

2000-7B

# AIRCRAFT ACCIDENT INVESTIGATION REPORT

UNITED AIRLINES FLIGHT 801  
BOEING 747-400, N179UA  
NEW TOKYO INTERNATIONAL AIRPORT  
NARITA, JAPAN  
MAY 12, 1998

DECEMBER 1, 2000

AIRCRAFT ACCIDENT INVESTIGATION COMMISSION

MINISTRY OF TRANSPORT, JAPAN

## ATTENTION

The English version report has been published and translated by ARAIC to make its reading easier for English speaking people those who are not familiar with Japanese.

Although efforts are made to translate as accurate as possible, only the Japanese version is authentic. If there is difference in meaning of the texts between the Japanese version and the English version, text in the Japanese version are correct.

This report on the accident of Boeing 747-400 of United Airlines, N179UA, has been prepared based upon the investigation carried out by the Aircraft Accident Investigation Commission in accordance with Annex 13 to the Convention on International Civil Aviation and Article 20 of the Aircraft Accident Investigation Commission Establishment Law of Japan.

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## CONTENTS

1	PROCESS AND PROGRESS OF THE ACCIDENT INVESTIGATION .....	1
1.1	Summary of the Accident .....	1
1.2	Outline of the Accident Investigation .....	1
1.2.1	Organization of the Investigation .....	1
1.2.2	Implementation of the Investigation .....	1
1.2.3	Hearings from Persons relevant to the Cause of the Accident .....	2
2	FACTUAL INFORMATION .....	2
2.1.	Flight History .....	2
2.1.1	Aspect proceeding to Emergency Evacuation after Pushback was commenced .....	2
2.1.2	Statements of Flight Crew and Ground Crew with regard to Aspect until Emergency Evacuation was conducted .....	3
2.2	Injuries to Persons .....	6
2.3	Damage to Aircraft .....	6
2.4	Damage to Other than the Aircraft .....	6
2.5	Crew Information .....	6
2.5.1	Flight Crew .....	6
2.5.2	Flight Attendants .....	7
2.6	Aircraft Information .....	9
2.6.1	The Aircraft.....	9
2.6.2	The Engines .....	9
2.6.3	Weight and Center of Gravity .....	9
2.6.4	Fuel and Lubricating Oil .....	9
2.7	Meteorological Information .....	9
2.8	Information on CVR and DFDR .....	10
2.8.1	DFDR Recordings .....	10
2.8.2	CVR Recording .....	10
2.9	Medical Information .....	10
2.10	Information on Fire and Fire Fighting .....	11
2.10.1	Information on Fire Fighting and Rescue Activities .....	11
2.11	Information on Search, Rescue and Evacuation relevant to Survival, Death or Injury .....	12
2.11.1	Aspect of Emergency Evacuation conducted by Flight Attendants and Passengers .....	12

2.12	Tests and Research to Find Facts .....	19
2.12.1	Investigation into the DFDR parameters relevant to the No.1 engine starting .....	19
2.12.2	Investigation into Fuel Metering Unit of the No.1 engine .....	19
2.13	Other Relevant Information .....	20
2.13.1	Outlines of a Starting Stall and Tailpipe Torching .....	20
2.13.2	The Company's Manuals relevant to Evacuation, etc. ....	20
2.13.3	Emergency Training for Flight Attendants. ....	22
3	ANALYSIS .....	22
3.1	Analysis .....	22
3.1.1	Certificates of the Flight Crew .....	22
3.1.2	Certificates of the Aircraft .....	22
3.1.3	Analysys of Weather Condition .....	22
3.1.4	Based on the investigation .....	22
3.1.5	Analysis of Torching .....	22
3.1.6	Analysis of Emergency Evacuation .....	23
3.1.6.1	Decision of Emergency Evacuation .....	23
3.1.6.2	Direction for Emergency Evacuation .....	24
3.1.6.3	Assistance on the Ground .....	25
3.1.7	Analysis of Injuries .....	25
4	CAUSES .....	26
5	SAFETY RECOMMENDATIONS .....	26
6	COMMENTS FROM THE USA .....	31

ATTACHED FIGURES

Figure 1	Location of Emergency Evacuation of the Aircraft Involved at New Tokyo International Airport .....	27
Figure 2	Three View Drawing of Boeing 747-400 .....	28
Figure 3	Drawing showing deployed Evacuation Slides and Standby positions of Fire Fighting and Rescue Vehicles .....	29
Figure 4	Engine Parameters .....	30

# AIRCRAFT ACCIDENT INVESTIGATION REPORT

## UNITED AIRLINES FLIGHT 801 BOEING 747-400, N179UA NEW TOKYO INTERNATIONAL AIRPORT NARITA, JAPAN MAY 12, 1998

### 1 PROCESS AND PROGRESS OF THE ACCIDENT INVESTIGATION

#### 1.1 Summary of the Accident

On May 12, 1998, a Boeing 747-400 of United Airline, registration N179UA, which was scheduled to depart New Tokyo International Airport as United Airlines (UAL) flight 801 for Hong Kong International Airport, experienced a torching from the tailpipe of No.1 engine on an apron shortly after the pushback from the parking spot was commenced. Thereafter, at about 1812 JST <sup>Note</sup>, an emergency evacuation using evacuation slides was conducted.

Of the 385 persons - 365 passengers and 20 crew members - aboard the airplane, 4 passengers were seriously injured, and 19 passengers and a flight attendant received minor injuries during the emergency evacuation.

Note: Unless otherwise indicated, all times are Japan Standard Time (JST), based on a 24-hour clock.

#### 1.2 Outline of the Accident Investigation

##### 1.2.1 Organization of the Investigation

1.2.1.1 On May 12, 1998, the Aircraft Accident Investigation Commission assigned an investigator-in-charge and four investigators.

1.2.1.2 Accredited representative from the USA, the State of Registry, the State of the Operator, the State of Design and the State of Manufacture participated in the factual investigation.

##### 1.2.2 Implementation of the Investigation

The investigation proceeded as follows.

May 12 ~ May 14, 1998	On-site investigation
May 15 ~ October 29, 1998	DFDR retrieval and analysis
July 11, 1998.	Investigation of Fuel Metering Unit of No.1 engine

### 1.2.3 Hearings from Persons relevant to the Cause of the Accident

Hearings were held.

## 2 FACTUAL INFORMATION

### 2.1 Flight History

On May 12, 1998, the aircraft, N179UA, was scheduled to depart from New Tokyo International Airport as United Airlines (UAL) flight 801 for Hong Kong International Airport. On board the airplane were 385 persons—365 passengers and 20 crew members.

According to a maintenance log of the UAL801, the airplane underwent a pre-flight inspection by the company's mechanics, and no anomaly was found.

#### 2.1.1 Aspect proceeding to Emergency Evacuation after Pushback was commenced

According to the DFDR data and the Airport Ramp Control (ARC) radio communications provided by New Tokyo International Airport Authority, aspect until emergency evacuation was conducted after the airplane was commenced for pushback from its parking spot was summarized as follows.

At 1804:06, the airplane was cleared pushback by the ARC and commenced the pushback from spot No.402.

At 1804:56,  $N_2$  (Rotating Speed % of High Pressure Compressor) of the No.1 engine began to increase and 40 seconds later once reached to approximately 53% RPM, then gradually began to decrease.

At 1805:40,  $N_2$  of the No.4 engine began to increase and, about 55 seconds later, reached approximately 62% RPM (a stabilized idle speed).

At 1806:30,  $N_2$  of the No.3 engine began to increase and, about a minute later, reached approximately 62% RPM (a stabilized idle speed).

At 1807:16,  $N_2$  of the No.2 engine started to increase and, about 47 seconds later, reached approximately 64% RPM (a stabilized idle speed).

At 1807:41, a fuel flow to the No.1 engine dropped to 0 lb/h.

At 1808:13,  $N_2$  of the No.1 engine spooled down to 0% RPM.

At 1810:31, N<sub>2</sub> of the No.1 engine began to increase and about 23 seconds later reached approximately 30% RPM. Correspondingly, from 1810:33, EGT of the No.1 engine increased from approximately 400 °C to 450 °C and thereafter gradually decreased.

At 1810:55, the airplane requested the ARC to dispatch fire fighting vehicles.

At 1812:34, All Nippon Airways (ANA) flight 904 radioed the ARC to inform that passengers were making an emergency evacuation from an airplane (N179UA) positioned on apron D.

At 1813:02, the airplane requested the ARC to keep other aircraft away from the airplane because of the emergency evacuation being conducted.

#### 2.1.2 Statements of Flight Crew and Ground Crew with regard to Aspect until Emergency Evacuation was conducted

The following are outlines of the statement on the aspect proceeding to the accident made by the Flight Crew, Ground Mechanic, Flight Attendants and Passengers.

##### (1) The statement of the Captain

“In the pushback sequence, I had the First Officer (FO) start the engines normally One, Four, Three and Two.

“Just completed pushback but the No.2 engine had not quite completed starting. And I was checking the outside, because the ground mechanics had disconnected from the airplane and I was waiting for salute for my left side. The FO on my right side said, ‘ No.1 engine stopped’.

So, with No.1 engine quitting, I noticed that the message of “ ‘Eng. #1 Fuel Vlv’ (amber) appeared on the EICAS screen.

“As the FO took out the check list, we followed it. And it stated ‘Do not start the engine, if you have this advisory’.

“I noticed when I looked outside that ground crew were looking and pointing in the direction of the No.1 engine. Because we couldn’t restart the engine, we should decide to go back to spot. To establish communication with the ground crew, I flashed my taxi light indicating to come back. One of the ground crewmen came running, plugged in the inter-phone, and, after several queries because he was very excited, I finally understood him to say ‘Motor #1’.

“Just as I did a dry motoring, I heard the EVAC signal erupted. I assumed that a flight attendant turned on the EVAC switch.

“In our company’s regulations, the flight attendants are allowed to start the evacuation under some conditions without my approval.



“The flight attendant who turned on the EVAC switch might have reported me, but I did not hear anything about this because I concentrated on talking to the ground crew.

“Passengers started evacuation with the EVAC signal flashing.

“I called ground control and asked them to control the passengers escaped on the ground and to send the fire trucks. I shut down the remaining engines. I then asked the ground control if they saw any smoke or flames. An airplane nearby quickly responded that ‘Nothing was visible’.

“There was no overheat or fire indication in the cockpit nor, from where I saw anything outside the cockpit. I, therefore, commanded the passengers by using intercom and PA (Passenger Address) to remain seated. Unfortunately, the FO said, some passengers on the main deck had already left the airplane, but all passengers on the upper deck stayed on the airplane.

“A ramp vehicle hooked up to the aircraft. So after confirming that all passengers on the upper deck left the airplane via the ramp, I deplaned using the same ramp.

(2) First Officer

“During pre-flight check, I checked the maintenance log, and it did not indicate any previous malfunction in the engines.

“All the doors were closed. During pushback, while I was starting the engines, one, four, three and two in this order, all the parameters were normal except EGT of the No.1 engine was a bit slow to rise.

“Just after completing the pushback while starting the No.2 engine, I noticed the No.1 engine has stopped. Advisory message (amber) ‘Eng. #1 Fuel Vlv’ appeared on EICAS screen was flashing. All of the No.1 engine’s indication on the instrument went zero. I conducted the engine shutdown procedures based on a checklist. I confirmed that flight manual basically stated ‘Do not try, Do not attempt to restart engine’. After completing the checklist, the Captain flashed taxi light to re-establish communications with ground crew who had been away from the airplane. A ground crew came back and excited saying ‘Motor Engine’ via plugged-in interphone. We could not understand what he was saying at first. After repeating 3 times I asked, maybe 4 at least 3 times that ‘Do you want us to motor engine No.1’, we both understood him to say ‘motor engine #1’.

“When the conversation with the mechanic went on, EVAC signal beeped and flashed red.

“I got an inter-phone from a female flight attendant, and she said ‘Is there fire? Did someone see fire?’ I replied ‘Standby, confirming the conditions at this

time'. We couldn't see a good view outside the cockpit, so the Captain radioed the ARC to ask if they can see any fire or visible smoke around the engine and call for fire trucks. But The ARC never answered. We made several attempts to call the ARC.

"Despite no answer from the ARC, an another aircraft's pilot who has heard our radio transmissions verified visually our airplane and said 'there is no smoke, no fire'.

"As the Captain found out that there was no fire and no smoke, he made the PA announcement with extremely loud voice 'Remain in your seats. Stay on the airplane. Remain on the airplane. Remain seated'.

"After his announcement, I asked the Captain if I can take a look at the cabin to verify the situation. He said 'Go ahead'. So I released my seat belt, walked through the upper deck and saw passengers remained seated. Then, when I walked down stairs to the main deck, I saw that doors were opened and slides were deployed.

"I walked to a door and had a good view at the engine. I confirmed there wasn't any fire or smoke. At this time, all passengers had already evacuated the airplane, and no body remained in the main deck.

"There were never any overheat or fire warning in the cockpit. We never turned on the EVAC switch and never commanded emergency evacuation.

"After confirming that all passengers on the upper deck left the airplane via ramp, I deplaned using the same ramp.

### (3) Ground Crew

"I positioned by the No.1 engine, and an assistant ground crew was in charge of operating the towing tractor and communicating with the cockpit.

"The starting order of the engines was 1-4-3-2. But the No.1 engine stopped at the time when the No.4 engine was started.

"when disconnecting the towing bar, I asked the assistant ground crew if there was anomaly in the No.1 engine. But he was not replied.

"We moved away from the aircraft by the Captain's command and positioned left side of the airplane where the Captain was able to see us from the cockpit, and we signaled that the airplane was ready to go.

"At that time, we saw smoke and flames were shooting out of the No.1 engine. So I radioed the maintenance center about the situation and also sent the assistant ground crew hand signals for requesting the Captain 'motor engine' in order to blow out the flames.

"The assistant ground crew ran toward the airplane's nose to establish

communication with the Captain.

“After confirming that the flames disappeared, when I was thinking about how to do next, the slides were open and passengers and a flight attendant evacuated the airplane.

**(4) Flight Attendants and Passengers**

Refer to section 2.11.1 for the statements of the flight attendants and passengers.

During the emergency evacuation, 4 passengers were seriously injured, and 19 passengers and one flight attendant sustained minor injuries.

The accident occurred at a rearward area of the No.402 spot on an apron-taxiway D at approximately 1812.

(Refer to attached Figure 1 and 4)

**2.2 Injuries to Persons**

Of the 385 persons - 365 passengers and 20 crew members - aboard the airplane, 4 passengers were seriously injured, and 19 passengers and one flight attendant sustained minor injuries.

**2.3 Damage to Aircraft**

Not applicable

**2.4 Damage to Other than the Aircraft**

Not applicable

**2.5 Crew Information**

**2.5.1 Flight Crew**

1. Captain: Male, aged 59

Airline Transport Pilot License

No.1629026, issued June 19, 1965

Type Rating

Boeing 747-400

Issued November 29, 1996

Class 1 Airman Medical Certificate

Term of validity

Until October 31, 1998

Total flight time

Approx. 19,000 hours

Total flight time on B747-400

Approx. 820 hours

Flight time during the previous 30 days

Approx. 90 hours

Latest training on evacuation

February 19, 1998

2. First Officer: Male, aged 36	
Commercial Pilot License	No.261650531, issued May 1, 1987
Type Rating	
Boeing 747-400	Issued September 27, 1995
Class 1 Airman Medical Certificate	
Term of validity	Until November 30, 1998
Total flight time	Approx. 13,900 hours
Total flight time on MD-11	Approx. 1,820 hours
Flight time during the previous 30 days	Approx. 80 hours
Latest training on evacuation	November 24, 1997

#### 2.5.2 Flight Attendants

1. Chief Purser (Female, aged 30)
 

Position in the cabin	1L door
Years for occupation	7years and 6months
Latest training on evacuation	May 8, 1997
2. Purser (Female, aged 29)
 

Position in the cabin	4L door
Years for occupation	3 years and 6 months
Latest training on evacuation	May 6, 1997
3. Flight Attendant A (Female, aged 38)
 

Position in the cabin	1L door
Years for occupation	2 years and 6 months
Latest training on evacuation	June 20, 1997
4. Flight Attendant B (Male, aged 27)
 

Position in the cabin	1R door
Years for occupation	3 years
Latest training on evacuation	June 4, 1997
5. Flight Attendant C (Male, aged 45)
 

Position in the cabin	1R door
Years for occupation	9 years
Latest training on evacuation	May 7, 1998
6. Flight Attendant D (Female, aged 29)
 

Position in the cabin	2L door
Years for occupation	2 years and 6 months
Latest training on evacuation	June 11, 1997
7. Flight Attendant E (Female, aged 27)

	Position in the cabin	2L door
	Years for occupation	1 years and 6 months
	Latest training on evacuation	April 29, 1998
8.	Flight Attendant F (Female, aged 25)	
	Position in the cabin	2R door
	Years for occupation	6 years and 6 months
	Latest training on evacuation	April 16, 1998
9.	Flight Attendant G (Female, aged 29)	
	Position in the cabin	3L door
	Years for occupation	2 years and 6 months
	Latest training on evacuation	April 16, 1998
10.	Flight Attendant H (Female, aged 28)	
	Position in the cabin	3L door
	Years for occupation	1 years and 6 months
	Latest training on evacuation	June 5, 1997
11.	Flight Attendant I (Female, aged 30)	
	Position in the cabin	3R door
	Years for occupation	1 years and 6 months
	Latest training on evacuation	July 17, 1998
12.	Flight Attendant J (Female, aged 31)	
	Position in the cabin	3R door
	Years for occupation	3 years
	Latest training on evacuation	April 27, 1998
13.	Flight Attendant K (Female, aged 35)	
	Position in the cabin	4R door
	Years for occupation	4 years
	Latest training on evacuation	May 5, 1997
14.	Flight Attendant L (Female, aged 34)	
	Position in the cabin	4R door
	Years for occupation	6 years
	Latest training on evacuation	June 2, 1997
15.	Flight Attendant M (Male, aged 34)	
	Position in the cabin	5L door
	Years for occupation	8 years and 6 months
	Latest training on evacuation	May 4, 1998
16.	Flight Attendant N (Male, aged 36)	
	Position in the cabin	5R door

Years for occupation	5 years
Latest training on evacuation	April 3, 1998
17. Flight Attendant O (Female, aged 32)	
Position in the cabin	UDL door
Years for occupation	8 years
Latest training on evacuation	June 2, 1997
18. Flight Attendant P (Male, aged 27)	
Position in the cabin	UDR door
Years for occupation	4 years and 6 months
Latest training on evacuation	June 5, 1997

## 2.6 Aircraft Information

### 2.6.1 The Aircraft

Type	Boeing 747-400
Serial No.	25158
Date of manufacture	July 31, 1991
Certificate of Airworthiness	issued July 31, 1991
Total aircraft flight time	33,078 hours 08 minutes
Aircraft flight time after scheduled maintenance for "B" check performed on May 3, 1998	125 hours 15 minutes

### 2.6.2 The Engines

Type : Pratt & Whitney model PW4056

	<u>Serial No.</u>	<u>Date of manufacture</u>	<u>Total time in service</u>	<u>Time in service after "B" check</u>
No.1	724420	May 18, 1992	28,838 hrs	125 hrs 15 min
No.2	724633	May 14, 1992	23,591 hrs	125 hrs 15 min
No.3	717551	December 30, 1988	34,430 hrs	125 hrs 15 min
No.4	727337	April 29, 1993	18,265 hrs	125 hrs 15 min

### 2.6.3 Weight and Center of Gravity

Not applicable.

### 2.6.4 Fuel and Lubricating Oil

The fuel on board was JET-A-1. The lubricating oil was Exxon Turbo Oil 2380.

## 2.7 Meteorological Information

The aviation weather observations around the time of the accident, as provided by the Aviation Weather Center at New Tokyo International Airport, were as follows:

Time of observation: 1800

Wind direction/speed	Variable/3 knots		
Visibility	4,800 meters		
Cloud			
Cloud amount	1/8	3/8	7/8
Cloud form	Stratus	Stratus	Stratocumulus
Height of cloud base	700 ft	1,000 ft	1,500 ft
Temperature/dew point:	17°C/15°C		
Atmospheric pressure (QNH)	29.90 inHg		

## 2.8 Information on CVR and DFDR

The airplane was equipped with AlliedSignal model UFDR 980-4100-DXUS DFDR (Serial No. 10994) and Fairchild model A100A CVR (Serial No. 56919). Both were removed from the airplane after the accident.

### 2.8.1 DFDR Recordings

Data on all parameters were recorded on the DFDR from the time when the No.1 engine had been started until the time shortly before all of the four engines were shutdown.

The times recorded on the DFDR were determined by matching VHF keying discrete data on the DFDR with the time on ARC radio transmissions recorder to evaluate the expected unreliability in the times.

Plots of the DFDR major parameters regarding the engines during the time zone before and after the accident occurred are attached as Figure 4.

### 2.8.2 CVR Recording

Voices and sounds in the cockpit are stored on a 30 minute endless loop magnetic tape recording medium until a CVR stops operating, recording over the oldest data after 30 minutes. However, all the recordings on the said CVR were voices and sounds pertinent to the maintenance that was carried out after the accident. Therefore, since the recordings near the accident were erased because the time has elapsed more than 30 minutes after the accident occurred, no CVR information pertinent to the accident was available.

## 2.9 Medical Information

According to diagnosis conducted at a hospital where four seriously injured persons were transported, details of the extent and portions of their injuries are as follows.

- (1) Female, Aged 38: Fracture of the right 1<sup>st</sup>, 3<sup>rd</sup> and 4<sup>th</sup> metatarsus
- (2) Female, Aged 44: Fracture around the right ankle
- (3) Female, Aged 65: Fracture dislocation of the right scaph-oid
- (4) Female, Aged 73: Fracture of the right distal radius

In addition, natures of minor injuries that 20 persons sustained were bruise, sprain and excoriation, etc.

## **2.10 Information on Fire and Fire Fighting**

### **2.10.1 Information on Fire Fighting and Rescue Activities**

- (1) Request for Dispatch and Mobilization of Fire Vehicles

At 1815, a command post of the fire fighting division of New Tokyo International Airport Authority (NTIAA) was notified by the ARC that passengers were evacuating from the airplane on an apron-taxiway D at rearward of the No.402 spot. Upon receipt of the notification, the command post issued a category III dispatch order to fire fighting stations of the NTIAA fire fighting division, and 11 fire fighting and rescue vehicles (FFRVs) including a commander vehicle and two ambulances dispatched and arrived at the scene at 1818.

Narita City Fire Department, which was informed by the command post of the NTIAA fire fighting division, also dispatched 6 FFRVs including an ambulance. They arrived at the scene at 1846.

- (2) Fire Fighting and Rescue Activities

According to the statements of the NTIAA fire fighting division, fire fighting and rescue activities at the scene were implemented as follows (Refer to attached figure 3.);

After arriving at the scene, FFRV from the fire fighting stations of the NTIAA fire fighting division found that there appeared not to have been any fire on the No.1 engine of the airplane and therefore, they were on standby in the vicinity of the No.1 engine without discharging water.

A large number of passengers had already evacuated the airplane by using evacuation slides; the injured persons were transferred by ambulance to a medical center in the airport and other hospitals.

After confirming no passengers left in the airplane at 1842, a standby order for the FFRVs except the commander vehicle was released at 1847, and, at the same time, a standby order for FFRVs dispatched from Narita City Fire



Department was also released. At 1907, a standby order for the commander vehicles was released.

## **2.11 Information on Search, Rescue and Evacuation relevant to Survival, Death or Injury**

### **2.11.1 Aspect of Emergency Evacuation conducted by Flight Attendants and Passengers**

The following are outlines of the statements obtained from flight attendants and passengers regarding the aspect of the evacuation. (Refer to attached figure 3.)

#### **(1) The Statements of Flight Attendants.**

##### **① Chief Purser positioned at door 1L (Female, aged 30)**

“I was working FLT 801 NRT to HKG as the Chief Purser.

“After doing the live safety demo, flight attendants (FAs) were doing there safety checks. I (at left) got a call from a FA positioned at door 5L. He said that there was a fire at door 5L, then he said that the No.1 engine was on fire, I told him I would notify the cockpit.

“I called the cockpit and reported what I had heard the Captain told me to standby. About 2 sec. later I got a call from a FA positioned at door 5R that said ‘the No.1 engine is on fire, evacuate the airplane’, and at the same time I heard the EVAC signal sound and saw the light flashing. I called the cockpit back but could not get an answer.

“I saw door 2L evacuating and the PAX from the back were all evacuating PAX from center cabin were coming up front to evacuate. At this point I then evacuated first class from door 1L. Door 1R started their EVAC, also after most of the main deck cabin were evacuated, a FA said “Stay seated”. I then went to the cockpit.

##### **② Flight Attendant positioned at door 3L (Female, aged 29)**

“After I did my live demo and I was on the way to my jump seat and prepare for final safety check, I heard EVAC alarm run off, and I tried to check what is going on.

“I heard a lot of passengers shout ‘on fire’ and I tried to guard the nearby door 3R. I tried to calm down passengers but they were too panic and couldn’t wait to open the door 3R. Then I heard PA (Passenger Address) said ‘Stay’, I know it should be from Captain, so I shouted ‘Stay’. Some passengers stayed and one passenger pushed me and opened the door by himself and he asked people ‘Run, run’. I continued to keep passengers on board until other FAs told me evacuate all passengers and so I just followed the command. After a while, everybody in EY (economy class) gone.

##### **③ Purser positioned at door 4L (Female, aged 29)**

“After I finished live demo, put away my demo equipment. I was walking toward to my door 4L and doing my final check with passengers. I was around row 42 or 43 on left aisle, and I heard someone shout ‘Fire, evacuate, get off the plane’. So I rushed to my door, looked out the window, and I saw big fire came out from the left engine No.1.

“I immediately disarmed my door. The cabin lights were off immediately and I started to hear alarm went off, but the volume was very low. All the passengers got off from their seats, rushed to my door, so I redirected the passengers to other doors.

“Around the door 4R everybody was standing and the door was open, but seemed like nobody jumped out the plane. So I tried to get passengers to the back which was door 5L. I did hear a man was on PA said something, but I couldn’t hear very well.

④ Flight Attendants positioned at door 4R (Female, aged 34)

“I was on FLT 801. After live demo, I was doing my safety check in D zone right side, then I heard an EVAC alarm went off, and I heard some people said loudly ‘Evacuate’, the minute I turned my face to my door 4R, 4R was open however slide did not open. FA was standby there and I assisted him direct PAX to other door and the same time I spoke up / really loud to PAX drop all their bag, then 4R slide slowly opened, then a FA and I directed PAX to slide down, FA assisted an old lady down, then another FA and I continued to direct PAX down at door 4R until most of PAX were down, then PA shouted to me Captain said ‘Stay’ it’s OK ! But I don’t know what/why caused the EVAC alarm.

⑤ Flight Attendants positioned at door 5R (Male, aged 36, slightly injured)

“Shortly after Live-demo, a FA (5R) notified me of an engine fire (No.1) and told me to check it at 4L. I saw black smoke and flames. At this time passengers at row 54A or B drew my attention and waved me over. I went there and looked at the situation from there. At this time there was flame’s blazing out of the engine horizontally of 2 to 3 yards.

“As I ran back to 4L, I took another look. The fire was still shooting out of 1R and did seem to develop. I took the phone dial PP, this sounds engaged. I reset and dialed 31, this was also engaged. I reset dial 11 for purser this was engaged I said to a FA ‘No.1 is on fire, I’ m gonna evacuate’.

“Considering the airplane on fire which was not moving with some 370 PAX plus 20 crew onboard and being not able to communicate with cockpit or purser, I initiated an evacuation at 4L but moved to 4R and

opened this door as 4L was too close to the fire.

“Slide did not inflate. I pulled a manual inflation handle once. Still no inflation. I pulled a second time, it broke still no inflation.

“I redirected PAX to 3R, as I noticed this condition door (3R) was not open. I shouted ‘Open that door’ twice after which a passenger opened this door, the slide inflated and evacuation began. Some 10 to 15 seconds later my slide at 4R inflated. I started evacuating PAX here too. At the same time a very elderly lady stood trembling at the top of the 4R slide. Considering that there was another 2 FA’s at 4R door. I decided to pick her up and took her down the slide. The old lady was OK. I injured my right foot but no fracture.

⑥ Flight Attendants positioned at door 5L (Male, aged 34)

“On FLT 801, NRT/HKG on the 12<sup>th</sup> May 98, after we armed the door for takeoff, PAX on seat 53ABC told me that there was fire on the No.1 engine. I looked at it and noticed there was fire covering the No.1 engine (the whole back 1/2 of the engine). I began to call a FA (5R) to look and monitor the fire and I would notify the C/P and Captain.

“The next thing I heard the EVAC alarm and evacuation started. I went back to 5L door and took PAX not to open the door and told them to come to door 5R because 5L was right behind the engine with fire. Before I could open 5R door the PAX already opened 5L door and some of them evacuated with that door. I went on to open 5R and could pull the PAX off and sent them away. The EVAC went smoothly.

⑦ Flight Attendant positioned at UDR (Upper Deck Right)

“I was sitting UD/R. After the live demo, as 3 of UD’ FAs were doing last minute pick ups and safety check, I heard an alarm sound.

“Initially, I thought it was smoke alarm because it sounded too low to sound like EVAC alarm. As soon as it was confirmed it was EVAC alarm, we wanted to make certain that this was not a mistake made by pilots, FAs or PAX. I looked down the stairs and saw and heard FA’s emergency command.

“Soon after that I heard PA voice reassuring that everyone should be seated. We immediately informed PAX to remain seated and that we would inform them if there was further notice from the pilots.

“F/O and Captain came out of the cockpit and told everyone in U/D that the airplane was fine. All PAX were calm.

⑧ Flight Attendant positioned at UDR (Upper Deck Right)

“After pushback, right after we completed the live demo (before Captain said ‘prepare for take off’), I heard EVAC alarm, emergency lights on, cabin got dark. I had a look outside and downstairs for few seconds. Nothing was happening.

“Then PAX started screaming, rushing to the doors.

“Upper deck remained calm and in their seats. Captain made an announcement ‘Remain seated’. So we went through the cabin to reassure them even though we didn’t have any information to tell them. Then F/O came out of the cockpit, went downstairs and told us that everything was OK. And plane was OK. After he went back to the cockpit, Captain came out and explained situation that everything was OK. PAX were calm.

(2) The Statements of passengers.

- ① Passenger on a window-side seat in the middle cabin of the main deck (Female, aged 65, seriously injured)

“Around when the airplane was pushed back and then stopped, I saw that a white smoke coming out of the left-side engine immediately changed to a black smoke and shortly thereafter flames were shooting out of the engine. Just after I saw the flames, group tour passengers around me were panic and scrambled to take out their luggage, and they rushed up to an evacuation door stamping my luggage which had been thrown out onto the aisle.

“I evacuated the airplane through an exit opposite to the flame side. A Flight Attendant guided me for the evacuation in the cabin. Passengers threw away their belongings on the slide from the cabin while I was sliding down. One of the belongings, a big and heavy briefcase made of duralumin, directly hit my right hand. At this time, my right index finger was fractured. When touching the ground, I was in the state of almost falling down and hit my lower back against the ground and sustained bruises. There was nobody on the ground who supported me.

“I received first aid treatment in the airport medical center and, the next day, I departed Narita to Hong Kong. I went to a hospital and was diagnosed as sustaining a serious injury that would take three weeks to heal.

- ② Passenger on an aisle-side seat in the rear cabin of the main deck (Female, aged 73, seriously injured)

“The aircraft was ready to depart, and after the aircraft moved I felt it stopped. After a while, a flight attendant looked like concerning about

something and then rushed toward the forward cabin.

“Since I was seated away from the window, I did not pay attention outside. A passenger on the window-side seat told me that there was fire on one of the engines.

“Passengers in the middle-forward cabin were standing up and I heard the sounds that seat belts were released. The cabin lights came off and an alarm started to go off.

“No announcement was made by the pilot or flight attendant.

“Since there was no fire and smoke in the cabin, passengers seated in the rearward portions of me seemed to remain calm. We were waiting for directions to be given to us.

“5 to 10 minutes later, someone shouted from the forward ‘Open that doors’. We passed this to passengers near an emergency exit in the rear cabin. We evacuated the aircraft through the exit.

“At the time of the emergency evacuation, no assistance by the United Airlines’ staff was given to the passengers.

“Sliding down was so fast that I worried about being injured by the speed.

“Unfortunately, my body was jumped up at the bottom of the slide. At this time, my right arm, with which I covered my face and head, was fractured.

- ③ Passenger on a right window-side seat in the forward cabin of the main deck (Female, aged 66)

“I did not notice any flame or abnormal sound from the engine because I read a book. Shortly after an alarm erupted, the cabin lights came off.

“At the time when the slide was deployed, a flight attendant repeatedly shouted in English ‘Leave your belongings and jump on to the slide’.

“I evacuated the aircraft without bringing anything. It was calm without any major chaos on the ground.

- ④ Passenger on a right-aisle-side seat in the middle cabin of the main deck (Female, aged 66)

“I heard alarm sounds with unusual tone cycle, but I couldn’t entirely understand the situation in the cabin whether I should evacuate the airplane.

“Passengers seated in the rear cabin, among whom a lot of Chinese speaking people were included, rushed up to the front and someone opened

a door (3R).

“I remained in the cabin until the last minutes.

“I heard conversation among flight attendants, and I deemed they looked like not figuring out what was going on. Even though flight attendants tried to keep passengers on board, but they evacuated the airplane.

“After a while, a flight attendant said us ‘Get out of the airplane’, so I deplaned.

“I had been seated just rear of the door (3R), since I was being preoccupied by people rushing up to the front from the rear cabin, I didn’t see who opened the door (3R) to evacuate.

“Nobody gave us a help when evacuating.

- ⑤ Passenger on a right-window-side seat in the rear cabin of the main deck (Male, aged 38)

“Just after the airplane began pushback, I heard a beeping sound started to go off.

“A little after, the airplane stopped after completing the pushback. A flight attendant came to running through left aisle to the rear cabin and then looked outside from a window near the exit, but I couldn’t figure out what the flight attendant was looking at.

“When looking back forward, a right side door in the middle cabin had been open but I didn’t see who opened the door. A flight attendant gestured directing passengers to evacuate the airplane.

“Passengers seated from row 30(A~H) to 50 (A~H) suddenly stood up, opened the overhead bins, took out their belongings and rushed up to the right-side door in the middle cabin.

“A passenger shouted ‘Open the door’ while another flight attendant was calling a flight attendant who positioned near the right-side door in the rear cabin to confirm the situation.

“Thereafter, the right-side door in the rear cabin was open from which passengers who had been seated in the cabin evacuated.

“The Captain made an announcement saying ‘Stay here’ before the door was open. This announcement was different from a direction made by the flight attendant in the main deck. I evacuated the airplane through the right-side door in the rear cabin. Nobody supported passengers sliding down except that a foreign male passenger was giving assistance to female passengers or passengers with infant at the bottom of the slide.

- ⑥ Passenger on a left-aisle-side seat in the rearmost cabin of the main deck (Female, aged 61)

“After fastening seat belt, when I looked outside, I saw and was concerned about black smoke belching out of an engine. After that, I saw small flames coming out of the engine.

“During this period, flight attendants were carrying out safety demonstrations for about 10 minutes in the cabin.

“Then, big flames were shooting out of the smoky engine horizontally of about 3 meters and, at the same time, an alarm went off. Passengers around me were standing up, and there were a lot of noise and communication in the cabin. Several men opened an exit door in the rear cabin and the slide was deployed through which passengers evacuated one after another.

“I went to the right-side exit where flames were not shooting out, and even though I was scared looking down, I finally jumped on to the slide.

“Two men supported me on both side of the bottom of the slide. This made me feel secure very much.

“However, I was anxious very much because nobody guided us on the ground to a safer place.

- ⑦ Passenger on a right-window-side seat in the forward cabin of the upper deck (Male, aged 36)

“After completing pushback, when a safety live demonstration in the cabin was almost finished, an alarm erupted and then I heard clattering sounds and loud voices like tapping the floor and speaking in Chinese in the main deck. After a while, cabin lights were off and engines stopped.

“No announcement was made, and I couldn’t figure out what was going on. Several minutes later, I could see through my window that passengers were sliding down from the aircraft. I realized that emergency situation had taken place.

“However, we haven’t been given any guidance yet in the upper deck, and I deemed that flight attendants remained seated.

“After that, there was a cabin announcement “Remain seated” and the flight attendants were shouting the same words.

“Even though I couldn’t judge the whole situation, I stayed in my seat because I deemed the situation wasn’t imminent one. Then, the person, who looked like the Captain, came out of the cockpit and proceeded to the middle in the upper deck explaining ‘I was reported someone saw fire on

the engine, but everything is OK. Please remain seated’.

“I finally deplaned via the ramp, which was connected to the airplane, without using the evacuation slide.

## 2.12 Tests and Research to Find Facts

Investigation into the No.1 engine issued in a torching was conducted as follows.

### 2.12.1 Investigation into the DFDR parameters relevant to the No.1 engine starting

Variations in  $N_2$ , fuel flow and EGT of the No.1 engine during the sequence from a first  $N_2$  increase at 1804:56 to a second  $N_2$  increase at 1810:31 were as follows.

#### (1) $N_2$

$N_2$  began to increase at 1804:56, 40 seconds later reached up to 53 % and subsequently spooled down to 0 % at 1808:13.

The  $N_2$  began to increase again at 1910:31, reached to a maximum value of 30 % then gradually decreased.

#### (2) Fuel Flow

The fuel flow increased to 600 lb/h at 1805:18.

20 seconds later, the fuel flow increased to a maximum of approximately 1,300 lb/h and gently reduced to approximately 300 lb/h. Subsequently, the fuel flow further reduced to 0 lb/h at 1807:41 when  $N_2$  of the No.1 dropped to approximately 6 %.

#### (3) EGT

The EGT began to rise at 1805:20 and reached at about 270 °C at the time when  $N_2$  reached its maximum value of 53 %.

Subsequently, despite the decrease in the  $N_2$ , the EGT still rose to about 400 °C at 1806:10 and continued to gently increase until it reached a maximum of about 500 °C at 1807:25. Around which the  $N_2$  decreased below 5 % but, even thereafter, the EGT of about 500 °C continued to have been recorded on the DFDR. This is due to retention of (EGT) parameters stored in memory in a sensor (FADEC) at a time when  $N_2$  of the engine decrease below 7 %.

$N_2$  began to increase again at 1810:31 and reached approximately 30 %.

The EGT rose from about 400°C to about 450°C and, thereafter, gradually decreased.

### 2.12.2 Investigation into Fuel Metering Unit of the No.1 engine

The following are the results of a visual check and a post accident bench test examination on the Fuel Metering Unit (FMU).



(1) Visual Check

There was no evidence of adherence of foreign object on both port inlet and outlet of the FMU, neither was faulty insulation or resistance in the electrical connections. Additionally, a Fuel Metering Valve had stopped at Max. fuel flow stop, and no noticeable malfunction was found.

(2) Bench Test Examination

The FMU functioned normally under its control signals, either did each solenoid valve operated properly. There was no noticeable malfunction in these units.

According to Manufacturer of the FMU, when  $N_2$  drops below about 7 %, the decrease in fuel pressure to the FMU may allow an internal spring of Min. pressure shutoff valve in the FMU to mechanically close the valve, and the FMU stops supplying fuel.

## 2.13 Other Relevant Information

### 2.13.1 Outlines of a Starting Stall and Tailpipe Torching

A starting stall is a HPC stall which can occur on some engines during acceleration (e.g. in the 40% to 60%  $N_2$  speed range), and it has been reported that starting stalls have occurred just after a starter cutoff.

Since most failed starts due to a starting stall result in a spool-down in  $N_1$  and  $N_2$  and a corresponding increase in EGT, the flight crew can recognize the anomaly of the engine by observing instrument in the cockpit. In this case, when fuel and ignition are commanded off by the flight crew, fuel flow into the burner stops and the flame in the burner is extinguished. However, if a relatively long time elapses after the starting stall occurs before the fuel and the ignition are cutoff by the flight crew, excess fuel can accumulate in the LPT and tailpipe region in the process of the engine rotors continuing spooling down. During this spool-down, since complete combustion is not occurring in the burner, inefficient combustion can extend into the turbines and tailpipe.

In this situation, a smoky tailpipe fire (torching) can continue until the residual fuel in the tailpipe is burned, evaporated, or blowout even though fuel is no longer delivered to the burner after fuel cutoff is commanded by the flight crew.

### 2.13.2 The Company's Manuals relevant to Evacuation, etc.

The following are Excerpts from "Flight Operations Manual", "B747-400 Flight Manual" and "Flight Attendants In-Flight Manual" of the Unite Airlines regarding procedures, etc. for emergency evacuation.

- (1) Excerpt from Flight Operation Manual (EMERGENCY EVACUATION EM/IR-9)

#### EMERGENCY EVACUATION:

Communication between the cockpit and cabin crewmembers is especially important, both to verify the situation and to ensure both groups are aware of the decision either to evacuate or not evacuate.

#### UNPLANNED EVACUATION:

In an obvious life-threatening situation (crash, fire, bent-scraping metal, gear collapse, etc.), Flight Attendants will initiate evacuation without awaiting orders from the Captain. In less obvious emergencies, conversation with the cockpit will be attempted to assist in the use of all resources to assess the situation before the Captain's decision is made. If contact with the cockpit is not possible, Flight Attendants will then make a decision independently.

If an irregularity or emergency develops during ground operations and it is not feasible to return or continue the terminal, the Captain should consider the use of emergency exits and evacuation slides to deplane the passengers and crew only if their safety is in question. Otherwise remote stairs or an eventual return to the terminal should be used for deplaning.

- (2) Excerpt from B747-400 Flight Manual (EVACUATION 8-19)

#### CREWMEMBER'S RESPONSIBILITIES:

##### Captain

Immediately after the aircraft stops, conditions permitting, accomplish cockpit shutdown, then proceed to the cabin and exercise overall command inside the aircraft. If unable to descend to the main cabin, leave the aircraft via the upper deck escape doors and escape slides and assume command outside.

##### First Officer

Immediately after the aircraft stops, conditions permitting, accomplish cockpit shutdown, then proceed to the cabin and determine that all usable exits doors are open. When all possible assistance has been given, leave the aircraft. If unable to descend to the main cabin, leave the aircraft via the upper deck escape doors and escape slides and assist evacuation from all available exits.

All crewmembers should assemble the passengers a safe distance upwind from the aircraft, keeping in mind the fire threat and approaching rescue vehicles. Provide first aid and comfort as necessary.

- (3) Flight Attendants In-Flight Manual (EMERGENCY PROCEDURES FIRES 1217)

#### Emergency Procedures – Fire:

Occasionally, torching from an engine or APU exhaust may be observed but is not usually a serious problem, and by itself, does not call for deplaning or evacuating the aircraft. However, if fire is discovered outside the aircraft,

immediately notify the flight crew and Purser.

Procedures relating to a fire outside the aircraft either on the ground:

In the case of a fire on the ground away from the gate, evacuate after aircraft comes to a complete stop.

#### 2.13.3 Emergency Training for Flight Attendants.

Crew members of the United Airlines were required to undertake emergency training once a year, and the company's records revealed that the crew members who were on duty at the time of accident had taken the required training as described in paragraph 2.5.

### 3 ANALYSIS

#### 3.1 Analysis

3.1.1 The captain and the first officer had valid airman proficiency certificates and valid airman medical certificates in accordance with applicable regulations.

3.1.2 The airplane had a valid airworthiness certificate and had been maintained and been checked in accordance with applicable regulations.

3.1.3 It is estimated that the weather conditions at the time of the accident had no bearing on the accident.

3.1.4 Based on the investigation, it is estimated that the flame issuing from No. 1 engine tailpipe noticed by the flight attendants and passengers was torching.

3.1.5 Analysis of Torching issuing from No.1 Engine tailpipe.

(1) Based on the investigation of the DFDR readouts during No. 1 engine starting shown in 2.12.1, it is estimated that during the acceleration period of the engine start, the abrupt drop of N2 and the abnormal rise of the exhaust gas temperature the starting stall conditions outlined in 2.13.1.

(2) Based on the following reasons, it is estimated that the fuel control switch had been in RUN" position until the flight crew shut down the engine in accordance

with the checklist:

The investigation of the fuel metering unit described in 2.12.2 shows that the minimum pressure shutoff valve of the FMU moves to the shutoff position mechanically as the fuel pressure drops.

The investigation of No. 1 engine start based on the DFDR readouts described in 2.12.1 shows that the fuel flow decreased coordinated to N2 dropped and when N2 dropped to approximately 6 % at 1807:41, the fuel flow decreased to 0 lb/h.

There is a statement of the flight crew to the effect that when No. 2 engine start was almost completed, they shut down No.1 engine in accordance with the checklist as "ENG. 1 FUEL VLV" (a message indicating that the position of minimum pressure shutoff valve did not match the fuel control switch position) was displayed on the EICAS system.

- (3) It is estimated that since the flight crew had not monitored well the engine instruments during the engine starting, they were late for noticing the occurrence of the starting stall, failing to turn the fuel control switch to "CUT OFF" position promptly.
- (4) It is estimated that since fuel had been pumped into the combustion chamber for about 2 minutes between the time since the fuel flow reached the maximum value of approximately 1,300 lb/h at 1805:36 and the time till it dropped to 0 lb/h at 1807:41 as described in 2.12.1(2), fuel in excess did not burn completely as shown in 2.13.1 and collected in the low pressure turbine section, resulting in the torching.

### 3.1.6 Analysis of Emergency Evacuation

#### 3.1.6.1 Decision of Emergency Evacuation

- (1) It is estimated that although the captain and the first officer noticed the stoppage of No. 1 engine and while they followed to conduct the engine shutdown, and also noticed that the "EVAC" alarm had been activated and evacuation of passengers had started, the captain made a cabin announcement to the effect that the

passengers were requested to remain in the cabin because there was no indication of fire on the instruments nor fire warning in the cockpit and they had received an advice from another airplane that no smoke nor fire was visible around the engines of the airplane.

- (2) It is estimated that according to the statement of the first officer, although the chief purser and the first officer had a communication on whether there was a fire, the instruction, "Standby a while" from the first officer (which was given after the EVAC" alarm was activated) had not been transmitted on to all the flight attendants.
- (3) It is estimated that the flight attendant in charge of 5R door who saw flame issuing from No. 1 engine thought that the fire would spread and the airplane would catch fire and additionally was unable to contact the captain or the chief purser, judged that the situation would call for the evacuation described in the Flight Operation Manual and was obliged to make the decision for emergency evacuation.

Further, it is estimated from the statement of the said flight attendant that this person tried to use the priority code for the inter-phone operation in order to contact the captain, but failed to make contact even if the highest priority code PP" for cut-in was used.

- (4) It is estimated that the flight attendant who made the decision for emergency evacuation was not familiar with the procedural note on torching described as " Occasionally, torching from the engine or APU exhaust may be observed but it is not usually a serious problem, and by itself, does not call for deplaning or evacuating the airplane." in the Flight Attendant Inflight Handbook as procedures for emergency evacuation.

#### 3.1.6.2 Direction for Emergency Evacuation

- (1) It is estimated that the flight attendant who noticed the torching judged it to be a fire which had to call for emergency evacuation before the chief purser transmitted on the first officer's instructions to other flight attendants, and activated the EVAC" alarm which resulted in the evacuation of passengers.

- (2) It is estimated that the direction for emergency evacuation to the passengers in the main deck was given to passengers by the flight attendant stationed in the main deck based on the "EVAC" alarm described in (1) above.

It is further estimated that by the time when the flight crew made an announcement to the effect that "passengers are requested to stay inside", the emergency evacuation had already been in progress and most passengers and flight attendants had been unable to understand the meaning of the cabin announcement because of noises inside the cabin.

- (3) It is estimated that the direction for emergency evacuation was not given to the passengers in the upper deck because the flight attendants stationed in the upper deck had tried to determine whether the "EVAC" alarm was an error or they had not noticed the torching was occurred and they knew the evacuation was in progress on the main deck when after a short while the flight crew announced to stop the evacuation.

#### 3.1.6.3 Assistance on the Ground

It is estimated that some passengers evacuated earlier and the ground personnel assisted the evacuating passengers by slides at the lower end of some evacuation slides for a part of the time.

It is further estimated that when the passengers who suffered from serious injuries slid down, there was no assistance available at the lower end of the slide used, although it was not possible to identify the slide whose passengers used.

As for the guidance of the evacuated passengers to the safe area, it is estimated that according to the statements of the passengers, such guidance was not conducted properly.

#### 3.1.7 Analysis of Injuries

It is estimated that all of the 24 injured persons received injuries when they slid down the slides or when they reached the ground because one of the heavily injured persons stated that a baggage belonging to another passenger hit her hard, resulting

in a bone fracture, and medical doctors who gave the first aid treatment to the passenger injured diagnosed that the seriously injured persons suffered from fractures and minor injured persons suffered mostly from contusions, sprains, abrasions etc.

#### **4 CAUSES**

It is estimated that this accident was caused by that a torching occurred in No. 1 Engine tailpipe when during the engine starting, one of the flight attendants decided it a fire of the aircraft exterior, activated the emergency evacuation alarm under the condition that the communication between the flight crews and flight attendants were not established, and as the emergency evacuation was conducted, resulting in injuries to some of the passengers and crew members who slid down the escape slides.

#### **5 SAFETY RECOMMENDATIONS**

As a result of the investigation of this accident, the Aircraft Accident Investigation Commission makes the recommendations to the Federal Aviation Administration of the United States of America that requires United Airlines to take proper actions to improve the education and training of crews on the following items:

- (1) Flight crew's instrument monitoring during engine starting,
- (2) Cabin crew's knowledge on torching phenomenon,
- (3) Communication between the flight attendant and the flight crew during emergency situation, and
- (4) Orderly execution of emergency evacuation.

Figure 1 Location of Emergency Evacuation of the Aircraft Involved at New Tokyo International Airport

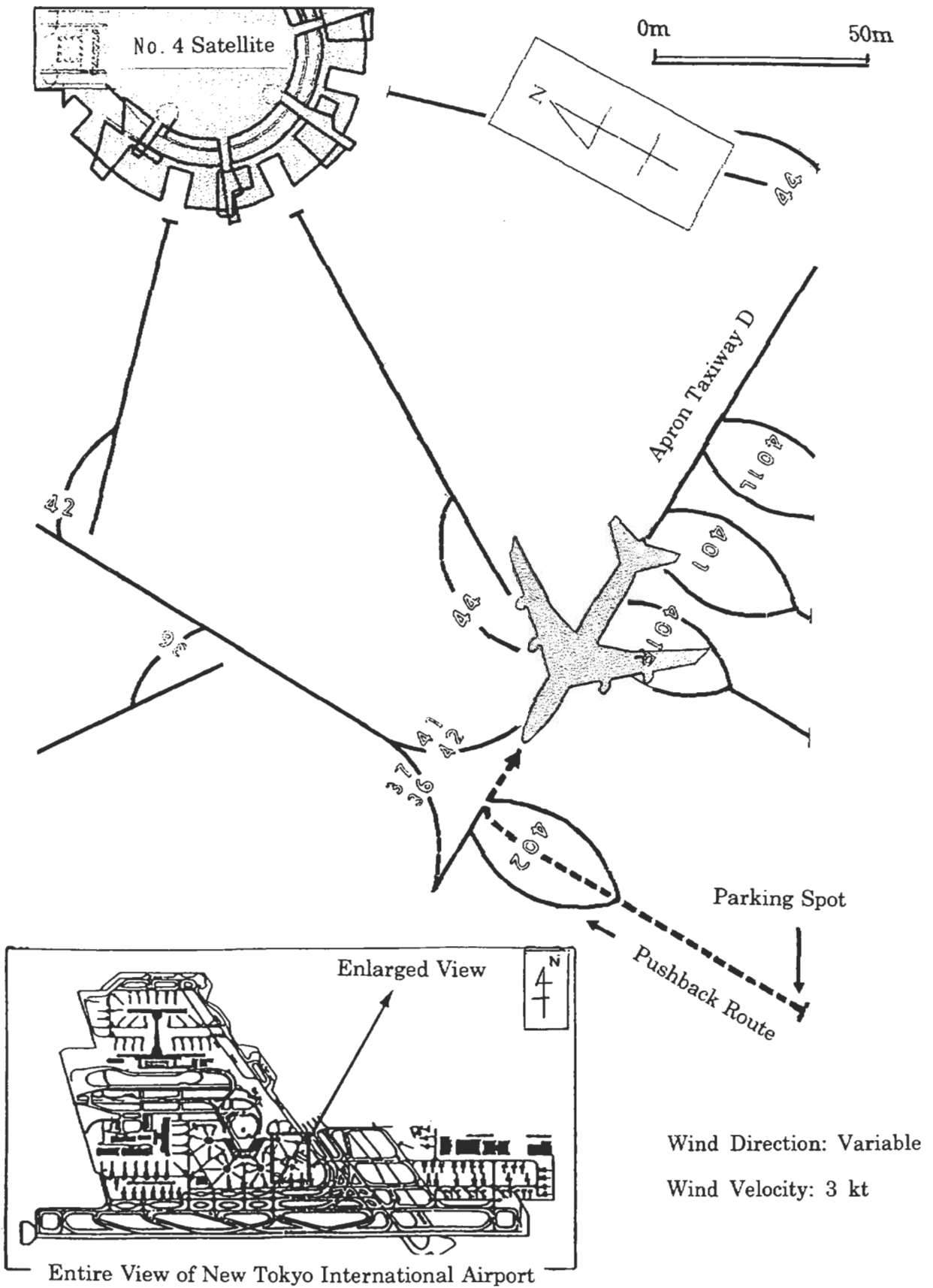




Figure 2 Three View Drawing of Boeing 747-400

Unit: m

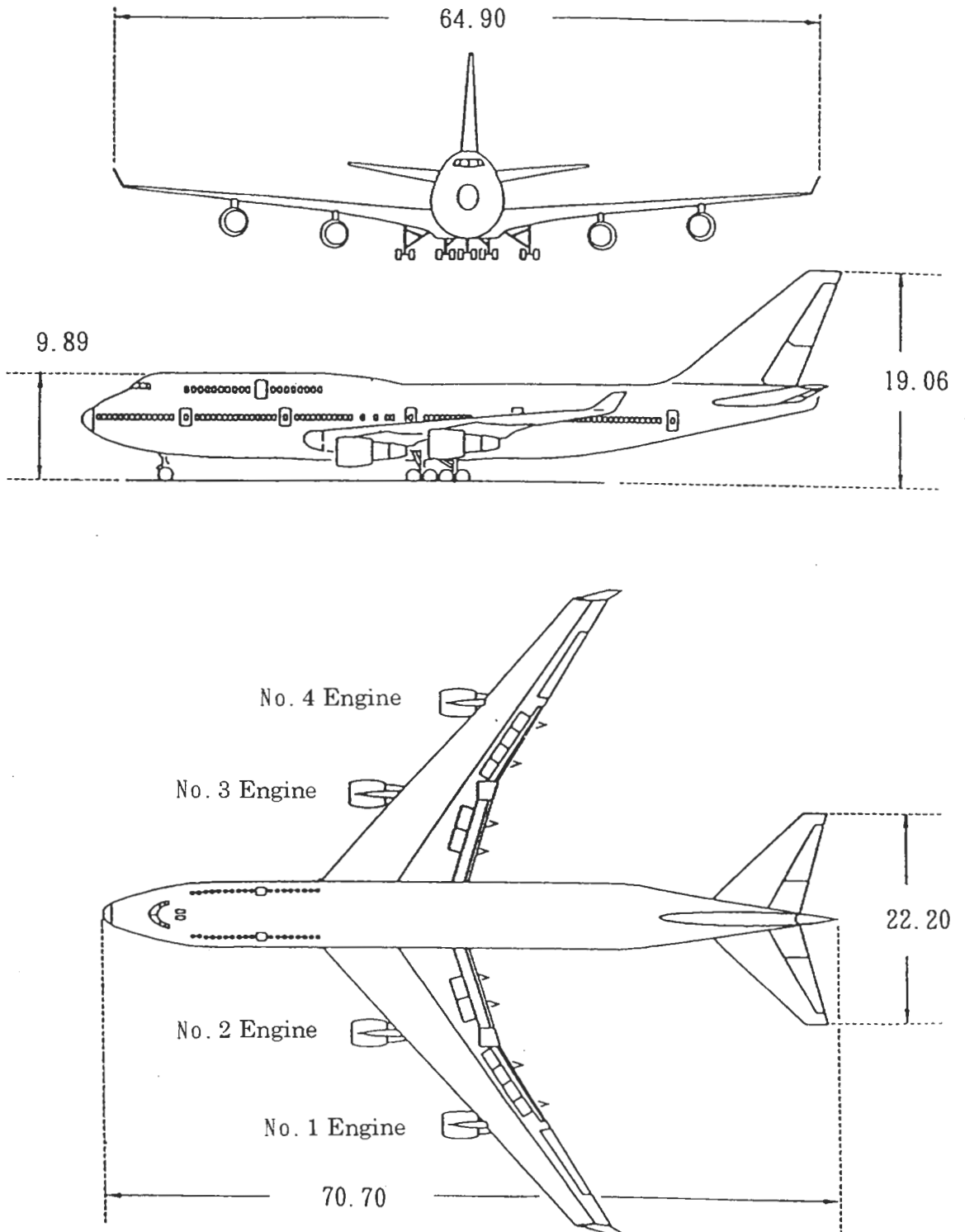
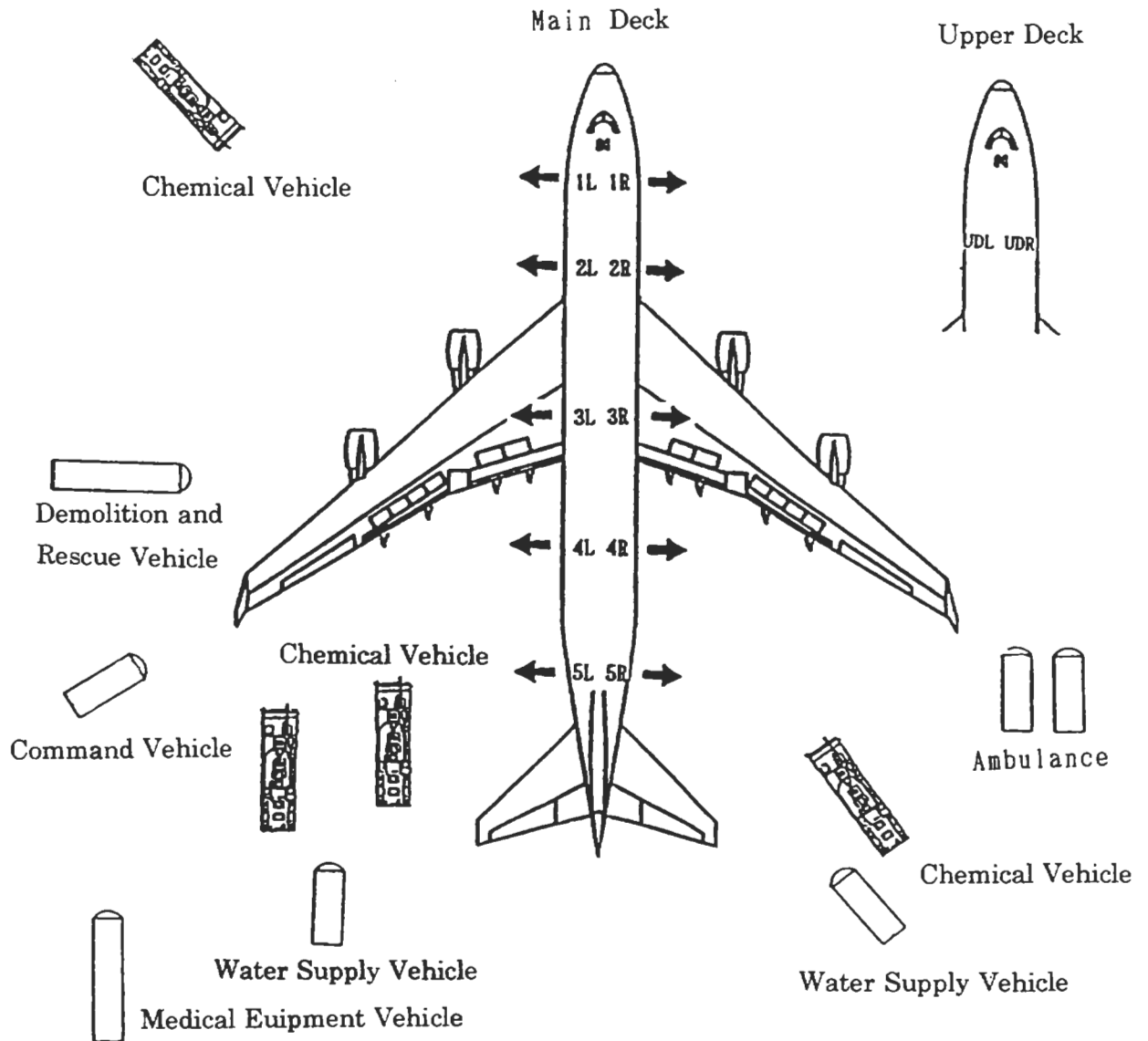


Figure 3 Drawing showing deployed Evacuation Slides  
and Standby positions of Fire Fighting and Rescue Vehicles



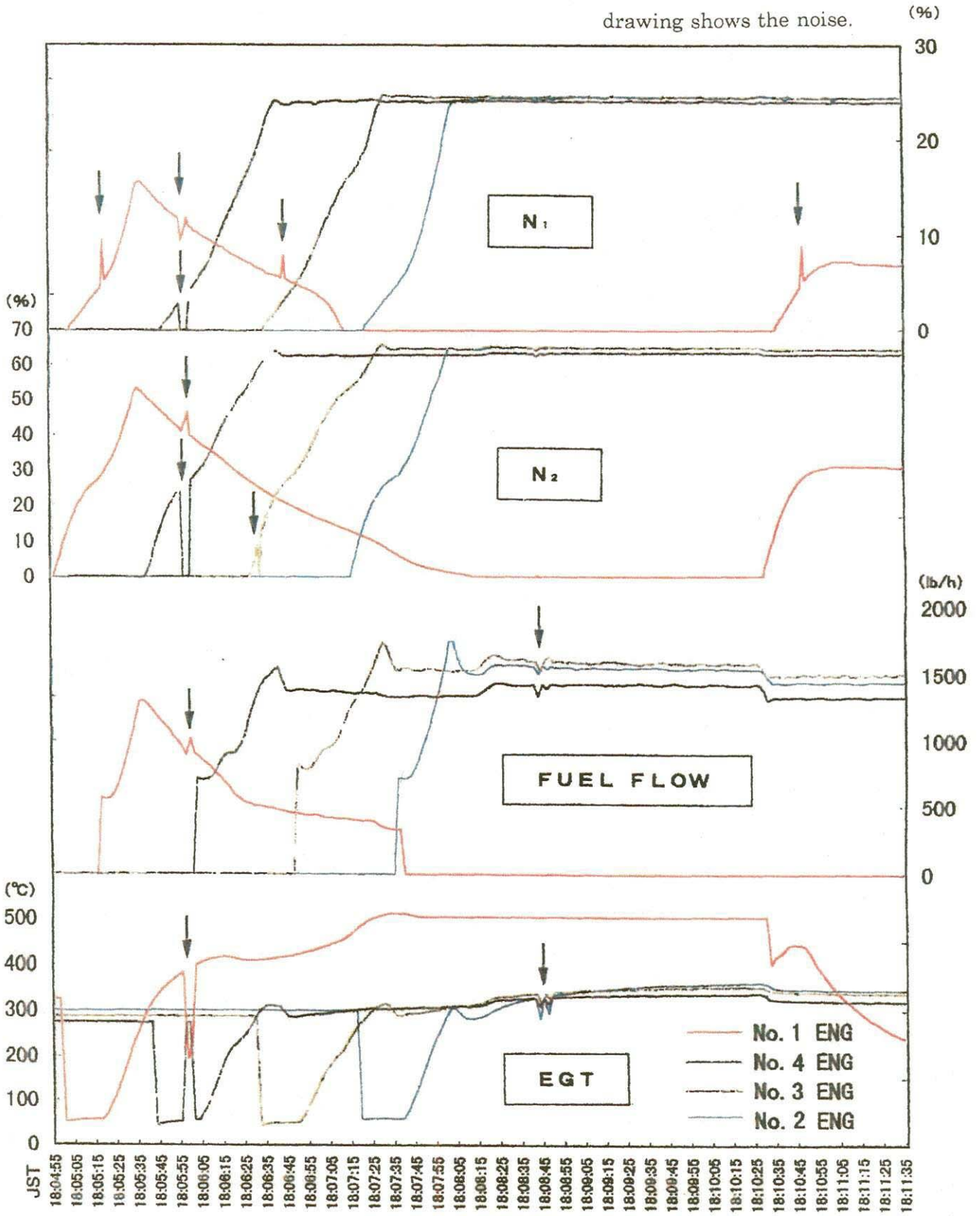
Note: 1 Arrows ( ← · → ) in the drawing show the deployed evacuation exits.

Note: 2 UDL and UDR were not used.

Note: 3 Fire fighting and rescue vehicles of Narita City Fire Fighting Headquarters are not shown in the drawing since the standby status was cancelled immediately after they arrived at the accident site.

Figure 4 Engine Parameters

Note: The arrow mark ( ↓ ) in the drawing shows the noise.



6 COMMENTS FROM THE USA



# National Transportation Safety Board

Washington, D.C. 20594

OCT 27 2000

Office of the Chairman

Dr. Yasuhiko Aihara  
Chairman  
Aircraft Accident Investigation Commission  
Ministry of Transport  
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Tokyo 100-8989  
Japan



Dear Dr. Aihara:

Thank you for the opportunity to review your final draft report of the investigation into the May 12, 1998, accident at New Tokyo International Airport involving United Airlines flight 801, a Boeing 747-400, N179UA. You request comments from the National Transportation Safety Board according to paragraph 6.9 of Annex 13 to the Convention on International Civil Aviation.

The Safety Board has no comments on the report; however, it congratulates the Aircraft Accident Investigation Commission, Ministry of Transport, on a thorough investigation and appreciates all of its hard work.

Sincerely,

  
Jim Hal  
Acting Chairman