

**FINAL REPORT ON
MA-60, XY-AIQ, RUNWAY EXCURSION
ACCIDENT MONGHSAT AIRPORT (VYMS)
ON 16 MAY 2013**

Executive Summary

At 11:10 Local time, on 16 May 2013, a MA- 60 aircraft register XY-AIQ operated by Myanmar Airways departed Heho airport (VYHH) on a scheduled passenger flight to Monghsat airport (VYMS) Myanmar. On board the aircraft were the pilot in command (PIC), first officer (FO), 2 Cabin crews and 51 passengers (55 POB). The FO was the designated line training (command) pilot for this flight.

Aircraft was climbed to 15000 ft with indicated airspeed 200 knots. At about 40 Miles reaching to Monghast, aircraft descent to 8000ft and performed visual approach to Monghsat airport. Aircraft approached to runway 12 with indicated air speed 120 Knots and flap 30 degree. During landing roll, aircraft overrun to runway 30 about 110 meters and struck to tree stump and coming to rest. After Cabin crews initiated emergency evacuation, one passenger suffered serious injury, one passenger suffered minor injury and other survived.

- | | |
|---------------------------------|---|
| - Registered owner and operator | - Myanmar Airways |
| - Air craft type | - MA-60 (MSN – 0808) |
| - Nationality | - Myanmar |
| - Registration | - XY-AIQ |
| - Place of Accident | - Monghsat Airport
(VYMS)
Latitude N 20° 30.83'
Longitude E 99° 15.88' |
| - Date & Time | - 16 May 2013 at 11: 50
(local time) |
| - Type of operation | - Scheduled passenger flight |
| - Phase of operation | - During landing rolls |

1) FACTUAL INFORMATION

1.1) History of the flight

1.1.1) Departure and En-route

On 16 May 2013 at 08:00 local Time, Myanmar Airways MA-60 aircraft registered XY- AIQ (MSN-0808) departed Yangon International Airport (VYYY) to Monghsat Airport. For this flight captain assigned FO to line training (Command) pilot and aircraft landed to Monghsat at about 09:25 local time. After passengers disembarked and boarded, aircraft departed to Heho at 09:55 local time and landed at about 10:40 local time. Aircraft refueled at Heho and departed to Monghsat at 11:10 local time with 4 crews and 51 passengers. First officer was designated as the Pilot flying for this flight.



Figure.(1) Myanmar Airways , MA-60 (XY-AIQ)

Captain contacted to Monghsat ATC weather information, and aircraft climbed to 15000-ft with indicated airspeed 200 knots. Where reaching 40 Miles to Monghsat airfield, Captain request descent clearance and descent to 8000 ft. After passing transition level 125 Monghsat airfield, QNH setting and performed approach check. During approach to Monghsat airfield, weather was fine and visibility was 4-5 Miles (8- km). When reaching 3 Miles distance to runway 12, approach speed was 120 knots IAS.

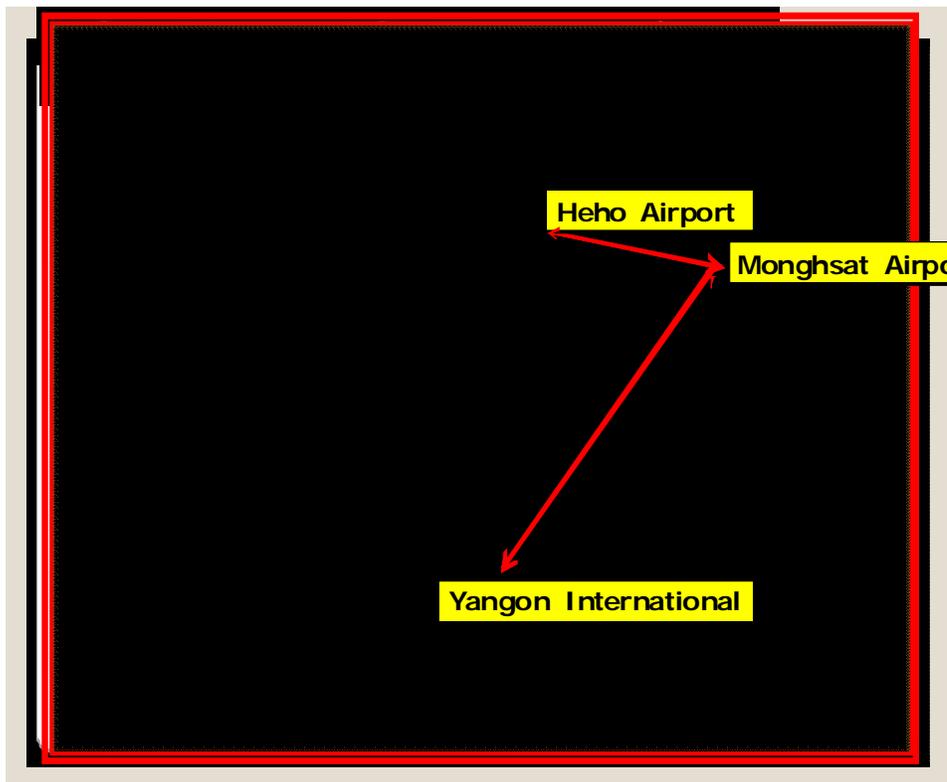


Figure. (2) XY- AIQ Flight Route

1.1.2) Aircraft over run and collision with tree stump

At about 11:47:59 local time, aircraft first touchdown to runway 12 with IAS 114 knots, vertical speed -288, flap 30 degree. During landing roll, aircraft over run to runway 30. At about (11:48:33) local time, aircraft struck to tree stump with IAS 40 knots and passing across to water drainage (gutter) located 110 meters from runway 30. After striking, aircraft turned to left 80 degree and came to rest. Cabin crews performed emergency evacuation, one passenger suffered serious injury, other one suffered minor injury and 53 of the occupants were survived.

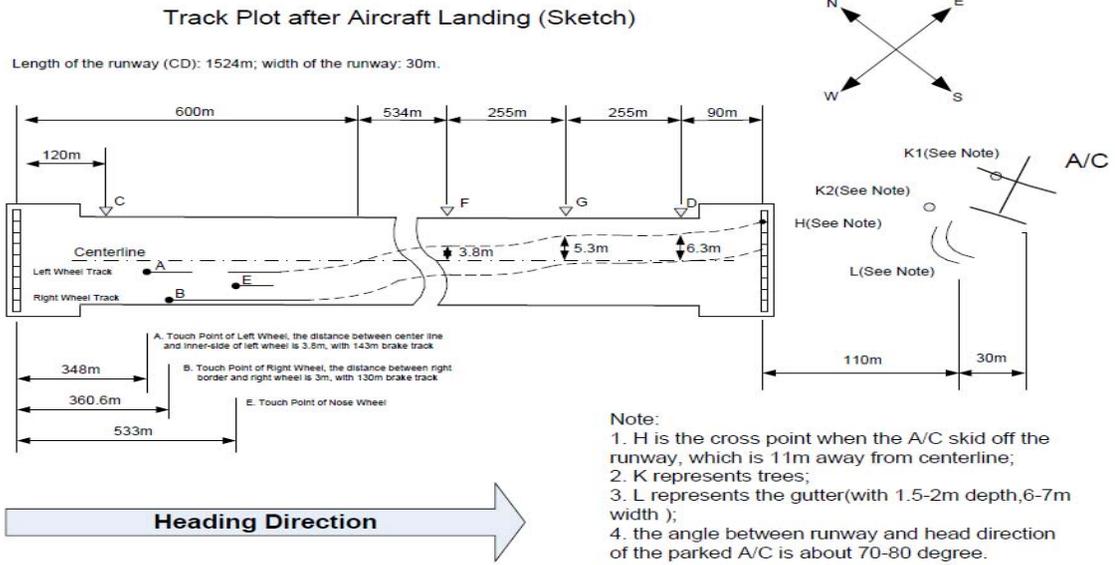


Figure (3). Accident site,

1.2) Injury to persons

One passenger was serious injury (back pain) and one passenger was minor injury (shoulder joint injury) due to accident.

Injuries	Crews	Passengers	Other	Total
Fatal	0	0	0	0
Serious	0	1	0	1
Minor	0	1	0	1
Nil	4	49	0	53
Total	4	51	0	55

1.3) Damage to aircraft

The left main leading gear and nose landing gear strut broken, left engine propeller blades broken, left wing tip broken and lower fuselage frame dents. Aircraft was substantial damage.



Figure (4). Damage to Aircraft

1.4) Other damage

There were no other damage due to accident.

1.5) Personnel information

1.5.1) Pilot in command

Personal details	Male, 54 years of age
Type of license	Airlines Transport pilot (aero plane)
Total flying hours	9066:05 hours
Total flying hours last 90 days	262:45 hours
Total flying hours last 30 days	87:25 hours
Total flying hours (MA-60)	2377:55 hours
Total Command hours	1735:32 hours
Last line check	31 Oct 2011
Last proficiency check	15 May 2013
Last instrument rating check	15 May 2013
Medical Expiry	13 Nov 2013
Marital status	Married.

Prior experience

The pilot in command obtained ATPL license (280) on 31 July 1995. Joined to airline on 18 March 2010, as a F/O. On 17 Sept 2010 he was assigned as a MA-60 commander. Flight crew initial training finished on 21, Sept 2010, and simulator instructor (class B) training (MA-60) finished on 31 October 2011.

Crew Resource Management and Dangerous good training accomplished on 17 Aug 2012. Last flying date was 13 May 2013 and Medical status class1.

1.5.2) First Officer

Personal detail	Male, 35 years of age
Type of license	Airlines Transport pilot (aeroplane)
Total flying hours	3414:17 hours
Total flying hours (MA-60)	1871:34 hour
Total flying hours last 90 days	121:30 hours
Total flying hours last 30 days.	41:49 hours
Last line check	16 May 2013
Last proficiency check	23 April 2013
Last instrument rating	11 April 2013
Medical Expiry	22 Oct 2013

Marital Status	Married
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Prior experience

The First officer obtained ATPL license (461) on 25 April 2011. Jointed to airline on 20 June 2010. On 2011 he was assigned as MA-60 first officer. Flight crew initial training (include simulator) finished on 21 September 2010.

1.5.3) Crew relationship

The pilot in command total flying hour was (9066:05) hrs while the copilot had flying hour (3414:17) hrs. The PIC finished simulator instructor course. Both crews were not finished recurrent training.

Based on log book entries and Myanmar Airways roster, the pilot in command and first officer operated as a crews together three days before. There was together flight on that route. There was no tension between the pilot in command and the first officer.

1.6) Aircraft information

1.6.1) Aircraft data

Registration mark	XY-AIQ
Manufacture	XIAN AIRCRAFT MANUFACTURE CHINA
Type/model	MA-60
Manufacture S/N and date	0808 , Sept 2010
Received date	29 Sept 2010
Certificate of Airworthiness	23 July 2012
Total airframe hours	3457:30- hours
Total airframe cycle	2973- cycles
Last lime check (125 hr)	22 Dec 2012
Last 'A' check (A-6 inspection)	26 Feb 2013
Last Base check (C-2 check)	26 Feb 2013

MA-60 is a twin-engine turbo prop aircraft designed for short and medium range operation. Maximum take of weight 21800 kg (48061 lb) and the maximum

operation altitude is 25000 ft (7620 Meters). Maximum operating speed 227 Knots and flap extension are (0,5,15,30) degree respectively. Pressurized fuselage with 6 exits. There were passenger entry door, two emergency exits in passenger cabin, one emergency exits in cockpit and two cargo compartment doors.

Nose wheel steering, landing gear retraction/ extension, main wheels braking and flap retraction/ extension are hydraulically operated. Hydraulic power supplying consists of a main hydraulic power system by engine driven pump and an emergency hydraulic power system driven by electric pump. **(Appendix –A)**

Aircraft is designed high wing and engines, main landing gears are fitted on center wing section. The landing gear consists of a forward retracting nose gear and two forward retracting main gears. Each gear is equipped with a shock absorber and main wheels with skid-control brake unit. Normal brake is controlled by rudder pedals and emergency brake handle at the back of center control console. Hydraulic pressure for these system are provided with main and emergency hydraulic system respectively. The nose gear is equipped with a nose wheel steering and centering system.



COCKPIT

Fig (5). Cockpit

1.6.2) Engine & Propeller Data

Engines	Left Engine	Right Engine
Manufacture	P&W 127J	P&W 127J
Serial number	0137	0136

Total flying hour	3798.30 hours	3457.34 hours
Total flying cycle	3029 cycle	2946 cycle

The aircraft is equipped with two P&W 127J turbo prop engines mounted one on each side of the wing. The P&W engines is a twin-spool gas generator, a free turbine, concentric shaft and reduction gear box assembly. Main components are centrifugal low- pressure compressor, centrifugal high-pressure compressor, annular backflow combustion chamber, axial- flow high-pressure turbine, axial-flow low-pressure turbine and axial-flow power turbine.

Propellers model are 247F- 3 (Hamilton Sundstrand) USA with four blades with feathering and reversing system controlled by propeller control unit and over speed governor. Maximum speed of propellers are 1200 rpm and variable pitch range +80 to -19 degree. The propeller control system use the condition lever to perform feathering, un-feathering and set the operation speed of propeller. In the BETA mode, the power lever can be directly used to change the propeller blade angle. Engine shall be transformed to the positive pull guiding aircraft to go ahead, and during the landing roll out of aircraft, in order to shorten the landing distance, the output torque of engine shall be transformed to the negative pull for decelerating the aircraft.

1.6.3) Weight and Balance

MCAR Part. 8, para 8.7 (Aircraft operating and performance limitations) an aircraft may not fly without ensuring that the maximum allowable weight. For a flight does not exceed the maximum allowable take off or landing weight or any applicable on route performance or landing distance limitations considering.

Myanma Airways (weight and Balance) stated to be loaded in accordance with an approved loading schedule weights and associated center of gravity limits, special care should be taken to ensure that the loading limitations of the floor and compartment strength are not exceeded. Maximum take off weight loading 21800 kg (48061- lbs) C.G limit within (15-31%) MAC. **(Appendix-B)**

The copy of the load and trim sheet for the accident flight from Heho (VYHH) to Monghsat (VYMS) on 16 May 2013 was indicated within take off allowable 21797 kg (47953-Ib) .

Dry Operation weigh	-	14567 kg
Take off fuel	-	(+) 2722 kg
passengers, baggage	-	(+) 4508 kg
		<hr/>
TOW	-	21797 kg
Trip fuel	-	(-) 450 kg
		<hr/>
Landing weight		21347 kg

1.6.4) Flight/ Navigation Instrument

Four display units are installed at the main instrument panel; Two displays are in front of each pilot, display flight and navigation information in colour, as part of EFIS they are described under FLIGHT/NAVIGATION INSTRUMENTS. The other two units which are installed at the center panel, person engine parameter, alert, procedures and message in colour.

Two air data computers received information from the respective Pilot static system, outside air temperature probe and angle-of-attack sensor. The QNH reference pressure can be set at the altimeter set panel. The inputs are converted into electrical signals which are supplied to-

- Automatic flight control Augmentation system (AFCAS).
- Flight Management system (FMS).
- Attitude and Heading system.
- Electronic Flight Instrument system (EFIS).
- Flight warning system.
- Enhanced Ground proximity warning system (EGPWS).
- Flight data Recording system.
- ATC Transponders.

1.6.5) Communication

-3100 Audio System

3100 audio system consists of interphone system, passenger address and entertainment system, and air/ ground crew call system.

-KHF-950 HF SSB Communication Radio

KHF-950 HF/SSB radio is the airborne equipment for distance communication between an aircraft and the ground or other aircraft.

-KTR908 VHF Communication Radio

KTR 908 very high frequency (VHF) communication radio is used for short-distance communication between an aircraft and the ground or among aircraft.

1.6.6) Navigation

-VIR-32 Very High Frequency Omni directional Range/ Instrument Landing System

VIR-32 Very high frequency omni directional range/ Instrument Landing System is composed of the function of very high frequency omni directional range, Localizer, Glide Slope and marker beacon receiver.

-DME-42 Distance Measuring Equipment System

DME-42 Distance Measuring Equipment, when cooperates with a ground station, can continually measure the slant distance between an airplane and the ground station.

- ALT-55B LOW-Altitude Radio Altimeter System

ALT-55B low-altitude radio altimeter system provides the real altitude from ground to aircraft, which can be used for approach, landing and flight. The ALT-55B low-altitude radio altimeter system can measure the altitude from 0 to 2500ft accurately.

- WXR-350 Weather Radar

WXR-350 color weather radar mounted on MA-60 aircraft is made by Collins company, USA. WXR-350 weather radar is mainly used to detect

weather conditions en route and in front of aircraft concerned with rainfall cloud and shows a color image on digital color display the strength and area of a thunder storm, distance from and azimuth relative to the aircraft.

1.6.7) Enhanced Ground Proximity Warning System (EGPWS)

Enhanced Ground Proximity warning (EGPWS) Type- MARK viii (part No- 965-1206-003) gives the pilots visual and voice warning. When the aircraft's flight path and position with respect to the terrain needs immediate attention from the pilots. It is only operative at the altitudes in the range of the low range altimeter. EGPWS has a computer with Basic EGPWS function 6 modes of operation with automatic-

- Mode 1: Excessive descent rate
- Mode 2: excessive terrain closure rate
- Mode 3: altitude loss after take-off
- Mode 4: unsafe Terrain Clearance
- Mode 5: excessive descend below glide slope deviation
- Mode 6: Advisory callouts
- Mode 7: wind shear

Forward look Terrain Avoidance (FLTA) function

- Below defined terrain clearance
- Approach to collision with terrain

Too early descent function (PDA)

- Terrain awareness
- Terrain display

Each mode has its own voice warning EGPWS system also calls the altitudes of the aircraft during an approach. EGPWS gets data from (Automatic flight control system, stall warning, flap position indication, landing gear position indication, Avionic switching panel, Air data computing, Inertial reference system, EFIS, ILS, RA, TCAS, FMS). The EGPWS sends data to (Audio management, Flight data recording, Flight warning system, TCAS). The program pins select mode envelopes and warnings.

These selections are-

- Visual alert steady
- Audio level selection
- Envelop selection
- In habit all modes selection
- Envelope modulation
- FMS data available
- Audio alert menu selection
- wind shear
- alternate mode 4
- altitude call out enable
- altitude call out menu
(500-200-100-50-40-30-20-10)
- mode 6 volume
- AC type

1.6.8) Automatic Flight Control

AFC is digitalized dual channel. Combine of auto pilot, flight guidance system, dual digitalized electronic flight instrument system, dual air data system and dual navigation attitude system.

1.6.9) Aircraft Airworthiness and Maintenance

A review of aircraft maintenance documentation showed that the aircraft (MSN-0808 and manufacture date Sept 2010) received from China Xian Aircraft Manufacture on 29 Sept 2010 with aircraft total flying hours (10:20 hours & 4 landings). Certificate of Airworthiness issued by Department of Civil Aviation, Myanmar on according with Myanmar Civil Aviation Requirement (MCAR) Part-21 and renewal every year.

Line check (125 inspection), A check (A1,A2,A4), Base check (C1 inspection) performed in accordance with MCAR part M.

Last line check performed on (22-12 -2012) and A check on (26-2-2013). Certificate of Airworthiness renewed on (20-7-2012). Aircraft was no accident recorded and no significant snags with engines. There were (4) snags rectification with brake system. Manufacture service bulletin No. MA-60-29-SB338 & SB339, SIL-2011-MA-6004 had been performed.

1.7) Meteorological information

The weather reported at Monghsat airport at 11:10 MST was temperature 30 degree C, QNH 1010 mb, Visibility 4-5Nm, cloud –scatter 5- 6000ft and wind calm.

1.8) Aid to Navigation

Monghsat Airport was equipped with a Non-Direction Bacon (NDB) Brand (Natural ND 500II) for use on approach to runway 12. NDB is a radio transmitter at a known location used as an aviation navigation aid with detect the automatic direction finder (ADF) equipment on the aircraft.

Monghsat runway equipped only NDB (non-precision approach runway) with frequency 312 KHz. The NDB was determined to be functioning normally. All domestic aircraft operation in to airport reported any abnormalities with the NDB.

1.9) Aerodrome Communication

Monghsat airport installed HF Brand (Barrett Condan) and VHF Brand (Exicom Dual). It had two ATC frequencies for approach (119.7MHz) and tower (118.7 MHz). There were no recording facilities for either frequency. Two way communication between Pilots and ATC, recorded on ATC log books.

1.10) Aerodrome information

Airport name	-	Monghsat Airport
Airport	-	VYMS
Type of Traffic permitted	-	IFR/VFR
Aerodrome reference point	-	N 20° 31' 01" 37" E 99° 15' 25" 61"
Minimum sector altitude (25)NM	-	7000 ft
Transition sector altitude	-	13000 ft
Transition level	-	FL-145
Obstacle clear high (OCH)	-	2370 (480)ft
Runway Dimension	-	5000 x 100 ft
Elevation	-	1898 ft
Runway direction	-	12 / 30
Type of pavement	-	Bituminous surface

The Airport had an Air Traffic Control (ATC) control tower controlling Class C airspace with no radar surveillance capability .

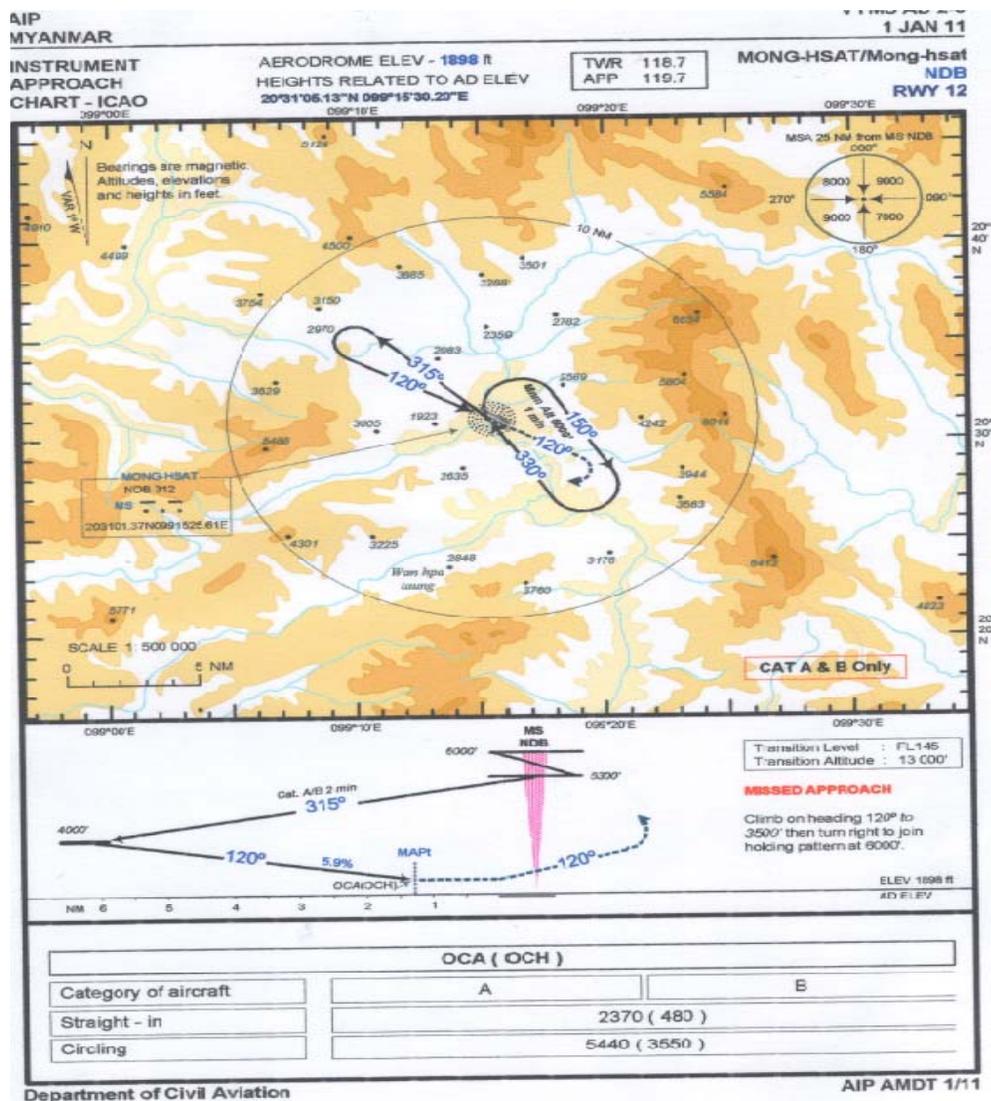


Fig (6). Instrument Approach Chart

1.11) Flight recorders

1.11.1) Flight data recorder

Myanmar Civil Aviation Requirement (MCAR), part-7 mentioned requirement FDR and CVR. The aircraft was fitted China made FDR (AVIC Shaanxi Qianshan Avionics Co.ltd), part No-FB -30 C (S/N-0608005). FDR was recovery at accident site and appearance was intact, no mach of mechanical

impact or scratch, neither deformation nor damage. FDR was successfully downloaded and analyzed at China Academy of Civil Aviation Science and Technology laboratory. FDR recorded 80 aircraft and engine parameters duration about 25 hours. (**Appendix-C**)

35	13:17:49	-2.227	1.758	96.659	60.425	60.513	87
17	13:17:50	-1.641	5.156	77.168	59.766	60.249	87
33	13:17:51	0.471	3.164	72.285	59.722	59.985	87
35	13:17:52	0.824	1.758	57.637	60.337	59.634	87
17	13:17:53	0.471	0.586	47.871	59.722	59.546	87
33	13:17:54	0.588	3.047	24.434	60.117	59.502	87
15	13:17:55	1.176	2.227	7.344	60.469	59.59	87
33	13:17:56	10.706	2.461	9.785	60.513	59.59	87
15	13:17:57	5.059	2.227	4.414	60.029	59.458	87
33	13:17:58	8.353	0.234	5.879	60.337	59.634	87
11	13:17:58	4.471	0.469	2.949	59.985	59.282	84.902
35	13:17:59	9.294	0.234	11.738	60.908	59.326	78.501
17	13:18:00	0.118	1.055	11.25	58.975	58.931	76.143
33	13:18:01	-3.516	0.234	15.156	58.184	58.272	74.402
15	13:18:02	-1.055	1.055	8.809	57.612	57.349	74.29
33	13:18:03	-0.82	1.289	4.902	57.436	57.568	74.065
19	13:18:04	-3.047	0.703	10.762	57.393	57.48	73.953
33	13:18:05	-3.398	1.055	10.762	57.173	57.349	73.953
35	13:18:06	0.588	0.469	10.762	57.217	57.041	73.896
33	13:18:07	-1.055	0.586	5.391	57.129	57.085	73.728
18	13:18:08	-1.641	0.469	5.391	57.085	57.393	73.896
37	13:18:09	0.235	0.234	6.367	57.305	57.217	73.896
33	13:18:10	-4.102	0.586	8.32	57.089	57.261	73.896
17	13:18:11	-0.234	0.469	3.438	57.129	57.305	73.896
33	13:18:12	-0.82	0.469	4.902	56.953	57.305	73.896
17	13:18:13	-1.289	0.82	5.879	57.48	57.964	76.311
17	13:18:15	-2.109	0.703	0.02	58.008	58.272	77.260
16	13:18:16	-5.625	0.938	0.996	58.359	58.447	79.179
33	13:18:17	-8.458	0.234	0.996	58.579	59.194	81.064
33	13:18:18	-4.453	0.703	0.02	59.019	59.282	82.433
33	13:18:19	-4.688	0	5.391	59.326	59.238	82.162
35	13:18:20	-4.688	0.117	0.908	59.458	59.678	82.509
35	13:18:21	-4.458	0.117	2.949	59.282	59.678	83.687
				0.998	59.546	59.722	84.116
				3.438	59.722	59.59	84.238
					59.802	59.678	84.397
					59.802	59.678	84.541

Figure (7) . FDR data downloaded

Myanmar Accident Investigation Team, China Academy of Civil Aviation Science and Technology (CAAC) specialists downloaded and decoded FDR and made flight path animation.

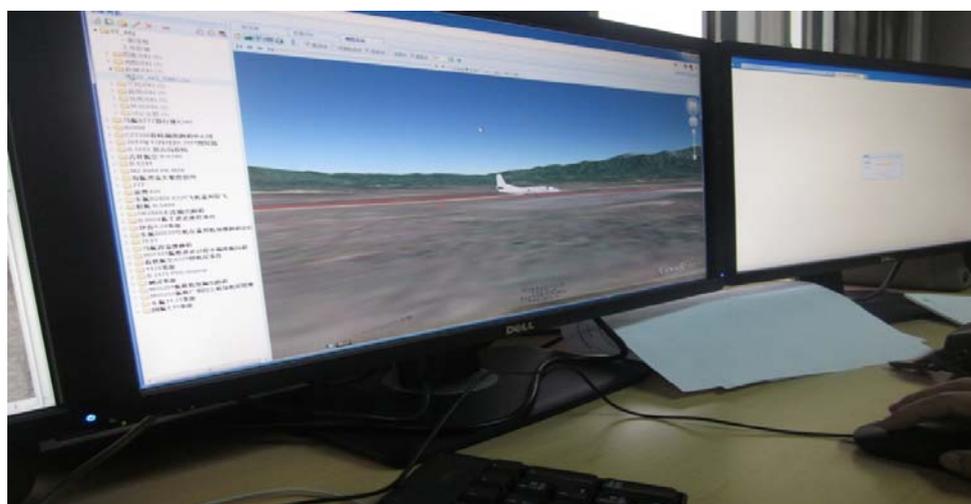


Figure (8) . FDR data Animation

1.11.2) Cockpit voice recorder

The aircraft was equipped with a Honeywell solid state cockpit voice recorder part No-980-6022-001 (S/N-CVR 120 -12181). The CVR was recovery at accident site. It appearance was intact, no mark of mechanical impact or stretch, neither deformation nor damage and successfully downloaded. CVR information recorded (1-5) channels, (1-3) channels have about 30 min audio files respectively and (4-5) channels are mixed channels (area microphone channels) which hole recording of 2 hours and 5 min for each. (CVR transcript, **Appendix-D**)

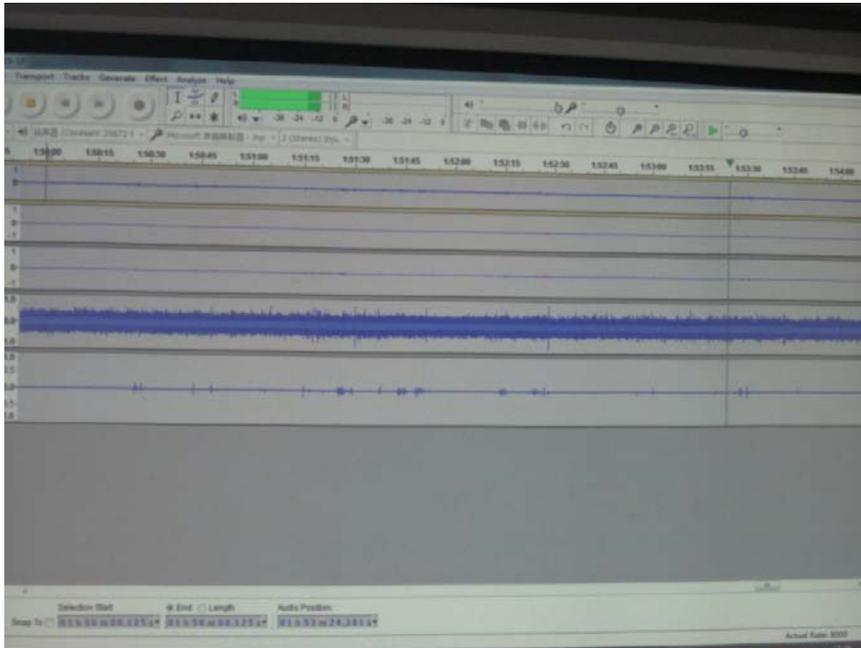


Figure (9). Cockpit Voice Recorder Downloaded

1.12) Wreckage and impact information

The accident site was located in a over run area about 140 meters from the threshold of runway 30 at an elevation of 1895 ft. The initial strike with trees stump with left propellers, left landing gear and nose gear; then aircraft passing a water drainage (gutter). After aircraft struck the trees stump, left main landing gear and nose gear folding struts broken and then aircraft turning left and came to rest. Left wing tip was broken, lower fuselage was dent.

The following components information was noted

- Left wing tip was broken.
- Left landing gear collapsed backward and nose gear forward. .
- Flap position was fully up and selector S/W retract position.

- Left emergency door and passenger door were opened. The cargo door and right emergency exit were not deployed due to right engine propellers rotating.
- Lower fuselage skin was dent and antennas were broken.
- Left propeller blades were broken.

1.13) Medical and pathological information

4 crews and 51 passengers were survived in crash site. 2 victims of survivors were send to local hospital and Yangon military hospital for urgent medical treatment and the remaining were medical checked. The test results of both pilots for drugs and alcohol were negative.

Within the limitations imposed on the samples because of their conditions, there were no evidence of in-flight incapacitation of crews of passenger from either toxic fumes of fire.

1.14) Fire

There was no evidence of pre and post fire.

1.15) Survival aspects

The cabin crew initiated an emergency evacuation as soon as the aircraft came to rest. The MA-60 aircraft has 5 exits and 1 front cargo door. Passenger entry door left and right passenger cabin emergency exits, cockpit emergency exit hatch, rear cargo compartment door and front cargo compartment door and passenger entry door. The entry door and left passenger cabin emergency exit opened. The right side passenger emergency exit and front cargo exits remained closed due to the damage of right propeller rotating. One passenger serious injury, one passenger minor injury and other were survived.



Figure (10). Survival aspect

Monghsat airport had an aircraft rescue and fire-fighting vehicle. That vehicle deployed to the scene immediately. Local authority, military, police assist the survivors.

1.16) Test and Research

1.16.1) Vertical Flight Path analyses (FDR)

FDR was download with FDR integrated data processing device (FZ J-1, S/N -1206001) manufactured by AVIC Shaanxi Qianshan Avionics Co.ltd. There are total 32694 frames of data in FDR and the frame error rate is 0.52% and data are valid for use FDR data analyses- **(Appendix- D)**

- 11:45:04 local time aircraft began extend flaps. IAS-160 knots, vertical speed- 800.ft/min, left/ Right Trim PLA 45 ± 1 degree.
- 11:45:39, IAS-167 knot, flap 15 degree, vertical speed (-1488ft/min)
- 11:46:43, IAS-155 knot, flap 28 degree, vertical speed (-1216ft/min), Radio Altitude 1043.7ft (The aircraft was operated normally)
- 11:47:49, IAS-123.5 knot, Radio Altitude 96.7ft, Flap-30 ,pitch-3, vertical speed -752 ft/min , left/right PLA 45/41.4. There was about 395 meters to threshold (out side of runway)
- 11:47:59, IAS-114 knot, flap 30, Radio Altitude 2.95 ft, Pitch-0, left/ Right PLA 36.6/ 36.7 aircraft position (250) meter inside threshold.

The data show pulling lever altitude , vertical acceleration , wheel trace

marking it is determined the first touch down was happened at (11:47:59) but PLAs 36.6 degree.

- 11:48:09, IAS 93.6 knot, Radio altitude 5.39-ft, vertical speed 32ft/ min, left/ /Right PLA 36.8/ 36.5° respectively vertical acceleration 0.7g, the flap began to be retracted.
- 11:48:16, IAS 72.8 knot, Radio altitude 0.02-ft, engines torque 2/3, vertical speed +128ft/min, left/ Right PLA 36.8/36.6° vertical acceleration 0.96, pitch-1, Elevator (-2.5), Flaps were retracted to 1° (**Appendix- D**), and flight path animation file. Left/ Right engine torque starting to increase.
- 11:48:50, IAS 40 knot, Radio altitude 3-4-ft, engine torque 14/15, vertical acceleration 2-g, vertical speed 32, Flap 0.15°, PLA 36.8/ 36.6° (Aircraft struck trees stamp and come to rest at 11:49 local time.



Figure (11). Instrument panel

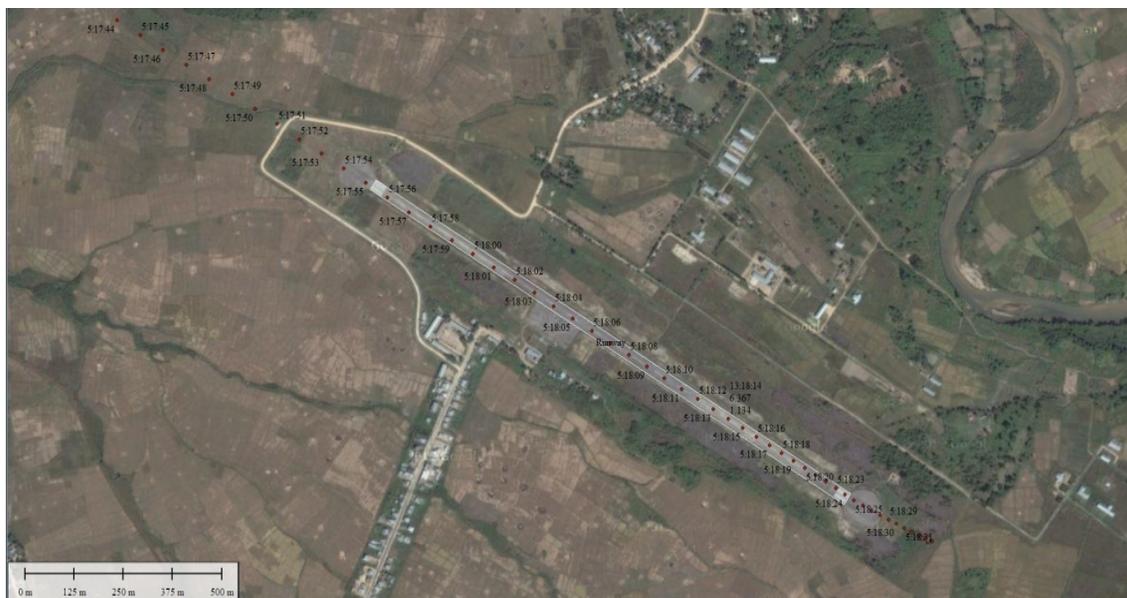


Figure (12). XY-AIQ Track

1.16.2) CVR transcript

During Final approach EGPWS callout (500, 400, 100, 50, 40, 30, 20, 10) and aircraft normal touch down. During the landing roll, PIC made some briefing FO about the landing procedures. After both crews noticed aircraft speed, they initiated normal brake firstly and then applied emergency brake. Although applied brake aircraft cannot stop and over run to runway. **(Appendix- C)**

1.17) Organization and management information

1.17.1) The Operator Myanmar Airways

Myanmar Airways was formed in (1948). It has an Aircraft Operator Certificate number (001/90) dated (4-4-1990). Following Myanmar Civil Aviation Requirement part 1, part 7 and part 8. It has deposited standard operation procedure and MA-60 flight operation manual approved by Department of Civil Aviation, Myanmar on 25 November 2010. The last authority audit was performed in 8 Oct 2011 for operation in Myanmar.

The fleet is composed of 1F-28, 3 MA - 60, 3 ATR-72-500/200, 1 ATR-42-320, 2 Embraea 190, 2 Beech 1900D, 13 pilots are authorized to perform public transport MA-60 operations. The company is organized as follow. **(Appendix- E)**

- Managing Director
- General Managers
- Chief of department (Flight Operation, Engineering, Human Resources and Admin, Finance and Account, Commercial)
- Manager (Training, Quality Assurance, Airline Safety, Airline Security, Cabin Crews)

The company operation manual includes operational information, regulation information and instructions in orders to carry out flight operations and ensure supervision of the services with trained personnel and adequate means.

1.17.2) Aircraft systems of company policy

Myanma Airways Flight Crew operating Manual (MA-60) issued dated 25 November 2010 stated that:

Para 2.14, During landing phase flap extend (5, 15, 30) degree orderly and Pilot flying and Pilot Monitoring have to be check.

Para 2.16 When the main wheel touchdown, PLA shall be placed in G.I position. **(Appendix -F)**

1.17.3) Regulatory information

Department of Civil Aviation noticed Aeronautical Information Publication (AIP, Myanmar) for Monghsat airport instrument approach chart.

1.18) Additional information

1.18.1) Testimony of the pilot

The captain explains that after preparation for schedule flight, walk around and cockpit check carried out and contacted to Monghsat ATC weather. At about 08:00 local time, departed to Monghsat airport, for this flight co-pilot was pilot flying. Although there was Mohsen storm left, route weather was fine. At Monghsat airport after passenger disembarked and board, aircraft departed to Heho at about 09:55 local time. After landed Heho, aircraft was refueled 6000.lb and passenger disembarked and board. Aircraft departed to Monghsat with 4

crews and 51 passengers operated by FO was PF. Heho- Monghsat route weather was fine except a little cloud and flight duration is 45 min. When reaching 40 Miles to Monghsat descent to 8000-ft.

After passing transition FL 125, Monghsat airfield QNH set and performed approach check and contact to ATC for visual approach. During approach, weather was fine and visibility was 4-5 Miles, ATC gave landing clearance. At 3 Miles to Monghsat set flap 30°, approach to runway 12 with approach speed 120-Knots.

After touchdown and denotation, FO made ground fine to decelerated. During landing roll, FO applied normal braking and ATC instructed to turn back to apron. Due to the plane fail to stop, PIC also tried normal brake but aircraft continued rolling. Finally he instruct to FO to applied emergency brake. But the aircraft over run to runway 30° and come to stop when it plunged to a ditch.

As soon as the plane stopped, condition lean of left engine to shut down, close fuel-shut off valve and emergency evacuation. After airhostess, cabin crews and passengers opened the emergency doors, and evacuated. PIC checked passengers, all were survived except two were injury of left arm and back bone.

1.18.2) Testimony of the First Officer

The FO explain that, he was assigned PF for that day flight as line training (Command) check. The route was Yangon- Monghsat- Heho- Monghsat- Yangon. Aircraft landed Heho at about 10:40, refueled and passenger disembarked and boarded. He checked hydraulic and brake system, then take off from Heho with 51 passenger. After contact Heho ATC, and climbed FL-130. At about 3 Miles to airport, he set flap 30 and landed to RW 12 with IAS 123 knot. Aircraft touch down within 1000ft from Runway threshold. During landing roll he applied normal brake. Because of speed cannot reduce, both crews applied normal brake. Finally applied emergency brake, but aircraft can not stop and over run from runway 30. Then he noticed, aircraft struck tree stump, over run water damaged and stop. He performed emergency shut-off procedure and evacuation.

1.18.3) Testimony of the cabin crew

Cabin crew explains that she was assigned senior cabin crew for this trip. The aircraft normal flight to Yangon -Monghsat - Heho route. After refueled at Heho, aircraft take off with 51 passengers. Aircraft touch down to Monghsat at normal landing. During she made after landing announcement, the plane over run to runway and she noticed the aircraft abnormal vibrated. She immediately instruct to passengers to brace and not to unlocked seat belt. After aircraft stopped, appeared emergency door and evacuated the passengers. She noticed aircraft left engine propeller broken. When she check female passengers and child remain inside cabin, so as opened left emergency exit and evacuated. She tried to opened front cargo door but blocked with bags. After them opened the cargo door with the assistance of other people and take out the passengers bags.

1.18.4) Testimony of the witness (ATC Operator)

Monghsat airport ATC operator explains that MA-60 (XY-AIQ) first time landed to Monghsat at about 09:21 local time. After passenger disembarked, departed to Heho at about 09:43. The aircraft was take off from Heho at about 11:08 and second time landed to Monghsat at about 11:51 from Runway 12. Aircraft touch down at about 950 ft from Runway threshold. He contact to pilot turn back (180) degree to apron before reaching to RW 30. But aircraft over run to runway 30. Immediately, he instructed fire-fighting vehicle to crash-site.

1.18.5) Testimony of the Witness (Passenger)

One passenger explains that he sit near passengers exit door. Aircraft take off from Heho and normal approach to Monghsat run way. During landing aircraft slightly vibrated and 2 time bounced. Aircraft fail to stop until end of runway. Then aircraft overrun to runway end and fall into drainage. Cabin crews immediately opened passenger door, front cargo door and left emergency exit. All the passengers were survived except two were injury.

1.18.6) Testimony of the Witness

A fire-fighting person of Monghsat airport explain that aircraft touchdown normally but speed is higher at landing roll. Aircraft fail to stop and over run to runway 30. The fire-fighting vehicle deployed to the scene immediately and assist the victims emergency evacuation.

2. ANALYSIS

2.1) Introduction

Analysis on the accident, we need to focus not just on individuals, but on the local hazards and local threats. Most of the accidents were unsafe condition and/ or unsafe act.

2.2) Occurrence events

2.2.1) Related information

The accident was almost the result of runway excursion, that is an airworthy aircraft under the control of the flight crew, he was normal landed to runway, probably less of check list procedure and multi-crew cooperation-

- **Flight control, Engines** Information available from FDR and witness statements provided strong evidence that the aircraft's flight control systems and Engines were complete functional.
- **Hydraulic System** Information available from FDR and witness statements provided that aircraft hydraulic system (Main wheel Brake, flap, steering, landing gear retract/ extension) was functioning normally.
- **Potential for pilot incapacitation** There was no evidence of pilot incapacitation on a review of medical records, CVR records, witness statements and radio broadcasts that indicated any problems associated the accident.

2.2.2) Other Potential technical problems consider by investigation

There was no indication that the altimeter were not functioning correctly prior to the accident. The barometric scale on the left altimeter was to the

appropriate QNH, computed air speed and pressure altitude were normal function. weight and balance were within allowable limit.

2.3) Overview of the flight

2.3.1) Handling pilot

It is very likely that the first officer (FO) was manipulating line training (Command) check and aircraft control for that day flight. Regardless of who is the handling pilot, the PIC is responsible for the overall conduct of the flight.

2.3.2) Individual action

Audio record from CVR, at 40 Miles to Monghsat aircraft descent to 8000 ft. During approach, checked landing speed and flap fully extended, and landing gear extended. Before landing, GPWS call out (500, 200, 100, 50, 40, 30, 20, 10) respectively. Although aircraft touchdown normally within 1000-ft from runway 12 threshold, aircraft speed cannot reduce and over run from runway 30. According FDR data, left and right PLA position were remained 36.8/ 36.6 degree respectively (more than GI position, Flight idle) and after-18 second from touch down, flap position moved 30 to 0 degree. According CVR transcript, PIC need to multi-crew cooperation and efficiently supervisory on FO at the final approved and landing.

2.3.3) Potential Scenarios

The investigation considered different scenarios to explain altitude was conducted -

- a) A potential scenario is that the FO was attempting normal touch down but lost of awareness on power lever position.
- b) A second potential scenario is FO was unintentionally activated the flap S/W to retracted position due to excitability.
- c) A third potential scenario is during final approach and landing phase, PIC need to multi-crew cooperation and effective supervisor.

Summary

It was considered very unlikely that the runway excursion was unsafe act and un effectiveness of CRM skill. The above scenarios are considered contributory factors, these have led to overrun to runway and struck to tree stump.

2.4) Local condition

Crew workload

It is likely that during first touch down FO was under pressure of PIC advisory (CVR record). Due to aircraft speed cannot reduce until half of the runway, the crews missed the correct procedures. (Check list, flap position and initiated reverse thrust)

Crew resource management conditions

Operating a multi-crew aircraft, the two pilots requires to work in a coordinated manner and effectively communication with each other, a loss of cross-checking and detection of errors.

2.5) Risk Control

Several risk controls were identified as being safety factors-

Pilot training

- The available evidence indicates that there was lack of recurrent or simulator training, under the abnormal/ emergency situation, Since MA-60 aircraft initial and type training finished on 21 September 2010.

Standard Operating Procedures

Myanma Airways, flight crew operations manual specified check list for Pilot flying and Pilot monitoring that during landing and taxing phase, flaps must set 30 degree and power level shall be placed at Ground Idle position. If it is necessary the PLA can be retracted to reversing feathering position. However the PF

unintentionally and lost of awareness placed power level above ground idle and put flaps position 30 to 0 degree. PLA have not initiated to reversing position.

2.6) Organizational influences (Myanma Airways)

Organization structure of Myanma Airways is Managing Director, General Managers, Chief of Heads (Flight Operation, Maintenance, Admin, Finance) and Manager (Flight Operation Security, Ground Operation, Training, Quality Assurance). etc.

Flight Operation Manager (Quality Assurance) is responsibility to ensure management of accident prevention, improvement of pilot and training requirement. Chief pilot (operation) is responsibility to ensure management of completed mission without accident.

However Myanma Airways need to efficiently implementation of CRM skill and flight data analyses programs.

2.7) Organizational influences (DCA)

An air operator's certificate (AOC) holder had a clearly defined responsibility under the Myanmar Civil Aviation Requirement (MCAR) to ensure the safety of its operations. MCAR, part 8 and AOC Manual mention about FDR analysis programs. The regulator audit was performed for over sighting surveillance activities.

However DCA need to ensure Myanma Airways implementation flight data analyses programs.

3. CONCLUSIONS

3.1) Findings

- There are no indications of flight control, hydraulic system and engines problems, potential for pilot incapacitation and a fire on board aircraft before the accident.
- The crews are completed related training and medical status class1.
- The PIC and FO proficiency checks, and instrument checks are valid.
- The limits on crew duty time were complied with.

- The flight crews had been working together for three days prior to the day of accident and no tension between them.
- The CVR and FDR data could be analyzed.
- The FDR, CVR data, there are no indication of fault in the navigation and communication equipment.
- The aircraft EGPWS system was operated normal function.
- Monghsat airport NDB was functioning normally.
- Aircraft approached to R/W 12 and landed at correct landing zone.
- During landing roll although FO retarded power level, PLA were remained 36.8 / 36.6 degree position respectively (More than Ground Idle)
- (18) seconds after first touch down, flaps start to retracted .
- The crews applied normal brake and emergency brake, but did not initiated power level to reversing feathering position.
- Crews need more practice in multi crews operation and CRM skill.
- PIC need effective supervisory on FO.
- Myanmar Airways need recurrent training for MA-60 fleet pilots.
- Myanmar Airways need to efficiently implement of flight data analyses programs.
- DCA need to ensure the Myanmar Airways implementation of FDR data analyses programs.

3.2) Primary Cause

- During landing roll FO retracted PIA to GI position, its remain above Ground Idle position (36.8/ 36.6) degree. After (18) seconds flap position changed to retract and both engines torque start to increase.
- Aircraft IAS unable to rapid decelerate during crews applied braking.

3.3) Secondary Cause

- Both crews are not initiated power lever reversing position.
- Crews need multi-crew operation.

4 SAFETY RECOMMENDATION

To reduce and eliminate of accidents and serious incidents, MAIB recommended following recommendation -

- Myanma Airways operation ensure to access multi-crew operation of CRM training, and supervision of Captain.
- Myanma Airways ensure the recurrent training for it MA-60 fleet Pilots.
- Myanma Airways ensure to emphasize on maintenance of MA-60 Brake system.
- Department of Civil Aviation ensure to maintain the runway over run area.



Investigator- in-Charge