Executive Summary

31 minutes after taking off from Taiwan's CKS International Airport at 0746[Note] local time on May 8, 2000, and during cruising level flight and heading for Ho-chiming City, Vietnam, the first officer of China Airlines' flight CI681, an A300-600R with registered number B-18503 and carrying 265 passengers found out that the captain had suddenly showed no response to the flight. Following the incapacitation procedures, the first officer called the cabin chief flight attendant and a flight attendant to help him to move the captain to the main cabin (galley) to do the first aid. At the same time, through the passenger address system the cabin chief announced for the help of a doctor on board, if any.

Then the first officer decided to turn back to CKS International Airport. Eventually, the aircraft landed safely via autopilot system on Runway 05-Left. At 0816, before landing, a request was issued for ambulance and towing vehicle to stand by. The aircraft landed at 0850 and stopped on the taxiway at 0852. As China Airlines allows no first officer taxi, the aircraft waited to be towed to the parking bay. After towing to the parking bay, medical personnel embarked the aircraft to carry out first aid. At 0936, the captain was carried to Mingsheng Hospital in Tao Yuan County. After unsuccessful operations, the captain was announced dead at 1020 in that hospital.

This flight crewmember incapacitation incident was rated as a serious incident and was then investigated by the Aviation Safety Council (ASC), the Executive Yuan. After the acknowledgement of the incident, ASC dispatched his investigators, as stipulated in Art. 84 of the Civil Aviation Law, to both CKS International Airport and China Airlines for investigations that included interview to associated personnel, examination to the captain's personal flight bag and the read out of Cockpit Voice Recorder (CVR) of the aircraft.

Note: All times indicated in this report are Taiwan time (Taiwan Time = GMT + 8).

At ASC, an investigation team was then established as stated by "The Regulation of Accident and Serious Incident Investigation Procedures ". An investigation was focused on potential causes to the captain's incapacitation and the emergency responses of the ground to the incident. After the investigation, ASC had the findings, probable causes and recommendations as below：

Findings

1. The captain held a physical certificate and a certificate of the aircraft rating issued by Civil Aeronautics Administration (CAA). The physical certificate showed no specific restrictions or any record of waiver. (1.5.1)
2. According to the data of his heavy weight, age, hyper lipidemia and smoking habit in his physical examination record, the pilot was grouping to a high potential cardiac patient. (1.13.3,1.13.4)
3. The incapacitated pilot made no remarkable improvement to the suggestions of the physical examination doctors. (1.13.3).
4. There was no pilot's medical history dated before his coming to work in Taiwan.
5. The track cardiograph of the pilot physical examination record showed no symptoms of myocardial infarct. The Aviation Medical Center did not have to conduct the follow-ups in accordance with the Procedures of Physical Examination of CAA. (1.13.5,2.2.6)
6. The pilot's working hours, flying hours, and Rest time were totally in accordance with CAA laws. The flight crew who flew with the said pilot in one or two days before the incident said that he did not exhibit any irregularity at work. (1.5.2)
7. The medication the captain carried with him showed no toxic ingredients or any cardiac-healing medicaments. (2.1.1)
8. The cause of death of the pilot was coronary artery occlusion, i.e., a natural death. (2.1.2)
9. The first officer conducted the flight with autopilot. The weather of the day was fair and the aircraft was in airworthiness condition. Before the incident, no flight crew had extra workload and the captain was under regular pressure of work. (1.1,1.6.2)
10. When the pilot incapacitation happened, the first officer proceeded with the airlines' incapacitation procedures and landed the aircraft safely with auto-land system at CKS International Airport. However, the first officer failed to use emergency phraseology to report the serious incident. (1.1,1.15.2,1.15.6)
11. As the captain experienced the incapacitation, the flight attendants that entered into the cockpit had good cooperation with one another and kept performing cardiopulmonary resuscitation (CPR) to the captain. (1.15.3)
12. The doctor on board performed first aid to the captain and found that the captain had incontinence of urine, mydriasis, no heartbeat and pulse reaction. (1.15.3)

13. The CKS International Airport provided medical personnel and facilities and maintained a medical cooperative contract with MinShen Hospital. The CKS Airport also provided procedures for seriously ill passengers to quickly pass the immigration. However, there were no medical treatment operation procedures established in CKS Airport. (1.13)
14. In the "Civil Aircraft Accident Procedure Highlights" of the CKS International Airport, it stipulated that medical service in airport was the responsibility of the contracted Mingsheng Hospital. However, the said Highlights failed to describe the duties and detailed procedures of the medical service team. (1.13,2.3.10.1)
15. . The air traffic controllers at Taipei Area Control Center failed to understand the message of incapacitation sent by the first officer of the aircraft. They relayed a wrong message of a seriously ill passenger to the airport authority. Again, the first officer made requests twice to land on Runway 05-Left, however, the air traffic controllers answered runway in use 06. It was observed that the air traffic controllers failed to comprehend the message sent by the first officer and that severely affecting the following emergency operations on ground. (1.15.6, 2.4.1,2.4.5)
16. The airport authority failed to offer the nearest parking bay available for the emergency response servicing. (2.4.7)
17. CAL's Asian Dispatch Center personnel failed to fully communicate with the first officer and keep close contact with the CKS International Airport authority. CAL's Asian Dispatch Center personnel failed to response properly for saving the time to comply the request of the officer to call towing vehicles to stand by the runway. It made the aircraft wait for towing vehicles for as long as 9 minutes (0852-0901) on the runway. (1.15.6, 1.15.6.1, 2.4.3, 2.4.4)
18. The commanding vehicle at the scene had no two-way radio for communications with the aircraft that made it impossible to know immediately of those emergency responses such as that the first officer was not authorized to taxi, the condition of the sick person and the intention of the aircraft commander. (1.15.6.2,2.3.8)
19. CKS Airport had the “Implementation Highlights of CKS Airport Accident and Incident Handling Procedure”, the “Civil Aviation Accident Notification Procedures,” the “CKS Airport Transit Procedure for Emergency Sick Passengers,” and the” Firefighting Operation Handbook”. However, there was no such “ Full Emergency Operation Procedures” as recommended by International Civil Aviation Organization. (1.18.1,2.4.3,2.4.6)

20. The aircraft landed and came to a completely stop at 0852. The incapacitated pilot was carried to the ambulance at 0936. The whole emergency process took 44 minutes. (2.3.4,2.3.10.1)

Probable Causes

The pilot's natural death was caused by heart rhythm disorder that was triggered by acute cardiac artery occlusion.

Contributing Factors

1. There were no follow-up actions to further remind the pilot who belonged to the high-risk coronary disease group.
2. According to the pilot's physical examination records, the pilot made no signs of substantial improvements to his health.

Recommendations

To China Airlines

1. To require the pilots to make substantial progress to the suggestions from their medical examination doctors (ASC-ASR-00-12-011).
2. To refer to the FRAMINGHAM HEART STUDY and other systems in evaluating whether the pilot belongs to a high-risk group of potential victims of cardiovascular diseases and in making recommendations on how to maintain good health. (ASC-ASR-00-12-012).
3. When hiring new pilots, the airlines should request for their recent medical histories for the aviation medical examiner's reference and follow-up. (ASC-ASR-00-12-013).
4. In case of emergency, the standard phraseology should be used in the communication between pilot, air traffic controller or relevant personnel. (ASC-ASR-00-12-014).
5. To enhance the ground personnel's emergency response training and communication with the airport authorities. (ASC-ASR-00-12-015).

To Civil Aeronautics Administration, Ministry of Transportation and Communications

1. To require the physical examination agencies to provide follow-up and controlling regulations over the high risky pilots suffering potential cardiac diseases. (ASC-ASR-00-12-016).

2. To require the airlines or contracted aviation medical agencies to establish the follow-up system to the suggestions of physical examiners. (ASC-ASR-00-12-017).
3. To improve the training of Air Traffic Controller in communication and message understanding during emergency. (ASC-ASR-00-12-018).
4. To refer to the methods and procedures for emergency responses of international standard and international airports to review exhaustively the emergency response plans and procedures used presently by our airports. In addition, to establish guidelines, providing them to every airport in order to modify their emergency response plans and procedures. (ASC-ASR-00-12-019).
5. To improve the emergency response operational plan, procedure, and the training of personnel in and out of the accident site in emergency medical treatment. (ASC-ASR-00-12-020).
6. To establish the cable and radio communication equipments as well as the operation procedure for the communication between the site commander and the flight crew. (ASC-ASR-00-12-021).

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Abbreviations

ACARS	ARINC Communications Addressing and Reporting System	航機通報系統
ALT	Altitude	氣壓高度
CAA	Civil Aeronautics Administration	交通部民用航空局
CAS	Calibrated Air Speed	修正空速
CM1	Crew Member 1	第一正駕駛
CPR	Cardio Pulmonary Resuscitation	心肺復甦術
CVR	Cockpit Voice Recorder	座艙語音記錄器
EMT	Emergency Medical Technicians	緊急醫療技術人員
FAA	Federal Aviation Administration	美國聯邦航空總署
FDR	Flight Data Recorder	飛航資料記錄器
FOM	Flight Operation Manual	航務手冊
GSPD	Ground Speed	地速
ICAO	International Civil Aviation Organization	國際民航組織
MHD	Magnetic Heading	磁航向
QAR	Quick Access Recorder	快速存取記錄器
VHF	Very High Frequency	特高頻

Chapter 1 Factual Information

1.1 History of Flight

When cruising at 31,000 feet after taking off at 0746[Note] local time on May 8, 2000, with destination of Ho-Chi-Minh City, Vietnam, the first officer of China Airlines' flight CI681, an A300-600R with No. B-18503, who was on control of the flight, found out that the captain, who had just finished a passenger address when the aircraft was turning from PARPA to KAPLI at 0815, was not right and showed no response to the first officer's two calls. The first officer then carried out the procedures of crewmember incapacitation and asked the chief flight attendant to reach the cockpit. Once in the cockpit, the chief flight attendant tried to wake up the captain and patted his face. Without having any response from the captain, another flight attendant was asked in with an oxygen cylinder to help remove the captain from his seat onto the forward galley floor. At the same time, a passenger address was made by the cabin crew to ask for a doctor on board to provide assistance. The first officer then made the decision of turning back to Taipei CKS Airport. With the help of the volunteered doctor on board, the flight attendants kept on performing CPR to the captain.

At 0816, the first officer advised Taipei Regional Control Center of the captain's incapacitation, though he failed to use "emergency" terms. At 0821, the first officer then advised Asian Dispatch Center of Joint Control, China Airlines and asked towing vehicle and ambulance to stand by.

At 0831, during the turning back, the first officer made a request to the air traffic controllers for first priority. During the approach, the air traffic controllers assigned the aircraft to use Runway 06 for the aircraft had been assigned to park at the south-parking bay. After making anther request by the first officer, the Runway 05 Left was assigned to the CI681. At 0850, the first officer landed the aircraft on Runway 05 Left on autopilot and then stopped at N7 taxiway and was waiting for towing vehicles to bay 608. Before landing of the aircraft, airport ambulances, doctors and nurses from the contracted hospital were already standing by at parking bay 608.

The towing vehicle arrived at 0901. At 0904 it began towing the aircraft eastward by passing through the taxiway to arrive the parking bay 608 at 0920. The contracted physicians and first-aid personnel embarked the aircraft to carry out the rescue effort. At 0938 the captain was carried on board of the ambulance and at 0947 reached MinShen Hospital, Tao Yuan. At 1020, the captain was announced dead in that hospital.

The incident, from the first officer's first notice at 0816 to the Taipei Regional Control Center regarding the captain's incapacitation to the aircraft's landing on Runway 05L and stopping later on the taxiway at 0852, lasted 36 minutes.

The towing began at 0852 and reached the parking bay 608 at 0920, lasted 28 minutes.

The captain was moved onboard of the ambulance at 0936, 44 minutes after the aircraft stopped on the taxiway （at 0852）.

1.2 Injuries to Persons

Casualty	Pilot	Flight attendant	Passenger	Others	Total
Death	1	0	0	0	1
Serious injury	0	0	0	0	0
Minor injury	0	0	0	0	0
No injury	1	12	265	0	278
Total	2	12	265	0	279

1.3 Damage to Aircraft

The aircraft suffered no damage.

1.4 Other damage

There are no other damages.

1.5 Personnel information

1.5.1 Basic information

Description	Captain	First officer
Sex	Male	Male
Age (years old)	45	27
Date of admission to CAL	Feb. 15, 1998	Aug. 18, 1998
License/expiration	Foreign temporary license /Jan. 31, 2001	Commercial aircraft pilot issued by CAA
	Captain certificate for A300-600R /March 13, 2001	Co-pilot certificate for A300-600R /June 18, 2001
	FAA certificate /Apr. 30, 2003	FAA certificate /July 31, 2004
	Class A pilot physical examination certificate /May 31, 2000	Class A pilot physical examination certificate /Aug. 31, 2000

Total flying hours	10559	821
Flying hours in last 90 days	172	154
Flying hours in last 60 days	143	108
Flying hours in last 30 days	95	70
Total flying hours for said model of aircraft	1375	412
Time after last flight	16 hours	44 hours

1.5.2 Crewmembers' daily life in 72 hours prior to the flight

1.5.2.1 Captain

The captain was not on duty on May 5. On May 6, he had a flight from Taipei to Hong Kong and continued from Hong Kong to Kuala Lumpur. On May 7, he flew from Kuala Lumpur to Hong Kong and then from Hong Kong to Taipei.

1.5.2.2 First officer

On May 5, the first officer had a flight from Taipei to Kaohsiung and continued to Hong Kong. On May 6, he flew from Kaohsiung to Taipei and was off on May 7.

1.6 Aircraft information

1.6.1 Aircraft's basic information

Aircraft information					
1	Aircraft No.	B-18503	2	Date of manufacture	Sep. 9, 1998
3	Registration No.	87-713	4	Service hours	4560:14
5	Airworthiness Certificate No.	88-09-116	6	Expiration of Airworthiness Certificate	Sep. 10, 1999 - Aug 31, 2000
7	Date of last shop check	Dec 27, 1999	8	Service hours since last shop check	1047:52
9	Date of last weekly check	May 02, 2000	10	Type of last weekly check	C Check

1.6.2 Airworthiness & maintenance

Both the maintenance and airworthiness of this aircraft meet the requirements of the Civil Aviation Law.

1.6.3 Weight and balance

The Weight and Balance Manifest - load sheet of the aircraft indicated that scheduled landing weight of the aircraft upon arrival at its original destination was 298,684 lbs and the specific gravity was at 25.9 % MAC c.g.

Due to the almost immediate return after its takeoff, the mean landing weight of the aircraft at CKS International airport was 330,353 lbs, exceeding 308,648 lbs., the rated maximum landing weight. Once on ground, the mechanics proceeded with the "Overweight Landing" inspection as suggested by the maintenance manual and found no irregularities. The aircraft was signed and returned to service.

1.7 Meteorological information

Prevailed by a split high pressure over Taiwan, the day was fine yet cloudy. The meteorological information recorded in CKS International Airport at 0800 was as follows: Wind direction 080^{o}, wind speed 14 knots, visibility over 10 km, few clouds at 1,200 feet, few clouds13,000 feet, scatter 20,000 feet, temperature 25°C, dew point 19°C and altimeter setting 1011pa.

1.8 Aids to Navigation

The day of the incident, the navigation aid and guidance facilities on Runway 05 Left at the CKS International Airport were normal.

1.9 Communications

On the day of the incident, the condition of the communication between the aircraft to Taipei Regional Control Center, CKS Approach, and the tower were normal. The condition of the communications between the aircraft and the airline's ground unit, the Asian Dispatch Center, was normal as well.

The cockpit voice recorder (CVR) transcript was shown as Attachment 1. The communication transcript between CKS ground control in tower/fire station/CKS Flight Operations Section Command/ambulance Radio (Freq.459.2MHz) was shown at Attachment 2. Communication transcript between CI681 aircraft/CKS tower/CKS ground radio (Freq.125.1/118.7/121.9MHz) was shown as Attachment 3. The Telephone transcript between the tower and the Flight Operations Section was shown as Attachment 4 and Telephone transcript among Taipei Regional Control Center/CKS Approach Station/CKS Tower/Airport Flight Operations Section was shown at Attachment 5. The ATC transcript showed the first officer asked Taipei Regional Control Center to contact CKS Airport for ground support. For contacts between CKS airport and relevant agencies, there were either exclusive frequencies,

or direct telephones. The communications between CKS Airport and the related agencies was shown in Fig. 1.9-1.

Fig. 1.9-1 Contacts between CKS Airport and all agencies

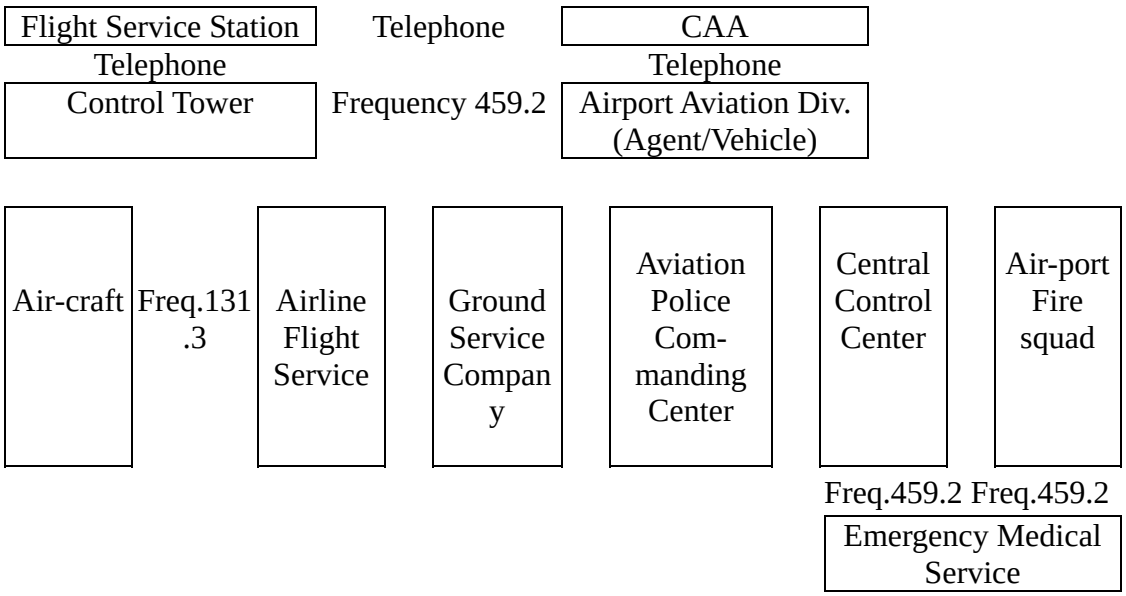

Fig. 1.9-1 Contacts between CKS Airport and all agencies

1.10 Aerodrome Information

The elevation of the CKS Airport was 107 feet and the end of Runway 05 Left was 73 feet. Runway 05 Left was 12,008 feet in length (3660 meters). The cement runway was heading at 053° and was dry with no rain.

Runway 05 Left was the only runway available for auto landing at CKS Airport.

All accidents in airport would notify the Flight Operations Section first. In case of any injury at the airport, the Flight Operations Section should then advise the fire fighting squad or the MinShen Hospital, the contracted medical treatment agency with the airport authority

1.11 Flight Recorder (FDR)

1.11.1 Cockpit Voice Recorder (CVR)

The solid-state Cockpit Voice Recorder was a FAIRCHILD A200S model, with Part No. S200-0012-00 and Serial No. 01566. The voice data lasted 120 minutes and

covered from aircraft engine start, taxi until its safe landing and connection to the towing vehicle. The transcript in association with this incident was provided as Attachment 1. The transcript covered: Regional Control Center's instructions to guide the aircraft to fly toward Hsikang (08:00:18) until the aircraft's landing and towing by the towing vehicle to Parking bay 608. (Recorder stops at 09:05:40)

1.11.2 Flight Data Recorder

The solid-type Flight Data Recorder was a FAIRCHILD F1000, with Part No. S800-2000-00 and Serial No. 02008. The total flight data covered 61 hours, 5 minutes and 48 seconds. Of all the decoded key parameters, 9 (ALT, CAS, GSPD, HEADING, LAT POSITION, LONG. POSITION, NOSE WHELL POSITION, PITCH and ROLL) were compared with the data in QAR. The results turned out to be identical, as shown in Fig. 1.11.2-1.

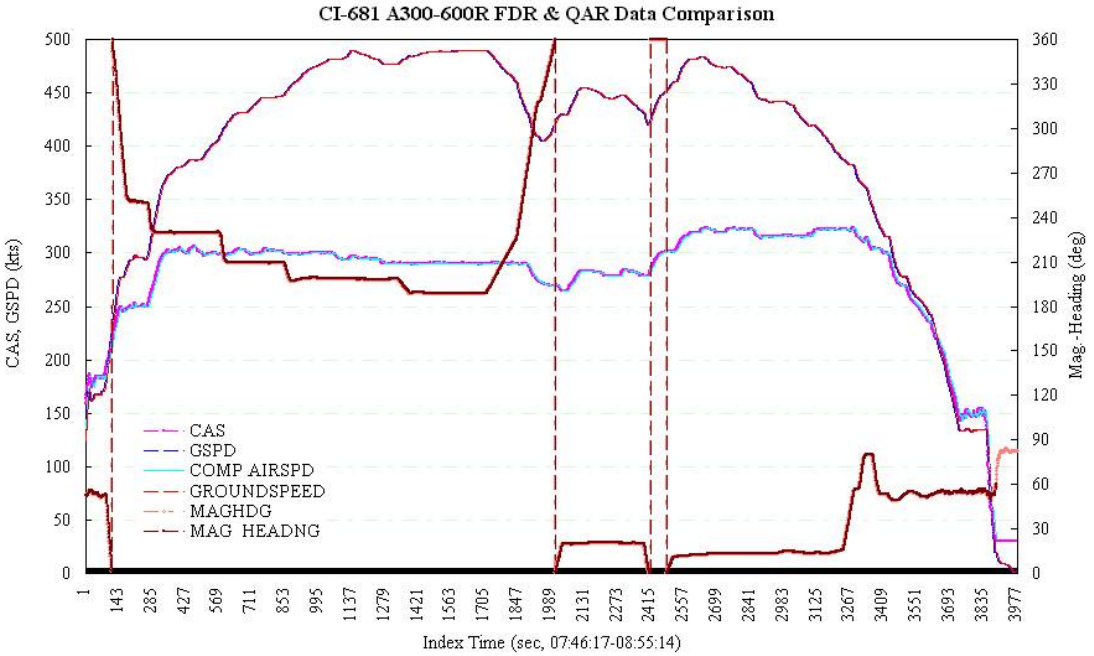

Fig. 1.11.2-1 FDR and QAR air speed, ground speed and heading angle

1.11.3 Quick Access Recorder (QAR)

The magnetic tape QAR had 258 flight parameters. With the assistance of CAL's Flight Safety Division, the QAR were decoded.

After decoding QAR, we had the following information:

- **Aircraft's takeoff time:** 07:46:17 (CAS=171 KTS; MHD= 52 DEG; CG%=26.2%) from CKS' Runway 5.
- **Aircraft's landing time:** 08:50:14 (CAS=145 KTS; MHD= 55 DEG; CG%=26.2%，Vertical g:1.12) at CKS' Runway 5L.
- **Aircraft's stop time:** 08:52:06 (CAS=30 KTS; GSPD= 0 KTS).
- **Aircraft's return position and time:** After passing over Hsikang, Tainan, the aircraft flew southward along A577. Its return began at 37.5Kms southwest of Kaohsiung and crossed G581 Air Way. Finally, the aircraft took the original departing route to return back to CKS International Airport. At 08:17:40, the aircraft reached its maximum distance from CKS Airport, 74kms southwest Kaohsiung and its altitude of 31,000 feet.

1.12 Wreckage and Impact Information

Not applicable.

1.13 Medical and Pathological Information

1.13.1 Medical care

Except the physical examination data, the captain's medical record filed in the Aviation Medical Center, CAA showed no records of medical treatment and services. The physical examination data included the re-check records of excessive leukocytes, cardiogram and X-ray.

1.13.2 Leukocytes

Excessive leukocytes had been detected in each of physical examinations. Only when the number of leukocytes in re-checks dropped to 10,000 or below, the captain passed the examinations.

1.13.3 The total cholesterol

In each of the physical examinations, the captain's total cholesterol exceeded the standard level of 122-200 mg/dl. The aviation medial doctor did not ask the captain to recheck due to his low data of high-density cholesterol. The physical examination doctor suggested the captain to do more exercise and to be careful to have a diet.

The following data showed the total cholesterol and leukocytes of the captain as recorded between Nov. 27, 1997 and Nov. 25, 1999 and the doctor's suggestions:

Examination date	Leukocyte	Total cholesterol	High-density cholesterol	Ratio	Finding		Doctor's suggestions
					Leukocyte	Blood fat	
Nov. 27, 1997	14,400	233	34	6.8	Too high	——	Recheck Leukocyte
Recheck Dec.04, 1997	9,200						
May 8, 1999	13,500	240	33	7.3	Too high	——	Recheck Leukocyte
Recheck May 21, 1998	10,000						
Nov. 6, 1998	14,500	233	30	7.7	Too high	——	Irregular leukocyte counts. Liver function ALT. Recheck late Dec. 1-month certificate
Recheck Dec. 22, 1998	12,400						Leukocytes remain high in recheck. Recheck in blood outpatients for tracking. Quit smoking
Recheck Feb. 12, 1999	14,400						No immediate cause to excessive leukocyte. Recheck in blood outpatient service for determination.
Recheck Apr. 14, 1999	9,800						
May 18, 1999	10,000	218	33	6.6	——	Low cholest-erol of high density	Appropriate exercises, quit smoking
Nov. 8, 1999	12,400	239	43	5.5	Excessive	——	Self-declared periodontitis, excessive cholesterol, irregular liver function and requests for checks by dentist. Blood and liver shall also be checked. Eat only low-fat, low-sugar and no fried food.
Recheck Nov. 25, 1999	10,000						Periodontitis checks showed normal blood, normal liver function, no hepatitis type B or AIDS. Certificate issued. Requires tracking.
Joint diagnosis with dentist Nov. 25, 1999							No acute periodontal inflammation. Requires tracking.

1.13.4 Physical conditions

The incapacitated captain who was a husky male of 40-50 years old； had excessive high total cholesterol； was a smoker and categorized to be in the high risk potential cardiac diseases group (Attachment 18). In his flight suitcase, the captain carried a number of medicaments, though there was nothing in association with cardiac heal or health care.

1.13.5 Cardiogram data

The 3 dynamite cardiogram data of the captain showed no abnormal record of the heart. The results of the 3 checks are given in Attachment 6.

1.13.6 Medical operations at CKS International Airport

CKS International Airport had its own medical team and facilities, though there is no first-aid procedure available.

In pursuance of Organic Regulations of Institutional Air Stations of Civil Aeronautics Administration under the Ministry of Transportation and Communications, CKS Airport is to have 2 doctors and 3 nurses. CKS Flight Operations Section has 3 nurses at this time. In Art. 13 of the Operational By-law of Institutional Air Stations of Civil Aeronautics Administration under the Ministry of Transportation and Communications, ”Subject to the commanding and supervision of Aviation Chief, the doctors treating patients shall have the following duties: 1. First aid or transfer of injured personnel or patients requiring emergency services. 2. Planning, ordering, safeguarding and use of medical materials and medicaments.”

Having a contract with CKS Airport, Mingsheng Hospital, Tao Yuan maintained one doctor and one nurse at the airport's clinic to carry out preliminary checks, bandaging and first treatment in case of accident and serious incident.

There were one airport nurse; one doctor and one nurse of Mingsheng Hospital to organize the emergency medical team on that day.

See 1.15, Survival Factors for the emergency medical treatment preceded that day.

1.14 Fire

Not applicable.

1.15 Survival Aspects

1.15.1 Captain's Incapacitation

The aircraft controlled by the first officer (Pilot Flying, PF) took off at 0746 from CKS International Airport to undergo a normal flight. During cruising flight, the first officer gave his welcome announcement via passenger address in Chinese. At 0808 the captain made his English-language announcement and at 0813 chatted with the first officer. At 0815, when the aircraft was approaching PARPA INTX and ready to make a right turn to KAPLI, the first officer found that the captain was not concentrating at the maneuvering of the aircraft and was breathing deeply； his right cheek slightly shaking； his body tilting leftward and the face slightly up； his eyes under the sunglasses slightly open and not responsive at all to the questions of the first officer.

1.15.2 Crewmembers' Incapacitation Procedure

The first officer immediately executed the crewmember incapacitation procedures of Flight Operation Manual (FOM) and called the chief flight attendant to the cockpit for assisting. The chief flight attendant checked the captain's condition by padding his cheeks twice and found the captain still no response. The chief flight attendant then requested the flight attendant in main-cabin take the oxygen cylinder for first aid. After 5 to 10 seconds, the captain was not breathing. During that time the chief flight attendant let the flight attendant make a passenger announcement if there were any doctor on board and asked the Z1 flight attendant be seated in the captain's seat and share some of the first officer's work. At the same time, the first officer made sure of the captain's incapacitation and decided to turn back to CKS International Airport.

1.15.3 On-board first aid

A volunteered doctor on board was led into the cockpit by a flight attendant to check the captain's condition. The preliminary check determined that the captain showed no heartbeat, breath and developed in continentia urine and mydriasis.

At about 0820, instructed by the doctor, the chief flight attendant and a flight attendant moved the captain to the forward galley (G1)(See Fig. 1.15.3-1 Main cabin and flight attendants' allocation) to conduct CPR. During the rescue, the doctor was trying to open the captain's throat and trachea to let the air into the lungs, to remove the vomit and asked for cardiac pads, laryngoscope, oxygen tubes and phlegm

extractor, cardiac pads to resuscitate the heart beat again. The flight attendant said that there was no laryngoscope, oxygen tubes or phlegm extractor.

While the chief flight attendant kept on doing the chest massage of CPR, the doctor on board gave instructions on artificial respiration and, with the help of a flight attendant (4L) who was a registered nurse and kept on checking the captain's pulse, breathing and pupils. After 20 minutes of CPR, the captain did throw dark-gray vomit.

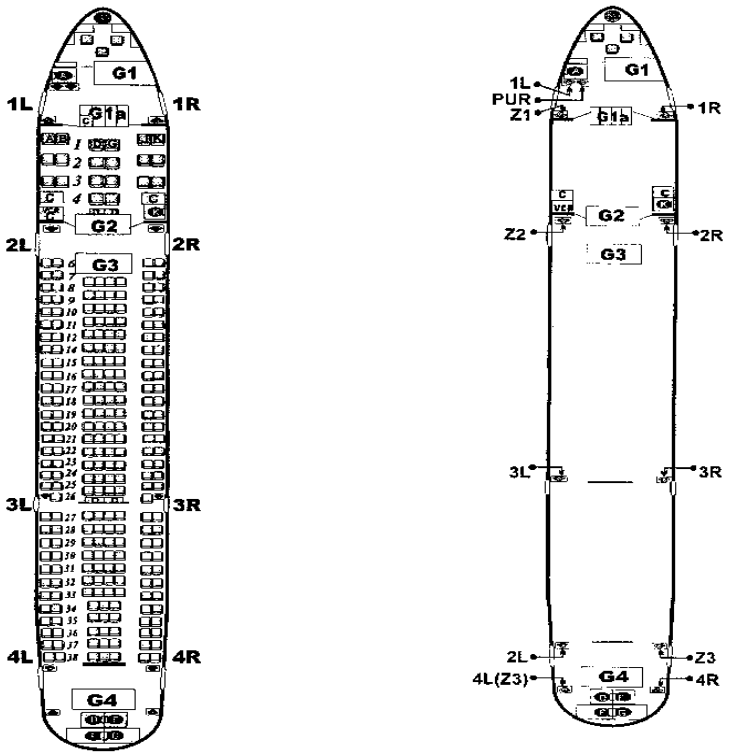

Figure 1.15.3-1 Main cabin and flight attendants' allocation

The on-board emergency effort continued the CPR from 0825 to 0925, and then the task was taken over by the MinShen Hospital medical team, CKS Airport.

The doctor on board let MinShen Hospital medical team take over the first-aid effort and said that the captain was in shock condition after the aircraft came to a stop.

1.15.4 First aid after landing

At 0850, the aircraft landed at CKS Airport's Runway 05 Left and was towed to parking bay 608 at 0920. When MinShen Hospital medical team went on board the aircraft, the captain showed no response at all and his mydriasis had no neck pulse. Laryngoscope was used and oxygen tube inserted while serum was applied at the same time as the CPR effort was carried on. The doctor of MinShen Hospital said that because of the confined space on board and no response of the patient during the

rescue effort, he had to decide to let the captain be rushed to Da-Yuan Min-Shen Hospital for rescue.

1.15.5 Medical attendance

At 0936 the captain was moved onto the ambulance, where the MinShen Hospital's doctor and the CKS nurse kept on with their first-aid effort. At around 0947, the ambulance arrived at Da-Yuan MinShen Hospital. At 1020 the unsuccessful first-aid effort stopped and the captain was declared dead. The diagnosis certificate of MinShen Hospital stated that the captain had passed away before his arrival at the hospital.

1.15.6 Airport Emergency Responses

The following is a summarized timetable of the emergency first aid. More than 1 occurrence may appear in one line. The recording time in different agencies was unable to be synchronized.

Airport Emergency Responses Timetable

Sources:
FDR, CVR, CI681 operation flow chart of Tao Yuan Airport Service Control Center, Irregularities Report of CAL Asian Dispatch Center Flight, CI681 Return Incident Report of CKS Flight Operations Section, Assignment Record of Fire Squad of CKS International Airport, CI681 Operation Processes of TASCO（Tao Yuan Airport Service Company） Parking Bay Section, Transcripts of Aircraft/CKS Approach /CKS Control Tower/CKS Ground Control (Frequency 125.1/118.7/121.9MHz), Transcripts of CKS Control Tower Ground Control/Fire truck/CKS Flight Operations Section Commander/Ambulance (Frequency 459.2MHz), Telephone transcript of Control Tower & Flight Operations Section, Transcripts of Taipei Regional Control Center/CKS Approach /CKS Control Tower/CKS Flight Operations Section internal telephone.

Time	Status
FDR074617	CI681 took off normally from CKS Runway 05 Left carrying 2 pilots, 265 passengers and 12 flight attendants.
CVR081519	First officer found out abnormal condition of captain (FO: Are you all right?)
CVR081630	First officer decided to turn back (FO to Area control…back to Taipei…. also requesting ambulance stand by in Taipei.
CVR081644	FO to Area control: the captain incapacity, we need ambulance standby in Taipei…
CVR081721	FO to Area control: one ambulance stand by, please
Air control record time 081748	Taipei Area control advised control tower that CI681 carrying 1 sick passenger and requesting for standby ambulance.
Flight Operations Section record time 081823	Control tower advises Flight Operations Section on-duty 681 returns with 1 ill passenger and asks for designated parking bay.

	The on-duty officer of Flight Operations Section relayed message to Asian Dispatch Center of CAL to provide an ambulance.
CVR081943	Area control center instructed to prepare a TIA Instrument Landing
CVR082136 CAL Asian Dispatch Center record time 0805	First officer said to CAL OD:‘CI681 returning to Taipei, captain passed out, I am coming in and will land at Taipei. Request towing vehicle to stand by at the runway. I do not intend to taxi the aircraft. I am busy and have no time to prepare (to taxi) .’ Asian Dispatch Center of CAL report indicated: CI681 first officer reported to Asian Dispatch Center that the first officer requested for return because captain had passed out.
CVR082200 CAL Asian Dispatch Center record time 0810	First officer to Asian Dispatch Center of CAL:‘Not sick passenger. It is the captain who had passed out. I am turning back, I have no time to talk to you. Please have an ambulance and a towing vehicle to standby. This is it. Thanks. D1 of Asian Dispatch Center of CAL advised his supervisor, Joint Control of CAL, Flight Operations Section of CAA.. The said Supervisor of CAL advised the Director of Aviation Joint Control and Division of Flight Safety of CAL.
CVR082324	First officer requested to land on Runway 05 Left
ATC082339 TAS record time 0825	The on-duty officer of Flight Operations Section checked with Tao-Yuan Aviation Service Company for available parking bay and reminded control tower to assign 608 BAY to CI681.
CVR082404	First officer requested again for landing on Runway 05 Left.
Flight control record time 082510	Airport Flight Operations Section advised Control Tower to confirm that the captain had passed out, and the control tower relayed the message to Taipei Approach.
CAL Asian Dispatch Center record time 0820	CAL Asian Dispatch Center informed Flight Operations Division of CAL regarding the captain's passing out.
Flight Operations Section record time 0825	Flight Operations Section confirmed the captain's passing out from Asian Dispatch Center and informed the On-duty Officer of Flight Standard Division, CKS office, Airport Central Control Center; asked for fire trucks and ambulances to standby at Runway 06.
Fire squad record time 0825	Airport Central Control Center advised the fire squad to have ambulance standby at parking bay 608.
Fire squad record time 0827	Airport fire squad ambulance carrying 1 nurse , 1 EMT1 personnel and 2 certified nurses arrived the 608 bay.
Fire squad record time 0828	Control tower advised the fire squad chief that aircraft with captain passing out was approaching to Runway 06.
Fire squad record time 0830	Fire trucks from South and North stations arrived at S8, S5 standby area respectively. Fire truck 1 advised ambulance at parking bay 608 to changed to S5 standby point.
CVR083117	Pilot called Taipei Area Center for priority to approach.

CVR083234	The flight attendant who sat at captain's seat advised Asian Dispatch Center of CAL that the captain had been moved to the forward galley.
TASCO record time 0835	CAL informed Tao Yuan Airport Service Company （TASCO） to prepare a wheelchair for sick people. TASCO suggested to use a stretcher for passed-out passenger. (Stretcher with a lift).
Mingsheng Hospital record time 0830-0840	CAL advised Mingsheng Hospital at 0830 and 0840 regarding a passed-out passenger without describing the detail. At 0840 medical personnel carrying first-aid gears, serum and oxygen for general condition rushed to 608 BAY via CAL vehicle.
CVR083646	ATC advised first officer that using 06 for landing. 'CI681 affirmative and depart B DME fix, turn right intercept ILS runway 06 final approach course by yourself'
CVR083656 CVR083716	'CI681 confirm and request 05L' ATC made corrections for landing on 05L 'CI681 depart Xerox correction, depart DME fix intercept runway 5L localizer over'
CVR083852 CAL Asian Dispatch Center record time 0835	Asian Dispatch Center supervisor relayed the telephone message of Director of Flight Operations of CAL to first officer to carry out an Auto-land.
TASCO record time 0840	A Stretcher with elevator was standing by at Bay 608.
Fire squad record time 0842	Control tower advised the fire squad at 0842 that the aircraft would land on Runway 05L.
Fire squad record time 0845	Fire trucks and ambulances moved to N6 and N10 stand by positions.
CAL Asian Dispatch Center record time 0846	The chief pilot of CAL A300-600 asked the on-duty supervisor to relay the message to CI677 crew to provide assistance to CI681 crew.
FDR085014 CVR085037 Fire squad record time 0850 CAL Asian Dispatch Center record time 0852 TASCO record time 0850	The aircraft landed.
FDR085206	Aircraft stopped on N7 next to 23L.
CVR085208 CVR085211 CVR085221 CVR085226	The first officer reported to have stopped the aircraft on N7. Ground controller called whether he needed a towing vehicle. Ground controller called whether he needed a towing vehicle again and said the aircraft was assigned to Bay 608. Ground controller called the aircraft to stop at N7.

CVR085311 CAL Asian Dispatch Center record time 0855 CAL Asian Dispatch Center record time 0900	The first officer checked with Asian Dispatch Center how long the towing vehicle would arrive. Dispatcher D1 called CAL TPEMM to send a towing vehicle for CI681. Dispatcher called TPEMM again for towing vehicle.
CVR085329	Ground controller called the aircraft to taxi to N7 next to N9. FO did not taxi.
Fire squad record time 0853	Control tower advised the fire squad to return to station but the commanding vehicle 108 and ambulance kept on watching the aircraft.
CVR085403	Ground controller called the aircraft to stop moving. (Fire truck moved back to station.)
Air Traffic control record time 085440-085500	Through control tower, Flight Operations Section checked whether the towing vehicles arrived, if not, would ask the aircraft to shut down the engines.
CVR085507	Ground controller asks aircraft to shut down the engines.
CVR085543	The FO called Asian Dispatch Center for towing vehicle.
TASCO record time 0856 CAL Asian Dispatch Center record time 0902	Asian Dispatcher of CAL advised TASCO for towing service to 608 BAY via N7. Asian Dispatcher of CAL called TASCO for towing service.
TASCO record time 0857	Joint Control of TASCO advised the Ramp Service Section to let the towing car at the North BAY A6 to tow the aircraft.
CVR085758	Dispatcher of CAL called the FO to check with control tower to taxi the aircraft to parking bay.
Air Traffic Control record time 085827-090050	Inspector of Flight Standard Division called the control tower not to allow the aircraft to taxi. The towing car arrived before the the information was issued by the tower.
CVR085833	FO called control tower for restarting engines
CVR085839	Control tower approved the restarting and the taxi to parking bay.
CVR090040 CAL Asian Dispatch Center record time 0905	FO called that towing vehicle arrived and shut down engines.

CVR090439 TAS record time 0904 CAL Asian Dispatch Center record time 0906	Towing aircraft started.
CAL Asian Dispatch Center record time 0910	Dispatcher D1 confirmed to Ground Service Department （TPETTCI）that ambulance wais at BAY 608.
TAS record time 0920 FO reports 0921	Towing vehicle towed the aircraft to BAY 608. Lift cart R1 and ladder L1 connected to the aircraft.
Fire squad record time 0936	The Captain had undergone onboard first aid by MinShen Hospital's medical team and CKS nurses and then moved to the ambulance through lift cart. The doctor on board and chief flight attendant performed CPR to the captain since his illness started until the arrival of MinShen Hospital's medical team and CKS nurses.
Fire squad record time 0938	While captain was rushed to MinShen Hospital Da-Yuan, a notice of the pilot’s sick condition was given to the hospital for preparing the necessary equipment.
Fire squad record time 0947	The sick Captain was sent to the hospital.

1.15.6.1 Airlines

Asia Dispatcher Center of Joint Control Division, CAL is responsible for contacts between the crewmembers and other supporting ground units.

Interview data indicated that upon receiving the FO's information regarding the captain's unconsciousness and the request of turning back with the need of ambulance standing by, the dispatcher failed to catch up the FO's request for a towing vehicle at runway end as well as never realized that FO was not allowed to taxi. (It was stipulated in Section 2, Chapter 4 of the Flight Operation Manual. “Only a captain [CM1] is authorized to taxi a passenger aircraft”.

Asia Dispatcher Center issued the notice of captain passed-out to Joint Control Division, Flight Operations Division, Flight Safety Division of CAL and CKS Flight Operations Section after its communication to CI681's FO. Asia Dispatcher Center knew the aircraft was assigned to Bay 608.

At 8:30, MinShen Hospital was contacted and requested for medical backup. At 0845, the medical team was rushed by CAL van to parking bay 608. At the same time, through CAL, the CKS Central Control Center received the message of CI681's return and the request for ambulance.

At 0830 CKS Flight Operations Section advised TASCO that CI681 was coming back and would stop at parking bay 608. At 0835, CAL asked TASCO to provide a wheelchair. TASCO suggested to provide a stretcher and ambulance that would fit the unconscious patient. At 0840, both the ambulance and the stretcher were ready at parking bay 608.

At 0852 the CI681 landed. FO checked the status of towing vehicle with Asia Dispatcher Center. Asia Dispatcher Center then made a second request to CAL Engineering and Maintenance Division for a towing service but failed. At 0856 Asia Dispatcher Center asked TASCO to provide towing service. The towing vehicle started towing at 0904 and finished towing the aircraft on parking bay 608 at 0920. The ladder connected on lL door and the ambulance (carrying MinShen medical team) approached to 1R door.

1.15.6.2 CKS International Airport

At 0818, the Information Branch of CKS Flight Operations Section received the notice from the control tower that CI681 had an ill passenger and requested for air turning back with ambulance service on ground. Flight Operations Section of CAA then relayed the message to Asia Dispatcher Center of CAL to call for ambulance, to understand the status of the sick passenger. At the same time, a reply was sent back to the control tower to assign the aircraft to stop at parking bay 608 after landing.

At 0825 CKS Central Control Center advised to have ambulances standby at parking bay 608. An ambulance carrying 1 nurse and 3 EMT1 fire fighters rushed to the parking bay.

At 0825 Asia Dispatcher Center of CAL replied to Flight Operations Section of CAA by stating that it was the captain had passed out. Flight Operations Section then relayed the information to CAA, Director of CKS Airport and the CKS Centralized Control Center.

The ambulance arrived the Bay 608 at 0827. At 0828, the control tower advised the fire squad that the aircraft carrying the unconscious captain was coming back and would land on Runway 06. Fire trucks were dispatched. The ambulance was instructed to meet the fire trucks at the southern standby position.

At 0835, the fire trucks were on S5 taxiway (fire trucks 1, 3, 5 and 16, ambulances and 108 fire-fighting commanding vehicle) and S8 taxiway (fire trucks 4, 6, 7 and 8). Flight Operations Section's No. 103 vehicle was then standby on S1 taxiway. See Fig. 1.15.6-1 and Fig. 1.15.6-2 for CKS International Airport Fire Fighting gridiron.

At 0838 the control tower advised Flight Operations Section that the aircraft was to land on Runway 05 Left.

At 0845, the fire trucks and ambulances moved to N6 taxiway (fire trucks 1, 3, 5 and 16, ambulances and 108 fire-fighting commanding vehicle) and N10 taxiway (fire trucks 4, 6, 7 and 8)to standby. Flight Operations Section's No. 101 vehicle parked on 05R and No. 103 vehicle standby on N6 taxiway while No. 105 vehicle stopped on domestic parking bays as planned.

At around 0850, the aircraft landed on Runway 05 Left and vacated the runway on N7 before reaching the Runway 05R. At 0852, the fire trucks at the North and South stations left except the #101 、 #108 commanding vehicles and ambulance stayed at the back of the aircraft.

The scene commander was the CKS International Airport Flight Operations Section Chief. At 0852 the scene commander asked the control tower why the aircraft stopped. The control tower replied by saying that the aircraft was requesting for a towing. At 0855 the commander asked TASCO about location of the towing vehicle and TASCO replied that the vehicle was preparing. At 0858 the control tower advised the scene commander that Asian Dispatch Center of CAL relayed the message that the first officer showed intention of proceeding to parking bay 608 on his own and was requesting guidance from the scene commander's vehicle. The towing vehicle arrived at 0901 and started towing the aircraft at 0904. The aircraft was towed along Runway 05R and into the East Cross Taxiway before turning right to SP Taxiway.

At 0920 the aircraft was towed to parking bay 608, where the medical team was standby with first-aid equipment. The ladder and the patient lifter were put onto the 1L and 1R door of the aircraft. The 1R door was opened from inside with some delay and was not opened by the ground personnel. According to interview data, the same one flight attendant opened both the lR and the 1L door.

Once the doors opened, CAL personnel, CKS Airport Flight Operations Section personnel and CKS nurses entered into the aircraft from the 1L door and MinShen Hospital's medical team and nurses entered from the 1R door to perform the first-aid task.

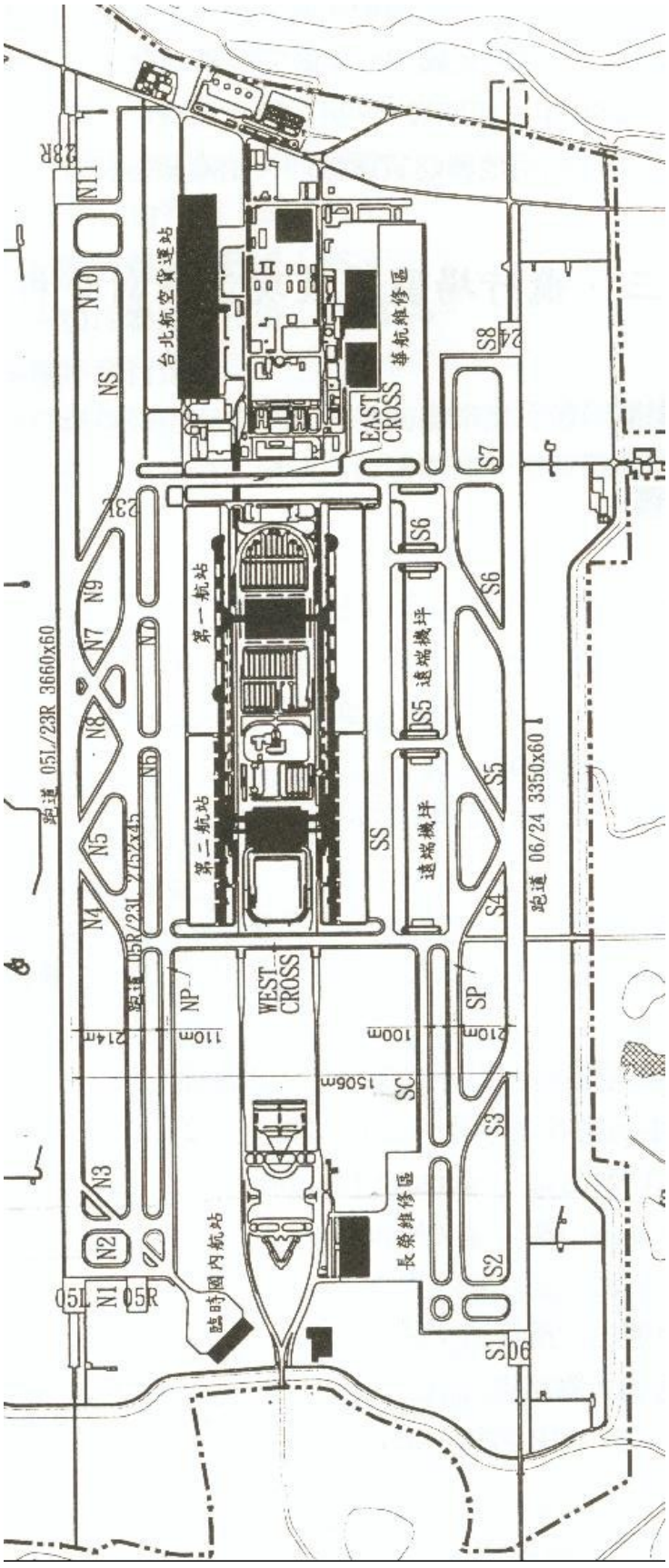

Fig.1.15.6-1 The fire truck Assigned Routs and Standby Positions at CKS International Airport

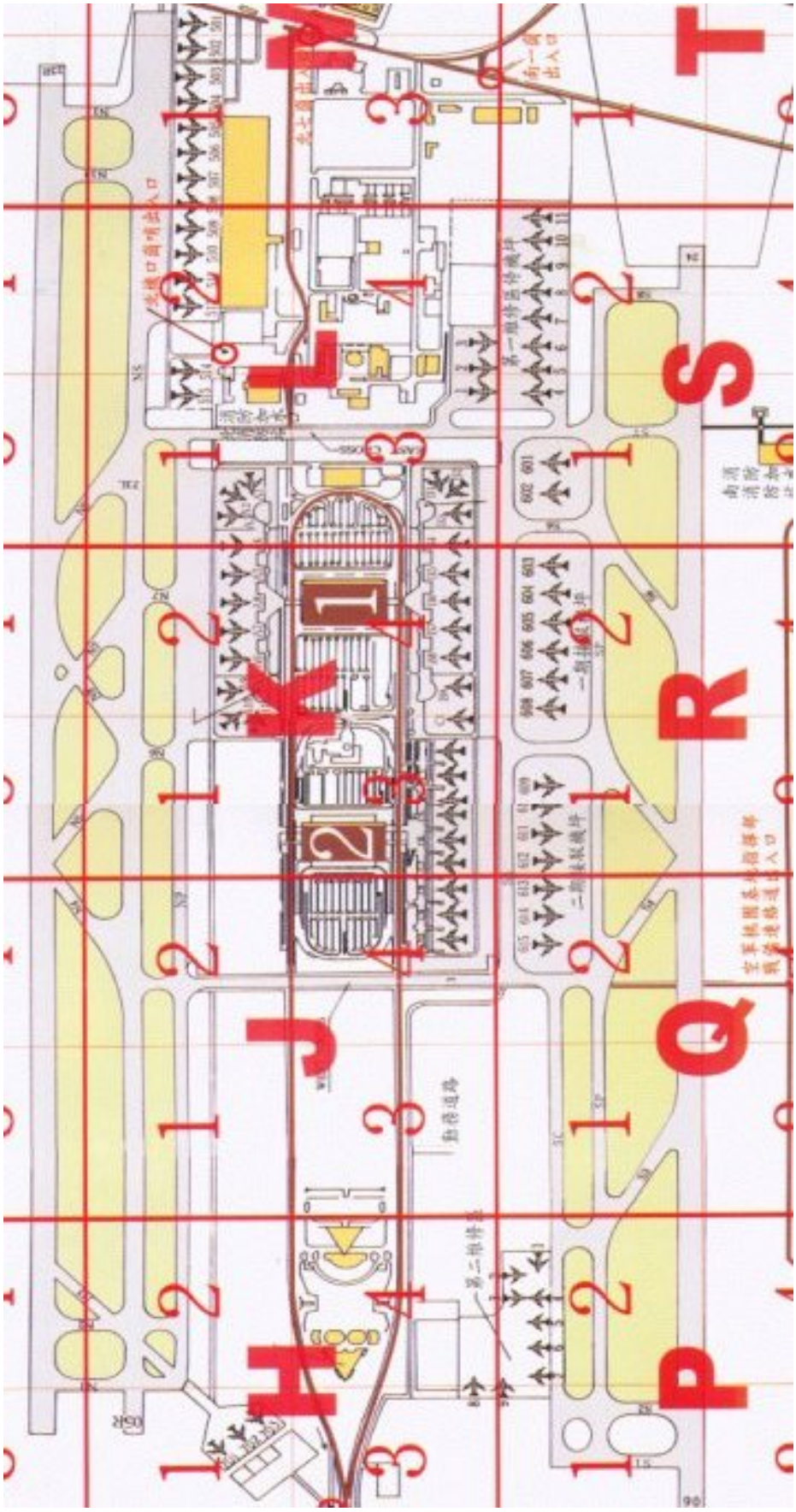

Fig. 1.15.6-2 The fire-fighting gridiron of CKS International Airport

1.16 Tests and Research

Not applicable.

1.17 Organization and Management

1.17.1 Aviation Medical Center at Civil Aeronautics Administration (hereinafter referred to as AMC)

1.17.1.1 Aviation Medical Center's organization chart

Beside the Aviation Medical Management Committee that supervises the Aviation Medical Center, there is a Medical Affairs Deliberation Committee that is responsible for the review of suspicious matters. The organic chart is given in Fig. 1.17.1-1.

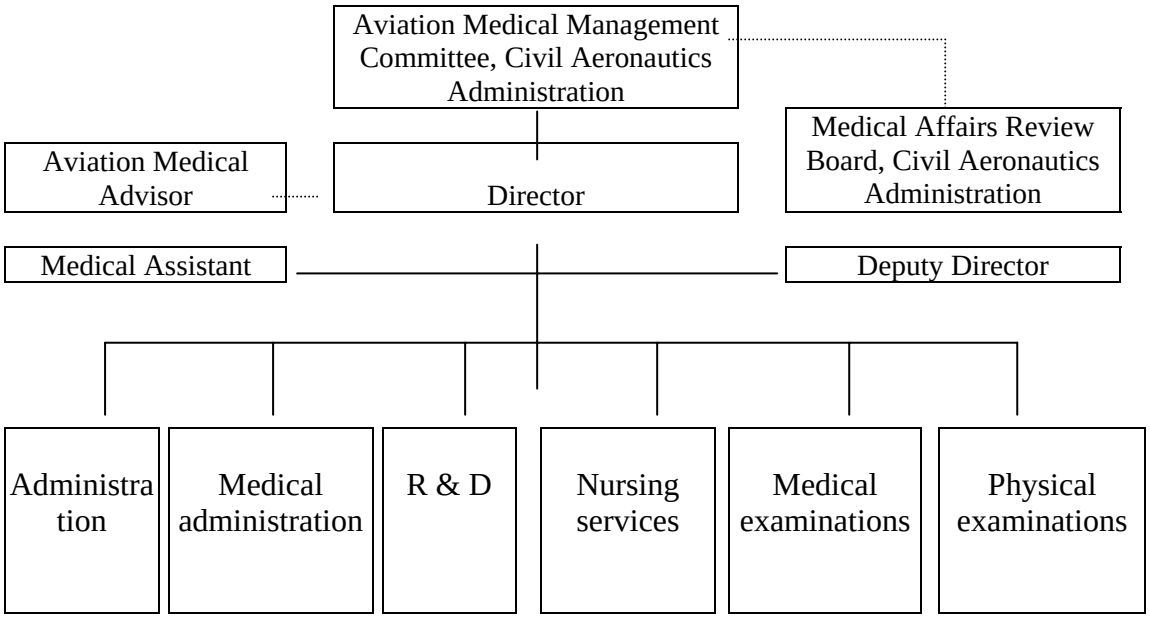

Fig. 1.17.1-1 Aviation Medical Center's organic chart

1.17.1.2 Aviation Medical Management Committee, Civil Aeronautics Administration

The Aviation Medical Center was founded in November 1970.

The Aviation Medical Center was the only agency responsible for physical examinations of all national aviators and foreign aviators working in local airlines. The Aviation Medical Management Committee, Civil Aeronautics Administration, directly supervised the Aviation Medical Center.

The Aviation Medical Management Committee, Civil Aeronautics Administration was organized by the Director General of CAA, two Deputy Director

General, Director of Planning Division, Director of Air Traffic Control Division, Director of Personnel Affairs Division, Chief Account of CAA, Director of Internal Affairs Division and a number of aviation medical advisors who would offer their specific opinions when necessary.

1.17.1.3 Medical team

The Director of Aviation Medical Center recruited all the medical team and the administration personnel when approved by CAA. The remuneration was determined by each of the personnel's seniority. They did not require the qualification of public servants.

Currently there were 6 doctors in Aviation Medical Center. Four of them worked as full time and 2 were part-time. Of the 8 nursing personnel, 1 was a dietician, 3 were testers and 2 were psychologists.

Institutionally, the Director and the Deputy Director of Aviation Medical Center performed both medical and administrative duties. The remuneration of the recruits was sourced from the collected physical examination fees of the aviators. CAA did not have budget for the salary of the recruits.

1.17.1.4 Responsibility of Aviation Medical Center

According to the information provided by Aviation Medical Center, its obligation and duties were described below:

Obligations:

1. Aviators' physical examinations.
2. Aviation physiological education and first aid training.
3. Medical investigations and suggestions on aviation accidents.

Duties:

1. Aviators' physical examination and preventive health care operations.
2. Psychological consultation and guidance.
3. Statistical analysis of medical information.
4. Crewmember evacuation education and first-aid training.
5. Supervision and suggestions on airport first-aid facilities and catering sanity affairs.
6. Suggestions on revisions of aviation physical examination standards.
7. Civil aviation medical research.

8. International aviation medical exchanges.

1.17.1.5 Physical examinations

Physical examinations at Aviation Medical Center were conducted on weekday mornings. The entire medical and the examination team were fully dedicated to this task. In average, there were 30-40 people to take Class A, B and C examination. Each of on duty doctors was responsible for the final examination of 5-8 aviators.

Table 1.17.1-1 Physical Examination Statistics of Aviation Medical Center
Jan.～Dec. 1999

	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Pilot	360	370	413	306	370	340	386	361	398	309	390	330	4333
Flight engineer	5	1	1	9	16	6	8	5	10	9	1	1	72
Airborne photographer	1	0	0	0	0	5	0	0	0	0	0	0	6
Flight attendant	115	136	179	148	96	143	120	246	193	258	132	131	1897
Controller	23	4	8	10	15	21	10	69	64	47	18	16	305
Ground mechanics	114	159	120	153	146	151	156	140	119	124	181	183	1746
Assignor	32	17	22	27	23	20	21	18	22	18	22	27	269
Administrative executive	0	0	31	3	0	1	4	34	10	19	13	2	117
Commissioned physical examination	2	1	0	3	0	2	3	4	1	1	3	0	20
Fire fighter	0	0	0	0	0	0	0	0	0	0	0	0	0
Others (swimmers)	1	1	0	0	1	1	7	2	0	0	0	0	13
Total	653	689	774	659	667	690	715	879	817	785	760	690	8778

1.17.1.6 Legal grounds for physical examination and standards

The Aviation Medical Center performed the physical examination tasks in accordance with the Civil Aviation Code 05-03A, i.e. the “Aviator’s Physical Examination Standards" (See Attachment 7), originally issued on Nov. 17, 1973 and reissued the 7th revisions of Chi-fa-fa No. 0002 Order on Feb. 2, 2000 from Civil Aeronautics Administration, Ministry of Transportation and Communications. The physical examination tasks were conducted by following the "Civil Aviators' Physical Examination Manual" (See Attachment 8), which had been prepared by Aviation Medical Center in 1994 and then revised in 1996. This manual provided the guidance only while the physical examination doctors should conduct all physical examination in accordance with "Aviator's Physical Examination Standards". Different items would be conducted accordingly to the type of license of the examinee.

For further examination of suspected abnormal cases, Aviation Medical Center should follow the "Aviator's Physical Examination Standards" to assign a specific

medical institution or a specialized doctor to conduct the examination. The physical examination doctor of Aviation Medical Center should compile the results and comments to submit to the Review Board of Aviation Medial Center of CAA for discussion and decision. The Director of the Aviation Medical Center had the responsibility to approve the final decision.

1.17.1.7 Waived item

The application for waived item of an examinee in accordance with the content of Chapter 5 of "Aviator's Physical Examination Standards" would be approved after the examination process of the physical examination doctor or some specific medical examination. The waiver would be accepted while the enriched experience of the aviator could compensate the said waiver without jeopardizing the aviation safety. It should be treated as a special case and to be approved by CAA.

There was no waiver item on the physical examination certificate of the captain involved in this incident.

1.17.1.8 Issuance of physical examination certificate

After a successful physical examination, the result was submitted to CAA for the signature of the Director General to issue the physical examination certificate.

1.17.2 The Flight Operations Section of CKS International Airport

The Flight Operations Section of CKS Airport was located in Terminal 1, next to A9 parking bay.

The Flight Operations Section of CKS Airport organized of totaling 20 people with a section chief, 15 section staffs working in three shifts and 4 staffs working in office hour. Each shift used to have of 4 staffs and would become 5 staffs after the Terminal 2 of CKS Airport established.

Personnel at Flight Operations Section took the training courses prepared by their own instructors. The annual re-current training and joint operation drills were held by Aviation Training Academy of CAA.

For emergency notice on aircraft accidents, the agencies in the airport communicated one another by the direct line of telephone. In case of emergency, the control tower would ring the alarm.

Regarding the duty assignment in case of on-airport aircraft accident, the Director of local Airport would be the Commander-In-Chief; the two Deputy Directors of local Airport and the Deputy Director of Airport Police Station were the Deputy Commanders-In-Chief. The Flight Operations Section chief was the on-scene Commander.

As of off-airport aircraft accident, there was no duty assignment except the following description from the emergency response handbook: "The local governor or his（her） designated proxy should become responsible with the full help from the local airport ".

1.17.3 CAL's Asian Dispatch Center under Joint Management Division

CAL's Asian Dispatch Center was responsible for aircraft dispatching, movement monitoring and the communication with the operating aircrafts. For contacts with aircraft within 200 nautical miles from the airport, they used the leased 131.5 VHF channel from CAA by voice communication or printer transmission of ACARS. In the CI-681 incident, the on-duty personnel at Asian Dispatch Center was not aware of the fact that the first officer was not allowed to taxi after landing. The first officer did request for towing in his communication but did not state that he was not allowed to taxi. The first officer did not use any word to express that it was an emergency condition. Asian Dispatch Center did not relay the information to the others in emergency.

1.18 Other information

1.18.1 ICAO emergency classification and description

ICAO's Emergency Manual provided the handling of airport emergency incidents. In 2.2.2, emergency was defined as (a) aircraft involved (b) aircraft not

involved (c) emergency medical incident and (d) combined incident:

(a) Emergency with aircraft involved:
  (1) Accident—on-airport aircraft accident
  (2) Accident—off-airport aircraft accident
    (I) On land
    (II) On water
  (3) Accident—aircraft in-flight incident
    (I) Severe turbulence
    (II) Loss of pressure
    (III) Structural failure
  (4) Incident—aircraft on ground
  (5) Incident—sabotage, including bomb threats
  (6) Incident—hijack

(b) Emergency involving no aircraft:
  (1) Fire—Air terminal structure on fire
  (2) Sabotage—including bomb threat
  (3) Natural disaster
  (4) Hazardous materials
  (5) Emergency medical service

(c) Combined incident
  (2) Aircraft/structure
  (3) Aircraft/fuel facilities
  (4) Aircraft/aircraft

In 2.2.3 of the manual, airport emergency zones come in 3 types:

(a) On/off-airport accidents:

(b) Full emergency: Aircraft approaching airport involving potential accident.

(c) Local standby: Aircraft approaching airport involving accident, but with possible safe landing.

In chapter 4 of the manual, there were 10 types of emergency cases. Duties and operation procedures of the agencies involved (Air Traffic, Fire fighting, Security, Airport Administration, Medical Service, Hospitals, Airlines, Government Agencies and Public Relations). The 10 accidents were given as follows:

(1) On-airport accidents
(2) Off-airport accidents
(3) Full Emergency
(4) Local Stand by
(5) Non-aircraft accident airport emergency measures
(6) Illegal intervention to flight

(8) Hazardous materials
(9) Disasters
(10) Aircraft in water

Chapter 2
Analysis

The pilot and co-pilot of this flight who had the health Certificate issued by the Aviation Medical Center of CAA. During this flight, the pilot became accidentally incapacitated and resulted in death.

The Aviation Medical Center of CAA was responsible for the physical examination of all the flight crew. The physical examination would greatly influence the flight safety.

The co-pilot, with the assistance of the Air Traffic Controller was able to land the aircraft safely although emergency support on the ground was not immediate. The parking bay prepared was not taken into account for emergency medical treatment. There was no appropriate communication to let the ambulance stand by the door of the aircraft. The aircraft was arranged to park at a remote bay. It delayed the medical

personnel from boarding the aircraft immediately. After landing, the required medical treatment to the patient was not timely serviced.

2.1 Analysis of the Cause of Death

An autopsy on the internal organs as well as inspection of the pilot's urine, blood, and stomach contents were performed by the examiner from the Ministry of Justice, upon the request of the Tao Yuan District Attorney Office. The examination report of the cause of death was listed as Appendix 9.

2.1.1 Examination

Visual observation: Upon examination of the dead person's whole body, no external injuries were found and the conjunctiva was normal. There was no bleeding on the scalp and no bones were broken. However, the upper left part of the coronary artery was 50% cramped. Valve membrane showed no signs of abnormality. The aorta was somewhat swollen and there was calcification of the abdominal artery and presence of ulcers.

Microscopic observation: Aside from the cramped coronary artery, there was no special irregularity.

Pathological observation: Acute coronary artery occlusion, with traces of dried plums found at the tip of the larynx, sudden death occurred, death by natural causes. Narcotics police found no traces of toxic elements. Alcohol found in the patient's blood, urine, and stomach contents had a 0.00487% level (W/V), less than 0.002% and 0.102%, with no other toxic elements. For details, please refer to Appendix 10.

Upon anatomy of the body, it was found that there was serious coronary artery occlusion and visible sclerosis, calcification, and ulcers of the abdominal aorta. Half-digested plum was found at the stomach. Some residue of plum was found in the upper part of the larynx.

2.1.2 Examination Result

The results of the examination of forensic doctor of the Department of Justice indicated that coronary artery occlusion was the cause of death, death by natural causes, as detailed in Appendix 9. The Aviation Safety Council had invited the related airline medical personnel and cardiovascular experts to conduct an in-depth investigation into the cause of the pilot's sudden death during the investigation. The cardiovascular doctor had directly pointed to acute coronary artery occlusion as the

main cause of death, thereby becoming the main reason for the incapacity. The plum residues found in the throat of the pilot was shifted during emergency rescue or the moving of the pilot. The residue of the plum was not the main cause of his sudden death.

2.2 Analysis of Physical Examination

2.2.1 The Examination Equipments of CAA

The pilot involved in the incident had undergone physical examinations five times at the Aviation Medical Center of CAA. Of these examinations, there were three treadmill EEG examination records. The treadmill was adjustable slope type equipment and received function test including the synchronization with the simulated EEG.

2.2.2 EEG Data

The Aviation Medical Center used the "Civil Aviators' Physical Examination Handbook" as basis for its handling of the examination affairs. Articles 18, 19, and 20 of Chapter 2 stated the handling procedures and principles for heart murmurs, athletic EEG irregularities, and arrhythmia.

In each of the EEG examinations of the pilot, no signs of irregularities or no positive reactions were found. Therefore, no further examination was made to the coronary artery occlusion and no CAT scan was conducted either. According to medical statistics, the accuracy rate of EEG in predicting coronary occlusion was 20%; of athletic EEG was about 50 to 60%; of the cardiovascular sonograms was 70% and of CAT scans was 95%.

2.2.3 The high number of white blood cell (WBC) to the cause of death

The Aviation Medical Center found out during each time of the physical examination that the pilot would need a re-examination due to his high number of white blood cell. The Aviation Medical Center had experienced twice of the accepting the re-examination data of the pilot examined in foreign country agencies. Only one inspection dated November 25, 1999 recommended that the pilot require having a special examination to the clinic of orthodontist in Aviation Medical Center to check the number of white blood cell. The result was no inflammation and was recommended to have a further inspection to the cause of high number of white blood cell. The Aviation Medical Center did not request for further examination or did the follow-up of this inspection.

Both the American Academy of Periodontology and the ROC Academy of Periodontology had formal documents describing that statistically the direct relationships between periodontal infection and cardiac diseases or strokes. They also pointed out that the risk factor of people who had periodontal infection to have systemic diseases and cardiac strokes was more than double as compared to people who did not have periodontal infections. (Reference: "Periodontal Disease As A Potential Factor for Systemic Diseases," Journal of Period ontology, Vol. 69, p. 841-850 1998.) Furthermore, based on the categorization of periodontal diseases, the traditional categories were: 1. Gum diseases, 2. Early periodontitis, 3. Mid-level periodontitis, 4. Serious periodontitis, 5. Recurring periodontitis. If based on the 1989 World Period ontology Congress, there would be eight categories, namely: 1. Gum diseases, 2. Chronic periodontitis, 3. Invasive periodontitis, 4. Disease related periodontitis, 5. Periodontonecrosis, 6. Pus swelling of periodontal structure, 7. Pathological changes in periodontal make-up, 8. Congenital or acquired periodontal-related irregularity. (Reference: "Screening and Categorization of Periodonts" Journal of ROC Academy of Period ontology, Vol. 3, p. 168 September 2000) This issue stated that periodontal infections should not be limited to acute periodontal infections. Inasmuch as the deceased pilot was diagnosed as having periodontitis in November 8, 1999, the Aviation Medical Center did not have related recommendations. When the pilot, in the process of the examination, told the center of his periodontal medical history, the center's diagnostic result was "non-acute periodontitis, needs to be pursued further." The whole thing was based on judgment, without the benefit of screening or diagnosis; therefore the pilot was not informed that his risk of heart diseases or cardiac strokes had just gone up.

According to the final judgment of the cardio-vascular specialist, the high white blood cell count did not bear any direct relationship to the coronary occlusion.

2.2.4 Impact of high blood fat on the cause of death

Article 22 of Chapter 2 of the "Civil Aviators' Physical Examination Handbook" stated very clearly the procedures for examination of high blood fat level, with cholesterol value in excess of 6 as a threshold level, where, on a case-by-case basis, a person may be asked to cut down smoking, lose weight, exercise, and go on a low-fat diet. When cholesterol level exceeded 240, dietary treatment should be recommend by a dietician.

The doctor of Aviation Medical Center wrote the suggestions for the pilot to watch his dietary intake as well as having a regular exercise regimen. However, there was no

obvious lowering of blood fat levels. There was no record of consultation with the medical center's dietician.

The high blood fat condition when combined with several factors such as age, gender, and smoking would make it a high-risk group of heart disease. In this case, the pilot had matched the characteristics of the high-risk group. Autopsy of the pilot had determined that the pilot indeed succumbed to coronary disease.

2.2.5 Comparison of Organizational Structures of the Aviation Medical Center, International Civil Aviation Organization, and the Federal Aviation Administration

Distinguishing Feature of the Physical Examination of ICAO described:
The International Civil Aviation Organization made the minimum requirement to flight safety, in order to make it easier for all countries to implement the procedure. Moreover, ICAO limited itself to only making physical examination standards on principle; it completely authorized the flight surgeon of each country to act and decide on the merits of medical knowledge, with protecting aviation safety as its highest goal. Presently, the civil aviators' physical examination standards followed in the country was much more stringent than those of ICAO.

Distinguishing Feature of the Physical Examination of FAA described:
The American Federal Aviation Administration designated doctors to conduct physical examinations of aviation personnel. Because the United States was a big country, with a large number of aviation personnel, the FAA conducted more than 500,000 physical examinations annually. Consequently, there was no way to centralize all the physical examinations, so it was necessary to designate authorized doctors to conduct these examinations. The number of the designated doctors was more than 5,000. Some of the doctors had to conduct physical examinations after undergoing few days training that resulted the inconsistency in the quality of the physical examinations. The examination doctor had limited examination items to check by using different equipments. During the physical examinations, the doctor would ask the examinee to self-describing the health conditions. However, if there were any concealment of the facts in the statement, there would be a US$ 250,000 fine or jail time of not more than five years. The two sentences even could be jointly meted out (refer to Appendix 11 FAA Physical Examination Chart). Individuals who had undergone both the FAA physical examination and CAA physical examination could realize that CAA examination was more stringent than FAA examination. For

example, the FAA examination would not require the Category I Pilot to attach the EEG record in his physical examination. The FAA accepted the 0.0 vision condition (Should be normal after correction) but the CAA only accepted 0.2 visions. In the past, many airlines hoped to hire foreign pilots who had the FAA physical examination certificate, but were not able to because those pilots did not pass the physical examination of CAA.

Unlike the FAA, our civil aviation law did not have a rule to punish individuals who hide their medical histories. It was very difficult to control the history hiding while the flight surgeon conducted the physical examination by asking the examinees to express their medical history. Especially in the present time where pilots came from various parts of the world, or local citizens who came from fields not related to aviation, the concealment of medical histories was a blind spot during physical examinations.

2.2.6 Examination of coronary diseases by the Aviation Medical Center

According to the statistics of the Aviation Medical Center, between the years 1987 and 1995, there had been 48 civil pilots, 4 of them were foreign pilots, lost their physical certificate. It was equivalent to 6.8% per thousand pilots. There were 25% of the pilots who lost their physical examination certificate were between the age of 40 to 49. There were 65% between the age of 50 to 59 and 10% of other age.

More than 50% of the pilots lost their physical examination certificate had the problem of coronary conditions. Heart attacks were difficult to predict, thereby having a major impact to flight safety. Because of flight safety, the doctor conducted regular physical examinations were looking for signs of coronary conditions to prevent the unpredictability of heart attacks. The Aviation Medical Center of CAA demanded that an athletic EEG examination be conducted annually would be a great help in early detection of coronary diseases. The Aviation Medical Center of CAA also suggested the examinee to conduct a bypass inspection or a CAT scan as necessary. In addition, a cardio-vascular ultrasound or a 24-hour EEG examination might also be suggested as required.

There were no irregularities found in the athletic EEG of the pilot in this incident. Therefore, no further examination was made to examine the narrow condition of the coronary artery. The Aviation Medical Center’s examination procedures of the athletic EEG is shown in Fig. 2.2.6-1

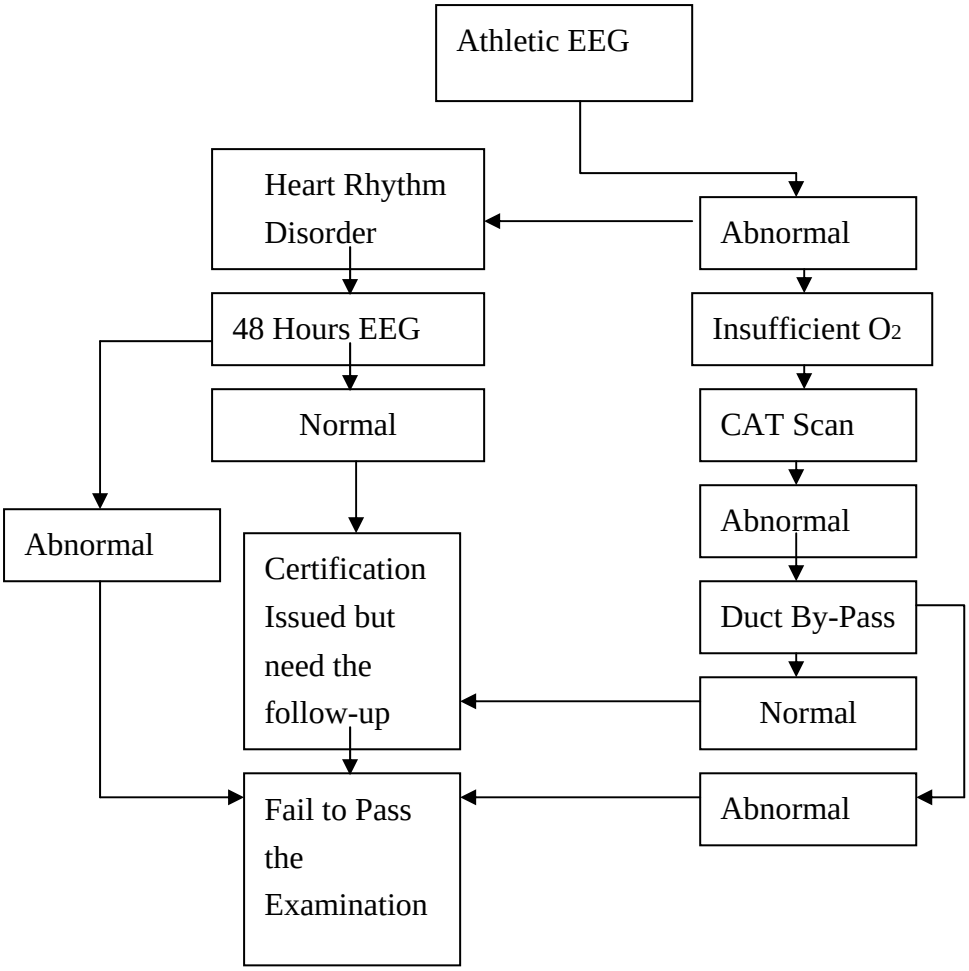

圖 2.2.6-1　　The EEG process of Aviation Medical Center

Aside from the present procedure of asking for medical histories, the evaluation of human cardio-vascular system found in clinical examination, tread mill athletic EEG, by-pass examination should consider to have the 24-hour EEG, cardiovascular ultrasound, and CAT scanning. For the proper management of the risk factors in coronary factors, one should refer to the Framingham Scoring System jointly recommend by the American College of Cardiology and American Heart Association. (Reference: Assessment of cardiovascular risk by use of multiple-risk-factor assessment equations, Journal of American College of Cardiology 1999 34:1348-59). One may also consider the evaluation procedures used in Europe (Reference: Prevention of coronary disease in clinical practice: recommendations of the second joint task force of European and other societies on coronary prevention, European Heart Journal 1998 19:1434-503).

2.2.7 Physical Examination Report of Aviation Medical Center

Presently, after the physical examination report and certificate were issued, the pilot who passed the examination but required to have a further examination, his certificate would be sent to the airline or the aviation medical doctor to transfer to the certificate holder. The Aviation Medical Center would not follow-up or analyze the suggestion they made.

Generally, when aviation medical department of the respective airlines received the physical examination reports of their pilots, they rarely controlled the suggestion items or followed up the health improvement of the pilots.

After receiving the physical examination report with suggestions but without warnings from the doctors or lack of personal health improvement knowledge, it was very easy for the pilots to ignore the self-improvement to the health.

The pilot in this incident belonged to a high-risk group. For the past three years, his white blood cell count as well as his blood fat level did not decreased. It was proved that there was lack of follow-up as well as substantial improvement, the airlines' management level or medical doctor and the Aviation Medical Center of CAA failed to require the suggestions to be improved and the pilots who had undergone the physical examination ignored the suggestions from the medical doctor.

2.3 Airport Emergency Procedures

This section was based on the Airport Service Manual, Airport Emergency Planning

DOC-9137 Part 7 recommended by the International Civil Aviation Organization. It looked into the related procedures for emergency incidents used at Chiang Kai Shek Airport.

2.3.1 Categorization and Details of CKS Airport Emergency Procedures

According to the categorization and details of emergency cases in chapter 1.18.1 of ICAO documentation, we reviewed the related regulations governing the CKS Airport emergency responses and found out the inconsistency of the categorization of emergencies and the procedures described in different procedure manuals. It made the involved agencies to do the emergency responses their own way or with no procedure at all. This resulted in the failure of agencies to be effectively integrated for their operations.

For example, the airport had “Implementation Highlights of CKS Airport to the Accident or Incident Handling Procedures.” The Chapter 9 of this document contained the procedures for accidents or incidents happened on and off the airport. If the accident happened on the airport, it would be categorized as either “Partial damage of the aircraft after landing；No fire explosion after landing with no injuries；Fire and explosion after landing with occupants injured and fatal.” The off airport accidents were categorized as “aircraft accident on ground”；“aircraft accident on sea.”

Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedures failed to take into account the total emergency accidents procedures and the local area standby procedures. However, the handbook of the firefighting squad of the CKS Airport categorized the procedures into “The accidents during takeoff or landing”；”Request for emergency landing due to special reason”； “The warning from the aircraft on ground “ ； ” Fire inside an architectural and fire outside an architectural” and so forth. This handbook described the handling procedures used by firefighters, but no sound procedures for the supporting agencies. There were procedures dealing with natural disasters mentioned in “CKS Airport Typhoon Precautionary Measures” There were emergency procedures for illegal interference of flying activities mentioned in “CKS Airport Emergency Responses for Aircraft Incident Except Hijacking.”

2.3.2 Procedures for Accidents Off the Airport

Section 4.2 of the ICAO Airport Emergency Handbook mentioned the responsibilities of each unit in the event of an accident off the airport (refer to Appendix 12). Section 3.12 of the handbook mentioned the important role played by the Search and Rescue Coordination Center in an off the airport accidents, especially when there was no

information of the accident site or there was a need for additional search and rescue equipment on site or near the site. The search and rescue coordination center needed to contact with the necessary agencies in a quick way. Its responsibilities included providing aircrafts, helicopters, special search and rescue equipment and team. The rescue plan should have a specific chapter describing the operations of the search and rescue coordination center. These operational procedures were not found in the "Implementation High Lights of CKS Airport Aircraft Accident and Incident Handling Procedures."

The "Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure" does not also mention the responsibilities and procedures of each unit involved, which results in the airport having difficulty providing professional technical assistance for search and rescue, like informing the rescue and firefighting units of local governments of the aircrafts fire-prone areas, position of dangerous elements the aircraft is carrying, and the aircraft's firefighting facilities, etc.

2.3.3 Airline Management Services

The airport management services mentioned in Sections 3.2, 4.1.2 of the ICAO Emergency Airport Handbook include the airport tower contacting firefighting agencies and provide basic as well as emergency information as the situation warrants. Information includes model of the aircraft, fuel volume, location of the accident. Furthermore, emergency plan should have a standardized method for the tower or airport management to get in touch with local firefighting agencies and other appropriate organizations. The initial report should provide graph maps, rendezvous points, open airport entrance; airport management does not have to handle these communication functions, but it should designate a group to see to it. Clear delineation of responsibilities should be done on the initial telephone report to avoid repetitions. Relevant data can be added over the phone, including the number of passengers, dangerous goods on board and the names of the flight personnel, and others. The airport may be declared closed while dealing with the emergency, although airport management has to make the call as well as register the time the agencies were contacted and signing up procedure.

The communication team provides the functions stated in the "Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure". However, it is not mentioned that the communication team also provides basic information to the support groups, that it should continue to collate materials to repeat contact as well as register the time the agencies were contacted and signing up procedure.

2.3.4 Firefighting and Rescue Services

Sections 3.3, 4.1.3 of the ICAO Emergency Procedure Handbook mentions that firefighting and rescue personnel should consider rescuing of individuals as the ultimate goal. In order to achieve this goal, fires will have to be put out and steps should be taken so it does not break out again; assistance should also be given to the people on the aircraft so fast exits can be arranged. It would be better if airport firefighting personnel or other personnel should have emergency medical training, because these people are on the frontline and are usually the first people to arrive on the scene. If the people who immediately respond to the crisis have medical qualifications, it can significantly reduce the death toll. Only firefighting personnel wearing fire protection suits and equipment will be allowed to get close to the aircraft. These personnel should suit up 100 meters outside of any point from the aircraft or from the oil dumping point. Firefighting personnel and vehicles should:
Be shown the fastest way into the site by airport management people.
Inform suggested mutual support firefighting agencies about:

Rendezvous point
Staging area
Labor and Equipment Support Needs
Other materials

Immediately establish temporary easily identifiable command center, until the command center of the airline management department is already up and operational.

Similar operational details and standardized responsibilities were not included in the "Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure."

2.3.5 Warning Service

Section 3.4 of the ICAO Airport Emergency Procedure Handbook states that police personnel should reach the accident site on the fastest time possible, close up the site, and wait until the police from the station with jurisdiction arrives at the scene to take over. The plan should take into account local police, the military and other government officials to be able to provide timely and efficient assistance. At the same time, they should immediately allow for unimpeded entrances and exits as well as smooth roads to allow emergency vehicles to come through. Bystanders should be barred from the scene, to prevent damaging the accident site and preserving the evidence useful to the investigation. Support plan should consider all possible police agencies including county police, the MP's, customs police, and others. Police

personnel should, at every checkpoint, inspect every rescue personnel entering the accident site. Identity cards should be provided and given to each individual involved in the incident. A lot of cases show that support vehicles like firefighting trucks cannot directly enter the accident site because of venue problems. Consequently, rendezvous points should be established, in order to minimize traffic congestion, which can interfere with operations at the accident site. Police should also be on hand to control the vehicular flow at these points.

The process of the “Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure” does not include making the nearby entrances and exits as well as the roads as unimpeded as possible, the making of identity cards as well as setting up checkpoints and review areas, establishing rendezvous points and coordinating with the police.

2.3.6 Airline Company

Section 3.8, 4.1.8.2 of the ICAO Airport Emergency Procedure Handbook states that in the plan, the airline company has to provide information on the aircraft involved in the incident such as the passengers’ manifest, jet fuel volume, dangerous goods (including liquid gas, flammable liquids, oxygen tanks, toxins, communicable and radioactive elements) and other basic information to the site commander and agencies that need to know. At the same time, it is necessary to arrange for those unhurt to proceed with their trip and to contact the relatives of those who are injured or dead. The plan should designate an airline company to handle transit as well as private, military, and other non-users of the airport.

The process in the “Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure” does not include immediately providing information on the aircraft such as the passengers’ manifest, jet fuel volume, dangerous goods, and other basic information to the site commander and agencies that need to know. There are also no provisions as to how the airline company will handle transit, private, military, and other non-users of the airport in an emergency situation.

2.3.7 Transport Support

Section 3.8 of the ICAO Airport Emergency Procedure Handbook states that during emergency rescue operations in an accident, search and rescue missions can be carried out, the transport of personnel, wreckages, and supplementary transports. The use of public utility vehicles, rented vehicles, trucks, meal vans should be included in the plan. Lead vehicle should be easy to identify and should be equipped with two-way radios. From the waiting area to the accident site, the lead vehicle should not be hampered by the operations of other aircrafts. There should also be provisions for

vehicles that can travel on water and marshes as well as other special vehicles.

The process in the “Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure” is for the ground crew to provide transport support, which does not include taking into account the abovementioned lead vehicle as well as the waiting areas. It also does not include detailed plans for airport capabilities investigation and allocation procedures.

2.3.8 Communication Coordination

Section 12.3.3 of the ICAO Airport Emergency Procedure Handbook states that the frequency used by the command center should be able to be connected directly to the aircraft as well as ground control personnel and that there should be earphones to reduce interference. Section 4.3 of the ICAO Firefighting and Rescue Handbook states that communication between firefighting; command and cockpit should be provided during special incidents, especially situations involving the wheels of the aircraft or the safety exits when the aircraft is in motion. (Chapter 12 of the ICAO Airport Emergency Procedure Handbook deals on communication planning, please see Appendix 13)

The “Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure” states that when an accident occurs, the communication team shall provide wireless handheld radios to the different working teams, for overall command to be better. When the incident with this aircraft occurred, the communication between all the units and the major players was very complicated. It was necessary to examine further the whole working structure and to include the communication equipment as well frequency planning into the emergency procedures. CKS Airport has not planned the emergency wireless communication between the aircraft and command center.

2.3.9 Telephone Number for Notification

Section 8.1 of the ICAO Airport Emergency Procedure Handbook stated that each unit should develop a telephone log for different emergency situations. CKS Airport had not set up telephone log for different situations that would result in difficult to accurately to choose the right unit be notified.

2.3.10 Airport medical and rescue procedures

2.3.10.1 Airport medical and rescue procedures and arrangements

Section 1.1.9 of the ICAO Airport Emergency Procedure Handbook states that rescuing the victims and stabilizing their conditions should be taken into account. Hence, it has declared that speed and skill of medical rescue so of paramount importance and that standardization and regular simulation are necessary. In addition,

Section 3.6.1 of the ICAO Airport Emergency Procedure Handbook states that the purpose of medical services is to provide categorization injury examination, emergency and medical treatment:

Reduce the risk of death of heavily injured individual
Ameliorate suffering
Transport the wounded to appropriate medical institution

CKS Airport has not set airport medical rescue procedures in either the "Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure" as well as emergency medical rescue procedure for a solitary case. There is only the procedure for immigration and custom process for seriously ill passengers, which cannot standardize the medical rescue emergency responses and techniques of different situations.

Section 4.1.6 of the ICAO Airport Emergency Procedure Handbook states that the following should be included as medical services during accidents:

Ensure that support and ambulance groups have been informed of the waiting area or other staging areas.
Organize injury categorization, handling of the wounded and the dead as well as arrange for vehicular transport.
Work together with transport personnel to control and ensure the flow of injured individuals; assign injured individuals to the appropriate hospitals.
Write out a list of wounded and dead individuals, including first and last names as well as final destination.
Coordinate airline companies to transport those who are not injured to areas designated.
Provide medical evaluation of passengers who need emergency assistance as well as those uninjured.
Arrange for additional medical equipment, if necessary.
Work with police agencies to handle matters pertaining to dead individuals.

The "Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure" has designated that Min Shen Hospital should establish a medical team at the accident site, coordinate with command to support medical units and to examine and categorize injuries and sending the injured to the appropriate hospital. However, it has not standardized the responsibilities of the medical team

during an emergency situation as well as the details of the operation.

2.3.10.2 Transport and handling procedures for medical and rescue capabilities

Section 3.6.4 of the ICAO Airport Emergency Procedure Handbook states that emergency plans should include provisions for transporting medical services, equipment, and personnel to the accident site by air, land, and sea. In terms of procedures, CKS Airport has not planned the transport of the abovementioned medical capabilities.

Section 3.6.5 of the ICAO Airport Emergency Procedure Handbook enumerates the following responsibilities of the medical transport personnel:
Report site situation to hospital and medical personnel.

Send patients needing special treatment to appropriate hospitals for treatment.

Record the names of individuals transported, the number of people transported, when they reach the hospital and the state of the wounded.

Call ahead for the hospital to prepare while the patients are on the way.

Continue to coordinate with the hospital, the ambulance, senior emergency rescue personnel, and site commander.

The CKS Airport has not seen any procedure standardizing the responsibilities of medical transport personnel and has not planned communication and connection methods for medical coordinators and the site commander as well as any of the vehicular transports.

2.3.10.3 Organizational plan for mental hygiene

Section 3.19 of the ICAO Airport Emergency Procedure Handbook mentions emergency response plans including local psychological teams providing counseling services to survivors, witnesses and rescue personnel. CKS Airport has not included support and operations of local psychological teams in the emergency procedures.

2.3.10.4 Medical training procedures for standard firefighter and rescue personnel

Section 3.3.2 of the ICAO Airport Emergency Procedure Handbook mentions that if the conditions of heavily injured individuals cannot be stabilized in a short time, which may lead to death, the firefighting and rescue personnel or other personnel should have better medical training, because these are the people who are on the

rescue frontlines and who enter the accident site first. If personnel who respond to the call has medical and rescue experience, it may reduce the number of casualties. Although CKS Airport has already started EMTI training of first line firefighting and rescue personnel, this function has not been mentioned in the emergency response procedures.

2.3.10.5 Hospital Spread Plan

Section 3.7 of the ICAO Airport Emergency Procedure Handbook states that hospitals should have an emergency plan for accidents. This would ensure that the hospital would be able to provide the site with a medical team. Moreover, hospitals should have the capability of handling airline incidents in the form of qualified personnel and appropriate equipment and facilities. The emergency plan should also include a form listing all the hospitals in the vicinity and further categorize special injuries such burns, and not to use up the resources of the nearby hospitals.

4.1.7 of the ICAO Airport Emergency Procedure Handbook states that designated hospitals complete the following steps:

Transport medical doctors as well as a medical team to deal with external injuries to the site of the incident as soon as notification is received.

Provide medical services when the injured reaches the treatment area.

Ensure that when emergencies occur, appropriate doctors, nurses, operation facilities, psychiatric treatment unit, surgical team, and blood bags are fully prepared.

A look at the CKS Airport medical rescue support group and capabilities' form of the "Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure" does not list the special capabilities of each hospital to be provided to the medical coordinators as reference when assigning the wounded to hospitals. Support agreements signed with the hospitals fail to list their capabilities and operation procedures during emergency situations.

2.3.10.6 Categorization and care of injuries

Chapter 9 of the ICAO Airport Emergency Procedure Handbook states the principle by which injury examinations are categorized, standardized injury identity card and its uses, care principle of similar categories, and a detailed operation procedure for the control of injuries. The "Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure" marks the aircraft failure treatment rescue map; wound list (injury examination form) yet does not include a detailed standard procedure (see Appendix 14).

2.3.11 Graphical illustrations of the airport and the suburbs

Section 7.1 of the ICAO Airport Emergency Procedure Handbook states that the emergency center should provide the tower, firefighting station, firefighting/rescue vehicles as well as all vehicles carrying support groups with graph maps of the airport and the outlying areas. It must provide two types of graph maps: 2.3.11-1 describes the airport roads and all other roads leading to the outside, water supply locations, waiting points, and staging areas; 2.3.11-2 shows at least 8 km. of land around the airport, which includes its topography, its road systems, hospital locations, materials, waiting points, and other information. The hospitals shown in the graph maps must also show the number of beds that can be utilized, fields of specialization, manpower, and other information.

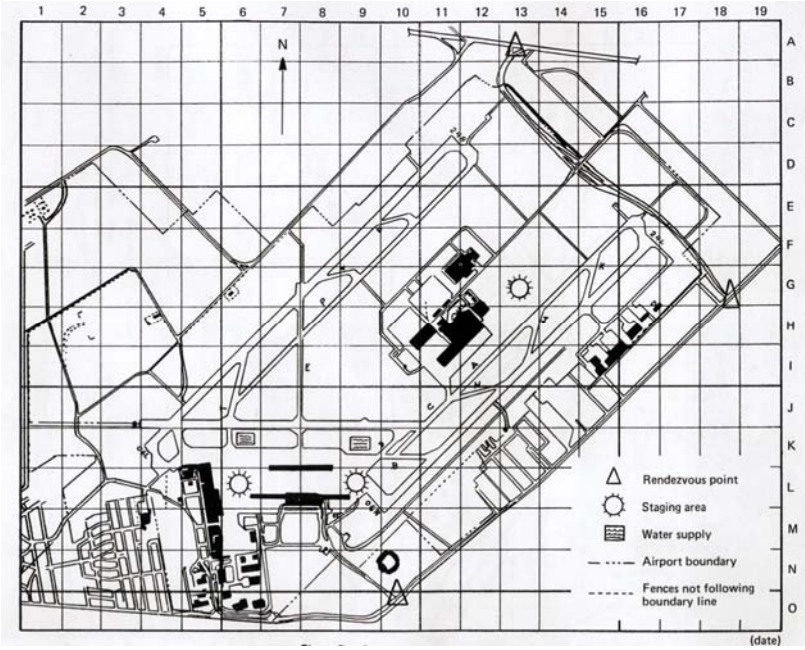

Fig. 2.3.11-1 First ICAO Graph Map of the Airport and Off-Airport Areas

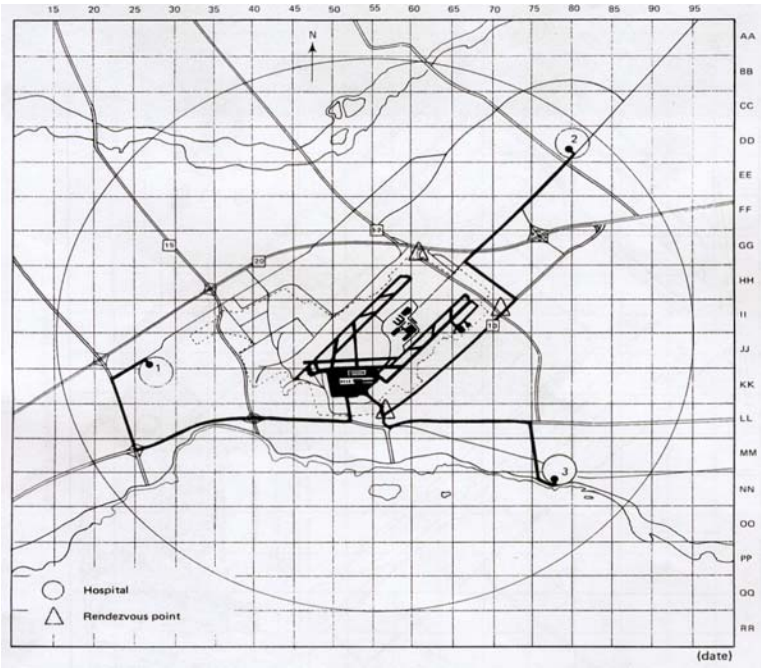

Fig. 2.3.11-2 Second ICAO Graph Map of the Airport and off-Airport Areas

A look at the CKS Airport medical rescue support group and capabilities' form of the "Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure" described that its graph map did not show the abovementioned water supply locations, preplanned waiting points, and staging areas, at least 8 km. of land around the airport, which included its topography, its road systems, hospital locations, materials, waiting points, and other information. The hospitals shown in the graph maps might also show the number of beds that could be utilized, fields of specialization, manpower, and other information.

2.4 Implementation of airport emergency procedures

2.4.1 Transmission of pilot's incapacitation

According to cockpit voice records, at 0815 the co-pilot discovered that the pilot's right cheek was trembling and his entire body was leaning towards more to the left, the face was upturned, the eyes under the sunglasses were slightly opened, breathing was heavy. At 0816-0817, the copilot communicated with Taipei Area Control Center to request for return to Taipei, saying that the pilot is incapacitated and requesting that an ambulance be placed on standby. According to the ground communication records of area control center/CKS parking bay/CKS tower/CKS aviation services (thereafter simply referred to "ground communication records" as in Appendix 5), at 0817, the Taipei Area Control Center informed CKS tower CI681 has a sick passenger onboard, that the aircraft was returning to Taipei and that there was request for an ambulance to

standby. At 0818, the tower informed airline service crew of the same news. Because the Taipei Area Control Center delivered the wrong information to the tower as and in turn, to the aviation service crew, OK area control center misunderstood the request of the co-pilot.

It was until 0825 that China Airlines (Asian Dispatch Center) informed the CKS Airport aviation services crew it has been confirmed that it was the pilot who lost consciousness. It was only at that point in time that the CKS aviation service crew and the airport central control center notified the units to start firefighting and search and rescue proceedings. The incapacitation of the pilot and the aircraft having to return to base poses a very big potential threat. With the transmission of faulty information, then later to be modified, time needed to prepare and adapt to the situation was severely reduced.

2.4.2 Announcement of emergency situation

At 0816, the co-pilot found out that the chief pilot was incapacitated and used the word “Incapacity” in informing airport management personnel. At 0831, because there were other aircrafts, which have requested “Priority,” nobody knew that the aircraft had an emergency situation until it landed. Based on Chapter 9 Section 9-1-1 of the Aviation Control Procedures, the decision for emergency situations are as follows:

Emergency situations may be perilous or urgent in nature, the definition of which is included in the pilot/ control personnel dictionary. (Emergency situation may refer to perilous or urgent)

b. When a pilot encounters a perilous situation, he/she should use the word “MAYDAY” in the initial radio communication to signify that there is an emergency situation, ideally repeating it three times. When the situation is urgent, the word to use is “PAN-PAN,” again following the same process.

c. If neither “MAYDAY” nor “PAN-PAN” is used, but the control personnel suspects that this situation may turn into something urgent or perilous, he may act accordingly.

The Flight Safety Foundation published the Airport Operation Magazine Vol. 26, No.3 in March-April 2000. Said magazine offers some standard language that aviation personnel can use when announcing any emergency situation. (See Appendix 19)

Chapter 14 of China Airlines’ aviation handbook states that radio communication

procedure during an emergency situation is “MAYDAY” for perilous situations and “PAN-PAN” for urgent situations.

Only Chapter 3 of China Airlines’ aviation handbook on the handling procedures of personnel incapacitation as a medical emergency and Chapter 14 on radio communication procedures during emergency situations do not state what the conditions are for announcing a perilous or urgent emergency situation. According to aviation control procedures, the incapacity of the pilot constituted an emergency situation; however, the co-pilot did not inform airport management personnel or Asian Dispatch Center personnel that this situation was an emergency situation, which affected the procedure.

2.4.3 Handling of Full Emergency Incidents

Because the pilot was incapacitated, the co-pilot landed the aircraft, which was very dangerous. In the categorization of emergency situation by the International Civil Aviation Organization, this incident should fall under Full Emergency. When the aircraft landed prematurely, there was a risk of failure, the level barely at the solution procedure at the time of the incident. Only because it did not standardize emergency procedure for such situations and categorization of the incident was different, the procedure for communication or for each unit was not comprehensive.

2.4.4 Transmission of request for ground towing car and read back procedures

According to the cockpit communication records, shortly after the co-pilot requested for a return to base form the Taipei Area Control Center, the co-pilot told the Asian Dispatch Center of China Airlines that the pilot has lost consciousness and that he was requesting that ground support prepare a towing car to be on standby on the runway at 0821. (At 0821:36, the co-pilot said to the Asian Dispatch Center, “681 return to Taipei. The pilot has lost consciousness. I am now returning to land in Taipei. Request tow car to be on standby on the runway. I don’t want to taxi the aircraft…” In order to ensure taxi safety, the flight personnel may not taxi the aircraft alone, according to company policy. The co-pilot pointed out that he needed the towing car to be on standby by the runway, to pull the aircraft to the parking bay.

Interviews conducted with the Asian Dispatch Center people working during that shift reveal that they did not hear the co-pilot request for a towing car to be on standby by the runway. Consequently, when the aircraft landed safely at about 0850, there was no towing car for support. It was only until 0852 when tower asked the co-pilot if he needed a towing car for assistance and reminded the co-pilot to ask the Asian Dispatch Center on how it is progressing with the towing car. It was only then that the

Asian Dispatch Center asked for a towing car from the China Airlines' aircraft services and Tao Yuan Logistics Center. The towing car requested form the Tao Yuan Logistics Center arrived at 0901 and at 0904 started towing the aircraft.

The only rule known and followed by all in land-to-air communication process is the read back procedure, which confirms transmitted materials on both sides to make sure there are no misinterpretations. If we take a look at the related information on land-to-air communication found in the China Airlines' airline services handbook (Chapter 13), the medical emergency situation of flight safety and safety management (Chapter 3), and flight assignment (Chapter 5) and other chapters related to emergency responses, we see that there is no read back procedure to ensure that information during an emergency situation can be relayed accurately. At the same time, because of the miscommunication on the towing car that occurred between the co-pilot and the Asian Dispatch Center personnel, it resulted in the co-pilot requesting for a towing car to be on standby while he was still up in the air at 0821, and the towing car coming in nine minutes later after the aircraft landed at 0852.

2.4.5 Transmission of runway designation

According to the cockpit communication records, at 0823, the co-pilot first contacted the Taipei Area Control Center East Division requesting to land on the Runway 05 Left. At 0824, the co-pilot first contacted the Taipei Area Control Center West Division requesting to land on the Runway 05 Left. With confirmation form the East Division, the co-pilot requested for Priority Landing, citing a sick passenger as reason. At 0836 the Taipei Area Control Center West Division requested that landing be made on Runway 06. The co-pilot immediately made a repeat request and was granted permission that Runway 05L be used. The request for a specific runway and the granting of the permission were repeated three times. There were discrepancies in the transmission of information between the co-pilot and aviation control personnel. According to the record of the firefighting crew, at 0825, airport control requested that the airport ambulance be on standby at Parking bay 608. At 0830, the firefighting crew instructed the firefighting truck and the ambulance to go Runway 06. They completed all preparations by 0835. Firefighting team records show that at 0842, the tower informed the firefighting team to transfer to Runway 05L, preparations were complete at 0845. Understanding of the information as well as the transmission error resulted in the ground response time being sharply reduced, affecting the overall affectivity of the emergency responses.

2.4.6 Training of medical coordinator

Section 3.6.3 of the ICAO Airport Emergency response Handbook speaks about the

operations procedure that the medical coordinator would have to implement in order to be able to control the medical situation in the accident site. This medical coordinator should be an airport medical personnel and he can designate as temporary coordinator one of the airport paramedics who can be on the site the soonest time possible.

The Chiang Kai Shek Airport has not set any medical operation procedure for emergency incidents. However, the “Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure” has designated personnel from the airport clinical department of Min Shen Hospital as medical coordinator. This medical coordinator should assign doctors, nurses, ambulances, to the accident site and establish an emergency injury examination center, coordinate command support agency (medical institutions belonging to the emergency medical rescue network of the Tao Yuan area), examine and categorize injuries, and send the injured to the appropriate hospitals.

After the incident, the medical coordinator we interviewed said that he never read through the “Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure,” and has never received training on how to set up an emergency injury examination center, coordinate command support, send the injured to appropriate hospitals and other responsibilities.

Looking at the “Implementation Highlights of CKS Airport Aircraft Accident and Incident Handling Procedure,” it does not designate one of the airport emergency personnel as temporary medical coordinator. Whoever the airport designates as the medical coordinator, any one of the participating medical personnel should be familiar with emergency medical procedures.

2.4.7 Designation of the aircraft parking bay

081748 Taipei Area Control Center informed the tower that CI681 that a sick passenger is requesting that an airport ambulance be on standby. 081823 Tower informed the airline services team on shift on parking bay 681 to return to base, that there is a sick passenger, and that the aircraft was requesting a specific parking bay. After conferring with the Tao Yuan prosecution office, 082339 airline service department head briefed the tower to assign parking Bay 608 BAY ferry parking bay. Based on interviews with airline services personnel, at this stage, parking Bay 608 was selected because the emergency personnel believe that the passenger was in dire need of emergency help and the other parking bays were already full; moreover, parking Bay 608 was closer to runway 06. The “Important Points in the CKS Airport

ferry of goods and passengers in the domestic lines and overnight adjustment of aircraft position" as well as the "Management Regulations of CKS Airport Ferry Parking bay Procedures" did not show that aircrafts returning to base should be limited to stopping at ferry parking bays. 082510-airport service department confirmed that the pilot has lost consciousness; the only inadequacy was that after the aircraft landed, the company refused to allow the co-pilot to taxi it. At 0826, tower informed airport services department that said aircraft had already landed at Runway 06, the distance of which was closer to Parking Bay 608, resulting in the airport services crew not being able to change to the parking bay where the aircraft was closer. According to the firefighting team, at 0842, the tower informed the firefighting team that the aircraft would be landing on Runway 05L instead, but when the aircraft started emergency landing procedures, the airport service crew was not any closer to the landing parking bay to shorten the time in sending the injured to the hospital because of the change.

2.4.8 Airport Emergency Rescue Procedures and the Command of Accident Site

The chief of Flight Operations Section of Chiang Kai Shek Airport was the on-site commander.

The ground-to-ground communication indicated that at 0818 the Flight Operations Section of CKS Airport received instruction from the tower that a sick passenger was carried on board. At 0823:39 the Flight Operations Section of CKS Airport informed the tower that the aircraft was assigned at transit-Bay 608. Records of the firefighting department showed that at 0825 the airport central control center informed the airport ambulance to go on standby at parking Bay 608. Till at 0830, it was confirmed that a pilot was incapacitated on board. At 0842 the ambulance was asked to change the standby position to the side of the runway. At 0920, the aircraft was towed to parking Bay 608, with the ambulance trailing behind the aircraft.

The medical coordinator designated by the airport (from the airport clinical department of Min Shen Hospital) was informed by China Airlines at 0830 for emergency. At 0840, China Airlines staff escorted the coordinator to Bay 608 for standby. The medical personnel stayed at Bay 608 until the aircraft towed in. The coordinator based on the "Implementation Highlights of the Procedures of CKS Airport Accident Handling," the designated medical coordinator should be informed by the central control center and controlled by the Accident Site Commander, Chief of Flight Operations Section" However, the site commander was not able to directly communicate with the medical coordinator.

At 0822, the Asian Dispatch Center of China Airlines was informed that the pilot had

lost consciousness. At 0835, it informed the Tao Yuan Ground Service Company that a passenger had lost consciousness and would need supporting equipment to hoist and lower the person. At 0840, the stretcher and the host and lower equipment were already on standby at parking Bay 608. Until 0920 the aircraft was towed to parking Bay 608, where the equipment awaited the patient. The site commander did not command the stretcher as well as the hoist and lower equipment to standby on the runway and to assist the medical personnel to immediately escort the patient down the aircraft.

At approximately 0852, the aircraft landed and stopped at the runway, the site commander did not communicate with the cockpit directly through radio. The cockpit and ground communication lines, those capable of communicating with the cockpit, were with the ground crew who came to the side of the aircraft together with the towing car. The site commander had to go through the tower to communicate with the cockpit and the co-pilot had no idea of what kind of emergency support the airport could provide. The commanding instructions and information of the site could not be transmitted clearly and timely.

The site commander was able to contact firefighting and medical units and put them on standby. After the aircraft came to a stop, the site commander was, because of poor communication with the cockpit, not able to know the reason why the aircraft was not able to taxi to the aircraft-parking bay. He did not command a stretcher and the medical coordinator (medical personnel from the airport clinical division of Min Shen Hospital) to go to the runway with the ambulance to provide support services by carrying the patient on a stretcher down to the aircraft and rushing him to the hospital. The site commander was not in a position to fully take position to initiate the real-time rescue immediately after the aircraft landed Moreover; such similar medical emergency procedures were not seen on the related Airport Emergency Response Manual.

Chapter 3
Conclusions

3.1 Findings

1. The captain held a physical certificate and a certificate of the aircraft rating issued by Civil Aeronautics Administration (CAA). The physical certificate showed no specific restrictions or any record of waiver. (1.5.1)

2. According to the data of his heavy weight, age, hyper lipidemia and smoking habit in his physical examination record, the pilot was grouping to a high potential cardiac patient. (1.13.3,1.13.4)

3. The incapacitated pilot made no remarkable improvement to the suggestions of the physical examination doctors.（1.13.3）

4. There was no pilot's recent medical history dated before his coming to work in Taiwan.

5. The track cardiograph of the pilot physical examination record showed no symptoms of myocardial infarct. The Aviation Medical Center did not have to conduct the follow-ups in accordance with the Procedures of Physical Examination of CAA. (1.13.5,2.2.6)

6. The pilot's working hours, flying hours, and Rest time were totally in accordance with CAA laws. The flight crew who flew with the said pilot in one or two days before the incident said that he did not exhibit any irregularity at work. (1.5.2)

7. The medication the captain carried with him showed no toxic ingredients or any cardiac-healing medicaments. (2.1.1)

8. The cause of death of the pilot was coronary artery occlusion, i.e., a natural death. (2.1.2)

9. The first officer conducted the flight with autopilot. The weather of the day was fair and the aircraft was in airworthiness condition. Before the incident, no flight crew had extra workload and the captain was under regular pressure of work. (1.1,1.6.2)

10. When the pilot incapacitation happened, the first officer proceeded with the airlines' incapacitation procedures and landed the aircraft safely with auto-land system at CKS International Airport. However, the first officer failed to use emergency phraseology to report the serious incident. (1.1,1.15.2,1.15.6)

11. As the captain experienced the incapacitation, the flight attendants that entered into the cockpit had good cooperation with copilot and kept performing cardio pulmonary resuscitation (CPR) to the captain. (1.15.3)

12. The doctor on board performed first aid to the captain and found that the captain had incontinence of urine, mydriasis, no heartbeat and pulse reaction. (1.15.3)

13. The CKS International Airport provided medical personnel and facilities and maintained a medical cooperative contract with MinShen Hospital. The CKS Airport also provided procedures for seriously ill passengers to quickly pass the immigration. However, there were no medical treatment operation procedures established in CKS Airport. (1.13)

14. In the "Civil Aircraft Accident Procedure Highlights" of the CKS International Airport, it stipulated that medical service in airport was the responsibility of the contracted Mingsheng Hospital. However, the said Highlights failed to describe the duties and detailed procedures of the medical service team. (1.13,2.3.10.1)

15. The air traffic controllers at Taipei Area Control Center failed to understand the message of incapacitation sent by the first officer of the aircraft. They relayed a wrong message of a seriously ill passenger to the airport authority. Again, the first officer made requests twice to land on Runway 05-Left, however, the air traffic controllers answered runway in use 06. It was observed that the air traffic controllers failed to comprehend the message sent by the first officer and that severely affecting the following emergency operations on ground. (1.15.6, 2.4.1,2.4.5)

16. The CKS airport authority failed to offer the nearest parking bay available for the emergency response servicing. (2.4.7)
17. CAL's Asian Dispatch Center personnel failed to fully communicate with the first officer and keep close contact with the CKS International Airport authority. CAL's Asian Dispatch Center personnel failed to response properly for saving the time to comply the request of the officer to call towing vehicles to stand by the runway. It made the aircraft wait for towing vehicles for as long as 9 minutes (0852-0901) on the runway. (1.15.6,1.15.6.1,2.4.3,2.4.4)

18. The commanding vehicle at the scene had no two-way radio for communications with the aircraft that made it impossible to know immediately of those emergency responses such as that the first officer was not authorized to taxi, the condition of the sick person and the intention of the aircraft commander. (1.15.6.2,2.3.8)

19. CKS Airport had the "Implementation Highlights of CKS Airport Accident and Incident Handling Procedure", the "Civil Aviation Accident Notification Procedures," the "CKS Airport Transit Procedure for Emergency Sick Passengers," and the" Firefighting Operation Handbook". However, there was no such " Full Emergency Operation Procedures" as recommended by International Civil Aviation Organization. (1.18.1,2.4.3,2.4.6)

20. The aircraft landed and came to a completely stop at 0852. The incapacitated pilot was carried to the ambulance at 0936. The whole emergency process took 44 minutes. (2.3.4,2.3.10.1)

3.2 Probable Causes and Contributing Factors

Probable Causes

The pilot's natural death was caused by heart rhythm disorder that was triggered by acute cardiac artery occlusion.

Contributing Factors

1. There were no follow-up actions to further remind the pilot who belonged to the high-risk coronary disease group.
2. According to the pilot's physical examination records, the pilot made no signs of substantial improvements to his health.

Chapter 4

Recommendation

4.1 Interim Flight Safety Bulletin

The Aviation Safety Council has already issued an Interim Flight Safety Bulletin (ASC-IFSB-89-05-1) dated May 19, 2000 as listed in Appendix 15.

4.2 Recommendations

To China Airlines

1. To require the pilots to make substantial progress to the suggestions from their medical examination doctors (ASC-ASR-00-12-011)

2. To refer to the FRAMINGHAM HEART STUDY and other systems in evaluating whether the pilot belongs to a high-risk group of potential victims of cardiovascular diseases and in making recommendations on how to maintain good health. (ASC-ASR-00-12-012)

3. When hiring new pilots, the airlines should request for their recent medical histories for the aviation medical examiner's reference and follow-up. (ASC-ASR-00-12-013)

4. In case of emergency, the standard phraseology should be used in the communication between pilot, air traffic controller or relevant personnel. (ASC-ASR-00-12-014)

5. To enhance the ground personnel's emergency response training and communication with the airport authorities. (ASC-ASR-00-12-015)

To Civil Aeronautics Administration, Ministry of Transportation

1. To require the physical examination agencies to provide follow-up and controlling regulations over the high risky pilots suffering potential cardiac diseases. (ASC-ASR-00-12-016)

2. To require the airlines or contracted aviation medical agencies to establish the follow-up system to the suggestions of physical examiners. (ASC-ASR-00-12-017)

3. To improve the training of Air Traffic Controller in communication and message understanding during emergency. (ASC-ASR-00-12-018)

4. To refer to the methods and procedures for emergency responses of international standard and international airports to review exhaustively the emergency response plans and procedures used presently by our airports. In addition, to establish guidelines, providing them to every airport in order to modify their emergency response plans and procedures. (ASC-ASR-00-12-019)

5. To improve the emergency response operational plan, procedure, and the training of personnel in and out of the accident site in emergency medical treatment. (ASC-ASR-00-12-020)

6. To establish the cable and radio communication equipments as well as the operation procedure for the communication between the site commander and the flight crew. （ASC-ASR-00-12-021）

Appendix 1 CVR Transcript

Taiwan Time: Cockpit recorder time is the same as that of the time of the Taipei Area Control Center

ATC Time: Transcript time is provided by the Flight Operations Section Control Center,

CAPT: Chief Pilot，FO: Co-pilot， FA: Flight Attendant，WR: West Control Center，ER: East Control Center，AREA: Cockpit area microphone，C1: Taipei Parking bay，C2: Taipei tower，C3:Taipei ground control parking bay，GND: Towing car Ground Crew，677: China Airlines Flight CI677，OP: China Airlines' Asian Dispatch Center

Time	By	Contents
8:00:18	WR	CI681, proceed direct to TNN, resume own navigation。
8:00:22	CAPT	681 direct to TNN, thank you。
8:07:40	WR	CI681, contact Taipei Control 130.6。
8:07:44	CAPT	130.6, Thanks good day, CI681。
8:07:48	WR	Good day。
8:07:54	CAPT	Taipei, morning, CI681 with you FL310。
8:07:59	ER	CI681, Taipei Control, 10 miles north of TNN, maintain FL310, and cleared from Parpa direct Kapli, flight plan route。
8:08:08	CAPT	Parpa to Kapli, CI681。
8:08:32	CAPT	Good morning ladies and gentleman. This is your captain speaking. On behalf of entire our crew, welcome aboard China Airline Airbus Flight 681 from TPE to Hu Chi Min city. Now we are maintaining our cruise altitude of 31thousand feet, average ground speed 570 miles per hour. Estimate time arrival Hu Chi Min at morning 0950. There is a one hour time different between Taipei and Hu Chi Min Local time is 8 minutes past 7 in the morning. Weather forecast at Hu Chi Min airport is 28 degree Centigrade about 82 degree F. Please enjoy your flight. Thank you.
8:09:30	FO	No change

8:09:37	FO	Is 30 and 45 for departure?
8:09:41	CAPT	Yeah.
8:12:56	CAPT	Do you have……something
8:12:59	FO	Yes
8:13:01	FO	You want to fly by yourself?
8:13:03	CAPT	Oh no.
8:13:09	CAPT	This is what we need.
8:13:11	FO	Ah ?
8:15:19	FO	Are you all right?
8:15:22	FO	Captain!
8:15:32	FO	Please come in
8:15:39	FO	Are you all right?
8:15:48	FO	Check and see how he is
8:15:54	PR	What is happening to him?
8:15:58	PR	Are you ok? Captain
8:16:07	PR	Captain
8:16:13	FO	I am going back to base, ask somebody to come in and help.
8:16:19	PR	Can you land?
8:16:20	FO	Yes…Yes…Yes…
8:16:21	FA	Captain isn't feeling well?
8:16:22	PR	Yes…
8:16:24	FO	Taipei Control, CI681。
8:16:28	ER	CI681, go ahead。
8:16:30	FO	CI681, got some problem, we need turning back to Taipei, and also request ambulance stand by at Taipei。
8:16:39	ER	CI681, say again your reason return to Taipei?
8:16:44	FO	The captain incur incapacity, we need ambulance stand by in Taipei, and currently just passing Parpa 310, we need radar vector back to Taipei。
8:16:53	ER	CI681, roger, and cleared from present position right turn, turn right direct to TNN, focus one arrival to TIA, stand by for descent, over。
8:17:08	FO	Roger, right turn direct to TNN, focus one arrival。
8:17:14	ER	CI681, and request ambulance, request how many ambulance?
8:17:21	FO	One ambulance the captain is incapacity, and we need turning back ambulance one, one ambulance stand by, please。
8:17:28	ER	CI681, roger。
8:17:54	PR	How long will it take
8:17:56	FO	Approximately.30 minutes
8:17:58	PR	Do we dump the fuel for 20, 30 minutes?
8:17:59	FO	This lane has not dumped its fuel. We are going to do an

		overweight landing
8:18:07	PR	You need about thirty minutes?
8:18:08	FO	We will try our best to prepare in thirty minutes, because we have no time to predict his actions
8:18:12	PR	Ok
8:18:16	FO	I have no time to make a broadcast. Please make the broadcast for me.
8:18:18	PR	Ok, we will use your name; don't mind us.
8:18:31	PR	How can it happen like this?
8:18:32	FO	After the takeoff…suddenly…he tried talking and…..
8:18:47	ER	CI681, do you prefer to descend now?
8:18:51	FO	CI681, Stand by。
8:19:04	PR	Do you need my help?
8:19:06	FO	It's not necessary. This should be ok, thank you. If moving him is inconvenient, please help him buckle up his harness to prevent him from falling forward and blocking my way.
8:19:17	PR	Do you want me to move him?
8:19:19	FO	If you can move him. If not….
8:19:21	PR	I can.
8:19:31	FO	Close the door. Don't let the passengers know.
8:19:36	PR	Let's lift him outside. Who is going to help me to lift him?
8:19:43	ER	CI681, cleared from present position direct to TIA, direct TIA, over。
8:19:50	FO	CI681, roger。
8:20:04	FA	Loosen that cart and help me put him…pull the cart over… pull the cart over and the we will put him…..
8:20:22	FO	Try not to bump into my controls
8:20:52	FO	CI681 roger. Frequency change for only five minutes to report the company。
8:21:00	ER	CI681, roger what?
8:21:03	FO	Request change frequency for 2 minutes to contact company。
8:21:08	ER	CI681, roger, approved, and cleared descend and maintain FL290, over。
8:21:13	FO	290, roger, leaving now。
8:21:15	ER	Roger。
8:21:19	FO	Operation, CI681
8:21:27	FO	Operation, CI681
8:21:34	OP	681 Go ahead, Sir
8:21:36	FO	681 Returning to Taipei. The pilot has lost consciousness. I want to land in Taipei. After landing, please have the towing car on standby beside the runway. I don't want to taxi the aircraft. The situation is a bit hectic, I don't have time to prepare.

8:21:47	OP	When do you expect to reach the airport, sir?
8:21:49	FO	We are currently leaving West Harbor, should reach the airport in about 20 minutes.
8:21:55	OP	Sir, if you have a minute, please tell us the seat number of the patient so we can tell the transport team.
8:22:00	FO	It's not the patient, it's the pilot who is unconscious……We are turning back…….. I don't have time to talk with you anymore…. Please prepare an ambulance and a towing car…hat's all…Thank you.
8:22:07	OP	Copy
8:22:09	FO	Taipei Control, CI681 back on frequency。
8:22:14	ER	CI681, roger, remain this frequency, and proceed direct to TIA, over。
8:22:20	FO	Present position direct to TIA, and descend passing FL300 to FL290。
8:22:25	ER	CI681, Roger。
8:23:24	FO	Taipei Control, CI681 reach and maintain FL290.And possible request long final for runway 05L
8:23:32	ER	.7 for further, over。
8:23:39	ER	CI681, contact Taipei Control 126.7 for further, over。
8:23:44	FO	126.7, CI681, thank you!
8:23:47	ER	You are welcome。
8:23:49	FO	Taipei Control, CI681 maintaining FL290。
8:23:53	WR	CI681, Taipei Control, Roger, 30 miles south of Shikang, descend and maintain FL270。
8:24:00	FO	Descend and maintain FL270, CI681。
8:24:04	FO	Taipei Control if possible, 681 request long final for runway 5L。
8:24:09	WR	CI681, copy, and do you need fuel dumping?
8:24:13	FO	Negative, Airbus unable dumping fuel。
8:24:17	WR	Thank you.
8:25:52	WR	CI681, Fly heading 360 for vector to final approach course, maintain FL270
8:25:59	FO	Heading 360,and maintain FL270 CI681
8:27:15	FO	Taipei Control, CI681, any chance direct to Karan？
8:27:20	WR	CI681,say again your request？
8:27:22	FO	Request direct to Karan.
8:27:27	WR	You mean the Karan？
8:27:28	FO	Yes, affirm.
8:27:30	WR	CI681, can you accept direct to "Bravo".
8:27:34	FO	Affirmative thank you, direct to "Bravo"
8:27:36	WR	Affirmative, direct to "Bravo"

8:29:06	WR	CI681, descend and maintain FL250
8:29:14	WR	CI681, descend and maintain FL250
8:29:19	FO	Descend and maintain FL250, CI681, thank you
8:29:23	FA	How much more time does the officer need?
8:29:25	FO	About twenty minutes.
8:29:26	FA	That long!
8:29:27	FO	I'll try to be as fast as I can, but any faster and there will be danger to the structure.
8:29:29	FA	You're going to be in danger. Well, safety should be our foremost priority. Any way, the Captain can still be saved.
8:29:35	FO	What is his current situation?
8:29:37	FA	It doesn't look good. If you arrive immediately, there may be hope, but if you come a little later, it may be too late to save him.
8:29:42	FO	Okay.
8:29:44	FA	Is there is an ambulance on the ground waiting?
8:29:46	FO	Yes…yes…yes
8:29:47	FO	Find a… How's your English, young man?
8:29:51	FA	It's not that good!
8:29:52	FO	Let's do it this way, please sit at the side. Now…please get the microphone…Are you familiar with the putting on the earphones and making contact with Operations.
8:30:01	FA	I'll be there in a short while.
8:30:09	FO	Taipei Control, CI681
8:30:39	FO	I don't know…He was okay when we took off. I saw after he changed course… I thought he was blowing something…I asked him…I saw he was like…snoring.
8:30:49	FA	He fell asleep? Or did he lose consciousness?
8:30:51	FO	His eyes were open…I thought he was playing a joke on me. Afterwards…
8:30:55	FA	He scared you.
8:30:56	FO	It was just the feeling…I thought he was playing a joke on. He plays jokes on me every time we fly together…
8:31:00	WR	CI681, traffic 2 O'clock 10 miles south bound, flight level 240.
8:31:05	FO	Say again flight level?
8:31:17	FO	CI681 got the traffic on TCAS, and also approaching FL250, request priority for landing, and the patient in critical condition.
8:31:26	WR	CI681, roger.
8:31:28	FA	OK, what do we do now, sir?
8:31:30	FO	Now you help me adjust a bit
8:31:32	WR	CI681, no ATC restriction on speed.
8:31:36	FO	681, roger, and maintain FL250

8:31:40	FO	You are on the Operation frequency, Asian Dispatch Center because I can hear what you're saying at the background. Talk to Operation.
8:31:48	FA	Are you now connected to the Asian Dispatch Center?
8:31:52	FO	Yes, tell him that we'll be there in twenty minutes.
8:31:53	WR	CI681, descend and maintain FL 230.
8:31:57	FO	Descend and maintain FL230, CI681.
8:32:01	FO	Get in contact with the company.
8:32:02	FA	Yes…Yes…Yes, you should tell him.
8:32:04	FO	OK
8:32:05	FA	Do I need press anything? No?
8:32:07	FO	You need to press a little bit
8:32:08	FA	Which button do I press in front?
8:32:09	FO	Don't press the others. Don't press the red button. This one, press it backwards.
8:32:12	FA	Pull it back
8:32:14	FO	Pull it inwards
8:32:15	FA	Pull it inwards and it should be okay to talk. Now, get in line with the Asian Dispatch Center.
8:32:18	FO	Pressing forward this way should be okay; it's safer.
8:32:20	FA	Hold this.
8:32:21	FO	Press forward then let go.
8:32:23	FA	Can this connect to the Asian Dispatch Center
8:32:25	FO	Talk to it while you're pressing it.
8:32:26	FA	Asian Dispatch Center
8:32:29	OP	Please speak
8:32:31	FA	We let go when he speaks, right? Do we let go?
8:32:32	FO	Yes.
8:32:34	FA	Asian Dispatch Center, this is the team at 681. Our Captain felt unwell shortly after takeoff and he has lost consciousness. We have put him on G1 and asked a physician to give him emergency medical treatment. We shall be landing at Taipei Airport in about twenty minutes.
8:32:50	OP	681, message received. Acknowledge content. We have already informed responsible agencies to prepare everything. Continue with your procedures.
8:33:02	FA	The Captain's current situation does not look good. The doctor says it does not look good. We have to land within the shortest time possible and emergency equipment must be on standby to receive him. It's the only way we can save him…
8:33:12	OP	OK, we have already made all arrangements. Allow us to ask another question, "is it the FO Li, Shin Tsai, who's flying the aircraft?"
8:33:19	FA	Yes, the FO is flying the aircraft. I am not the FO; I'm the flight attendant.

8:33:24	OP	Copy.
8:33:28	FO	It's like this, all you have to do is help me at that aspect. Because you have to monitor my situation. There is a emergency button down there, if…
8:33:35	FA	If I hear him, then I see you operating, right?
8:33:37	FO	If the situation is abnormal, I'm telling to do just two things. First, to press this button. Just to press this button…
8:33:43	FA	What kind of button is this?
8:33:44	FO	This is to maintain high altitude
8:33:45	FA	Maintain high altitude
8:33:46	FO	Right. And then turn the second button to 250.
8:33:49	FA	250, just turn this, right? Turn downwards, but not now.
8:33:53	FO	Now turn from 315 to 250 and make sure that the two lights are on.
8:33:57	FA	To ensure the two lights are on, we need to press only one, not two, just one.
8:34:01	FO	Press it down and it should be okay.
8:34:02	FA	Press it down.
8:34:03	FO	Just make sure these lights are on.
8:34:04	FA	Ok, these two lights…If altitude is to be maintained, this is the switch, right?
8:34:08	FO	And then, all that remains to be done is to get in touch with the tower following the procedure we did just now. Get in touch with the OD. If something happens to me, ask him for assistance.
8:34:14	FA	Ok, ok, ok
8:34:16	FA'	How long before you land?
8:34:18	FA	About 15 to 20 minutes.
8:34:19	FO	About 15 minutes
8:34:22	FO	Have we already made the announcement at the back?
8:34:24	FA	I afraid to make the announcement. If the guests knew, I don't know how they will react…
8:34:27	FO	Just tell them we're turning back, that's it.
8:34:28	WR	CI681 descend and maintain FL170
8:34:30	FA	Ok, then I will tell them that we're turning back, ok?
8:34:33	FO	Descend and maintain FL170 CI681
8:34:35	FA	The Interphone is there, I'll use the intercom to tell them we're turning back.
8:34:40	FO	Let me do the announcement.
8:34:41	FA	You're doing the announcement? Ok!

8:34:50	FO	Ladies and gentleman due to aircraft maintenance problem, we have to return back to Taipei International Airport. About landing at CKS Airport about 15 minutes from now. Sorry for the inconvenience.
8:35:20	FA	It's closed.
8:35:23	FO	This is okay.
8:35:24	FA	The light is not on, is it okay?
8:35:28	FO	It's okay, I am going to land right now.
8:35:31	WR	CI681 descend and maintain FL150
8:35:35	FO	Descend and maintain FL150 CI681
8:35:47	FO	You just monitor my situation ad the operation of the aircraft will not be a problem. After I land, I need you to look at several things for me, which I may not look at if I were communicating with the other party when I land. There should be two green lights here. If there's none, then should ask me. That's all.
8:36:12	FA	If the two green lights don't it up, then I should tell you.
8:36:13	FO	Right.
8:36:14	FA	There are two green lights, one at each side, right? At approximate below how many thousand miles?
8:36:17	FO	No…No…if , after touchdown, you do not see a green light after 3 to 4 seconds, then shout.
8:36:24	FA	There should be a green light right after we touchdown. — Touch down
8:36:25	FO	Just call my name and I'll know.
8:36:29	FA	Then you should have another step.
8:36:30	FO	That should be to pull the Reverse lever
8:36:33	FA	Reverse, it won't lit up if you don't pull it.
8:36:35	FO	Our aircraft is very heavy. I don't want to use too much runway space. I'll try to send the Captain home as fst as possible.
8:36:40	WR	CI681 descend and maintain FL150
8:36:44	FO	Descend and maintain FL150 CI681
8:36:46	WR	CI681 affirmative and depart B DME fix turn right intercept ILS runway 06 final approach course by yourself
8:36:56	FO	CI681 confirm can we request 05L
8:36:59	WR	Stand by
8:37:11	FO	Help me if the marker there is Cat II or not.
8:37:15	FA	It's Cat II.
8:37:16	WR	CI681 depart xerox correction, depart B DME fix intercept runway 5L localizer over
8:37:25	FO	Depart B intercept 5L localizer CI681 thank you

8:37:29	WR	You're welcome.
8:37:38	FO	Now, please draw the two curtains. Thank you.
8:37:41	FA	These two?
8:37:41	WR	Break, CI681 contact Taipei Approach 125. 1 see you
8:37:44	FO	It's up to you, please.
8:37:45	FA	No, no, everybody's in on this.
8:37:51	FO	CAL 681, this is Assignment Center over…
8:37:54	FA	Assignment Center is calling
8:37:57	FO	Assignment Center is calling 681? Why don't you talk to him?
8:38:00	WR	CI681 Taipei
8:38:02	FA	CI681, go ahead.
8:38:03	FO	CI681go ahead
8:38:03	FO	681 go ahead
8:38:04	WR	CI681 contact Taipei Approach 119 ,correction 125.1 over
8:38:10	FA	You're coming through clearly. Plase repeat.
8:38:10	FO	125.1,CI681 good day
8:38:13	WR	Good morning
8:38:15	C1	CI681, Taipei
8:38:16	OP	The assistant pilot is using Auto landing
8:38:17	FO	681, CI681 with you, passing FL178 for 150.
8:38:23	FA	FO and the officer are now talkikng to each other. Please repeat.
8:38:23	C1	CI681 Taipei Approach, ident, descend and maintain 11 thousand, Taipei QNH 1013 runway 05L.
8:38:26	OP	Please the FO to use Auto Landing.
8:38:31	FO	1013 ,11 thousand, descend 11 thousand, CI681 thank you, say again wind.
8:38:37	FA	Please repeat now, okay? We were on the line just then and did not hear what you said.
8:38:38	C1	CI681 now the wind is 070 at 14.
8:38:43	FO	Thank you.
8:38:44	FA	He wants to talk to you now?
8:38:46	FO	OPS, CI681 go ahead
8:38:52	OP	They are requesting for Auto land.
8:38:53	FO	Autoland roger. First, let me tell you that according to procedure, Auto land is not recommend. But as you have made a request, basically I will monitor you. There shouldn't be any problems.
8:39:09	OP	Our department head and chief mechanic hope he can use Auto land to land the aircraft.
8:39:11	C1	CI681 descend and maintain 4000.
8:39:15	FO	Roger, you tell him that I'm now overweight. I will implement Auto land. If things are not normal, I will abort.

8:39:19	OP	Roger, thank you.
8:39:19		CI681 descend and maintain 4000.
8:39:24	FO	Confirm 681 descend to 4000.
8:39:26	C1	CI681 affirmative, descend and maintain 4000.
8:39:30	FO	Descend And Maintain 4000, CI681, and request high speed below one zero thousand.
8:39:34	C1	CI681 approved as requested.
8:39:37	FO	CI681 thank you.
8:39:44	FA	Auto land, but we are overweight.
8:39:47	FO	These people are…
8:39:48	C1	CI681 depart BRAVO turn right heading 080 intercept localizer runway 05L.
8:39:54	FO	080 depart from BRAVO intercept localizer runway 5L, CI681.
8:40:06	FA	Sir, why are you listening to them? If this SOP is not in accordance…
8:40:11	FO	No, there's no problem. But this aircraft has to be inspected on the Ground. It'sdoesn't matter.
8:40:19	FA	It's okay, if there is any danger….
8:40:21	FO	There is no danger; there is no danger in landing.
8:40:24	FA	Right, if you are sure, if what he just instructed will in any way put our safety at risk, we'll just follow SOP!
8:40:31	FO	There is no danger.
8:40:32	FA	Because the chief mechanic and the department head are not AB6 pilots, right?
8:40:47	FO	We can do Auto Land, because I will monitor it. If there is any problem, I will abort. There are monitor procedures in the Auto Land. It may be real heavy, so we will ask the ladies to sit tight and we will secure the Captain.
8:40:55	FA	He' ging to give warning.
8:41:00	FA	It's like this. I will talk to him first and aks them to sit tight. How long will it take? He said 4000 feet, but he's still at 11000. Is it correct that he'll be right here?
8:41:17	FO	Yes, yes, we'll be right be right there, maybe in 6, 7 minutes.
8:42:35	FO	681 establish on localizer runway 5L.
8:42:38	C1	CI681 roger, 25 miles from outer marker, cleared ILS runway 05L approach.
8:42:44	FO	Cleared ILS runway 5L approach, CI681.
8:43:17	FO	We land in five minutes
8:43:21	FA	We land in five minutes.
8:44:16	FA	Don't be nervous. Sir, go slow, please start from the beginning. There's no problem. This is the latest aircraft model.
8:44:29	FO	I am more worried about the Captain, not about the aircraft.
8:44:53	677	OPS, 677

8:44:55	OP	Officer Chang, Yeh Chia Wei, Officer Wei is coming over. Please pay attention to the 681 situation.
8:45:04	677	Ok what is his situation?
8:45:05	OP	681, Captain has lost consciousness in-flight. The FO is now preparing to land.
8:45:11	677	What are you calling me for?
8:45:14	OP	Captian Yeh, please monitor CAL 681 situation.
8:45:18	677	I am at the gate. How do I monitor from the gate?
8:45:20	OP	Yes, the call a while ago confirmed it. Please listen for a while….if you need any assistance.
8:45:25	677	Ok, I am now on the Approach frequency.
8:45:54	C1	CI681 contact Taipei Tower 118.7, Good day.
8:45:58	FO	118.7 Good day CI681.
8:46:10	FO	Taipei Tower CI681 ILS runway 05L twelve miles.
8:46:17	C2	CI681 Taipei Tower, runway 05L, wind 080 at 17, QNH 1013 cleared to land.
8:46:25	FO	Cleared to land CI681, runway 5L roger, please say again the wind.
8:46:29	C2	CI681 surface wind 080 at 17.
8:46:34	FO	080 at 17 CI681
8:46:36	AREA	Gears down
8:46:37	FO	Plase calla policeman, don’t mind it.
8:46:38	677	Ok, Lin Shin, I’m Chang Chien Ho. Is there any problem?
8:46:42	FO	No problem, I am now at ten miles entering ILS.
8:46:46	677	Ok, Auto land in an over weight situation.
8:46:50	FO	Roger，Now that the APU has started, follow procedure.
8:46:52	677	Flare is not enough. If it is Flare, if it is enough, just release to help it flare a bit.
8:46:57	FO	Yes,roger
8:46:58	677	Ok.
8:47:00	FO	Why don’t w wait and see?
8:47:06	FA	What are you going to do afterwards? After you release, just step on the brakes.
8:47:09	FO	Yes, I will use automatic brakes.
8:47:12	FA	You’ll be using automatic brakes. If you sense anything wrong, just use the automatic brakes.
8:47:18	FO	Good fellow, sorry, but I can’t talk to you right now.
8:47:43	677	OPS 677
8:47:45	OP	Sir, please call the officer.
8:47:46	677	I want to ask if the Captain of 681….Is the medical emergency equipment ready or not?
8:47:53	OP	It’s all ready….Sir, Mr. Tung is requesting that you monitor and assist him….

8:47:59	677	Yes, our IP has already communicated with Lin Shin. Now he is on final descent at 7, 8 miles. He's going to land soon. Let's wait until he lands, then push back.
8:48:08	OP	Roger Roger
8:48:10	677	Currently speaking, there is no problem.
8:48:14	FO	Reading out check list
8:48:36	AREA	Going through OM
8:48:42	FO	OM, 1400 Check
8:48:59	677	Lin Shin, at what distance are you right now?
8:49:02	FO	3.5
8:49:03	677	Ok pay attention to the flare on top of FMA. The most important is that the flare still has thrust retard. If there is no flare, release immediately and then switch to manual flight.
8:49:04	FO	Check
8:49:25	FO	Wind check please,
8:49:30	C2	CAL 681, this is Taipei Tower.
8:49:32	FO	Please come in.
8:49:33	C2	Is the person you have just spoken with your OD?
8:49:37	FO	IP.
8:49:39	C2	How was he able to shoot this wave channel?
8:49:43	FO	I don't know.
8:49:44	FO	I don't hav time to talk now.
8:49:46	C2	Can you notify us? There are other aircrafts under control at this moment.
8:49:49	FO	Roger I am landing now.
8:50:08	AREA	Three hundred
8:50:15	AREA	Two hundred (Sound of IM)
8:50:23	AREA	One hundred
8:50:28	AREA	Fifty
8:50:30	AREA	Thirty, fifteen, ten, frive
8:50:37	AREA	Sound of landing
8:50:41	FO	Reverse check, manual brake"80"
8:50:49	FO	Eighty
8:50:57	FO	Fans on ,Sixty ,Idle thrust
8:51:15	AREA	Sound of auto pilot disengagement
8:51:18	C2	CI681 high speed N7 turn off, and cross runway 05R, contact ground 121.7.
8:51:25	FO	681 roger, we vacate runway on the 23L and stand by for the tow car.
8:51:32	C2	Ok, CI681 left turn join runway 23L, and hold between N9 and N7, stand by further.
8:51:56	FO	Operation, 681 has landed.
8:51:59	OP	Thank you, sir. Congratulations.

8:52:01	C2	CI681 contact Taipei Ground 121.7 for further.
8:52:05	FO	121.7 CI681.
8:52:08	FO	Ground CI681 holding N7.
8:52:11	C3	CI681 Taipei Ground roger, confirm you want tow car.
8:52:18	FO	681 where is our parking bay?
8:52:21	C3	CI681 confirm you need a tow car to tow you to Bay 608.
8:52:26	FO	608 roger, so we need tow car.
8:52:29	C3	CI681 roger now hold your position.
8:52:34	FO	Hold N7, CI681.
8:53:07	FO	OPS, CI681
8:53:09	OP	681 go ahead
8:53:11	FO	How long will the tow truck take?
8:53:13	OP	Immediately, sir. Please standby.
8:53:15	FO	Please hurry, our captain is in trouble. Hurry.
8:53:18	OP	Copy
8:53:29	C3	CI681 taxi a little bit ahead and hold between N7 and N9.
8:53:36	FO	681 roger
8:53:38	C3	CAL 681 to Taipei Tower
8:53:40	FO	Come in.
8:53:52	FO	Come in, 681
8:53:54	C3	CAL 681 to Taipei Tower.
8:53:56	FO	Come in, 681
8:53:59	C3	CAL 681 to Taipei Tower
8:54:01	FO	Come in, CAL 681
8:54:04	C3	Please wait where you are, sir.
8:54:07	FO	Roger that. At the left front side there is a car, which is unable to taxi.
8:54:10	C3	Roger, you should wait where you are. The firefighting truckis on the ground right now.
8:54:14	FO	Roger.
8:54:21	FO	How long do we have to wait for the tow car?
8:55:04	C3	CAL 681 to Taipei tower
8:55:06	FO	Come in, 681.
8:55:07	C3	681, please stay where you are and await further instructions. Now please close the car.
8:55:11	FO	Car closing…
8:55:13	FO	681 Roger. ◦
8:55:37	FO	Ops, this is CAL 681
8:55:42	OP	Come in, 681
8:55:43	FO	How long will the tow car take?
8:55:45	OP	The tow car has already gone out. I don’t know what’s taking thm this long. Please standby.

8:55:49	FO	It’s a matter of life and death.
8:56:13	FO	XXXX
8:56:40	FO	What aircraft….
8:57:16	FO	Operation CI681
8:57:20	OP	Go ahead please
8:57:21	FO	Is the tow truck coming or not? If it doesn’t come soon, I will have to start the engines and taxi.
8:57:25	OP	Can you communicate with tower? We have already notified the tow car, but it’s taking a long time in coming. If you notify tower and it agrees, then you can taxi first.
8:57:37	FO	The tow tuckhas already gone to tow the Pax Aircraft away. The chief pilot has died. Who is going to take responsibility?
8:57:45	OP	Roger roger
8:57:47	FA	Tower is allowing you to taxi, just taxi.
8:57:48	FO	My engines are closed.
8:57:50	FA	Oh, your engines are closed down. You can’t communicate wit tower.
8:58:29	FO	Ground, this is 681.
8:58:31	C3	Please speak.
8:58:33	FO	Request start engine. We have been waiting too long for the tow truck. Captain may have problems. I want to request start engine and do the taxi myself.
8:58:39	C3	Okay, you may drive.
8:58:41	FO	Thank you.
8:59:25	C3	CAL 681 to Taipei
8:59:26	FO	681, go ahead
8:59:27	C3	681, please inform us as soon as you are ready to taxi.
8:59:29	FO	Roger…two minutes.
9:00:04	FO	I have been wanting to go to the bathroom from the time the parking bay has not been changed.
9:00:07	AREA	(Cockpit interphone call)
9:00:08	FO	Answer him…
9:00:11	FA	Please speak
9:00:12	FO	681Ready for taxi
9:00:14	C3	681, please taxi with the yellow airline truck in front of you.
9:00:22	C3	681, please wait a while. There are people beneath your aircraft. We will notify them to leave.
9:00:26	FA	There are people beneath the aircraft.
9:00:28	FO	Roger. Oh, the tow car is here. I’ll wait for the tow car. I am shutting down the engine. Thank you.
9:00:30	FA	I’ve already told you that the commanding officer has already called dozens of times. But company regulations state that FO is not allowed to taxi. The tow car is here now…the tow car s here now.

9:01:03	FO	GND Cockpit GND Cockpit
9:01:13	GND	Cockpit from GND.
9:01:14	FO	Go ahead
9:01:15	GND	Pleas throw the Gear Pin down from the window. We need to plug in the Gear Pin so we can tow the aircraft.
9:01:20	FO	Do you not have a Bypass Pain?
9:01:22	GND	Bypass pin has already plugged in.
9:01:24	FO	Why do we need the gear pin?
9:01:26	GND	It's airport regulations. The gear pin of the landing gear must be plugged in so the aircraft can be towed.
9:01:31	FO	I'm only one person here. How can I leave my seat?
9:01:35	GND	Okay. Wait a minute.
9:01:38	FO	Parking brake, Do we release it or not?
9:01:41	GND	Not yet…not now. The tow truck hasn't come yet.
9:01:47	FO	Regulation….regulations, xxxx!Still more regulations.
9:01:59	FO	Is he comin up? Is he coming up from below?
9:02:19	FO	He should be able to push it open. Help him open it, okay?
9:02:22	GND	Plase open it up so our personnel can go up and get theGear pin.
9:02:28	FO	Do not stepon it…Do not step on the cover.
9:02:37	FO	Ground cockpit
9:02:39	GND	Please speak.
9:02:40	FO	I'msorry for the bad attitude, but the Captain….
9:02:45	GND	We know…we know….
9:02:49	FO	Just cover it.
9:03:11	FO	We need the tow truck now…The foot ramp should not be stepped on.
9:03:17	FA	What about his brakes?
9:03:25	FA	This is important.
9:03:26	FO	We don't have it yet, wait for him.
9:03:27	FA	Wait for him to call out.
9:03:28	FO	Standby for the parking brake
9:03:32	GND	Cockpit from ground
9:03:33	FO	Go ahead
9:03:34	GND	Sir, please loosen the brakes.
9:03:37	FO	Brakes loosened, please start towing, thank you.
9:03:39	GND	Towing…
9:03:43	FA	Please speak (facing the back)
9:03:48	FA	The commanding officer has already called for it many times, but there are company rules. The company does not allow it to wait by the taxi. We have already contacted the tow truck; it will be there shortly. Just bear with it, okay? We have already called them lots of times.

9:04:27	FO	Operation CAL 681
9:04:33	FO	Operation CAL 681
9:04:35	OP	Go ahead 681
9:04:37	FO	Is the ramp car on stand by at the parking bay? The Captain has already lost too much time. Please, it has to be on stand by.
9:04:44	OP	Copy
9:04:45	FO	Thank you.
9:05:40		End of recorder

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附錄二 中正塔台地面席/消防車/中正航務組指揮/救護車無線電(頻道 459.2MHz)通訊紀錄抄本

I HEREBY CERTIFY THAT THE FOLLOWING IS A TRUE TRANSCRIPTION OF THE RECORDED CONVERSATIONS PERTAINING TO THE REPORTED CASE.

Name：林怡忠

Title：塔台長

中正塔台地面席/消防車/中正航務組指揮/救護車無線電(頻道 459.2MHz)通訊紀錄抄本 TRANSCRIPT OF COMMUNICATION BETWEEN Taipei TWR Ground Control/ Fire truck/ FOC/ Ambulance, on May 8, 2000 on CH One (459.2).

UTC	Com.	Contents
003200	救護車	消防隊，救護車呼叫。
	消防隊	救護車請你不要呼叫，請你在原地待命。
	FOC	航務一號，…呼叫。
	FOC 1	航務一號回答。
003212		他在 6 號跑道。
		是的，謝謝。
003217	消防車	塔台，南站消防車脫離 24。
	塔台	Roger。
	??	塔台，請問一下，在 SP 上的 EVA 的飛機要拖到哪裡？
	塔台	他待會兒要拖到 B5，現在讓他到 S6 上稍待可以嗎？
		S6 上稍待是嗎？
	塔台	會不會影響到你們？
	塔台	SP 上的長榮拖車，塔台。
	長榮拖車	長榮拖車回答，請講。
	塔台	你現在左轉加入 S6，在 SS 外稍待。
	長榮拖車	長榮拖車瞭解，謝謝。
003318	消防車	北站消防車直接切入這個接駁機坪，我們走接駁機坪裡面。
	消防車	北站消防車收到。
003450	FOC103	塔台，黃車 103 呼叫，Over。
	FOC103	塔台，黃車 103 呼叫，Over。
003505	塔台	請稍待。
003510	FOC103	103 位置在 W 交通道，請求經 W、SP 到 S1 Stand by, over。
003517	塔台	黃車 101，可以通行。

	FOC103	103 可以通行。
003523	消防車	塔台，北站消防車已到達 608 待命，請問回航航機還多久可以落地？
	塔台	目前還沒有消息。
	消防車	Roger。
003535	塔台	預計是 45 分。
	塔台	預計落地時間是 45 分。
	黃車 103	塔台，黃車 103 已到 S1 Stand by，over。
	塔台	稍待。
	消防二號	救護車，消防二號。
	救護車	請講。
003740	消防二號	請你到消防車一號旁邊來。
003745	塔台	OK，航務組消防車跟黃車 103，塔台。
		黃車 103 回答，請講。
		塔台，黃車 103 回答，請講。
003802	塔台	中華 681 現在請求用 5 左落地，用 5 左落地，請你們移防到北邊來。
		Roger，103 由 SC、W 到 5 左跑道，over。
	塔台	Roger，可以走 SC、W 進入 NP 前呼叫。
		Roger，NP 前呼叫。
003832	???	N10 北面消防車到 N6 待命。
003840	塔台	塔台廣播，消防車你們可以走滑行道，然後自行避讓航機。
		消防車 Roger 請求進入 E。
	塔台	可以的。
003903	消防一號	塔台，消防一號呼叫。
	塔台	請講。
	消防一號	位置 608，請求進入 SS、W 到 N6 待命。
	塔台	可以的。
003937		到 N10 待命。
		Roger。
003942	消防 108	消防 108 航務組。
	航務組	108 回答。
003948	航務組	你有沒有帶手機，能夠，可以的話，打個電話到航務組來給我。
	消防 108	Roger。
004002	黃車 103	塔台，黃車 103，預計到達 NP 前，Over。
004018	黃車 103	塔台，黃車 103，是否可以繼續由 NP 到 N1 Stand by，over。
004030	黃車 105	103，105 現在在國內機坪待命。
	黃車 103	Roger。

004048	消防車	塔台，消防車位置在 W 前，請求由 NP 前往 N6 待命。
	塔台	可以到 N6。
004058	消防車	收到，可以到 N6。
004110	黃車 101	塔台，黃車 101 呼叫。
	塔台	101 呼叫塔台嗎？
004117	黃車 101	101 現在位置在 E Cross 跟 NP 交口，我們請求進入副跑道。
	塔台	103 對不對？
004125	黃車 101	黃車 101。
	塔台	101 可以進入副跑道。
004135	黃車 101	塔台麻煩可不可以告訴我們一下，681 預計甚麼時候可以落地。
	塔台	現在螢幕上看不到。
	黃車 101	請你有進一步消息，麻煩廣播。
004145	塔台	OK，中華 681 預計在 7 分鐘後落地。
	黃車 101	Roger，在 7 分鐘後落地。
004158	消防車	塔台，北站消防車已到 N6 待命。
	塔台	Roger。
004205	消防車	塔台，南站消防車到達 N10 待命。
	塔台	Roger。
004228	黃車 103	塔台，黃車 103 請求由 NP 到 N6 Stand by，over。
	塔台	103 可以的。
	黃車 103	Roger 103。
004306	黃車 105	103，105 呼叫。
	黃車 103	103 回答請講。
004312	黃車 105	等一下航機落地，我就直接 Follow 飛機了。
	黃車 103	Roger。
004324	塔台	塔台廣播，中華 681 在五邊 25 浬。
	消防車	消防車 Roger。
004550	黃車 103	105，黃車呼叫 103，over。
	黃車 105	105 回答。
004555	黃車 103	它待會脫離跑道後，我 follow 他到接駁機坪，over。
	黃車 105	Roger，跑道上面交給我。
	黃車 103	Roger。
004628	塔台	塔台廣播，五號跑道五邊要落地的就是中華 681。
	消防一號	消防一號 Roger。
004642	黃車 105	塔台，105 現在在國內線機坪，681 落地後我直

		接進入 follow。
	塔台	105，Roger。
	黃車 105	謝謝！
004845	黃車 101	塔台，黃車 101 呼叫。
	塔台	101 請講。
004854	黃車 101	請問五邊落地的飛機，是不是中華 681？
	塔台	對的，現在要落地的就是中華 681。
	黃車 101	101，Roger。
004906	黃車 103	塔台，黃車 103 呼叫，Over。
	塔台	103 請講。
	黃車 103	請問落地 681 有沒有預計由那一個滑行道脫離，over。
	塔台	我沒辦法預測，看他自己的落地情況。
	黃車 103	oh，over。
004923	中華拖車	塔台你好，中華拖車。
	塔台	中華拖車，請講。
	中華拖車	中華 605 在維護區拖往 A4 號，請放行。
	塔台	稍待。
	中華拖車	Roger，在維護區稍待。
005015	消防一號	塔台，消防一號呼叫。
	塔台	消防一號，請講。
		….
	塔台	落地以後你們可以自行進入跑道。
	消防車	Roger，謝謝。
	塔台	飛機落地後，你們可以自行進入跑道。
005122	航務員	消防車不要進入跑道，走副跑道就可以了，速度放慢。
	消防車	消防車知道。
005134	中華拖車	塔台，中華拖車呼叫。
	塔台	拖車，有飛機要走 E，請稍待。
	中華拖車	好，謝謝。
005152	消防車	南站消防車跟塔台呼叫，現在歸隊。
	塔台	南站消防車 Roger。
005200	消防車	塔台，南站消防車現在脫離 N10。
	塔台	Roger。
005206	消防車	北站消防車除救護車外，都可以呼叫歸隊。
	塔台	北站消防車知道。
005253	黃車 101	塔台，黃車 101 呼叫。
	塔台	101 請講。
	黃車 101	現在 681 停在副跑道上，現在下一步準備怎麼樣？

005300	塔台	他要找拖車拖行，他不自己滑，要找拖車拖。
	黃車 101	101roger。
005310	塔台	所有消防車都可以撤離了，謝謝。
	消防一號	消防一號，roger，謝謝。
005318	救護車	塔台，請問一下需不需要救護車？
	塔台	救護車現在先稍待一下。
	救護車	救護車我建議你還是跟著飛機好了。
005335	消防車	塔台，北站消防車呼叫。
	塔台	北站，請講。
005340	消防車	北站消防車請求 N7 回北機坪。
	塔台	Roger，可以的。
005355	消防車	北站消防車注意，現在飛機滑行。
005410	黃車 105	塔台，105 脫離五左跑道，Runway clear。
	塔台	Roger，謝謝。
005416	消防車	塔台，南站消防車請求穿越 24 跑道至南消。
	塔台	你可以過 24。
	消防車	謝謝，可以過。
005434		黃車 101，這個中華要用拖車拖嗎？
	塔台	中華拖車，OK，可以拖行，E 交通道前呼叫。
	中華拖車	中華拖車，可以拖行，北消前呼叫，謝謝。
005455		中華 681 是不是要用拖車拖回來？
	塔台	對的。
	黃車 101	拖車要用拖桿，請你準備拖桿，通知可以到副跑道上。
		好！好！知道。
005508	消防車	塔台，北站消防車脫離北邊跑道，進入北消，謝謝。
	塔台	Roger。
005514	消防車	塔台，南站消防車脫離 24，謝謝。
	中華兩號拖車	塔台，中華兩號拖車呼叫。
005522	塔台	中華兩號拖車，請講。
		飛機貨機 617 在 Cargo511，拖回中華維護區，請放行。
005538		Cargo511 的現在可以後推。
005548	黃車 101	桃勤拖車，航務組黃車 101 呼叫。
	桃勤拖車	桃勤拖車。
	黃車 101	請問你們拖車位置在那裡？
	桃勤拖車	我們現在準備拖，還沒有。
005612	黃車 101	請儘快過來，請儘快，謝謝。
005704	塔台	Cargo511 的，你要拖到甚麼位置？
		Cargo511 的要拖回中華維護區。

005711	塔台	Roger，後推完成之後，往前拖，暫時不要進入 E。
		Roger，謝謝。
005818	塔台	黃車 101，塔台。
	黃車 101	黃車 101，回答。
	塔台	黃車 101，塔台。
005849	塔台	黃車 101，塔台。
	黃車 101	塔台，黃車 101 回答。
005854	塔台	中華 OD 通知，中華 681 請他再開車，自行滑到 608。
	黃車 101	Roger。
005904	黃車 101	我們引導他到 608，謝謝。
005911	塔台	OK，我請他自行開車，然後，開車完畢就用滑行的。
	黃車 101	現在 E 上面這個,他是不是要走 E 過去。
005918	塔台	那我可以安排。
	黃車 101	Roger。
005940	塔台	黃車 101,我們請飛機跟著你,走副跑道、E 到 608。
	黃車 101	101，Roger。
010025	塔台	黃車 101，塔台。
	塔台	黃車 101，塔台。
010039	黃車 101	101 回答。
	塔台	黃車 101，塔台。
	黃車 101	塔台，黃車 101 回答。
010046	塔台	現在拖車又過去了，可能又要變更了。
	黃車 101	101roger，101 還是在副跑道等待。
010051	塔台	Roger。
010245	黃車 101	塔台，黃車 101 現在脫離副跑道，回到北機坪，脫離波長，謝謝。
	塔台	101，Roger，謝謝。
010388	桃勤拖車	塔台，桃勤拖車。
	塔台	桃勤拖車，請講。
	桃勤拖車	現在副跑道的拖車，現在準備好了，是不是可以開始拖。
010345	塔台	好，你走副跑道，然後 ECHO 到南邊。
	桃勤拖車	好，知道。
011054		塔台，CI681 是不是繼續拖到 608。
	塔台	CI681 走 SP 到 608。
		Roger，知道，SP 到 608，謝謝。
011122	塔台	桃勤拖車 CI681，塔台。

	桃勤拖車	聽到，請講。
	塔台	你在 S6 前面稍待，國泰進來，他第一架飛機進來。
	桃勤拖車	好、好，知道，國泰離開後，我們再到 608。
011136	塔台	對。
011224	塔台	CI681 拖車直接走 SP 到 608。
		（註：此時桃勤拖車在 ECHO 滑行道上，塔台指示拖車在 S6 前稍待，係為航管隔離之預防措施，桃勤拖車前進過程塔台未曾延誤。）
011600	黃車 105	航務組，105 呼叫，over。
	航務組	請講。
	黃車 105	請一位教官送照相機到 608。
	航務組	608….嗎？
011620	黃車 105	對，照相機。
012005	桃勤小客車	塔台，桃勤小客車呼叫。
	塔台	桃勤小客車，塔台，請講。
	桃勤小客車	桃勤小客車現在在 NP 交通道，W 前，等待許可進入 W 到 608 受傷區去工作。
012023	塔台	桃勤小客車可以通行。
	桃勤小客車	可以通行，桃勤小客車，Roger，謝謝。
012032	塔台	你要走那裡？
	桃勤小客車	我到南面交通道。
	塔台	桃勤小客車，roger。
012128	桃勤小客車	塔台，桃勤小客車，脫離 W，謝謝，再見。
	塔台	桃勤小客車，roger，再見。
013012	航務組	航務一號，航務組。
013020	航務組	航務一號，航務組。
013132	航務組	航務一號，航務組。
013135	航務組	航務一號，航務組。
013144	航務一號	航務一號回答。
		（註：由上述時間至 0140 時均無有關 CI681 之通話。）

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Appendix 3 Transcript of Communication BetweenCAL 681/Taipei Approach/Taipei Tower/Taipei Ground on Frequnecy 125.1/118.7/121.9 MHz

I HEREBY CERTIFY THAT THE FOLLOWING IS A TRUE TRANSCRIPTION OF THE RECORDED CONVERSATIONS PERTAINING TO THE REPORTED CASE.

Name：Lin, Yi-Chung
Title：Tower Control

TRANSCRIPT OF COMMUNICATION BETWEEN CI681/ Taipei Approach/ Taipei Tower/ Taipei Ground on May 8, 2000 on FREQUENCY 125.1/ 118.7/ 121.9

P:Pilot of CI681
C1: Controller of Taipei Approach
C2: Controller of Taipei Tower
C3: Controller of Tapei Ground

UTC	Com.	Contents
003815	C1	CI681, Taipei
	P	681,CI681 with you, passing FL178 for 150.
003822	C1	CI681 Taipei Approach roger, ident, descend and maintain 11000, Taipei QNH 1013 Runway 05L.
003830	P	1013 11000, DESCEND 11000,CI681 thank you,say again wind.
	C1	CI681 now the wind is070 at 14.
	P	Thank you.
003910	C1	CI681 descend and maintain 4000.
	C1	CI681 descend and maintain 4000.
	P	Confirm 681 descend to 4000.
	C1	CI681 affirmative, descend and maintain 4000.
	P	Descend and maintain 4000, CI681, AND request high speed below 10000.
003934	C1	CI681 approved as requested.
	P	CI681 thank you.

003946	C1	CI681 depart BRAVO turn right heading 080 intercept locaizer runway 05L.
	P	080 depart from BRAVO intercept localizer runway 5L,CI681.
004235	P	681 establish on localizer runway 5L.
	C1	CI681 roger, 25 miles from outer marker, cleared ILS runway 05L approach.
	P	Cleared ILS runway 5L approach, CI681.
004554	C1	CI681 contact Taipei Tower 118.7, good day.
	P	118.7 good day CI681.
	P	Taipei Tower CI681 ILS runway 05L twelve miles.
004612	C2	CI681 Taipei Tower, runway 05L, wind 080 at 17, QNH 1013 cleared to land.
	P	Cleared to land CI681, runway 5L roger, please say again the wind.
	C2	CI681 surface wind 080 at 17.
	P	080 at 17 CI681.
		和哥…你好，有沒有問題，沒問題吧！
004644	P	沒問題，我現在十浬進場 ILS。
		和哥 overload, overweight 的情況之下，就是 flare 會比較不夠，如果認為 flare 如果不夠的話，就是 release 把他調整一下。
	P	Roger.
		OK.
004859		你現在幾浬？
	P	3.5。
		OK，注意上面的 floor，……Floor release,然後 flap….
004930	C2	中華 681，這是台北塔台。
	P	請講。
	C2	剛才跟你通話的是不是你們的 OD？
	P	IP.
004939	C2	請問他怎麼發射這個波道的？
	P	我不曉得。
004945	C2	如果要使用麻煩通知我們一下，還有其他飛機在管制當中。
	P	Roger we are landing now.
	C2	Roger.
005118	C2	CI681 highspeed N7 turn off, and cross runway 05R, contact ground 121.7.
	P	681 roger, we vacate runway on the 23L and stand by for the tow car.

005130	C2	OK, CI681 left turn join runway 23L, and hold between N9 and N7, stand by further.
005205	C2	CI681 contact Taipei Ground 121.7 for further.
	P	121.7 CI681.
005209	P	Ground CI681 Holding N7.
	C3	CI681 Taipei Ground roger, confirm you want tow car.
	P	681 where is our parking bay?
005219	C3	CI681 confirm you need a tow car to tow you to Bay 608.
	P	608 roger, so we need tow car.
	C3	CI681 roger now hold your position.
	P	Hold N7, CI681.
005328	C3	CI681 taxi a little bit ahead and hold between N7 and N9.
	C3	中華 681，台北。
005354	C3	中華 681，台北。
	C3	中華 681，台北。
	P	中華 681 請講。
005403	C3	教官請你原地稍待。
	P	瞭解，左前方一台車不能滑行。
	C3	對的，你要在原地稍待一下。現在地面消防車在通行。
	P	Roger.
005502	C3	中華 681，台北。
	P	681 請講。
005508	C3	681 你留在原地稍待，現在請你關車。
	P	681Roger.
005830	P	地面中華 681。
	C3	請講。
005833	P	Request start engine，等太久了，Captain 可能會有問題，Request start engine，自己滑。
005841	C3	好的，可以自己開車。
	P	謝謝。
005924	C3	中華 681 台北。
	P	681 請講。
	C3	681 準備好滑行通知一下。
	P	Roger 好的。
010012	P	CI681 ready for taxi.
	C3	681 你跟前方航務黃車，跟他滑，預計走 ECHO。
010034	C3	681 等一下，你飛機下面有人，我們通知他們離

		開。
	P	靠上來了，我檢查一下 shutdown engine。

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Appendix 4 Transcript of Inteprhone Communication of Taipei Tower

I HEREBY CERTIFY THAT THE FOLLOWING IS A TRUE TRANSCRIPTION OF THE RECORDED CONVERSATIONS PERTAINING TO THE REPORTED CASE.

Name：Lin, Yi-Chung
Title：Tower Control

TRANSCRIPT OF COMMUNICATION BETWEEN Taipei TWR/ Interphone on May 8, 2000 on Telephone NO. 3983023 & 87702192

UTC	Com.	Contents
		….
005440	TWR	Tower.
	FOS	Tower, we have a question. Does Cal 681 need a tow car or not?
	TWR	Yes, it needs a tow car.
	FOS	Please ask him to stay where the aircraft is right now and turn off the engines.
	TWR	Okay.
	FOS	Please ask him to stay where the aircraft is right now and turn off the engines.
	TWR	Turn off the engines?
	FOS	Turn off the engines, turn off the engines.
	TWR	OK, OK.
		….
005758	TWR	This is TWR.
	CAL OD	Hello, this is the operation center. Cal 681 would like to taxi by himself, because the tow car has not arrived yet. The Captain has already lost consciousness and is in danger.
	TWR	The tow car has not come. Does he want to taxionhis own?
	CAL OD	Yes, that is right.
	TWR	Does the pilot know?
	CAL OD	The pilot knows. He has already asks us.
	TWR	Okay, okay.
		….

005827	APP	Hello.
	STANDARD TEAM	Hello, I'm Lin Ro-Chun.
	APP	Hello.
	STANDARD TEAM	We have not been able to get in touch with the Sung Shan Tower. That means that we do not know if the China Airline flight from Ho Chi Minh City has already entered the Gate. If it hasn't, we hope it doesn't taxi.
	APP	I don't know, please wait.
	STANDARD TEAM	Okay.
		….
	TWR	Please go on.
	STANDARD TEAM	Hello, is this Tower?
	TWR	Yes.
	STANDARD TEAM	Hello, please wait a minute.
	TWR	Hello.
	STANDARD TEAM	Hello, I am the POI of China Airlines. If he lands, where is he going to land?
	TWR	He's going to land at the secondary runway and then rendezvous at the meeting point of N7 and the secondary runway.
	STANDARD TEAM	Okay, okay, then have it stop there Is everything being implemented now?
	TWR	Well, you have a person, who is asking your pilot to taxi, which means the tow car does not have to be used. Is it the case?
	STANDARD TEAM	No, he does not have…he is now…I think the pilot…. Ask him to assign tow car…Ask him to park at the secondary runway, where he will not be in anyone's way….and then have the tow car tow it away….because…
	TWR	He is now in the way…he is now in the way…
	STANDARD TEAM	Why don't we ask him to taxi ahead a little bit tow here he will not be in anyone's way, okay?
	TWR	You are asking him to taxi, is that it?
	STANDARD TEAM	Not to taxi by himself… ask him to use the aircraft…the tow car.
	TWR	No, no, another person from your end asked him to taxi on his own, that you will not assign any tow car anymore.
	STANDARD TEAM	Which person?
	TWR	Another person from your end?

	STANDARD TEAM	I am not China Airlines. I am form the FAA.
	TWR	Oh, the FAA, excuse us.
	STANDARD TEAM	I do not recommend that he taxi, because the co-pilot has not undergone training for taxiing.
	TWR	But their own pilot, in that condition…. Who is this?
	STANDARD TEAM	I'm Fan…Fan Hong Chi.
	TWR	Oh, from what team are you?
	STANDARD TEAM	I am the CAL POI officer in charge of airline safety.
	TWR	Oh! But he said it was his Asian Dispatch Center representative who said….Oh! Now the tow car is also already here. You say that now they want to have the aircraft towed?
	STANDARD TEAM	Right, right.
	TWR	Please wait a moment.
	STANDARD TEAM	I'll call them via phone…
	TWR	The tow car is already on its way. They should be able to use the tow car to tow the plane away.
	STANDARD TEAM	Okay, okay.
	TWR	OK。
	STANDARD TEAM	Thank you.
0010050	TWR	Not at all.
		….

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Appendix 5 Transcript of Interphone Communication Between Taipei Area Control Center/Taipei Approach/Taipei Tower/CKS Airport Flight Operation Section

I HEREBY CERTIFY THAT THE FOLLOWING IS A TRUE TRANSCRIPTION OF THE RECORDED CONVERSATIONS PERTAINING TO THE REPORTED CASE.
Name：Lin, Yi-Chung
Title：Tower Control

TRANSCRIPT OF INTERPHONE COMMUNICATION BETWEEN Taipei Area Control Center (TACC) /Taipei Approach (Approach) /Taipei Tower (Tower) /CKS Airport Flight Operation Section (FOS) on May 8, 2000

UTC	Com.	Contents
001748	TACC	Tower, CI681 is coming back immediately due to illness of one of its passengers. It needs an ambulance.
001756	Tower	An ambulance? Okay, thank you.
001800	TACC	Not at all.
001803	Tower	Do you know that CAL 681 is coming back?
	Approach	No, we don’t.
	Tower	Okay. I’m telling you now. There is a sick passenger on the aircraft. This is the reason.
	Approach	Okay. CAL 681, roger that. Thank you.
001821	FOS	FOS…
001823	Tower	CAL 681 is coming back, I repeat, coming back.
	FOS	CAL 681 is coming back.
	Tower	The reason is because there is a sick passenger on the aircraft.
	FOS	There is a sick passenger.
	Tower	They need an ambulance.
	FOS	Okay.
	Tower	We are not yet certain of the time, please standby.
	FOS	Okay! Okay!
002030	Approach	Sir, where is CAL 681 going to stop?
	Tower	We’re still making arrangements.
	Approach	Uh?

	Tower	We’re still making arrangements Still making arrangements.
	Approach	Where is it coming back from? Where is it going?
	Tower	CAL 681…
	Approach	Is it Hong Kong or somewhere else…
	Tower	Look at your takeoff records.
	Approach	Okay, I’ll look for it.
002339	FOS	When it comes back, it should land at 608.
	Tower	Okay, thank you.
002510	FOS	He lost consciousness.
	Tower	Please.
	FOS	Hello, the Captain has lost consciousness, so the firefighting truck will have to mobilize.
	Tower	What? The captain of 681 has lost consciousness,
	FOS	It’s true, so the firefighting truck has to mobilize.
	Tower	Roger, we understand.
002555	Approach	Please.
	Tower	CAL 681 has notified FOS that it is the Captain who has lost consciousness.
	Approach	What?
	Tower	We are calling the firefighting truck.
	Approach	Okay.
	Tower	Firefighting truck, when the aircraft lands, please close off the runway temporarily.
	Approach	Roger.
002653	Tower	Roger.
	Approach	Hello。
	Tower	681, please communicate with the radar man, he’s….
	Approach	Radar man already knows.
	Tower	Please note what the co-pilot has to say.
	Approach	Okay, we will ask the SP to talk to the OD. We will give a permit for direct entry.
	Tower	Right, right, just allow him to have a smooth entry.
002805	Tower	Hello。
	FOS	May we ask how long until they land?
	Tower	Bravo estimates 38 minutes, 45 minutes more or less.
	FOS	45 minutes before landing, okay, thank you.
	Tower	Please notify firefighting team. Or do we notify them?
	FOS	Well, why don’t you notify them? You should appraise them of the situation.
	Tower	Okay, thank you.

003255	Tower	Please.
	TACC	CAL 681, please turn back. He needs an ambulance; you know that!
	Tower	Roger.
	TACC	OK.
003313	FOS	FOS…
		Reconfirming, CAL 681, does he need an ambulance?
		Yes, we need an ambulance.
		I was, I followed that….ahead of me.
		Roger, I'll get in touch again with the ambulance.
		Thank you, Bye-bye。
002550		Shio Shio, You are at D Man. Does the problem of CAL 681 lie with the aircraft or with a passenger of the aircraft?
		We have been in touch with the tower. He needs an ambulance.
002620		We now know that the Captain has lost consciousness. Who said that? The Tower has been in touch. The Captain has lost consciousness. Let me call the CAL Airport Services Center. Let me us; we will give them direct entry, ok?
003230		Western side, come in.
		CAL 681 has applied for First Priority. He said that the patient is in critical condition. I have voided the speed limit of ATA.
		OK.
003405		I am southern side. I'll direct him towards the nearest way.
		CAL 681, you are flying direct TIA.
		I gave him the nearest route. What do we do afterwards?
		Okay, no problems. Afterwards, I shall suggest borrowing airspace with Taichung. Then going to a lower altitude, and then fly straight-in. We'll work it out form here to make for early landing.
		I'm asking you if he will have a problem flying straight TIA.
		I don't have a problem here, because he is Number One Priority。
003625		CAL 681 shall go to ILS 5left runway after BRAVO FIX. Is this alright?
		No. 6, No.6.
		Is he No. 6?
		Yes.
003710		CAL 681, please ask for Left 5.

		Okay, we will reposition the firefighting truck.

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附錄六 EEG Report

Graded Exercise Summary Report

CIVIL AVICTIOON ME: CAL CENTER

MUSE Loc: 0

Name: GUEORGUIEV, GUEO.
ID: 25044
Age: 43yrs
Ht: 181cm
Wt: 81kg
Sex: Male
Race: Cauc

Date: 06-NOV-98
Time: 09:00:51
Referred by:
Medications:
Test Indication: TMX
Test Type: CAMC
Technician: KU

Phase	Stage	Time in Phase	Duration of Stage	Speed (km/h)	Grade (%)	W.L. (METS)	H.R. (bpm)	B.P.	R.P.P. (x100)	P.E.	V.E. (/min)	ST (I)	Comments
PRE-TEST		00:00	00:00	0.0	0.0	1	86	128/90	110		0	0.6	
SUPINE		00:00	00:00	0.0	0.0	1	89				0	0.6	
STANDING		00:00	00:00	0.0	0.0	1	91				0	0.6	
HYPERV		00:17	00:17	3.5	0.0	1	88				2	0.6?	
EXERCISE	1	01:00	01:00	5.6	0.0	1	102				2	0.8?	
	2	04:00	03:00	5.6	5.0	6	116				1	0.2	
	3	07:00	03:00	5.5	10.0	8	144				0	0.8	
	4	08:20	01:20	5.6	15.0	9	160	164/80	262		1	0.9	
PEAK EX		00:10	00:10	5.6	15.0	9	160				1	0.9	
RECOVERY		07:04	07:04	0.0	0.0	1	95	110/70	105		0	0.4	

Results:
Procedure: CAMC
Exercise Time: 08:20
Maximum Heart Rate Attained: 160bpm 90% Max Predicted 177bpm
Maximum BP: 164/80
Maximum Workload Attained: 9METS
Reason for Termination:
NONE
Impressions:

Graded Exercise Summary Report

CIVIL AVIVTION MEDICAL CENTER, R. O. C.

MUSE Loc: 0

Name: GUEORGUIEV, GUEOUGUI
ID: 4258
Age: 42yrs
Ht: 181cm
Wt: 81kg
Sex: Male
Race: Cauc

Date: 27-NOV-97
Time: 14:09
Referred by:
Medications: NONE
Test Indication: TMX
Test Type: CAMC
Technician: HO

Phase	Stage	Time in Phase	Duration of Stage	Speed (km/h)	Grade (%)	W.L. (METS)	H.R. (bpm)	B.P.	R.P.P. (x100)	P.E.	V.E. (/min)	ST (V6)	Comments
PRE-TEST		00:00	00:00	0.0	0.0	1	83				0	0.9	
SUPINE		00:00	00:00	0.0	0.0	1	83				0	0.9	
STANDING		00:00	00:00	0.0	0.0	1	82				0	0.9	
HYPERV		01:33	01:33	3.5	0.0	1	98	145/105	142		2	0.5	
EXERCISE	1	03:00	03:00	5.6	0.0	3	114	174/97	198		0	2.3	
	2	06:00	03:00	5.6	5.0	6	123	168/82	207		0	0.8	
	3	09:00	03:00	5.6	10.0	8	141	190/80	268		0	1.0	
	4	10:56	01:56	5.6	15.0	9	162				1	0.7	
PEAK EX		00:10	00:10	5.6	15.0	9	163				3	0.6	
RECOVERY		07:17	07:17	0.0	0.0	1	106	131/86	139		0	0.4	

Results:
Procedure: CAMC
Exercise Time: 10:56
Maximum Heart Rate Attained: 164bpm 92% Max Predicted 178bpm
Maximum BP: 224/79
Maximum Workload Attained: 9METS
Reason for Termination:
NONE
Impressions:

Graded Exercise Summary Report

CIVIL AVIACTION MEDICAL CENTER

MUSE Loc: 0

Name: GUEORGUIEV. GUEORGUI
ID: 0000025044
Age: 44yrs
Ht: 181cm
Wt: 84kg
Sex: Male
Race: Orient

Date: 08-NOV-1999
Time: 06:42:42
Referred by:
Medications:
Test Indication: TMX
Test Type: CAMC
Technician: KU

Phase	Stage	Time in Phase	Duration of Stage	Speed (km/h)	Grade (%)	W.L. (METS)	H.R. (bpm)	B.P.	R.P.P. (x100)	P.E.	V.E. (/min)	ST (I)	Comments
PRE-TEST		00:00	00:00	0.0	0.0	1	89	122/74	109		0	0.8	
SUPINE		00:00	00:00	0.0	0.0	1	89				0	0.8	
STANDING		00:00	00:00	0.0	0.0	1	89				0	0.8	
HYPERV		00:25	00:25	3.5	0.0	1	90				0	0.9	
EXERCISE	1	01:00	01:00	5.6	0.0	2	103				0	0.7	
	2	04:00	03:00	5.6	5.0	6	125				0	1.1	
	3	07:00	03:00	5.6	10.0	8	150	146/76	219		4	0.9	
	4	07:33	00:33	5.6	15.0	8	155				0	0.8	
PEAK EX		00:10	00:10	5.6	15.0	8	156				0	0.8	
RECOVERY		07:03	07:03	0.0	0.0	1	98	116/72	114		0	0.6	

Results:

Procedure: CAMC
Exercise Time: 07:33
Maximum Heart Rate Attained: 159bpm 90% Max Predicted 176bpm
Maximum BP: 146/76
Maximum Workload Attained: 8METS
Reason for Termination:
NONE

Impressions:

附錄七 Flight Personnel Physical Examination Standards

人員檢定與訓練類〇五—〇三A

航空人員體格檢查標準

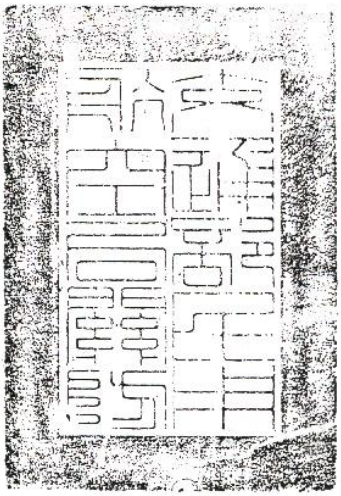
中華民國六十二年十一月十七日民用航空局企法（六二）字第七九三〇號令頒佈
中華民國六十四年一月十日民用航空局企法（六四）字第〇一九九號令修正
中華民國七十一年五月十九日民用航空局企法（七一）字第三六二八號令修正
中華民國七十六年四月三十日民用航空局企法（七六）字第二八九八號令修正
中華民國八十年九月二十日民用航空局企法（八〇）字第七三九號令修正
中華民國八十一年三月三十一日民用航空局企法（八一）字第二九七二號令修正
中華民國八十二年八月二十六日民用航空局企法（八二）字第〇九一九八號令修正

交通部民用航空局 令

發文日期：中華民國八十九年二月二日
發文字號：企法發字第 000二 號

修正「航空人員體格檢查標準」。

附「航空人員體格檢查標準」。



副本：行政院衛生署、交通部、青杏醫學文教基金會、心臟研究基金會、中華民國航空醫學會、中華民國眼科醫學會、中華民國職業病醫學會、中華民國環境職業醫學會、中華民國內科醫學會、中華民國外科醫學會、中華民國耳鼻喉科醫學會、中華民國精神醫學會、中華民國骨科醫學會、中華民國牙科醫學會、中華民國腎臟醫學會、中華民國家庭醫學醫學會、中華民國民航飛行員學會、國防醫學院航太醫學中心、中華航空公司、遠東航空公司、立榮航空公司、亞太航空公司、瑞聯航空公司、德安航空公司、金鷹航空公司、凌天航空公司、大鵬航空公司、中興航空公司、復興航空公司、長榮航空公司、華信航空公司、西北航空公司、聯合航空公司、加拿大國際航空公司、沙烏地航空公司、荷蘭皇家航空公司、菲律賓航空公司、澳洲航空公司、瑞亞航空公司、紐西蘭航空公司、英國亞洲航空公司、印尼航空公司、荷蘭馬丁航空公司、國泰航空公司、盧森堡航空公司、泰國航空公司、馬來西亞大馬亞洲航空公司、楓葉航空公司、美國保羅航空公司、美國優比速航空公司、新加坡航空公司、皇家汶萊航空公司、日亞航空公司、日本日空航空公司、越南航空公司、越南太平洋航空公司、美國大陸航空公司、美商聯邦快遞股份有限公司、東亞太平洋空運有限公司、澳門航空公司、法國國際東方航空公司、香港港龍航空公司、馬來西亞航空公司、澳洲安捷航空公司、美國長青國際航空公司、美國密克羅尼西亞航空公司、亞洲航空公司、長榮航太科技公司、華普飛機引擎科技公司、

航空人員體格檢查標準修正條文

第一章　總　則

第一條　本標準依民用航空法第二十六條第二項規定訂定之。

第二條　航空人員體格檢查給證依本標準處理之。

第三條　航空人員之體格應經民用航空局（以下簡稱民航局）檢查。但民航局得委託航空體格檢查醫師（以下簡稱體檢醫師）檢查之。

前項體檢醫師委託要點由民航局訂定之。

第四條　航空人員體格標準分為甲類體位、乙類體位與丙類體位三大類。其適用對象如下：

一、甲類體位：商用駕駛員、高級商用駕駛員、民用航空運輸業駕駛員。

二、乙類體位：學習駕駛員、自用駕駛員、普通航空業駕駛員、飛航機械員、飛航管制員。

三、丙類體位：地面機械員、航空器維修廠、所維修員、簽派員。

第五條　航空人員申請體格檢查（以下簡稱體檢）時，對航空人員體檢紀錄表規定之自填項目，應據實逐項填報簽字。

第六條　民航局或體檢醫師認為有必要時，得要求航空人員提供有關資料或指定醫療機構、專科醫師檢查，作為評定之參考。

因前項規定所生之費用，由航空人員負擔。

第七條　航空人員之體檢經評定符合規定之標準或經民航局准予缺點免計者，由民航局核發體格檢查及格證（以下簡稱體檢證，如附件一），航空人員應於執業時隨身攜帶。

航空人員之體格經評定不符合規定之標準者，民航局應將評定不符合標準之理由及申請覆議之規定以書面通知之。

第八條　航空人員對前條之評定有異議時，應於不符合標準通知書送達之次日起三十日內向民航局提起覆議。

民航局於覆議時，得召開醫事審查會議，並邀請專家、學者參加審議，且於審議時，準用第六條規定。

民航局之覆議決定書，應附記如不服本決定，得於決定書送達之次日起三十日內向有權管轄機關提起訴願。

第九條　航空人員之體檢應依下列規定期限實施：

一、商用駕駛員、高級商用駕駛員、民用航空運輸業駕駛員應每六個月檢查一次。但年逾六十歲者，應每四個月檢查一次。

二、學習駕駛員、自用駕駛員、普通航空業駕駛員應每十二個月檢查一次。但年逾六十歲

四、胸腔壁、肋骨或縱膈腔之手術後遺症。

五、任何腎臟及泌尿道疾病或手術後之後遺症。

第十九條　內科檢查標準如下：

一、不得有任何足以影響安全執行職務之疾病或機能失常。

二、心臟不得有下列情形之一或見諸病史：

（一）冠狀動脈疾病。

（二）第二度以上之房室傳導阻滯或解離。

三、不得有足以影響安全執行職務之下列情形之一：

（一）嚴重之肥厚性心肌症或擴大性心肌症。

（二）心臟左束枝傳導阻滯。

（三）先天性心臟病。

（四）心臟瓣膜疾病。

（五）心律不整。

（六）傳導異常。

（七）曾患心包膜炎、心內膜炎或心肌炎。

（八）心臟雜音。

四、血壓檢查標準如下：

（一）收縮期血壓為一百四十毫米汞柱以下，舒張期血壓為九十毫米汞柱以下。

（二）依賴單一藥物控制血壓符合前目規定之血壓標準且無併發症者，視為正常。

五、不得有循環系統顯著之機能上或構造上之違常。

六、不得有肺組織、縱膈腔、肋膜之急性疾病。

七、不得有自發性氣胸病史。

八、不得有罹患慢性阻塞性肺部疾病合併症狀。

九、不得有經確定活動性肺結核。

十、不得有足以影響安全執行職務之腸胃道或肝臟、膽囊、胰臟嚴重機能障礙或疾病。

十一、不得有足以影響安全執行職務之腎臟、泌尿道或生殖器疾病。

十二、不得有足以影響安全執行職務之局部性或全身性淋巴腺腫大、脾腫大或有血液疾病

十三、不得有惡性腫瘤。

十四、不得有足以影響安全執行職務之新陳代謝、營養或內分泌之障礙。

十五、不得有糖尿病。

附錄八 Civil Aviation Personnel Physical Examination Handbook

正本

89-763

交通部民用航空局　函

受文者：航空醫務中心

速別：最速件
密等及解密條件：普通
發文日期：中華民國八十九年五月二十五日
發文字號：標準三(89)字第００一五六四七號
附件：如文

主旨：函頒「航空人員體格檢查手冊」，請查照。

說明：本手冊係依「航空人員體格檢查標準」第十三條規定訂定。

正本：航空醫務中心、飛航標準組
副本：企劃組、空運組、飛航管制組、助航組、場站組、供應組、資訊室、秘書室、人事室、政風室、會計室、發言人室、桃園航空客貨運園區開發中心(均含附件)

局長 張有恆

機關地址：台北市敦化北路三四０號
傳　真：（02）23496071

第一頁

民用航空人員體格檢查手冊

第一章　通則

第　一　條　本手冊依航空人員體格檢查標準（以下簡稱本標準）第十三條規定訂定之。

第　二　條　航空體格檢查醫師（以下簡稱體檢醫師）依本標準檢查航空人員身心健康狀況，並依檢查結果研判是否合於簽署體格檢查及格證（以下簡稱體檢證）條件，或需進一步治療診查。

本手冊僅係原則性之指導，實際作業時體檢醫師應根據其醫學專業，仔細逐項檢查及記錄，並依航空人員之執照種類、任務、其他狀況，應用其航醫知識，做最適當之研判及決定。

第　三　條　體檢醫師負責航空人員之體檢、研判、簽署體檢證。並應瞭解錯誤之給證，將使體格不合格之航空人員於操縱航空器或執行任務時，有導致飛航安全之虞。

體檢醫師如故意未按規定之檢查程序或涉及違法行為，致不合格之體檢缺陷未被發現，危及飛航安全者，體檢醫師應對其後果負責。

第　四　條　航空人員於體檢時對其以往病史隱匿不填，致使體檢醫師不克作重點檢查時，經民用航空局（以下簡稱民航局）查證屬實者，由民航局依民用航空法相關規定辦理。

第　五　條　體檢證由體檢醫師簽署後，由民航局核發。

體檢有異常發現時，應做進一步之評估或經由討論、專家顧問協助處理之。

第　六　條　體檢醫師如有理由懷疑持有體檢證之航空人員之身心、行為狀況有問題時，經報請民航局同意後

得實施臨時體檢。

第 七 條　體檢證應註明實際接受體檢之日期，而非發證日期；甲類體檢證適用甲類、乙類、丙類航空人員職務，乙類體檢證適用乙類、丙類航空人員職務，丙類體檢證適用丙類航空人員職務，其有效期間應附註於體檢證中。航空人員申請不同類別之體檢證時，體檢醫師應檢視航空人員有關體檢資料。

第 八 條　體檢醫師認為有必要時，得要求航空人員提供有關資料或指定醫療機構、專科醫師檢查，其結果體檢醫師應彙整並由所屬醫療機構開會討論作成決議，報請民航局作為評定之參考。

第 九 條　航空人員之體檢結果如不合本標準時，當事人可依缺點免計程序提出申請，經鑑定認為無礙飛航安全，准按缺點免計規定辦理之。

第 十 條　航空人員之體檢結果經評定不符合本標準時，體檢醫師應檢具資料並註明理由及引用法條函送民航局辦理。

第十一條　航空人員之個人病歷、工作人員應嚴守秘密不得洩露，唯有負責之體檢醫師始得將有關病情告知航空人員。

第二章　處理程序與原則

第十二條　心臟雜音之處理如下：

一、航空人員有心臟雜音者，應作心臟超音波檢查評估。

二、心臟超音波得由指定之心臟專科醫師檢查，隨後每六個月至一年應繼續追蹤檢查。

第十三條　冠狀動脈疾病之篩檢及處理如下：

一、甲類或乙類航空人員應作履帶式運動心電圖檢查。

二、運動心電圖呈陽性結果者，應接受進一步檢查，如心電圖呈陽性，除檢討有無冠狀動脈疾病之危險因子而加以改正外，並在指定時間內安排作核子醫學（核醫）心臟掃瞄檢查。

三、檢查結果正常者，可照常工作。如為異常者，則立即安排至指定醫院作心導管檢查；如心導管檢查正常，由民航局發證；心導管檢查結果異常者（冠狀動脈阻塞程度大於50%者），依第十條規定辦理。

四、檢查正常者，以後每次之運動心電圖應加以比較，如出現變化，應接受核子醫學心臟掃瞄檢查。

五、曾做心導管檢查者，如隨後運動心電圖有明顯變化或心臟血管疾病危險因子未見改善時，則應隨時作進一步檢查。

第十四條　心律不整之處理如下：

一、靜止心電圖或運動心電圖呈現心律不整時，應做二十四至四十八小時心電圖檢查及評估。

二、陣發性心室上心搏過速者，經電氣生理檢查，且接受高頻輻射導管電燒術治療成功後，經追蹤觀察理想者，得依缺點免計程序提出申請。

三、心律不整者，除二十四小時心電圖監控檢查外，得視需要另做履帶運動心電圖、超音波檢查、電氣生理、心導管檢查、或其他項目檢查。

四、陣發性單次心房纖維震顫者，應接受下列檢查：四次二十四至四十八小時心電圖檢查、甲狀腺功能檢查、心臟超音波檢查、頭部核磁共振造影檢查、心導管血管攝影及電氣生理檢查等。如上述檢查均正常，得依缺點免計程序提出申請。

第十五條　高血壓之處理如下：

一、血壓異常者，需追蹤檢查後評估。

二、檢查發現有高血壓者，應按下列方式處理：

（一）追蹤檢查(包含終端器官受傷程度評估)，如不能恢復至正常數值，建議專科門診。

（二）評估其危險因子，建議其注意改正。

（三）對疑為高血壓患者，宜作二十四小時自動血壓監測，以評估其血壓之變動。

三、專科門診治療高血壓時，應提供主治醫師之處方及診斷證明，並定期檢查血壓及血清之電解質濃度。

四、使用二種以上藥物控制血壓者，得依缺點免計程序提出申請。

第十六條　高血脂症之處理如下：

一、總膽固醇超過240mg/dl、低密度膽固醇超過160mg/dl、三酸甘油脂超過200mg/dl，建議飲食治療、營養師諮商，或膽固醇危險度比值超過五者，依情況建議戒煙、減重、運動，並定期追蹤檢查。

二、總膽固醇或三酸甘油脂超過300mg/dl需積極治療，有潛在安全顧慮者，應邀集專科醫師評鑑。

第十七條　甲狀腺問題之處理如下：

一、甲狀腺功能亢進者，應轉至新陳代謝科專科診治，穩定後再作評估。

二、甲狀腺結節腫者，應立即赴專科進一步檢查。

第十八條　血糖異常之處理如下：

一、有下列情形之一經診斷為糖尿病：

Appendix 9 Confirmation Report on the Cause of Death

鑑定資料

一、鑑定文號：桃園地檢署八十九年度相字第三四〇號、第八四一號。

二、鑑定標本：解剖內臟、血、尿、胃內容物。

案情摘要

死者GUEORGUIEV G. I.，男，四十五歲，為華航A300客機正駕駛於八十九年五月八日上午八時許在台北往越南之CAL681班機上執行任務，在抵台南上空時突然發生失能狀況，經機上有醫師緊急救治，落地後送桃園敏盛醫院時認已死亡。

航醫中心體檢出現白血球過多，肝功能、牙齒略有異常。八十八年十一月廿五日之體檢未做X光檢查。

鑑定經過

屍體經家屬及檢察官王怡青在場確認後於八十九年五月十六日上午九時二十分於台北市立第二殯儀館實施解剖。

一、肉眼觀察結果：

男屍身長一八〇公分，體重約九十五公斤，營養體格良，黑灰短髮三公分後頭禿頂。

整體檢查無外傷。

臉無異常，眼球呈死後脫水下陷，瞳孔等圓〇．四公分直徑，眼結膜無異常。

耳、鼻、口無異常。

前胸部：有急救所發生之皮膚壓迫痕，無其他異常。

腹部、四肢：無異常，無外傷。

依式自下頜中線切開至恥骨聯合，皮下組織豐富二．五公分厚。

腹腔：無腹水，無出血，無外傷，無異常，各臟器之位置關係無異常。

胸腔：無積水，無出血，無骨折，無粘連。

臚腔：頭皮無出血，無骨折，無異常。

各臟器依序摘出檢查，並採樣做組織切片。

心：重三五〇公克，冠狀動脈在左前支起始部五〇%以上狹窄，瓣膜無異常，心肌無肉眼變化。主動脈呈粥腫樣變化，在腹主動脈有鈣化及潰瘍出現。

肺：左重一〇〇〇公克，右重一二五〇公克，無異物，水腫，淤血著明，無炎症反應。

肝：重一七〇〇公克，色無異常，膽囊無結石無異常。

脾：重一二〇公克，無異常。

腎：左重二五〇公克，右重二二〇公克，淤血外無異常。

腎上腺：兩側均無異常。

胃：有內容物爲半固體之梅子干渣殘留，紅色，無其他食物，死前一小時進食，無出血，無潰瘍。

小腸、結腸：無異常。

胰腺：重九〇公克，無異常。

喉：有水腫，有異物梅干渣在喉頭聲門上緣，無炎症反應。

氣管：無異物。

食道：無異常。

腦膜無出血，無異常。

腦：重一三〇〇公克，無水腫，有淤血。在左中腦動脈見一個〇．五公分直徑之動脈瘤，完整，腦底之血管無異常，無硬化。

採血、胃內容物、尿做毒化。

二、顯微鏡觀察結果：

除心冠動脈狹窄外，無其他特殊異常。

三、病理檢察結果：

死者GUEORGUIEV G.I.，男，四十五歲，因急性心冠動脈狹窄阻塞，並有梅子干殘渣異物見於喉頭，猝死，自然死，隨身之藥品經刑事局檢驗結果無特殊之毒藥物成分。

參考航醫中心之體檢紀錄，未發現有心臟異常之表現，在解剖時之嚴重心臟冠狀動脈阻塞應在血中膽固醇過高時提高警覺，又在腹主動脈見著明之血管硬化，鈣化及潰瘍形成，在腹部X光應可能有表現值得參考注意。又該死者在航醫中心祇有二年之體檢記錄，應要求將以前之體檢記錄併入供發證之參考。

四、參考資料：

(一)血液、尿液、胃內容物含酒精0.0048%(W/V)、小於0.002%(W/V)及0.102%(W/V)。無其他毒藥物成分。

(二)死者生前心電圖報告正常（八十七年十二月下旬及八十八年十一月廿五日），生前抽煙習慣，八十八年五月十八日體液檢查顯示高密度膽固醇過低，胸部X光正常。八十七年十一月六日起即發現白血球偏高，經複驗乃原因不明。

鑑定結果

死者GUEORGUIEV G. I.，男，四十五歲，因心冠動脈狹窄阻塞死亡。自然死。以下空白

法務部法醫研究所　鑑定人：方中民

法務部法醫研究所鑑定書專用章

中華民國　八十九　年　七　月　七　日

Appendix 10 Drug Confirmation Report

內政部警政署刑事警察局鑑驗通知書

中華民國 89 年 06 月 05 日刑鑑字第 61378 號

受文機關	航空器飛航安全委員會	委文驗號	89 年 05 月 10 日 (89)飛安字第 00105 號 函
副本送抄單位	本局鑑識科	鑑驗單位	鑑識科毒物組(B49 C050) (毒鑑字第 890109 號)
案由	鑑驗有關 華航 CAL681 航班「機長死亡」意外事件證物。		
鑑驗資料	1.編號 1 藥物。 2.編號 2 藥物。 3.編號 3 藥物。 4.編號 4 藥物。 5.編號 5 藥物。 6.編號 6 藥物。	7.編號 7 藥物。 8.編號 8 藥物。 9.編號 9 藥物。 10.編號 10 藥物。 11.編號 11 藥物。 12.編號 12 藥物。	13.編號 13 藥物。 14.編號 14 藥物。 15.編號 15 藥物。 16.編號 16 藥物。 17.編號 17 藥物。 18.編號 1 食品。
鑑驗方法	一、氯化物呈色分析法。 二、氣相層析質譜分析法。 三、液相層析質譜分析法。 四、掃描式電子顯微鏡 X 光能譜分析法。 五、頂空氣相層析質譜分析法。		六、感應偶合電漿光譜分析法。 七、磷酸呈色分析法。 八、高錳酸根呈色分析法。 九、薄層分析法。 十、紅外線光譜分析法。
鑑驗結果	如附頁。		
備考	關於送驗各藥物之副作用，隨個人之體質及疾病史而有輕、重之別，請洽詢專科醫師。		

裝 訂 線

一致，隨機抽取兩顆鑑驗，餘貳顆。

2.a.均檢出維他命 C(即抗壞血酸 ascorbic acid)成分。

b.均未檢出氰化物成分。

均未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。

均未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。

3.維他命 C：用於預防及治療壞血病。

五、編號 5 藥物：

1.包裝印有"Inhaler"字樣，係塑膠棒狀外用藥，壹支。棒內僅有一棉條，取其棉條浸泡液分析。

2.a.檢出薄荷(menthol)成分。

檢出水楊酸甲酯(methyl salicylate)成分。

檢出 triacetin 成分。

b.未檢出氰化物成分。

未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。

未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。

3.薄荷(menthol)：具健胃、驅風、清涼等作用。

水楊酸甲酯(methyl salicylate)：用於神經痛、關節痛、肌肉痛擦劑，

triacetin：具抑制黴菌生長之作用。

六、編號 6 藥物：

1.包裝印有"xylometazoline"字樣，壹瓶。約 10 毫升，取 1 毫升鑑驗，餘約 9 毫升。

2.a.檢出 Xylometazoline 成分。

檢出 trolamine 成分。

b.未檢出氰化物成分。

未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。

未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。

3.xylometazoline：對鼻腔內微小動脈有收縮作用，用於一般感冒、鼻塞、流鼻水、過敏性鼻炎。

trolamine：具止痛效果。

七、編號 7 藥物：

1.藥粒印有"ALLERGOPOS"字樣，壹瓶。約 10 毫升，取 1 毫升鑑驗，餘約 9 毫升。

2.a.檢出 tetrahydrozoline 成分。

b.未檢出氰化物成分。

未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。

未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。

3. tetrahydrozoline：具收縮血管、抗粘膜充血和殺菌等作用，用於眼睛結膜炎、結膜充血。

八、編號 8 藥物：

1.藥粒印有"Ospexin"字樣，共壹拾顆。每顆重約 700 毫克，顏色外觀均

一致，隨機抽取肆顆鑑驗，餘陸顆。
2.a.均檢出 cephalexin 成分。
b.均未檢出氰化物成分。
均未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。
均未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。
3. cephalexin：為抗生素之一種，具強烈殺菌作用。

九、編號 9 藥物：
1.藥粒印有"NCIPD"字樣，共貳顆。每顆重約 700 毫克，顏色外觀均一致，取壹點伍顆鑑驗，餘約零點伍顆。
2.a.均檢出氧化鎂、氧化鋁成分。
均檢出薄荷(menthol)成分。
b.未檢出氰化物成分。
未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。
未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。
3.氧化鎂、氧化鋁、薄荷之成分組合，用作胃部制酸劑。

十、編號 10 藥物:
1.瓶身印有"CARBOPHOS"字樣，壹瓶，內含錠片壹拾肆顆。每顆重約 1400 毫克，顏色外觀均一致，隨機抽取兩顆鑑驗，餘壹拾貳顆。
2.a.均檢出活性碳成分。
均檢出碳酸鈣成分。
均檢出磷酸鈣成分。
b.均未檢出氰化物成分。
均未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。
均未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。
3.活性碳、碳酸鈣、磷酸鈣之成分組合，用作解毒劑。

十一、編號 11 藥物:
1.瓶身印有"Betadine"字樣，壹瓶。內含液體約 8 毫升，取 2 毫升鑑驗，餘約 6 毫升。
2.a.檢出碘成分。
b.未檢出氰化物成分。
未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。
未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。
3.碘:具殺菌、消毒等作用。

十二、編號 12 藥物:
1.瓶身印有"IMODIUM-RICHTER"字樣，壹瓶。內含綠-紫色膠囊陸顆，，綠-灰色膠囊參顆，各取貳顆鑑驗，餘綠-紫色膠囊肆顆，綠-灰色膠囊壹顆。
2.a.均檢出 Loperamide 成分。
b.均未檢出氰化物成分。
均未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。

均未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。

3.Loperamide:對腸胃炎、飲食或功能異常所引起之腹瀉具抑制作用，用作止瀉劑。

十三、編號 13 藥物:

1.瓶身貼有"ASPISAL Analgesic Quality Value 325mgNDC508-44 757-12 made in USA"字樣，壹瓶。內含顏色外觀一致之錠劑肆顆，隨機抽取壹顆鑑驗，餘參顆。

2.a.檢出乙醯水楊酸(Acetylsalicylic acid)成分。

b.未檢出氰化物成分。

未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。

未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。

3.乙醯水楊酸(acetylsalicylic acid)：用於慢性關節炎、症候性神經痛、腰痛症、感冒之熱解、頭痛、牙痛等。

十四、編號 14 藥物:

1.外包裝標示"KALII PERMANGANAS"字樣，壹包。內含深棕色固體，毛重為 13.5 公克，淨重 12.3 公克，取 1.0 公克鑑驗，餘 11.3 公克。

2.a.檢出高錳酸鉀($KMnO_4$)成分，純度百分之柒拾壹以上。

b.未檢出氰化物成分。

未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。

未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。

3.高錳酸鉀:本成分水溶液與有機物作用時，放出多量之氧，具有強大之消毒作用。

十五、編號 15 藥物:

1.藥膏，印有"Latycin 5g eye-ointment"字樣，壹支。取其內容物 0.5 公克鑑驗。

2.a.檢出四環素(Tetracycline)成分。

b.未檢出氰化物成分。

未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。

未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。

3.四環素:係抗生素之一種，具抗菌、消炎等作用。

十六、編號 16 藥物:

1.藥膏，印有"nemybacin 2.5g"字樣，壹支。取其內容物 0.5 公克鑑驗。

2.a.檢出疑似新絲菌素(Neomycin)成分，由於本局並無新絲菌素標準品可供比對，無法確認此成分。

b.未檢出氰化物成分。

未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。

未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。

3.新絲菌素:係抗生素之一種，具抗菌、消炎等作用。

十七、編號 17 藥物:

1.粉劑，包裝上印有"Medi pulv Antiseptic powder"字樣，壹包。取粉劑0.5公克鑑驗。

2.a.檢出 Chlorhexidine 成分。

b.未檢出氰化物成分。

未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。

未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。

3. Chlorhexidine:具抗菌、消炎等作用。

十八、編號 1 食物:

1.糕點，壹包。經檢視，其包裝完整，印有"元祖 子福 Q 餅 50±2 公克"字樣，毛重為 53.5 公克，淨重 50.0 公克，取 5.0 公克鑑驗，餘 45.0 公克。

2.a.檢出鈉、鎂、鈣、銅、磷等元素成分。。

b.未檢出氰化物成分。

未檢出一級毒品海洛因(Heroin)或嗎啡(Morphine)成分。

未檢出二級毒品安非他命(Amphetamine)或甲基安非他命(Methamphetamine)成分。

3.鈉、鎂、鈣、銅、磷:為食品中常見元素，皆無急毒性。

十九、以上驗餘證物均封妥隨文檢還。

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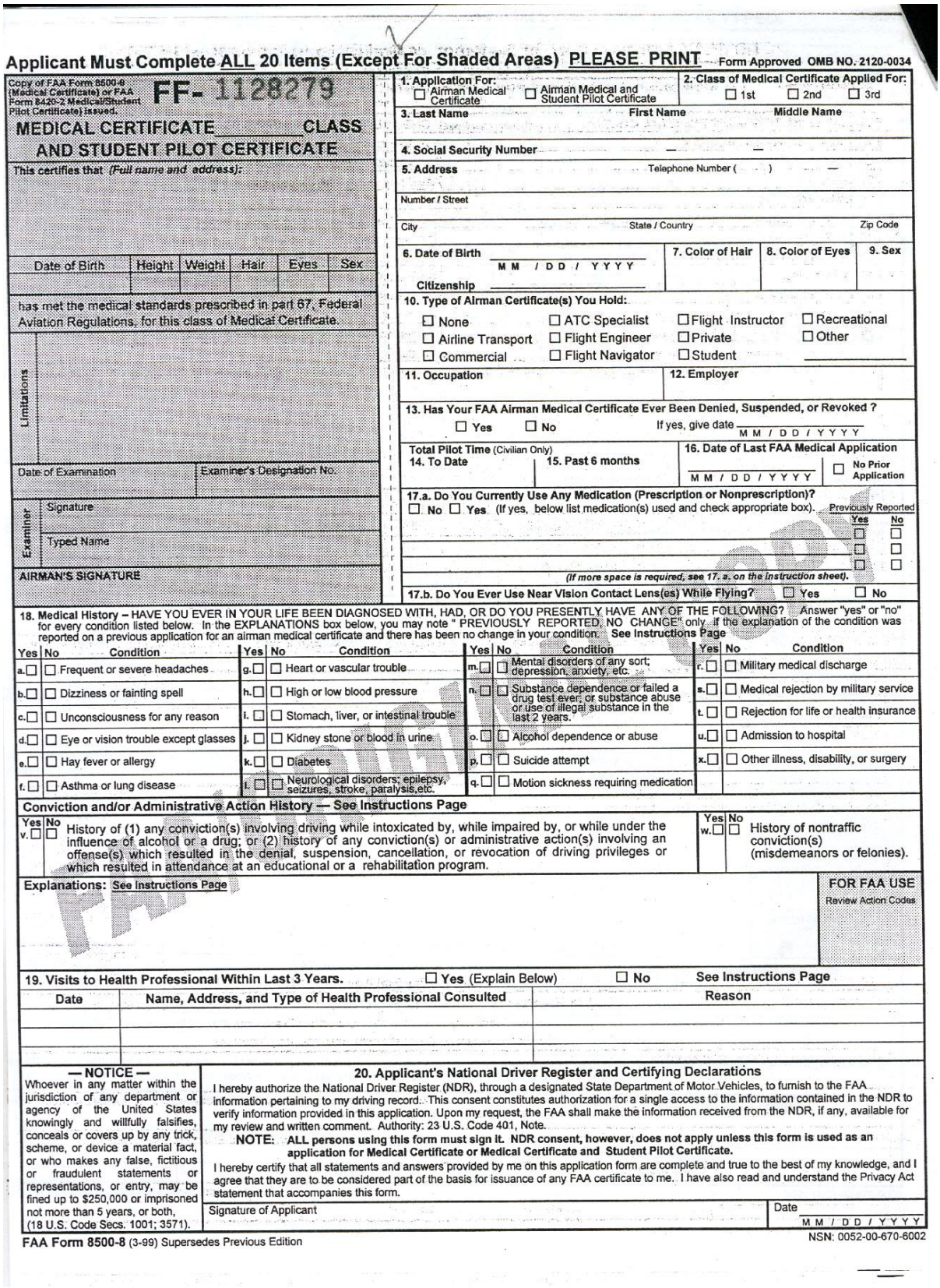
Appendix 11 Cover Page of the FAA Physical Examination Form



Applicant Must Complete ALL 20 Items (Except For Shaded Areas) PLEASE PRINT — Form Approved OMB NO. 2120-0034

Copy of FAA Form 8500-8 (Medical Certificate) or FAA Form 8420-2 Medical/Student Pilot Certificate) is void. **FF- 1128279**

MEDICAL CERTIFICATE CLASS AND STUDENT PILOT CERTIFICATE

This certifies that *(Full name and address):*

Date of Birth	Height	Weight	Hair	Eyes	Sex

has met the medical standards prescribed in part 67, Federal Aviation Regulations, for this class of Medical Certificate.

Limitations

Date of Examination | Examiner's Designation No.

Examiner: Signature / Typed Name

AIRMAN'S SIGNATURE

1. Application For: ☐ Airman Medical Certificate ☐ Airman Medical and Student Pilot Certificate
2. Class of Medical Certificate Applied For: ☐ 1st ☐ 2nd ☐ 3rd
3. Last Name First Name Middle Name
4. Social Security Number — —
5. Address Telephone Number ( ) —
Number / Street
City State / Country Zip Code
6. Date of Birth MM / DD / YYYY
7. Color of Hair
8. Color of Eyes
9. Sex
Citizenship
10. Type of Airman Certificate(s) You Hold:
☐ None ☐ ATC Specialist ☐ Flight Instructor ☐ Recreational
☐ Airline Transport ☐ Flight Engineer ☐ Private ☐ Other
☐ Commercial ☐ Flight Navigator ☐ Student
11. Occupation
12. Employer
13. Has Your FAA Airman Medical Certificate Ever Been Denied, Suspended, or Revoked ? ☐ Yes ☐ No If yes, give date MM / DD / YYYY
Total Pilot Time (Civilian Only) 14. To Date 15. Past 6 months
16. Date of Last FAA Medical Application MM / DD / YYYY ☐ No Prior Application
17.a. Do You Currently Use Any Medication (Prescription or Nonprescription)? ☐ No ☐ Yes (If yes, below list medication(s) used and check appropriate box). Previously Reported Yes No
(If more space is required, see 17. a. on the instruction sheet).
17.b. Do You Ever Use Near Vision Contact Lens(es) While Flying? ☐ Yes ☐ No

18. Medical History – HAVE YOU EVER IN YOUR LIFE BEEN DIAGNOSED WITH, HAD, OR DO YOU PRESENTLY HAVE ANY OF THE FOLLOWING? Answer "yes" or "no" for every condition listed below. In the EXPLANATIONS box below, you may note " PREVIOUSLY REPORTED, NO CHANGE" only if the explanation of the condition was reported on a previous application for an airman medical certificate and there has been no change in your condition. See Instructions Page

Yes	No	Condition	Yes	No	Condition	Yes	No	Condition
a. ☐	☐	Frequent or severe headaches	g. ☐	☐	Heart or vascular trouble	m. ☐	☐	Mental disorders of any sort; depression, anxiety, etc.
b. ☐	☐	Dizziness or fainting spell	h. ☐	☐	High or low blood pressure	n. ☐	☐	Substance dependence or failed a drug test ever; or substance abuse or use of illegal substance in the last 2 years.
c. ☐	☐	Unconsciousness for any reason	i. ☐	☐	Stomach, liver, or intestinal trouble	o. ☐	☐	Alcohol dependence or abuse
d. ☐	☐	Eye or vision trouble except glasses	j. ☐	☐	Kidney stone or blood in urine	p. ☐	☐	Suicide attempt
e. ☐	☐	Hay fever or allergy	k. ☐	☐	Diabetes	q. ☐	☐	Motion sickness requiring medication
f. ☐	☐	Asthma or lung disease	l. ☐	☐	Neurological disorders; epilepsy, seizures, stroke, paralysis,etc.			

Yes	No	Condition
r. ☐	☐	Military medical discharge
s. ☐	☐	Medical rejection by military service
t. ☐	☐	Rejection for life or health insurance
u. ☐	☐	Admission to hospital
x. ☐	☐	Other illness, disability, or surgery

Conviction and/or Administrative Action History — See Instructions Page

v. Yes ☐ No ☐ History of (1) any conviction(s) involving driving while intoxicated by, while impaired by, or while under the influence of alcohol or a drug; or (2) history of any conviction(s) or administrative action(s) involving an offense(s) which resulted in the denial, suspension, cancellation, or revocation of driving privileges or which resulted in attendance at an educational or a rehabilitation program.

w. Yes ☐ No ☐ History of nontraffic conviction(s) (misdemeanors or felonies).

Explanations: See Instructions Page

FOR FAA USE Review Action Codes

19. Visits to Health Professional Within Last 3 Years. ☐ Yes (Explain Below) ☐ No See Instructions Page

Date	Name, Address, and Type of Health Professional Consulted	Reason

— NOTICE —
Whoever in any matter within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals or covers up by any trick, scheme, or device a material fact, or who makes any false, fictitious or fraudulent statements or representations, or entry, may be fined up to $250,000 or imprisoned not more than 5 years, or both, (18 U.S. Code Secs. 1001; 3571).

20. Applicant's National Driver Register and Certifying Declarations

I hereby authorize the National Driver Register (NDR), through a designated State Department of Motor Vehicles, to furnish to the FAA information pertaining to my driving record. This consent constitutes authorization for a single access to the information contained in the NDR to verify information provided in this application. Upon my request, the FAA shall make the information received from the NDR, if any, available for my review and written comment. Authority: 23 U.S. Code 401, Note.

NOTE: ALL persons using this form must sign it. NDR consent, however, does not apply unless this form is used as an application for Medical Certificate or Medical Certificate and Student Pilot Certificate.

I hereby certify that all statements and answers provided by me on this application form are complete and true to the best of my knowledge, and I agree that they are to be considered part of the basis for issuance of any FAA certificate to me. I have also read and understand the Privacy Act statement that accompanies this form.

Signature of Applicant | Date MM / DD / YYYY

FAA Form 8500-8 (3-99) Supersedes Previous Edition NSN: 0052-00-670-6002

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Appendix 12 Emergency response Plan of ICAO Airport Services Handbook Chapter 4.2 on Accidents Occurring In and Out of the Airport

4.2.1 General Principle

場站外失事機場緊急應變計劃及相互支援協議應一併實施，各單位作業行動詳見 4.2.2-4.2.11。

4.2.2 Initial Notification

場站外失事應為目擊證人提供給警察消防隊或地方警告簽派中心（Alarm and Dispatch Centre）該中心基於緊急狀況特性通報給適當單位。

4.2.3 **Mobilization of Aviation Services**

4.2.3.1 使用圖 8-2 之警告通訊系統進行初使通告。

4.2.3.2 提供有管轄權的緊急應變單位，失事位置、參考方格圖、其他基本資料，包含失事時間及失事時間、航機機型，隨後視可能再提供乘客數、燃油量、駕駛員及機載危險物品數量位置等。

4.2.3.3 依據機場應變計劃通知警備、航站管理、醫療服務單位，提供方格參考資訊。

4.2.3.4 視需要發佈 NOTAM 內容為：

”Airport rescue and Fire fighting service protection unavailable until（ Time ） or until further notice. All equipment committed to aircraft accident.”

4.2.3.5 複查檢查表中上述應進行的行動，寫下完成通告時間、簽名。

4.2.4 Mobilization of Airport Firefighting and Rescue Personnel

4.2.4.1 場站外失事正常應由航管單位、地方警察、消防隊通知航站消救單位，根據相互支援協議應有受指定之消救車輛應趕赴現場。

4.2.4.2 航站消救單位應

(a) 前往由地方警察協調適當之出入道路到達失事現場。

(b) 與相互支援消救單位進行協調。

(c) 赴現場途中與具管轄權之消救單位交換下列資訊：

(1) 等待點及運作區

(2) 人力及裝備狀況

(3) 其它確定資訊

4.2.4.3 航站消防資深人員應向有管轄權之地方消防隊資深人員報告並請求指示。

4.2.4.4 先前簽訂之協議應由航站消防單位及場外支援單位簽訂包含航廈及棚廠應有消防裝備，牽涉航廈之消防應由何單位指揮等。

4.2.5 Mobilization of Police Services

4.2.5.1 第一位抵達的機場警備，有責任與現場指揮官協調並負警備職責，需建立緊急車輛出入口道路之通暢，直到指定之警察單位到達。

4.2.5.2 警備單位主要責任為交通順暢及現場警衛。應通知適當之聯絡中心可抵達現場之出入路線。與現場指揮官聯繫後進行出入路線之交通管制輔助緊急應變車輛。

4.2.5.3 警衛及警察須處理失事現場週邊交通，避免破壞散落現場之物品。

4.2.5.4 失事現場須設警戒標誌隔離入侵、媒體、旁觀者、打劫者。建立警告標誌警告侵入現場人員將可能受到重大傷害，接近失事現場 100 公尺處嚴禁煙火。

4.2.5.5 聯絡介於所有警備點、指揮所及緊急操作中心應立即完成通連。

4.2.5.6 圖 8-2 顯示應立即通知人員。

4.2.5.7 警備單位或或授權單位應訂定背章、現場通行證及識別卡的樣式。

4.2.5.8 特別提供飛航資料記錄器及座艙語音記錄器的保護、增加信件保護、保管危險物品及保護人員防止爆炸及放射物傷害。

4.2.6 Mobilization of Airport Management

相互支援協議規定航站管理應採取下列行動：

(a) 到達失事現場

(b) 若須要時啟動航站緊急應變中心及行動指揮所

(c) 應具管轄權之指揮要求擴大支援

(d) 通知航空公司

(e) Notify the other agencies 通知圖 8-2 之其它單位

(f) Provide medical equipment and personnel

4.2.7 Mobilization of Medical Services

4.2.7.1 民防及地方應組織醫療服務，航站之醫護中心也應參與。

4.2.7.2 依據與航站週邊單位訂定之相互支援協議航站醫療應提供部份醫療用品、設備及人員至失事現場。

4.2.8 Hospital Mobilization

4.2.8.1 Provide medical services

4.2.8.2 Confirm that when emergency incidents happen, doctors, nurses, operating room, counseling units, surgery, blood bag preparation.

4.2.9 Mobilization of Airline Company

4.2.9.1 航空公司資深代表須報告予現場行動指揮官協調航空公司作業狀況，若失事航空公司非機場使用者，機場管理者應指定場內適當航空公司處理，直到該航空公司人員到達。

4.2.9.2 航空公司資深代表應提供機載乘客名單、飛航組員及危險物品放置位置，危險品包含易爆物、壓縮、液態氣體、易燃液固體、氧氣瓶、有毒物質、傳染、放射物質，並將該危險品資料之告知消防指揮及醫療協調者。

4.2.9.3 安排交通工具運送未受傷乘客指定的未受傷人員休息區，禁止可行走之受傷乘客之運送，除非獲得醫護協調者允許。

4.2.9.4 航空公司人員應前往未受傷人員休息區，由資深人員負責指派該公司人員負責接待、登記及福利工作。

4.2.9.5 航空公司在未受傷區的代表，須觀察乘客須要適時提供額外的醫療服務、衣物、電話設備等服務。

4.2.9.6 接待人員須在乘客由失事現場前往休息區之下車處等候，指引乘客登記處位置，這些人員應了解廁所、電話、衣物、飲食位置。

4.2.9.7 登記人員應於手冊中記錄乘客姓名，意欲如何安排行程，如旅館安排轉機或其他運輸工具，登記人員須列出乘客身體及心理或潛在狀況，之後給與乘客一個身份標籤（如附錄七第十段），登記後指示該乘客到福利協調者處。

4.2.9.8 Representative from the airline company should be responsible for communicating the incident to the following agencies:

a) Health and social welfare agencies (Department of Health and Department of Social Welfare)
b) Bureau of Customs
c) Bureau of Entry and Exit

d) Post Office

e) Environmental Protection Agency

4.2.9.9 Senior airline officials have the responsibility of contacting next of kin.

4.2.9.10 The airline company, in cooperation with the PR of the airport and other agencies, should make a formal announcement.

4.2.9.11 The airline company is responsible for removing the aircraft's wreckage from the scene, with permission from the agency investigation the incident. Please refer to Airport Service Manual（Doc9137）,Part5-Removal of Disable Aircraft

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附錄十三　Emergency response Plan of the ICAO Airport Services Handbook Chapter 12 on Communication 國際民航組織機場服務手冊緊急應變計畫第十二章通訊

12.1General Principle

All personnel involved in the incident should established two-way communication, including off-site support groups. This is to enable the site commander and emergency center to continue to be able to maintain communication links with all the units involved. At the same time, back-up communication channels should be planned for in the counterplan.

12.2　Communication network

12.2.1 Where there is more than one agency involved in the rescue effort, communication links are of major importance.

12.2.2 There should be an adequate number of direct link radios, telephones, and other communication equipment establishing primary and secondary communication channels. This communication network should link the emergency center, site commander as well as all the agencies involved.

12.2.3 Direct communication methods should be provided to the following agencies:

a）Between tower or aviation services team, airport management personnel, airport machine operators, or airline company and airport emergency rescue unit.

b）Between tower and aviation services team, fire station/firefighting assignment center and firefighting and rescue personnel on the road and on the site.

c）Off-site support units, which include the police notifying al possible support groups.

d）Between firefighting vehicles, firefighters should have a way of communicating with each other.

12.3　Communication equipment

12.3.1 Adequate number of communication equipment should be provided make sure that personnel involved are able to act on situations. The following equipment should be provided:

12.3.2 Wireless radios: portable two-way radios should be provided to every unit involved in order to be able to communicate with the site commander.

12.3.3 Communication regulations should be strictly controlled to make sure that lines are not busy. Each unit should use a different channel; a channel should especially be reserved for the site commander.

12.3.4 The radio channel used by the site commander should enable him to directly link up with the aircraft and ground control personnel. He should also be equipped with earphones to minimize interference.

12.3.5 To communicate directly with the cockpit, Cockpit to Ground lines may be used. 須要配套之連接器、線材、麥克風及耳機，因此須航站消救人員及航空公司相互配合。

12.3.6 行動指揮所需具備足量電話及行動電話線路與場外單位通聯以減少無線電頻率通話負載過重。

12.3.7 醫療單位及救護車須要通訊能力利用週遭醫療機構之先進生命支援系統。

12.3.8 行動指揮所須裝備通訊規劃良好之車輛及通訊操作人員。

12.3.9 需記錄緊急應變中心或行動指揮所含時間的所有通聯狀況。

12.3.10 Other communication equipment like should be considered 其他通訊裝備之考量如擴音器。

12.4 場坪及候機室意外

12.4.1 航站管理或航空公司應建立發生在候機或機坪意外之通訊系統，以利快速反應（機坪意外包含客艙失火，燃油外洩，航車碰撞，緊急醫療）。

12.4.2 機坪主管應配置雙向直通中央控制室之通訊設備。

12.4.3 航機謝載區或空橋(loading gate or jet way)須有電話裝設於登機口及機坪層，緊急電話號碼須明示在電話機上。

12.5 Testing and Inspection

12.5.1 Communication system should be tested on a daily basis (including wireless radios and telephone communication network).

12.5.2 A complete list of the telephones of units and personnel should be provided to every participant of the emergency procedures and should be updated monthly.

Appendix 14 Emergency response Plan of the ICAO Airport Services Handbook Chapter 9 on Categorization and Examination of Injuries and Medical Care

9.1 Immediate care of injured persons from the aviation incident

Many people die because injuries sustained from the incident do not receive immediate medical attention. It is necessary for the medical agency involved to respond timely and categorize these injuries so that appropriate medical measures may be applied.

9.2 Categorization of Injuries (Applicable to all emergency situations)

The priority by which categorized injuries are dealt with and govern post-incident care are as follows:

9.2.1 The injured may be divided into four levels:

1st level: Immediate care

2nd level: Delay care

3rd level: Minor care

4th level: Deceased

9.2.2 The first qualified medical personnel to reach the site should proceed with categorization of injuries until a senior individual or the flight surgeon arrives at the scene. The victims should be transferred from the injury categorization area to the appropriate care area. The victims should also wait until injuries have stabilized before being moved to the designated hospital.

9.2.3 The victims belonging to the first level of injuries should be given priority treatment and sent to designated hospitals ASAP. This is the responsibility of the personnel categorizing the injuries.

9.2.4 The categorization of injuries completed on site is most effective. The only thing is that the people on the site should send the victims to the hospitals as soon as possible or remove them from the site. As a principle, moving the victims should not interfere with emergency firefighting work.

9.2.5 Categorization of injuries should make use of identification cards to help in the arrangement for transport to the hospitals.

9.3 Standardization of Injury Identification cards and their uses

9.3.1 Color and identifying marks shall be used to distinguish the cards from one another. This may improved the care given to the victims as well as shorten the length of time before the victims are sent to the hospitals.

9.3.2 The identification card should be water proof and protected from the elements of the weather:

1st level or immediate care: red, roman numeral I, and the mark of a rabbit.

2nd level or delay care: yellow, Roman numeral II, and the mark of a turtle.

3rd level or slightly injured: green, Roman numeral III, and the ambulance has an X mark.

4th level or casualty: black

9.3.3 If there are no identification cards, Roman numerals may be written on tapes or directly on the forehead or skin of the injured to signify priority level or how to deal with the person. If there are no markers, lip balms may also be used.

9.4 Principles of Care

9.4.1 Patients whose conditions are serious need ot be stabilized on site and then transported to the hospital within the shortest time possible.

9.4.2 Firefighters or the first batch of personnel on the scene should understand that people in serious conditions needs to be stabilized first. Other situation such as the control or prevention of fire should not be the primary focus. Firefighting personnel should listen to the instructions from personnel trained in first aid. The first ambulance to arrive at the scene should have equipment for dealing with injuries, such as : trachea tube, bandages, oxygen tanks, and others to stabilize the conditions of the patients with external injuries as well as to provide rescuers with adequate oxygen. Particular attention must be given to risks posed by clothing, which have flammable oil as other flammable liquids, which may come in contact with the oxygen.

9.4.3 To stabilize the conditions the first few minutes before more professional people arrive to deal with them or until the special external injury team arrives, where they can proceed with more complicated procedures like CPR.

9.4.4 The categorization of injuries, as well as supplementary emergency methods, must be implemented by a medical coordinator. However, prior to the

arrival of the medical coordinator, this responsibility rests on the director othe rescue operations.

9.4.5 The medical coordinator should to notify the site director about all the medical rescue situations. The most important job of the medical coordinator is that of management; he or she should not participate in giving medical assistance.

9.4.6 The medical coordinator should wear a white hat, with the words Medical Coordinator written in the front and back of a white jacket, for easier recognition.

9.4.7 Injuries categorized as 1st level injuries include:

a） Brain hemorrhage;

b） Severe smoke inhalation;

c） Asphyxiating thoracic and cervico- maxillo- facial injuries;

d） Cranial traumata with coma and rapidly progressive shock;

e） Compound fracture;

f） Extensive burns exceeding 30% of skin surface;

g） Crush injuries;

h） Other types of shock;

i） Spinal cord injuries.

9.4.8 Methods of care include:

a） Emergency rescue

b） Maintian consciousness

c） Give oxygen

d） Place in tent awaiting transport to hospital

9.4.9 Injuries categorized as 2nd level injuries include:

a） Non-asphyxiating thoracic and cervico-maxillo-facial injuries

b） Closed fractures

c） Limited burns less than 30% of skin surface

d） External skull injuries not causing a loss of consciousness or shock

e） Injury to the soft parts of the body

9.4.10 Victims with injuries belonging to this category are not on the priority list for transport to hospital.

9.4.11 Injuries belonging to the 3rd level are considered light injuries. They may interfere with the implementation of priority medical treatment. Consequently, the main hing to do is to transport such patients to the designated waiting area.

9.4.12 The airline company or the Red Cross should provide care to those with 3rd level injuries as well as to designate a waiting area beforehand. They may use an empty hangar, the firefighting station, or an area within the airport. There should be provisions for ventilation, lighting, water, telephone, bathroom, and other facilities. This position should be made known to all airline company personnel as well as all airport tenants.

9.5 Control of flow of the injured victims

9.5.1 Four care areas should be established as in Fig. 9-1

a） Assembly area－The seriously injured should be housed in this area where the paramedics will turn them over to medical personnel.

b） Injury categorization area－ should be at least 90m from the site and may be put up in different areas.

c） Care area－After categorization, the injured shall be placed in respective care areas, which will be divided into three levels:

1st level: Shall be identified via a red banner or stremer.

2nd level: Shall be identified via a yellw banner or streamer.

3rd level: Shall be identified via a green banner.

d） Transportation area－ Shall be placed between the exit and care areas. There shall only be one transportation area or else a communication network should be put up.

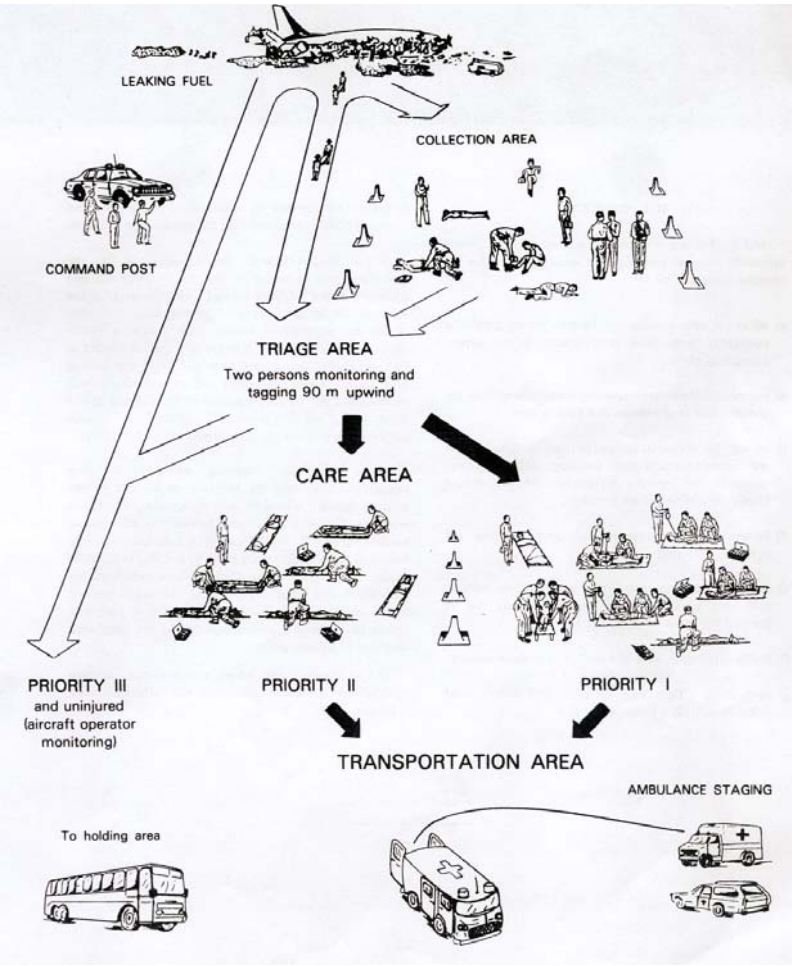


Fig. 9-1 Flow chart of categorization of injuries as well as medical care

9.5.2 Mobilization equipment is of help in stabilizing the conditions of victims with 1st and 2nd level injuries. Lengt ofuse does not exceed 30 minutes.

a） Simplified or recovery ambulances shall be used by victims having 1st level injuries. Recovery ambulances are able to transport the victims to the hospitals.

b） The red tent, designated for the seriously injured, will be equipped with ventilation and lighting facilities which will be brought iver together with all the required medical equipment.

c） The yellow tent is designated for victims in the 2nd level.

Appendix 15 Flight Safety Report During the Course of the Accident Investigation

No.: ASC-IFSB-89-05-01

Incident: On May 8, 2000, China Airlines Flight 681 returns to Chiang Kai Shek International Airport due to incapacitation of the chief pilot, where medical personnel proceed to board the aircraft and administer emergency procedures.

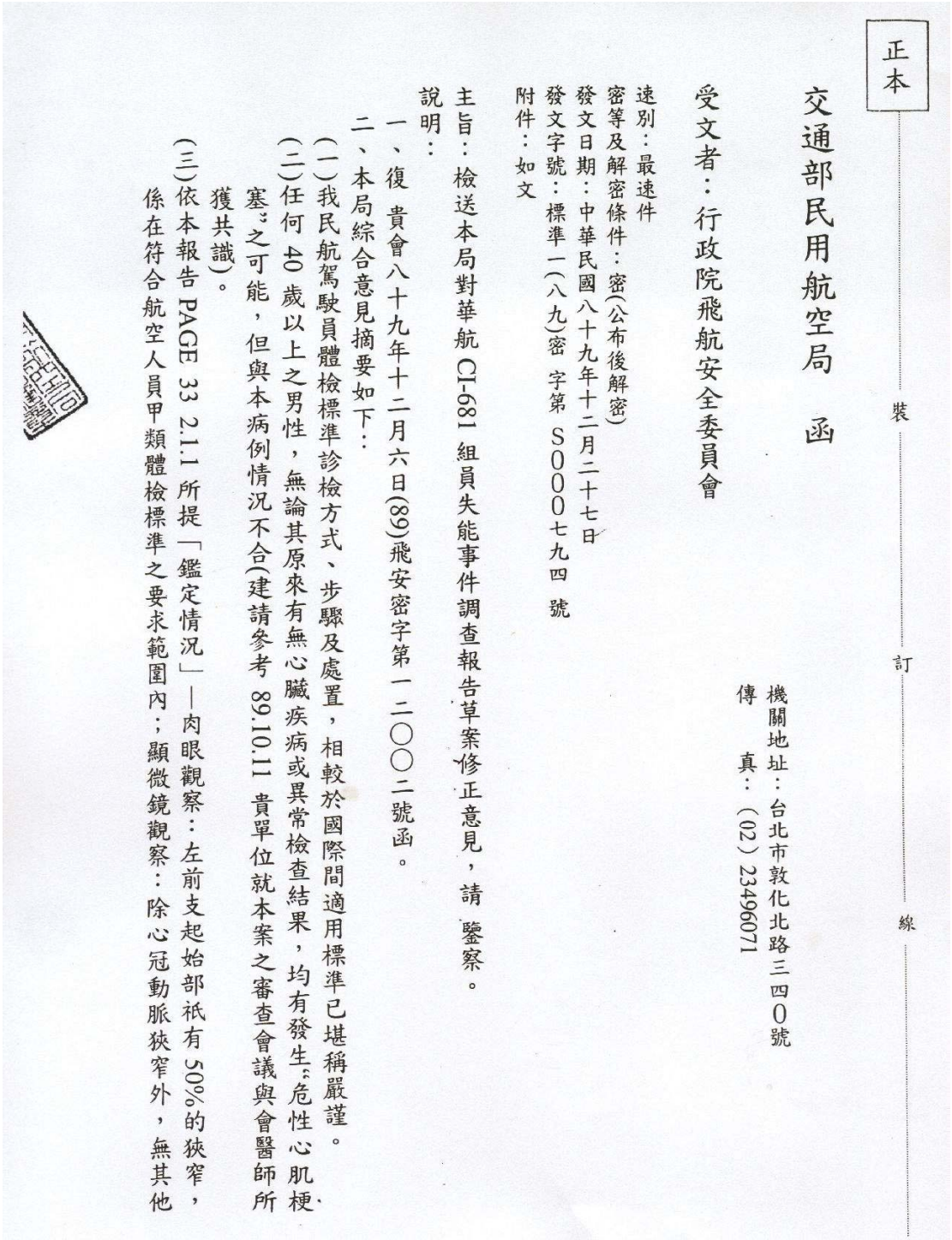
Date of Report: May 19, 2000

Report Items:

1. On the matter of the co-pilot discovering the captain's incapacitation when the aircraft was flying on an altitude of 31,000 feet, preliminary investigation showed that after landing, the medical personnel was not able to board the aircraft immediately and administer emergency medical procedures.
2. To prevent any similar delays, the board makes the following recommendations:
   a. When aviation personnel has an emergency situation on hand, he should use the standard emergency phraseology MAY DAY, MAY DAY or PAN, PAN to relay the seriousness of the current situation to the responsible persons.
   b. Upon receiving of notification of such emergency situation, each department at the airport as well as the airline company should actively communicate with each other and exchange information. Moreover, as soon as the aircraft lands, these departments should implement the most effective method as well as assign medical personnel to administer real time medical assistance.

Jieh Kai
Executive Director
Aviation Instrument Aviation Flight Safety Board

Appendix 16 Amended Recommendations on the Report of the Ministry of Transportation and Communication Civil Aviation Association



正本

交通部民用航空局　函

機關地址：台北市敦化北路三四0號
傳　真：（02）23496071

受文者：行政院飛航安全委員會

速別：最速件
密等及解密條件：密(公布後解密)
發文日期：中華民國八十九年十二月二十七日
發文字號：標準一(八九)密 字第 S000七九四 號
附件：如文

主旨：檢送本局對華航 CI-681 組員失能事件調查報告草案修正意見，請 鑒察。

說明：

一、復 貴會八十九年十二月六日(89)飛安密字第一二〇〇二號函。

二、本局綜合意見摘要如下：

(一)我民航駕駛員體檢標準診檢方式、步驟及處置，相較於國際間適用標準已堪稱嚴謹。

(二)任何 40 歲以上之男性，無論其原來有無心臟疾病或異常檢查結果，均有發生"危性心肌梗塞"之可能，但與本病例情況不合(建請參考 89.10.11 貴單位就本案之審查會議與會醫師所獲共識)。

(三)依本報告 PAGE 33 2.1.1 所提「鑑定情況」—肉眼觀察：左前支起始部祇有 50%的狹窄，係在符合航空人員甲類體檢標準之要求範圍內；顯微鏡觀察：除心冠動脈狹窄外，無其他

特殊異常。就以上二項檢查結果而論，並未發現有冠狀動脈阻塞現象，唯在解剖報告中又提出嚴重心臟冠狀動脈阻塞之論點，前後有矛盾之處。

(四)梅核是否會引起急性氣道梗塞(究係吞下或嘔出)建請再詳加研究。

(五)飛航駕駛員失能肇因之預防至為重要，是故成因之判斷及於預防措施均宜審慎研議，建議邀集國內、外相關醫學專家共同就本案再行評定，以資公信。

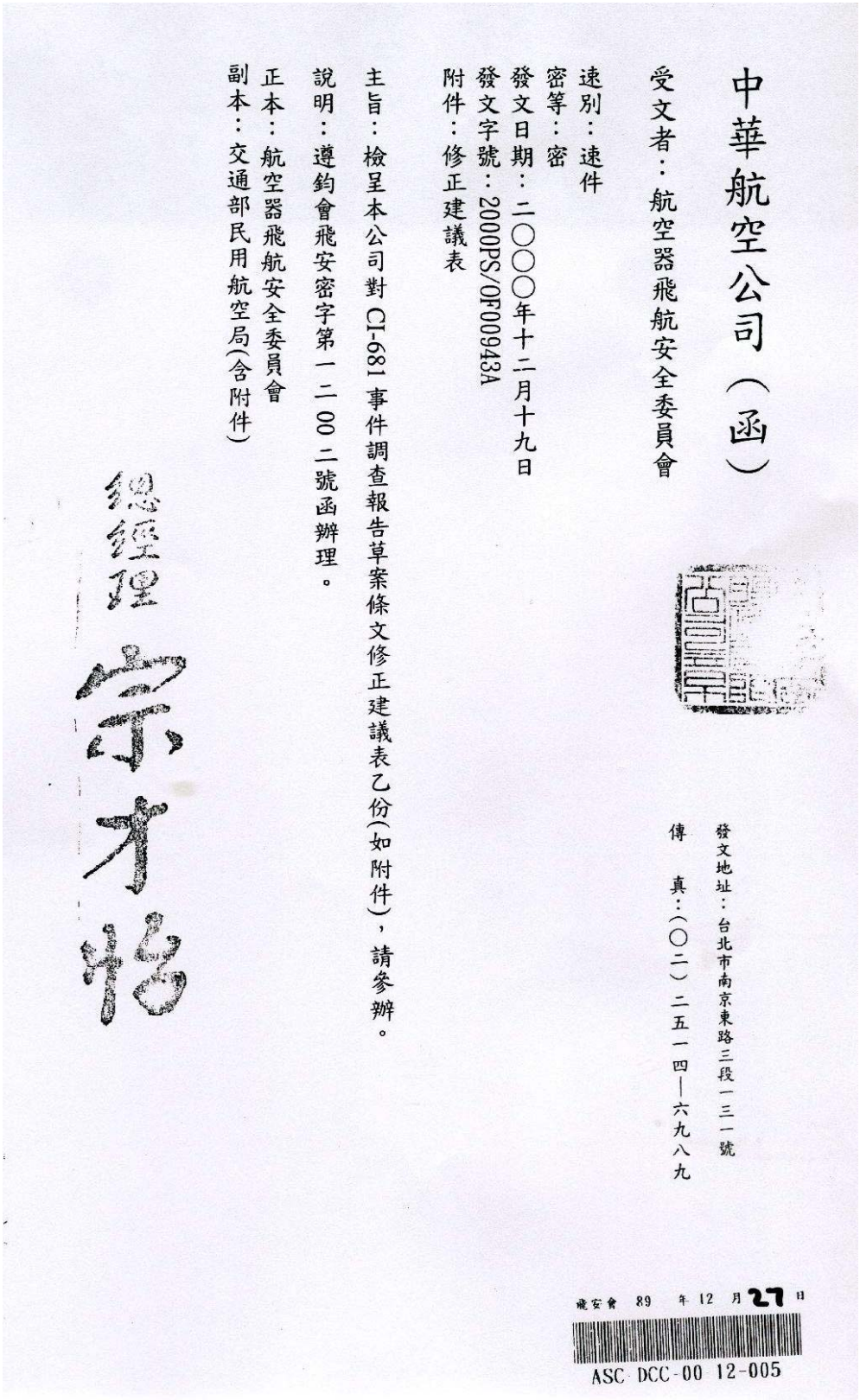
(六)航醫中心對冠心病危險因子之檢查，歷來均列為航空體檢之重點項目，今後當再加強與航空公司醫務、航務部門連繫，俾嚴加掌控。

三、本調查報告草案文字修正建議如附件(請參考)。

局長 張有恆

正本：行政院飛航安全委員會
副本：本局飛航標準組

Appendix 17 China Airlines' Amended Report and Recommendations



中華航空公司（函）

受文者：航空器飛航安全委員會

速別：速件
密等：密
發文日期：二〇〇〇年十二月十九日
發文字號：2000PS/OF00943A
附件：修正建議表

主旨：檢呈本公司對 CI-681 事件調查報告草案條文修正建議表乙份(如附件)，請參辦。

說明：遵鈞會飛安密字第一二00二號函辦理。

正本：航空器飛航安全委員會
副本：交通部民用航空局(含附件)

總經理

發文地址：台北市南京東路三段一三一號
傳　真：(〇二)二五一四—六九八九

飛安會 89 年 12 月 27 日

ASC DCC-00 12-005

華航對 CI681 事件調查報告草案條文修正建議表

項次	現行條文	建議修正條文	說明
一	第三章結論3.1調查結果。 第七條：「…起飛後不久副駕駛改採自動駕駛…。」。	…起飛後不久副駕駛採用自動駕駛…。	副駕駛係依飛航操作程序。
二	第三章3.1之第八條：「…未有增加飛航組員工作量之故障」。	「…未有增加飛航組員工作量之情況」。	故障二字宜引人誤導。
三	第三章3.1之第九條：「…惟未使用緊急狀況術語通報」。	…惟未使用標準緊急狀況術語通報。	副駕駛已通報惟因情況緊急未及使用標準術語。
四	第三章3.1第十四條：「…未瞭解該副駕駛…致傳遞偏差消息」。	…「未及時瞭解該副駕駛…致傳遞不完整之消息」。	
五	第三章3.1第十五條：「亞派中心人員未瞭解該機…於地面有九分鐘延誤」。	「…亞派中心人員不知該機…於地面九分鐘之時間」。	
六	第三章3.1第十七條：「華航亞派中心人員未充分瞭解公司…」。	建議全條刪除	PIC 依 FOM 規定有權做任何緊急狀況之處理決定。
七	第三章3.3第一條：「體檢機關及航空公司未能加強…」。	請斟酌刪除	1此種疾病可預知嗎？ 2航空公司有提醒之義務嗎？
八	第三章3.3第二條：「駕駛員本身未重視體檢結果…」。	請斟酌刪除	身體狀況既是機師賴以工作之本錢，未重視之事實根據為何？
九	第四章4.2第一條：「要求駕駛員重視體檢」。	請斟酌刪除	如右
十	第四章4.2第二條：「應對駕駛員中可能具潛在冠心病遭以列管，並提出保健建議」。	請斟酌刪除	「可能具…」 如何偵知？實務上可行性為何？ 本公司對具潛在冠心病已有列管及提出保健建議。
十一	第二章2.4.2：「…惟華航航務手冊第二章醫療緊急狀況中組員失能之處置程序及第十四章緊急程序之危難及緊急時，無線電通話程序中均未敘述緊急情況(危難及緊急)之宣告條件為何…」。	請斟酌刪除本段文字 建議刪除	

Appendix 18 AHA/ACC Scientific Statement

AHA/ACC Scientific Statement

Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations

A Statement for Healthcare Professionals From the American Heart Association and the American College of Cardiology

Scott M. Grundy, MD, PhD; Richard Pasternak, MD; Philip Greenland, MD; Sidney Smith, Jr, MD; Valentin Fuster, MD, PhD

The past decade has witnessed major strides in the prevention of coronary heart disease (CHD) through modification of its causes. The most dramatic advance has been the demonstration that aggressive medical therapy will substantially reduce the likelihood of recurrent major coronary syndromes in patients with established CHD (secondary prevention). The American Heart Association (AHA) and the American College of Cardiology (ACC) have published joint recommendations for medical intervention in patients with CHD and other forms of atherosclerotic disease (1). A similar potential exists for risk reduction in patients without established CHD (primary prevention). However, the risk status of persons without CHD varies greatly, and this variability mandates a range in the intensity of interventions. Effective primary prevention thus requires an assessment of risk to categorize patients for selection of appropriate interventions. The present statement is being published jointly by the AHA and ACC to outline current issues and approaches to global risk assessment for primary prevention. The approaches described in this statement can be used for guidance at several levels of primary prevention; however, the statement does not attempt to specifically link risk assessment to treatment guidelines for particular risk factors. Nonetheless, it provides critical background information that can be used in the development of new treatment guidelines.

The major and independent risk factors for CHD are cigarette smoking of any amount, elevated blood pressure, elevated serum total cholesterol and low-density lipoprotein cholesterol (LDL-C), low serum high-density lipoprotein cholesterol (HDL-C), diabetes mellitus, and advancing age (Table 1). The quantitative relationship between these risk factors and CHD risk has been elucidated by the Framingham Heart Study (2) and other studies. These studies (2) show that the major risk factors are additive in predictive power. Accordingly, the total risk of a person can be estimated by a summing of the risk imparted by each of the major risk factors. Other factors are associated with increased risk for CHD (Table 2). These are of 2 types: conditional risk factors and predisposing risk factors. The conditional risk factors are associated with increased risk for CHD, although their causative, independent, and quantitative contributions to CHD have not been well documented. The predisposing risk factors are those that worsen the independent risk factors. Two of them—obesity and physical inactivity—are designated major risk factors by the AHA (3,4). The adverse effects of obesity are worsened when it is expressed as abdominal obesity (5), an indicator of insulin resistance.

Clinical Importance of Global Estimates for CHD Risk

Preventive efforts should target each major risk factor. Any major risk factor, if left untreated for many years, has the potential to produce cardiovascular disease (CVD). Nonetheless, an assessment of total (global) risk based on the summation of all major risk factors can be clinically useful for 3 purposes: 1) identification of high-risk patients who deserve immediate attention and intervention, 2) motivation of patients to adhere to risk-reduction therapies, and 3) modification of intensity of risk-reduction efforts based on the total risk estimate. For the latter purpose, patients at high risk because of multiple risk factors may require intensive modification of ≥1 risk factors to maximize risk reduction. Guidelines for the management of individual risk factors are provided by the second Adult Treatment Panel report (ATP II) of the National Cholesterol Education Program (NCEP) (6), the sixth report of the Joint National Committee (JNC VI) of the National High Blood Pressure Education Program (7), and the American Diabetes Association (ADA) (8). All of these guidelines are currently endorsed or supported by the AHA and the ACC. These reports (6–8) advocate adjusting the intensity of risk factor management to the global risk of the patient. In ATP II and JNC VI (6,7), overall risk is estimated by adding the categorical risk factors. They do not use a total risk estimate based on summation of risk factors that have been graded according to severity; this latter

This statement was approved by the American Heart Association Science Advisory and Coordinating Committee in June 1999 and by the American College of Cardiology Board of Trustees in July 1999. This document is available on the World Wide Web sites of the American Heart Association (www.americanheart.org) and the American College of Cardiology (www.acc.org). Reprints of this document (the complete guidelines) are available for $5 each by calling 800-253-4636 (US only) or writing the American College of Cardiology, Resource Center, 9111 Old Georgetown Road, Bethesda, MD 20814-1699. To purchase additional reprints: up to 999 copies, call 800-611-6083 (US only) or fax 413-665-2671; 1000 or more copies, call 214-706-1466, fax 214-691-6342, or e-mail pubauth@heart.org. To make photocopies for personal or educational use, call the Copyright Clearance Center, 978-750-8400.

(J Am Coll Cardiol 1999;34:1348–59)

PII S0735-1097(99)00387-3

TABLE 1. Major Independent Risk Factors

Cigarette smoking
Elevated blood pressure
Elevated serum total (and LDL) cholesterol
Low serum HDL cholesterol
Diabetes mellitus
Advancing age

approach has been advocated recently by Framingham investigators (2). The use of categorical risk factors has the advantage of simplicity but may be lacking in some of the accuracy provided by graded risk factors.

Some researchers and clinicians believe that the summation of graded risk factors provides advantages over the addition of categorical risk factors. For instance, the use of graded risk factors has been recommended in risk-management guidelines developed by joint European societies in cardiovascular and related fields (9). Advocates of this approach contend that the increased accuracy provided by the grading of risk factors outweighs the increased complexity of the scoring procedures. If the Framingham system is to be used, however, its limitations as well as its strengths must be understood. The AHA's Task Force on Risk Reduction recently issued a scientific statement (10) that reviewed and assessed the utility of Framingham scoring as a guide to primary prevention. The present report expands on this assessment and considers factors that must be taken into account when the Framingham algorithm is used (2).

Primary Versus Secondary Prevention

The present report focuses mainly on risk assessment for coronary disease and not on risk for other cardiovascular outcomes. Framingham scores estimate risk for persons without clinical manifestations of CHD (2). Therefore, the scores apply only to primary prevention, ie, to prevention in persons without established CHD. Once coronary atherosclerotic disease becomes clinically manifest, the risk for future coronary events is much higher than that for patients without CHD (6), regardless of other risk factors, and in this case, Framingham scoring no longer applies. The AHA and ACC have issued joint guidelines for the management of risk factors for patients with established CHD and other forms of atherosclerotic disease (1).

TABLE 2. Other Risk Factors

Predisposing risk factors
Obesity*†
Abdominal obesity†
Physical inactivity*
Family history of premature coronary heart disease
Ethnic characteristics
Psychosocial factors
Conditional risk factors
Elevated serum triglycerides
Small LDL particles
Elevated serum homocysteine
Elevated serum lipoprotein(a)
Prothrombotic factors (eg, fibrinogen)
Inflammatory markers (eg, C-reactive protein)

*These risk factors are defined as major risk factors by the AHA (3,4).

†Body weights are currently defined according to BMI as follows: normal weight 18.5–24.9 kg/m^2; overweight 25–29 kg/m^2; obesity >30.0 kg/m^2 (obesity class I 30.0–34.9, class II 35.9–39.9, class III ≥50 kg/m^2). Abdominal obesity is defined according to waist circumference: men >102 cm (>40 in) and women >88 cm (35 in) (5).

Definition of CHD

Interpretation of risk estimates for CHD requires a precise definition of CHD. Framingham estimates traditionally predict total CHD, which includes angina pectoris, recognized and unrecognized myocardial infarction, coronary insufficiency (unstable angina), and CHD deaths. In contrast, many clinical trials (11–14) that have evaluated specific risk-reducing therapies have specified major coronary events (recognized acute myocardial infarction and CHD deaths) as the primary coronary end points. In accord, the recent Framingham report (2) also provided estimates for "hard" CHD, excluding angina pectoris. The inclusion of coronary insufficiency (unstable angina) and unrecognized myocardial infarction (defined by electrocardiography) probably gives estimates of hard CHD that are somewhat higher than combined end points reported in several clinical trials (11–14). A recent clinical trial, the Air Force/Texas Coronary Artery Prevention Study (AFCAPS/TexCAPS) (15), specified acute coronary events, including unstable angina, acute myocardial infarction, and coronary death, as the primary end point. This combined end point probably corresponds closely to the Framingham study's definition of hard CHD. Definitions of coronary end points assume critical importance when risk cutpoints are defined to select patients for specific therapies.

Absolute Risk Estimates

Absolute risk is defined as the probability of developing CHD over a given time period. The recent Framingham report (2) specifies absolute risk for CHD over the next 10 years. Although absolute risk scores can be used to evaluate preventive strategies, 4 caveats must be kept in mind. First, Framingham scores derive from measurements made some years ago; the possibility exists that absolute risk for any given level of risk factors in the general population may have changed since that time. Second, absolute risk in the Framingham population for any given set of risk factors may not be the same as that for all other populations, for example, those of differing ethnic characteristics. Third, Framingham risk scores represent average values; however, considerable individual variability in risk exists within the Framingham population. For example, several other factors not included in the Framingham scores potentially modify absolute risk for individuals (see Table 2). Finally, Framingham scores are not necessarily elastic; the magnitude of risk reduction achieved by modifying each risk factor may not equal (in reverse) the increment in risk accompanying the factors.

TABLE 3. Definition of a Low-Risk State*

Serum total cholesterol 160 to 199 mg/dL
LDL-C 100 to 129 mg/dL
HDL-C ≥45 mg/dL in men and ≥55 mg/dL in women
Blood pressure <120 mm Hg systolic and <80 mm Hg diastolic
Nonsmoker
No diabetes mellitus

*According to Framingham Heart Study (2).

Definition of Low Risk

The Framingham report (2) defined low risk as the risk for CHD at any age that is conferred by a combination of all the following parameters: blood pressure <120/<80 mm Hg, total cholesterol 160 to 199 mg/dL (or LDL-C 100 to 129 mg/dL), and HDL-C ≥45 mg/dL for men or ≥55 mg/dL for women in a nonsmoking person with no diabetes (Table 3). This definition of low risk seems appropriate and should be widely applicable; for example, in the follow-up of 350 000 screenees of the Multiple Risk Factor Intervention Trial (16), most of the excess mortality from CHD could be explained by the presence of the major risk factors above these levels. The NCEP (6) designated a total cholesterol level of <200 mg/dL (or LDL-C of <130 mg/dL) as a desirable level. Framingham investigators (2) included total cholesterol levels in the range of 160 to 199 mg/dL (and LDL-C of 100 to 129 mg/dL) in their definition of the low-risk state. In addition, NCEP (6) recognized an LDL-C level of ≤100 mg/dL as optimal and as the goal of therapy for secondary prevention. This level corresponds to a total cholesterol level of ≈<160 mg/dL. An elevated LDL-C level appears to be the primary CHD risk factor, because some elevation of LDL seems to be necessary for the development of coronary atherosclerosis (17). A very-low-risk state can be defined as an LDL-C level of <100 mg/dL in the presence of other low-risk parameters (Table 3). Therapeutic efforts to reestablish a very-low-risk state appear to be justified for secondary prevention (1,6); in primary prevention, however, a very low LDL-C level is not currently deemed necessary (6).

Relative Risk Versus Absolute Risk: Estimations From Framingham Scores

The relative risk is the ratio of the absolute risk of a given patient (or group) to that of a low-risk group. Literally, the term relative risk represents the ratio of the incidence in the exposed population divided by the incidence in unexposed persons. The denominator of the ratio can be either the average risk of the entire population or the risk of a group devoid of risk factors. The Framingham definition of the low-risk state provides a useful denominator to determine the effect of risk factors on a patient's risk. Both the absolute and relative risk can be derived from the recently published risk score sheets (2).

The first step in estimating risk is to calculate the number of Framingham points for each risk factor (Table 4). For initial assessment, measurements of serum levels of total cholesterol (or LDL-C) and HDL-C are required (2). The points for total cholesterol instead of LDL-C are listed in Table 4 because some of the Framingham database did not include LDL-C. Hence, total cholesterol gives more robust estimates. Evaluation for cholesterol disorders requires measurement of LDL-C, which is also the primary target of cholesterol-lowering therapy (6). The blood pressure value used in scoring is that obtained at the time of assessment, regardless of whether the patient is taking antihypertensive

TABLE 4. Global Risk Assessment Scoring

	Risk Points	
Risk Factor	Men	Women
Age, y		
<34	−1	−9
35–39	0	−4
40–44	1	0
45–49	2	3
50–54	3	6
55–59	4	7
60–64	5	8
65–69	6	8
70–74	7	8
Total cholesterol, mg/dL		
<160	−3	−2
169–199	0	0
200–239	1	1
240–279	2	2
≥280	3	3
HDL cholesterol, mg/dL		
<35	2	5
35–44	1	2
45–49	0	1
50–59	0	0
≥60	−2	−3
Systolic blood pressure, mm Hg		
<120	0	−3
120–129	0	0
130–139	1	1
140–159	2	2
>160	3	3
Diabetes		
No	0	0
Yes	2	4
Smoker		
No	0	0
Yes	2	2
Adding up the points		
Age _____		
Cholesterol _____		
HDL-C _____		
Blood pressure _____		
Diabetes _____		
Smoker _____		
Total points _____		

Age	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74		
(Low-risk level)*	(2%)	(3%)	(3%)	(4%)	(5%)	(7%)	(8%)	(10%)	(13%)	Absolute Risk	Absolute Risk‡
Points †										Total CHD‡	Hard CHD¶
0	1.0									2%	2%
1	1.5	1.0	1.0							3%	2%
2	2.0	1.3	1.3	1.0						4%	3%
3	2.5	1.7	1.7	1.3	1.0					5%	4%
4	3.5	2.3	2.3	1.8	1.4	1.0				7%	5%
5	4.0	2.6	2.6	2.0	1.6	1.1	1.0			8%	6%
6	5.0	3.3	3.3	2.5	2.0	1.4	1.3	1.0		10%	7%
7	6.5	4.3	4.3	3.3	2.6	1.9	1.6	1.3	1.0	13%	9%
8	8.0	5.3	5.3	4.0	3.2	2.3	2.0	1.6	1.2	16%	13%
9	10.0	6.7	6.7	5.0	4.0	2.9	2.5	2.0	1.5	20%	16%
10	12.5	8.3	8.3	6.3	5.0	3.6	3.1	2.5	1.9	25%	20%
11	15.5	10.3	10.3	7.8	6.1	4.4	3.9	3.1	2.3	31%	25%
12	18.5	12.3	12.3	9.3	7.4	5.2	4.6	3.7	2.8	37%	30%
13	22.5	15.0	15.0	11.3	9.0	6.4	5.6	4.5	3.5	45%	35%
>14	26.5	>17.7	>17.7	>13.3	>10.6	>7.6	>6.6	>5.3	>4.1	>53%	>45%

* Low absolute risk level = 10-year risk for total CHD end points for a person the same age, blood pressure < 120/<80 mmHg, total cholesterol 160-199 mg/dL, HDL-C ≥45 mg/dL, nonsmoker, no diabetes. Percentages show 10-year absolute risk for total CHD end points.

† Points = number of points estimated from Table 4

‡ 10-year absolute risk for total CHD end points estimated from Framingham data corresponding to Framingham points (Table 4)

¶ 10-year absolute risk for hard CHD end points approximated from Framingham data corresponding to Framingham points (Table 4)

Color Key for Relative Risk

Green	Violet	Yellow	Red
Below Average risk	Average risk	Moderately above average risk	High risk

Figure 1. Relative and absolute risk estimates for CHD in men as determined for Framingham scoring (2). The number of Framingham points is derived as shown in Table 4. Relative risk estimates for each age range are compared with baseline risk conferred by age alone (in the absence of other major risk factors). Relative risk is graded and color coded to include below average, average, moderately above average, and high-risk categories. Distinctions in relative risk are arbitrary. Average risk refers to that observed in the Framingham population. Absolute risk estimates are given in the 2 right-hand columns. Absolute risk is expressed as the percentage likelihood of developing CHD per decade. Total CHD risk equates to all forms of clinical CHD, whereas hard CHD includes clinical evidence of myocardial infarction and coronary death. Hard CHD estimates are approximated from the published Framingham data (2).

drugs. The average of several blood pressure measurements is needed for an accurate determination of the baseline level. Finally, in the present report, Framingham risk scores for borderline elevations have been modified to assign stepwise incremental risk in accord with current NCEP (6) and JNC VI (7) guidelines. Failure of Framingham scores to identify stepwise increments in risk in borderline zones probably reflects the relatively small size of the Framingham cohort. Diabetes is defined as a fasting plasma glucose level >126 mg/dL, to conform with recent ADA guidelines (18); in the Framingham study, diabetes was defined as a fasting glucose level >140 mg/dL. The designation of "smoker" indicates any smoking in the past month. The total risk score sums the points for each risk factor.

Risk ratios, relative to the low-risk state (Table 3), are shown for men in Figure 1 and for women in Figure 2; for each age, the number shown gives the relative risk. In addition, 10-year absolute risk values are shown for both total and hard CHD. The definition of hard CHD is that used by Framingham investigators; values shown for hard CHD are approximately two thirds those for total CHD, which are in accord with the recent Framingham report (2). Gradations of increasing relative risk are given in color. At the midpoint of this gradation is the average risk for the Framingham cohort for each age range. Ratios above average are divided into moderately high relative risk and high relative risk. A 3-fold increase in relative risk above the lowest risk level is designated moderately high risk; a 4-fold or greater increase is called high risk. Absolute risk levels rise progressively with age, even in the absence of risk factors.

Relative risk is useful for providing the physician with an immediate perspective of a patient's overall risk status relative to a low-risk state. This perspective can be helpful as a frame of reference for both physician and patient. Moreover, relative risk probably can be used to compare risk among individuals in populations in which baseline absolute risk has not been established. Absolute baseline risk (low-risk level) almost certainly varies among different populations, but the relative contributions of individual risk factors to total risk appear to be similar among all populations. Although the comparability of relative risk has not been proven rigorously, examination of available data from different epidemiological studies (19–28) suggests this to be the case.

It is apparent from Figures 1 and 2 that the relative risk associated with a given set of risk factor levels (expressed as a single Framingham number) declines with advancing age. At the same time, 10-year absolute risk rises with aging. Both changes have implications for prevention. Higher relative risk estimates in young adults are an indication of the high long-term risk accompanying the risk factors; they point to the need to institute a long-term risk-reduction strategy. On the other hand, the increasing absolute risk that accompanies advancing age reveals the opportunity for reducing absolute short-term risk by an immediate aggressive reduction of risk factors in older people. However, the best candidates for aggressive risk reduction among older patients may be those with moderately high or high relative risk. Recent guidelines have emphasized absolute risk estimates for use in treatment guidelines. Even so, the utility of relative risk estimates for areas of primary prevention that are most contentious, specifically, in young adults and elderly patients, should not be overlooked in the development of future guidelines.

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74		
(Low-risk level)*	(2%)	(3%)	(5%)	(7%)	(8%)	(8%)	(8%)	Absolute Risk	Absolute Risk
Points †								Total CHD‡	Hard CHD¶
0	1.0							2%	1%
1	1.0							2%	1%
2	1.5	1.0						3%	2%
3	1.5	1.0						3%	2%
4	2.0	1.3						4%	2%
5	2.0	1.3						4%	2%
6	2.5	1.7	1.0					5%	2%
7	3.0	2.0	1.2					6%	3%
8	3.5	2.3	1.4	1.0				7%	3%
9	4.0	2.7	1.6	1.1	1.0	1.0	1.0	8%	3%
10	5.0	3.3	2.0	1.4	1.3	1.3	1.3	10%	4%
11	5.5	3.7	2.2	1.6	1.4	1.4	1.4	11%	7%
12	6.5	4.3	2.6	1.9	1.6	1.6	1.6	13%	8%
13	7.5	5.0	3.0	2.1	1.9	1.9	1.9	15%	11%
14	9.0	6.0	3.6	2.6	2.3	2.3	2.3	18%	13%
15	10.0	6.7	4.0	2.9	2.5	2.5	2.5	20%	15%
16	12.0	8.0	4.8	3.4	3.0	3.0	3.0	24%	18%
≥ 17	>13.5	>9.0	>5.4	>3.9	5.4	5.4	5.4	>27%	>20%

* Low absolute risk level = 10-year risk for total CHD end points for a person the same age, blood pressure < 120/<80 mmHg, total cholesterol 160-199 mg/dL, HDL-C ≥55 mg/dL, nonsmoker, no diabetes. Percentages show 10-year absolute risk for total CHD end points.

† Points = number of points estimated from Table 4

‡ 10-year absolute risk for total CHD end points estimated from Framingham data corresponding to Framingham points (Table 4)

¶ 10-year absolute risk for hard CHD end points approximated from Framingham data corresponding to Framingham points (Table 4)

Key for Relative Risk

Green	Violet	Yellow	Red
Below average risk	Average risk	Moderately above average risk	High risk

Figure 2. Relative and absolute risk estimates for CHD in women as determined for Framingham scoring (2). The number of Framingham points is derived as shown in Table 4. Relative risk estimates for each age range are compared with baseline risk conferred by age alone (in the absence of other major risk factors). Relative risk is graded and color coded to include below average, average, moderately above average, and high-risk categories. Distinctions in relative risk are arbitrary. Average risk refers to that observed in the Framingham population. Absolute risk estimates are given in the 2 right-hand columns. Absolute risk is expressed as the percentage likelihood of developing CHD per decade. Total CHD risk equates to all forms of clinical CHD, whereas hard CHD includes clinical evidence of myocardial infarction and coronary death. Hard CHD estimates are approximated from the published Framingham data (2).

Absolute Short-Term Risk

Estimates of short-term risk (absolute risk in the next 10 years) are potentially useful for the identification of patients who need aggressive risk reduction in the clinical setting. Patients at high short-term risk may need pharmacological agents to control risk factors. The precise level of absolute risk that defines a patient at high short-term risk has been an issue of some uncertainty and involves a value judgment. Theoretically, this level of risk justifies aggressive risk-reduction intervention and is set through an appropriate balancing of efficacy, costs, and safety of therapy. Over time and depending on economic considerations, the thinking about this critical cutpoint of risk may change. Furthermore, little dialogue has occurred in the United States regarding the process of choosing a single absolute risk cutpoint for high short-term risk. The NCEP has taken the lead in adjusting the aggressiveness of cholesterol-lowering therapy to the absolute risk of patients. The NCEP identified patients having established CHD and other atherosclerotic disease as being at very high risk and deserving of aggressive therapy. For primary prevention, LDL-C goals were established by counting risk factors, but they did not define absolute risk in precise, quantitative terms. Future guidelines for risk reduction in the United States likely will put greater emphasis on quantitative global risk assessment.

Recently, guidelines of the joint European Societies (9) have identified high short-term risk as an absolute risk that imparts a >20% probability of developing CHD in the next 10 years. Once a patient reaches this threshold of risk, guidelines similar to those for secondary prevention are triggered. This threshold may be reasonable, but several comments must be made about how the European guidelines were derived. The authors (9) made use of older Framingham risk equations, (29) but their own risk estimates were based only on age, cigarette smoking, blood pressure, and total cholesterol. HDL-C levels were not included. Framingham risk equations (2,29) consistently include HDL-C, which is a powerful independent risk factor. The absence of HDL-C as a risk factor in European guidelines must be considered a limitation. As previously mentioned, European guidelines (9) used Framingham's total CHD as the coronary end point, which is a liberal coronary outcome and lowers the barrier to initiation of secondary-prevention guidelines. Irrespective of these details, there appears to be considerable consensus in the European cardiovascular community that a 10-year risk for clinical coronary end points of >20% justifies the category of high short-term risk. One concern about European guidelines is that although they creatively bridge the gap between primary and secondary prevention, they seemingly deemphasize the need for long-term primary prevention in the clinical setting.

Absolute Long-Term Risk

Framingham scoring does not directly project long-term risk (>10 years), although such risk can be approximated by the summing of risk scores over successive age categories and the subtraction of those persons removed by having CHD events. Thus, 20-year risk should be at least twice the 10-year risk. An important aim of primary prevention is to reduce CHD over the long term and not just over the short term. For a patient in the age range of 50 to 54 years, a 20-year projection of absolute risk may be of more interest to both the physician and the patient than a 10-year projection. Such a patient whose 10-year risk for CHD is 15% may not qualify as being at high short-term risk, but this same patient has a >30% probability of developing CHD before age 75. This latter projection needs to considered when primary prevention strategies are planned.

Another critical point to make about long-term risk is that any single coronary risk factor, eg, cigarette smoking, hypertension, high serum cholesterol, or diabetes, can lead to premature CHD (or stroke) if left untreated over a period of many years. Therefore, each of the major risk factors deserves intervention in the clinical setting, regardless of the short-term absolute risk. The centerpiece of long-term risk reduction is modification of lifestyle habits, eg, smoking cessation, change in diet composition, weight control, and physical activity (30). Nonetheless, in patients in whom long-term risk is high, the use of drugs for treatment of hypertension or serum cholesterol disorders may be warranted, as described in JNC VI (7) and ATP II (6), respectively.

Severity of Major Risk Factors

Framingham scoring takes into account gradations in risk factors when estimating absolute risk. The scoring does not adequately account for severe abnormalities of risk factors, eg, severe hypertension, severe hypercholesterolemia, or heavy cigarette smoking. In such cases, Framingham scores can underestimate absolute risk. This underestimation is particularly evident when only 1 severe risk factor is present. Thus, heavy smoking (31) or severe hypercholesterolemia (32) can lead to premature CHD even when the summed score for absolute risk is not high. Likewise, the many dangers of prolonged, uncontrolled hypertension are well known. These dangers underscore the need to control severe risk factors regardless of absolute short-term risk estimates.

Diabetes Mellitus as a Special Case in Risk Assessment

That diabetes mellitus is a major risk factor for CVD is well established (2). Both type 1 diabetes (33) and type 2 diabetes (34) confer a heightened risk for CVD. Type 2 diabetes is of particular concern because it is so common and usually occurs in persons of advancing age, when multiple other risk factors coexist. There is a growing consensus that most patients with diabetes mellitus, especially those with type 2 diabetes, belong in a category of high short-term risk. When the risk factors of diabetic patients are summed, their risk often approaches that of patients with established CHD (35). The absolute risk of patients with type 2 diabetes usually exceeds the Framingham score for hyperglycemia because other risk factors almost always coexist. Another reason to elevate the patient with diabetes to a higher risk category than suggested by Framingham scoring is the poor prognosis of these patients once they develop CHD (36). These factors point to the need to intensify the management of coexisting risk factors in patients with diabetes (7,37). These considerations about the very high risk of patients with diabetes apply to ethnic groups that have a relatively high population risk for CHD. The inclusion of patients with type 2 diabetes in the very-high-risk category may not be appropriate when they belong to ethnic groups with a low population risk.

Absolute Risk Assessment in Elderly Patients

One of the more prominent features of the Framingham risk scoring is the progressive increase in absolute risk with advancing age (Figures 1 and 2). This increase undoubtedly reflects the cumulative nature of atherogenesis. With advancing age, people typically accumulate increasing amounts of coronary atherosclerosis. This increased plaque burden itself becomes a risk factor for future coronary events (38–40). Framingham scoring for age reflects this impact of plaque burden on risk. Still, average scores mask the extent of variability in plaque burden in the general population. To apply average risk scores for age to individual patients may lead to miscalculation of true risk, particularly because Framingham applies so much weight to age as a risk factor. Miscalculation of risk could lead to inappropriate selection of patients for aggressive risk-reduction therapies. This fact points to the need for flexibility in adapting treatment guidelines to older persons. The tempering of treatment recommendations with clinical judgment becomes increasingly important with advancing age, particularly after the age of 65. In the future, measures of subclinical atherosclerosis may improve the accuracy of global risk assessment in older patients. When risk scoring is used to adjust the intensity of risk factor management in elderly patients, relative risk estimates may be more useful than absolute risk estimates. Relative risk estimates essentially eliminate the age factor and are based entirely on the major risk factors. These estimates allow the physician to stratify and compare patients of the same age, and patients at highest relative risk could be selected for the most aggressive risk management.

Certain Limitations of Framingham Database

Certain features of the Framingham scores reflect limitations of the data set. For example, LDL-C and HDL-C levels are known to be continuous in their correlation with CHD risk. Presumably because of an insufficient number of subjects in all categories, these continuous relationships are not consistently observed between each incremental category (2). Moreover, the assigned scores for each category are not entirely consistent with the notations for graded risk proposed by the NCEP (6) and the JNC (7). Framingham scores probably require adjustment to account for the continuous relationship between risk factors and CHD (6,7). As stated previously, this adjustment was made in Table 4. Finally, there is no indication that Framingham scoring has been corrected for regression dilution bias (41); this bias results from the random fluctuation of risk factors over time such

that single measures of risk factors systematically underestimate the association between risk factors and CHD.

Prediction scores from Framingham illustrate the substantial difference in CHD risk between men and women before age 70. The difference between men and women particularly stands out for hard CHD end points. The diagnosis of angina contributes a sizable fraction of all CHD end points in middle-aged women and accounts for the notable difference between total CHD and hard CHD in this age group. Nonatherosclerotic anginal syndromes may have been mislabeled among total CHD end points in some Framingham women. The relatively small rise in risk for total CHD events after age 55 should not obscure the progressive increase in risk for hard CHD in older women. Framingham findings on hard end points are more consistent with population studies that show a sharp rise in CHD morbidity and mortality in women after age 70. Even so, a discrepancy in CHD risk between men and women persists throughout all age groups.

Use of Conditional and Predisposing Risk Factors in Risk Assessment

In addition to the major risk factors (Table 1), a series of other risk correlates have been identified (Table 2). Their presence may denote greater risk than revealed from summation of the major risk factors. Their quantitative contribution and independence of contribution to risk, however, are not well defined. Usually, therefore, they are not included in global risk assessment. This does not mean that they do not make an independent contribution to risk when they are present. A sizable body of research supports an independent contribution of each. Their relation to CHD is more complex than is that of the major risk factors. In some cases, they are statistically correlated with the major risk factors; hence, their own independent contribution to CHD may be obscured by the major risk factors. In other cases, their frequency in the population may be too low for them to add significant independent risk for the entire population; in spite of this, they could be important causes of CHD in individual patients. Several of the other risk factors represent direct targets of therapy, either because they are causes of the major risk factors or because circumstantial evidence of a role in atherogenesis is relatively strong. Thus, even though these other risk factors are not recommended for inclusion in absolute risk assessment, their exclusion from this function should not be taken to imply that they are clinically unimportant. Their role in evaluation and management of patients at risk deserves some consideration.

Obesity

The AHA defines obesity as a major risk factor for CVD (42). Risk is accentuated when obesity has a predominant abdominal component (5). Obesity typically raises blood pressure and cholesterol levels (42–44) and lowers HDL-C levels (43,44). It predisposes to type 2 diabetes (5). It also adversely affects other risk factors: triglycerides (43,44); small, dense LDL particles (45); insulin resistance (46,47); and prothrombotic factors (48,49). Although not shown by the Framingham data (2), other long-term longitudinal studies suggest that obesity predicts CHD independently of known risk factors. The association between excess body weight and CHD seems particularly strong in white Americans. For example, in one long-term prospective study (50), men aged 40 to 65 years with body mass index (BMI) 25 to 29 kg/m^2 were 72% more likely to develop fatal or nonfatal CHD than were men who were not overweight. In another study (51), women whose BMI was 23 to 25 kg/m^2 carried a 50% increase in risk for CHD compared with women with lower BMIs. The overall relation between body weight and CHD morbidity and mortality is less well defined for Hispanics, (52) Pima Indians (53), and black American women (54); even so, obesity is a risk factor for type 2 diabetes, which itself is a risk factor for CHD. Much remains to be learned about the biological mechanisms underlying the association between obesity and CHD, but without question, a strong association exists. Consequently, obesity is a strong risk factor for CHD (3) and is a direct target for intervention (5). Prevention of obesity and weight reduction in overweight persons are integral parts of the strategy for long-term risk reduction. The recent report of the NHLBI Obesity Education Initiative (5) provides a comprehensive guideline for the management of overweight and obese patients in clinical practice.

Physical Inactivity

The AHA also classifies physical inactivity as a major risk factor. (4) Many investigations (55), including the Framingham Heart Study (56–59), demonstrate that physical inactivity confers an increased risk for CHD. The extent to which physical inactivity raises coronary risk independently of the major risk factors is uncertain (60). Certainly, physical inactivity has an adverse effect on several known risk factors (60). Even though physical inactivity is an independent risk factor, physical activity levels are difficult to reliably measure in individual patients. For these reasons, physical inactivity is not included in quantitative risk assessment. In spite of these limitations in assessment, previous studies (61,62) document that regular physical activity reduces risk for CHD. Physical inactivity constitutes an independent target for intervention. Physicians should encourage all of their patients to engage in an appropriate exercise regimen, and high-risk patients should be referred for professional guidance in exercise training. The AHA recently published practical recommendations for exercise regimens designed to reduce risk for CVD (63).

Family History of Premature CHD

There is little doubt that a positive family history of premature CHD imparts incremental risk at any level of risk factors. This association has been shown by the Framingham Heart Study (64). Nonetheless, the degree of independence from other risk factors and the absolute magnitude of incremental risk remain uncertain. For this reason, Framingham investigators did not include family history among the major independent risk factors. The NCEP (6) counts a positive family history of CHD as an independent risk factor that modifies the intensity of LDL-lowering therapy. Regardless of whether family history is used to modify risk management in individual patients, the taking of a family history is

Other Risk Correlates

Other potential risk factors include elevated concentrations of lipoprotein(a), fibrinogen, and C-reactive protein. Routine measures of these risk factors currently are not recommended. An elevated serum lipoprotein(a) correlates with a higher incidence of CHD in some studies (102,103) but not in others (104,105). Furthermore, specific therapeutics to reduce lipoprotein(a) levels are not available; some investigators have suggested that an elevated lipoprotein(a) level justifies a more aggressive lowering of LDL-C. An elevated fibrinogen level also is correlated with a higher CHD incidence (106,107). Again, no specific therapies are available, except that in smokers, smoking cessation may reduce fibrinogen concentrations (108). Finally, C-reactive protein is promising as a risk predictor (109,110). The preferred method for measurement appears to be a high-sensitivity test (111). C-reactive protein appears to be related to systemic inflammation; however, its causative role in atherogenesis is uncertain.

Implications for Clinical Risk Reduction

Identification of risk factors lies at the heart of clinical efforts to reduce risk for CVD and/or CHD. Every major risk factor predisposes to CHD and other cardiovascular events, particularly if left unattended for long periods. In addition, when multiple risk factors occur in a single individual, risk is compounded, which justifies efforts to estimate global risk. The summation of contributions of individual risk factors can be a valuable first step in planning a risk-reduction strategy for individual patients. This first step should be divided into 2 phases. First, absolute risk should be estimated from the major risk factors (listed in Table 1). Framingham risk scoring provides an acceptable tool for most non-Hispanic white, Hispanic, and black Americans. People of South Asian origin appear to have about twice the absolute risk for any set of risk factors as whites. In contrast, East Asian Americans may have a lower absolute risk than other ethnic groups in the United States. Second, when absolute risk has been estimated from the major risk factors, consideration can be given to modifying the estimate in the presence of other risk factors (Table 2). Clinical judgment is required to estimate incremental risk incurred by these latter factors. Risk estimates are useful both for short-term, high-risk primary prevention and for long-term (or lifetime) primary prevention. Implications for global risk assessment can be considered for each.

Short-Term Prevention

Recent clinical trials demonstrate that significant risk reduction can be achieved by aggressive reduction of risk factors in high-risk patients. Clinical trials have shown that excess risk can be reduced by ≈33% to ≈50% in ≈5 years. This is particularly the case when risk-reduction strategies use smoking cessation, blood pressure–lowering agents, cholesterol-lowering drugs, and aspirin. Clinical trials strongly suggest that glucose control reduces the incidence of various cardiovascular end points in patients with either type 1 diabetes (112) or type 2 diabetes (113). Other clinical trials (114,115) strongly suggest that aggressive LDL-lowering therapy reduces risk for CHD in patients with type 2 diabetes. For this reason, detection of patients at high risk, with the aid of global risk assessment, should be an important aim of routine medical evaluation of all patients. Specific therapies for risk reduction in high-risk patients are described in the NCEP ATP II report for cholesterol management (6), the JNC VI report for treatment of hypertension (7), and by the ADA's guidelines for treatment of diabetes mellitus (8). Once appropriate therapies are selected, global risk scores can also be used to help instruct patients and to improve compliance with preventive interventions.

Long-Term Prevention

Global risk assessment is particularly useful in young and middle-aged adults for assessing relative risk and absolute long-term risk (Figures 1 and 2). Even though short-term risk may not be high in younger patients who have multiple risk factors of only moderate severity, long-term risk can be unacceptably high. Risk assessment in these patients will highlight the need for early and prolonged intervention on risk factors. In young adults, relative risk ratios help to reveal long-term risk for CHD. Although long-term prevention may not call for the use of risk-reducing drugs, it definitely will require the introduction of lifestyle modification (ie, smoking cessation in smokers, weight control, increased physical activity, and a diet low in cholesterol and cholesterol-raising fats). The AHA provides guidelines to assist healthcare professionals in the implementation of life-habit modifications (30). There is a common misconception that most of the excess risk accumulated over many years can be erased by aggressive short-term prevention introduced later in life. Although the use of risk-reducing drugs can significantly lower risk when begun in later years, there is no evidence that it can return a patient to the low-risk status of a younger person. This reduction can only be accomplished by decreasing the magnitude of coronary plaque burden through long-term control of risk factors. Therefore, appropriate intervention, guided by risk assessment that is performed periodically in early adulthood and early middle age, has the potential to bring about a significant reduction in long-term risk.

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undoubtedly important. A positive family history for premature CHD calls forth the need to test a patient's relatives for both premature CVD and the presence of risk factors.

Psychosocial Factors

There has long been an interest in the contribution of personality and socioeconomic factors to CHD risk. Recently, specific factors including hostility, depression, and social isolation have been shown to have predictive value (65–67). These factors, however, are not included in the Framingham data and cannot be incorporated into the model currently. Nonetheless, they might be taken into account in individual patients when an overall strategy for risk reduction is being developed.

Ethnic Characteristics

The Framingham population represents the world's most intensively studied population for cardiovascular risk factors. This study is of great value in developing population-based risk estimates in this population. Because Framingham residents are largely whites of European origin, it is uncertain whether baseline absolute risk is similar to that in other populations. Available evidence suggests that absolute risk varies among different populations independently of the major risk factors. For example, absolute risk among South Asians (Indians and Pakistanis) living in Western society appears to be about twice that of whites, even when the 2 populations are matched for major risk factors (68–70). This higher baseline risk should be considered when South Asians living in the United States are evaluated. Available comparisons of non-Hispanic white, non-Hispanic black, and Hispanic Americans (71,72) point to a comparable absolute risk status, but large systematic comparisons are in the early stages. It is also possible that some populations have a lower baseline risk than the whites studied in Framingham. For example, results of the Honolulu Heart Study (27) suggest that Hawaiians of East Asian ancestry have only about two thirds the absolute risk of Framingham subjects. In the Seven Countries Study (73), the population of Japan exhibited a much lower risk for CHD for a given set of risk factors than other populations. Differences in absolute risk among different demographic groups suggest the need for adjustments in estimates of absolute risk from Framingham scores depending on racial and ethnic origins. Although absolute risk scores may not be transportable to all populations, relative risk estimates probably are reliable across groups. To date, comparison studies are insufficient to provide quantitative estimates of the adjustments needed for Framingham scores when they are applied to individuals from different demographic backgrounds. In spite of the limitations of the Framingham data, absolute risk estimates as applied to some populations seem applicable to the large populations of non-Hispanic white, Hispanic, and black Americans in the United States. For other groups, relative risk estimates still seem applicable.

Hypertriglyceridemia

Framingham scoring does not ascribe independence to triglyceride levels in risk assessment. Framingham investigators (74) nonetheless have reported that elevated serum triglycerides are an independent risk factor, as have other reports. (75–77) Hypertriglyceridemia is correlated with other risk factors (78); however, its degree of independent predictive power is difficult to assess. Several clinical trials (79–81) found that drugs that primarily affect triglyceride-rich lipoproteins reduce CHD risk when used with patients with hypertriglyceridemia. Elevated triglycerides consequently may become a target of therapy independent of LDL lowering. The reduction of serum triglyceride levels will also decrease the concentrations of small LDL particles, another putative risk factor (82,83). Of course, weight reduction in overweight patients and adoption of regular exercise by sedentary persons will lower triglyceride levels, which is one way in which these changes in lifestyle reduce CHD risk.

Insulin resistance is another risk correlate for CHD (84,85). The mechanisms of association between insulin resistance are complex and likely multifactorial. Regardless, a large portion of all patients who are candidates for global risk assessment have insulin resistance and its accompanying metabolic risk factors (the metabolic syndrome). The components of this syndrome include the atherogenic lipoprotein phenotype (elevated triglycerides, small LDL particles, and low HDL-C levels) (78,86), elevated blood pressure, a prothrombotic state, and often, impaired fasting glucose (87). The metabolic syndrome is a clinical diagnosis, but the risk accompanying it can be assessed in large part by Framingham scoring. This scoring does not count impaired fasting glucose as an independent risk factor, although Framingham publications (88–90) would support doing so. Insulin resistance can be assumed to be present in a patient with obesity (BMI >30 kg/m^2) (46,47) or overweight (BMI 25 to 29.9 kg/m^2) plus abdominal obesity (46,47), especially when accompanied by elevated plasma triglycerides (78,91), low HDL-C (92), or impaired fasting glucose (93). Insulin resistance is acquired largely through obesity and physical inactivity, although a genetic component undoubtedly exists. The only therapies presently available for insulin resistance for patients without diabetes are weight reduction (94) and increased physical activity (95).

Homocysteine

A high serum concentration of homocysteine is associated with increased risk for CHD (96–98). The AHA recently published an advisory on homocysteine that provides an in-depth review of the relation between homocysteine and CVD (99). Several mechanisms whereby elevated homocysteine predisposes to CVD have been postulated. However, it remains to be proved in controlled clinical trials that a reduction in serum homocysteine levels will reduce risk for CHD. In some patients, nonetheless, high levels of homocysteine can be lowered by recommended daily intake of folic acid (99–101). If homocysteine levels are elevated, patients should be encouraged to consume the recommended daily intake of folic acid, as well as vitamins B_6 and B_{12}. Routine measurement of homocysteine levels was not recommended for purposes of risk assessment, but measurement is optimal in high-risk patients (99).

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KEY WORDS: AHA/ACC Scientific Statement ■ coronary disease ■ risk factors ■ risk assessment

Appendix 19 Airport Operations

FLIGHT SAFETY FOUNDATION
Airport Operations
Vol. 26 No. 3 *For Everyone Concerned with the Safety of Flight* March–April 2000

Use of Standard Phraseology by Flight Crews and Air Traffic Controllers Clarifies Aircraft Emergencies

International Civil Aviation Organization procedures for declaring mayday or pan pan eliminate ambiguity about an aircraft in distress or an aircraft in an urgency condition, respectively. Declaring an emergency generates maximum assistance from air traffic controllers worldwide, but delay in declaring an emergency may create confusion or narrow the pilot's options.

FSF Editorial Staff

Ten years ago, during the U.S. National Transportation Safety Board's (NTSB) investigation of the Avianca Airlines Flight 052 accident, U.S. Federal Aviation Administration (FAA) air traffic controllers said that they expected flight crews to use the specific words "mayday" or "emergency" to declare an emergency.[1,2]

The investigation considered — among other issues — whether international procedures and phraseology for pilot-controller emergency communications were adequate. One outcome was safety recommendations to distinguish situations in which an aircraft is in distress because of low fuel and situations in which a flight crew cannot accept any undue delays because of low fuel. Otherwise, there was consensus that the procedures and phraseology were adequate.

Declaring an emergency obligates controllers — under procedures of the International Civil Aviation Organization (ICAO), FAA and other civil aviation authorities — to give maximum assistance and priority handling to an aircraft in distress. The term "priority handling" (and similar terms such as "traffic priority") have not been defined officially by ICAO or FAA, but "priority" in air traffic control (ATC) refers to aircraft order of service established by procedures for determining the order of importance. Priority handling may be provided to aircraft for various reasons other than an emergency (for example, a medical transport mission or search-and-rescue operations); nevertheless, specific procedures for declaring an emergency ensure the maximum level of priority handling.

David Canoles, manager, FAA air traffic evaluation and investigation staff, said, "In general, all traffic in the system is handled on a first-come, first-served basis. Priority handling does not mean urgency or distress, it simply means no undue delay.

"In an emergency, however, the controller can break all the rules to assist the pilot."[3]

Cay Boquist, chief of the ICAO Air Traffic Management Section, said that air traffic controllers commonly use priority in the dictionary sense, but pilots and controllers have come to understand priority handling to mean specifically a method of ATC operation in which controllers typically would provide

direct routing to an airport, would reroute other aircraft to the extent necessary to avoid delays and would not use holding for the aircraft receiving priority handling.[4]

Boquist said that the following excerpts from ICAO documents summarize key concepts of priority handling of aircraft and pilot-controller authority to take necessary action during an emergency:

- "An aircraft known or believed to be in a state of emergency, including being subjected to unlawful interference, shall be given priority over other aircraft;"[5]
- "The approach sequence shall be established in a manner which will facilitate the arrival of the maximum number of aircraft with the least average delay. A special priority may be given to: a) an aircraft which anticipates being compelled to land because of factors affecting the safe operation of the aircraft (engine failure, shortage of fuel, etc.); b) hospital aircraft or other aircraft carrying any sick or seriously injured person requiring urgent medical attention; [and,]"[6]
- "The various circumstances surrounding each emergency situation preclude the establishment of exact detailed procedures to be followed. ... Air traffic control units shall maintain full and complete coordination, and personnel shall use their best judgment in handling emergency situations."[7]

The action or inaction of pilots and controllers during an emergency may have immediate safety consequences, and may affect court judgments about legal responsibility if an accident occurs. (See "Analysis of U.S. Court Cases Shows Compatibility of Safety, Legal Responsibility" on page 3.)[8]

ICAO procedures for emergency communication do not "prevent the use, by an aircraft in distress, of any means at its disposal, to attract attention, make known its position and obtain help."[9]

Specific ICAO terms — for declaring an emergency and for telling ATC about an aircraft in an urgency condition — were designed to be simple but unmistakable signals taught during the basic training of pilots and air traffic controllers worldwide.

To declare an emergency, the pilot precedes the message with the word "mayday," preferably spoken three times, at the beginning of the first distress communication. ("Mayday" comes from the French "m'aidez," which means "help me.")

To declare an urgency condition, the pilot precedes the message with pan pan, preferably spoken three times. (ICAO said that pilots also can precede each subsequent communication in distress radio communication or urgency radio communication with mayday or pan pan, respectively.)[10]

Following ICAO procedures, the pilot of the aircraft in distress should transmit on the air-ground frequency in use at the time (that is, normally the station communicating with the aircraft or in whose area of responsibility the aircraft is operating). Emergency frequency 121.5 MHz or an alternative aeronautical mobile frequency can be used "if considered necessary or desirable," but some aeronautical stations do not guard continuously the emergency frequency. In using any means available to attract attention and communicate about the aircraft's conditions, the pilot also may activate the appropriate secondary surveillance radar transponder mode and code. The pilot should tell ATC, speaking slowly and distinctly, as many of the following items of information as possible (the exact procedures of a specific civil aviation authority or airline may vary):

- The identification of the station addressed;
- The identification of the aircraft;
- The nature of the distress condition;
- The intentions of the pilot-in-command (PIC); and,
- The present position, altitude and heading.[11]

Flight crews should expect air traffic controllers to take the following actions:

- Acknowledge immediately the crew's distress message;
- Take control of the communications or clearly transfer that responsibility to another controller (and notify the flight crew);
- Take immediate action to inform other ATC facilities (and the aircraft operator as soon as possible);
- Warn other ATC facilities to prevent the transfer of non-related communications to the frequency in use for distress communication;
- Possibly impose radio silence on that frequency for either all stations of the mobile service (that is, all aircraft and ground facilities) in the area or for any station that interferes with the distress traffic; and,
- Announce the termination of distress communication and of radio silence, if imposed.[12]

ICAO's policy on languages to be spoken in international aviation is that the language of the ground station (typically the language of the country in which the station is located) determines the primary language to be used in air-ground communications. If English is not the language of the ground station, however, ATC services in English should be available on request. English, in effect, serves as a universal medium of radio communications.[13]

Analysis of U.S. Court Cases Shows Compatibility of Safety, Legal Responsibility

Two aviation principles — that the pilot-in-command (PIC) of an aircraft has authority for the safe conduct of flight and that pilots may exercise emergency authority to deviate from the normal regulations and clearances — are among many that come into play when U.S. courts determine legal responsibilities following an aircraft accident.

Declaration of an emergency by either a flight crewmember or an air traffic controller may become a pivotal element of judging whether an aviation professional exercised the degree of care expected by society — by following applicable regulations and standard operating procedures, for example.

Steven Riegel, a senior aviation counsel in the U.S. Department of Justice, in 1997 analyzed the legal responsibilities of pilots and air traffic controllers in the context of in-flight emergencies by reviewing the relevant laws and regulations, discussing 10 court cases that involved pilot-controller emergency communication and citing several dozen court decisions that have set legal precedents.[1]

Based on his experience representing U.S. air traffic controllers in legal matters, Riegel said that typically controllers expect to handle aircraft emergencies as part of their normal services to pilots, focus on assisting pilots who declare an emergency and do not want to generate unnecessary paperwork.

Riegel said, "Air traffic controllers are trained to provide maximum assistance to pilots in an emergency situation, but the majority of controllers are not pilots, and no controller can be as familiar as the pilot with a particular pilot's situation, capabilities and needs in an emergency. Therefore, the more specificity in a pilot's request, the better the controllers can accommodate the requests."

Riegel made the following points among the findings in his analysis:

- Pilots and air traffic controllers have concurrent responsibilities for the safety of an aircraft flight and passengers;
- The pilot and the air traffic controller switch roles in some respects after the pilot declares an emergency. That is, the PIC then tells air traffic control (ATC) his or her intentions, deviates from normal rules and clearances as necessary, and obligates air traffic controllers to provide maximum assistance to enable the flight crew to conduct the flight via the course of action determined by the PIC;
- In the United States, Federal Aviation Regulations (FARs) have the force and effect of law, and the recommended procedures adopted by the International Civil Aviation Organization may be significant in establishing in court the standard of care expected of aviation professionals;
- U.S. courts have held that the authority of the PIC includes presumptions that aircraft pilots will handle unusual and unexpected occurrences appropriately, will exercise discipline on the flight deck, will be cognizant at all times of any hazards that they can perceive (and declare an emergency when appropriate), and will reject any ATC vectors, instructions or clearances that would jeopardize safety;
- Litigation involving the actions of air traffic controllers may consider whether ATC met the standard of care of maximum assistance after declaration of an emergency, but controllers have not been expected to have known an aircraft's situation beyond what has been communicated by the flight crew or has been reasonably apparent (for example, by observing the aircraft using radar);
- Air traffic controllers must warn aircraft to avoid a hazard when they are aware of the hazard, but they are not necessarily negligent when they deviate from guidelines issued by FAA, do not warn pilots about something that the pilot should know in ordinary circumstances, or do not anticipate that an aircraft emergency will develop from the limited information that they have received;
- FAA personnel can assume that pilots will know and follow all FARs applicable to the flight operation, will exercise their best judgment and, to a reasonable degree, will provide information that is relevant to the pilot's decision making; and,
- U.S. courts have not accepted arguments that pilots should be exempt from enforcement action if they declared an emergency and this action was, in reality, not related to an in-flight emergency that required immediate attention.♦

— FSF Editorial Staff

Reference

1. Riegel, Steven. "In-flight Emergencies: Legal Responsibilities of Pilots and Air Traffic Controllers." Paper presented at the 31st annual Southern Methodist University Law Symposium, Dallas, Texas, U.S., February 1997.

Describing the need for a universally available language, ICAO said, "It is always possible that an emergency may require communication with a ground station not foreseen in the original planning [of crewmember assignments by language qualification], and that the handicapping or prevention of such emergency communications by the lack of a language common to the aircrew and the ground station could lead to an accident."[14]

Standardized phraseology and communication procedures help to compensate for distractions and ambiguity of context inherent in pilot-controller radio communication even when English is used. For example, in the 1977 fatal accident involving two Boeing 747 aircraft on a runway in Tenerife, Canary Islands, Spain, one pilot's use of the phrase "at takeoff" was misinterpreted by a tower controller to mean that his aircraft was ready for takeoff when the pilot actually was beginning the takeoff.[15]

Several civil aviation authorities, international aviation organizations, controllers and pilots said that they believe that ICAO procedures for pilot-controller emergency communication work well. They said that in current practice, the following commonalities, and a few differences, are significant:

- ICAO procedures and phraseology for declaring an emergency are well documented, but many flight crews use alternate phraseology in their first language if circumstances permit;
- Air traffic controllers in some countries are receiving more training to be alert to signs of an aircraft emergency or impending emergency, to question flight crews and to declare an emergency for the flight crew in some situations;
- Some said that ICAO phraseology for communicating an urgency condition apparently is not used, or not used appropriately, by many flight crews;
- Hesitancy or reluctance to declare an emergency was not considered to be a significant issue for airline pilots, especially in the United States and most of Europe;
- Flight crews do not gain anything significant by not declaring an emergency when circumstances indicate that they should do so; and,
- The universal, overriding objective of ATC is to provide assistance, not to enforce regulations, when an aircraft is in a distress situation or an urgency situation. Typically, declaring an emergency does not carry any penalty and does not prompt an automatic investigation of the emergency, because civil aviation authorities want to encourage pilots to request ATC assistance at the earliest possible time. Flight crews might be expected to document what occurred for their airline and/or civil aviation authorities, however, and may not be exempt from regulatory enforcement action for other reasons.

Accident Focused Attention on Issues in Declaring an Emergency

The following statements concerning pilot-controller emergency communication were part of the discussion in NTSB's final report on the Avianca Flight 052 accident:[16]

- "If a pilot, or flight crew, has a limited English-language vocabulary, he has to rely heavily on the meaning of the words he does know. If those words have a vague meaning, such as the word 'priority,' or if a clear set of terms and words [is] not used by pilots and controllers, confusion can occur, as it did in this accident";
- "The word 'priority' was used in procedures manuals provided by The Boeing Co. to the airlines. A captain from Avianca Airlines testified that the use by the first officer of the word 'priority,' rather than 'emergency,' may have resulted from training at Boeing. The captain also testified that airline personnel, who provided flight and ground instruction to the first officer of AVA052, were trained by Boeing. He stated that these personnel received the impression from the training that the words priority and emergency conveyed the same meaning to air traffic control. ... Also, in its published procedures, Avianca Airlines uses the term 'priority' regarding the communication of low fuel status";
- "When [U.S.] ATC controllers were asked the phraseology that they would respond to immediately when a flight crew indicated a low-fuel emergency, they replied 'mayday,' 'pan pan' and 'emergency.' The controllers stated that, although they would do their utmost to assist a flight that requested 'priority,' the word would not require a specific response and that if a pilot is in a low-fuel emergency and needs emergency handling, he should use the word 'emergency'";
- "The question also was raised during the investigation about whether pilots might use such words as 'priority,' when they really needed emergency assistance, because of concern about receiving a flight violation or having to write a report to the FAA after landing. ... However, [FAA] said that there would not be unwarranted actions against any pilot who had declared an emergency and that if a pilot has an emergency, he or she is encouraged to declare it"; [and,]
- "The evidence gathered by the [NTSB] during its investigation of the Avianca accident suggests that FAA ATC phraseology is not always understood by [non-U.S.] pilots."

U.S. Airline Pilots Believe Key Lessons Have Been Learned

Capt. Paul McCarthy, executive air safety chairman for the Air Line Pilots Association, International (ALPA), said that the Avianca Flight 052 accident was significant in revealing the types of problems that might occur in communications during an emergency.[17]

The NTSB report said that the accident flight crew did not adequately communicate its increasingly critical fuel situation to the controllers who handled the flight; that the first officer (who made all recorded transmissions to U.S. controllers) incorrectly assumed that his request for priority handling by ATC had been understood as a request for emergency handling; that the captain experienced difficulties in monitoring communications between the first officer and ATC; and that the first officer did not use the appropriate phraseology to communicate to ATC the aircraft's minimum fuel status. The Colombia Department of Civil Aeronautics, in comments on the NTSB report, said that "the control tower gave no special meaning to the statement made by the flight crew 'And we are running out of fuel, sir' made during their missed approach."

The Avianca Airlines Route Manual contained the following information about low-fuel state, said the NTSB report:

- "Advise ATC of your minimum fuel status when your fuel supply has reached a state where, upon reaching [the] destination, you cannot accept undue delay;
- "Be aware that this is not an emergency situation but merely an advisory that indicates an emergency situation is possible should any undue delay occur; [and,]
- "Be aware [that] a minimum fuel advisory does not imply a need for traffic priority."

The NTSB report said, "After the flight discontinued its approach to [John F. Kennedy International Airport (JFK), New York, New York, U.S.,] ... the captain advised the first officer, 'tell them we are in emergency.' However, the first officer acknowledged an ATC altitude and heading instruction to the JFK tower controller, adding ' ... we're running out of fuel.' He did not use the word 'emergency,' as instructed by the captain, and therefore did not communicate the urgency of the situation. Thus, the controller was not alerted to the severity of the problem."

McCarthy said that when an airline pilot declares an emergency, most often the situation involves one of three things: a problem with the aircraft, low fuel or the need to deviate around weather at a time when the controller cannot give this clearance because of other traffic. Airlines' standard operating procedures (SOPs) and emergency training cover most situations that could be anticipated and the corresponding decision-making processes. (See "Reports Show Various Circumstances for Declaring an Emergency" on page 6.)

McCarthy cited one possible source of misconceptions about adverse consequences for an airline captain after declaring an emergency. If a mechanical anomaly were to occur — such as a malfunction of flaps — and emergency procedures were followed to land the aircraft safely, the decision to declare an emergency would not be questioned. After landing, even if the pilot could move flaps to the commanded position and then cycle the flaps normally, this fact would not indicate that the pilot's declaration of an emergency was unwarranted, he said. Nevertheless, if the captain failed to make the appropriate logbook entries to document an anomaly that the flight crew experienced, the result could be regulatory enforcement action or enforcement of policy by the company.

"If you declare an emergency for a malfunction and you do not log [the malfunction], you have breached your obligation as a pilot," said McCarthy.

Regional Airline Safety Manager Finds ATC Proactive in Emergencies

Capt. Deborah Lawrie, flight safety manager of KLM Cityhopper and chairwoman of the European Regions Airline Association's Air Safety Work Group, said that in general, unless pilots in Europe declare pan pan or mayday, they will not be given priority handling or emergency assistance. Lawrie said that sometimes air traffic controllers recognize that an emergency situation exists, request clarification and begin appropriate procedures before the flight crew declares an emergency. Flight crews should not assume or expect that controllers will interpret the aircraft's situation correctly; therefore, flight crews should declare an emergency promptly, she said.[18]

"Certainly you need to register the aircraft's distress status or urgency status with ATC to receive the correct priority," Lawrie said. "If an aircraft crew has been conducting communications about a developing problem, then it is probable that ATC will treat the situation as an emergency even before an official declaration of an emergency has been made by the flight crew."

Lawrie said that controllers in most parts of Europe commonly ask flight crews "if operations are normal," when the crew is unable to comply with ATC instructions or requests clearance to return to the departure airport or to divert. In these situations, ATC may not know whether an emergency situation exists, she said.

"It is my experience that ATC inquires about emergency status rather than requesting that pilots declare an emergency or urgency status," said Lawrie. "In some cases, the pilot simply may have overlooked the formality of declaring mayday or pan pan."

Reports Show Various Circumstances for Declaring an Emergency

[FSF editorial note: The following excerpts from incident reports and accident reports in the United States describe circumstances in which airline flight crews and air traffic controllers declared an emergency or an urgency condition. The reports have been edited for clarity.]

- "After an engine was shut down due to an engine low-pressure light, we declared an emergency and requested the emergency equipment to stand by for landing at [Viracopos Airport, Sao Paulo, Brazil]. [The] Curitiba [Center] controller had difficulty understanding our request due to the language barrier between us. In addition, he did not realize that we were declaring an emergency. He asked us if it was a red, yellow or green emergency. We did not know what this meant. This resulted in my decision to dump fuel without notifying air traffic control (ATC). I also failed to set the transponder to 7700. Not being able to communicate adequately with ATC greatly increased our workload. (Callback conversation with [the captain who filed the report] revealed the following information: [the captain] expresses concern primarily over the fact that the Curitiba Center controller did not understand the meaning of the word 'emergency.' This captain stated 'emergency' many times, and it was not until another aircraft interrupted the communications, about five minutes after the first emergency declaration, that [the captain's] words were translated into Portuguese for the controller. It was then that the controller asked if this was a 'red, green or yellow' emergency. [The captain] replied, 'red,' as he believes that anyone would. ... He now believes that the problem was purely related to the controller's failure to understand 'emergency.' ... In hindsight, the captain states that he should have communicated the fuel dumping to ATC and set 7700 in the transponder. He also might have tried 'mayday' and ['pan pan.'] [The captain] has questioned his own actions in this emergency, [and] he states that everything was so confusing as a result of the conversation that transpired."[1]

- "On May 7, 1998, about 1920 eastern daylight time, a Douglas DC-9-32, N948VV, registered to and operated by AirTran Airlines as Flight 426, [U.S. Federal Aviation Regulations (FARs)] Part 121 scheduled domestic passenger service from Atlanta, Georgia, to Chicago, Illinois, encountered turbulence and hail near Calhoun, Georgia, while climbing through 20,000 feet, after departure from Atlanta. Instrument meteorological conditions (IMC) prevailed at the time, and an instrument flight rules (IFR) flight plan was filed. The aircraft received substantial damage. One flight attendant received serious injuries, and one passenger received minor injuries. The airline-transport-rated captain, first officer, two flight attendants, one jump seat rider and 80 passengers were not injured. The flight originated from Atlanta, Georgia, the same day, about 1905. The flight crew stated that while at a position about 50 miles north of Atlanta, they asked for and received permission from the [U.S. Federal Aviation Administration (FAA)] air traffic controller to fly a heading of 330 degrees to go around weather. This would take them between two weather returns and also allow them to follow another aircraft ahead of them. They had not given the flight attendants permission to leave their seats, and the captain again called them and asked them to remain seated. While climbing through 20,000 feet, they encountered severe hail, which lasted about five seconds, and moderate turbulence which lasted about 30 seconds. The three front windshields shattered and the radome separated from the aircraft. The captain's [airspeed indicator] and first officer's airspeed indicator became inoperative, and it became very noisy in the cockpit. They declared an emergency with the FAA air traffic controller and asked for directions to the nearest airport. An approach to landing was made to Lovell Field, Chattanooga, Tennessee, with FAA air traffic controllers reporting the aircraft's groundspeed about every 10 [seconds to] 15 seconds. A landing was made at 1940, and, after inspection of the aircraft by fire-department personnel, the aircraft was taxied to a gate."[2]

- "Over the Atlantic [Ocean] at Flight Level (FL) 320, the first officer came into the cabin to tell me that I should come back into the cockpit. I was on my break. Arriving in the cockpit, the first officer and international-relief first officer briefed me on the loss of engine oil in [the] no. 2 engine. The quantity showed one quart, the engine temperature was slightly higher than the left engine, and the oil pressure was about 26 pounds per square inch (psi) [1.84 kilograms per square centimeter] with some dips to below 25 psi [1.76 kilograms per square centimeter] showing an intermittent amber exceedance. Following the procedures, we increased the left engine to maximum continuous power and brought [the] no. 2 [engine] to idle. A [satellite communication (SATCOM)] call was placed to dispatch and patched into maintenance. Maintenance advised against running [the] engine in [the] amber zone for long. At idle, [the] engine still went into amber. I made the decision to shut down [the] engine, clear the North Atlantic Tracks track, descend to FL 240 and [divert to Bermuda International Airport, St. George's, Bermuda]. New York [FAA flight service station] was notified via a high-frequency [declaration of pan pan] and an emergency was declared. We were about two hours [from landing at the airport,] so the passengers were not informed of the situation until one hour out and were given an excellent briefing by the purser. We briefed a full emergency landing and the evacuation procedure, but passengers were given all assurances that the landing would be normal. [The flight crew] restarted [the]

engine 20 miles [(37 kilometers) from the airport] and kept it in reserve ... only adding minimal power on short final. No red exceedances were noted. Landing was not overweight and was normal in all respects. [The flight crew] terminated [the] emergency with [the airport] tower."[3]

- "Deviating around [thunderstorms] (approximately 40 [nautical] miles [74 kilometers]) south and roughly paralleling [the] wind, while in cloud with light-to-moderate turbulence, [the aircraft] encountered [an] extremely strong updraft that forced auto-disconnect of [the] autopilot and [an] approximately 2,000-foot altitude excursion prior to manually stabilizing [the] aircraft. No traffic conflict occurred and no injuries or damage [were] sustained, but [a] significant clearance deviation occurred. [The captain who filed the report] broadcast a [pan pan] message on [the] center frequency and [ATC] immediately recleared [the aircraft for] 'block FL 370–410.' [The aircraft] returned to FL 370 within approximately two minutes after [the] event. Turbulence never [was] greater than 'moderate' even though [an] updraft of approximately 5,000 feet [1,524 meters] per minute [was] experienced. After situation assessment and contact with both ATC and company, [the] flight proceeded with normal operations to [the] destination."[4]

- "On Aug. 9, 1998, about 1253 eastern daylight time, an Embraer EMB-120RT, N225AS, landed with smoke trailing from the right engine at the Atlanta Hartsfield International Airport, Atlanta, Georgia. The airplane was operated by Atlantic Southeast Airlines as Flight 735, under the provisions of [FARs] Part 121 and IFR. Visual meteorological conditions (VMC) prevailed, and an IFR flight plan was filed. The airline transport pilot, copilot, one flight attendant and 23 passengers were not injured, and the airplane was not damaged. The flight originated at the Meridian, Mississippi, airport, at 1212. According to the FAA, while the aircraft was on final approach, air traffic controllers observed smoke trailing from the right engine. They notified the pilot [and aircraft] rescue and fire fighting (ARFF) and declared an emergency. The airplane landed on Runway 27L without incident and evacuated passengers via the stairs. There was no fire."[5]

- "On Feb. 16, 1999, at 1602 eastern standard time, an Airbus A320-231, N628AW, operated by America West Airlines as Flight 2811, received minor damage when it landed at Port Columbus International Airport, Columbus, Ohio. There were no injuries to the two certificated pilots, three flight attendants and 26 passengers. [VMC] prevailed for the scheduled passenger flight which had departed from Newark, New Jersey, about 1404. Flight 2811 was operated on an IFR flight plan under [FARs] Part 121. According to statements from the flight crew, Flight 2811 was uneventful until the landing gear was lowered prior to landing at [the airport]. The flight crew received multiple faults and elected to enter a holding pattern at the outer marker. The flight crew contacted maintenance control for assistance and was unsuccessful in clearing the faults. The flight crew then decided to perform a landing at [the airport], with the knowledge that the thrust reversers and nosewheel steering would be inoperative. On short final, the flight crew asked the control tower for a visual check of the nose landing gear, and was informed that the nosewheel was cocked. A go-around was initiated, and then another flyby was made. The nosewheel was reported to be turned 90 degrees. The cabin crew was notified of an impending emergency landing and the cabin and passengers were prepared for the landing. The captain declared an emergency and initiated the approach. Touchdown was described as soft, and the airplane stopped on the 10,250-foot-long [3,124-meter-long] runway with about 2,500 feet [762 meters] of runway remaining. Damage was limited to the nose landing gear tires and rims. The captain noticed that smoke was drifting up on the right side of the airplane. ... All passengers were evacuated via the overwing exits."[6]♦

References

1. U.S. National Aeronautics and Space Administration (NASA). Aviation Safety Reporting System (ASRS). Report no. 342790. July 1996. ASRS is a confidential incident-reporting system. ASRS acknowledges that its data have certain limitations. ASRS *Directline* (December 1998) said, "Reporters to ASRS may introduce biases that result from a greater tendency to report serious events than minor ones; from organizational and geographic influences; and from many other factors. All of these potential influences reduce the confidence that can be attached to statistical findings based on ASRS data. However, the proportions of consistently reported incidents to ASRS, such as altitude deviations, have been remarkably stable over many years. Therefore, users of ASRS may presume that incident reports drawn from a time interval of several or more years will reflect patterns that are broadly representative of the total universe of aviation-safety incidents of that type."

2. U.S. National Transportation Safety Board (NTSB). *NTSB Aviation Accident/Incident Database Report.* Report no. DCA98MA045.

3. NASA ASRS Report no. 425407. January 1999.

4. NASA ASRS Report no. 180941. June 1991.

5. NTSB. *NTSB Aviation Accident/Incident Database Report.* Report no. ATL98SA109.

6. NTSB. *NTSB Aviation Accident/Incident Database Report.* Report no. NYC99IA062.

She said that one misconception among some pilots is the difference between declaring mayday and pan pan.

"I have observed many cases where a mayday is given when pan pan should be sufficient," Lawrie said. "Many pilots do not realize that this distinction is ATC's way of prioritizing two or more aircraft with an emergency at the same time."

She said that from a flight crew's perspective, the following factors are *most important* in deciding to declare an emergency:

- Is the aircraft in immediate danger?
- Does the aircraft require immediate assistance?
- Will the aircraft need priority handling during the approach or during any other phase of flight?
- Will the aircraft need special assistance on the ground?
- Does the crew need any assistance from other parties?

Lawrie said that the following factors are the *least important* in deciding whether to declare an emergency:

- Will declaring an emergency inconvenience other traffic?
- Will declaring an emergency involve extra expense?
- Will declaring an emergency cause extra paperwork or other problems afterward?
- Will declaring an emergency cause inconvenience or interrupt the aircraft's planned schedule?

"Questions often arise as to whether a situation warrants distress or urgency communication," said Lawrie. "Often times — or at least in our company documentation — it is stated clearly when and which specific conditions require such communications. For situations not covered in company documentation, the decision often depends upon the pilot's own training or experience as to whether or not he adequately recognizes an emergency situation."

Airlines' Standard Operating Procedures Affect Pilot Decisions in Emergencies

Capt. Ashok Poduval, director of flight operations and safety services for the International Air Transport Association, said that the SOPs for handling aircraft emergencies are similar among airlines, but vary enough that describing universal practices is difficult. For example, different companies would have separate procedures on how and when flight crews should call for company assistance in an emergency, he said.[19]

Flight crews typically decide when to declare an emergency based on their assessment of all available information about the situation, applying memorized checklists for time-critical and safety-critical sequential actions, conducting challenge-and-response checklists for many specific types of emergencies and following expanded post-emergency drills, he said.

Poduval said, "These are all covered in company SOPs. What should be done [to obtain maximum ATC assistance is to follow] the ICAO procedures for emergency communication. As part of crew resource management, the flight crew also may be aided by dispatchers, such as in the selection of a diversion airport and in determining various sources of assistance." A dispatcher may have very little involvement or considerable involvement in handling an emergency, depending on airline policy, SOPs and related training.

"Pilots appear to have moved away from the strict use of ICAO phraseology," Poduval said. "For example, in the United States, although pilots and air traffic controllers speak English, it is often spoken very rapidly and there is considerable use of colloquialisms and American expressions that are often not understood by international operators within the airspace."

Current Procedures Remain Satisfactory

Boquist said that, historically, some airline captains have not declared an emergency at the earliest possible time.[20] He said that this sometimes has occurred because of human factors — especially initial psychological resistance to admitting the seriousness of an unexpected turn of events — and sometimes because of cultural factors.

Boquist said that if a flight crew does not use the correct phraseology for communicating an emergency, this omission can result in miscommunication, which is undesirable in an emergency. For example, some pilots continue to make vague requests for "priority" from ATC when they are short of fuel, said Boquist.

"Controllers should recognize that an aircraft in that situation needs priority handling, but there is no provision in ICAO phraseology and procedures — other than declaring mayday — to ensure priority handling and maximum assistance from ATC," he said. The term "minimum fuel" — in phraseology recommended by ICAO after the Avianca Flight 052 accident — means "a situation in which an aircraft's fuel supply has reached a state where little or no delay can be accepted." A note that accompanies this definition said, "This is not an emergency situation but merely indicates that an emergency situation is possible, should any undue delay occur."[21]

Boquist said, "No changes were made to mayday and pan pan phraseology or procedures after the accident because the [Avianca] accident flight crew did not use the language that was available."

Global phraseology — including pilot-controller emergency communications — may be enhanced within a few years by several international initiatives, however, said Boquist.

"The ICAO Secretariat has submitted a new proposal to the Air Navigation Commission to have a new part of the ICAO *Procedures for Air Navigation Services (PANS)* assigned completely to emergencies and contingencies (such as short-term conflict alert, blocked frequencies and minimum safe altitude warnings)," he said. "This will be reviewed by the commission in March 2000, then sent to ICAO member states for comments. This is part of updating the provisions in *Rules of the Air and Air Traffic Services (PANS-RAC)*."

ICAO also has been involved recently in several initiatives on worldwide pilot-controller communication. A coordinating group has presented to the ICAO Secretariat an amendment proposal to change phraseology in ICAO annexes and in the ICAO *PANS-RAC*, he said.

The Multi-agency Air Traffic Services Procedures Coordination Group recently compared FAA phraseology and ICAO phraseology, he said, and generated a working paper to be presented to the Air Navigation Commission session in May 2000.

"We have added some phraseology and adopted some FAA phraseology. Eurocontrol, NavCanada and FAA have worked on it and will present a revised phraseology for global application; some of it is emergency communications," Boquist said.

One objective is to reduce air traffic controllers' use of non-ICAO phraseology in normal operations throughout the world, he said.

"There should be no problem for a controller to understand a pilot who uses standard ICAO phraseology, and I cannot believe that a pilot would misunderstand ICAO phraseology," said Boquist.

He said that, typically, the English phraseology used by pilots worldwide is not significantly different, but controllers may use some localized phraseology that is unfamiliar to pilots who are accustomed to standard ICAO terms. Nevertheless, this practice affects routine operations but is unlikely to cause problems in declaring mayday or pan pan, Boquist said.

"We also have started technical work on a task called *Radiotelephony Speech for International Aviation*," he said. "The intent is to develop and establish proficiency requirements, review everything in present provisions and look at minimum skill levels for the use of common English. It is something we have never done before.

In an emergency situation after declaring an emergency, people may not be able to use a standardized English phraseology for all situations. We are looking for controllers and pilots in the future to have a common level of English knowledge for routine and emergency aviation communications."

Boquist said that most of the world's ATC facilities are sensitive to flight crews' requests for assistance and that most countries have worked to improve controllers' ability to recognize signs of aircraft emergencies and impending emergencies.

"What we are saying is that if [ATC] believes there to be a state of emergency, the emergency aircraft shall be given priority handling over other aircraft," said Boquist.

An air traffic controller's ability to recognize signs of an aircraft emergency and to request nonroutine information in English from flight crews may be impeded by limited English (or any nonnative language) proficiency of the controller or the flight crew. For example, in the American Airlines Flight 965 accident near Cali, Colombia, the official accident report of the Aeronautica Civil of the Republic of Colombia said, "When asked a specific question regarding his opinion about the effects the difference in native languages between the accident flight crew and approach control may have had, [the controller] stated that he would have asked the pilots of [Flight] 965 more detailed questions regarding the routing and the approach if the pilots had spoken Spanish. He stated that he believed that his comprehension of the pilot's transmission was satisfactory, and that the pilot also understood him. ... The air traffic controller also stated that the request from the flight to fly direct to the TULUA VOR, when the flight was [38 nautical miles] north of Cali [and already had flown past the TULUA VOR], made no sense to him. He said that his fluency in nonaviation English was limited, and he could not ask them to elaborate on the request."[22]

Timely communication of an emergency by flight crews is paramount and must be unambiguous, said Boquist.

"The authority of the pilot-in-command is a universal rule of aviation," he said. "There is no requirement for a controller to question a crew's decision to declare an emergency. It is up to the civil aviation authority to decide the policy. The emergency declaration does not imply use of PIC authority to depart from rules of the air."[23]

U.S. Controllers Focus on Assistance, Not Enforcement, in Handling Emergencies

Maureen Woods, deputy director, Air Traffic Services, FAA, said that in the United States, regulations and ATC procedures have been designed to enable pilots and controllers to respond safely to an almost infinite variety of aircraft emergencies.[24] (See "U.S. Federal Aviation Administration Summarizes Mayday System" on page 12.)

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of the emergency within 48 hours to the ATC facility, *if requested by ATC* [emphasis added by FAA];

- "The pilot declaring an emergency can file a report with the [U.S. National Aeronautics and Space Administration (NASA)] Aviation Safety Reporting System (ASRS) and receive limited immunity from enforcement action if noncompliance was involved. Declaring an emergency is not automatically considered noncompliance, but many pilots file this ASRS report after declaring an emergency. We support that. Most pilot-employee groups recommend that after declaring an emergency, the pilot fill out an ASRS report 'just in case' of some violations;[25]

- "The act of declaring an emergency does not necessarily initiate an enforcement investigation because [FARs] 91.3(b) allows the pilot to deviate from any rule to the extent needed to address the emergency. The pilot does not really gain anything by not declaring an emergency. In a lot of cases, the emergency would be declared and there would not be any subsequent investigation based on the type of communication that took place. ... However, if an accident or incident results and, as part of that investigation, the FAA determines that noncompliance occurred and led to the need for declaring an emergency, the airman could be subject to an enforcement investigation for noncompliance;

- "The intent of the written report requirement is to assure that pilots use their emergency authority only in emergency situations and do not attempt to cover up or elude investigation for noncompliance; for example, descending below minimums during an approach, then declaring an emergency to avoid responsibility for deviating from a clearance or regulation. There is an [enforcement] element to keeping the system — the whole process — honest ... we want to avoid abuse of the privilege of declaring an emergency. We [would not want a system in which] by declaring an emergency, the [circumstances] never would be looked at subsequently. A report of pilot incapacitation, for example, will trigger an investigation whether or not an emergency was declared. A series of [aircraft emergency] events also would attract an investigation;

- "FAA inspectors are expected to investigate all possible safety violations any time the inspector has reason to question compliance. An investigation does not automatically happen because of a declaration of an emergency. However, if, in the process of reviewing a report sent to the [FAA] administrator by the pilot or the pilot's company, a violation becomes obvious, that inspector is mandated to take appropriate action;

- "At the time of the emergency, the situation will be treated as an emergency in accordance with the responsibility of the PIC. If we find out otherwise, we would take [enforcement] action — but those [cases] would be extremely rare. If there was a deviation from ATC instructions, obviously we would look at that [and ask if the deviation] occurred before the emergency declaration. [FSF editorial note: In the United States, for example, FARs Part 91.123(c): "Each pilot-in-command who, in an emergency, or in response to a traffic-alert and collision avoidance system resolution advisory, deviates from an ATC clearance or instruction shall notify ATC of that deviation as soon as possible."];

- "After the fact, [responsibility for any] investigation would come back to Flight Service. What we are really trying to do is capture what happened — to track back to the root cause, such as a fire or lack of pressurization. We want an open investigative process in terms of what did occur. We are not necessarily looking to take action against the individual pilot because a regulation was overlooked; [and,]

- "If the declaration of an emergency or an urgency situation is part of an overall accident/incident or compliance investigation, there would be a reference in the accident/incident report or investigative report that becomes part of the airman's record. However, the FAA does not track how many times a pilot declares an emergency and does not place such information in the airman's permanent record as a specific entry. When Flight Standards does investigate, we [use the findings to] make recommendations to the company."[26]

Company Philosophies Influence Pilots During Emergencies In Eurocontrol Area

Gilles Le Galo, air traffic management expert in the Safety-Quality and Standardization Unit of Eurocontrol, said that the 38 countries in the European Civil Aviation Conference (ECAC) have different legislation, rules, habits and ways of doing things in some aspects of aviation. Nevertheless, ICAO procedures and phraseology for communicating an aircraft emergency transcend these differences. Le Galo said that company philosophies and expectations can vary significantly, and may affect pilot decision making.[27]

Another factor that might affect a flight crew's decision to declare an emergency is a punitive culture of either an airline or a civil aviation authority.

If a flight crew was hesitant or reluctant to declare an emergency, one likely cause would be human factors, he said.

"People may express themselves in a way that they believe will be interpreted as emergency communication," he said.

U.S. Federal Aviation Administration Summarizes Mayday System

[FSF editorial note: The U.S. Federal Aviation Administration (FAA) — through Nicholas Lacey, director, Flight Standards Service, and Maureen Woods, deputy director, FAA Air Traffic Services — provided the following summary of FAA policies and procedures related to pilot-controller emergency communications during airline operations in U.S. airspace:]

- U.S. Federal Aviation Regulations (FARs) Part 91.3(a) said that the pilot-in-command (PIC) of an aircraft is "responsible for and the final authority as to the safe operation of that aircraft;"

- FARs Part 91.123(a), *Compliance with ATC [Air Traffic Control] Clearances and Instructions*, said that a PIC cannot deviate from a clearance except when an amended clearance is obtained, in response to an emergency or in response to a traffic-alert and collision avoidance system (TCAS) advisory;

- The FAA *Aeronautical Information Manual (AIM)* said that pilots in urgency situations should request assistance before the situation becomes a distress situation. *AIM* 6-1-2(b) said, "Pilots who become apprehensive for their safety for any reason should *request assistance immediately* [emphasis in original];"

- If the pilot uses appropriate phraseology — such as "mayday" — to communicate the nature of the emergency, or if the pilot clearly communicates a problem before a distress situation develops, the controller will have an unmistakable concept of the pilot's situation and what needs to be done. This enhances safety by assuring that the flight crew receives the appropriate ATC assistance for the situation;

- When a pilot declares an emergency, the controller will try to determine the nature of the emergency and the pilot's intentions. Priority handling by ATC will continue as long as required to resolve an emergency situation. ATC assistance may include, for example, communication with the pilot, coordination with other sectors and facilities, and communication with other pilots to assist the flight crew. Supervisory personnel also would be notified to handle coordination and resource management;

- The PIC does not need to declare an emergency to take action using emergency authority, but after an emergency has been declared, the pilot is considered by FAA to be operating under emergency authority.[1] The pilot has the final authority regarding the operation of the aircraft; if unable to comply with ATC clearances, the pilot has the authority to deviate from the clearance. By communicating the nature of the emergency and the pilot's course of action, both the flight crew and the controller understand what can be accomplished and what cannot be accomplished. Air traffic controllers will accommodate whatever actions the pilot deems most appropriate whenever a pilot exercises emergency authority. This may result in the re-routing or delay of other aircraft;

- When a pilot reports a malfunction or other unusual situation, an air traffic controller may ask if the flight crew is declaring an emergency. Based on information received from the flight crew, air traffic controllers may consider that an emergency exists and handle the flight accordingly. Unless there is some indication that an emergency might occur, ATC normally would not take action prior to declaration of an emergency by the PIC. If there is some indication of an emergency, the controller will try to find out as much information as possible to assist the flight crew;

- FARs Part 121.557, *Emergencies: Domestic and Flag Operations*, said that the PIC may take any action considered necessary under the circumstances and in the interest of safety, and that airline dispatchers may declare an emergency if they are unable to communicate with the PIC. On the ground, the dispatcher and PIC share authority for the flight and both sign the dispatch release; during flight, the PIC is the final authority for the conduct and safety of the flight. If an emergency situation requires a decision by the PIC, the airline dispatcher must advise the PIC, ascertain the decision of the PIC and record the pilot's decision. If the dispatcher cannot communicate with the PIC, the dispatcher must declare an emergency, take any action necessary, advise the appropriate ATC and dispatch facilities, and send a written report to the FAA administrator within 10 days. When a controller declares an emergency, dispatchers normally are not notified by ATC. (Requirements for supplemental operations under FARs Part 121.559 are similar, but the regulation said that airline management, not a dispatcher, has the responsibility in flight following to declare an emergency on behalf of the PIC.);

- When an emergency occurs, FAA ATC facilities compile and record the information in their daily record of facility operations, and prepare a miscellaneous incident report form that is forwarded to the appropriate FAA Flight Standards District Office. No data are collected by air traffic controllers concerning the incidence of pilots declaring an emergency or the number of emergencies that are reported;

- FAA analyzes events for trends after reviewing pilots' written reports of deviations, after counseling pilots

or after investigations of accidents or incidents. This can result in changes to regulations, to the *AIM*, to training requirements and to other documents. FAA looks for general trends to improve safety, but does *not study the history of declarations of an* emergency by any specific pilot or compare pilots who, over their careers, may have declared an emergency several times; and,

- If a pilot questions the ATC handling received after declaring an emergency or after requesting assistance, the ATC facility may review the tapes of the exchange. As a result, FAA procedures or phraseology may be changed. Similarly, if a review of the tapes by the FAA Flight Standards Service indicates some anomaly in training or other certification standards, those areas could be reviewed or changed.♦

— U.S. Federal Aviation Administration and FSF Editorial Staff

Reference

1. The U.S. Federal Aviation Administration (FAA) cited U.S. Federal Aviation Regulations (FARs) Parts 91.3(a), 91.3(b), 91.123(a), 121.557(a) and 121.559(a).

"There could be conscious reluctance and unconscious reluctance. Anyone is sometimes reluctant to admit a difficult situation; there is a tendency to underestimate what is happening to you. This pushes people to not really declare what they have experienced. There also can be a problem of flight crews or controllers not really knowing the ICAO provisions ... they really do not know exactly when to declare what; it is more ignorance than reluctance."

Apparent delay in declaring an emergency, however, also may indicate that the flight crew is conducting crew resource management procedures that involve a delay before the flight crew declares an emergency, Le Galo said.

Le Galo said that there is a possibility in some states that an air traffic controller might disregard a pilot's request for priority handling if specific ICAO phraseology is not used to declare an emergency, he said.

"No special service would be provided in some parts of Europe unless very specific words are used to declare an emergency," said Le Galo. "In other areas, the situation would be treated as an emergency by ATC just as if the pilot had declared the emergency."

Typically, there is no systematic way to determine whether declaring an emergency was warranted by the circumstances.

"I have not really seen an example of second-guessing a pilot's decision to declare an emergency," he said. "If there is not a big problem for ATC, nothing will happen. If traffic was really disturbed and subsequent handling by controllers created a difficult situation to handle with a lot of traffic around — combined with suspicion that the flight crew overstated the situation — the occurrence would be subject to inquiry by the state. I have not heard recently of any case like that, but before Eurocontrol traffic flow management, general aviation pilots sometimes made inappropriate requests for ATC priority."

Eurocontrol has no authority to request that a member country's civil aviation authority investigate an aircraft emergency, however, Le Galo said.

"As far as I know, there would be no automatic review by air traffic management [ATM] providers if a pilot declared an emergency; what would occur really depends on the outcome of the flight," he said. "If the aircraft lands safely, then, from the ATM side, nothing will happen. It will be left to the airline to decide what the pilot must do. Since Jan. 1, 2000, Eurocontrol has been requesting occurrence data only to monitor safety levels and to identify safety trends from an ATM perspective."

The training of air traffic controllers for positions in Eurocontrol's Maastricht Upper Area Control Center — which provides air traffic services in the upper airspace of Belgium, Luxembourg, the Netherlands and part of Germany — includes an *ab initio* course that "follows as closely as possible ICAO procedures for handling an aircraft in distress or urgency," said Le Galo. "Before going to the center for live traffic training, controllers take a three-week course on handling of all kinds of emergencies using procedures derived from and closely aligned with the ICAO provisions."

There have been a variety of situations that show different levels of preparedness among ATC facilities in various European states, he said.

"Some states of Europe have had aircraft emergencies where handling by ATC has not been what would have been expected," said Le Galo. "This is an issue here that we are addressing. We would like to encourage other states to follow the example of five or six countries in controller training for emergencies. One of the big issues is how to assess whether someone handled an aircraft in distress appropriately. One of the aviation myths to kill in Europe is that you cannot train controllers effectively on aircraft emergencies ... because emergencies never will be the same thing twice and you cannot say what will happen."

By studying incident reports from pilots, airlines and ATC, civil aviation authorities understand better the circumstances of occurrences in which flight crews declare an emergency. Current ICAO phraseology for pilot-controller emergency communication works well and enhances safety when used properly.

Notes and References

1. U.S. National Transportation Safety Board (NTSB). *Aircraft Accident Report NTSB/AAR-91/04. Avianca, The Airline of Colombia, Boeing 707-321B, HK 2016, Fuel Exhaustion, Cove Neck, New York, January 25, 1990.* Avianca Airlines Flight 052, a Boeing 707-321B, struck terrain in Cove Neck, Long Island, New York, U.S., during a scheduled international passenger flight from Bogota, Colombia, to John F. Kennedy International Airport, New York, with an intermediate stop at Jose Maria Cordova Airport near Medellin, Colombia. Seventy-three of 156 people on the flight were fatally injured, and the aircraft was destroyed. NTSB, in its final report on the accident, said that the probable causes were "the failure of the flight crew to adequately manage the airplane's fuel load, and their failure to communicate an emergency fuel situation to air traffic control before fuel exhaustion occurred." Contributing to the accident was "the flight crew's failure to use an airline operational control dispatch system to assist them during the international flight into a high-density airport in poor weather." Also contributing to the accident was "inadequate traffic flow management by the [U.S.] Federal Aviation Administration and the lack of standardized understandable terminology for pilots and controllers for minimum and emergency fuel states." NTSB said "windshear, crew fatigue and stress were factors that led to the unsuccessful completion of the first approach and thus contributed to the accident." NTSB said that among safety issues raised in the report was "pilot-to-controller communications regarding the terminology to convey fuel status and the need for special handling."

2. The term "declaring an emergency" — while not part of the official phraseology of the International Civil Aviation Organization (ICAO) — is widely understood to mean that a pilot (or air traffic controller or aircraft operator) is formally notifying air traffic control that an aircraft is in distress. "Distress" in ICAO phraseology means "a condition of being threatened by serious and/or imminent danger and of requiring immediate assistance." In addition to the word "mayday" in voice radio communication, the letter group "SOS" telegraphed in Morse code, rockets or shells throwing red lights (fired one at a time at short intervals) or a parachute flare showing a red light communicate distress in ICAO procedures. "Urgency" in ICAO phraseology means "a condition concerning the safety of an aircraft or other vehicle, or of some person on board or within sight, but which does not require immediate assistance." (*ICAO Annex 10, Aeronautical Telecommunications*, Volume 2, 5.3.1.1) ICAO also said that an urgency signal will "mean that an aircraft wishes to give notice of difficulties which compel it to land without requiring immediate assistance." (*ICAO Annex 2, Rules of the Air*, Appendix 1, 1.2.1) In addition to the word "pan pan" in voice radio communication, repeated switching on and off of the landing lights or repeated switching on and off of navigation lights (in such manner as to be distinct from flashing navigation lights) communicates urgency in ICAO procedures.

3. Canoles, David. Interview by Rosenkrans, Wayne. Alexandria, Virginia, U.S., March 15, 2000. Flight Safety Foundation, Alexandria, Virginia.

4. Boquist, Cay. Interview by Rosenkrans, Wayne. Alexandria, Virginia, U.S., March 15, 2000. Flight Safety Foundation, Alexandria, Virginia.

5. ICAO. *Rules of the Air and Air Traffic Services (PANS-RAC Doc 4444)* 16.2.1.

6. ICAO *PANS-RAC* 12.1.1.

7. ICAO *PANS-RAC* 16.1.1.

8. In the United States, U.S. Federal Aviation Administration (FAA) Order 7110.65L *Air Traffic Control* 10-1-3 (the handbook for U.S. air traffic controllers) said, "Provide maximum assistance to an aircraft in distress. Enlist the services of available radar facilities, the military services and the Federal Communications Commission, as well as other emergency services and facilities, when the pilot requests or when you deem necessary." *Air Traffic Control* 10-1-1 c. said, "If the words 'mayday' or 'pan pan' are not used and you are in doubt that a situation constitutes an emergency or potential emergency, handle it as though it were an emergency."

9. ICAO. *Annex 2, Rules of the Air*, Appendix 1 Signals, 1.1 Distress Signals.

10. ICAO. *Annex 10, Aeronautical Telecommunications*, Volume 2, 5.3.2.1 and 5.3.3.1.

11. ICAO. *Annex 10, Aeronautical Telecommunications*, Volume 2, 5.3.2.1.

12. ICAO. *Annex 10, Aeronautical Telecommunications*, Volume 2, 5.3.2.2 through 5.3.2.5.3.

13. ICAO. *Annex 10, Aeronautical Telecommunications*, Volume 2, Attachment B, "Development of Radiotelephony Speech for International Aviation," 1.2 and 1.4. The document said that ICAO believes that the current recommended practice on language has many limitations and that the process of developing a universal language for aviation must continue to enhance safety. ICAO said, "In attacking the problem with the sole objective of obtaining the highest efficiency in air-ground communication, the cooperation of all states may be expected and the burden now largely carried by non-English-speaking countries will be more equitably

shared; for the extent of the new language having to be acquired by non-English-speaking personnel will be reduced, while the English-speaking states will at the same time accept the obligation of training their personnel to keep within the agreed limits in the use of their own language." (2.6)

14. ICAO. *Annex 10, Aeronautical Telecommunications*, Volume 2, Attachment B, 1.4.

15. Cushing, Steven. "Pilot-Air Traffic Control Communications: It's Not (Only) What You Say, It's How You Say It." *Flight Safety Digest* Volume 14 (July 1995). Airclaims said that on March 27, 1977, a KLM Royal Dutch Airlines Boeing 747-200B during takeoff struck a taxiing Pan American Boeing 747 at Los Rodeos Airport, Tenerife, Canary Islands, Spain. All 14 crewmembers and 234 passengers on the KLM aircraft were killed. On the Pan American aircraft, nine crewmembers and 326 passengers were killed, seven crewmembers and 52 passengers were seriously injured; and two passengers received minor injuries or no injuries. Both aircraft were destroyed. Visibility at the time of the accident was poor with fog and light rain. The Subsecretaria de Aviacion Civil of Spain said that the cause of the accident was that the KLM captain conducted the takeoff without clearance, did not obey a "standby for takeoff" instruction from the control tower, and did not reject the takeoff when the Pan American flight crew said that their aircraft was still on the runway. Misunderstanding of orders, instructions, and low ceiling and fog were contributing factors.

16. NTSB. Aircraft Accident Report NTSB/AAR-91/04, 64–65.

17. McCarthy, Paul. Interview by Rosenkrans, Wayne. Alexandria, Virginia, U.S., Feb. 17, 2000. Flight Safety Foundation, Alexandria, Virginia.

18. Lawrie, Deborah. Interview by Rosenkrans, Wayne, and personal communication. Alexandria, Virginia, U.S., Feb. 24, 2000. Flight Safety Foundation, Alexandria, Virginia.

19. Poduval, Ashok. Interview by Rosenkrans, Wayne. Alexandria, Virginia, U.S., Feb. 24, 2000. Flight Safety Foundation, Alexandria, Virginia.

20. Boquist, Cay. Interview by Rosenkrans, Wayne. Alexandria, Virginia, U.S., Feb. 17, 2000. Flight Safety Foundation, Alexandria, Virginia.

21. ICAO. *Rules of the Air and Air Traffic Services (PANS-RAC Doc 4444)* 1–8.

22. Aeronautica Civil of the Republic of Colombia. *Controlled Flight into Terrain, American Airlines Flight 965, Boeing 757-223, N651AA, near Cali, Colombia, December 20, 1995*. The official report of the Aeronautica Civil of the Republic of Colombia said that American Airlines Flight 965, a Boeing 757-223, was transitioning from cruise flight to a very high frequency omnidirectional range (VOR)/distance measuring equipment (DME) instrument approach to Runway 19 at the Alfonso Bonilla Aragon International Airport (SKCL), Cali, Colombia, when the aircraft collided with a mountain 53 kilometers (33 miles) northeast of the CALI VOR. Two flight crew members, six cabin crew members and 151 passengers were killed. Five passengers survived the Dec. 20, 1995 accident, but one of them later died as a result of injuries sustained in the accident. The aircraft was destroyed. The accident occurred at night in visual meteorological conditions. The report said that "the probable causes of this accident were: (1) the flight crew's failure to adequately plan and execute the approach to Runway 19 at SKCL, and their inadequate use of automation; (2) failure of the flight crew to discontinue the approach into CALI, despite numerous cues alerting them of the inadvisability of continuing the approach; (3) the lack of situational awareness of the flight crew regarding vertical navigation, proximity to terrain and the relative location of critical radio aids; [and] (4) failure of the flight crew to revert to basic radio navigation at the time when the FMS [flight management system]-assisted navigation became confusing and demanded an excessive workload in a critical phase of the flight." The report also said that "contributing to the cause of the accident were: (1) the flight crew's ongoing efforts to expedite their approach and landing in order to avoid potential delays; (2) the flight crew's execution of the GPWS [ground-proximity warning system] escape maneuver while the speedbrakes remained deployed; (3) FMS logic that dropped all intermediate fixes from the display(s) in the event of execution of a direct routing; [and] (4) FMS-generated navigational information that used a different naming convention from that published in navigational charts."

23. ICAO *Annex 2, Rules of the Air*, said, "The pilot-in-command of an aircraft shall, whether manipulating the controls or not, be responsible for the operation of the aircraft in accordance with the rules of the air, except that the pilot-in-command may depart from these rules in circumstances that render such departure absolutely necessary in the interests of safety." (2.3.1) The same document said, "The pilot-in-command of an aircraft shall have the final authority as to the disposition of the aircraft while in command." (2.4)

24. Woods, Maureen, and Lacey, Nicholas. Interview by Rosenkrans, Wayne. Alexandria, Virginia, U.S., Feb. 22, 2000. Flight Safety Foundation, Alexandria, Virginia.

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National Library Published Material Editorial Information

Investigation report on a serious incident involving a China Airlines airplane (B-18503,A300-600R), while flying from Chiang Kai Shek International Airport to Ho Chi Min City, Vietnam, pilot became incapacitated
Edited by Aviation Safety Council

ISBN 957-02-7893-5 (Paperback)

1. Aviation Serious Incident Investigation
2. Flight Safety Council

557.909 90002100

Investigation Report

A Serious Incident Involving a

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Editor: Aviation Safety Council, Executive Yuan
Publishing Agency: Aviation Safety Council, Executive Yuan
Tel. No.: (02) 25475200
Address: 16th floor., No.99, Fu Hsing North Road, Sung Shan District, Taipei City
Website: http://asc.gov.tw

Publishing Date: January 2001

ASC-AIR-00-12-002
ISBN: 957-02-7893-5

統一編號
1009000141

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