

Aircraft Accident Investigation Bureau of Myanmar

The aircraft accident investigation bureau (AAIB) is the air investigation authority in Myanmar responsible to the Ministry of Transport and Communications. Its mission is to promote aviation safety through the conduct of independent and objective investigations into air accident and incidents.

For aviation related investigations, the AAIB conducts the investigations in accordance with Myanmar Aircraft Act and Rules and Annex-13 to the Convention on International Civil Aviation.

In carrying out the investigations, the AAIB adheres to ICAO's stated objective, which is as follows:

"The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability."

Accordingly, it is inappropriate that AAIB reports should not be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

**FINAL REPORT OF HARD LANDING INCIDENT OF AIR MANDALAY AIRLINES
EMBRAER-145EP IN SITTWE AIRPORT ON 18th SEPTEMBER, 2017**

SYNOPSIS

At 0552 (UTC) on September, the 18th, 2017, Embraer-145EP aircraft encountered hard landing while landing to runway-11 of Sittwe airport. There were 40 people on board from Yangon airport to Sittwe Airport. At Sittwe airport preflight inspection was carried out and then the aircraft flew back to Yangon International airport. After that the aircraft operated from Yangon airport to Tachileik airport and then flew back to Yangon airport. After the incident flight, the aircraft operated three sectors. At every station preflight inspections were performed. During daily inspection at the hangar after all the flight, the cracks and damage were found. There were no injuries in the incident.

Aircraft Details

Air Mandalay Airlines

Registered owner and operator	: Air Mandalay Airlines
Aircraft type	: Embraer-145EP
Nationality	: Myanmar
Registration	: XY-ALE
Place of Occurrence	: Sittwe Airport
Date & Time	: 18 September 2017 (0552 UTC)
Type of operation	: Scheduled Passenger Domestic Flight
Phase of operation	: Landing
Persons on Board	: Crew - 4, Passengers- 36

1. FACTUAL INFORMATION

1.1 History of the flight

1.1.1 The aircraft was flying from Yangon International Airport to Sittwe Domestic Airport. The flight crew comprised of a Captain as Pilot-in-command (PIC) on the left seat, a Co-pilot on the right seat as the pilot monitoring.

1.1.2 At 05:47:15Z, the aircraft began the left hand turn to intercept the final approach course (QDM 100 or heading 100°). At this time, the aircraft indicated airspeed (from now on IAS) was 132 knots and the radio altimeter indicated 942 ft AGL.

1.1.3 At 05:47:46Z, the aircraft was established in the final approach course. At this time, the IAS was 138 knots and the aircraft height was 706 ft. The aircraft continued to descend with vertical speed around 500 ft/min. Beginning at 05:47:56Z, the vertical speed shows a gradual reduction.

1.1.4 At 05:48:04Z, the AP vertical mode transitioned to altitude hold (announced as “ALT”). At 05:48:17Z, the aircraft leveled off at about 500 ft AGL.

1.1.5 At 05:48:49Z, when the aircraft was at a distance of 0.8 nautical mile to the runway 11 threshold of Sittwe airport, the AP was disengaged and the TLA began to move towards idle. At this time, the aircraft IAS was 135 knots and the aircraft height was 520 ft.

1.1.6 The vertical speed gradually increased and reached values around of -1300 fpm at 05:49:04Z, the same moment when the TLAs reached IDLE. At this moment the aircraft IAS was 134 kts and the aircraft height was 347 ft.

1.1.7 At 05:49:08Z, the aircraft height was 249 ft and the vertical speed reached -1429 fpm. There was a “Master Caution” at this time, probably an EGPWS warning (Mode 1– Approaching Envelope).

1.1.8 At 05:49:12Z, the aircraft crossed the runway 11 threshold at a height of approximately 150 ft and IAS of 126 kts.

1.1.9 At 05:49:14Z, the aircraft was at a height of 231 ft, descending at -1422 fpm. There was another “Master Caution” at this time, also probably related to the EGPWS (Mode 1 – Approaching Envelope).

1.1.10 At 05:49:17Z, the right spoilers on the aircraft transited out of the stowed position indicating the first instance where the aircraft landed on the runway.

1.1.11 As the aircraft landed, the recorded value of the vertical acceleration experience by the aircraft increased from +1.1G to a maximum of +4.226G. (*As vertical acceleration is recorded at 8Hz, the maximum actual vertical acceleration experienced by the aircraft might exceed the recorded value*)

1.1.12 During the period of increased vertical acceleration, the aircraft roll angle increased from +1.1 degree to +3.7 degree (i.e. right roll where the right wing was lower than the left wing).

1.1.13 After the landing in Sittwe Airport, the First Officer performed a transit check which required him to visually inspect the aircraft to ensure that there was no anomaly that affect the aircraft’s airworthiness for the next flight. According to him, he did not observe any anomaly during the transit check.

1.1.14 The aircraft performed two further flights before the operator’s maintenance personnel performed night stop inspection of the aircraft at Yangon Airport, after all scheduled flights for that aircraft was completed. During the night stop inspection, the maintenance personnel discovered several cracks in the aircraft’s right wing area.

1.2 Injuries to Persons

Not applicable.

1.3 Damage to Aircraft

1.3.1 Right Hand Wing, Spar No 3 broken

- (a) Crack propagation from (RIB 3A YA-1392.67 up to RIB 5 YA-2222.70)
- (b) Length of crack is 32 inches.
- (c) Nature of crack is diagonal across the SPAR No 3
- (d) Refer to Figure no.1

1.3.2 RIB 4A twisted or deformed

- (a) The length twist is about 9 cm
- (b) Refer to Figure no.2

1.3.3 Right Hand Wing Skin at Trailing Edge Separation

- (a) Location is between Y-1085.00 to RIB 4A YA-1912.56
- (b) Fasteners to RIB 3 and Spar No 3 went off
- (c) Length of Skin Separation (61 cm long).
- (d) Peak of buckle is about 3 cm high.
- (e) Refer to Figure no.3

1.3.4 Buckling of Right Hand Wing Inboard Spoiler

- (a) Spoiler Panel buckling (Length is about 128 cm in wave form)
- (b) Refer to figure no.4

1.3.5 Deformation of LH Side lateral fairing, (Location: Central Fuselage)

- (a) Fiber glass panel buckled (Length 180 cm)
- (b) Refer to Figure no.5

1.3.6 Deformation of RH Side lateral fairing, (Location: Central Fuselage)

- (a) Fiber glass panel buckled (Length is 190 cm)

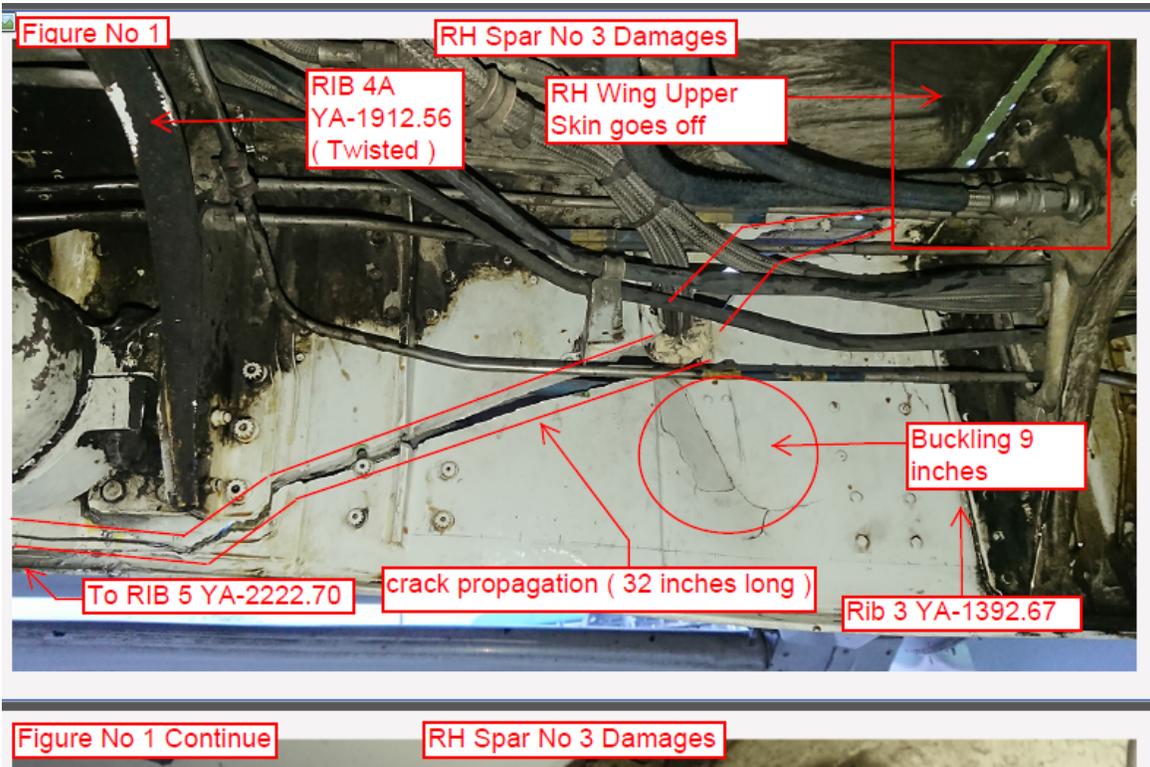


FIGURE NO 3

RH Wing, Trailing Edge Skin Buckling (From Y - 1085.50 + 61 cm)



Figure No 4

Damages and skin Buckling of RH Inboard Spoiler Panel





1.4 Personnel Information

Pilot in Command (Air Mandalay Airlines)

Age	: 62
Licence	: ATPL
Licence issued date	: 24 th May 2011
Total hours	: 17878:29
On type	: 1151:11
Medical expire	: 30 th November 2017
Line check date	: 20th July 2016
Type rating check date	: 15 th March 2015
Last 90 days	: 173:37
Last 30 days	: 70:51
Last 24 hours	: 3:14

Co-Pilot (Air Mandalay Airlines)

Age : 39
 Licence : ATPL
 Licence issued date : 19th March 2013
 Total hours : 3596:23
 On type : 1002:17
 Medical expire : 31st March 2018
 Line Check date : 11th August 2017
 Type rating check date : 11th August 2017(recurrent)
 Last 90 days : 194:01
 Last 30 days : 72:34
 Last 24 hours : Nil

1.5 Aircraft information

1.5.1 General

Air Mandalay Airlines

Manufacture : Embraer
 Type : EMB-145EP
 Serial number : MSN 145039
 Date of Manufacture : October, 1998
 Total airframe hours : 37132:34 FH
 Certificate of Registration : XY-ALE
 C of A : Myanmar DCA,valid
 Flight Number : 6T- 611
 Call Sign : 6T
 Last Time Check : 1st August 2017,(2A+4A)
 Last Base Check : 5th May 2013,(C check)

1.6 Meteorological Information

There was no Automatic Terminal Information Service at Sittwe airport. Visual observation by the air traffic controller was: wind 180° at 10 knots, sometimes gusty wind at 20 knots. It was raining.

1.7 Aid to Navigation

It was discovered that physical DVOR/DME has been installed; ICAO VOR chart, however, was not been published yet.

1.8 Communication

There was no record of unserviceable equipment on the day of occurrence.

1.9 Aerodrome Information

The runway (runway designation 11/29) at Sittwe airport was (2286 meter x 46 meter).

1.10 Recorders

The cockpit voice recorder (CVR) and flight data recorder (FDR) of the aircraft were removed by Aircraft Accident Investigation Bureau (AAIB) for download and readout.

The flight data downloaded from the FDR was of good quality and flight data around the time of the occurrence was available.

The CVR contained two hours of cockpit voice recording. However, the recording around the time of the occurrence was overwritten as the damage to the aircraft was only detected after the aircraft completed three subsequent flights.

1.11 Wreckage, Site and Impact Information

Not applicable.

1.12 Medical and Pathological Information

Not applicable.

1.13 Fire

Not applicable.

1.14 Survival Aspects

Not applicable.

1.15 Test and research

Not applicable.

1.16 Aircraft History

The maintenance records provided by the aircraft operator did not review any history of damage to the right wing area of the aircraft.

2. ANALYSIS

2.1 Introduction

The analysis by the investigation team has focused on the following areas:

- a) Flight data recorder
- b) ERJ-145 Standard Operating Procedure
- c) Pre-flight inspection and transit inspection
- d) Hard landing inspection

2.1.1 Flight data recorder

The aircraft was making visual approach to runway-11 of the Sittwe airport.

The aircraft height when intercepting and when established in the final approach course were significantly lower than that instructed by the IAC.

The crew then flew the aircraft to a height of approximately 500 ft, which is consistent with obstacle clearance height of the NDB procedure to runway 11 and leveled off until 0.8 nautical mile from the runway threshold.

At 0.8 nautical mile from the runway 11 threshold and at a height of 520 ft AGL, the autopilot was disengaged the aircraft resumed the descent, with vertical speeds exceeding - 1400 fpm at some points and engines' power gradually brought to IDLE.

The fact that the crew leveled off and maintained the aircraft in an altitude consistent with the obstacle clearance height suggests that they did not have the runway in sight until at least 0.8 nautical mile from the runway threshold, what seems to indicate that restrict visibility conditions prevailed.

According to the Embraer ERJ-145 SOP (section 3-40, page 1, see Annex C), during approaches in IMC (which seems to be the case for this landing), the airplane must be stabilized by 1000 ft from touchdown. An approach is considered stabilized when all of the following criteria are met:

- The airplane is on the correct flight path;
- Only small changes in heading/pitch are required to maintain the correct flight path;
- The airplane is in the correct approach speed;
- The airplane is in the correct landing configuration;

- Sink rate is not greater than 1000 ft per minute; if an approach requires a sink rate greater than - 1000 ft per minute, a special briefing should be conducted;
- Power setting is appropriate for the airplane configuration;
- All briefings and checklists have been conducted.

The aircraft was only established on the final correct flight path below 1000 ft (the aircraft was established on final approach course about 700 ft AGL) and its sink rate exceeded 1400 fpm during the short final, period during which the TLAs were brought to idle.

Therefore, an analysis of this approach indicates that it was not stabilized. Still according to the ERJ-145 SOP, “unstable approaches may result in difficult landings with unexpected sink rates, side loads or bounce backs”.

2.1.2 Pre-flight inspection and transit inspection

Pre-flight inspection and transit inspection were carried out at every airport. At Yangon airport these inspections were carried out by the licensed engineers. At out-station at the other airports these inspections were conducted the flight crew who were given the training and authorization by the airlines.

At Sittwe airport the transit inspection was conducted by the co-pilot and did not detect any damages and anomaly. At Yangon airport transit inspection were conducted by the licensed engineer team and did not detect any damages and anomaly. At Tachileik airport transit inspection was conducted by the pilot himself and did not detect any damage and anomaly. Only when daily flight inspection was carried out at night in the hangar after flight, wing spar III crack and other anomaly were found.

2.1.3 Hard landing inspection

Flight crew did not entry hard landing or suspected hard landing in the technical log and did not report about it to anybody. That's why maintenance engineers were not able to perform thorough hard landing inspection. It was discovered that there was no hard landing monitoring system.

3. CONCLUSIONS

3.1 Findings

From the evidence available, the following findings are made. These findings should not be read as apportioning blame or liability to any particular organization or individual:

- a) It was discovered that during an unstabilized approach, the pilot continued to landing.
- b) The pilot and engineers did not carry out pre-flight inspection (transit inspection) in an appropriate and effective manner.

3.2 Primary Cause

- a) The pilot continued to landing during an unstabilized approach.

4. SAFETY RECOMMENDATIONS

To reduce and eliminate of accidents and incidents, AAIB recommended the followings:

- 4.1** The operator should provide refresher training to remind pilots to execute a go-around during an unstabilised approach.
- 4.2** The airline should establish Flight data analysis program (FDAP).
- 4.3** Pre-flight inspection including transit inspection should be carried out in an appropriate and effective manner.

5. SAFETY ACTIONS

5.1 The respective department has published the Instrument Approach Chart ICAO- (VOR chart) for Sittwe airport.

A handwritten signature in blue ink, consisting of a stylized 'J' followed by 'm' and a large flourish.

Investigator -in -charge