training 25 hours minimum, simulator training 11 sessions, local training 2 hours 56 minutes, and line training 3 phases.

The first officer failed his first simulator check; the comment from the examiner was “Could not properly identify abnormal engine start. Not properly handle standard callouts, engine flame out, engine fire, and go around.”

He passed his simulator check after remedial training on 19 September, 2008. He completed transition training on 8 November, 2008 and the line check result was “pass”.

Recurrent Training

The latest recurrent ground training was conducted on 12 September, 2014, for eight hours in total. The syllabus included adverse weather operations, normal/abnormal procedure, such as PF/PM and other flight crew task sharing, positive transfer of aircraft control, consistent checklist philosophy, emphasis on an "aviate, navigate, communicate" priority, proper use of all levels of flight automation, proper crew response to system malfunction, and aircraft type systems and limitations.

The latest proficiency training was conducted on 17 September, 2014. The syllabus included stall recovery, unusual attitude recovery, and engine flame out at takeoff. The result of training was “Satisfactory”.

The latest proficient check was conducted on 18 September, 2014.

Check items included stall recovery, unusual attitude recovery, and engine flame out at takeoff. The result of check was “pass”.

The latest annual line check was completed on 26 November, 2014. The result of check was “pass”.

Differences Training

The first officer received his ATR72-600 differences training from 12 January 2015, including ground training, simulator training, and line training.

The ground training and simulator training were conducted in the ATR Singapore training center. He completed the check for difference simulator training on 19 January. 2015. The result of check was “pass”, but part of the comment from the examiner were “*will need some time to get used to the 600 (ATR72-600), flying with an experienced captain is strongly recommended*.”

As the date of occurrence, the first officer was still under his ATR72-600 differences training, the occurrence flight was an observation flight for him.

1.5.3 Flight Crew Medical Information

1.5.3.1 Captain A

The latest first class medical certificate of captain A was issued by CAA on 03 September 2014 with limitations on “Holder shall wear corrective lenses”.

1.5.3.2 Captain B

The latest first class medical certificate of captain B was issued by CAA on 12 September 2014 with no limitations.

1.5.3.3 First Officer

The latest first class medical certificate of first officer was issued by CAA on 2 October 2014 with limitations on “Holder shall wear corrective lenses”.

1.5.4 Flight Crews’ Activities within 72 Hours before the Occurrence

1.5.4.1 Captain A

1. February 1st, 2015: rest period before flight duty was 19 hours and 44

minutes. Reported to Songshan airport at 0640 and carried out scheduled flights of Songshan → Kinmen → Songshan → Kinmen → Songshan, total flight time was 4 hours 26 minutes, and then the assigned flight duty ended at 1405.

2. February 2nd, 2015: day off, no assigned flight or ground duty.

3. February 3rd, 2015: rest period before flight duty was 40 hours 35 minutes. Reported to Songshan airport at 0640 and carried out scheduled flights of Songshan → Kinmen → Songshan → Kinmen → Songshan, total flight time was 4 hours 30 minutes, and then the assigned flight duty ended at 1405.

4. February 4th, 2015: rest period before flight duty was 9 hours 55 minutes. Reported to Songshan airport at 0640 to carry out the flight duty of the occurrence date.

1.5.4.2 Captain B

1. February 1st, 2015: rest period before flight duty was 17 hours 26 minutes. Reported to Songshan airport at 1320 and carried out scheduled flights of Songshan → Kinmen → Songshan → Hualien → Songshan, total flight time was 3 hours 44 minutes, and then the assigned flight duty ended at 1935.

2. February 2nd, 2015: day off, no assigned flight or ground duty.

3. February 3rd, 2015: rest period before flight duty was 35 hours 5 minutes. Reported to Songshan airport at 0640 and carried out scheduled flights of Songshan → Kinmen → Songshan → Kinmen → Songshan, total flight time was 4 hours 30 minutes, then the assigned flight duty ended at 1405.

4. February 4th, 2015: rest period before flight duty was 9 hours 55 minutes. Reported to Songshan airport at 0640 to carry out the flight duty of the occurrence date.

1.5.4.3 First Officer

1. February 1st, 2015: day off, no assigned flight or ground duty.

2. February 2nd, 2015: went to office for self-study from 0830 to 1730,

and then went home.

3. February 3rd, 2015: day off, no flight or ground duty assigned.

4. February 4th. 2015: reported to Songshan airport at 0640 for the flight duty of the occurrence date as an observer.

1.6 Airplane Information

1.6.1 The ATPCS

The ATPCS is one of a sub-system of propulsion unit, which provides in case of an engine failure during takeoff the uptrimmed takeoff power and auto-closing of bleed valves on the live engine combined with an automatic feathering of the failed engine. This system enables to reduce the power normally used for takeoff by an amount of about 10% below the power certified by the engine manufacturer. This is favorable to engine/propeller life without affecting the takeoff performance in case of an engine failure. Full ATPCS (uptrim and auto feathering) is only available for takeoff.

The ATPCS operates with an Auto Feathering Unit (AFU) on each engine. The AFU conditions torque signal and send it to the MFCs (Multi Function Computers) which includes autofeather/uptrim logic functions. The MFC delivers signals to the Engine Electronic control (EEC) to enable power increase from takeoff power to reserved takeoff power, to the feather solenoid mounted on the Propeller Valve Module (PVM), and the feathering electric pump installed on the reduction gear box on each engine.

The control in the cockpit includes the ATPCS push button on the cockpit center panel, the power lever (PL) position (switch set to 49°) and a test selector located on the pedestal. The arming conditions are shown in Figure 1.6-1. The trigger condition is one of the engine torques below 18% and the sequence after trigger is shown in Figure 1.6-2.

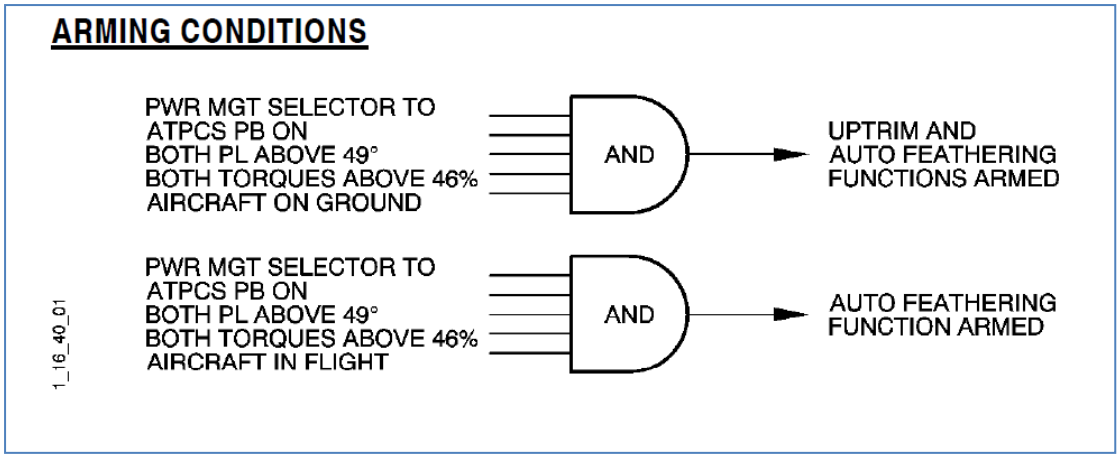

Figure 1.6-1 The ATPCS arming conditions

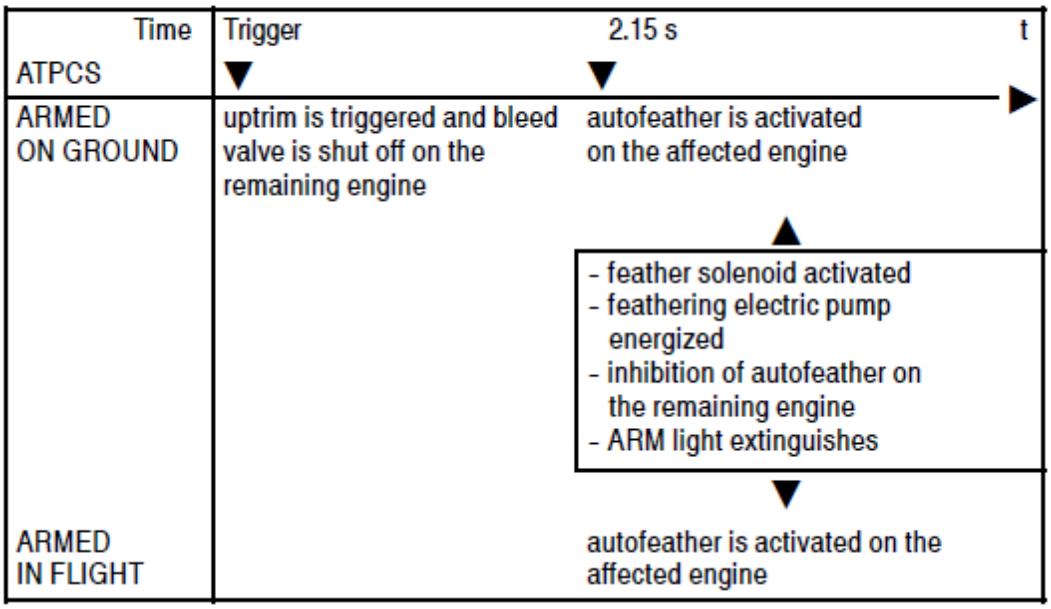

Figure 1.6-2 The ATPCS sequence after trigger

Once the sequence has been triggered, its cancellation can only result from either of the following actions: PWR MGT selector not in TO position, ATPCS Push Button set to OFF position or retard both PL bellow 49°. When the ATPCS is triggered, the Engine and Warning Display (EWD) will show "UP TRIM" on live engine, "AUTO FTR" on affected engine and the procedure of ENG1(2) FLAME OUT AT TAKE OFF. Figure 1.6-3 and Figure 1.6-4 illustrate simulated EWD displays of engine #2 autofeathering and the "ENG 2 FLAME OUT AT TAKE OFF" procedure.

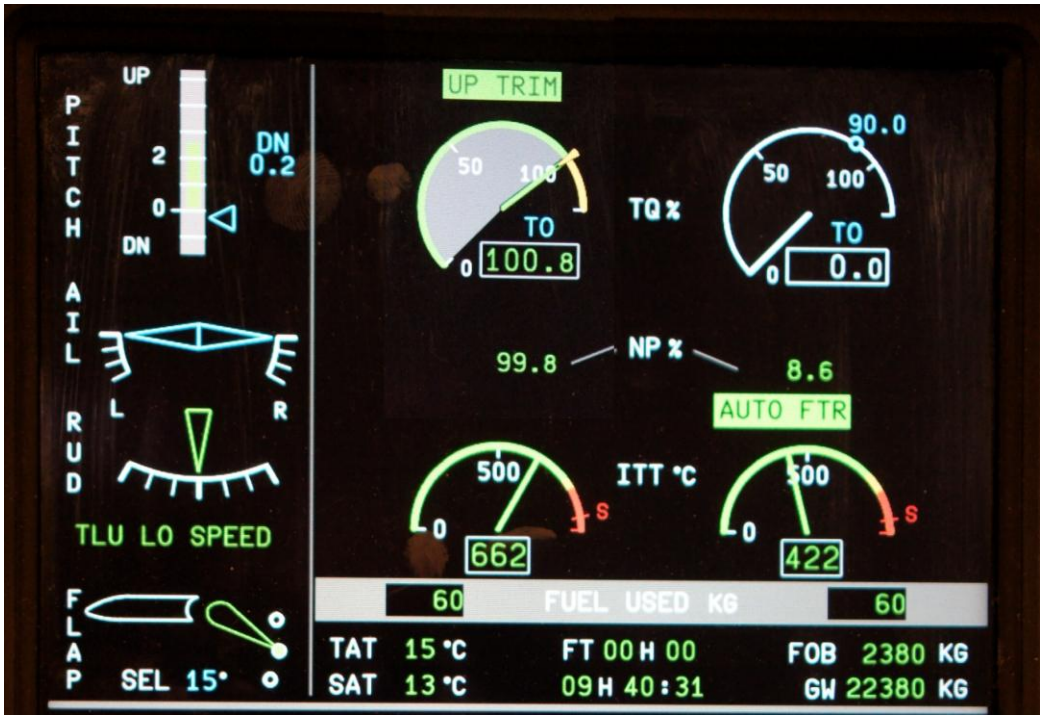

Figure 1.6-3 Simulated EWD display of ENG 2 autofeathering at takeoff

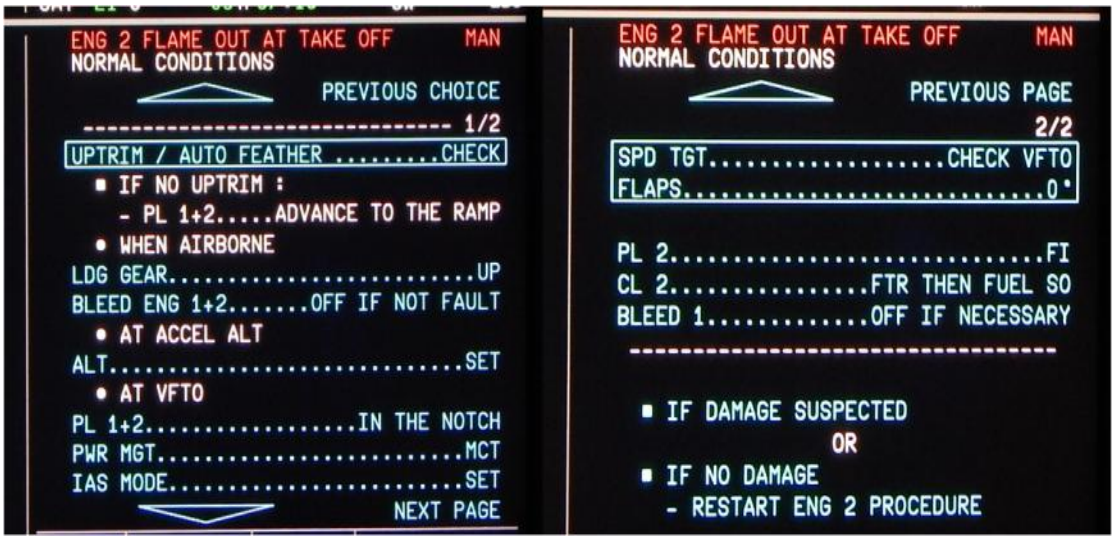

Figure 1.6-4 Simulated EWD display of ENG 2 FLAME OUT AT TAKE OFF procedure

1.6.2 Weight and Balance Information

The actual takeoff weight of this airplane was 44,890 lb. and was loaded within Weight and Center of Gravity (CG) limits. The center of gravity of takeoff was located at 27.6% MAC and was within the certified limitations between 20.8% and 37% Mean Aerodynamic Chord (MAC). The center of gravity envelope of ATR72-600 is shown in Figure 1.6-1. Table 1.6-1 shows the weight and balance data.

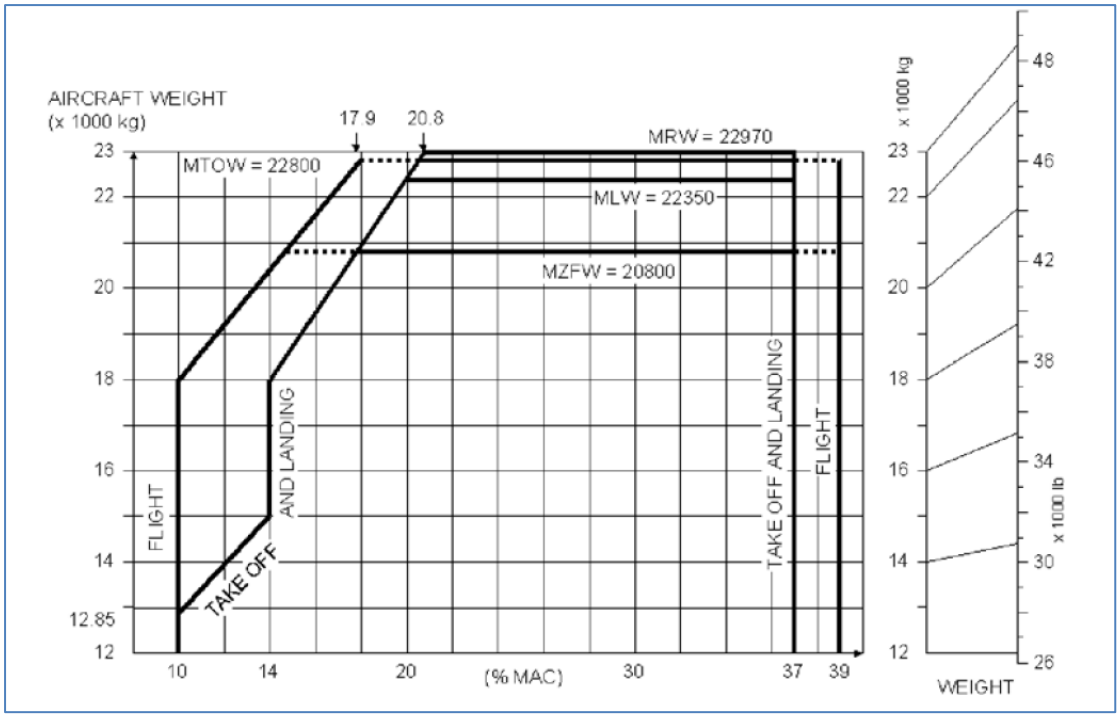

Figure 1.6-4 The center of gravity envelope of ATR72-600

Table1.6-1 Weight and balance data

Max. zero fuel weight	45,856 Lbs
Actual zero fuel weight	39,989 Lbs
Max. takeoff weight	50,265 Lbs
Actual takeoff weight	44,890 Lbs
Take off fuel	4,901 Lbs
Estimated trip fuel	1,720 Lbs
Max. landing weight	49,273 Lbs
Estimated landing weight	43,170 Lbs
Takeoff Center of Gravity	27.6% MAC*

*MAC: Mean Aerodynamic Chord

1.16 Tests and Research

1.16.1 TNA Simulator Training Observation

In May 2015, three members of the Flight Operations Group took 2

days to observe 6 sessions of TNA's ATR72-600 fleet annual recurrent training and check (PT/PC) in Bangkok Airways training center, Bangkok. Four of 6 were PT, Another 2 were PC, the crew paring include a captain and a FO play PF and PM in each session, and conducted by the instructor pilot/check pilot. The task/events of the specific PT/PC are shown as Appendix 1-2. The detailed OBS report referred to Attachment 1-2. The observations summary is briefed as below:

The ATPCS test was not performed in the sessions(include the PC sessions); the takeoff briefing did cover the single engine procedures and the acceleration altitude, the flight crew did conduct the ATPCS callout "ARM" during the airplane takeoff rolling. The PF was responsible for the PL and PM was responsible for CL during the single flameout procedures operations, however, the PF operated both of the PL and CL during the emergency descend and engine fire during takeoff operations.

1.17 Organizational and Management Information

1.17.1 Flight Operations Division

The TNA FOD is headed by an AVP and consists of Administration & Scheduling Department, Fleet Management Department and Standard, Training & Development Department (STDD). The organization chart of Flight Operations Division refers to Figure 1.17-1.

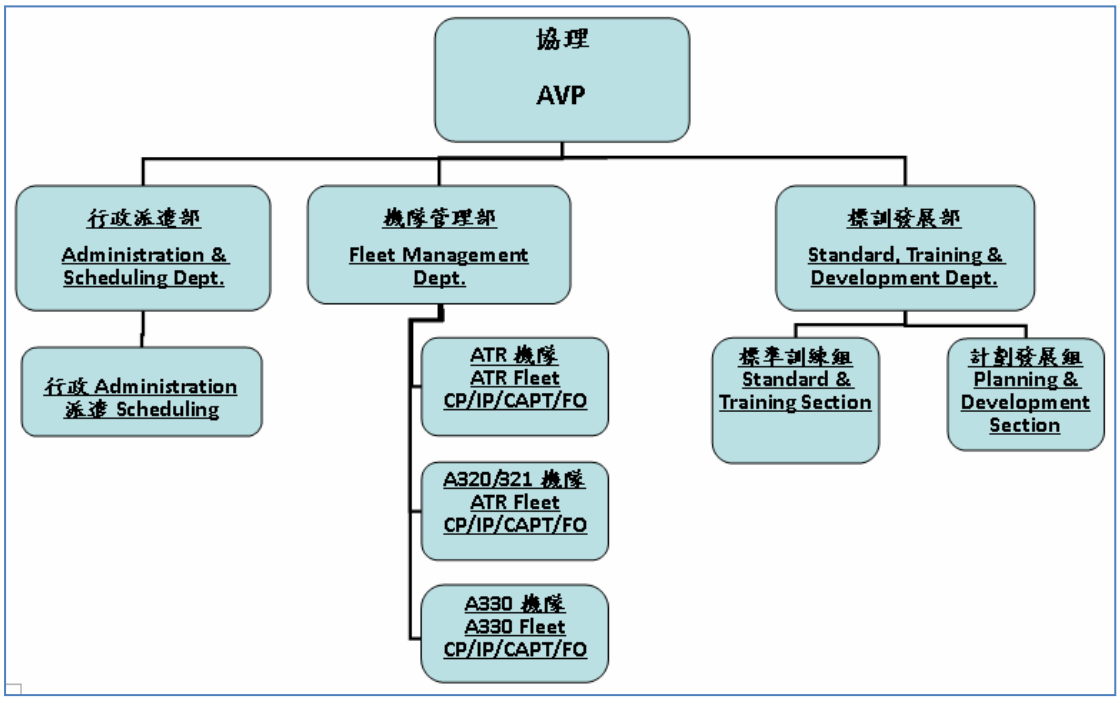

Figure 1.17-1 Organization chart of TNA Flight Operations Division

The Standard Training & Development Department is responsible for the flight trainings and checks of pilots in TNA. This department provides the following trainings and checks for all fleets, including the ATR fleet:

(a) Aircraft type training;
(b) Ground school;
(c) Initial training;
(d) Recurrent training;
(e) Transition training;
(f) Upgrade training;
(g) Instructor and examiner training;
(h) Ab-initio training;
(i) Re-qualification training;
(j) Cross crew qualification (for airbus fleet) or differences (for ATR fleet) training.

In addition to the aforementioned trainings, the STDD also provides dangerous goods training and special operations training, such as RVSM (Reduced Vertical Separation Minimum), PBN (Performance Based Navigation), ETOPS (Extended Range Two Engine Operations), LVO (Low Visibility Operations), Cold Weather Operations and High Elevation Airport Operations.

The specific first officer upgrade training referred to 1.17.2.

1.17.1.1 Initial Training

The aircraft initial training comprises of the following:

(a) Ground school: may be conducted by e-learning or in the class room for teaching aircraft systems, aircraft performance, related regulations, safety related and emergency procedures;

(b) Line observation: There are totally 8 flights, four of it must be completed before commencing simulator training; another 4 will be conducted before Initial Operating Experience (IOE);

(c) Simulator training: There are totally 18 sessions covering normal, abnormal and emergency procedures, including wind shear, CFIT, TCAS, and Unusual Attitude Recovery. This training of 7 sessions is conducted in fixed based, and 11 sessions of full flight simulator;

(d) Local training: The local training includes two training flights and one check flight;
(e) IOE: contains three different phases. The first phase focuses on the PM duties, the second phase focuses on the PF duties, and the last phase emphasizes total performance;
(f) Trainees will be required to pass a final line check prior to be a fully qualified line pilots.

1.17.1.2 Recurrent Training

The Standard Training & Development Department also provides a recurrent training program for pilots every 6 months or annually. The program consists of ground school and simulator sessions. The ground school shall not be less than 20 hours each year. Within the twelve calendar months valid period of type rating certificate, two recurrent trainings and checks shall be conducted. The training shall be completed before the check, and the interval between two checks shall be within four to eight calendar months.

1.17.2 First Officer to Captain Upgrade Process and Training

1.17.2.1 Captain Upgrade Selection Process

First Officer to Captain Upgrade (hereinafter "upgrade") procedures in TNA is described in section 5-3 of the Flight Operations Division (FOD) Operations Manual (See 1.18.1.6). The section 5-3-1 "Selection Procedures" indicates that the FOD shall hold a meeting which at least has the presence of two-thirds of the fleet Instructor Pilot (IPs) and Check Pilots (CPs) to carry out a review and oral test for determination of final scores and ranking of the candidates for upgrade training. A candidate, whose score of oral test below 60 points given by one-third of the interviewers, cannot be recommended to attend upgrade training.

Three ATR First Officers including Captain A of the GE235 attended the above oral test on April 7, 2014. The interviewers of the test consisted of 6 ATR IP/CPs (12 IP/CPs at that time in total). One interviewer gave below 60 points to all interviewees, another one gave exactly 60 points to all interviewees and the others gave above 60 points to all interviewees.

1.17.2.2 Upgrade Training

Upgrade training in TNA comprises ground training, flight simulator training and line training as described in section 2.4 of the Flight Training Management Manual (Ref. 1.18.1.5). The section 2.4.2 "Ground Training" indicates that the ground test shall be conducted after the completion of all

ground courses.

Four ATR First Officers attended the upgrade training in 2014. Three of the trainees including Captain A completed all ground courses after they had the ground test on May 12, 2014. The reason was they were assigned flight duty during the ground training periods.

1.17.3 ATR72-500 to ART72-600 Differences Training

1.17.3.1 EASA Operational Evaluation Board Report

The ATR72-500 to ATR72-600 differences (hereinafter "ATR72-600 differences") training program in TNA was developed according to the EASA Operational Evaluation Board (OEB) report[8]. Two types of ATR72600 differences training programs are recommended in OEB report, including 5-day or 10-day programs respectively. As described in section 6.4.1 of OEB report, the 5-day program requires trainees to be current and qualified on the ATR72-500 and have a minimum experience on ATR aircraft of 500 hours in total, or 100 hours in the last twelve months; Pilots not meeting the above pre-requisites of ATR72-500 experience should follow the 10-day program.

The section 6.7.1 of the OEB report indicates that several items should receive special emphasis on the differences training, such as:

- Engine malfunctions during take-off;
- Use of avionics in normal and abnormal / emergency operations, including Flight Mode Annunciation (FMA) annunciations, caution and warning messages on the Engine & Warning Display, and associated human factors issues;
- Use of flight management system;
- Use of electronic checklist.

Familiarization flights following ATR72-600 differences training are described in section 9.3.2 of the OEB report. Pilots who attend to the 5-day program should receive familiarization flights ranging from 6 to 10 sectors; Pilots who attend to the 10-day program should receive familiarization flights ranging from 25 to 30 sectors.

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[8] European Aviation Safety Agency Operational Evaluation Board Report, ATR 42/72 Flight Crew Qualifications Revision 3, 23 August 2013.

1.17.3.2 TNA ATR72-600 Differences Training Program

A current ATR72-500 aircraft pilot selected to fly an ATR72-600 aircraft shall complete an ATR72-600 Difference training in advance. The TNA ATR72-600 Differences training shall be conducted by ATR as described in section 2.18 of the Flight Training Management Manual (Ref. 1.18.1.5). The training syllabus is described in Appendix 1-1. An extra simulator check shall be conducted by the Designated Examiner (DE) or CAA inspector following the ground and simulator training.

After passing the simulator check, the pilot who holds the ATR72-600 type rating shall have at least 8 sectors of line training and 2 sectors of line check for Initial Operating Experiences of an ATR72-600 aircraft.

1.17.4 Crew Resources Management Training

1.17.4.1 Training Policy

The TNA Crew Resource Management (CRM) training policy for flight crew is described in the Flight Training Management Manual. The TNA latest edition (33rd Edition) of the Flight Training Management Manual (FTMM) was updated on January 8, 2015 (See 1.18.1.5), within one month prior to the GE235 occurrence. The CRM training for the GE235 flight crew was still based on the previous edition of the FTMM.

The requirements of CRM training for flight crew in the latest and the previous edition (the 32nd) of the FTMM are summarized respectively as follows:

The 33rd Edition of the FTMM

- There shall be one course (four hours) of LOFT[9] FFS[10] training in the initial/ upgrade/ transition training respectively;
- There shall be 4 hours CRM ground course in the initial training. The course content includes: definition of CRM, automation, logic of CRM application, CRM policy, CRM development, CRM skills, error avoidance, decision making process, threat and error management, communication, and case introduction;
- After the completion of initial training, all flight crew shall have recurrent CRM ground course every 24 months. There is no training

[9] Line-Oriented Flight Training.

[10] Full Flight Simulator.

hour requirement of recurrent CRM ground course in the FTMM;

- The philosophy and practices of CRM skills shall be an integral part of training courses in a simulator and an aircraft, and be conducted both in initial and annually recurrent trainings.

The 32nd Edition of the FTMM

- There shall be 4 hours CRM ground course in the initial training. There is no any requirement for CRM ground course content in the FTMM;

- After the completion of initial training, all flight crew shall have recurrent CRM ground course at least every 3 years. The recurrent CRM ground course should be included in the safety recurrent training which is conducted by the Safety and Security Office. There is no training hour requirement of recurrent CRM ground course in the FTMM (the duration of the training was one hour every two years according to the training record and Safety Management Manual) ;

- The CRM training shall be incorporated into courses of recurrent simulator training at least once a year;

- The recurrent simulator training (4 hours) shall be designed with LOFT concept once a year. Such training shall be administered real-time in a line environment setting, and an uninterrupted planned scenario with specific CRM objectives where such skills are observed and debriefed up completion.

The TNA flight crew training supervisor and assistant manager stated in the interviews: prior to the GE 235 occurrence, the way to teach trainees how to use CRM skills in simulator trainings depended on IP's experience. The TNA did not provide relevant course to guide IPs how to incorporate the practice of CRM skills into simulator trainings, and also not develop detailed LOFT or CRM scenarios plan with specific CRM objectives for simulator training. In addition, IPs rarely used videos of the simulator training for discussion the CRM performance with trainees during the training debriefing.

1.17.4.2 Materials of CRM and Human Factors Ground Courses

The main content of CRM course to flight crew focused on the introduction of CRM development history. Each instructor has his/her own training materials. In accordance with the statements of TNA safety staff; the training materials of CRM skills are basically followed the chapter 5 of TNA flight operations manual which included: CRM skills, errors

avoidance, threat management, errors management and decision making.

1.17.5 Training Records Management

An operator shall establish a system to keep all training records for CAA's inspection as described in Article 21 of the Aircraft Flight Operation Regulations.

The management of flight operations records and data in TNA is described in the FOD Operations Manual (See 1.18.1.6). The section 11-9 indicated that flight crew training records shall be maintained during the employment period.

Before the GE 235 occurrence, the ART72-600 differences training records of all ATR72-600 pilots were not completely maintained by the Flight Operations Division. The above records are kept by the manufacturer ATR.

1.17.6 ATPCS Associated Policy and Procedure

The ATPCS is a subsystem of power plant unit. The ATPCS provides, in case of an engine failure during take-off, up-trimming take-off power for the remained engine combined with an automatic feathering of the failed engine.

The TNA Flight Operations Division issued two technical notices to ATR pilots[11], in order to reduce the aborted take-off rates due to the ATPCS not armed during take-off rolling in 2011 and 2012 respectively as follows:

- Technical notice No.1001130p in 2011

  The notice required flight crew to add an extra item in take-off briefing as follows: flight crew shall check the regulatory take-off weight (RTOW) limitation during take-off briefing. In case of the actual take-off weight below the limitation of the RTOW, flight crew can continue to take off even if the ATPCS is not armed during take-off rolling. Otherwise, flight crew shall abort take-off.

- Technical notice No. m1010604x in 2012

  The notice included detailed procedures and attachments (Airplane Flight Manual (AFM) Supplement 7_02.10, see Appendix 1-2) regarding to the ATPCS not armed as follows:

[11] The TNA only had ATR72-500 aircrafts at that time.

1. Before engines start, flight crew shall check the RTOW chart according to weather conditions to acquire take-off weight limitation and performance data;

2. In case of the ATPCS not armed, CM1 shall apply reserved take-off (RTO) power by pushing both power levers to the RAMP position, and order CM2 to select ATPCS “OFF” and bleed valves “OFF”;

3. After take-off, set both power levers into Notches position, and then select both bleed valves to “ON” while conducting an after take-off checklist.

The TNA flight crew training supervisor stated in the interview: the above technical notices only apply to operations of ATR72-500. The ATR72-600 pilots were trained to abort takeoff while the ATPCS was not armed during take-off rolling.

The ATPCS related operational procedures in TNA are listed as follows:

- Dispatch with ATPCS OFF procedure

  This procedure (Appendix 1-2) is described in Airplane Flight Manual (AFM) Supplement 7_02.10. While the ATPCS may be inoperative, flight crew can follow this procedure to dispatch the aircraft.

- ATPCS Static Test procedure

  This procedure is described in Preliminary Cockpit Preparation Page 5-17 of the ATR72-600 SOP.(See 1.18.1.2) The flight crew shall conduct this test procedure to check the function of the ATPCS during the preliminary cockpit preparation.

- ATR72-600 Normal checklist

  The flight crew shall check “ATPCS off (Inoperative) Takeoff Weight” while conducting takeoff briefing. (See 1.18.1.2)

- Takeoff procedure

  This procedure is described in Takeoff Page 12-1 of the ATR72-600 SOP. The CM1 shall check if the ATPCS is armed or not and then announce the result. (See 1.18.1.2)

- ATPCS Dynamic Test procedure

  This procedure is described in Daily Checks Page 23-1 of the ATR72-600 SOP. The flight crew shall conduct this procedure to

check the function of ATPCS in the end of final flight sector of a day. (See 1.18.1.2)

The TNA flight crew training supervisor in the interview stated: it was emphasized in the flight crew training that the ATR72-600 pilots should abort takeoff while the ATPCS is not armed during the takeoff rolling. There are several procedures shall be conducted while the ATPCS is not armed, but it is inappropriate to do those procedures during takeoff rolling. This is why need to abort takeoff. However, the above policy was not clearly described in any manuals and notices to flight crew.

1.18 Additional Information

1.18.1 Manual Information

TNA provided flight operations related policies, requirements, procedures, and guidance to flight crews in several document, the detailed are shown as below:

1.18.1.1 Flight Operations Manual

The current TNA Flight Operations Manual (FOM) (Attachment 1-3) is revision 42, published on January 26, 2015 which establishes general procedures and provides instructions and guidance for use by flight operations personnel in the performance of their duties. The related paragraphs are:

Chapter 3 Duties and Responsibilities

3.8 PF/PM Task Sharing

1. *Whenever irregularities occur during flight that have effects on aircraft operation or result in serious failure, the Captain shall immediately take over the control from FOs and serve as PF. If the PF/CM2 is a Captain, the other Captain (CM1) shall exercise CRM principle and take over the control if necessary for safety concerns.*
2. *For tasks sharing between PF/PM for normal operations, see relevant SOPs.*
3. *The general task sharing shown below applies to both emergency and abnormal procedures.*
   a. *The pilot flying remains pilot flying throughout the procedure.*
   b. *For Airbus 320/321/330:*

      ……

c. *For ATR72:*

PF is responsible for:

- *power lever*
- *flight path and airspeed control*
- *aircraft configuration*
- *navigation*
- *communications*

PM is responsible for:

- *Monitoring and check list reading*
- *execution of required actions*
- *actions on overhead panel*
- *condition lever*

Note: The Automatic Flight Control System (AFCS) is always coupled to the PF side (Couple selection).

Chapter 5 Crew Resource Management (CRM)

5.4 TNA CRM Policy

TAN believes that optimally safe and efficient flight operations are best achieved when crewmembers work together as a coordinated team, fully utilizing all resources available to them –human resources, hardware and information.

To achieve this optimal level of performance, TNA further believes that all flight crewmembers must embrace CRM principles and techniques and apply them consistently in all aspects of flight operations.

Accordingly, the company has established the following CRM policy:

1. *CRM ability and a facility for teamwork will be criteria for flight crewmember selection.*
2. *CRM principles and practices will be fully integrated into all aspects of flight operations training.*
3. *All crewmembers will share the responsibility for establishing an environment of trust and mutual commitment prior to each flight, encouraging his fellow crewmember(s) to speak out and to accept mutual responsibility for the safety and well-being of the passengers and equipment entrusted to them. "What's right, not who's right" will be the motto of TNA crews.*
4. *Each flight crewmember will be responsible for notifying the pilot in command if any condition or circumstance exists that could endanger the aircraft or impair the performance of any crewmember.*

5.7 Error Avoidance

- *High levels of training and proficient.*
- *Following SOP's.*
- *Proper use of checklists.*
- *Minimizing distractions.*
- *Planning ahead.*
- *Open two-way communication.*
- *Maintaining situational awareness.*

5.9 Error Management

Reasons for making errors: lack of experience; rushed; distractions; stress.Crews make mistakes several times during each flight, most of which are unimportant. However it can be beneficial to recognize and learn from errors, since it will help crewmembers manage resources better during the next flight.

Types of Error:

- *Intentional Noncompliance - Violations. Ex) Checklist from memory.*
- *Procedural - followed procedures with incorrect execution Ex) Wrong altitude setting dialed.*
- *Communication - Missing information or misinterpretation. Ex) Miscommunication with ATC.*
- *Proficiency - Lack of knowledge or skill. Ex) Lack of knowledge with automation.*
- *Decision - Crew decision unbounded by procedures that unnecessarily increased risk. Ex)*

Managing Errors:

Once an error is committed, it is difficult for a crewmember to catch (trap) his/her own error. Other people are more likely to catch his/her error. Therefore, redundancy is one strong defense against error.

Execution: Monitor/crosscheck; workload management; vigilance; automation management.

Guidelines and techniques for effective challenging: timely; with respect; constructive intent; specific; use questions.

5.10 Decision Making Processes

5.10.1 General

The company has chosen a standard mnemonic – S A F E – to help remember the steps for effective decision-making. SAFE means:

S State the problem
A Analyze the options
F Fix the problem

E Evaluate the result

5.10.2 Priorities of Flight

Always take into account the following priorities when invoking the decision-making process:

a. Safety

b. Punctuality

c. Passenger Comfort

d. Economy

Chapter 7 Flight Operations Procedure

7.3 Callouts

1. Call Outs shall not interfere with ATC communications.

2. To establish CRM, the communications between flight crewmembers shall be based on verbal standard callouts, rather than using looks.

3. Except for the flight controls, power levers and deceleration systems, all switches and push buttons have to be changed or executed by PM under PF command (except as otherwise noted in specific aircraft type's SOP), who is responsibility to cross check these positions are in the right position while the aircraft is in manual flight.

4. All switches and push buttons are set by PF and cross - checked by PM when it is in auto pilot operation.

5. Either auto pilot flight or manual flight; all the appeared flight mode indications (ATR) and FMA (Airbus) have to be called out and crosschecked by PF or PM according to respective SOPs. Any deviation or movement of CDI shall be reported by PM and verified by PF.

6. To hand over the aircraft controls, the PF has to call: a. "YOU HAVE CONTROL". As soon as positive control has been taken, PM must call: "I HAVE CONTROL".b. The PIC shall make a go-around immediately and call out "I have control" if the aircraft not stabilized during approach. c. For seamless radio communications, when PM is busing in dictating metrological information or liaison with other units, he or she shall tell PF "YOU HAVE RADIO", then takes action after PF responses.

7. Use of Checklist:

a. The PIC shall ensure that the flight crew utilizes checklists to comply with standard operating procedures and provisions of the certificate of airworthiness, which may include safety check, originating/receiving, before start, after start, before taxi, before takeoff, after takeoff, climb, enroute, before landing, landing,

after landing, parking, emergency, non-normal, abnormal procedures checklists.

b. Normal Operation Checklist (placed in the cockpit)

Checklist Job Description:

Commander /Checklist Holder

Give command to checklist holder to execute the check, regularly, check the regulation and main procedure first, after completing the check, and inform checklist holder to read checklist. Apply the check procedure as per one's habit flow pattern. Visually check the item being called and report its current position or function. Check the prescribed checklist item with the response and execute the next checklist item. (Visually check the item, its position or its function if workload permits.) If the response is different from the checklist, a correction shall be made before proceeding to the next item. The checklist will not be completed if any item is standby unless the item is accomplished. Example: Checklist will be completed by _____. When _____ has been done, then call ***"CHECKLIST COMPLETED"****. Example: During approach, if the seat belt light is not on, the Approach Checklist will be completed by Seat Belt on, when the seat belt light is on the Approach Checklist is complete.*

c. Abnormal/Emergency Checklist (also QRHs, placed in the cockpit)

(i) During an abnormal or emergency condition, PF gives command to check and checklist is executed by PM with "Read and Do". PF is responsible for confirmation on the operations of switches and push buttons while maintaining aircraft in safe attitude.

(ii) All failing switches must be confirmed before turned off.

7.5.8 Sterile Cockpit Environment

1. The company prohibits all activities in the cockpit not required for the safe operation of the aircraft during critical phases of flight. These prohibited activities include non-safety related company calls, PA's, logbook entries, and non-essential conversations. Critical phases of flight include all ground operations involving taxi, takeoff, and landing, and all other flight operations conducted below 10,000 ft (for Airbus) or 5,000 ft (for ATR), except cruise flight.

2…….

7.5.10 Crew Monitoring And Cross-Checking

1. The PF will monitor/control the aircraft, regardless of the level of automation employed.

2. The PM will monitor the aircraft and actions of the PF.

……

……

……

8. Pilots shall make a cross-check by dual response before actuation of critical controls, including: i)thrust lever reduction of failed engine; ii) fuel Master/Control switch; iii) fire handle and extinguisher switch; iv) IDG Disconnect Switch.

1.18.1.2 TNA Standard Operations Procedure

The current TNA standard Operations Procedure (SOP) (Attachment 1-4) is revision 1, published on January 20, 2015 which established ATR72-600 operating procedures and provided specific procedures and techniques for flight crew. The related paragraphs are shown as below:

1.5 Sterile Cockpit Environment

- *The company prohibits all activities in the cockpit not required for the safe operation of the aircraft during critical phases of flight. These prohibited activities include non-safety related company calls, PA's, logbook entries, and non-essential conversations. Critical phases of flight include all ground operations involving taxi, takeoff, and landing, and all other flight operations conducted below 5,000 ft, except cruise flight.*
- During the periods mentioned below, calls from the cabin to the cockpit shall, except in case of an emergency, not be made:
  a. After takeoff: Until the turning off of seat belt sign.
  b. Before landing: After being notified b y the cockpit of reaching 5,000 ft. In case the period mentioned above is anticipated to become longer than usual, proper information shall be given from the cockpit.

1.6 Crew Monitoring and Cross-Checking

- *If an indication is not in compliance with a performed action, crew members must check that involved system is correctly set and/or take any necessary action to correct the applicable discrepancy. PM can be temporarily busy (ATC message, listening to weather, reading operating manuals,performing related procedure action, etc). Any significant status change (AFCS, FMA, systems...) must be reported to PM when his attention is restored.*
- *When making auto flight systems inputs, comply with following items in the acronym CAMI:*
  - **C**onfirm FMS inputs or performance calculations with the other pilot when airborne.
  - **A**ctivate the input.
  - **M**onitor Flight Mode Annunciator (FMA) to ensure the auto pilot system performs as desired.
  - **I**ntervene if necessary.

During high workload periods FMS inputs will be made by the PM, upon the request of PF. Examples of high workload include when flying below 10 000 ft and when within 1 000 ft of level off or Transition Altitude. Flight crewmembers shall include scanning of the Flight Mode Annunciator as part of their normal instrument scan, especially when automation changes occur (e.g., course changes, altitude level off,

etc.). Changes to the Automated Flight System (AFS)/Flight Management System (FMS) and radio navigation aids during the departure and or approach phases of flight shall be monitored and crosschecked.

- ATPCS TEST ..... PERFROM

ATPCS: STATIC TEST

Check the following results on EWD.

- Turn the ATPCS knob to the left to the arm position and check:
  - ARM light ..... ILLUMINATES
  - TQ needles ..... > 60 %
- Turn the ATPCS knob to ENG 1 position and check:
  - ENG 2 ..... UPTRIM
  - TQ 1 needle indicates ..... ZERO
  - After 2.15 s:
    - ARM light ..... EXTINGUISHES
    - ENG 1 ..... AUTO FTR
- Turn the ATPCS knob to the right to the arm position and check:
    - ARM light ..... ILLUMINATES
    - TQ needles ..... > 60 %
- Turn the ATPCS knob to ENG 2 position and check:
    - ENG1 ..... UPTRIM
    - TQ 1 needle indicates ..... ZERO
    - After 2.15s:
    - ARM light ..... EXTINGUISHES
    - ENG 2 ..... AUTO FTR

- TRIMS ..... CHECK

- PEC 1+2 ..... DEPRESSED IN/NO LIGHT

- PWR MGT rotary selector ..... TO

- IESI ..... CHECK NO FLAG

- EWD:

- EWD FLIGHT CONTROL window ..... CHECK

Check TRIMS and FLAPS, indications

- ENG 1 & 2 INSTRUMENTS ..... CHECK

Check TQ, RTO TQ, TO TQ, NP, ITT

- TAT / SAT ..... CHECK

ENG PANEL:

- EEC 1 & 2 P/B ..... CHECK DEPRESSED IN / NO LIGHT

- ATPCS P/B ..... CHECK DEPRESSED IN / NO LIGHT

- CAB PRESS PANEL ..... CHECK

Check no light

Check the rotary selector is facing the green mark

- AUTO PRESS PANEL ..... TEST / CHECK

Depress the TEST P/B and check

- On local panel:

- Cycling display between -8800 and 18800 ..... CHECK

- MC + SC + AIR AUTO PRESS on Alerting Window (1 flash) ..... CHECK

- MODE SEL P/B FAULT amber light (1 flash) ..... ILLUMINATED

- CABIN SD page:

CAB ALT / VS / ΔP ..... CHECK

ANTISKID PANEL P/B depressed in, no LIGHT ..... CHECK

GLARESHIELD:

- GPWS P/B TEST ..... PERFORM

CM1

LEFT LATERAL CONSOLE

- COCKPIT COM HATCH ..... OPEN

Cockpit com hatch must be opened until engine 1 start, in order to avoid that the extract fan suction creates a depressurization when passenger doors is closed, (ref procedure and techniques 2.02.03).

PF **- TO BRIEFING ..... PERFORM**

- Take off briefing should usually be a brief confirmation of the departure briefing made at the parking bay, and should include any change (RWY, SID...)

- Standard calls
- For significant failure before V1, CAPTAIN will call "STOP" and will take any necessary stop actions.
- Above V1 take off will be continued and no action will be taken except on CAPTAIN command;
  - Single Engine procedure is.....
  - Acceleration Altitude is.....
  - Departure clearance is.....

CM1 **- CABIN REPORT.....OBTAIN FROM CABIN ATTENDANT**

ALL **- TAXI C/L ..... COMPLETED**

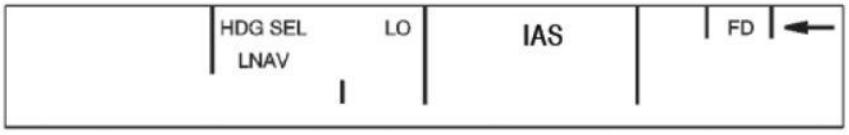
12 TAKEOFF

CM1 - **"TAKE OFF AT XX: XX, V1XXX"** ..... **ANNOUNCE**

CM1 - **BRAKES** ..... **RELEASED**

CM1 - **PL 1 + 2** ..... **SET IN THE NOTCH**

CM1 - **FMA** ..... **ANNOUNCE**



CM1 - **FMA** ..... **CHECK**

CM2 - **"ATPCS ARM"** ..... **CHECK then ANNOUNCE**

CM2 - **ENGINE PARAMETERS** ..... **CHECK**

Note: Parameters should be obtained at around 60 Kt

ACTUAL TQ ..... MATCH T.O BUG

Note: If necessary, adjust PLs to obtain TO TQ (bugs)

RTO BUG ..... CHECK

NP ..... ~ 100 %

Note: NP =100 % -- 0.6%I+0.8%

ITT ..... CHECK

CM2 - **TO INHIB** ..... **CHECK**

CM2 - **"POWER SET"** ..... **ANNOUNCE**

When reaching 70 Kt

CM2 - **"SEVENTY KNOTS"** ..... **ANNOUNCE**

CM1 - **SPEED** ..... **CROSS CHECK on PFD**

And cross check speeds with IESI

ALL - **"I HAVE CONTROL" / "YOU HAVE CONTROL"** ..... **ANNOUNCE**

- If CM1 becomes PF, CM1 announce only "I HAVE CONTROL"
- If CM2 becomes PF, CM1 announce "YOU HAVE CONTROL" & CM2 answer "I HAVE CONTROL"

PM - **"V1"** ..... **ANNOUNCE**

When reaching VR:

PM - **"ROTATE"** ..... **ANNOUNCE**

PF - **ROTATION** ..... **PERFORM**

Note: Pitch rotates smoothly and follow FD bar.

After LIFT OFF:

PM - "POSITIVE RATE" ..... ANNOUNCE
PF - "GEAR UP" ..... ORDER
PM - LDG GEAR LEVER ..... SELECT UP
PM - YAW DAMPER ..... ENGAGE
PM - TAXI & TAKE OFF LIGHT ..... OFF
PM - LDG GEAR LIGHTS ..... CHECK EXTINGUISHED

At ACCELERATION ALTITUDE:

PF - "AFTER TAKE OFF PROCEDURE" ..... ORDER
PM - AFTER TAKE OFF PROCEDURE:
- PL1 + 2 ..... CHECK IN THE NOTCH
- PWR MGT ..... CLIMB
- NP ..... CHECK
- BLEEDS ..... CHECK ON

Note: Pack 2 valve FAULT will illuminate during 10 seconds. A 10 seconds delay is used for pack 2 valve to avoid pressure shocks.

- SPEED TARGET ..... MAGENTA 170 kt CHECK

- "AFTER TAKE OFF PROCEDURE COMPLETED" ..... ANNOUNCE

PNF - FMA MODE ..... ANNOUNCE
PF - FMA ..... CHECK

When passing WHITE bug (F SPEED: White in Normal conditions)

PF - "FLAPS ZERO" ..... ORDER
PM - FLAPS ZERO ..... SELECT
PM - "FLAPS ZERO SET" ..... ANNOUNCE WHEN INDICATED

When passing ICING bug (F SPEED: Amber in Icing conditions)

PF - "FLAPS ZERO" ..... ORDER
PM - FLAPS ZERO ..... SELECT
PM - "FLAPS ZERO SET" ..... ANNOUNCE WHEN INDICATED

When cleared to a FL :

ALL - ALTIMETERS 1+2 ..... SET STD & CROSS CHECK

Note: Set Standard pressure by pushing BARO SET P/B

ALL - AFTER TAKE OFF C/L ..... PERFORM
PM - AFTER TAKE OFF procedure ..... COMPLETED

20 AFTER LANDING

When runway vacated :

CM1 - "AFTER LANDING PROCEDURE" ..... ORDER

CM2 - AFTER LANDING PROCEDURE:

- TRIMS ..... RESET
- FLAPS 0 ..... SELECT
- GUST LOCK ..... ENGAGE
- FLIGHT CONTROL ..... CHECK LOCKED
- TCAS ..... STBY
- XPDR ..... AS RQD
- RADAR ..... STBY
- LANDING LIGHT AND STROBE ..... OFF
- PROBES HTG / ANTI ICING / DE ICING ..... OFF

CM2 - ATPCS TEST (Last flight of the day) ..... PERFORM

> **CAUTION**
> **Do not perform ENG TEST while taxiing as ACW is temporary lost and, subsequently, both main HYD pumps are temporarily lost as well.**

ATPCS TEST (dynamic test: once a day) ..... Refer to FCOM 2.03.24

After at least one minute :

CM1 - "CL1 FEATHER" ..... SELECT&ANNOUNCE

CM2 - "ACW BTC TIDE HYD PRESS NORMAL" ..... CHECK

After 20 SECONDS :

CM1 - CL1 ..... FUEL SO

CM2 - DC BTC TIDE HYD PRESS NORMAL ..... CHECK

ALL - AFTER LANDING C/L ..... COMPLETE

> CAUTION
> Prior to ENG FTR, select HYD SD page, to check HYD pressure for Normal brake efficiency

Note : Keep running at least one minute at GI power before shutting down to assist in reducing residual heat build up in the engine nacelle.

Note : After the last flight of the day, maintain feather position for 20 seconds before selecting FUEL SO to allow oil level check by maintenance.

ATPCS TEST (dynamic test: once a day) (autofeather and uptrim while engines running)

Conditions: - PL 1 + 2 in GI - CL 1 + 2 in AUTO.

- ATPCS P/B depressed in, OFF light extinguished
- PWR MGT on TO position

Check the following results on EWD:

- Turn the ATPCS knob to the left to the arm position and check
  - ARM light ..... ILLUMINATES
  - TQ INDICATION ..... INCREASE
  - NP & NH INDICATION ..... DECREASE
- Turn the ATPCS knob to ENG 1 position and check :
  - ENG 2 UPTRIM LIGHT ..... ILLUMINATES
  - TQ 2 ..... NO CHANGE
  - NP, NH ..... INCREASE SLIGHTLY
  - TQ 1 needles indication ..... DECREASE BELOW 18 %
  - After 2.15 s : associated propeller is automatically feathered
    - ARM light ..... EXTINGUISHED
    - PROP 1 AUTO FTR LABEL ..... DISPLAYS
- Turn the ATPCS knob to the right to the arm position and check :
  - ARM light ..... ILLUMINATES
  - TQ INDICATION ..... INCREASE
  - NP & NH INDICATION ..... DECREASE

- Turn the ATPCS knob to ENG 2 position and check :
  - ENG 1 UPTRIM LIGHT ..... ILLUMINATES
  - TQ 1 ..... NO CHANGE
  - NP, NH ..... INCREASE SLIGHTLY
  - TQ 2 needles indication ..... DECREASE BELOW 18 %
  - After 2.15 s : associated propeller is automatically feathered
    - ARM light ..... EXTINGUISHED
    - PROP 2 AUTO FTR LABEL ..... DISPLAYS

CAUTION: Do not perform ENG TEST while taxiing as ACW is temporarily lost and consequently, both HYD pumps are temporarily lost as well.

Note: If ENG TEST must be repeated, wait 10minutes before setting ATPCS selector in ENG position in order not to damage feathering pumps. (Winding heating).

24. STANDARD CALLOUTS

24.1 COMMUNICATIONS AND STANDARD TERMS

Standard phraseology is essential to ensure effective crew communication. The phraseology should be concise and exact. The following Chapter lists the callouts that should be used as standard. They supplement the callouts identified in the SOP.

These standard ATR callouts are also designed to promote situational awareness, and to ensure crew understanding of systems and their use in line operation.

24.2 CHECKLIST CALLOUTS

- "CHECK": A command for the other pilot to check an item.
- "CHECKED": A response that an item has been checked.
- "CROSSCHECKED":A callout verifying information from both pilot stations.

If a checklist needs to be interrupted, announce: "HOLD CHECKLIST AT" and "RESUME CHECKLIST AT __" for the continuation.

Upon completion of a checklist announce: "__CHECKLIST COMPLETE".

24.3 ALTITUDE

The PM calls out "ONE THOUSAND TO GO" when passing 1 000 ft before the cleared altitude or FL, and the PF calls out "CHECKED".

24.4 TASK SHARING

FGCP INPUTS	MCDU INPUTS
Are performed by: – PF when the AP is ON – PM on request from PF when AP is OFF. All FGCP inputs must be called. All FGCP inputs must be checked by the PF on the FMA. PM must cross-check (FMA, PFD and ND) and called "CHECK".	Are performed by: – PF when the input has an operational benefit and could quickly be done. Example: **DIR TO**, activation of **SEC F-PLN**, speed or Alt constraint, Enable Alternate. – PF during a temporary transfer of command to the PM (Approach preparation). – PM upon request of the PF to decrease PF workload. Before pressing "EXEC" key, the input must be cross checked by the other crew member and calls "CHECK". Time consuming inputs should be avoided below FL 100.

24.9 SUMMARY FOR EACH PHASE

FINAL COCKPIT PREPARATION		
EVENT	**CM1**	**CM2**
Preliminary cockpit preparation complete	"FINAL COCKPIT PREPARATION PROCEDURE"	"FINAL COCKPIT PREPARATION PROCEDURE COMPLETE"
FINAL COCKPIT PREPARATION PROCEDURE COMPLETE	"FINAL COCKPIT PREPARATION CHECKLIST"	"FINAL COCKPIT PREPARATION CHECKLIST COMPLETE"

BEFORE PROPELLER ROTATION		
EVENT	**CM1**	**GND Mech**
Ready to start engine 2 in HOTEL mode	"GROUND FROM COCKPIT, READY TO START ENG 2 IN HOTEL MODE, CONFIRM SERVICE DOOR CLOSED AND AREA CLEAR" "LEFT SIDE CLEAR" "RIGHT SIDE CLEAR (CM2) " "STARTING ENG"	"CLEAR TO START ENG. 2"
When engines start completed	"GROUND FROM COCKPIT DISCONNECT GPU"	"DISCONNECT GPU"
When ready for pushback, and pushback clearance received from ATC	"GROUND (from) COCKPIT, CLEARED FOR PUSH"	"COCKPIT (from) GROUND, RELEASE BRAKES"
Start of push	"PARKING BRAKES RELEASED, NOSE WHEEL OFF, READY TO PUSH"	
When pushback complete	"PARKING BRAKES SET"	"SET PARKING BRAKES"
When ready to disconnect (after engine started, and parameters are stabilized)	"CLEAR TO DISCONNECT (hand signals on left/right) "	"DISCONNECTING (hand signals on left/right) "

BEFORE TAXI		
EVENT	**CM1**	**CM2**
When NO 2 ENG IN HOTEL MODE, PARAMETERS STABILIZED	"BEFORE PROPELLER ROTATION CHECKLIST"	"BEFORE PROPELLER ROTATION CHECKLIST (refer to EWD C/L) "
Start up clearance received	"BEFORE TAXI PROCEDURE" "BEFORE TAXI CHECKLIST"	"BEFORE TAXI PROCEDURE COMPLETE" "BEFORE TAXI CHECKLIST (refer to EWD C/L) " "BEFORE TAXI PROCEDURE COMPLETE"

BOTH ENGINES FLAME OUT

PL 1 + 2 ..... FI
■ **If NH drops below 30 % (no automatic relight)**
CL 1 + 2 ..... FTR THEN FUEL SO

ENG 1(2) FLAME OUT AT TAKE OFF

UPTRIM ..... CHECK
AUTOFEATHER ..... CHECK
■ **If no UPTRIM**
PL 1 + 2 ..... ADVANCE TO THE RAMP

● **When airborne**
LDG GEAR ..... UP
BLEED 1 + 2 ..... OFF, IF NOT FAULT

● **At Acceleration Altitude**
ALT ..... SET

● **At VFTO**
PL 1 + 2 ..... IN THE NOTCH
PWR MGT ..... MCT
IAS ..... SET
■ **If normal condition**
SPD TGT ..... CHECK VFTO
FLAPS ..... 0°
■ **If icing condition**
SPD TGT ..... CHECK VFTO ICING FLAPS 15°
FLAPS ..... MAINTAIN 15°

PL affected side ..... FI
CL affected side ..... FTR THEN FUEL SO
BLEED engine alive ..... OFF if necessary

SMOKE

CREW OXY MASKS ..... ON / 100%
GOGGLES ..... SET
CREW COMMUNICATIONS ..... ESTABLISH
RECIRC FANS 1 + 2 ..... OFF
AP ..... ON

UNRELIABLE AIRSPEED INDICATION

AP/YD/FD ..... OFF/OFF/STBY
PITCH AND TQ ..... MAINTAIN
■ **If at take off or GA below 1500 ft:**
PITCH IMMEDIATELY ..... 8°
ICING / VOLCANIC ASHES CONDITIONS ..... ESCAPE

25.2.2 FOLLOWING FAILURE

ABNORMAL PARAMETERS DURING START

■ **If ITT tends to exceed 900°C, or no ITT, or no NH**
CL affected side ..... FUEL SO
ENG START ROTARY SELECTOR ..... OFF / START ABORT

FIRE LOOP 1A (1B) (2A) (2B) FAULT

LOOP affected ..... OFF

ENG 1 (2) FLAME OUT IN FLIGHT

PL affected side ..... FI

■ **If NH drops below 30 % (no immediate relight)**
CL affected side ..... FTR THEN FUEL SO

PEC 1(2) FAULT

■ **If below 400 ft**
GO AROUND procedure ..... APPLY

LO PITCH IN FLIGHT

PL affected side ..... FI
CL affected side ..... FTR THEN FUEL SO

25.3.5 Approach to stall and stall recovery

PF	PM
CONTROL COLUMN..... ..... NOSE DOWN UNTIL OUT OF STALL (1) **"FLAPS 15"**(2) CONTROL WHEEL..... ROLL TO WINGS LEVEL(3) PL.....INCREASE AS NEEDED	FLAPS ..... 15°
APPLY GENTLE ACTION FOR RECOVERY(4)	
RETURN TO THE DESIRED FLIGHT PROFILE(5)	

(1) The priority is to reduce the angle of attack.
Crew members must accept to lose altitude. To recover from a stall or approach to stall and maintaining the altitude at the same time is not possible.

(2) If the aircraft is in flaps 0° configuration, extend flaps to 15° during the recovery.
In all other configuration and for any flight phase maintain the current configuration for the recovery.

(3) To correctly orientate the lift vector for recovery.

(4) To avoid secondary stall.

(5) Fly the aircraft first and then when it is under control, fly the trajectory.

NOTE: *Use of rudder is not recommended during stall recovery as it can worsen the situation.*

Stick pusher procedure

If angle of attack continues increasing up to the stick pusher angle of attack threshold, the control column is suddenly and abruptly pushed forward. This initiates the stall recovery.

Apply the stall procedure previously described.

Never counteract the stick pusher action.

Procedure at lift-off

Incursion in stick shaker range during lift-off can be generated by:

- Excessive pitch up during rotation
- Excessive rate of pitch rotation
- Turbulences
- Windshear situation

In this case, maintain 10° pitch and when out of the stall warning, follow FD bars.

26. ABNORMAL & EMERGENCY PROCEDURES

26.1 GENERAL

Flight crewmembers shall cope with abnormalities/emergencies by adapting the following principle:

- Prioritization: Aviate-Navigate-Communicate
- Task Sharing
- Division of PF/PM Duties
- Crew Coordination

IMPORTANT: *Never rush up, take all necessary time to analyze situation before acting. No actions (except memo items), no checklists to be performed before acceleration altitude is reached.*

Continuing to fly the airplane is the single most important consideration in almost every situation.

28.1 CREW COORDINATION

Whenever irregularities occur during flight that have effects on aircraft operation or result in serious failure, the Captain shall immediately take over the control from FOs and serve as PF.

PF is responsible for:

- power lever
- flight path and airspeed control
- aircraft configuration
- navigation
- communications

PM is responsible for:

- Monitoring and check list reading
- execution of required actions
- actions on overhead panel
- condition lever

28.2 RULES

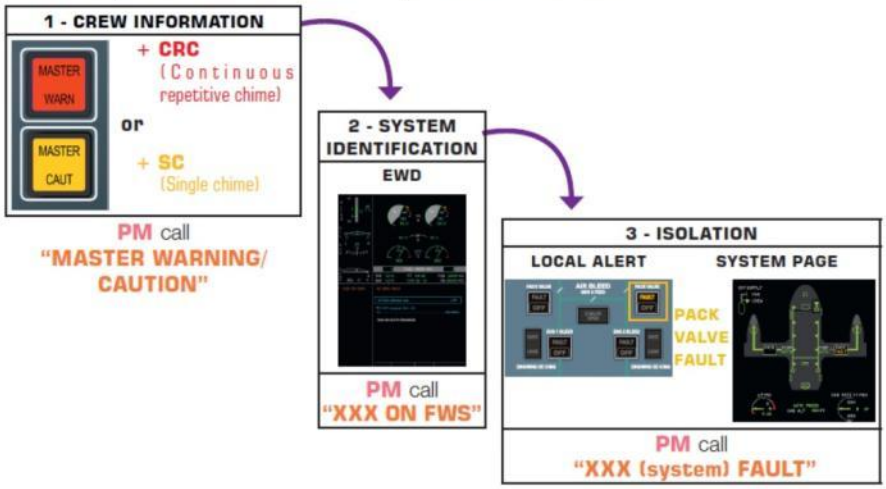
When an emergency or abnormal situation occurs:

1. FLY THE AIRPLANE.

One pilot will devote his/her attention to flying the airplane. When a non-normal situation occurs, the pilot flying (PF) will continue to fly the airplane until properly relieved of that responsibility. It is the captain's (PIC) responsibility to determine who will be the PF for the purposes of situation stabilization and clean-up, and will ensure that both pilots understand who is flying the airplane at all times. The PF will also handle ATC communications as aircraft control permits. Unless the emergency or abnormal procedure directs the pilot to disconnect the auto flight system, It is recommended that it be used as much as possible during these situations.

2. Failure identification

In case of system failure, information is provided to the crew:



PF	PM
	Checks involved flasher and label flashing on EWD **"MASTER WARNING/CAUTION"** **"XXX ON FWS"**
"CHECK" Acknowledges failure or event identification and when able **"SYSTEM CHECK"**	Cancels flashing warning/caution, then checks relevant SD page and lit local alert **"XXX FAULT(OR TYPE OF EVENT)"**

3. Failure analysis: system check

Six checks must be performed for failure confirmation. They are triggered by PF, calling "SYSTEM CHECK" and executed by PM:

Control

Is the system control in a relevant position?

Indicator

Is the indication relevant? Is the indication in compliance with the corresponding SD page and with the control?

Supply

Are the supply source(s) available?

TransAsia | ATR72-600 NORMAL CHECKLIST | REV 04 17 NOV 2014

TAKE OFF BRIEFING		APPROACH BRIEFING
• Aircraft Technical Status • Conditions at departure airport (NOTAM, weather, runway condition, ground movement, obstacle info.) • Rwy excursion risk assessment • Normal departure procedure • Check "ATPCS OFF(INOP)" Take Off Weight • Emergency procedure – Red warning before V1: * On ground emergency EVAC PROC. – Red warning after V1 * Acceleration altitude * Single engine operation proc. • Checklist sequence if emergency exit **Emergency Normal Abnormal**		• Aircraft Technical Status and NAV status • Conditions at destination airport (NOTAM, weather, runway data (length, surface condition, braking action, landing taxi route, lighting)) • Landing performance (landing distance, Go-around climb gradient)) ***Note***: *add 15% to the In-flight LDG Dist. except in emergency.* • Rwy excursion risk assessment • Sudden occurrence handling proc. • Approach chart (date, no. , App. Type) • Transition Level, MSA • Primary App. NAV freq. and course • Approach route course • FAF (or FAP) altitude • DH or MDA and missed approach point – Missed approach procedure * Alternate * Extra & Divert fuel – Go around procedure
TAILWIND LIMITATION: *(Based on AFM 2.03.02 REV16)*	**15 kts**	
CARGO DOOR LIMITATION: *(Based on AFM 2.05.07 REV16)*	Do not operate cargo door with a crosswind component ≥ 45 kts	

Note: *When entering icing conditions (TAT ≤ 7°C with visible moisture), apply the adequate icing procedures and speeds must be complied and carefully monitored.*

1.18.1.3 ATR72-600 Flight Crew Operations Manual

The current ATR72-600 Flight Crew Operations Manual (FCOM) (Attachment 1-5) is revision 3, published on January 19, 2015 and accepted by CAA, the contents of FCOM are similar to SOP but more detailed. In addition, this SOP also contains the features of flight operation in TNA. If there is any conflict between the FCOM and the SOP, operators should follow the SOP that plays as the primary indicator of TNA policies. The related paragraphs are shown as below:

ENGINE FAILURE

AT TAKE OFF BELOW V1

Abort is mandatory: both PLs are retarded to GI and full braking applied if needed. Reverse is available even on single engine down to full stop: again, control column is transferred to the co-pilot when captain takes nose wheel steering and, in case of single reverse operation roll control must be applied (possibly to full travel) in order to minimize the tendency to bank on the side of the operating engine.

AT TAKE OFF ABOVE V1

Take off must be continued. Directional control must be maintained with rudder and, as soon as aircraft becomes airborne, aileron input to stabilize heading with about 2° of bank toward the operating engine is highly recommended in order to decrease rudder deflection thence improve climb performance.
Both rudder and aileron forces may be completely trimmed out, even at minimum scheduled V2. Once both yaw and roll axis are trimmed out, autopilot may be engaged.

IN APPROACH

Directional control must be maintained with rudder, (which disengages automatically YD and AP if previously engaged) and aileron, in a manner similar to what was described for the continued take off case.

The ATPCS functioning is different between approach and take-off.
Even if TO position is selected:
- Uptrim function is never available
- Auto feather function may be available depending on PL position at the time of the failure.

If autofeather has not operated (windmilling), the drag depends on the engine failed PL position. For this reason :
- In approach, do not reduce the affected PL below 45° PLA before manually feathering the engine.
- If a go around is performed, advance both PLs to the ramp. When appropriate, manually feather the failed engine.

AA

STALLS

STALL WITHOUT ICE ACCRETION

In all configurations, when approaching the stall, the aircraft does not exhibit any noticeable change in flight characteristics: control effectiveness and stability remains good and there is no significant buffet down to CL max ; this is the reason why both the stall alert (audio "cricket" and shaker) and stall identification (stick pusher) are "artificial" devices based on angle of attack measurement.
Recovery of stall approaches should normally be started as soon as stall alert is perceived : a gentle pilot push (together with power increase if applicable) will then allow instantaneous recovery. If the stall penetration attempt is maintained after stall alert has been activated, the STICK PUSHER may be activated : this is clearly unmistakable as the control column is suddenly and abruptly pushed forward, which in itself initiates recovery.

Note : The "pushing action" is equivalent to 40daN/88 lbs applied in 0.1 second and it lasts as long as angle of attack exceeds the critical value.

R **WARNING** : Stall training excercises without stick pusher are prohibited.

STALL WITH ICE ACCRETION

Even with airframe de-icers used according to procedure (i.e. as soon as and as long as ice accretion develops on airframe), the leading edges cannot be completely cleared of ice accretion because of existence of "unprotected" elements on the leading edges and continued accretion between two consecutive boots cycles.

This residual ice on leading edges changes noticeably the characteristics of flight BELOW the minimum operating speeds defined for ice accretion, as follows :

- Control effectiveness remains good, but forces to manoeuver in roll and to a lesser degree in pitch, may increase somewhat.
- Above the reduced angle of attack :
  . An aerodynamic buffeting may be felt which will increase with the amount of ice accumulated and angle of attack increase.
  . Stability may be slightly affected in roll, but stick pusher should prevent angle of attack increase before wing rocking tend to develop (Refer to FCOM 1.02.30 for stall alarm threshold definition).

Recovery of stall in such conditions must be started as soon as stall warning is activated or buffeting and/or beginning of lateral instability and/or sudden roll off is perceived.
Recovery will be best accomplished by :
- A pilot push on the wheel as necessary to regain control.
- Selection of flaps 15.
- Increase in power, up to MCT if needed.

AA

STICK PUSHER / SHAKER TEST (once a day)

-Release gust lock
-Push control column in nose down position
-Select WARN rotary selector (LH maintenance panel) to STICK PUSHER YES
-Depress and maintain PTT
  -Monitor stall cricket and stick shaker.
  -After ten seconds, monitor:
    CHAN 1 and CHAN2 illuminate green on LH maintenance panel.
    STICK PUSHER lights illuminate green on both pilots FMA.
    Stick pusher actuator operates.
-Select WARN rotary selector to NORM FLT
-Reengage the gust lock

ATPCS TEST (dynamic test: once a day) (autofeather and uptrim while engines running)

Conditions: - PL 1 + 2 in GI - CL 1 + 2 in AUTO.
- ATPCS P/B depressed in, OFF light extinguished
- PWR MGT on TO position

Check the following results on EWD:

- Turn the ATPCS knob to the left to the arm position and check
  - ARM light . . . . . ILLUMINATES
  - TQ INDICATION . . . . . INCREASE
  - NP & NH INDICATION . . . . . DECREASE
- Turn the ATPCS knob to ENG 1 position and check :
  - ENG 2 UPTRIM LIGHT . . . . . ILLUMINATES
  - TQ 2 . . . . . NO CHANGE
  - NP, NH . . . . . INCREASE SLIGHTLY
  - TQ 1 needles indication . . . . . DECREASE BELOW 18 %
  - After 2.15 s : associated propeller is automatically feathered
    - ARM light . . . . . EXTINGUISHED
    - PROP 1 AUTO FTR LABEL . . . . . DISPLAYS
- Turn the ATPCS knob to the right to the arm position and check :
  - ARM light . . . . . ILLUMINATES
  - TQ INDICATION . . . . . INCREASE
  - NP & NH INDICATION . . . . . DECREASE
- Turn the ATPCS knob to ENG 2 position and check :
  - ENG 1 UPTRIM LIGHT . . . . . ILLUMINATES
  - TQ 1 . . . . . NO CHANGE
  - NP, NH . . . . . INCREASE SLIGHTLY
  - TQ 2 needles indication . . . . . DECREASE BELOW 18 %
  - After 2.15 s : associated propeller is automatically feathered
    - ARM light . . . . . EXTINGUISHED
    - PROP 2 AUTO FTR LABEL . . . . . DISPLAYS

R **CAUTION** : Do not perform ENG TEST while taxiing as ACW is temporarily lost and consequently, both HYD pumps are temporarlily lost as well.
Note : If ENG TEST must be repeated, wait 10 minutes before setting ATPCS selector in ENG position in order not to damage feathering pumps. (Winding heating).

Mod: 5948

AA **BOTH ENGINES FLAME OUT**

ALERT

CONDITION	VISUAL	AURAL
Both engines flame-out	- MW light flashing red - Associated ENG 1+2 OUT red message on EWD	CRC

PROCEDURE

BOTH ENGINES FLAME OUT

PL 1 + 2 ..... FI

■ **If NH drops below 30 % (no automatic relight)**

CL 1 + 2 ..... FTR THEN FUEL SO

FUEL SUPPLY ..... CHECK

OPTIMUM SPEED ..... Vm HB

COMMUNICATIONS ..... VHF 1

ENG START ROTARY SELECTOR ..... START A & B

ENG 2 RELIGHT

ENG 2 START pb ..... ON

● **When NH above 10%**

CL 2 ..... FTR

ENG 2 RELIGHT ..... MONITOR

CL 2 then PL 2 ..... AS RQD

ENG 1 RELIGHT

ENG 1 START pb ..... ON

● **When NH above 10%**

CL 1 ..... FTR

ENG 1 RELIGHT ..... MONITOR

CL 1 then PL 1 ..... AS RQD

■ **If neither engine starts**

CL 1 + 2 ..... FTR THEN FUEL SO

ENG START ROTARY SELECTOR ..... OFF/START ABORT

FUEL PUMPS 1 + 2 ..... OFF

FORCED LANDING or DITCHING procedure(2.04.05) ..... APPLY

CAUTION : Do not select AVIONICS VENT EXHAUST MODE to OVBD.

R ■ **If at least one engine recovered**

CL / PL engine(s) recovered ..... AS RQD

■ **If one engine not recovered**

CL engine NON recovered ..... FTR THEN FUEL SO

R LAND ASAP

SINGLE ENG OPERATION procedure(2.05.02) ..... APPLY

R SYSTEMS affected ..... RESTORE

APM ..... OFF

AA

ENG 1 (2) FLAME OUT AT TAKE OFF

ALERT

An engine flame out may be recognized by :
- Sudden dissymetry
- TQ decrease
- Rapid ITT decrease

CONDITION	VISUAL	AURAL
engine flame out or ATPCS sequence	- MW light flashing red - Associated ENG 1 (2) OUT red message on EWD + AUTO FTR and UPTRIM labels on EWD	CRC

PROCEDURE

R

ENG 1(2) FLAME OUT AT TAKE OFF

UPTRIM . . . . . CHECK
AUTOFEATHER . . . . . CHECK
■ **If no uptrim**
PL 1 + 2 . . . . . ADVANCE TO THE RAMP
● **When airborne**
LDG GEAR . . . . . UP
BLEED 1 + 2 . . . . . OFF, IF NOT FAULT
● **At acceleration altitude**
ALT . . . . . SET
● **At VFTO**
PL 1 + 2 . . . . . IN THE NOTCH
PWR MGT . . . . . MCT
IAS . . . . . SET
■ **If normal conditions**
SPD DGT . . . . . CHECK VFTO
FLAPS . . . . . 0°
■ **If icing conditions**
SPD DGT . . . . . CHECK VFTO ICING FLAPS 15°
FLAPS . . . . . MAINTAIN 15°

PL affected side . . . . . FI
CL affected side . . . . . FTR THEN FUEL SO
BLEED engine alive . . . . . OFF if necessary

■ **If damage suspected**
FIRE HANDLE affected side . . . . . PULL
LAND ASAP
SINGLE ENG OPERATION procedure(2.05.02) . . . . . APPLY
■ **If no damage suspected**
ENG RESTART IN FLIGHT procedure(2.05.02) . . . . . APPLY
■ **If unsuccessful :**
LAND ASAP
SINGLE ENG OPERATION procedure(2.05.02) . . . . . APPLY

GENERAL

The procedures following failures represent the actions applicable after a failure to ensure adequate dafety and to ease the further conduct of the flight. They are applied according to the "Read and Do" principle except for the memory items.

PRESENTATION

The procedures are presented in the basic check list format with an adjacent expanded section which provides:

- indication of the particular failure, alert condition
- explanation for actions where the reason is not self evident
- additional background information

The abbreviations used are identical with the nomenclature on the cockpit panels. All actions are printed in CAPITAL letters.

■ : a preceding black square is used to identify a pre-condition (in bold) for given action(s).

● : a preceding black dot is used to indicate the moment (in bold) when given action(s) have to be applied.

TASK SHARING

For all procedures, the general task sharing stated below is applicable.

The pilot flying remains pilot flying throughout the procedure.

PF, Pilot Flying, responsible for:

- PL
- flight path and airspeed control
- aircraft configuration
- navigation

PM, Pilot Monitoring, responsible for:

- check list reading
- execution of required actions
- actions on overhead panel
- CL
- communications

The AFCS is always coupled to the PF side (CPL selection).

PROCEDURES INITIATION

- No action will be taken (apart from depressing MW pb):
  . Until flight path is stabilized.
  . Under 400 ft above runway (except for propeller feathering after engine failure during approach at reduced power if go around is considered).

- Before performing a procedure, the crew must assess the situation as a whole, taking into consideration the failures, when fully identified, and the constraints imposed.

ANALYSIS OF CONSEQUENCES OF A FAILURE ON THE FLIGHT

Basic airmanship calls for a management review of the remaining aircraft capabilities under the responsability of CM1.

FWS ALERTING

(see page 3)

ELECTRONIC CHECK-LISTS USE : HUMAN FACTOR RECOMMENDATIONS

Upon completing procedure, PNF need tick each item, i.e. meaning the item was acknowledged and taken care of.

- Importance of procedure pending message:

Pending procedure notice need be carefully considered when displayed, therefore meaning this one needs yet be performed and completed.

- Importance "PROCEDURE COMPLETED" item:

Completed procedure item, is displayed at the end of each started procedure, provided all items have been properly ticked. It is the only way to complete and correctly terminate a started procedure.

- Importance "IF" statements:

Following each procedure's "IF" alternative proposition, PNF must carefully read and understand these different alternatives to meet current depiction and get PF's approval and confirmation to comply with relevant "IF" procedure.
Once an "IF" case has been selected, PNF must carefully read and understand relevant procedure's proposition and it's associated subtitle, obtain PF's confirmation before resuming corresponding associated task.

R - Awareness of STATUS:
R The flight crew must open and review the statuses during recall.

- DU failure:

Neither DU fault procedure exists and no relevant reference is made in FWS, FCOM nor QRH.

AA

SINGLE ENG OPERATION

ALERT

CONDITION	VISUAL	AURAL
Engine flame out	- MC light flashing amber - SINGLE ENG amber message on EWD	SC

PROCEDURE

SINGLE ENG OPERATION

PWR MGT . . . . . MCT
ENG BOOST FUNCTION (if installed) . . . . . AS RQD
LAND ASAP
FUEL PUMP affected side . . . . . OFF
DC GEN affected side . . . . . OFF
ACW GEN affected side . . . . . OFF
PACK affected side . . . . . OFF
BLEED affected side . . . . . OFF
APM . . . . . OFF
TCAS . . . . . TA ONLY
OIL PRESSURE AND NP ON FAILED ENGINE . . . . . MONITOR

Note: In icing conditions, FLAPS 15 will be selected to improve drift down performances and single engine ceiling.

Note: Refer to QRH pages (4.61) and (4.62) to determine single engine gross ceiling.

Note: If during the flight, a positive oil pressure has been noted on the failed engine for a noticeable period of time, maintenance must be informed.

Note: monitor fuel balance. Recommended operational maximum fuel unbalance is 200 kg (440 lb).

● **When FUEL CROSS FEED is required**

FUEL PUMP affected side . . . . . ON
FUEL X FEED . . . . . ON
FUEL PUMP on operating engine . . . . . OFF

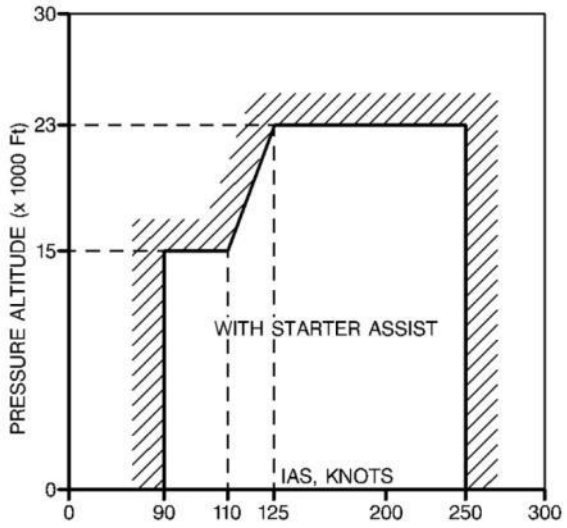
To be continued next page(...\...)

AA

ENG RESTART IN FLIGHT

PROCEDURE

ENG RESTART IN FLIGHT



FUEL SUPPLY ..... CHECK
CL ..... FUEL SO
PL ..... FI

CAUTION: After ATPCS sequence PWR MGT rotary selector must be set to MCT- position before engine restart in order to cancel propeller feathering.

ENG START ROTARY SELECTOR ..... START A & B

R START PB ..... ON

Note : AP-YD may disconnect during start

R ● **When NH above 10 %**

CL ..... FTR
RELIGHT ..... MONITOR
CL ..... AUTO
PL ..... ADJUST TO OTHER ENGINE

R ENG START ROTARY SELECTOR ..... OFF/START ABORT
SYSTEMS AFFECTED ..... RESTORE

R APM ..... OFF

COMMENTS

- Engine relighting in flight is only guaranteed within the envelope and always necessitate starter assistance.
- The power may be restored immediately after relighting provided OIL TEMP > 0°C.
- Should the engine fail to light up within 10 seconds, select fuel to shut off, the ignition OFF and allow engine to be ventilated for 30 seconds minimum prior to making another attempt.

Mod : 5948

AA

ENG 1(2) FLAME OUT IN FLIGHT

ALERT

CONDITION	VISUAL	AURAL
Engine 1(2) flame out	- MW light flashing amber - ENG 1(2) OUT amber message on EWD	SC

PROCEDURE

ENG 1(2) FLAME OUT IN FLIGHT

PL affected side . . . . . FI

■ **If NH drops below 30% (no immediate relight)**
CL affected side . . . . . FTR THEN FUEL SO

■ **If damage suspected**
FIRE HANDLE affected side . . . . . PULL
R LAND ASAP
SINGLE ENG OPERATION procedure (2.05.02 page 1) . . . . . APPLY

■ **If no damage suspected**
ENG RESTART IN FLIGHT procedure (2.05.02 page 10) . . . . . APPLY

R ■ **If engine out confirmed**
LAND ASAP
SINGLE ENG OPERATION procedure (2.05.02 page 1) . . . . . APPLY

COMMENTS

- Shut down the engine if no immediate relight.
- The causes of engine flame out can generally be divided into two categories :
  . External causes such as icing, very heavy turbulence, fuel mismanagement. These causes, which may affect both engines can generally be easily determined and an immediate relight can be attempted.
  . Internal causes which as engine stalls or failures usually affect a single engine and are not so easily determined. In these cases, the engine is shut down then the cause of the flame out investigated. If it cannot be positively determined what caused the flame out, the need for engine restart should be evaluated against the risk or further engine damage or fire that may result from a restart attempt.
- If damage is suspected, as precautionary measure, the FIRE handle is pulled.

1.18.1.4 ATR Flight Crew Training Manual

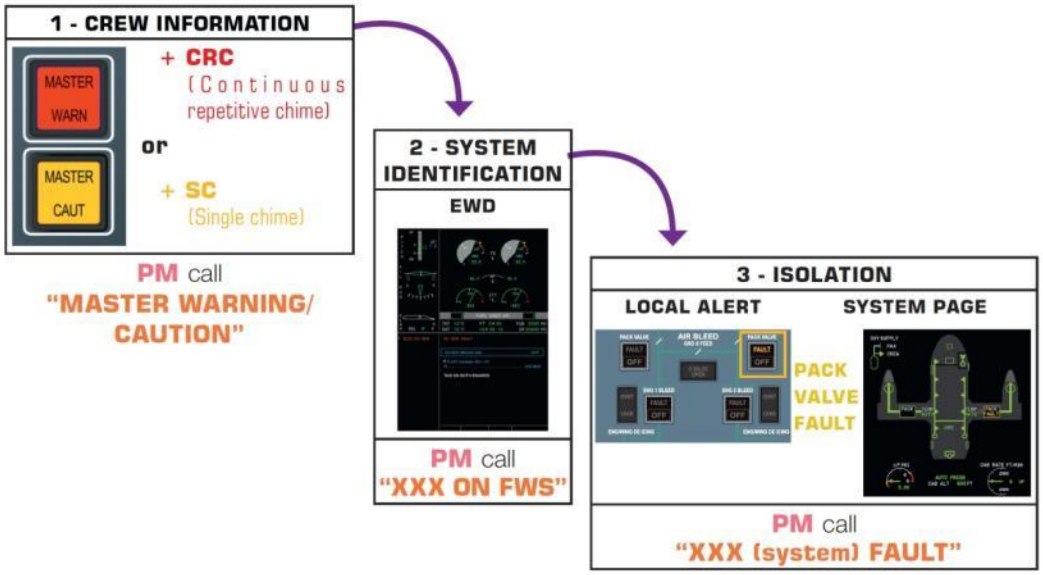
The Flight Crew Training Manual (FCTM) (Attachment 1-6) provided by ATR is an essential tool to learn the ATR standard operating procedures. It has been conceived as the standard baseline for all ATR flight crew training. The manual was published in February 2014. The related paragraphs are shown as below:

4. Abnormal and emergency procedures

IMPORTANT: Never rush up, take all necessary time to analyse situation before acting. No actions (except memo items), no checklists to be performed before acceleration altitude is reached.

4.1. Failure identification

In case of system failure, information is provided to the crew:



PM	PF
PM checks involved flasher and label flashing on EWD. ▶ CALL "MASTER XXX, XXX ON FWS"	
PM cancels flashing **WARNING** and / or **CAUTION**, then checks relevant SD page and lit local alert and: ▶ CALL "XXX FAULT (OR TYPE OF EVENT)"	▶ CALL "CHECK" PF acknowledges failure or event identification and when able: ▶ COMMAND "CHECK SYSTEM"

4.2. Failure analysis: system check

Six checks must be performed for failure confirmation. They are triggered by PF, calling **"SYSTEM CHECK"** and executed by PM:

Control

Is the system control in a relevant position?

Indicator

Is the indication relevant? Is the indication in compliance with the corresponding SD page and with the control?

Supply

Are the supply source(s) available?

Circuit breakers

Flight Crew may reengage a tripped circuit breaker only if he/she judges it necessary for a safe continuation of the flight. In this case only one reengagement should be attempted.

If the failure alert disappears, continue normal operation and record the event in the maintenance log. If not, apply the associated failure procedure.

On the ground, a pilot may re-engage a tripped circuit breaker provided the action is coordinated with the maintenance team.

Lighting

Are the bulb(s), digit(s) working?

Reset

At PF discretion, one reset of a push button of a failed system, associated with an amber caution, may be performed by selecting system related push button OFF for 3 seconds and then ON.

EXCEPTIONS: BLEED LEAKS, LO LEVEL, EEC, PEC, BUS, CAB PRESS MAN.

4.3. Checklist methodology

Before executing checklist crew must **confirm** it is the appropriate one:

PM	PF
▶ CALL "SYSTEM CHECKED, XXX FAILURE CONFIRMED" (OR NOT)	▶ CALL "SINGLE PACK VALVE FAULT CHECKLIST"

READ AND DO, CROSSCHECKS

Concept: PM reads out the item loudly and performs the required action AFTER PF confirmation.

PM	PF
PM reading the C/L on EWD. ▶ READ AND CALL "PACK VALVE AFFECTED SIDE....OFF" PM points out the PACK VALVE PB. ▶ CALL "PACK VALVE 2?"	▶ CHECK AND CALL "CONFIRMED"
After PF confirmation, PM depresses PACK VALVE 2 PB. ▶ CALL "OFF"	

EXCEPTION: Once **on the ground**, with aircraft stopped and parking brake set, CM1 performs required actions as stated in the emergency procedure. No crosscheck procedure is required. Once all procedures are completed, CM1 calls out checklist. In this case, *Challenge and response* methodology is used (refer to 01.04 p5).

Once checklist is completed, PM calls out:

PM	PF
After checklist completion: ▶ CALL "SINGLE PACK VALVE FAULT C/L COMPLETE "	

4.4. Assessments / decision / information

4.4.1. Assessment

Once checklist is completed, PM reads status on PF request, PF summarizes the situation, taking into account the three following aspects: T-O-C

- Technical assessment: consider consequences of related failure on systems by scanning the overhead panel (fuel, DC/AC, anti-/de-icing, ACW, hydraulic, air) and checking the relevant SD page.
- Operational assessment: consider possibility to land at destination, divert / alternate, depending on failure, operational limitations, weather conditions, fuel status.
- Commercial assessment: consider passengers or crew casualties (e.g.: depressurization) and in case of diversion, possibility to allow passengers to proceed to destination airport (transportation, feeding, lodging accommodations...), in accordance with operator policy.

4.4.2. Decision

Once assessment is performed, PF is able to suggest a decision, endorsed by Captain.

Crew must settle a consensus before making a decision.

4.4.3. Information

PF and PM plan together the consequences of failures encountered. Then PM informs, if necessary:

- ATC
- Flight attendant
- Passengers
- Dispatch

4.5. Example

Follows a PACK VALVE FAULT troubleshooting example:

Flight events	PM	PF	
MC + SC + AIR PACK ON FWS + PACK VALVE FAULT (LOCAL ALERT)	▶ CALL AND DO "MASTER CAUTION, AIR PACK ON FWS" MASTER CAUTION PB.....DEPRESS		Failure Identification
AFTER ASSOCIATED PANEL AND SD PAGE CHECK	▶ CALL "PACK VALVE 2 FAULT"	▶ CALL "CHECK"	
	▶ DO PACK VALVE PB.. CHECK DEPRESSED SUPPLY.....ENG OK CIRCUIT BREAKER.....CHECK LIGHTING .....OK	▶ COMMAND "CHECK SYSTEM"	Failure Analysis
IF NO ABNORMAL CONDITION IS NOTED	▶ CALL "PACK VALVE 2 RESET?"	▶ COMMAND "RESET PACK VALVE 2"	
	▶ DO AND CALL PACK VALVE 2.....POINTED AT WITH FINGER "PACK VALVE 2?"	▶ DO AND REPLY ITEM POINTED AT BY PM..... CHECK "CONFIRMED"	
	▶ DO AND CALL PACK VALVE 2..... OFF (for 3 sec) "OFF" PACK VALVE 2.....ON "ON"		
PACK VALVE 2 FAULT CONFIRMED	▶ CALL "SYSTEMS CHECKED, PACK VALVE 2 FAILURE CONFIRMED"	▶ COMMAND "SINGLE PACK VALVE FAULT CHECKLIST, RADIO RIGHT SIDE"	Failure Confirmation
PM READS AND EXECUTES C/L DISPLAYED ON EWD UNDER PF CONTROL	▶ READ, DO AND CALL "PACK VALVE AFFECTED SIDE OFF" PACK VALVE 2.....POINTED AT WITH FINGER "PACK VALVE 2?"	▶ DO AND REPLY ITEM POINTED AT BY PM..... CHECK "CONFIRMED"	Checklist Completion
	▶ DO AND CALL PACK VALVE 2..... OFF "OFF"		
	▶ CALL "AVOID LARGE QUICK POWER CHANGES AT HIGH ALTITUDES"	▶ REPLY "CHECK"	

Flight events	PM	PF	
PM READS AND EXECUTES C/L DISPLAYED ON EWD UNDER PF CONTROL (CONT'D)	▶ CALL "MAXIMUM FLIGHT LEVEL 200/MEA" ▶ CALL "SINGLE PACK VALVE FAULT C/L COMPLETED PENDING STATUS"	▶ REPLY "CHECK"	Checklist Completion
PM READS STATUS DISPLAYED ON EWD	▶ CALL "STATUS PACK FAULT PENDING ACTIONS: AVOID LARGE QUICK POWER CHANGES AT HIGH ALTITUDES LIMITATION: MAX FL 200/MEA STATUS PACK FAULT COMPLETED"	▶ CALL "STATUS PACK FAULT"	Reading of status
WHEN ABLE, PF ASSESSES THE SITUATION	▶ CALL "GO AHEAD"	▶ CALL "READY FOR ASSESSMENT?" ▶ CALL TECHNICAL "WE HAVE A PACK VALVE 2 FAILURE. FUEL OK, DC/AC OK, HYD OK, AIR: REMAINING ONLY LEFT SIDE CIRCUIT. OPERATIONAL "FL LEVEL IS LIMITED, LARGE & QUICK POWER CHANGES AVOIDED. DESTINATION AIRPORT IS MAINTAINED". COMMERCIAL "TEMPERATURE CABIN MAY INCREASE"	Assessments
PF SUGGESTS A DECISION TO CM1		▶ CALL "I SUGGEST THAT WE CONTINUE TO DESTINATION AND WRITE IT DOWN IN MAINTENANCE LOG."	Decision
		"NOBODY NEEDS TO BE INFORMED EXCEPT COMPANY, IF YOU AGREE. CONTACT DISPATCH TO INFORM ABOUT MALFUNCTION."	Information
	CAPTAIN ▶ CALL "I AGREE"	▶ CALL "CLEAR FWS, RADIO LEFT SIDE"	
	▶ DO AND CALL CLR PB ..... DEPRESS "FWS CLEARED"		

5. Flows

During their mission, crew members have several sequences of tasks to perform. These sequences are defined by the manufacturer to:

- Fit the design of the aircraft,
- Prioritize the tasks,
- Organize the workload on board.

When a sequence of tasks is necessary to complete the requirements of a flight phase, they are organized in Standard Operational Procedures (SOPs).

Example: Before Take-Off Procedure

In order to achieve the procedures, the SOPs tasks are organized in an ergonomic and logical order with regard to the instruments and the systems the pilots have to use. The physical progression to achieve this procedure is called "Flow".

The completion of these flows facilitates the pilot activity and the memorization of the procedures.

Example: Please refer to the Preliminary Cockpit Preparation flow described in 02.02.04.

9. Briefings

9.1. Departure briefing

1. All departure settings must be ready before PF performs the briefing.

2. General Conditions
   - Actual and expected weather for departure, cruise and arrival. Hazardous phenomena (Icing, thunderstorm, turbulence…)
   - NOTAMs
   - Aircraft status: daily check, documentation, MEL items…

3. Taxi
   - Taxi out description
   - Restrictions: contamination, closed Taxiway…
   - Runway in use and expected holding point
   - Anticipate de-icing holdover times.

4. Take-off Performance
   - Limitations, bleeds ON or OFF, power setting (Boost, RTO).

Departure chart

5. Jeppesen chart n° and date

6. Departure procedure name

7. MSA

8. Flight path description: routing, 1st altitude or FL, climb gradient

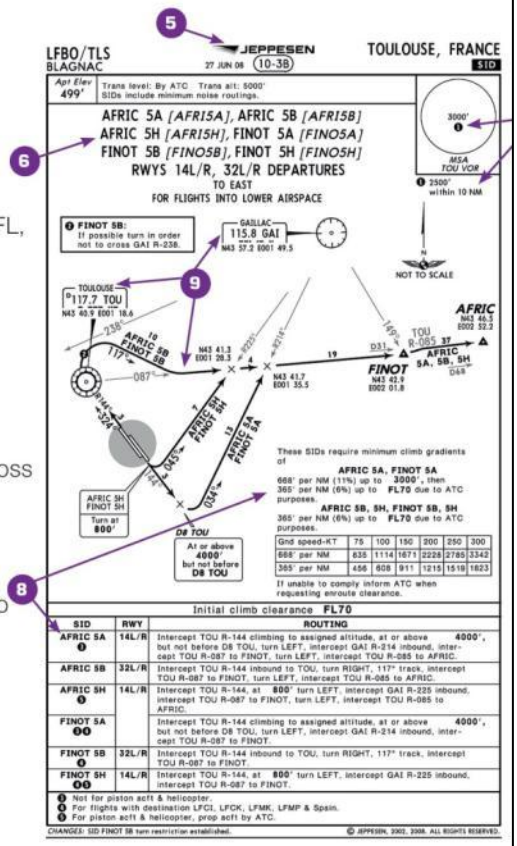
9. NAVAIDS settings:
   Active frequencies & associated courses
   Standby frequencies (if necessary)
   DME hold (if necessary)
   BRG 1 & 2 setting: VOR or ADF

10. FMS setting: Check SID inserted in FPL for cross check operation

11. Single engine flight path description: routing, acceleration altitude, return to departure airport and expected approach, or diversion to take-off alternate.

12. Review potential specific threats

13. Open questions



Example: CM2 is PF.

1. **"ARE YOU READY FOR THE DEPARTURE BRIEFING?"**
2. **"VISIBILITY IS 2000M, CEILING AT 1500FT, WIND FROM 320/15 KT, QNH 1012, NORMAL CONDITIONS. NO MEL, NO NOTAM."**
3. **"WE'LL TAXI OUT VIA PAPA, HOLDING POINT N1, FOR RUNWAY 32R."**
4. **"TAKE-OFF WITH BLEEDS ON, ANTI-ICING OFF."**
5. **"CHART 10-3B, VALID FROM JUNE 27TH."**
6. **"EXPECTED DEPARTURE IS AFRIC5B."**
7. **"MSA IS 3000 FT, 2500 FT WITHIN 10NM."** (Set ALT SEL or Set SID or MSA constraint)
8. **"324 INBOUND TO TOU THEN RIGHT TURN TO HEADING 117 TO INTERCEPT 087 OUTBOUND RADIAL FROM TOU TO FINOT. THEN INTERCEPT 085 OUTBOUND RADIAL TO TOU TO AFRIC. CLIMB GRADIENT IS 11% UP TO 3000FT, WHICH WE CAN COMPLY ON BOTH ENGINES."**
9. **"NAV 2: TOU, CRS 324, STBY ILS**
   NAV 1: TOU, CRS 087, STBY GAI
   ADF1 & 2: TOE
   BRG1 ON VOR, BRG2 ON ADF."
10. **"FINOT SID IS SET IN THE FMS..."** (PF CHECK on FPLN page / PM CHECK with SID Jeppesen chart)
11. **"IN CASE OF ENGINE FAILURE, PROCEED STRAIGHT AHEAD CLIMBING 3000 AND REPORT ATC."**
12. **"NO SPECIFIC THREAT"**
13. **"ANY QUESTIONS? DEPARTURE BRIEFING COMPLETE."**

9.2. Departure clearance

When departure clearance is obtained from ATC, you must check its consistence and compliance with expected SID:

- Is cleared SID in compliance with prepared one?
- Altitude clearance selected and crosschecked on PFD(s).
- Set transponder code.

If no clearance amendment is received, PF calls: **"NO CHANGE"**

If clearance is amended, modify FMS FPLN, reorganize NAVAIDS and perform new briefing.

9.3. Take-off briefing

1. PF calls: **"ARE YOU READY FOR TAKE-OFF BRIEFING?"**
2. Take-off parameters: runway QFU reminder, TOW, V1
3. Procedure in case of failure: take-off abort & continuation description
4. Open questions

Example: CM2 is PF.

1. **"ARE YOU READY FOR TAKE-OFF BRIEFING?"**
2. **"TAKE-OFF RUNWAY 32R, WEIGHT 22 TONS, V1 111 KT, NORMAL CONDITIONS."**
3. **"ANY FAILURE BEFORE V1, YOU CALL "STOP" AND STOP AIRCRAFT**

IF FAILURE AT OR AFTER V1, WE CONTINUE TAKE-OFF, RUNWAY HEADING TO 3000 FT, THEN RIGHT TURN TRACKING TOE CLIMBING TO 4000 FT, ACCELERATION ALTITUDE IS 1000 FT, MSA IS 3000 FT."

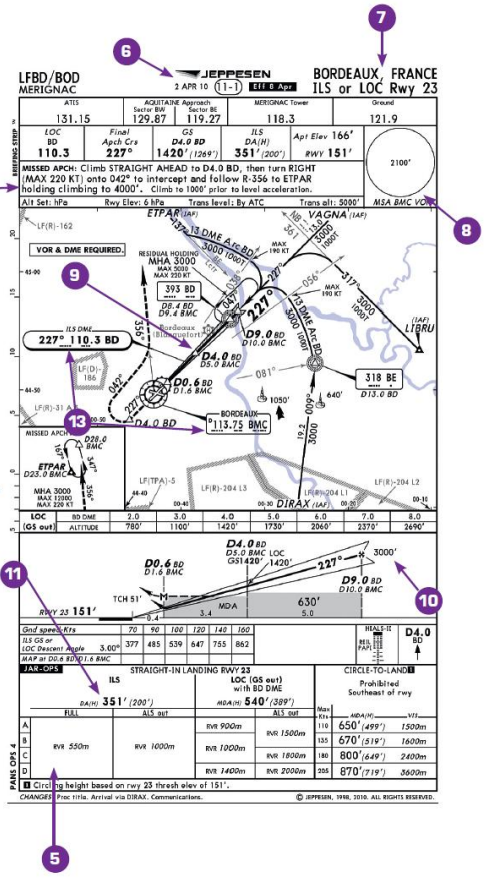
4. **"ANY QUESTIONS? TAKE-OFF BRIEFING COMPLETE."**

9.4. Arrival briefing

1. All settings must be performed before PF's arrival briefing.
2. **Top Of Descent (TOD)**
   - Expected remaining distance and MSA
   - Expected point of deceleration
3. **Approach conditions**
   - Actual and forecast weather, normal or icing atmospheric conditions
   - Aircraft status: MEL items, En-route failure(s)
   - NOTAMs / ATIS: airport equipments failures, anticipate runway assignments changes & unexpected closure.
   - Landing weight, runway in use: landing limitation and approach climb limitation if any.
4. **Alternate & Holding time**
   - Quote holding time before diversion. For computation details refer to 2.01.09 p5 *Holding Time*.

Approach chart

5. Actual and forecast weather at destination: visibility / RVR compared to minima
6. Jeppesen chart n° and date
7. Type of approach procedure



1.18.1.5 TNA Flight Training Management Manual

The current ATR72-600 Flight Training Management Manual

(FTMM) (Attachment 1-7) is revision 33, published on January 8, 2015 and approved by CAA. The purpose of the FTMM is to establish a unified training system, procedures and standards for each fleet.

1.18.1.6 TNA FOD Operations Manual

The current Flight Operations Department Operations Manual (FOD OM) (Attachment 1-8) is revision 33, published on October 01, 2014. The related paragraphs are shown as below:

5-3 副駕駛昇訓正駕駛程序(FO to Captain Upgrade Training)

5-3-1 甄選程序Selection Procedures

基本甄選程序Basic Selection Procedures：

1.航務處平時即根據本手冊第10章相關資格列出合格人員送交所屬 機隊教師(IP)會議評估合乎基本甄選資格人員之平時飛航表現，獲 得推薦者，得參加日後航務處不定期辦理之昇訓甄選。未能獲得推 薦者，由IP會訂定加強職能計劃與時程，完成加強後，重新送交IP 會評估成效，直到獲得推薦.(FOD will list the FOs who meet the basic qualification for upgrade in accordance with the relevant qualifications specified in Chapter 10 of the Manual from time to time and present to relevant IP meetings for recommendation. Those who are recommended by the IP meetings are qualified candidates for the future upgrade training selection. Those who are not recommended by the IP meetings shall complete the reinforcement measures provided by the IP meetings until being acknowledged and recommended)

2.航務處依人力需求不定期呈報昇訓需求人數，經 總經理核准後實施以下甄選程序。(FOD shall submit report on the number of persons required for upgrade training before the implementation of the following procedure to the President for approval prior to implementation)

3.由機隊管理部宣佈昇訓額度，獲得IP會推薦者，需於指定期間內參加學科考試，且成績達90分以上。 由標訓部安排於特定期間內舉行學科考試，逾期不得要求測試。(Qualified candidates must take written tests within specified time and reach 90 points or higher. The STD shall schedule for holding the written test within specified period and candidates must take the test within the time frame and may not request for test taking past this period.

4.由航務處將入選名單填入本章附表二「副駕駛昇訓正駕駛評分表」(如附表二)，並逐項給分。(Qualified candidates will be listed by the FOD and filled into the Appendix 2 of the Chapter with scores given accordingly).

5.由航務處該機隊至少三分之二以上人員出席之IP聯席會議，舉行口試/面試後，並依最終排名擇定昇訓人員。(FOD will call at least two thirds of the fleet IP/CPs to carry out a review and oral test. The result will

be filled into the Appendix 2 to produce the final scores and ranking of the selected candidates.

Remark: Candidates falling below 60 points given by one third of the interviewers can not be recommended (see Appendix 5 of this Chapter)

6.由航務處簽報甄選結果，呈總經理核准。(The FOD shall report the selection results to the President for approval.

……

口試/面試評分表
Oral/Written Tests Evaluation Sheet

項目 Item / 姓 名 Name	口試分數 Oral Score (50%)	線上綜合表現評估 Comprehensive Online Performance Evaluation (50%)	總分 Total Score

說明 Instructions:：

一、 本表由擔任面試官填寫。

二、 「口試分數」以受試者回答口試題目正確性與完整性給分。

三、 「線上綜合表現評估」由面試官根據受試者在線上表現之實際案例綜合評估後給分。

四、 總分若有三分之一出席之考試官評定低於 60 分者，則不予推薦。

1. The sheet is filled out by interviewer.
2. The "oral test score" is based on the correctness and comprehension of the respondent's reply to oral test questions.
3. The "Online Comprehensive Performance Evaluation" is scored by the interviewer according to the real cases of respondent's online performance in comprehensive evaluation.
4. If there is score falling below 60 points from one third of the interviewers, the applicant will not be recommended.

填表人 Filled by：

***11-9** 記錄與資料控管方式(**The management and control of flight operations records and data**)*

各項記錄或資料依達到其規定之保存期限後，由各記錄或資料保存者適時銷毀，包括但不限於：飛時記錄（保存一年）、飛航文件（保存3個月）、飛航駕駛員班表（保存

兩年）、個人資料與訓練記錄（聘雇期間）。
附註：駕駛員訓練/考核(包括檢定不及格之記錄)與資格記錄應於駕駛員聘用期間持續保存。
(Flight Operations related records and data shall be preserved accordingly: Flight Time/Duty Time Related Records (at least one year); flight documents (at least 3 months); Rosters (at least 2 years); Personal data and training records, including successful and unsuccessful flight crew evaluations (employment period). After the required retention periods, the records may be disposed.)
以上記錄(包括電子形式，若有)於保存時，應有適當之識別方式、清楚可讀、專檔或專櫃維護、鎖妥，並僅供權責人員存取。存檔設備需能具備基本防火、防盜功能。
(The above records (including in an electronic form) shall be identifiable with proper naming or filing system. They shall be legible, maintained and locked in proper storage devices (such as metal cabinets) with protection/security functions, and are accessible to authorized personnel only.

1.18.1.7 ATR72-600 Minimum Equipment List and Configuration Difference List

The current ATR72-600 Minimum Equipment List and Configuration Difference List (MEL/CDL) is revision 1 and was published on February 10, 2015. It is developed from the ATR Master MEL revision 05 and ATR72-212A AFM revision 15, and then be tailored to TNA specific operational requirements. It was approved by CAA. The MEL paragraphs related to propellers are shown in Appendix 1-3

1.18.1.8 ATR72-600 Runway Analysis Manual

The current ATR72-600 Runway Analysis Manual (RAM) published on September 30, 2013, and was approved by CAA. It provides flight crewmembers and other operational personnel the aircraft takeoff and landing performance data, including Regulatory Take-Off Weight (RTOW) chart and Regulatory Landing Weight (RLW) chart, and computation of the takeoff and landing performance assuming the case of a critical engine failure at any point during takeoff and landing. The information of engine out standard instrument departure of Songshan airport runway 10 is shown in Appendix 1-4.

1.18.1.9 RCSS Departure Aeronautical Chart

The Aeronautical Information Publication (AIP) Taipei FIR is published by CAA. In accordance with the AIP, the RCSS MUCHA TWO

departure chart is shown in Figure 1.18-1. The KEELUNG ONE departure chart is shown in Figure 1.18-2.

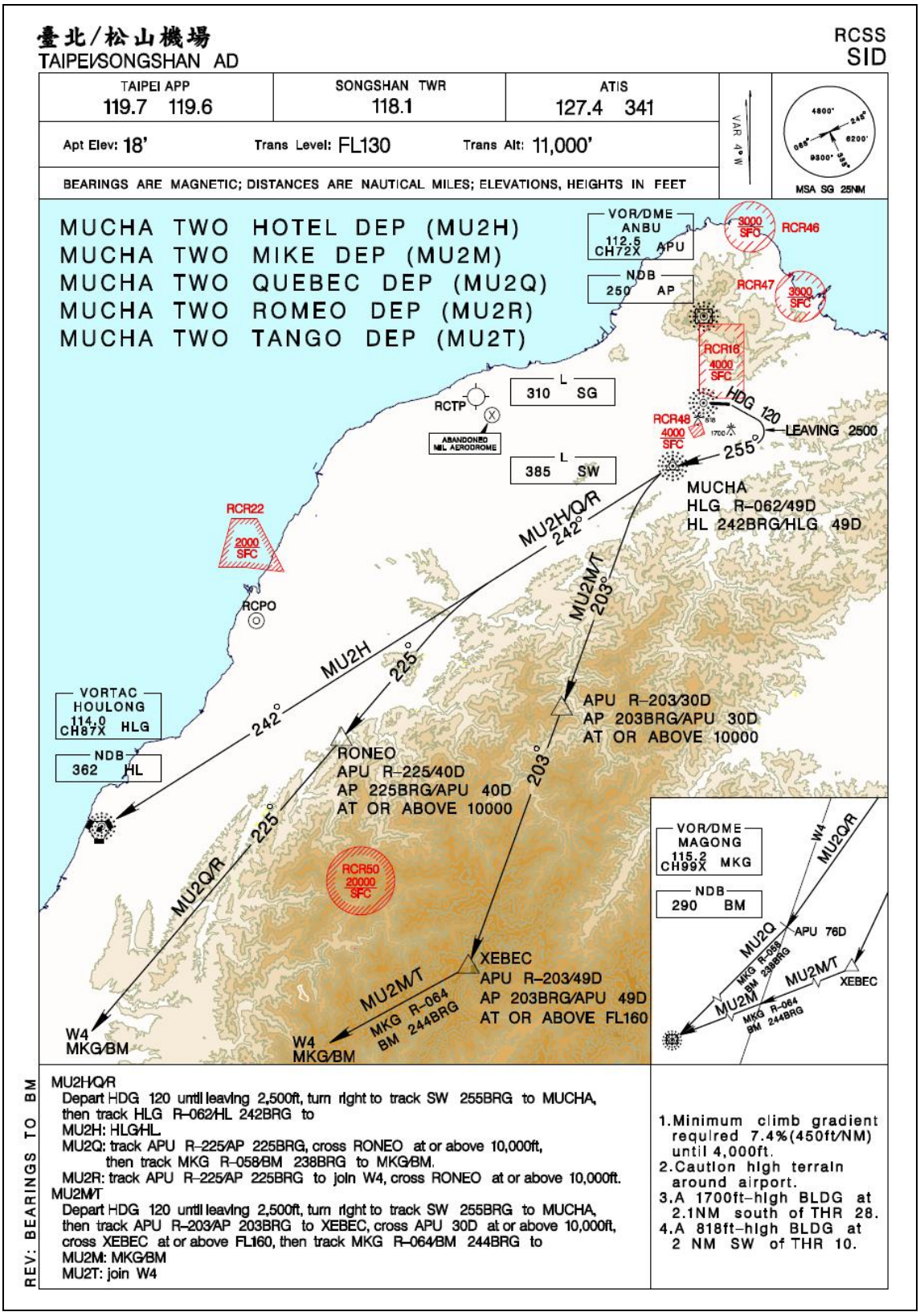


Figure 1.18-1 RCSS MUCHA TWO departure chart

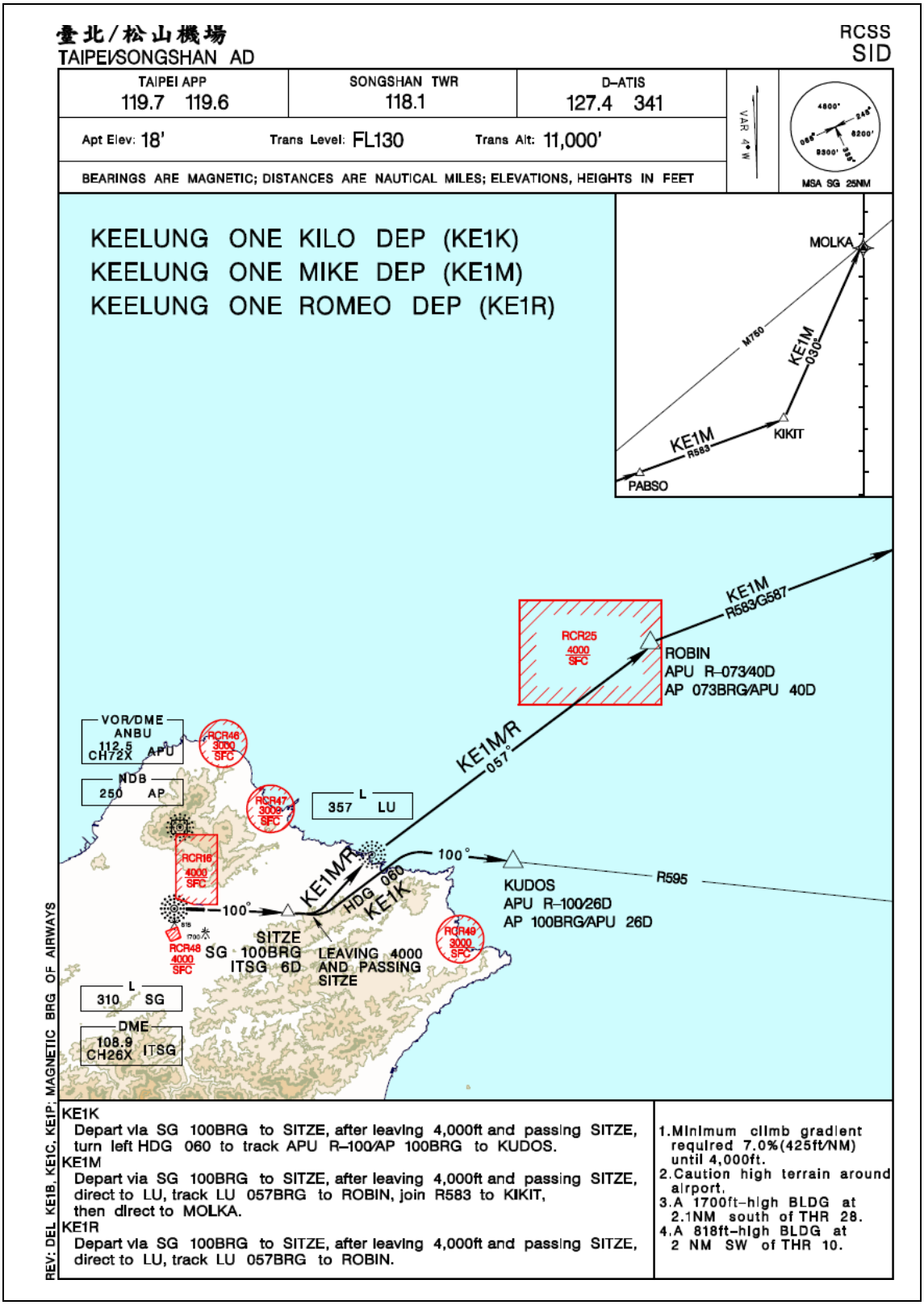


Figure 1.18-2 KEELUNG ONE departure chart

1.18.2 TNA Flight Crew Interview

The flight operations group interviewed 12 TNA ATR flight crews after the GE235 occurrence. The interviewees include:

- Four ATR72-500 IPs/CPs;
- Two ATR72-600 IPs/CPs;
- Two ATR72-600 Captains;
- Four ATR72-600 First Officers.

The interview notes were integrated into 9 topics and summarized as following:

- Abort take-off policy while ATPCS not armed during rolling

  Most of the interviewees stated that the ATR72-600 flight crew should abort take-off if the ATPCS is not armed during take-off rolling. While encountering the same condition, the ATR72-500 flight crew can continue the take off if the ATPCS off weight had been calculated and below the RTOW limitation. However, some ATR72-500 interviewees prefer to disregard the above company policy and abort take-off regardless of take-off weight.

- ATPCS dynamic test

  Only few interviewees can correctly indicated that ATPCS dynamic test should be conducted at the end of the last flight of a day. Some ATR72-500 interviewees stated that ATPCS dynamic test is unnecessary for an ATR72-500 aircraft. Most interviewees agreed that the dynamic test was rarely conducted by flight crew. One interviewee stated that he learned the ATPCS dynamic test from ATR72-600 differences training and tried to conduct it in line operations. However, some captains refused to do it because they would like to get off duty early.

- Crew coordination for controls of power levers and condition levers

  With regard to ATR72-600 operations, most interviewees stated that they follow the instructions from ATR72-600 differences training. The PF is responsible for power levers and PM is responsible for condition levers in abnormal or emergency condition. One ATR72-600 interviewee stated that both of power and condition levers should be controlled by CM1 in line operations.

  With regard to ATR72-500 operations, there are several different

statements for this issue.

- Crew resource management

  Most of the interviewees were unable to share what they learned from the CRM training. There were some introductory cases in CRM recurrent training but the instructor did not design scenarios to lead the trainees discussing the specific situation.

  Few senior captains do not consider that using a standard call-out is important and prefer to apply gestures instead of call-outs. Some first officers would try to challenge a captain's SOP non-compliance behavior but would not insist in correcting it. In addition, several interviewees do not want to report a SOP non-compliance behavior to the safety reporting system of the company because they do not trust the system.

- ATR72-600 differences training

  A few ATR72-600 interviewees who had flown a glass cockpit aircraft stated that the 5-days difference training was adequate. The others stated that it was not adequate, especially for FMS and electronic displays familiarization. Most ATR72-600 interviewees stated that longer lead time periods prior to the differences training would be helpful for learning, such as conduct the ATR72-600 observation flights, more full time self-study courses (at least one week) , and counseling program from experiences and current ATR72-600 pilots. Interviewees also indicated that there were about 7 days for self-study arranged by the TNA prior to the differences training. However, most of the self-study time was shortened to 2-3 days due to support flight duties.

- One engine flameout at take-off

  Most of the interviewees stated that the scenario of one engine flameout at take-off in simulator training was set at the aircraft just lifted off the ground and auto pilot was not engaged condition. In simulator, The IP required trainees to carry out the procedures step by step and not rush to complete the procedures.

- Autopilot engagement issue

  Most of the ATR72-500 interviewees stated the autopilot will disengaged automatically while one engine flameout occurred under AP engaged condition due to its abrupt yawing moments. However, the ATR72-600 interviewees stated that the autopilot will not

disengaged automatically while one engine flameout occurred under AP engaged condition, further more they also indicated that the ATR72-600 aircraft has more powerful auto-trim function and applying too much rudder pedal to correct direction is not necessary, it could caused yaw damper disengaged if you do so. One ATR72-600 interviewee stated that he may manually disengage autopilot while one engine flameout occurred even if the autopilot did not disengage automatically. Some interviewees stated that ATR instructors taught them not to disengage the autopilot because it could reduce the workload.

- Comments on GE235 flight crew

  Most of the interviewees made positive comments on the GE235 flight crew. Pilots flew with Captain A or Captain B within one week prior to the occurrence stated that their behaviors and conditions were normal in flight.

  One IP who was conducted the upgrade training to the captain A indicated that his comments to captain A was “a little nervous during line operations and had a tendency of rush to perform the procedures without coordination with the PM.”

- ATR fleet manpower problem

  A few interviewees stated that the TNA should increase training requirements and standards for flight safety. In recent years, several senior ATR first officers were transferred to Airbus fleet. Salaries paid by TNA also cannot attract high qualities pilots from outsources. This resulted in TNA have the limited choice to select the first officers who have less experiences and upgrade them promote to captain.

IV. Appendices

Appendix 1-1 TNA ATR72-600 Differences Training Syllabus

ATR 600 Difference Course
One week

Publication date: 08/11/13

DAY1	DAY2	DAY3	DAY4	DAY5
NAS presentation Planning Interactive tools (2H00) VHP1 Briefing (0H30) VHP (3H00) NAS presentation --- FMS initialization Lateral/Vertical revision pages presentation Debriefing (0H30) [redacted] - GLASS COCKPIT FAMILIARISATION -VCP	[redacted] -FLIGHT NSTRUMENTS -INTEGRATED SYSTEMS VHP2 Briefing (0H30) VHP (3H00) full cockpit preparation (SOP) Complete System pages description --- FMS practice (speed configurations) Debriefing (0H30) CRM (2h00)	[redacted] -FWS -AFCS VHP3 Briefing (0H30) VHP (3H00) Failures treatment Flaps Unlock DC Gen fault IOM failures FMS failures DU failures Engine Flame Out FWS failure FMS msg (INTEG, Unable RNP, D-R) Emergency Evacuation Debriefing (0H30)	VHP4 Briefing (0H30) VHP (3H00) NAVIGATION (LFBO →LFMT) FMS practice Non Precision Approach Debriefing (0H30) [redacted] -NAVIGATION SYSTEM -COMMUNICATION	FFS Briefing (1H00) FFS (4H00) Severe Icing Stall EFATO Go-Around twin ENG Go-Around Single ENG Debriefing (1H00)

All [redacted] modules are flexible therefore, they must be studied by the end of the week under trainee responsibility.

AFCS= Automatic Flight Control System **EFATO**=engine flameout at take-off **FFS**=full flight simulator **FWS**= Flight Warning System **LMS**=Learning Management Software **MFSTD**= Maintenance & Flight Synthetic Training Device **NAS**=New Avionic Suite **NPA**=Non Precision Approach **VHP**=Virtual Hardware Platform **VCP**= Virtual Control Panel **CRM**= Crew Resource Management

Appendix 1-2 PT/PC training syllabus

復興航空 TransAsia Airways

ATR FLEET PROFICIENCY TRAINING
YEAR 2015 (1ST)

Trainee:	Crew Member:	Day Month Year 2015
☐ CAPT ☐ F/O	**SIMULATOR TIME** PF: PM:	**Instructor :**

RCSS	RCQC

5: Proficient **4:** Satisfactory **3:** Acceptable **2:** Improvement required **1:** Unsatisfactory

NO	ITEM	5	4	3	2	1
1	TRANSIT COCKPIT PREPARATION					
2	ENG START					
3	CROSS WIND TAKE OFF(RWY 10)					
4	TCAS					
5	EXCESS CAB ALT EMER DESCENT					
6	HYD BLUE OVHT					
7	VOR RWY 20 APP (CDFA)					
8	FLAP UNLK					
9	GO AROUND WITH TWO ENGINE					
10	RWY 20 VISUAL approach / Landing					
11	TAKE OFF (RWY 02)					
12	ENG FLAME OUT AFTER V1					
13	RWY 02 ILS APP and Manual Landing					
14	TAKE OFF (RWY 02)					
15	ENG FIRE BEFORE V1					
16	RTO					
17	EMER EVACUATION					

If the grade will be marked on "3" or below, please add comment as clear as possible on the back for additional training reference.

復興航空 TransAsia Airways

ATR FLEET PROFICIENCY CHECK YEAR 2015 (1ST)

Examinee:	Crew Member:	Day Month Year 2015
☐ CAPT ☐ F/O	SIMULATOR TIME PF: PM:	Examiner :

S: Satisfactory **U**: Unsatisfactory SB: Satisfactory With Briefing

NO	ITEM	S	U	SB
1	TRANSIT COCKPIT PREPARATION			
2	ENG START			
3	CROSS WIND TAKE OFF(RWY 10)			
4	TCAS			
5	EXCESS CAB ALT EMER DESCENT			
6	HYD GREEN OVHT			
7	TLU FAULT			
8	VOR RWY 20 APP (CDFA)			
9	GO AROUND WITH TWO ENGINE			
10	RWY 20 VISUAL approach / Landing			
11	TAKE OFF (RWY 02)			
12	ENG FLAME OUT AFTER V1			
13	RWY 02 ILS APP and Manual Landing			
14	TAKE OFF (RWY 02)			
15	ENG FIRE BEFORE V1			
16	RTO			
17	EMER EVACUATION			

Appendix 1-3 MEL Paragraphs Related to Propellers

61 PROPELLERS

1. ITEM		2. RECTIFICATION INTERVAL	3. NUMBER INSTALLED	4. NUMBER REQUIRED FOR DISPATCH	5. REMARKS OR EXCEPTIONS	
21-4	**PIU And Associated Propeller Speed Selection**	C	2	0	**(o)**	May be inoperative provided both CL are set to 100% OVRD. **Note:** *If affected side cannot be identified, both PIU should be considered as inoperative.*
	OPERATING PROCEDURES *a) Engine not running – PL on GI – CL on FUEL SO* *– RH Maintenance Panel, set WOW on FLT position* *– Advance CL to AUTO* *– Check PEC FAULT illuminates after 30 seconds* *– Retard CL to FUEL SO* *– Check PEC FAULT extinguishes after 30 seconds* *– Reset PEC to make sure that SGL CH extinguishes* *– RH Maintenance Panel, set WOW on NORM position* *b) Confirm SGL CH light illumination and extinction during unfeathering.*					
22-1	**Autofeather System (and Associated Test)** OD	C	2	0	* **(o)**	May be inoperative provided operations are conducted in compliance with AFM
	OPERATING PROCEDURES *– Refer to AFM Supplement 7_02.06: Dispatch with Autofeather system inoperative.* *– For MTOW and takeoff speeds, refer to the RTOW chart titled "**AUTOFEATHER INOP**".* *Note: In case of engine failure after V1, do not reduce PL below 45° of PLA before feathering.*					
22-2	**ATPCS (and Associated Test)** OD	C	1	0	* **(o)**	May be inoperative provided operations are conducted in compliance with the AFM
	OPERATING PROCEDURES *– Refer to AFM Supplement 7_02.10: Dispatch with ATPCS OFF.* *– For MTOW and takeoff speeds, refer to the RTOW chart titled "**ATPCS OFF**".*					
22-3	**ATPCS ARM Light**	C	1	0	*	May be inoperative provided ATPCS is considered inoperative.

DISPATCH WITH AUTOFEATHER SYSTEM INOPERATIVE

R **Uptrim and AFU are considered operative. If not, refer to the connected procedure.**

– Increase V1 limited by VMCG by 5 kt

– Increase VR by 2 kt

– Increase VMCA by 3 kt, check VR, V2

– Increase VMCL by 3 kt

– Check effect on TOR, TOD, 2nd segment climb

NOTE :In case of engine failure after V1, do not reduce PL below 45º of PLA before feathering.

DISPATCH WITH ATPCS OFF

R **AFU is considered operative. If not, refer to the connected procedure.**

- Select ATPCS OFF and BLEED VALVES OFF
- Increase V1 limited by VMCG by 5 kt
- Increase VR by 2 kt
- Increase VMCA by 3 kt. Check VR and V2
- Increase VMCL by 3 kt
- Check ATPCS inoperative effect on TOR, TOD and 2nd segment
- Apply RTO power by pushing both PLs up to the ramp
- After take off set both PLs into the notches, then apply CLIMB SEQUENCE
- BLEED VALVES . . . . . ON

NOTE :In case of engine failure after V1 do not reduce PL below 45° of PLA before feathering

Appendix 1-4 RAM of Songshan Runway 10

Runway DRY
Anti-Icing OFF
QNH 1013

SONGSHAN 10

MTOW=50,265 LBS

Rwy Length: **8547 FT** Elevation: **13 FT** Slope: **0.01 %** **RCSS / TSA**

EOSID:

- *Climb runway heading to O locator ;*
- *Turn LEFT bearing 066 to LU and hold.*

ACC. HEIGHT (ALT): **1100 FT (1113 FT)**

MAX. ACC. HEIGHT (ALT): 2255 FT (2268 FT)

OAT	A/C ON					ATPCS OFF (MEL 61-22-2)				
DC	-15 KT	-10 KT	-5 KT	0 KT	10 KT	-15 KT	-10 KT	-5 KT	0 KT	10 KT
10	**48535** 4-6 94/113/118 -227 lb /-10 hPa	**50209** 4-4 104/118/122 -230 lb /-10 hPa	**50264** 1-1 104/111/115 +0 lb /-10 hPa	NL	NL	**42722** 4-4 108/109/112 -194 lb /-10 hPa	**43960** 4-4 117/117/119 -187 lb /-10 hPa	**44885** 4-4 118/118/121 -188 lb /-10 hPa	**45742** 4-4 119/119/122 -189 lb /-10 hPa	**46298** 4-4 120/120/122 -190 lb /-10 hPa
12	**48369** 4-6 94/113/117 -234 lb /-10 hPa	**50041** 4-4 104/118/122 -229 lb /-10 hPa	**50264** 1-1 106/111/115 +0 lb /-10 hPa	NL	NL	**42581** 4-4 107/109/112 -193 lb /-10 hPa	**43821** 4-4 116/116/119 -187 lb /-10 hPa	**44745** 4-4 118/118/120 -188 lb /-10 hPa	**45601** 4-4 119/119/122 -189 lb /-10 hPa	**46156** 4-4 120/120/122 -190 lb /-10 hPa
14	**48201** 4-6 94/113/117 -233 lb /-10 hPa	**49873** 4-4 103/118/122 -229 lb /-10 hPa	**50264** 1-1 107/111/115 +0 lb /-10 hPa	NL	NL	**42439** 4-4 107/109/112 -193 lb /-10 hPa	**43682** 4-4 116/116/119 -186 lb /-10 hPa	**44605** 4-4 118/118/120 -188 lb /-10 hPa	**45461** 4-4 119/119/121 -189 lb /-10 hPa	**46015** 4-4 120/120/122 -190 lb /-10 hPa
16	**48036** 4-6 94/112/117 -232 lb /-10 hPa	**49708** 4-4 103/118/122 -228 lb /-10 hPa	**50264** 1-1 108/111/115 +0 lb /-10 hPa	NL	NL	**42300** 4-4 107/109/112 -192 lb /-10 hPa	**43547** 4-4 116/116/119 -186 lb /-10 hPa	**44469** 4-4 117/117/120 -187 lb /-10 hPa	**45323** 4-4 119/119/121 -188 lb /-10 hPa	**45876** 4-4 120/120/122 -189 lb /-10 hPa
18	**47866** 4-6 93/112/116 -227 lb /-10 hPa	**49545** 4-4 103/117/121 -227 lb /-10 hPa	**50264** 1-1 109/111/115 +0 lb /-10 hPa	NL	NL	**42162** 4-4 107/108/112 -192 lb /-10 hPa	**43414** 4-4 116/116/118 -186 lb /-10 hPa	**44335** 4-4 117/117/120 -187 lb /-10 hPa	**45189** 4-4 119/119/121 -188 lb /-10 hPa	**45741** 4-4 119/119/122 -189 lb /-10 hPa
20	**47705** 4-6 93/112/116 -232 lb /-10 hPa	**49384** 4-4 102/117/121 -228 lb /-10 hPa	**50264** 1-1 110/111/115 +0 lb /-10 hPa	NL	NL	**42025** 4-4 106/108/111 -193 lb /-10 hPa	**43283** 4-4 116/116/118 -187 lb /-10 hPa	**44203** 4-4 117/117/120 -189 lb /-10 hPa	**45056** 4-4 118/118/121 -190 lb /-10 hPa	**45608** 4-4 119/119/122 -191 lb /-10 hPa
22	**47539** 4-6 93/111/116 -226 lb /-10 hPa	**49222** 4-4 102/117/121 -228 lb /-10 hPa	**50264** 4-1 111/111/115 +0 lb /-10 hPa	NL	NL	**41888** 4-4 106/108/111 -193 lb /-10 hPa	**43152** 4-4 116/116/118 -187 lb /-10 hPa	**44071** 4-4 117/117/119 -189 lb /-10 hPa	**44923** 4-4 118/118/121 -190 lb /-10 hPa	**45474** 4-4 119/119/121 -191 lb /-10 hPa
24	**47377** 4-6 92/111/115 -232 lb /-10 hPa	**49062** 4-4 101/117/121 -229 lb /-10 hPa	**50264** 4-1 111/113/116 +0 lb /-10 hPa	NL	NL	**41751** 4-4 106/108/111 -193 lb /-10 hPa	**43021** 4-4 115/115/118 -188 lb /-10 hPa	**43938** 4-4 117/117/119 -190 lb /-10 hPa	**44790** 4-4 118/118/120 -191 lb /-10 hPa	**45340** 4-4 119/119/121 -192 lb /-10 hPa
26	**47213** 4-6 92/111/115 -228 lb /-10 hPa	**48900** 4-4 101/117/121 -228 lb /-10 hPa	**50264** 4-1 110/115/118 -88 lb /-10 hPa	NL	NL	**41613** 4-4 105/108/111 -193 lb /-10 hPa	**42891** 4-4 115/115/118 -187 lb /-10 hPa	**43806** 4-4 117/117/119 -189 lb /-10 hPa	**44657** 4-4 118/118/120 -190 lb /-10 hPa	**45206** 4-4 119/119/121 -191 lb /-10 hPa
28	**47050** 4-6 92/110/114 -227 lb /-10 hPa	**48740** 4-4 101/117/120 -231 lb /-10 hPa	**50246** 4-4 110/119/122 -239 lb /-10 hPa	NL	NL	**41477** 4-4 105/108/111 -193 lb /-10 hPa	**42762** 4-4 115/115/118 -188 lb /-10 hPa	**43676** 4-4 117/117/119 -190 lb /-10 hPa	**44526** 4-4 118/118/120 -191 lb /-10 hPa	**45075** 4-4 119/119/121 -193 lb /-10 hPa
30	**46888** 4-6 92/110/114 -227 lb /-10 hPa	**48580** 4-4 100/116/120 -235 lb /-10 hPa	**50078** 4-4 109/118/122 -237 lb /-10 hPa	NL	NL	**41340** 4-4 105/107/110 -192 lb /-10 hPa	**42633** 4-4 115/115/117 -188 lb /-10 hPa	**43546** 4-4 116/116/119 -190 lb /-10 hPa	**44395** 4-4 118/118/120 -192 lb /-10 hPa	**44942** 4-4 118/118/121 -193 lb /-10 hPa
32	**46727** 4-6 91/109/114 -227 lb /-10 hPa	**48418** 4-4 100/116/120 -243 lb /-10 hPa	**49913** 4-4 109/118/122 -247 lb /-10 hPa	**50264** 1-1 110/111/115 +0 lb /-10 hPa	NL	**41206** 4-4 104/107/110 -198 lb /-10 hPa	**42504** 4-4 115/115/117 -206 lb /-10 hPa	**43416** 4-4 116/116/118 -209 lb /-10 hPa	**44264** 4-4 117/117/120 -211 lb /-10 hPa	**44811** 4-4 118/118/120 -213 lb /-10 hPa
34	**46583** 4-6 91/109/114 -278 lb /-10 hPa	**48264** 4-4 100/116/119 -303 lb /-10 hPa	**49757** 4-4 108/118/122 -316 lb /-10 hPa	**50264** 1-1 111/111/115 +0 lb /-10 hPa	NL	**41081** 4-4 104/107/110 -249 lb /-10 hPa	**42373** 4-4 115/115/117 -281 lb /-10 hPa	**43283** 4-4 116/116/118 -286 lb /-10 hPa	**44130** 4-4 117/117/120 -291 lb /-10 hPa	**44676** 4-4 118/118/120 -294 lb /-10 hPa
36	**46323** 4-6 91/109/114 -415 lb /-10 hPa	**47967** 4-4 100/116/119 -477 lb /-10 hPa	**49439** 4-4 109/118/121 -494 lb /-10 hPa	**50264** 4-1 113/113/117 +0 lb /-10 hPa	**50264** 1-1 109/111/115 +0 lb /-10 hPa	**40836** 4-4 105/107/110 -382 lb /-10 hPa	**42065** 4-4 114/114/117 -467 lb /-10 hPa	**42968** 4-4 116/116/118 -477 lb /-10 hPa	**43806** 4-4 117/117/119 -486 lb /-10 hPa	**44348** 4-4 118/118/120 -492 lb /-10 hPa
38	**45793** 4-6 92/110/115 -440 lb /-10 hPa	**47344** 4-4 101/115/119 -466 lb /-10 hPa	**48794** 4-4 109/117/120 -483 lb /-10 hPa	**50196** 4-4 118/119/122 -507 lb /-10 hPa	**50264** 4-1 114/114/118 +0 lb /-10 hPa	**40348** 4-4 106/106/109 -391 lb /-10 hPa	**41418** 4-4 113/113/116 -456 lb /-10 hPa	**42304** 4-4 115/115/117 -466 lb /-10 hPa	**43128** 4-4 116/116/118 -475 lb /-10 hPa	**43660** 4-4 117/117/119 -481 lb /-10 hPa
40	**45221** 4-4 93/111/115 -432 lb /-10 hPa	**46724** 4-4 101/114/118 -458 lb /-10 hPa	**48153** 4-4 110/116/120 -474 lb /-10 hPa	**49509** 4-4 119/119/122 -507 lb /-10 hPa	**50200** 4-4 124/124/127 -541 lb /-10 hPa	**39813** 4-4 107/107/110 -402 lb /-10 hPa	**40774** 4-4 112/112/115 -446 lb /-10 hPa	**41644** 4-4 114/114/116 -457 lb /-10 hPa	**42453** 4-4 115/115/117 -466 lb /-10 hPa	**42975** 4-4 116/116/118 -472 lb /-10 hPa
42	**44655** 4-4 94/111/115 -439 lb /-10 hPa	**46107** 4-4 102/113/117 -451 lb /-10 hPa	**47515** 4-4 111/115/119 -465 lb /-10 hPa	**48804** 4-4 120/120/123 -513 lb /-10 hPa	**49414** 4-4 123/123/127 -534 lb /-10 hPa	**39231** 4-4 109/109/111 -420 lb /-10 hPa	**40132** 4-4 111/111/114 -439 lb /-10 hPa	**40986** 4-4 113/113/115 -449 lb /-10 hPa	**41778** 4-4 114/114/116 -458 lb /-10 hPa	**42291** 4-4 115/115/117 -464 lb /-10 hPa
44	**44057** 4-4 95/110/114 -432 lb /-10 hPa	**45493** 4-4 103/112/116 -442 lb /-10 hPa	**46880** 4-4 112/115/118 -455 lb /-10 hPa	**48053** 4-4 121/121/124 -513 lb /-10 hPa	**48626** 4-4 122/122/126 -527 lb /-10 hPa	**38616** 4-4 109/109/111 -420 lb /-10 hPa	**39494** 4-4 110/110/113 -431 lb /-10 hPa	**40330** 4-4 112/112/114 -441 lb /-10 hPa	**41106** 4-4 113/113/115 -450 lb /-10 hPa	**41609** 4-4 114/114/116 -456 lb /-10 hPa
46	**43450** 4-4 96/109/113 -428 lb /-10 hPa	**44873** 4-4 104/112/115 -437 lb /-10 hPa	**46244** 4-4 113/114/117 -450 lb /-10 hPa	**47279** 4-4 121/121/124 -516 lb /-10 hPa	**47832** 4-4 121/121/124 -522 lb /-10 hPa	**37988** 4-4 108/108/110 -415 lb /-10 hPa	**38850** 4-4 109/109/112 -426 lb /-10 hPa	**39669** 4-4 111/111/113 -436 lb /-10 hPa	**40430** 4-4 112/112/114 -444 lb /-10 hPa	**40923** 4-4 113/113/115 -450 lb /-10 hPa
48	**42839** 4-4 97/109/113 -419 lb /-10 hPa	**44254** 4-4 106/111/114 -426 lb /-10 hPa	**45579** 4-4 114/114/118 -459 lb /-10 hPa	**46491** 4-4 120/120/123 -507 lb /-10 hPa	**47035** 4-4 120/120/123 -513 lb /-10 hPa	**37359** 4-4 107/107/109 -406 lb /-10 hPa	**38204** 4-4 108/108/111 -416 lb /-10 hPa	**39007** 4-4 110/110/112 -426 lb /-10 hPa	**39753** 4-4 111/111/113 -435 lb /-10 hPa	**40236** 4-4 112/112/114 -441 lb /-10 hPa
50	**42236** 4-4 98/108/112 -410 lb /-10 hPa	**43643** 4-4 107/110/114 -418 lb /-10 hPa	**44873** 4-4 116/116/119 -480 lb /-10 hPa	**45706** 4-4 119/119/122 -499 lb /-10 hPa	**46240** 4-4 119/119/122 -505 lb /-10 hPa	**36735** 4-4 106/106/108 -397 lb /-10 hPa	**37564** 4-4 107/107/110 -408 lb /-10 hPa	**38351** 4-4 109/109/111 -418 lb /-10 hPa	**39080** 4-4 110/110/112 -427 lb /-10 hPa	**39554** 4-4 111/111/113 -432 lb /-10 hPa

TOW (LB) Codes
V1 / VR / V2 (IAS KT)
DTOW / -10 hPa

Limitation Codes:
0=Dry check, 1=Structure, 2=2nd segment, 3=Runway, 4=Obstacle
5=Tire speed, 6=Brake energy, 7=Rwy 2 engines, 8=Final T.O., 9=VMC

Date: 30 SEP, 2013 **REV 00**

V. Attachment List

No	Item
1-1	Captain A training records in previous airlines
1-2	PT/PC Observation Report
1-3	TNA Flight Operations Manual (FOM)
1-4	TNA ATR Standard Operation Procedure (SOP)
1-5	ATR72 Flight Crew Operating Manual (FCOM)
1-6	ATR Flight Crew Training Manual (FCTM)
1-7	TNA Flight Training Management Manual (FTMM)
1-8	TNA Flight Operations Department Operations Manual (FODOM)
1-9	ATR 42/72 Flight Crew Qualifications (European Aviation Safety Agency Operational Evaluation Board Report)
1-10	TNA Operations Specification
1-11	TNA Staff Interview Records
1-12	TNA flight schedules (January 2015)
1-13	TNA ATR fleet recurrent training schedules(May 2015)