

## **Forward**

### **The Aircraft Accident Investigation Bureau of Ethiopia**

The Aircraft Accident Investigation Bureau (AIB) is the investigation authority in Ethiopia responsible to the Ministry of Transport for the investigation of aircraft accidents and serious incidents to Ethiopian and foreign registered civil aircraft that occurred in Ethiopia . The AIB also participates in the investigations of accidents and serious incidents involving aircraft operated by Ethiopian air operator.

The mission of the AIB is to promote aviation safety through the conduct of independent, separate and conducted without prejudice to any judicial or administrative action and objective investigations into air accidents and incidents consistent with Annex 13 to the Convention on International Civil Aviation.

The AIB conducts the investigations in accordance with the proclamation No 957/2016 and Annex 13 to the Convention on International Civil Aviation organization, which governs how member States of the International Civil Aviation Organization (ICAO) conduct aircraft accident investigations internationally.

The investigation process involves the gathering, recording and analysis of all available information on the accidents and incidents; determination of the causes and/or contributing factors; identification of safety issues; issuance of safety recommendations to address these safety issues; and completion of the investigation report. In carrying out the investigations, the AIB will adhere 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.”

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## **Abbreviations**

<b>AABIA</b>	Addis Ababa Bole International Airport
<b>ACDM</b>	Airport collaboration decision making
<b>AIB</b>	Accident investigation Bureau
<b>APU</b>	Auxiliary power unit
<b>ATC</b>	Air Traffic Control
<b>ATPL</b>	Air Transport pilot license
<b>CCTV</b>	Close circuit television
<b>CPL</b>	Commercial pilot license
<b>CVR</b>	cockpit voice recorders
<b>DFDR</b>	Digital Flight Data Recorder
<b>ECAA</b>	Ethiopian Civil Aviation Authority
<b>GES</b>	Ground equipment service
<b>ICAO</b>	International Civil Aviation Organization
<b>IIC</b>	Investigator in Charge
<b>MHZ</b>	Megahertz
<b>NOTAM</b>	Notice to airmen
<b>RWY</b>	Runway
<b>TWY</b>	Taxiway
<b>S/N</b>	Serial Number
<b>TSN</b>	Time Since New
<b>TSO</b>	Time Since Overhaul
<b>UTC</b>	Co-ordinate Universal Time
<b>VHF</b>	Very high frequency (30 to 300 MHz)

## **General**

Classification

Serious Incident

Aircraft Type and Registration:

1) Boeing 777-200, ET AQL

2) Airbus A350, ET ATR

Date & Time (UTC): 20 Aug. 2017 at 1830 hrs

Location: Bole International Airport

Type of Flight: 1) scheduled Passenger flight  
2) pushback phase

Persons on Board: 1) Crew - 10 Passengers - 253  
2) Brake rider & three A check tech.

Injuries: 1)- None  
2) - None

Nature of Damage: 1) Left wing tip damaged  
2) Vertical fin and fairing damaged

## **Synopsis**

The two aircraft, operated by the same company, Boeing 777, ET AQL on taxiing out from gate one , collided with Airbus A350, ET ATR, whilst being pushed back from its stand No 22 at Bole International airport.

The accident occurred because of various contributing factors that the ATC erroneous instruction , the Airbus 350 pushback was not conducted in accordance with the aircraft operator's normal operating procedures and pushed off the parking position, partially obstructing the taxiway , and was not seen by the crew until just before the collision. A number of organizational issues were also identified which may have been contributory.

## **Notification**

AIB was notified On 20 August 2017 at 1832 UTC. Following the notification the Ministry of Transport assigned the investigation team to investigate the Serious incident.

## **The Final report includes the following main parts:**

- 1/ Factual information
- 2/ Analysis
- 3/ Conclusions
- 4/ Safety recommendation

## **1. Factual Information**

### **1.1. History of the flight**

The history of the flight has been compiled from a number of sources, including preliminary information from the flight data recorder (FDR), cockpit voice recorder (CVR) and recorded ATC transcript data and CCTV footage .

On 20 August 2017, Ethiopian Boeing 777-200LR registration mark ET-AQL with flight number ETH 610 was on a scheduled passenger flight from Addis Ababa Bole International Air port to Mumbai(India) . The aircraft parked at passenger gate one of Bole international Airport in terminal two. The estimated time of departure was 1800UTC as per filed flight plan.

At 1822UTC, the pilot in command of ETH 610 called ground controller on frequency 121.9 mhz and requested clearance to start engine and pushback with on board 253 passengers and ten crew members. The duty controller approved engine start up and pushback clearance facing east to exit via taxiway C . The pilot acknowledged the clearance and started the push back to exit VIA taxiway "C" on RWY 07L and "E"for 07L. meanwhile DLH 599 which landed on runway 25L was given taxi clearance via C to gate 2 for parking. After ETH 610 completed push back taxi clearance issued via taxiway C 07L and E for 25L and commenced accordingly. Ground controller observed a Lufthansa aircraft (DLH 599) turning left to taxi way "C" from runway 07L,and recognized that it was a complete head on traffic on taxi way "C", and inadvertently amended the clearance for Eth 610 to taxi VIA "B" 07L, "E".

In the mean time the airbus A350-900 was tasked push back to hangar for A-check maintenance. The push back was initiated with two mechanics, one in the cockpit and the other with head set on the ground and tag driver. All were employee of EAL. This operation advised at 18:29 UTC by air traffic controller to move from stand 22 to hangar through the main apron.

As Eth 610 taxiing through the center line of apron taxiway, at the speed of 18 knots, collided with an Airbus A350 on push back from stand 22 at about 18:32 UTC.

In the night shift of the incident day, four Aerodrome air traffic controllers were assigned who work on control positions with two different frequencies.

Controller -1 assigned at tower control position with frequency 118.1 to issue landing and takeoff clearance, after getting permission from approach controller and coordinating with ground controller

Controller -2 assigned at ground control position with frequency 121.9 to control the ground movement of aircraft coordinate with controller -1

During incident, the other two duty controllers were on tea break. The assigned supervisor was tasked at ACDM office to coordinate and facilitate the traffic movement.

### **Sequence of incident events**

- At 18:20.51 UTC Eth610 requested start up and push back from gate one destination Mumbai Persons on board 253/10.
- At 18:21 ground controller cleared Eth 610 to start up and push back facing east to exit Via "C" for runway 25L
- At 18:24:32 DLH599 "contacted ground on VHF 121.9mhz. and the controller cleared DLH 599 to proceed Via "C" to gate2 for parking.
- At 18:28:54 ET-ATR called ground controller .but there was no respond from the controller.
- At 18:28:54 Eth610 requested taxi clearance. and The controller cleared ET 610 to taxi holding point to 25L Via C 07L E .
- At 18:29 the controller confirmed, if ET-ATR was calling
- AT 18:29:16ET-ATR requested pushback from stand 22 to hangar, and the ground controller cleared to proceed to hangar.  
The ET ATR responded proceeding to hangar



- At 18:29:20 ETH 610 and DLH599 were holding, as they were head on traffic on taxiway C.
- At 18:29:50 The controller instructed Eth 610 to continue Via taxiway B.
- At 18:31:45 the controller issued route clearance to ETH 610 as per flight plan filed to destination FL370 squawk 2441, ETH 610 responded to the clearance.  
The controller released Eth 610 to Tower frequency 118.1mhz.
- At 18:32:23 the sound from ATC fire! Announced .
- At 18:32:23 watch room received the sound fire from Ground controller on VHF radio 121.9 and alarm
- At 18:35 fire fighting vehicles with R/3 and R/4 were on the incident site at stand 22.
- Then fire on the APU of ET ATR became under control.

#### CCTV footage of the B777 and A350 incident

The investigation committee went to see the CCTV and did observation on the timely happening of serious incident of the B777 (ET-AQL) and the Airbus A350 (ET-ATR) on the CCTV recorder. What exactly happened was the A350 (ET-ATR) got a clearance to be taken to the Hangar for maintenance check at 18:29:16 UTC and started pushing back having switched on all the light (beacon light, tail light and wing tip position light )from gate 22. Previously B777 (ET-AQL) destined to MUMBAI was given a clearance to Taxi for RWY 25 Via Taxi way C., then after at 18:29:20 UTC the controller changed the instruction and gave a new one via apron Taxi way B,07L and E and then the aircraft started Taxing out per the new instruction. while ETH 610 was taxing along the center line and reached abeam gate number 12, Airbus A350 was being pushed back from its original parking position (gate 22//15) and had stopped entering the main apron taxing path. At that moment the distance from stand number 12 to 15(22) is 125mts. Subsequently ETH 610 was continuing taxing and collided with the Airbus A350 at apron taxi way at 18:32 UTC.

After the incident the B777 had stopped, and then the Tow truck pulled back to stand position.

Air bus on stop  
position already

Stand 15

Boeing crossed stand 12

West side  
8/20/2017 9:39:04.61 PM (+03:00 UTC)

Stand 12



While the Air Bus was already in the stop position, the Boeing B777 was passing abeam stand 22.

## 1.2 Injuries to persons

<b>Injuries</b>	<b>Crew members</b>	<b>passengers</b>	<b>Others</b>
<b>Fatal</b>	Nil	Nil	Nil
<b>Serious</b>	"	"	"
<b>Minor</b>	"	"	"

## 1.3 Damage to Aircraft

### 1.3.1 ET-ATR, Airbus A350-900

Tail cone seriously damaged, left and right horizontal stabilizer lower skin scratched and gouged, right elevator inboard lower surface damaged, right horizontal stabilizer access panel at inboard lower surface damaged, right horizontal stabilizer fuselage AFT fairing access panel damaged, APU seriously damaged, APU fire extinguisher damaged, APU fuel shroud damaged, APU bleed duct damaged.



### **1.3.2 ET-AQL B777-200R**

Left wing raked wing tip assembly damaged, left wing leading edge slat damaged, left wing fixed leading edge under leading edge slat damaged, left wing upper fixed leading edge slice strap bent torn and cracked, left wing lower skin panel wing extension deformed, left wing web rear spar assembly deformed, left wing two vortex generators damaged, left wing outboard aileron outboard edge area cracked and gouged, left wing rib assembly fixed leading edge assembly torn, cracked, and developed multiple gouges.



#### **1.4 Other damage**

There was no other damage

#### **1.5 Personnel information**

##### 1.5.1 Pilot-in-command:

- Sex .....Male
- Age .....36
- ATPL number..... AA-543
- Medical expiry day .....10/03/2017
- Total flight hours.....10,230hrs
- On type Command time.....326.40hrs
- Hours last 90 days.....209:35hrs
- Hours last 30 days .....102:40hrs

- Hours last 7 days .....22hrs

### 1.5.2 **First Officer**

- Sex .....Male
- Age .....32
- CPL number.....AC-1124
- Medical expiry day .....19/10/16
- Total flight hours.....5996;49hrs
- On type .....2590hrs
- Hours last 90 days.....284hrs
- Hours last 30 days .....82hrs
- Hours last 7 days .....16;35hrs

### 1.5.3 ATC information Aerodrome controller

Sex .....Male

Age.....27

Service year.....from assistant to aerodrome 5 years

Served as aerodrome.....starting April 2010

He is Qualified and certified

Previous accident or incident ,....The controller was involved in an incident in 2014.He was then transferred to where there is low traffic movement. and refreshment training was given to him accordingly and went under proper evaluation and assessment until such time that his efficiency is found to be up to the standards.

### 1.5.4 Tug driver information

- Sex .....Male
- EAL Service .....21 years
- experience GES operator.....7 years

### 1.5.5 Brake rider

- Joined EAL in 2008
- Lead aircraft technician in line maintenance
- Has aircraft maintenance technician license issued by the Ethiopian civil Aviation Authority
- Rated in Boeing(737,767,757)and Airbus A350
- Served in hangar maintenance for 1year and then transferred from hangar maintenance to line maintenance.  
The brake rider in the cockpit is responsible to set and release parking brake by communicating with the mechanic on the ground. He also communicates with ground controller (ATC) through VHF radio (121.9) to request towing clearance.

#### 1.5.6 Ground Mechanic

- Joined EAL in 2005 Completed Aircraft Maintenance Technician course with Diploma
- Has aircraft maintenance technician license issued by the Ethiopian civil Aviation Authority
- Rated in Boeing 737and Airbus A350
- Served in hangar maintenance for 4years and then transferred from hangar maintenance to line maintenance.  
The ground mechanic communicates between the mechanic in the cockpit and the driver. He follows the aircraft by walking on foot and communicates with them regarding the overall towing operation specially the setting and release of brakes.

#### 1.5.7 A-Check Mechanics

During push back process A-check maintenance mechanics were on board in ET-ATR with no factors to the incident.

### 1.6 Aircraft Information

#### 1.6.1 Boeing 777-200

Manufacturer .....Boeing Company

Model.....777-200LR

S/N.....43814



Category..... Public Transport  
Registration..... ET-AQL (on 02 July 2013.)

**Engine**

Manufacturer.....General,electric  
Model..... GE 90-115B

Review of the current maintenance log revealed that there was no record of any remark as well as any significant system failure of any type that can be related to the accident.

**1.6.2 Airbus A-350**

Manufacturer .....Air Bus Company  
Model.....A350XWB-900  
S/N.....0043  
Category..... Public Transport  
Registration..... ET-ATR( on 15 August 2016.)

**Engine**

Ma

Manufacturer .....Rolls Royce  
Model.....TRENT XWB

Review of the current maintenance log revealed that there was no record of any remark as well as any significant system failure of any type that can be related to the accident.

**1.7 Meteorological information**

-The weather at the time of the incident was fine

**from 1800z--1830z**

visibility ..... more than 10km

Wind.....at RWY07 ....Calm and at RWY25....120/04KT

Visibility....10km Cloud.....SCT720M

Temperature...15<sup>0</sup>c Dew point....13

QNH.....1026HPA QFE.....774.5PHA

## 1.8 Navigation Aids

NIL

## 1.9 Communications

The communication on VHF 121,9 mhz was clear and understandable. But some of the communication part lack proper and standard phraseology as per the ICAO procedure.

### 1.10 Aerodrome Information

#### 1.10.1 Addis Ababa Bole International airport

Coordination .....N085828.6

E0384712.14

Run way orientation.....07 /25

RWY length.....3800metres

RWY width.....45 meters

Elevation.....7596FT

#### 1.10.2 Taxiway Information

- .RWY 07L/25R and07R/25L have rapid taxiway(TWY) exists designed with TWY A,B,C,D,E,G H and\_ each taxiway has 23 mts. width except taxiway H and I.
- Taxiway edge lights are fixed with lights showing blue space at an interval of 60mts
- Taxiway center line markings are marked with yellow color to indicate continuous center line of the taxiway/runway and aircraft stands. the width of the taxiway center line marking is 15cm.
- The width of apron taxiway from the upper gate to the lower gate is about 85 mts,

#### 1.10.3 Apron Information

- The main apron accommodates large(wide body)and medium(narrow body) aircrafts, each aircraft stand is numbered with coordinates as per the size and performance.
- The aircrafts involved at the incident were at their assigned gate and stand number, ETH 610 was taxiing out from gate 1 and ET ATR was pushing back from stand number22.

#### 1.10.4 **Apron flood lighting Information**

Apron flood lighting system is provided for the use during darkness and bad weather(poor visibility).

On the day of the incident, the flood lights were fully serviceable . the movement area of the aerodrome is clearly visible for all users to control and monitor the movement of the aircraft.

## **1.11 Flight records**

### **1.11.1 DFDR READ OUT**

#### **1. Background**

On the date July 20, 2017 ETH operated 777 A/C ET-AQL aircraft has sustained impact damage on left wing tips area due to collision with airbus A350 tail section. The incident happened during the 777-200LR (ET-AQL) taxing while the airbus was on push back.

#### **2. Fight Data Readout Analysis**

This Summery Report is prepared per the ETH MRO Quality Assurance, safety office request with the plan to identify

- Taxi Speed

- A/C heading information prior to and after collision
- Braking action (any indication that shows Crew trail to stop the A/C)
- QRH before taxi producer accomplishment.

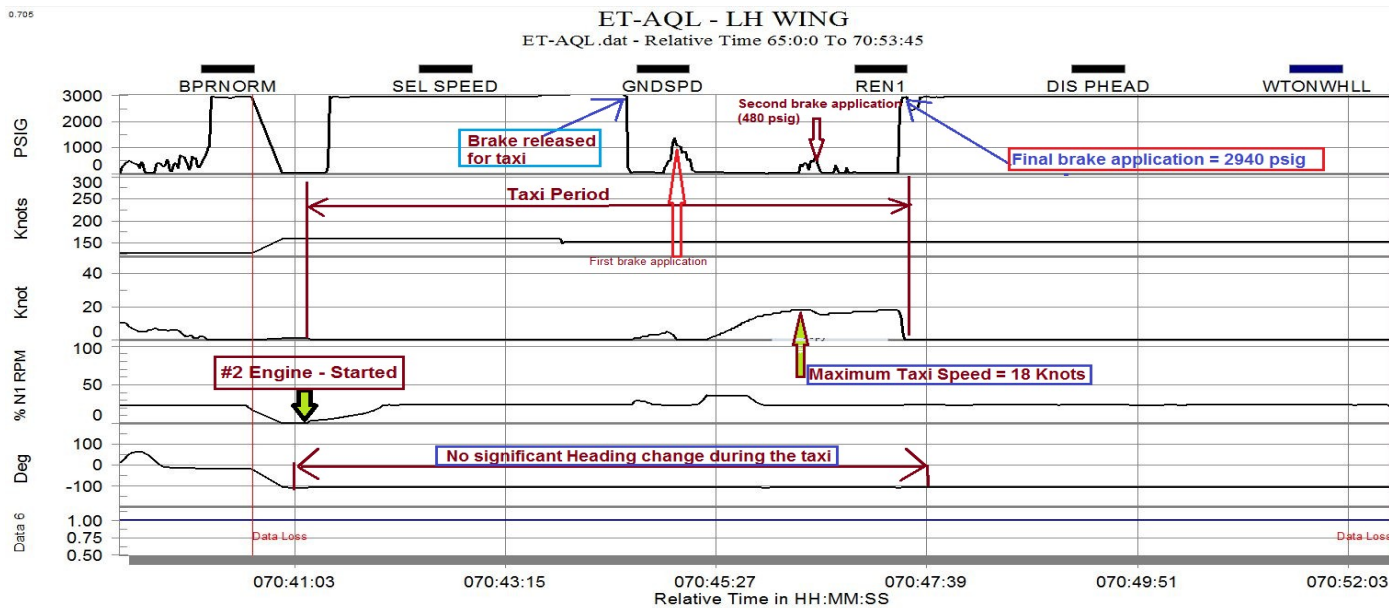
### **3. Parameters selected to analyze the incident.**

The following parameters which have direct or indirect relation to the incident and recorded by the FDR were selected and for analysis.

- Air/Grnd (Air/Ground)
- TIME (HH:MM:SS) GMT
- GROUNDSPEED
- Computed Airspeed
- Brake pressure LH
- Brake pressure RH
- Heading
- Engine rpm (N1)

#### **1. Observation**

- Engine started for taxi with heading – 108.5, @ 18:25:53
- Brake fully Released for taxi @ 18:29:14
- First brake applied and released at 18:29:35 after 21 seconds of brake fully released.
- Final taxi start (A/C started to build up taxi speed) 18:30:03
- Maximum taxi speed of the period attained 18 Knots @18:30:54
- Second brake application trial at (maximum brake pressure 480 psi, and at taxi speed 18 Knots) 18:31:06
- Final full brake application of 2,984 psi @18:32:02 (also at max taxi speed of 18 knots), heading -109.0



### 1.11.2 ATC radio and CVR READ OUT

Time	From	To	Text of Communication	Remark
18:20:51	Pilot	Controller	Ground good evening again ETH 610 Get 1 destination Mumbai FL 370 POB 253/10 ETAQL request start up and push back	
18:21	Controller	Pilot	Clear to start and push back facing west to exit via C:	
18:21	Pilot	Controller	Clear to start and push back facing west to exit via C- ETH 610	
18:21:19	Pilot	Controller	Ground ETH 920 good evening after landing join 07L ETAPE	
18:21:19	Controller	Pilot	ETH 920 good evening via G stand 51	
18:22:47	Pilot	Controller	Ground good evening ETH 3710 cargo terminal request start up and push back request 340 ETARJ	
18:22:47	Controller	Pilot	Clear to start and push on discretion RWY 25L	
18:24:32	Pilot	Controller	Grand good evening DLH 599	
18:24:32	Controller	Pilot	DLH 599 good evening via 'C'get 2	
18:25:18	Controller	Pilot	ETH 610 short push traffic behind	
18:25:18	Pilot	Controller	Short push ETH 610	
18:28:54	ATR	Controller	Ground Alpha Tango romea	
18:28:54	Controller	ETATR	No replay	
18:25:54	Pilot	Controller	Ground ETH 610 request taxi	
18:28:54	Controller	Pilot	610 taxi holding 25L, left on C and 07L, E 1026	
18:29	Controller	TR	Tango Romeo confirm calling?	
18:29:16	ETATR	Controller	Ground aipha tango romew stand 22 18 17 08 070C 048 6.677	

			ነበር	
18:29:18	Controller	ETATR	መሄድ ትችላላችሁ	
18:29:18	ETATR	Controller	Ok, TR proceeding to hangar	
18:29:20	Controller	Pilot	ኧ ኧ 610 hold position	
18:29:20	Pilot	Controller	Holding position ETH 610 የሚያሳልፈው ግን አይመስልም	
18:29:50	Controller	Pilot	Ok continue via 'B'	
18:29:50	Pilot	Controller	continue	
18:30:05	Controller	Pilot	DLH 599 hold position	
18:30:05	Pilot	Controller	DLH 599 hold .....	Replay was not clear
			አያየሁት ነበር left clear ልል .....	Jamming of transmission
18:30:15	Pilot	Controller	ETH 3710 ready for taxi	
18:30:30	Controller	Pilot	ETH3710 Taxi holding 25L B 07L, E 1026	
18.30.32	Pilot	Controller	Taxi holding point 25L B07L, E102l ETH 3710	
18.30.42	Controller	Pilot	DLH 598 request persons on board passengers and crew separately?	
18.30.46	Pilot	Controller	DLH 599 go ahead....	Replay jamming not clear
18.30.46	Controller	Pilot	Say again?	
18.31	Pilot	Controller	DLH 599 souls on bound 14 crew 48 passengers	
18.31	Controller	Pilot	A' copied continue get No 2	
18.31.25	Pilot	Controller	Get No 2 DLH 599 thank you	
18.31.33	Controller	Pilot	ETH 3710 No 2, ETH 610 No 1 copy clearance	
18.31.38	Pilot	Controller	Go, ahead	ETH 610 replied
18.31.40	Controller	Pilot	Clear to Mumbai FPL route to climb and maintain FL 370 Squawk 2441.	
18.31.45	Pilot	Controller	ETH 610 clear to Mumbai FPL route to climb and maintain FL 370 squawk 2441	
18.31.50	Controller	Pilot	Correct, sorry for the inconvenience 07L TWR 118.1 መልካም በረራ	
18.31.57	Pilot	Controller	Its ok, መልካም አዳር ETH 610	
18:32:01	Controller	Pilot	ETH 3710 clearance	
18:32:23	Pilot	Controller	Go ahead	
18:32.23	Controller	controller	ኧረ ኧረ Fire fire አንድ አይሮፕላን ተቀጥሏል /ተጋጭቷል/ ምን? አየገፉ? አዎ	
18:32.36	Controller	Watch room	Watch room ground, watch room ground	
18:32:36	Watch	Controller	Ground watch room go ahead	

	room			
18:32:36	Controller	Watch room	Fire, fire, fire, fire, fire ,fire Get AH, Ah, Get 22 fire, fire ,fire, fire stand 22, Get ሃያ ሁለት fire, fire, Airbus	
18:32:38	Controller	Controller	Siren አብሩ	
18:32:40	Watch room	Controller	Roger, Roger, fire, fire	
18:32:45	Pilot	Controller	Ground ETH 610 holding position AV, እ አንድ አይሮፕላን ሳይገጩን አይቀርም ከኋላችን	
18:32:58	Controller	Watch room	Ground watch room go ahead	
18:33:00	Watch room	Controller	Go, ahead	
18:33:10	Controller	Watch room	Stand 22 ላይ አይሮፕላን crash ሳይደርጉ አይቀርም	
18:33:15	Watch room	Controller	Roger, Roger	
18:33:20	Pilot	Controller	Ground ETH 610 እስቲ status ንገሩን የመታነው አይሮፕላን የእኛ ከንፍ ላይ fire አለ የሚሉት ነገር ምንድነው?	
18:33:20	Controller	Pilot	Ok, እናንተ ከንፍ ላይ ምንም fire የለም	
18:33:21	Pilot	Controller	Ok, Thank you, እናመሰግናለን	
18:33:30	watch room	Controller	Ground watch room Type of aircraft and mature of emergency ንገሩን	
18:33:30	Controller	Watch room	Ok, ወደኋላ push ሲደርጉ ነው የገጩዎቻቸው ከETH 610 እየወጡ ከአሁን በኋላ እሳት የለም አሁን currently እንደምናየው	
18:33:54	Watch room	Controller	Watch room ok, fire, fire, ሲሉን ስለረበሽን ነው Ok	
18:35:00	Controller	pilot	ETH 610 shut down engine	No replay from pilot
18:35:39	Follow me	Controller	Ground follow me እንጅኑን ያጥፉ	

**Pilot, Cabin Crew and Holloway communication script**

**extracted from CVR during Incident**

Time	From	To	Text of Communication	Remark
	Controller	Pilot	No replay	
	Crew	Passengers	Ladies and gentlemen my I have your attention. Please take your seat immediately, take, your seat immediately please, clear the baggage out from your .... Ladies and gentlemen keep sealed will advise you, Exit from your baggage and take your seat	



			immediately.	
	Pilot	IOCC	IOCC ETH 610	
	IOCC	Pilot	610 IOCC go ahead	
	Pilot	IOCC	IOCC ETH 610 ከኋላ በኩል የገጨን አይሮፕላን አለመሰለኝ ለእኛ ብዙም አይታየንም ስለዚህ hold እርግን ቆመናል	
	IOCC	Pilot	Copied ETH 610	
	Cabin crew	Pilot	Captain Dek Inflate አድርጓል	
	Pilot	Cabin crew	Inflate አድርጓል?	
	Cabin crew	Pilot	አዎ	
	Pilot	Cabin crew	Inflate አድርጓል Ok, standby ሁኑና ጠብቁ ምንም ነገር አታድርጉ will advise you.	
	Cabin crew	Pilot	እሺ.	

### 1.12 Description of incident site

The incident occurred on the apron taxi way at night and both aircraft involved in the incident were found displaced from the site before AIB arrived at the site. Because of this it was not possible to take necessary measurements and photographic data in order to determine the exact position of the aircrafts during the incident.

### 1.13 Medical and pathological information

Nil

### 1.14 Fire

- During the incident fire was observed on the APU of ET ATR.
- Ground controller declared fire on VHF 121.9 MHZ and siren Alarm was on.
- watch room dispatched fire fighting personnel with R3 and R4 to control the reported fire 'fire at stand 22 on ET ATR
- fire fighting personnel arrived at the incident side the fire was extinguished with 7000lit of water .

### 1.15 Survival aspects

### 1.16 Test and Research

Nil.

### **1.17 Organizational and management information**

The Ethiopian Airlines Technical policy and procedure manual, on section 9.2.9/4.5 states that the push back team shall consists at least 5 persons, that is two wing walker, brake rider in the cock pit, ground technician with head set and a tug driver.

### **1,18 Additional information**

ACDM – Airport collaboration decision making unit

This unit is established in July 2016 comprising of coordinating committee members from Ethiopian airlines, Airport enterprise and ECAA with the aim of improving air traffic flow and capacity management by reducing delays of departure and arrival flights as well as ensuring the optimal utilization of available resources through sharing of information. It is located in ground buildings nearest to the lower gate of the ramp movement area lacking visual observation of traffic movement on the apron. The office works for 24 hours and is equipped with VHF 121.9 MHz radio direct telephone and walkie-talkies. During the incident night the duty chief air traffic controller (tower controller supervisor) was in the ACDM office being committee member.

## **2. Analysis**

### **2.1 General**

The Tower personnel were found properly qualified for their functions and have valid medical certificate. Four Airdrome air traffic controllers were assigned on the night shift of the incident day, who work on control positions with two frequencies.

The crew were qualified to perform the flight in accordance with ECAA regulation and have valid medical certificate.

Both mechanics Have aircraft maintenance technician license issued by the Ethiopian civil Aviation Authority.

The aircraft has a valid certificate of airworthiness.

On the day of the incident, the apron flood lights were fully serviceable . The movement area of the aerodrome is clearly visible for all users to control and monitor the movement of the aircraft.

The communications on both frequency(121.9 and 118.1mhz) between ground & aircraft were legible in either way. All facilities required for the provision of control services were operational.

Weather was not a factor to the incident.

The traffic movement was normal and there was no work load.

## **2.2 Air traffic controllers**

On the 20 of August 2017 four aerodrome controllers were assigned for duty at Bole control tower. All the controllers reported on duty at 1700UTC as per the scheduled roster time. After they took over watch(duty),two of the controllers left the office for tea break at 1800utc .The remaining two controllers continued their duty on side positions on the same consol using different frequencies. The controller involved in the incident was on VHF 121.9mhz , controlling the ground movements of aircraft, vehicles and personnel as per ATCI standard procedure manual chapter 1 section 1.2.1 but he did not able to perform that. As he reported in the interview, he was under stress and fatigues due to family problem .

In the event of performing his duty, the ground controller received a call from Eth 610 scheduled passenger flight requesting start up the engine and push back clearance from gate 1, the Clearance issued as requested. In the meantime DLH 599 was instructed to taxi via taxiway C to gate 2 for parking after landing on RWY 25L. Subsequently the controller issued taxi clearance to Eth610for RWY 25L via taxiway C.

About half a minute later, an Airbus A350 with registration ET ATR was also given towing clearance from stand 22 to EAL Hangar along the apron taxiway. While ETH 610 commencing taxi for RWY 25L via taxi way C, a landed Lufthansa aircraft (DLH 599) was turning left to taxi way "C". Since

both of them were head on traffic , he instructed them to hold position and inadvertently amended the clearance for Eth 610 to taxi VIA “B” 07L, “E” through the main apron, without taking into account the given towing clearance to ET-ATR along the same apron taxiway .The investigation committee discussed that the incident occurred due to lack of close attention and monitoring the movements of traffic on the apron .

The duty chief air traffic controller(supervisor) being member of ACDM(Airport collaboration decision making) unit was having continuous listening watch on VHF 121.9, where there is no visual observation of traffic movement on the apron.

## **2. The pilot and co-pilot of ETH- 610**

While Eth 610 was continued taxing via taxi way “B” for RWY 25Lon main apron, an aircraft with registration mark ET-ATR was pushing back from stand 22 . Beacon light, wing tip lights and tail light were on. However the crew of Eth 610 did not observe carefully the illuminated lights of ET-ATR which was pushing back in front from stand 22. The evidence from the CCTV footage reveals that, while ETH 610 was taxing along the center line and reached abeam gate number 12, Airbus A350 was being pushed back from its original parking position (gate 22//15) and had stopped way in the main apron taxing path. At that moment the distance from stand number 12 to 15(22) is 125mts. Subsequently ETH 610 was continuing taxing and collided with the Airbus A350 at apron taxi way at 18:32:23 UTC. From the above statement , the pilot in command of Eth 610 didn’t scan the surrounding upper and lower gates while taxing about 900mts from gate 1 to the incident site on the center line of the apron taxi way. the investigation committee discussed that regardless of any ATC clearance, it remains the duty of the commander of an aircraft to monitor and check the apron taxiway and to observe traffic movement in the gates and take all possible safety actions to prevent collision.

According to the rules of Air , annex 2 of chapter 2 section 2.3.1 which states that the pilot in command of an aircraft shall, whether

manipulating the controls or not ,be responsible for the operation of the aircraft in accordance with the rules of the air, except that the pilot in command may depart from these rules in circumstances that render such departure absolutely necessary in interest of safety.

Furthermore the pilot/co-pilot did not maintain listening watch attentively on ground frequency 121.9mhz in order to safeguard the normal operation and ground movement and to act on the instructions from the control tower as per the procedure.

### **Push back of an aircraft**

The Ethiopian Airlines Technical policy and procedure manual, on section 9.2.9/4.5 states that the push back team shall consists at least 5 persons, that is two wing walkers, brake rider in the cock pit, ground technician with head set and a tug driver. Wing walkers shall be assigned for push back and towing operation to ensure clearance between the aircraft and objects . However, in the case of this incident , the push back was initiated with three people only (brake rider, ground technician and a tug driver).It was performed without wing-walkers or marshaler.

After performing the necessary preparation, the push back team of ET ATR aircraft requested ground controller for towing clearance from main apron stand 22 to hangar for A- check maintenance.

As the clearance obtained , the push back commenced and the tail tip was way in into main apron, while Eth 610 was taxiing on the center line of the apron taxiway.

The interview and written report from the push back team states that they have no knowledge about taxing of the aircraft on the main apron.

But the investigation committee discussed that, it was possible for brake rider in the cockpit to listen through radio when the ground controller issued clearance to Eth 610 and understood the position of the aircraft to take appropriate actions accordingly.

Further in the interview the ground mechanic and tug driver mentioned that, at near distance they saw an aircraft was coming towards taxiway B and it seems faster than usual taxiing speed. From the FDR reading the speed of the aircraft was 18 knots (33.3k/h).

Then the ground crew immediately tried to pull back the aircraft but could not succeed to make it .

### **Measurements**

- The width of apron taxiway from upper stand to the apron center line is 42.5 mts. this includes about 7mts line for vehicles movement path.
- The wing span for Boeing 777-200 is 64.8 mts (half wing 32.4m)

Hence while taxiing aircraft Boeing 777-200 appeared abeam stand 12 on the center line of apron taxiway, Airbus A350-900 was entered inside the apron taxiing area from stand 22. The aircraft was perpendicular to the taxiway edge line and its tail was crossing the upper stand line by some 14.1metres.

As the Boeing 777-200 proceeding the taxiing on the center line of the apron the wingtip collided and overlapped with the Airbus A-350 tail cone approximately about 4 meters.

Siren Alarm was activated and watch room (Fire fighting station ) was informed. Fire fighting personnel with R3 and R4 vehicle arrived at the incident site immediately and the fire was under control .

### **3. Conclusions**

#### **3.1. Findings**

1. Crews have valid licenses and medical certificates in accordance with ECAA regulation.
2. . Both mechanics Have aircraft maintenance technician license issued by the Ethiopian civil Aviation Authority
3. The Tower personnel were found properly qualified for their functions.
4. Two of the controllers left for tea break while the rest two continued on duty.
5. The controller involved in the incident ,in his interview mentioned that he was under stress on that night due to family problem
6. The push back was initiated with two mechanics, one in the cockpit and the other with head set on the ground and tag driver. There were no wing walkers or marshaller as per the procedure.
7. The aircraft was properly maintained and had a valid Certificate of Airworthiness.

- 8.** Ground controller instructed both DLH 599 and ETH 610 to hold position as they were head on opposite traffic and then rerouted ETH 610 to taxi via **taxiway B for runway 25L**
- 9.** The mechanics requested ground controller towing clearance for ET ATR from stand 22 to hangar and obtained approval at 18:29:16 .the same time reported proceeding to hangar.
- 10.** The mechanics failed to check the surrounding taxiway, as it was clear and safe for the aircraft prior to enter the apron taxiway
- 11.** The ground controller failed to check the relative position of ET ATR by the time ETH 610 was rerouting via taxiway B.
- 12.** The traffic movement at the time of incident was normal and unchallenged to manage.
- 13.** After observing that an aircraft was coming towards taxiway B the mechanic from ET ATR tried to pull back to avoid collision, but could not make it and collided with ET610.
- 14.** The crew member of ETH 610 was not attentively watching the navigation lights of ET ATR pushing back ahead of them from stand 22.
- 15.** The crew did not maintain listening watch on VHF 121.9mhz.
- 16.** The pilot in command heard noise while passing in front of ET ATR aircraft and felt shake on his aircraft and stopped.
- 17.** ground control declared Fire' on VHF 121.9MHZ and Siren Alarm heard
- 18.** watch room dispatched fire fighting personnel with R3 and R4 to control the reported fire at stand 22 on ETATR
- 19.** the fire vehicles arrived at the incident site the fire was extinguished with 7000liters of water.



### **3.2 Probable Cause of the incident.**

The Investigation committee determines that the probable cause of the incident was human error in that :-

- The ATC inadvertent instruction to Eth 610 aircraft and failure using of controlling techniques as per the procedures..
- Violating the established aircraft operator's normal operating procedures during pushback./lack of wing walkers/
- The crew failed to observe the navigation lights of pushing back aircraft in front from stand 22.

### **3.3 Contributing factors**

- Both aircraft failed continues monitoring and listening watch at the radio frequency 121.9 mhz. for any instruction from control tower for safe operation.
- The controller involved in the incident has been under stress.
- Location of the ATC supervisor as ACDM team member in ground building, lacking visual observation of aircraft movement along the apron to take corrective measure.

### **3. Safety Recommendations**

ECAA shall.

- Establish regular programs for the ATC members that have demonstrated performance deficiencies or experienced failures in air traffic control capacity that would require a review of their performance and administer additional oversight recurrent training to ensure that performance deficiencies are addressed and corrected.
- Take appropriate measures to develop a culture where individuals properly evaluate their own physical and mental condition prior to assuming their duty on the provision of air traffic control service.
- Consider to update ATC standard operating procedures to have backup personnel that assist visual check to warrant the safe operation of the aircraft movement on maneuvering area.

The Aircraft operator shall

- Take appropriate measures to ensure that pushback and towing of aircraft is strictly performed and adherences to implement as per established Ethiopian Airlines Technical policy and procedure manual
- Establish programs for the crew members that have demonstrated performance deficiencies or experienced failures in the working environment that would require a review of their performance and administer additional oversight training to ensure that performance deficiencies are addressed and corrected.
- Ensure that all crew members are capable of monitoring and continuous listening watch on VHF radios and communicate with air traffic controllers using standard phraseology as per the ICAO requirement.

#### **Other recommendations**

- Airport collaboration decision making unit shall be provided with adequate facilities for smooth coordination.

