



ARAIB

Report No. ARAIB/AAR-F0901

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# Aircraft Accident Report

**A passenger got burnt during flight**

**Japan Airlines Flight 950**

**B747-400, JA8074**

**About 4 NM East of Anyang VOR**

**27 January 2009**



**October 28, 2010**

**Aviation and Railway Accident Investigation Board  
Ministry of Land, Transport and Maritime Affairs  
Republic of Korea**

**According to the provisions of the Article 30 of the Aviation and Railway Accident Investigation Act of the Republic of Korea, it is stipulated;**

*The accident investigation shall be conducted separately from any judicial, administrative disposition or administrative lawsuit proceedings associated with civil or criminal liability.*

**And in the Annex 13 to the Convention on International Civil Aviation, Paragraphs 3.1 and 5.4.1, it is stipulated and recommended as follows;**

*The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents, and it is not the purpose of the activity to apportion blame or liability. Any judicial or administrative proceedings to apportion blame or liability should be separate from any investigation conducted under the provisions of this Annex.*

Thus, this incident investigation report issued as the result of the investigation on the basis of the Aviation and Railway Accident Investigation Act of the Republic of Korea and the Annex 13 to the Convention on International Civil Aviation, shall not be used for any other purpose than to improve aviation safety.

In case of divergent interpretation of this report between the Korean and English languages, the Korean text shall prevail.

## Aircraft Accident Investigation Report

Aviation and Railway Accident Investigation Board. A passenger got burnt during flight, Japan Airline Flight 950, JA8074, 4 NM east of Anyang VOR, 27 January 2009. Aircraft Accident Report ARAIB/AAR-F0901. Seoul, Republic of Korea

Korea Aviation and Railway Accident Investigation Board (ARAIB) is a government organization for independent investigation of aviation and railway accident, and the accident investigation shall be carried out based on the Aviation and Railway Accident Investigation Law of the Republic of Korea and Annex 13 of the Convention on International Civil Aviation.

The objective of accident or incident investigation of the Korea Aviation and Railway Accident Investigation Board is not to apportion blame or liability but to prevent accidents and incidents.

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**Japan Airlines International Co., Ltd. Japan****Boeing B747-400****JA8074****4 NM east of Anyang VOR, Republic of Korea****27 January 2009 (10:05)<sup>1)</sup>****Synopsis**

Japan Airlines' Flight 950 aircraft (B747-400, registration JA8074, hereinafter referred to "Flight 950"), which took off from Incheon International Airport of the Republic of Korea at about 9:58 on 27 January 2009 for Narita International Airport of Japan, was climbing to airway G597, when the service cart of the upper deck cabin slid at an altitude of 7,000 feet near Anyang VOR causing hot beverage on the cart to be spilt over and a serious injury<sup>2)</sup> to a passenger.

Flight 950 was a regular scheduled international passenger service flight operating under instrument flight rules within the airspace of the Republic of Korea, according to the provisions of the Korean Aviation Act, the Japan Aviation Act and Convention on International Civil Aviation. The captain, first officer, 14 cabin attendants, and 314 passengers were on board.

Notified by Japan Transport Safety Board (hereinafter referred to "JTSB") of the fact two days after the accident occurred, the Aviation and Railway Accident Investigation Board of the Republic of Korea (hereinafter referred to "ARAIB") organized an accident investigation team to conduct accident investigation, and notified this to the ICAO and the investigation authority<sup>3)</sup> of the state of manufacturer, and JTSB assigned its accredited representative to support ARAIB's accident investigation activity.

The ARAIB reviewed general information, flight factors, cabin attendant safety duties, and cabin service cart elements in the analysis of this accident investigation, and developed findings derived from the factual information and analysis of this accident in three categories: findings related to probable causes, findings related to risk, and other findings, and issued four (4) safety recommendations to Japan Airlines on the basis of the results of the accident investigation.

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<sup>1)</sup> All the times in this report are Korea Standard Time (International Standard Time +9)

<sup>2)</sup> Second degree burn

<sup>3)</sup> National Transport Safety Board of U.S (NTSB)

## 1. Factual Information

### 1.1 History of Flight

According to the captain's statements, the Flight 950 crew members left the hotel around 07:15 on 27 January 2009 for Incheon International Airport, arrived at the Incheon Airport departure gate around 08:15, and had a briefing from the flight dispatcher.

At this briefing, the captain received information that the weather in the Kanto region of Japan was bad and informed the cabin attendants of this at the joint briefing conducted in the aircraft around 08:30. The captain also asked the purser how long it would take to finish the in-flight service.

Flight 950 took off runway 15R of Incheon International Airport at 09:57:39, and at about 5,000 feet during the climb it started flying with autopilot. At 09:58:22, as the air traffic controller instructed "JAL 950, radar contact, SEL2R, maintain 7,000 initially," Flight 950 responded and reached an altitude of 7,000 feet at 10:00:29. The captain then turned off the seat belt sign and the first officer did not raise any objection to this.

On board of Flight 950 were the captain, first officer, 14 cabin attendants and 314 passengers, 22 of which were on board in the upper deck with two cabin attendants<sup>4)</sup>.

According to the upper deck cabin attendants, the seat belt sign was off earlier than usual at about 10:00, and they began preparations for meals to serve passengers right after.

At about 10:04, the cabin attendant in charge of the upper deck brought a cart carrying meals and beverages to the aisle of row 16. She was taking out the table of the passenger on seat 15A after applying the front brake<sup>5)</sup> of the cart, as the cabin attendant in charge of the galley applied the rear brake and went to the galley to fetch a sticker<sup>6)</sup> for a sleeping passenger. (See Fig. 1)

According to the recording of air traffic control communications and flight data recorder, the air traffic controller instructed Flight 950 "JAL950 climb to FL230" at about 10:04:27, to

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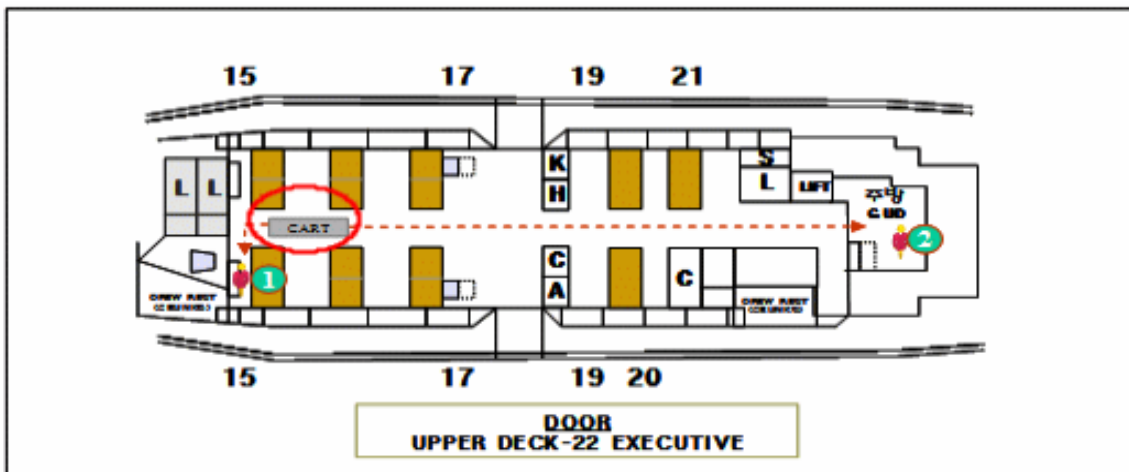
<sup>4)</sup> One in charge of the cabin and one in charge of the galley

<sup>5)</sup> The cart has brakes at the front and rear

<sup>6)</sup> The sticker, on which is written "Please let us know when you wake up," is used for flight attendant's later service if there is a passenger who was sleeping during meal and beverage service.

which Flight 950 responded "climb to FL230 JAL950" and resumed altitude climb<sup>7)</sup> at 10:04:41 from level flight at 7,000 feet with the seat belt sign off.

As Flight 950 started climbing, the pitch became high, and the cart slid backwards exceeding its maximum brake capability. As the cart hit the seat 19H, the cart tumbled towards the seat 19C, and the hot beverage on the cart was spilt on the right arm of the passenger in seat 19C.



[Fig. 1] Upper deck situation map

- Note: ① The cabin attendant in charge of cabin  
 ② The cabin attendant in charge of galley

### 1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	-	1	-
Minor	-	-	-
None	16	313	-

<sup>7)</sup> VNAV SPD Mode



### 1.3 Damage to Aircraft

There was no damage to the aircraft in this accident.

### 1.4 Other Damage

There was no other damage in this accident.

### 1.5 Personal Information

#### 1.5.1 The Captain

The captain (male, age 39) held a valid Airline Transport Pilot Licence<sup>8)</sup>, B747-400 type rating<sup>9)</sup>, Class 1 Airman Medical Certificate<sup>10)</sup>, Aviation English Language Proficiency Certificate<sup>11)</sup> and Aeronautical Radio Operator Licence<sup>12)</sup> in accordance with Japan Civil Aeronautics Act.

The captain's total flying time was 5,563 hours, including 5,091 hours on B747-400, 81 hours in the last 90 days, and 18 hours in the last 30 days. The captain had 13 times of flight experience for the Incheon /Narita section since he was promoted to captain<sup>13)</sup>.

He rested on 25 January which was three days before the event flight, arrived at Seoul on the 26th as a deadhead crew by Flight 953 (Narita/Incheon section), and flew Flight 950 on the 27th.

#### 1.5.2 The First Officer

The first officer (male, age 28) held a valid Commercial Pilot Licence<sup>14)</sup>, B747-40 type rating<sup>15)</sup>, Class 1 Airman Medical Certificate<sup>16)</sup>, Aviation English Language Proficiency Certificate<sup>17)</sup> and Aeronautical Radio Operator Licence<sup>18)</sup>.

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<sup>8)</sup> Certificate number: A107498(2006.8.8)

<sup>9)</sup> Date of issue: 1997. 5. 29

<sup>10)</sup> Effective date: Until 2009. 2. 6

<sup>11)</sup> Aviation English Communication Ability Certificate / Certificate No.: 1357(2007.8.6)

<sup>12)</sup> Certificate Number: AARE617

<sup>13)</sup> Date of promotion to captain: 2008.8.11

<sup>14)</sup> Certificate Number : A320052(2006.5.25)

<sup>15)</sup> Date of issue: 2008.1.28

<sup>16)</sup> Effective date: Until 2009.7.16

<sup>17)</sup> Certificate Number.: 4915(2008.4.4)

<sup>18)</sup> Certificate Number.: EBCE3

His total flying time was 599 hours, including 325 hours on B747-400, 119 hours in the last 90 days and 45 hours in the last 30 days. He had 10 times of flight experience for the Incheon/Narita section, including 2 observation and 2 training flights.

He had a Narita/Incheon round-trip flight on 25 January which was three days before the event flight, arrived at Seoul on the 26th through deadheading by Flight 953 (Narita/Incheon section), and flew Flight 950 on the 27th.

### **1.5.3 The Cabin Attendants**

The senior cabin attendant (female, age 41) had a total flying time of 15,485 hours since she was employed by Japan Airlines in December 1988, and completed the emergency evacuation and first aid training in March 2008 and the Safety/CRM regular training in September 2008.

The cabin attendant in charge of the upper deck (female, age 39) had a total flying time of 10,408 hours since she was employed by Japan Airlines in September 1993, and completed the emergency evacuation training in May 2008, the first aid training in December 2008, and the Safety/CRM regular training in April 2008.

The cabin attendant in charge of the upper deck galley (female, age 26) had a total flying time of 2,657 hours since she was employed by Japan Airlines in April 2005 and had completed emergency evacuation training in May 2008, first aid training in December 2008, and safety/CRM regular training in June 2008.

## **1.6 Aircraft Information**

### **1.6.1 Aircraft History**

The aircraft of Flight 950 was manufactured<sup>19)</sup> by The Boeing Company of the United States and held a valid airworthiness certificate<sup>20)</sup>. The total flying time of the aircraft was 78,107 hours, including 432 hours since A-check. The results of checking the flight data recorder and flight/maintenance log showed no defects or abnormalities related to the event flight.

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<sup>19)</sup> Serial No.: 24426

<sup>20)</sup> Certificate No.: 99-024

The aircraft has four CF6-80C2B1F engines manufactured by General Electric Co., and the total operation time and the operation time after overhaul are shown in the Table 1 below.

Engine No.	No.1	No.2	No.3	No.4
Total operation time	58,503	75,567	55,006	54,418
Operation time after overhaul	11,982	3,321	3,198	17,149

[Table 1] Engine operation time

### 1.6.2 Weight and Balance

Comparison between actual weight and maximum allowed weight showed surplus in the weight as shown in Table 2. The fuel load was suited for the flight between Incheon International Airport and Narita International Airport, and the takeoff center of gravity percentage mean aerodynamic chord (TOW C.G%MAC) was within the limit range<sup>21)</sup>.

Classification	Weight and Balance Data
Zero fuel weight (ZFW)	213,368 kg (maximum 256,282 kg)
Takeoff fuel (TOF)	26,853 kg
Takeoff weight (TOW)	240,221 kg (maximum 317,518 kg)
Trip fuel (TIF)	14,923 kg
Landing weight (LDW)	225,298 kg (maximum 285,766 kg)
Takeoff weight center of gravity percentage mean aerodynamic chord (TOW C.G%MAC)	26.7 % MAC

[Table 2] Weight and balance data

<sup>21)</sup> Limit range: 13 ~ 33 C.G%MAC

### 1.6.3 Cart Information

The relevant cart is the same type as 95F0567 made by Showa Aircraft Industry Co., Ltd. (Fig.2). The cart could not be found after it was handed over to a cart cleaning company of Japan Airlines after arrival at Narita Airport.

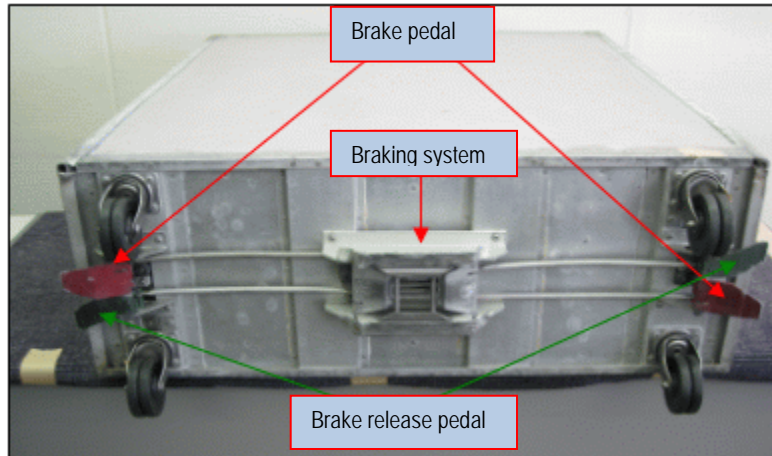
According to the manual of this cart, the tare weight of the cart is 48lb, and the maximum loadable weight is 152lb. This cart has two brake systems, and the capability of its brake system is at least 8 degrees at the time of manufacturing when the total weight<sup>22)</sup> of the cart is 200 lbs.



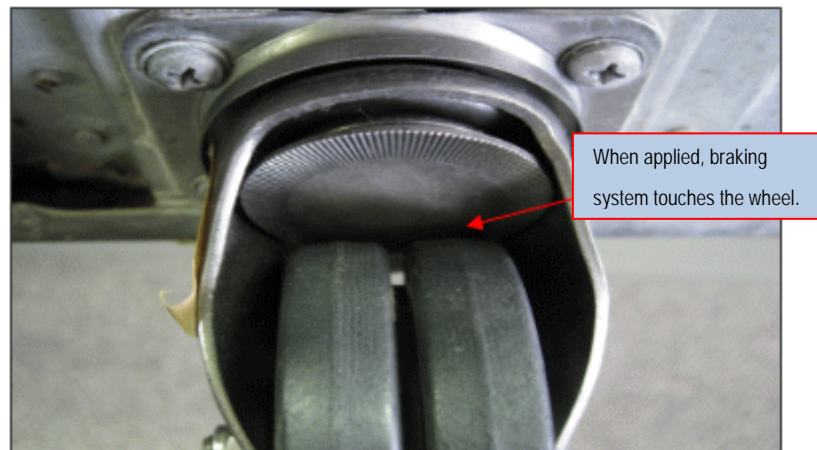
[Fig. 2] Cart of the same type as the lost one

As shown in Fig.3, the cart has its braking systems in the center of the bottom and one pair of brake pedals (red) and brake release pedals (green) on both sides. Brake is applied and released by stepping on either brake or brake release pedal as shown in Fig.4.

<sup>22)</sup> Size:30.4cm(W), 86,28cm(L), 100,96cm(H), Maximum operable weight (tare weight + maximum load weight): 200lb



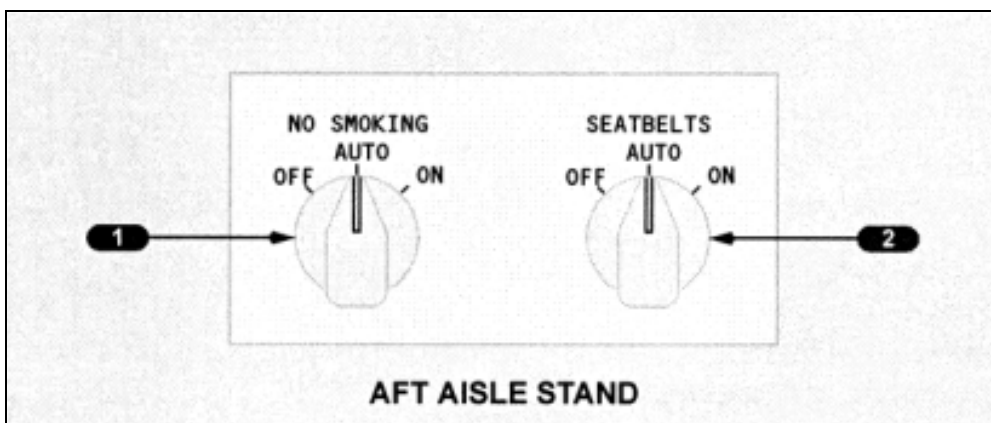
[Fig. 3] Braking system



[Fig. 4] Braking applied

### 1.6.4 Seat Belt Signs

As shown in Fig.5, the seat belt sign switch has OFF, AUTO, and ON positions, and their functions are as follows;



[Fig.5] Seat Belt Signal Selection Switch

- OFF: “FASTEN SEAT BELT and RETURN TO SEAT”. Signs are not illuminated.
- AUTO: “FASTEN SEAT BELT and RETURN TO SEAT”. Signs are illuminated when;
  - Landing gear is not up or not locked, or
  - Flap lever is not in UP position, or
  - Aircraft altitude is below 10,300 ft, or
  - Cabin pressure altitude is above 10,000 ft
- ON: “FASTEN SEAT BELT and RETURN TO SEAT”. Signs are illuminated.

### **1.7 Meteorological Information**

There was no peculiar weather condition that could affect the accident.

### **1.8 Aids to Navigation**

There was no trouble with the aids to navigation that affected this accident.

### **1.9 Communications**

There was no trouble with communications with air traffic control agencies during the Flight.

### **1.10 Aerodrome Information**

There was no trouble with aerodrome information that affected this accident.

### **1.11 Flight Recorders**

#### **1.11.1 Cockpit Voice Recorder**

Flight 950 was equipped with a solid state cockpit voice recorder manufactured by Sundstrand Co. of the U.S.<sup>23)</sup>, which can record up to 120 minutes. However, since 120 minutes has passed with the cockpit voice recorder data not protected, the relevant data were deleted.

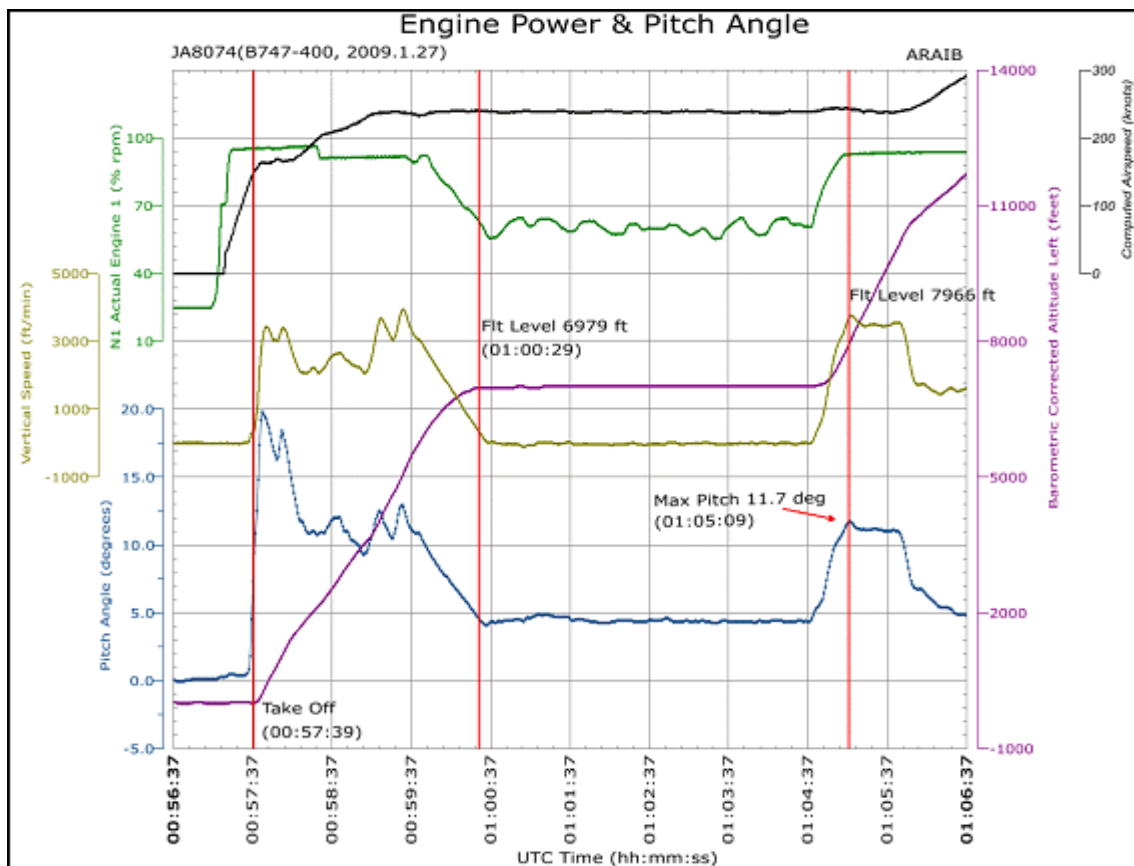
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<sup>23)</sup> Part No.: 980-6022-001, Serial No : 1670

1.11.2 Flight Data Recorder

Flight 950 was equipped with a solid state flight data recorder manufactured by Sundstrand Co.<sup>24)</sup>, which can record at least 25 hours

ARAIB excerpted 333 parameters from the time when Flight 950 took off to the time when it reached 11,000ft, and analyzed necessary parameters to help analyze the flight data.



[Fig. 6] Major parameters of the flight data recorder

As shown in the altitude and pitch parameters in Fig.6, Flight 950 took off at 09:57:39 and reached 7,000 feet at 10:00:29. After maintaining level flight, it started to climb to 23,000ft at 10:04:41 with the pitch up again.

As shown in Fig.7, after Flight 950 started to climb from 7,005 feet, the pitch angle was recorded to be 11.7° at maximum at 10:05:09, N1 at 92.6% RPM, Computed Airspeed at 243 knots, and Vertical Speed at 3,736 feet per minute.

<sup>24)</sup> Part No.: 980-4700-033, Serial No.: 0262

UTC Time (hh:mm:ss)	Alt_Baro (feet)	Pitch Angle (degrees)	CAS (knots)	N1 Actual (% rpm)	Vertical Spe (ft/min)	AP 2 Eng
	7006	4.3	239	60.8	-8	ENGAGE
	7005	4.4	239	60.8	8	ENGAGE
1:04:41	7005	4.6	239	60.9	56	ENGAGE
	7008	4.8	239	62.9	136	ENGAGE
	7014	5.1	240	66	232	ENGAGE
	7023	5.3	239	68.1	328	ENGAGE
1:04:45	7032	5.4	240	69.9	416	ENGAGE
	7040	5.4	240	71.8	504	ENGAGE
	7046	5.6	240	73.5	592	ENGAGE
	7053	5.8	241	75.2	688	ENGAGE
1:04:49	7060	6	242	77.1	824	ENGAGE
	7072	6.4	242	78.5	992	ENGAGE
	7089	6.9	242	79.6	1200	ENGAGE
	7111	7.4	243	80.9	1424	ENGAGE
1:04:53	7138	7.9	243	82.1	1664	ENGAGE
	7168	8.3	243	83.1	1880	ENGAGE
	7202	8.8	244	84.2	2096	ENGAGE
	7239	9.1	243	85.2	2288	ENGAGE
1:04:57	7281	9.6	243	86.2	2480	ENGAGE
	7328	9.8	244	87.1	2640	ENGAGE
	7380	10	244	88.1	2784	ENGAGE
	7437	10.2	244	89	2896	ENGAGE
1:05:01	7494	10.4	244	89.8	2992	ENGAGE
	7552	10.5	243	90.6	3072	ENGAGE
	7608	10.6	242	91.4	3136	ENGAGE
	7663	10.8	243	92	3208	ENGAGE
1:05:05	7718	11	243	92.5	3320	ENGAGE
	7776	11.2	244	92.6	3440	ENGAGE
	7837	11.4	244	92.6	3560	ENGAGE
	7900	11.6	243	92.6	3664	ENGAGE
1:05:09	7966	11.7	243	92.6	3736	ENGAGE

[Fig.7] FDR Parameters

**1.12 Wreckage and Impact Information**

There were no relevant wreckage and impact information to the accident.

**1.13 Medical and Pathological Information**

No medical and pathological factors that affect this accident were found in the flight and cabin attendants.

**1.14 Fire**

There was no fire in this accident.

**1.15 Survival Aspects**



According to the statement of the cabin attendant in charge of the upper deck, she went to the passenger in 19C who complained of pain. The cabin attendant then confirmed that she got burnt, gave her first aid using an ice bag and cold insulation (Hyalon) on her right arm where she had blisters on the affected part.

The senior cabin attendant checked the extent of injury of the passenger, judged that she should be examined by a medical doctor after arrival at Narita International Airport, and reported the situation to the captain. The first officer notified the company about the condition of injured passenger using ACARS<sup>25)</sup>.

The senior cabin attendant handed the injured passenger over to a ground staff after arrival at Narita International Airport, and the ground staff had her diagnosed and treated by a doctor at the Narita International Airport Clinic Center of Japan Medical College in Narita International Airport.

## **1.16 Test and Research**

On 18 November 2009 at 10:00, in the conference room of Corporate Safety Division of Japan Airlines, there was a test confirming the braking capability of the cart in the presence of the ARAIB investigator, JTSB investigator, and related personnel of Japan Airlines and Shouwa Company.

In the test, things were put inside and outside of the same type of cart, weight of the cart was set at 200 lb, and conditions were set similar to the time of the accident. Then the cart was put on a test table with the same type of carpet as the aircraft floor, braking system was applied, and the angle was measured by electronic clinometers when the cart began to slide as the front of the test table was lifted.

This test was conducted three times, and the participants confirmed that "the cart started to slide with the brake not released when an inclination of about 10.7° was given to the test table."

## **1.17 Organization and Management Information**

### **1.17.1 Passenger Signs Operation Procedures**

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<sup>25)</sup> ACARS (ARINC communications addressing and reporting system): a VHF data communications system developed by ARINC, an aviation communications company of America

**1.17.1.1 Operations Manual of Japan Airlines**

Operations Manual 9-3-2 of Japan Airlines specifies that the captain shall turn the seat belt sign on when the aircraft is moving on the ground, taking off or landing, flying in turbulence or when turbulence is anticipated, as shown in Fig. 8.

<p>1. The PIC shall turn the seat belt sign on in the following cases:                  (In case this is inoperative, he shall use other means so that all occupants are informed:)</p> <p>(1) During moving on the ground.</p> <p>(2) During takeoff and landing.                  Note: The PIC shall, in principal, turn on the seat belt sign for landing after notifying 10,000ft to cabin attendants.</p> <p>(3) During flying in turbulent air condition and when turbulence is expected.</p>
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[Fig. 8] Seat Belt Signs

**1.17.1.2 B747 Aircraft Operating Manual of Japan Airlines**

According to the normal procedures of the B747 Aircraft Operating Manual of Japan Airlines, the passenger seat belt switch is to be set at AUTO position when preflight procedures are being carried out, as shown in Fig. 9.

<p>Passenger signs ..... Set</p> <p>NO SMOKING selector - ON</p> <p>SEATBELTS selector - AUTO</p>
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[Fig. 9] Passenger Signs - Preflight Procedures (Japan Airlines)

Also, according to the climb and cruise procedures which are taken when passing 10,000 feet, Japan Airlines does not specify about passenger signs as shown in Fig. 10, although the manual of the Boeing Company specifies to set the passenger signs as needed as shown in Fig.12

Pilot Flying	Pilot Monitoring
	At or above 10,000 feet, set all LANDING light switches to OFF.

[Fig. 10] Passenger sign procedure during climb - Japan Airlines

**1.17.1.3 B 747 Flight Crew Operations Manual – Boeing**

According to the Normal Procedures of Boeing's B747 Flight Crew Operations Manual, the passenger sign switch is to be set at AUTO or ON position when the preflight procedures are taken, as shown in Fig. 11.

Passenger signs ..... Set JA401J - JA8901, JA8903 - JA8905, JA8907, JA8908, JA8910 - JA8922 NO SMOKING selector - AUTO or ON SEATBELTS selector - AUTO or ON
---

[Fig. 11] Passenger Signs - Preflight Procedures – Boeing

According to the climb and cruise procedures which are taken when passing 10,000 feet, the passenger signs are to be set as needed as shown in Fig. 12.

Pilot Flying	Pilot Monitoring
	Above 10,000 feet, position Inboard Landing Light switches OFF.
	Set the passenger signs as needed.

[Fig. 12] Passenger sign procedures during climb – Boeing

**1.17.2 Providing Cart Information to Flight Crew and Cabin Attendants**

According to the data provided by Japan Airlines, no flight crew or cabin attendants were provided with information on the limitations of the cart braking system through training or by a manual before the flight.

## 2. Analysis

### 2.1 General

The flight crew members of Flight 950 held valid certificates of qualification proper to the ICAO<sup>26)</sup> standards and Japan Airlines' conditions of qualification, and took sufficient rest before the flight. Any factors that could affect their duty performance were not found.

The aircraft of Flight 950 had its airworthiness certified in accordance with Japan aviation law, ICAO standards and Japan Airlines' procedures. It was properly maintained and the weight and balance was within the specified limitations.

This analysis was made on the flight operation factors, cabin attendant safety duty, the data of the flight data recorder during climb, the operating system and management status of the cart manufacturing department, and the sharing of information on the cart's brake capability between flight operations and cabin departments.

### 2.2 Flight Operation Factors

According to the preflight procedures of the B747 Aircraft Operating Manual, the aircraft takes off with its seat belt sign switch set at AUTO position and the sign remains on until the aircraft reaches 10,000 feet. Considering the fact that the seat belt sign is automatically turned off when the aircraft reaches 10,000 feet as shown in the manual, it should be regarded as the normal procedure of Japan Airlines' B747 aircraft.

When the captain got a briefing from the dispatcher, he received the information that the weather in the Kanto region of Japan was bad. The captain briefed this to the cabin attendants in the aircraft and checked with the senior cabin attendant of the time needed for in-flight service.

Since all seats were taken and the weather in the vicinity of Narita was bad, the captain judged that there might be a great possibility that the aircraft would be shaken. To secure sufficient time for cabin service, the captain turned the seat belt sign off when the aircraft reached 7,000 feet and leveled off as instructed by ATC which is earlier than usual, and the first officer consented to this.

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<sup>26)</sup> International Civil Aviation Organization

The maximum flying speed regulated for below 10,000 feet is 250 knots, and the aircraft increases the speed to the climb speed<sup>27)</sup> after it passes 10,000 feet. According to the flight data recorder, Flight 950 maintained the speed less than 250 knots below 10,000 feet and started increasing its speed after it had passed 10,000 feet.

When the captain engaged the autopilot for a climb to 23,000 feet as he was instructed by ATC during level flight at 7,000 feet, the engine thrust N1 increased from 60.8% to 92.6%, and the pitch attitude increased up to 11.7°.

Because climb should be made while maintaining the same thrust with flying speed of less than 250 knots below 10,000 feet, the pitch attitude becomes higher. Above 10,000 feet, however, if the aircraft speed was increasing to the climb speed or once the climb speed was reached, a high pitch attitude is not needed for an altitude climb.

Consequently, in the process of climbing to 23,000 feet after a level flight at 7,000 feet, Flight 950 had the pitch attitude lifted so high that it exceeded<sup>28)</sup> the maximum braking capability of the cart and caused the cart to slide.

Such a result was caused by the captain's failure to anticipate that a high pitch attitude occurs when climbing again after maintaining level flight below 10,000 feet. Although he turned the seat belt sign off earlier to secure sufficient service time for the cabin attendants, he was not aware of the fact that the cart for in-flight service was manufactured with braking capability maintainable only up to an 8° pitch.

### **2.3 Cabin Attendant Safety Duty**

There were 22 passengers in the upper deck of Flight 950 with two cabin attendants at work, and the scheduled flight time was 2 hours and 20 minutes. Because the weather of the Kanto region was bad at the time, the captain turned off the seat belt sign earlier than the specified altitude after takeoff in order to secure service time for the cabin attendants.

However, the captain's turning off the seat belt sign at 7,000 feet is a signal for the cabin attendants and the passengers that it is safe to move around in the cabin. The cabin attendants, therefore, switched from safety duty to service duty as usual based on this signal.

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<sup>27)</sup> For Japan Airlines: less speed of 340 knots or mach .84

<sup>28)</sup> Specification of Japan Airlines technical standard: 8° angle inclination, the test result of measuring the braking ability 10.7° angle of inclination

The upper deck cabin attendants felt the seat belt sign was turned off earlier than usual but they started meal service preparation for passengers according to the procedures and brought the cart to row 16 before 10:04:41.

The cabin attendants were away from the cart for their duties after applying the brake system, but judging that the cart would be safe with its applied brake system they did not take any action to prepare for the cart sliding.

According to the recording of the flight data recorder, the maximum aircraft pitch at the time of level flight at 7,000 feet was 4.8°, so the cart did not move at the fixed position. After the cart exceeded the sustainable climbing angle of 8° with the climb of altitude, however, it is assumed that the cart started to slide.

Unlike on the ground, because the aircraft is not always in a level flight even at the cruising altitude, the cabin attendants must always bear in mind that the cart could slide. In anticipation of an unexpected encounter of turbulence and a sudden change of aircraft attitude, it seems necessary that at least one attendant should watch the cart.

The regulation in the Cabin Attendant Safety Manual<sup>29)</sup> provided by Japan Airlines is regarding the cabin attendant's leaving the cart during service when anticipating turbulence. Since it does not mention cabin attendant's leaving the cart during service in normal flight, it is deemed that there should be a regulation for this situation.

## 2.4 Cart Operating System

Total of 10 departments share the management of the cart in Japan Airlines. These departments determine and make basic specification of the cart, and publish and amend manuals related to the cart. They also select the manufacturer, order production, receive delivered carts, and inspect their functions. The departments inspect the quality of repair consignments, take inventory and carry out periodical inspection (including the management on expiration).

Showa Company manufactured carts from 1981 to 1998 and supplied them to Japan Airlines. At present, however, the production is suspended and only the departments of troubleshooting and repair for after-sales service for the supplied carts remain.

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<sup>29)</sup> Cabin Attendant Safety Manual(Turbulence): Chapter 2-26

The cart involved in the accident was a product manufactured according to the specifications<sup>30)</sup> requested by Japan Airlines and the TSO (Technical Standard Order) of Japan Civil Aviation Bureau.

Because the cart used on the aircraft was not managed by serial number, Japan Airlines could not retrieve the cart that was collected by an employee at Narita Airport. Wheels and brakes of the cart thus could not be checked if they were in normal condition. Its satisfaction to the product specifications required by Japan Airlines, however, was confirmed through the brake performance test on the cart of the same kind conducted jointly by the ARAIB and JTSB.

According to the Showa Company's monthly report of maintenance in October 2009, the number of brake malfunction repair and exchange of electric heat cart was 317 with their wheel change 751, and brake malfunction repair and exchange of non-electric heat cart was 35 with their wheel change 174.

Accordingly, although most of the Shouwa Company carts owned by Japan Airlines were used for more than 10 years since its production, it is judged that production specifications are maintained continuously, and safety management is carried out properly.

According to Appendix 2 of the Cabin Service Device Management Manual<sup>31)</sup>, it is necessary to set regulations and cautions in the Cabin Attendant Manual<sup>32)</sup> regarding operating the cart as it is one of the cabin equipments. Because the Cabin Attendant Safety Manual<sup>33)</sup> provided by Japan Airlines does not specify it, it is judged that complement is necessary.

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<sup>30)</sup> Based on Japan Airlines Specification(S-205) Paragraph 3-13-10

<sup>31)</sup> The Cabin Service Device Management Manual: a manual for management of devices provided by Japan Airlines for passenger service

<sup>32)</sup> Cabin Attendant Manual(CAM): a manual for cabin attendants

<sup>33)</sup> Cabin Attendant Safety Manual (Safety Confirmation before Takeoff/Landing): Chapter 2-20

### 3. Conclusions

On the basis of factual information and the analysis of the Flight 950 accident, the ARAIB developed findings<sup>34)</sup> in three categories including probable causes<sup>35)</sup>, risk<sup>36)</sup>, and other findings<sup>37)</sup>.

#### 3.1 Findings related to probable causes

Flight 950 maintained level flight at 7,000 after takeoff, and as it started climbing again the pitch attitude was lifted to a climbing angle exceeding the braking capability of the cart during in-flight service. Consequently, the cart slid and hit a seat when the hot water on the cart spilt over the passenger in the seat.

#### 3.2 Findings related to risk

1. The flight crew members were not aware that a pitch attitude would exceed the braking capability of the in-flight service cart when the aircraft climbed again after maintaining level flight at 7,000 feet.

2. When the in-flight service cart slid, both of cabin attendants in charge were away from the cart.

3. The departments in charge of production/management of the carts for in-flight service did not provide the departments of flight operations and cabin with information on the operational limitations of the carts.

4. Hot beverages were set on the top of the in-flight service cart.

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<sup>34)</sup> **Findings** are a key part of this report and are published solely to identify safety deficiencies and risk for the prevention of future accidents. Any use of the findings to assign blame or liability would be a violation of international aviation law and international best practices, including those contained in Annex 13, Chapter 3, Paragraph 3.1, and Chapter 5, Paragraph 5.4.1, to the Convention on International Civil Aviation.

<sup>35)</sup> **Findings related to probable causes** identify elements that have been shown to have operated in the incident, or almost certainly operated in this incident. These findings are associated with unsafe acts, unsafe conditions or safety deficiencies associated with safety significant event that played a major role in the circumstances leading to this incident.

<sup>36)</sup> **Findings related to risk** identify elements of risk that have the potential to degrade aviation safety. Some of the findings in this category identify unsafe acts, unsafe conditions, and safety deficiencies, including organizational and systematic risks that have the potential to degrade aviation safety; however, they cannot be clearly shown to have operated in the incident. Further, some of the findings in this category identify risks that are unrelated to this incident, but nonetheless were safety deficiencies that may warrant future safety actions.

<sup>37)</sup> **Other findings** identify elements that have the potential to enhance aviation safety, resolve an issue of controversy, or clarify an issue of unresolved ambiguity. Some of these findings are of general interest and are not necessary analytical, but are often included in the ICAO format of accident reports for informational, safety awareness, education, and improvement purposes.



### 3.3 Others Findings

1. The flight crew members of Flight 950 held certificates of qualification proper to the relevant flight and were not assigned with excessive work load or flight.

2. The aircraft of Flight 950 held valid airworthiness certificate and operational limit designation, took off with proper fuel loaded and was within the limitations of weight and balance.

3. Turbulence was not encountered at the time of this accident.

4. Because B747 of Japan Airlines takes off with the seat belt sign switch set at AUTO position, the seat belt sign is to be turned off automatically when the aircraft climbs above 10,000 feet.

5. The captain of Flight 950 turned off the seat belt sign after reaching 7,000 feet level flight to secure sufficient time for cabin service.

6. The brake system of the cart was applied when the upper deck cabin attendants were away from the cart.

7. The Cabin Attendant Safety Manual and Cabin Service Manual did not specify a standard about leaving the cart during service.

8. When the in-flight service carts were manufactured, the brake capability specification was 8°, and it was maintained up to 10.7° in the actual test.

#### **4. Safety Recommendations**

On the basis of the findings from investigation of the Flight 950 accident which occurred about four miles east of Anyang VOR on 27 January 2009, the ARAIB issues the following safety recommendations.

##### **To Japan Airlines**

1. Reflect on the related guidance material about the possibility of pitch attitude exceeding the braking capability of the cart for in-flight service when climbing again after maintaining level flight below 10,000 feet, and inform flight crew members about this (AAR-F0901-1)
2. Establish a standard about cabin attendant's leaving the cart (AAR-F0901-2)
3. After takeoff, refrain from in-flight cabin service using service cart in critical phase of flight during climb (AAR-F0901-3)
4. Devise a scheme for serving hot beverage safely in the cabin (AAR-F0901-4)