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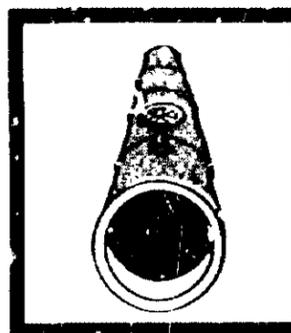
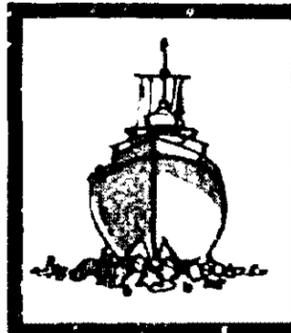
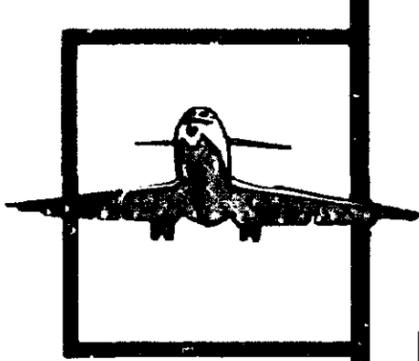
AIRCRAFT ACCIDENT REPORT

**PUERTO RICO INTERNATIONAL
AIRLINES, INC. (PRINAIR)
DeHAVILLAND HERON, DH-114, N575PR
ALEXANDER HAMILTON AIRPORT
CHRISTIANSTED, ST. CROIX,
U.S. VIRGIN ISLANDS
JULY 24, 1979**

NTSB-AAR-80-3

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16. Abstract <p>About 0922 Atlantic standard time on July 24, 1979, Puerto Rico International Airlines, Inc., Flight 610, a deHavilland Heron DH-114, crashed on the airport while executing a takeoff from the Alexander Hamilton Airport, Christiansted, St. Croix, U.S. Virgin Islands. There were 19 passengers and 2 crewmembers on board. The first officer and 7 passengers were killed, and the captain and 12 passengers were injured seriously. The aircraft was destroyed.</p> <p>Witnesses saw the aircraft assume a nose-high attitude shortly after takeoff. The aircraft then began to roll to a left then to a right wing-down attitude, followed by a momentary pitchdown. The aircraft then pitched up and oscillated to a left wing-down and then a right wing down attitude while losing altitude. It struck the ground while in a right wing-down attitude.</p> <p>The gross weight of the aircraft at takeoff was found to be 1,060 lbs over its maximum allowable takeoff weight of 12,499 lbs., and the center of gravity was about 8 ins. beyond the maximum allowable rear limit.</p>			
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Abstract Continued

The National Transportation Safety Board determines that the probable cause of this accident was the pilot's loss of control of the aircraft after takeoff because of the aircraft's grossly overweight and out-of-balance condition which resulted from misloading by the company's load control personnel. The misloading was due to the failure of the company to supervise and to enforce its loading procedures. The Safety Board also determines that inadequate surveillance and enforcement by the FAA were causal factors in this accident.

CONTENTS

Synopsis	1
1. Investigation	1
1.1 History of Flight	1
1.2 Injuries to Persons	4
1.3 Damage to Aircraft	4
1.4 Other Damage	4
1.5 Crew Information	4
1.6 Aircraft Information	5
1.7 Meteorological Information.	9
1.8 Aids to Navigation	9
1.9 Communications	9
1.10 Aerodrome and Ground Facilities	9
1.11 Flight Recorders	9
1.12 Wreckage and Impact Information	9
1.13 Medical and Pathological Information	11
1.14 Fire	11
1.15 Survival Aspects	11
1.16 Tests and Research	13
1.16.1 Test of Engine-Driven Fuel System Component and Fuel Indicating System.	13
1.16.2 Examination of the No. 4 Propeller	13
1.16.3 Performance	14
1.17 Additional Information.	15
1.17.1 PRINAIR Operations	15
1.17.2 PRINAIR Weight and Balance Procedures.	15
1.17.3 Actual Weight and Balance Procedures at St. Croix	17
1.17.4 Load Control Responsibility and Training.	18
1.17.5 History of PRINAIR's Weight and Balance Discrepancies	18
1.17.6 FAA Surveillance and Actions	21
1.18 New Investigation Techniques.	23
2. Analysis	23
3. Conclusions	28
3.1 Findings	28
3.2 Probable Cause	29
4. Safety Recommendations	30
5. Appendixes.	31
Appendix A--Investigation and Hearing.	31
Appendix B--Personnel Information	32
Appendix C--Aircraft Information.	33
Appendix D--PRINAIR Weight and Balance Procedures	35
Appendix E--Crash Site/Witness Location Char'.	40

Appendix F—Letter of Agreement of September 26, 1979 between PRINAIR and the FAA	41
Appendix G—Emergency Order of Suspension	43
Appendix H—Letter of Agreement between PRINAIR and the FAA of October 28, 1979.	54

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

Adopted: March 28, 1980

PUERTO RICO INTERNATIONAL AIRLINES, INC. (PRINAIR)
DEHAVILLAND HERON, DH-114, N575PR
ALEXANDER HAMILTON AIRPORT
CHRISTIANSTED, ST. CROIX, U.S. VIRGIN ISLANDS
JULY 24, 1979

SYNOPSIS

About 0922 Atlantic standard time on July 24, 1979, Puerto Rico International Airlines, Inc., Flight 610, a deHavilland Heron DH-114, crashed on the airport while executing a takeoff from the Alexander Hamilton Airport, Christiansted, St. Croix, U.S. Virgin Islands. There were 19 passengers and 2 crewmembers on board. The first officer and 7 passengers were killed, and the captain and 12 passengers were injured seriously. The aircraft was destroyed.

Witnesses saw the aircraft assume a nose-high attitude shortly after takeoff. The aircraft then began to roll to a left and then to a right wing-down attitude, followed by a momentary pitchdown. The aircraft then pitched up and oscillated to a left wing-down and then a right wing-down attitude while losing altitude. It struck the ground while in a right wing-down attitude.

The gross weight of the aircraft at takeoff was found to be 1,060 lbs over the maximum allowable takeoff weight of 12,499 lbs, and the center of gravity was about 8 ins. beyond the maximum allowable rear limit.

The National Transportation Safety Board determines that the probable cause of this accident was the pilot's loss of control of the aircraft after takeoff because of the aircraft's grossly overweight and out-of-balance condition which resulted from misloading by the company's load control personnel. The misloading was due to the failure of the company to supervise and to enforce its loading procedures. The Safety Board also determines that inadequate surveillance and enforcement by the FAA were causal factors in this accident.

1. INVESTIGATION

1.1 History of the Flight

Puerto Rico International Airlines, Inc., (PRINAIR), Flight 610, a deHavilland DH-114 (N575PR), was a regularly scheduled passenger and cargo flight from San Juan, Puerto Rico, to the West Indies Islands of St. Croix, St. Kitts, St. Maarten, and St. Thomas.

In San Juan on the morning of July 24, 16 passengers boarded the aircraft, which had been loaded with 665 lbs of baggage and cargo. The weight and balance form given to the flightcrew reflected a gross weight of 12,467 lbs and a moment of +33 (in. lbs x 1,000). The form indicated that the load was within the allowable gross weight of 12,499 lbs and the moment limits of -19 to +101.

At 0811 ^{1/} the flight departed for St. Croix and a departure message was sent from the company's San Juan load control to its St. Croix load control. However, because of mechanical difficulties with the teletype machine, the message, which normally includes the flight number, the aircraft number, crew names, estimated time of departure, gasoline in gallons, total number of passengers, a passenger destination breakdown with seat assignments, passenger weights, and baggage and cargo weights showing the number of pieces in bins "A" and "B," was not delivered at the usual time. However, the departure message for this flight did not include a listing of baggage and cargo loaded in bin "B," where 15 pieces of baggage and 2 large boxes had been placed. The total weight of these articles was 560 lbs. This information did appear on the customs declaration manifest, which was carried by the crew and which was given to St. Croix load control when the flight arrived in St. Croix. However, St. Croix load control predicated its loading on the departure message and did not examine the customs declaration.

When the customary message was not received at St. Croix, personnel telephoned San Juan and asked for and were given the loading information. Testimony and statements as to exactly what information was passed on to St. Croix are in conflict. The Supervisor of Operations at San Juan stated that when he received a telephone call from St. Croix, he "gave the information that was on the departure message or General Declaration." However, the PRINAIR load control representative in St. Croix stated that when her assistant talked to San Juan she was not given any information regarding bags or cargo in bin "B" and received only the incomplete information reflected in the departure message.

The flight en route to St. Croix was uneventful. The captain stated that he flew the aircraft and while inbound to St. Croix, the first officer contacted St. Croix load control. The captain could not recall what information the first officer transmitted to St. Croix.

The flight arrived at St. Croix at 0900, and three passengers deplaned. The aircraft was loaded using the information in the departure message. A load manifest for the flight to St. Kitts was prepared and given to the crew. It gave the gross weight of the flight as 12,374 lbs and the moment as +34, both of which were within the allowable limits for the flight. The load manifest was then reviewed by the crew and signed by the captain.

The two persons who had loaded the aircraft at St. Croix were employed by a ground handling service company. One loader stated that when he opened the aircraft door, he saw that bin "B" (the rear compartment) was "half full." It contained five boxes and three or four suitcases. He off-loaded bin "A" (the forward compartment) then reloaded it until it was full. The other loader

^{1/} All times herein are Atlantic standard based on the 24-hour clock.

stated that he "stuffed baggage into bin B until it was full." Both loaders stated that they placed bags and cargo marked "A" in the "A" bin, and bags and cargo marked "B" in the "B" bin. Neither loader could recall having received any specific training but stated that if they encountered a problem, they would go to the PRINAIR "counter girl" for resolution.

Six passengers boarded at St. Croix bringing the total number of passengers on board to 19. The captain stated that he reviewed the weight and balance computations on the St. Croix load manifest and found them to be correct. He made a walkaround of the aircraft before entering, and loading personnel were in the process of loading the aircraft. The crew started the engines, was cleared to taxi to runway 09, and began the taxi. According to the line crew, they had to wait for the aircraft to move before they were able to remove the tail stand.^{2/} One witness saw the nose wheel leave the ground occasionally while the aircraft was being taxied out. When questioned, the captain could not recall having experienced anything unusual during taxi.

At 0921:36 after being cleared to St. Kitts, Flight 610 was cleared for takeoff. According to most witnesses, the takeoff roll and rotation were "normal," with the rotation about 2,500 ft from the takeoff end of the runway. The aircraft then entered a normal climb attitude of about 10° noseup. The flaps were down 20° and the gear was retracted. At an altitude of about 150 ft above the runway, near midfield, the aircraft pitched up steeply to about 30° to 35° attitude. At this time, a rapid, almost complete power reduction was heard by witnesses, followed immediately by the sound of power being added on all engines. The aircraft then began to fishtail and rolled to a right wing-down, nosedown attitude. The aircraft rolled back to the left as it gained speed. It then pitched up a second time, followed immediately by a rolloff and pitch down. The right wing first contacted the ground, and was followed immediately by the nose. None of the witnesses reported anything falling from the aircraft, nor any smoke or fire before ground impact.

The captain testified that the takeoff was normal until he retracted the landing gear and flaps. When he retracted the landing gear, the aircraft assumed a nose-high attitude and although he pushed the yoke forward as hard as he could and applied full nosedown trim, he could not bring the nose down. He called for help from the first officer and together they brought the nose down, but not below the horizon. He reduced power and then added power to see if he had a powerplant problem, but the engines reacted properly. He estimated that the flight reached an altitude of between 250 and 300 ft. He stated that the aircraft was like a "leaf coming from a tree," with the aircraft rolling left wing down, then right wing down.

The aircraft came to rest on its right side adjacent to the firehouse. A small postaccident engine fire was extinguished immediately. (See figure 1.)

^{2/} A bar to support the tail of the aircraft to prevent it from lowering. It is usually attached when an aircraft is parked and always removed before flight operations.



Figure 1.--Left side of aircraft

The accident occurred during daylight hours at latitude 17°42'13.7"N and longitude 64°47'56.2" W.

1.2 Injuries to Persons

<u>Injuries</u>	<u>Crew</u>	<u>Passengers</u>	<u>Other</u>
Fatal	1	7	0
Serious	1	12	0
None	0	0	0

1.3 Damage to Aircraft

The aircraft was destroyed by impact.

1.4 Other Damage

None

1.5 Crew Information

The crewmembers were qualified and properly certificated.

According to information contained in hospital records, the captain, who was injured seriously, stated to a hospital attendant that he had a few beers that "morning." As the result of this information, an extensive check was made of the captain's activities during the 24-hour period before the flight's departure from

San Juan. No evidence was found to indicate that the captain had been drinking alcoholic beverages during the period. Investigation also indicated that the captain did not have a background of drinking, and that he had made a number of incoherent and unfounded statements between the time of the accident and the time he was sedated for surgery. When questioned regarding his statement, the captain stated that he had not been drinking within the 24 hours before the accident and had gone to bed shortly after 2000 on the night before the accident. He stated that he had a good night's sleep and awoke around 0600 in the morning. He then ate breakfast and went to the airport, arriving there about 0730. (See appendix B).

1.6 Aircraft Information

The aircraft was certificated and maintained in accordance with applicable regulations. It was fitted with 19 seats in addition to a pilot and a copilot seat. (See appendix C.)

PRINAIR allows a free baggage allowance of 44 lbs per person. The aircraft contains two baggage compartments, bin "A" in the nose and bin "B" in the tail. The forward baggage bin is limited to a maximum weight of 300 lbs, and the rear bin is limited to 730 lbs. Placards are in place to inform loaders and crewmembers of the weight restrictions.

The rear cabin layout was modified as authorized by Supplemental Type Certificate (STC) SA-1828-WE, so that the aft bulkhead (between the passenger cabin and bin "B") was relocated aft of the cabin entry door and a passenger divan (seats 10A and 10B) was installed at the rear of the cabin. In this configuration, the rear bin's authorized maximum weight of 730 lbs includes the weight of the divan occupants. Since Flight 610 had two passengers seated on the divan whose combined weight was 330 lbs, the baggage and cargo in bin "B" was limited to 400 lbs total weight.

PRINAIR's baggage procedures, implemented on July 15, 1979, required that "baggage loaded in bin A will be of group 2 (small baggage) using an average weight of 15 lbs per bag. Baggage loaded in bin B will use an average weight of 30 lbs. This included baggage of groups 1 and 2." (See appendix D). Group 2 consists of larger pieces and includes satchels and large suitcases, while group 1 consists of small bags.

The weight and balance form calculated by the PRINAIR load control personnel at St. Croix for the departure from St. Croix listed the row numbers, passengers weights, and baggage as follows:

<u>ROW</u>	<u>PASSENGER WEIGHT (lbs)</u>	<u>BAGGAGE (lbs)</u>
1-A	165	bin "A"
1-B	160	34
2-A	120	30
2-B	190	20
3-A	135	75
3-B	120	3 pcs.
4-A	110	1 pc.
4-B	120	bin "B"
5-A	130	20
5-B	110	54
6-A	165	1/15
6-B	180	32
7-A	165	32
7-B	125	32
8-A	125	26
8-B	125	48
9-B	140	1 pc.
10-A	140	
10-B	190	
bin "A"	229	
bin "B"	289	
Operating Weight	8,148 lbs	
Fuel	<u>1,020 lbs</u>	
Total -	12,374 lbs	

The location of persons and baggage is shown in figure 2.

The calculated moment for the 12,374 lb load was given as +34 (in. lbs x 1,000), ^{3/} and the moment unit limits were between -20 to +101. The retraction of the landing gear causes a total positive moment change of 265 ft lbs and a corresponding rearward movement of c.g. position.

Four of the passengers who boarded at San Juan were interviewed by investigators. They stated that neither PRINAIR counter nor load control personnel had asked them their weight, and their carry-on baggage was not weighed. None of the passengers who had boarded at St. Croix could recall having been asked their weight or having their carry-on baggage weighed.

3/ To facilitate weight and balance calculations at its various stations, PRINAIR uses a system of inch-pounds in computing weight and balance. The charts used by PRINAIR personnel list pre-multiplied weight and moment arms and give the moment divided by 1,000. This is done for convenience and the moments expressed are called inch or datum numbers. Accordingly, the weight-moment envelope varies from a forward limit of about -57 to a rear limit of +101, depending upon the gross weight of the airplane at the time of departure.

RECONSTRUCTED ACTUAL WEIGHTS

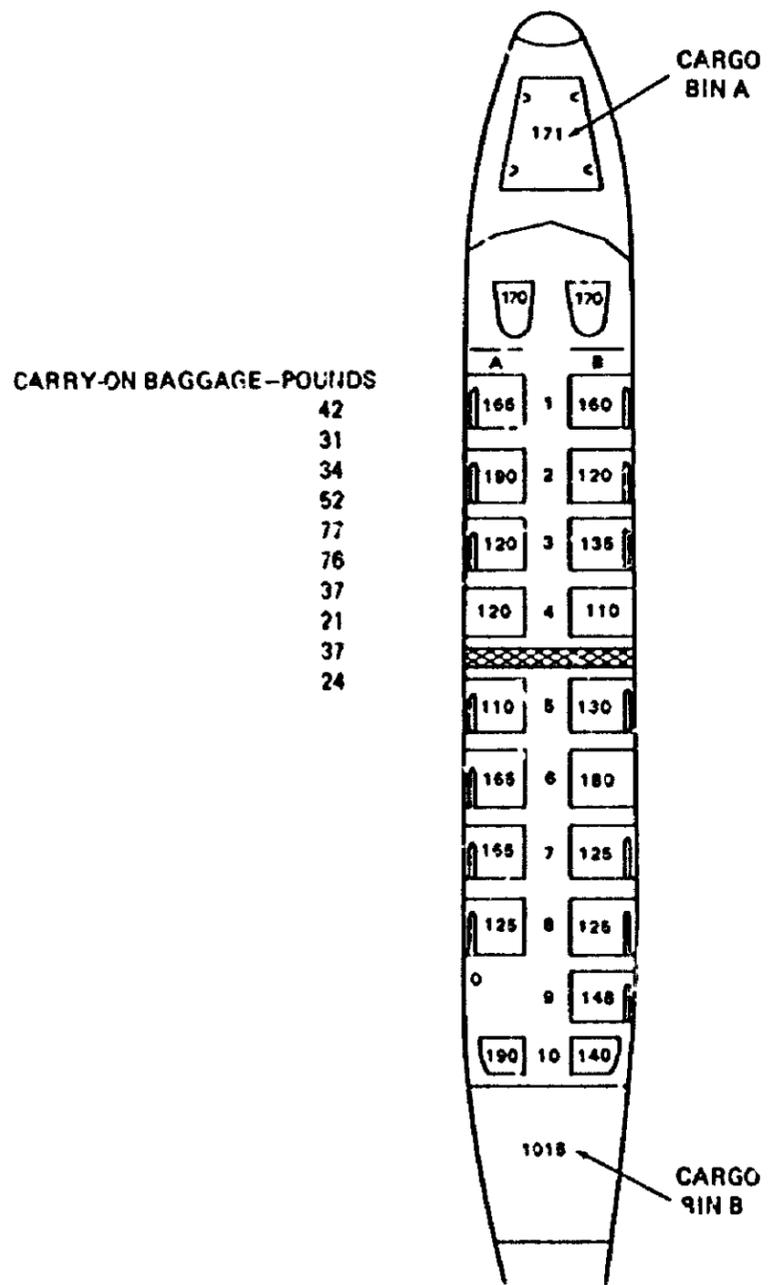


Figure 2.--Location of Persons and Baggage

Following the accident, the Safety Board obtained the actual weights of all passengers. The baggage in bins "A" and "B" and the carry-on baggage were removed from the wreckage and weighed. Although the weight and balance manifest prepared by St. Croix load control indicated 229 lbs in bin "A", the actual weight of the baggage was total of 171 lbs. The weight and balance manifest indicated 289 lbs of baggage in bin "B"; however, when weighed, the baggage totaled 1,015 lbs. When the actual weight of the two passengers that occupied the divan was added, the total weight for the rear compartment area was 1,315 lbs. Baggage marked "A" was found in bin "B". The total weight of carry-on baggage and crew bags was 431 lbs. (See Table 1.)

Thus, the actual c.g. was calculated by dividing the total moment of 216,494 by the aircraft weight of 13,559. The resultant c.g. was +15.96 ins. The aircraft's allowable maximum gross weight of 12,499 lbs was, therefore, exceeded by 1,060 lbs and its aft c.g. limit of 8.1 in. was exceeded by 7.9 in.

TABLE 1

Reconstruction Of Flight 610 Weight and Balance Manifest

<u>Item</u>	<u>Weight (lbs)</u>	<u>Carry-On Baggage (lbs)</u>	<u>Datum</u>	<u>Moment</u>	<u>Total Weight (lbs)</u>
Empty Weight	7,739	-	-7.39	-57,191	7,739
Crew	340	-	-109	-37,060	340
Fuel	1,020	-	+12	+12,240	1,020
Oil	120	-	-58.6	-7,032	120
Bin "A"					
Baggage	171	-	-129.5	-22,144	171
Seat 1-A	165	42	-84	-30,828	367
Seat 1-B	160				
Seat 2-A	190	31	-58	-19,778	341
Seat 2-B	120				
Seat 3-A	120	34	-32	-9,248	289
Seat 3-B	135				
Seat 4-A	120	52	-6	-1,692	282
Seat 4-B	110				
Seat 5-A	110	77	+33	+1,0461	317
Seat 5-B	130				
Seat 6-A	165	76	+60	+25,260	421
Seat 6-B	180				
Seat 7-A	165	37	+87	+28,449	327
Seat 7-B	125				
Seat 8-A	125	21	+114	+30,894	271
Seat 8-B	125				
Seat 9-B	148	37	+141	+26,085	185
Seat 10-A	190	24	+169.5	+60,003	354
Seat 10-B	140				
Bin "B"					
Baggage	1,015	-	+205	+208,075	1,015
Totals	13,128	431		+216,494	13,559

1.7 Meteorological Information

The current official weather observation taken at 0930 was as follows: scattered clouds at 2,000 ft, visibility—10 mi, temperature--84°F, dewpoint--73° F, wind 050° at 10 kn, altimeter setting—30.10 inHg.

1.8 Aids to Navigation

Not applicable.

1.9 Communications

There were no communications difficulties.

1.10 Aerodrome and Ground Facilities

Alexander Hamilton Airport has one asphalt-concrete runway, 09/27, which is 7,612 ft long and 150 ft wide. The airport is 61 ft above sea level. The airport was in compliance with 14 CFR 139 with no exceptions. A Virgin Island Port Authority firehouse is located on the airport and employs 17 trained firefighters. The firehouse is equipped with two Oshkosh firetrucks, one International 1900 firetruck, one International 1000 firetruck, one Ford tanker, one 1966 Dodge station wagon converted to an ambulance, and one 1977 Chevette, which is an escort vehicle. (See appendix E.)

1.11 Flight Recorders

The aircraft was not equipped, nor was it required to be equipped, with flight recorders.

1.12 Wreckage and Impact Information

The aircraft hit the ground on a heading of 120° with the right wing down and the fuselage in a near level attitude. It came to rest on a heading of 200° about 792 ft to the right of the takeoff runway centerline and 216 ft from the airport firehouse. There was no evidence of in-flight fire.

Examinations of the available control system and control surface components showed no evidence of prior structural failure or malfunction. The fuselage had sustained severe damage from ground impact forces. The cockpit and nose structure were severely crushed. The canopy, including the windows, had separated at fuselage station (FS) 95 and had folded over the nose structure. The nose section upper access door had separated from its attach structure, however, the door remained in its relative position. The cargo door located on the left side of the nose section remained intact and closed. The door between the cockpit and cabin had separated from the bulkhead.

The right side of the fuselage had split open on a horizontal plane adjacent to the top of the cabin windows. The split extended from the cockpit bulkhead aft to about FS 145. The fuselage also split about FS 145, across the top to the left side to a point just above the airstair door area.

The left wing assembly was in the upright position. The forward upper wing to fuselage fairing was intact and attached to the wing assembly. The right wing assembly was in the upright position. The forward portion of the fiberglass wingtip was missing.

The left horizontal stabilizer, elevator, and elevator tab remained intact and attached, with no evidence of damage. The right horizontal stabilizer, elevator, and elevator tab sustained severe and extensive impact damage. The elevator tab was in the down position. The rudder torque tube and yoke assemblies remained intact and attached with no evidence of damage noted. The rudder and rudder trim tab cables were intact and attached. Both rudder stops were intact and secure.

The elevator torque tube and yoke assemblies remained intact and attached with no evidence of damage noted. The elevator and elevator trim cables were intact and attached. Both elevator stops were intact and secure. The elevator down spring required by STC SA1685WE drawing No. 1014 was found to be properly installed and operational.

The trim tabs are nonreversible screwjacks. The tab measurements are for tab deflections relative to mounted surface. They were:

Left Aileron Tab — Down 14°
Right Aileron Tab — Up 10.5°
Left Elevator Tab — Up 20°
Right Elevator Tab — Down 40° (beyond limits)
Rudder Tab — Left 43° (beyond limits)

The continuity of the trim tab cables was confirmed from the tabs forward to the wing front spar's carry-through structure. From this point forward to the pedestal, tension existed on the cables.

The continuity of the rudder control cables was confirmed from the rudder forward to the cockpit area. The rudder trim tab cables had failed in tension in the area of the wing aft spar carry-through structure. The Nos. 1, 2, and 4 engines had separated from their installed positions and were partially retained to the aircraft's structure by hoses, electrical cables, control rods, or control cables. The No. 3 engine had completely separated from the aircraft's structure. There was no evidence of fire damage. The Nos. 2, 3, and 4 propellers remained attached to their respective engines; the No. 1 propeller had separated from the engine. Two blades had separated from the No. 3 propeller while one blade was separated from the No. 4 propeller. With the exception of some small sections of propeller blades, all of the separated blades sections were recovered; these sections comprised nearly complete blade assemblies. All of the attached propeller blades exhibited varying degrees and patterns of twisting and bending.

All four powerplants were examined on-scene and fuel samples were taken. Fuel samples were not contaminated.

The powerplants were then disassembled and their components examined in detail by Safety Board investigators. The propellers were also removed and examined at both St. Croix and at Hartzell Propeller, Inc., Piqua.

Ohio. Examination revealed that the propeller blades were bent and distorted in a manner expected if the engines were producing power.

In addition, the magnetos, the engines, and the aircraft fuel system components were either functionally tested or were disassembled and examined by Safety Board investigators at the PRINAIR engine overhaul facilities. All four powerplants were capable of producing takeoff power. No abnormalities were found in the aircraft systems that could have contributed to the accident. The nose and main landing gear were retracted at impact. The wing flap actuator on the right wing was at the 20° position at impact.

1.13 Medical and Pathological Information

Postmortem examination of the first officer and the seven passengers revealed that they died from multiple traumatic internal injuries and internal hemorrhaging. Generally, these injuries included the rupture or laceration of the heart, liver, and other internal organs. The captain and the other 12 passengers sustained multiple serious injuries consisting mainly of fractured limbs, lacerations, and contusions. Toxicologic specimens of the first officer were sent to the Federal Aviation Administration's (FAA) Civil Aeromedical Institute (CAMI) in Oklahoma City, Oklahoma. Results were negative for neutral, basic and acidic drugs, carbon monoxide, and ethyl alcohol.

1.14 Fire

A small ground fire started between the Nos. 3 and 4 engines and was extinguished immediately.

1.15 Survival Aspects

When the aircraft crashed, the airport manager went directly to the scene, after which he told his office to notify the agencies listed in the Airport Emergency Plan that outside medical assistance was needed. Notification was made by telephone — the only means of communication available. Further notification was made over the civil defense radio by Civil Defense personnel.

The aircraft was configured with 2 pilot seats, 17 single passenger seats, and a bench seat. There were three emergency exits; two over the right wing at seat rows 4 and 7 and one over the left wing at seat row 4. A passenger entry door with integral stairs was located behind seat row 8 on the left side of the aircraft.

The fuselage remained on its right side throughout the crash sequence. The cockpit and the right cabin wall were torn apart during the ground slide, which reduced severely the occupiable volume of the forward cabin. The remainder of the cabin received progressively less severe damage.

The captain's seat was partially detached at its bulkhead fitting and displaced inboard. The seatpan frame was fractured. The first officer's seat had failed. The seatpan rivets were pulled loose and the frame was broken on both sides. The seatbelts on both seats were intact and the webbing was not stretched.

The seats were not equipped with shoulder harnesses. Although shoulder harnesses in this type of aircraft are required by 14 CFR 135.171, the extended compliance date granted by 14 CFR 135.10 had not passed.

The passenger seats 1A, 1B, 2B, 3B, and 4B had failed at their seat-to-track attachments. Seats 2A, 3A, 4A, 5B, 6B, 7B, 8B, and 9B had become partially detached from the floor, but remained attached to the wall tracks. The remaining four seats and the bench showed relatively little damage. A seatbelt anchorage had failed on the left bench seat (seat 10A).

Only six passengers recalled the rescue operation. These passengers remembered two men going through the fuselage and assisting persons leaving the aircraft. The points of egress were through the forward right opening in the fuselage and through the passenger entry door. No attempt was made to open the left emergency exit, and when inspected it was found to be jammed as a result of the accident.

The firehouse crew chief stated that rescue operations began immediately after the aircraft crashed. He stated that the firehouse dispatched the Oshkosh firetrucks, and since there was no fire, they began rescue operations at once. He stated that while rescue operations were in progress, other persons arrived on scene and assisted. He further stated that when smoke was seen coming from two areas of the aircraft, the firemen extinguished the small fires and removed the aircraft's battery. He stated that "as fast as the injured were removed from the aircraft, they were dispatched to the hospital," and that the rescue operation took about 20 minutes. The area was cordoned off by the maintenance division, and fuel which had leaked from the right wing was covered with light water. A temporary morgue was set up in the firehouse.

During the Safety Board's public hearing, St. Croix fire department personnel also stated that they responded to the crash immediately and one of the crash crew entered the aircraft and began removing the injured passengers for transport to the hospital.

According to the fire chief, two of the six firefighters were in the area of the airport terminal when the aircraft crashed. The two firefighters stated that they ran to the area of the accident, then back to the firehouse to don protective clothing. This would have taken 3 to 4 minutes. Another crewmember and an employee of another airline rescued the captain from the cockpit and transferred him to the only ambulance at the fire station.

According to the Director of Cargo Management for Caribbean Air Services, Inc., (CASAIR) and an employee of Eastern Caribbean Airways, the first persons to arrive at the crash scene were three CASAIR employees. Immediately thereafter, two employees from Eastern Caribbean Airways and American Inter-Island arrived followed by the crash/fire/rescue crew.

According to the Director of Maintenance for American Inter-Island, a mechanic carried a hand-held fire extinguisher to the scene and extinguished a small fire near either the No. 3 or No. 4 engine, and remained on fire watch until the fire department arrived. Two other mechanics immediately started to remove

survivors from the wreckage, and they were soon joined by personnel from other airlines and companies in the area. He also stated that an employee from another airline disconnected and removed the battery and that the crash/fire/rescue crew arrived on scene about 3 to 4 minutes after the crash. After the crash crew arrived on the scene, the airport ambulance left with one of the survivors and all of the medical equipment, including the only resuscitator. Removal of the equipment from the scene impaired the medical treatment of the injured survivors. All but one of the other survivors were transported to the hospital in two large vans which were provided by another airline.

According to an instructor—emergency medical services—for the St. Croix Office of Civil Defense, who arrived at the scene about 8 minutes after the accident, all of the injured had been transported by about 0935 (13 minutes after the accident). Upon arriving, he noted six to eight persons lying on the ground, and firemen shoveling sand on a running stream of gasoline. There were no emergency vehicles in sight and no persons representing any type of medical authority. Firemen and airport authorities were involved in moving wreckage and looking for passengers. No form of triage was attempted by the firemen. He stated that he had to emphasize repeatedly that the dead should not be transported until the injured were treated and evacuated. He also stated that the firemen foamed the wreckage after the last passenger was removed from the aircraft. He was critical of the medical aspects of the rescue procedures. He stated, "It is felt that the many serious injuries involved with this disaster would not have been aggravated to the extent seen had there been adequately trained medical personnel stationed at the airport who were oriented towards proper triage, extrication, and medical treatment."

Review of the crash/fire/rescue personnel's training records and hearing testimony indicates that all crash/fire/rescue personnel were given training as required by the Virgin Islands Port Authority. According to the testimony of the FAA Inspector from the Atlanta, Georgia, certification branch, the St. Croix crash/fire/rescue facilities and personnel are satisfactory and meet the requirements of the Federal Aviation Administration.

1.16 Tests and Research

1.16.1 Test of Engine-Driven Fuel System Component and Fuel Indicating System

The engine-driven fuel system components were tested and examined at PRINAIR's San Juan facilities and found to be capable of functioning normally. Examination of the engine low oil pressure warning light bulb for the No. 4 engine showed a cold break with no stretching.

The fuel indicating system gages and tank units were tested at Aero Systems in Miami, Florida. The gages and units operated properly.

1.16.2 Examination of the No. 4 Propeller

The No. 4 propeller was disassembled and examined at the facilities of Hartzell Propeller, Inc., to ascertain if any impact marks could be found to indicate the angle of the propeller blade at initial impact, and, therefore, provide

additional evidence of power production by the No. 4 engine. The hub pilot tube for two of No. 4 propeller's blades was broken near the intersection of the pilot tube hub flange radius. The pilot tube fracture surfaces were oriented in the rotational plane of the propeller. However, no conclusive impact propeller blade angle correlations could be made. Measurements of impact blade angles ranged from 9° to 20° at the blade's 30-in. station. There was no evidence of any preimpact failure of a propeller operating component.

1.16.3 Performance

N575PR was equipped with four Continental IO-520-E engines with takeoff ratings of 300 h.p. The FAA issued STC SA 1685WE to PRINAIR on June 28, 1968, for installation of these engines in place of the original 285 h.p. deHavilland Gypsy Queen engines. A type inspection authorization (TIA) was issued on May 9, 1968, requiring flight testing of the Heron with the new engines and propellers. Six flights were made with the gross weights varying between 11,044 lbs and 13,826 lbs with c.g.'s at the forward and aft limits. The test results which are documented in a type inspection report (TIR) did not contain any comments showing noncompliance with the applicable certification standards.

Stall characteristics were explored during certification flights and found to be satisfactory. At 13,805 lbs, aft c.g., takeoff flaps and gear extended, the wings-level power-on stall speed was 70 mph indicated air speed. Light airframe and elevator control column buffet was evident at 77 mph, (10 percent above V_{stall}). Recovery from the stall required reducing the pitch attitude to zero (the horizon) and a loss of 100 ft of altitude during recovery. Controllability about all axes during recovery was rated as "good." The stick forces tended to become light just before the stall. The tests were repeated for the clean configuration -- power off. A higher stall speed of 89 mph was preceded by light airframe and control column buffet at 109 mph. Recovery required pitch reduction to 8° below the horizon and a loss of 440 ft of altitude. No difficulties were noted in recognizing the stall or maintaining control during the stall and recovery.

Power-on stalls were evaluated at 13,827 lbs with an aft c.g. and the throttle on the No. 1 engine (the critical engine for minimum control speed) closed. Stall was experienced at 84 mph, preceded by buffet at 96 mph. Recovery required pitch reduction 5° below the horizon and a loss of 110 ft of altitude. No adverse stall characteristics were noted.

Because of hazards involved, tests were not conducted nor were they required to be conducted at c.g.'s out of the allowable limits. However, the effect of extreme aft c.g. on longitudinal stability and control was examined in this investigation. Loading beyond the aft c.g. limit reduces longitudinal stability and controllability and allows for pitchups, which in some cases are sudden and uncontrollable. An uncontrollable pitchup can lead to a low-altitude stall and crash because of lack of control and insufficient altitude and time for recovery. According to testimony by the Chief of the FAA's Flight Test Branch at Atlanta, Georgia, an aircraft, loaded as N575PR was loaded, would have become uncontrollable immediately after it became airborne. At least 100 ft of altitude would be required for stall recovery under controlled conditions.

PRINAIR had previously experienced pitchups on takeoff and in one case, the captain was able to regain control by quickly moving passengers forward. This action moved the c.g. sufficiently forward to regain elevator effectiveness in pitching the nose down. Aircraft loaded beyond the aft c.g. limit have been known to selfrotate for takeoff without pilot input to the elevator. In ground effect and at takeoff power, the elevator effectiveness will increase because of reduced downwash, which in turn will aid the pilot in keeping the nose down while accelerating. Once airborne and out of ground effect, however, the downwash effect increases and reduces elevator effectiveness. Then the pilot may have difficulty keeping the nose of the aircraft down. According to the Airplane Flight Manual (AFM), retraction of the landing gear is required immediately after becoming airborne at V_2 and causes rearward movement of the c.g. and a noseup pitching moment. This movement was calculated at 0.2 ins.

1.17 Additional Information

1.17.1 PRINAIR Operations

PRINAIR, the largest commuter airline in the world, held FAA Operating Certificate No. 61-SO-26, effective September 10, 1965, and reissued at San Juan, Puerto Rico, on February 25, 1975. PRINAIR was authorized to operate as an air taxi/commercial operator to conduct air taxi operations as an air carrier engaged in air transportation or commercial operations utilizing aircraft of 12,500 lbs or less maximum certificated takeoff weight, in accordance with the applicable provisions of 14 CFR Part 135. Operations were authorized in the following categories and classes of aircraft: Airplane multiengine land, visual flight rules, and instrument flight rules day and night, passenger and cargo. Areas of operation were between Puerto Rico, the U.S. and British Virgin Islands, the French, British, and Dutch West Indies; the Dominican Republic; Haiti; Colombia; Venezuela; Jamaica and the Islands of Trinidad and Tobago; the Bahama Islands; the Turks Islands; and the Netherlands Antilles.

The company operated 27 deHavilland DH-114 Heron aircraft; its main operation and maintenance base was at San Juan International Airport, San Juan, Puerto Rico. The company also controls Caribbean Aircraft Development, Inc., at Building 408, Opa Locka Airport, Opa Locka, Florida, where most of the modifications and airframe maintenance on DH-114's were accomplished.

1.17.2 PRINAIR Weight and Balance Procedures

PRINAIR's weight and balance procedures, as set forth in the company's training and coordination manual, were as follows:

"Functions of Load Control Center, in San Juan Station:

(a) General:

The proper loading of an aircraft cannot be overemphasized. An aircraft can be loaded within the maximum weight limitations (12,499 lbs.), yet be unairworthy, due to improper distribution of the weight;

(b) Who prepares the Weight and Balance:

Load Control Department has the responsibility of making sure that the Weight and Balance limitations are complied with before takeoff. The pilot's responsibility is to verify the accuracy of same before signing. The Weight and Balance is done through procedures already established by the Company.

These procedures are designed to control and provide a uniform system to control the loading factors of an aircraft within the maximum weight limitations thus providing a safe and efficient operation.

Load Control Department is under the direct control and direction of the Station Manager, however, it works in coordination with Reservations, Gate, Counter, Ramp, Operations and Lost and Found Department.

A Weight and Balance Manifest is issued to record and keep track of proper loading of the aircraft, (from the figures entered in this Manifest.)

The acceptance by the crew of this flight will be dependent on the figures entered in this Manifest, therefore, accuracy, neatness and legibility are imperative.

Weight And Balance Manifest:

Preparation:

A Weight and Balance Manifest is prepared for each and every flight. On this form the weight of the passenger, seat occupied, baggage and fuel are recorded.

Always assign seats beginning with row 8, and work forward, e.g., 7, 6, 5, etc.... The last seats assigned are 9B, 10A, and 10B.

The rear compartment has a maximum load capacity of 730 pounds and front compartment 300 pounds. Seat numbers 10A and 10B are located in the rear compartment. When these seats are assigned, weight of passengers occupying these seats must be subtracted from 730 to determine maximum baggage that may be carried in the rear baggage compartment, also called Bin B.

If the tenth row seats must be used, the lightest passengers should always be assigned these seats. It is an FAA Regulation to always ask the passenger his weight. If passenger has hand baggage or an infant, this weight is also taken into consideration and included with the passenger's weight. Do not guess the passenger's weight, always ask passenger for his weight."

PRINAIR's Operations Manual, Chapter III, Section 3.50 - Weight and Balance Procedure, states:

"3.50 WEIGHT AND BALANCE PROCEDURE

The importance of proper loading of an aircraft should be realized by pilots and ground personnel. An airplane can be loaded within the maximum weight limitation yet be unairworthy because of improper placement of the load that may cause it to be out of balance.

Good loading gives good aerodynamic qualities which in turn means efficient operation.

1. The Captain is responsible for the proper loading of the aircraft.
* * * *
4. Load Control Department is responsible for the correct preparation of a Weight and Balance form for each and every flight."

Weight and balance procedures as published in the company's training and coordination manual state, in part,

"(b) Who prepares the Weight and Balance

Load Control Department has the responsibility of making sure that the Weight and Balance limitations are complied with before takeoff. The pilot's responsibility is to verify the accuracy of same before signing...."

1.17.3 Actual Weight and Balance Procedures at St. Croix

The weight and balance information was prepared by one of the station employees of PRINAIR.

According to PRINAIR instructions, the weight of each customer is asked and if any doubt exists, the customer is asked to step on a scale. This weight, along with any weight of carry-on baggage, is entered in the "weight" column of the weight and balance manifest opposite the column where the seat assigned to that customer is entered. Assignment of seats is from seat 8B forward. Baggage is sorted according to group 1 or group 2 and then tagged for bin "A" or "B." This weight is also entered in the "pieces" column of the weight and balance manifest followed by the letter "A" or "B".

All weight in bins "A" and "B" is totalled and entered next to the bin "A" and "B" box on the weight and balance manifest. The total of all passengers' weights, fuel weight, and operating weight is tallied, and all minus and plus moments calculated. A total takeoff gross weight and c.g. are then determined. The weight and balance manifest is then initialed by the person who prepares it; the c.g. limits for that weight are listed; and the manifest is given to the captain of the flight or his representative for his signature. He certifies that the takeoff weight and index fall within the allowable values shown in the applicable flight operations manual.

The baggage is then moved to the loading area where loaders load each piece in bins "A" and "B" appearing on the baggage tag. Baggage is loaded by

employees under contract from the Airport Aviation Service, Inc., a ground handling organization. If any problems develop such as bin discrepancies, excess baggage, incorrect manifesting, or other problems, the loaders are instructed to contact the person who prepared the manifest to resolve the problem.

Subsequently, either before departure or shortly after departure, a departure message is sent to the destination station.

1.17.4 Load Control Responsibilities and Training

According to testimony at the Safety Board's public hearing into the accident, PRINAIR's Operations Manual, and PRINAIR's Training and Coordination Manual, the crew of an aircraft is responsible for verifying that the computed moment figure is acceptable for the weight of the aircraft, and the load control department is responsible for the correct preparation of the manifest. The load control department's responsibility includes the accuracy of the passengers' weights, the accuracy of the baggage and cargo weight, the proper seat assignment of the passengers, and the proper placement of the baggage and cargo.

Review of the preaccident flight schedules with attention focused on times between scheduled arrivals and departures and testimony at the hearing revealed that a crew does not have sufficient time to monitor the loading of the aircraft even if it makes special efforts to do so. In addition, some stops require a crew to go through customs while the aircraft is being loaded.

Investigation and hearing testimony indicated that most of the training given to load control personnel was "on the job" and that no training was given to the loaders. Many load control personnel did not know the critical safety aspects of proper loading.

1.17.5 History of PRINAIR's Weight and Balance Discrepancies

As the result of hearing testimony and review of PRINAIR's and FAA's records and correspondence, the Safety Board found that PRINAIR had a history of improperly loaded aircraft and corresponding incorrect weight and balance forms. Both the management of PRINAIR and officials of the FAA were aware of the numerous loading problems and in some cases took remedial action; however, the problem persisted.

For a period from 1974 until after the accident, weight and balance forms were reviewed and over 300 of these forms contained incorrect information. Typical errors included (1) listing of fewer pieces of cargo or baggage than were actually aboard an aircraft, (2) incorrect weights, and (3) the loading of baggage and cargo in locations other than those shown on the weight and balance form. For example, even after the accident, a passenger was listed as weighing 30 lbs when he actually weighed 150 lbs.

On at least two previous occasions, misloading due to improper weight and balance procedures by load control personnel led to situations wherein action was necessary by the flightcrews to avoid accidents:

- (1.) The captain of PRINAIR Flight 720 from Beef Island, Tortolla, on August 5, 1977, stated that he had as passengers a number of 12- to 14-year-olds who were interested in the airplane, the cockpit, and flying. They had expressed an interest in coming forward and observing the takeoff through the cockpit door. They were seated in passenger seats during takeoff.

The copilot was making the takeoff, during which the airplane entered a high pitched, nose-high attitude and the airspeed decelerated below 90 kns during climbout. The captain could not understand the problems the first officer was having and pushed the stick forward. He observed that the trim was full forward but the airplane still was climbing at a steep attitude.

He immediately yelled for the youngsters to "come forward." Several youngsters rushed forward from their seats after which the airplane's nose dropped but the airplane continued to "fishtail."

Power was first reduced, then full power was added. The airplane was observed to disappear behind a hill by the tower operators, who immediately called the Coast Guard, because they assumed that the aircraft had gone down in the sea.

The captain was able to maneuver the airplane into a 180° turn and land down wind from the takeoff direction. He was able to stop the airplane on the end of the runway and immediately, the tail fell to the runway.

Upon examination, the rear baggage bin "B" was found to be overloaded with numerous scuba-diving tanks, exceeding the rear baggage load limit. Scuba tanks rolled out of the rear baggage compartment when the compartment door was opened.

2. Another PRINAIR captain related an incident that occurred on February 10, 1978, during a departure from runway 7 at San Juan International Airport. During the takeoff, the copilot was flying and he utilized full forward trim and full wheel forward in an attempt to keep the nose down after takeoff. The captain took over the controls, pushed the column forward and, at 150 ft, power was reduced. The nose-high condition worsened and the captain applied full power, lowered the gear, and put down full flaps. He hit the runway just as the gear locked down.

He determined that the recorded weights of the passengers on seats 10-A and 10-B were too low and the weight of the baggage was 933 lbs, more than reflected on the weight and balance manifest.

Review of carrier, FAA, and Airline Pilots Association correspondence, some of which dated back to 1975, indicated the concern of the PRINAIR pilots and

some of PRINAIR's load control personnel regarding the misloading of aircraft. A letter dated March 21, 1978, from the Airline Pilots Association's Central Air Safety Chairman for PRINAIR to the Director of Stations for PRINAIR stated, in part:

"On March 18, 1978, Flight 412 was delayed over 30 minutes because of a weight and balance discrepancy that is very far from being considered a candid individual mistake. It clearly denotes an unwritten policy which we are as sure was not engendered by a load control agent as we are sure it would not be condoned by you.

"There are several question marks on PQ412 incident, among them are the following:

"Why on PQ412 of March 18, 1978, with the exception of one passenger there was not an obvious discrepancy on the weights of the passengers and their manifested weights?

"Why an average of 10 lbs. was subtracted from each passenger weight on the weight and balance manifest?

"Why the weights indicated on the individual boarding passes . . . was the actual weight of the passengers, but an average of 10 lbs. less was entered on the weight and balance manifest?

"Why the load control agent that prepared the complete weight and balance manifest for PQ412 did not put his initials on it?

"Why the date on the weight and balance manifest for PQ412 says March 18, 1974, instead of March 18, 1978?

"In a related subject, with the exception of St. Thomas and St. Croix most of the stations very seldom ask passengers for the weight of hand-carry articles thus said weights are not being included on the weight and balance computations. Also passengers are still allowed thru gates by our gate agents with more than one article or bigger than that of acceptable dimensions thus causing unnecessary delays at the ramp when crews enforce Company and FAA Rules. In Ponce there are no gate agents at all, this further complicates things when relatives of emplaning passengers wander around the aircraft on the ramp."

A copy of the letter was sent to the Principal Operations Inspector of the FAA's San Juan Flight Standards District Office (FSDO).

In a letter to PRINAIR's President dated August 2, 1979, a former manager of PRINAIR's St. Croix station stated, in part:

"During the time that I was Station Manager of your company in St. Croix, Flight 610 was always a source of concern and worry to me.

"Numberless were the times when I fought the hierarchy because of the irresponsible manner the aircraft was being loaded in San Juan. For years I insisted that the flight be limited to 17 passengers because of

the baggage and rear weight problems particular to this flight. Many a time I off-loaded 610 in St. Croix before it left on its way down island. I did this because I was conscious of the fact that the airplane was overweight and out of balance. I also deplaned passengers for the same reason.

"I persistently informed your Director of Stations of this problem. I begged the Chief Pilot Office to take note of it. I talked to the training managers, and I also brought it up repeatedly at the Station Manager's meetings."

According to evidence obtained during the Safety Board's hearing, many of the PRINAIR pilots were not made aware of some or all of the requirements called for in an agreement between FAA and PRINAIR, such as the requirement for one of them to be present during loading. In addition, the duration of en route stops was not increased to facilitate the requirement that they be present.

1.17.6 FAA Surveillance and Actions

The FAA Flight Standards District Office in San Juan, Puerto Rico, is responsible for the surveillance of PRINAIR. Its authority to conduct such surveillance is 14 CFR 135.49, and its guidelines are contained in Chapter 6 of the Commuter and V/STOL Air Carrier Handbook Order 8430.1A, dated November 3, 1970, and the Flight Standards Program Guidelines Order 1800.12D, dated September 21, 1977.

Order 1800.12D was issued to provide general guidance to Flight Standards field units for the development and execution of their annual work programs. Section 13.G.(1) under Airworthiness directs that the FSDO should "monitor air taxi inspection programs to ensure the programs are adequate and the operators have sufficient procedures to have defects reported and repaired between inspections." Section C under Operations directs that the FSDO should monitor air taxi inspection and surveillance programs to ensure that Air Taxi/Commercial Operation can safely conduct operations for which they are authorized under applicable regulations.

Paragraph 113a of FAA Order 8430.1A, revised October 12, 1973, states, "The certificate holding district office has the responsibility for planning and programming the surveillance and inspection of an operator regardless of the area of operation."

At the time of the accident the San Juan FSDO had seven Principal Inspectors assigned, of which two were Operations Inspectors and two were Maintenance Inspectors. There are 44 commuter and air taxi operators, 3 agricultural operators and 5 school's to surveil, as well as other assigned tasks, including surveillance of 14 CFR 91 operators, making en route inspections, and initiating violations proceedings.

During the period from July 29, 1979, through August 8, 1979, a FAA Southern Region inspection team conducted a special evaluation of air taxi operators in the Caribbean area. The main conclusion drawn from the inspection

was "that all of the operators inspected in the Caribbean area appear to be deficient in several areas, but particularly in weight and balance." The team also concluded that only frequent and constant surveillance of each operator would reduce the number of deficiencies.

Some of the team's comments regarding PRINAIR as they related to load control are as follows:

- "1. Some air taxi operators including PRINAIR use passenger declared weight as actual weight as allowed by their Operations Specifications. The survey, by actual scale weighing of the passengers on approximately 20 flights showed the average passenger weight to be 166.7 pounds. The same flight's manifest showed the average weight to be 153.8 pounds, an approximate 13 pounds per passenger error.
- "2. The PRINAIR station manager in Mayaguez, Puerto Rico, did not know that he could, and should, in fact, have an apparently overweight person step on the scales. This procedure is in the company's manual under Weight and Balance, Chapter III, Section 350, Page 13.
- "3. During the first three days of the surveillance, most PRINAIR flights were found, when passengers and baggage were actually weighed, to be 200 to 400 pounds over manifest weight with four being over gross, the highest by 54 pounds. This problem steadily decreased as the inspections continued. At the same time the amount of baggage started to stack up at most stations and so did passenger complaints about their baggage.
- "4. The baggage averaging for PRINAIR has a built in discrepancy. They average a bag at 30 lbs., but have to scale weigh it and mark it only if it is over 50 pounds. There could be an overage of 20 pounds per bag and there are no instructions on how to determine when a bag is over 50 pounds.
- "5. On departing PRINAIR flights it was found that passengers were not sitting in their assigned seats. For example, in some cases the company would give a single ticket jacket to the father of a family of four telling him his family had seats 8 A&B and 9 A&B. The father would then seat his family but the weight distribution would not necessarily be in conformity with the manifest. The manifest calls for specific weights to be in specific seats. On all flights checked, the Captain had to move at least two people to their proper seats.

No enforcement actions were taken against PRINAIR at the time of the evaluation; however, some of the other operators were cited.

FAA was aware of PRINAIR's numerous weight and balance discrepancies, and the FAA principal inspector for PRINAIR stated that he was made aware of the Beef Island incident about 30 minutes after the PRINAIR chief

pilot returned from his trip to Tortolla. On September 26, 1979, the FAA and PRINAIR signed a letter of agreement for the purpose of amending PRINAIR's load control procedures. The agreement called for immediate and positive control of weight and balance by load-control department personnel and for a crewmember to be present while the aircraft was being loaded. Its long-range objectives called for load control to be placed under the Flight Operations Department and for increased training of load-control personnel. (See appendix F.)

After the accident, PRINAIR and the FAA took immediate action regarding the correct loading of PRINAIR aircraft. More than 15 different procedural changes were implemented by PRINAIR. Nevertheless, a spot check by FAA of a number of PRINAIR's operating stations while the Safety Board's hearing was in progress, determined that PRINAIR had "failed or refused to abide by the terms of the agreement." As a result of the spot check and other discrepancies showing noncompliance with applicable Federal regulations, the FAA suspended PRINAIR's air taxi operator certificate on October 25, 1979, by issuing an Emergency Order of Suspension.

On October 28, 1979, another agreement between the FAA and PRINAIR was signed. It stipulated a number of actions to be taken by PRINAIR to improve its operation. It also called for the withdrawal of the Emergency Order of Suspension of PRINAIR's Commercial Operator Certificate when PRINAIR showed evidence of successfully completing the terms and requirements of the agreement.

PRINAIR was aware of the terms of the agreement before it was signed and began an intensive effort to comply with all of its requirements. The FAA assisted PRINAIR in its efforts and on October 29, 1979, the suspension order was withdrawn although some areas as stipulated in the agreement were to be completed at a later date. (See appendix G.)

No monetary civil penalty was assessed against the company, since the FAA estimated that the company lost about \$213,000 in revenue during the 3 days that its certificate was withdrawn.

1.18 New Investigation Techniques

None

2. ANALYSIS

The pilots were certificated properly and were qualified for the flight. There was no evidence of any medical problems which may have affected their performance.

The aircraft was certificated and maintained according to applicable regulations. There was no evidence of preimpact failures, malfunctions, or abnormalities of the airframe, the control systems or surfaces, or the powerplants. The evidence is conclusive that the aircraft was loaded 1,060 lbs over its allowable weight and was about 8 ins aft of its allowable aft c.g. limit. This c.g. resulted in uncontrollable flight characteristics.

The captain stated that he did not notice a lack of control until he had retracted the landing gear. At that time, the aircraft assumed a nose-high attitude over which he had no control; witness observations substantiate his statements. Gear retraction and the application of full engine power added to the loss of elevator effectiveness. A stall developed because the longitudinal control needed to maintain proper climbing speed was lost. The aircraft stalled at too low an altitude to effect recovery. Elevator effectiveness was lost because of the aircraft's extreme aft c.g. and overgross weight. Therefore, the Safety Board concludes that the aircraft stalled and became uncontrollable because of an overweight and out-of-balance condition.

In view of this conclusion, the Safety Board explored in detail the responsibilities of the flightcrew, the carrier, and the FAA, in assuring safety of operations.

Flightcrew Responsibilities

Review of the evidence obtained during the investigation and hearing indicates that at the time of the accident, PRINAIR did not require crewmembers to supervise the loading of the aircraft and that such supervision was not feasible because of ground time available. During loading operations at San Juan and St. Croix, the flightcrew of Flight 610 was busy with other duties and did not watch the actual loading.

PRINAIR's Operations Manual contains adequate instructions on the importance of accurate weight and balance computations and adequately describes the procedures for proper loading. The manual states that the captain is responsible for the proper loading of the aircraft while the load control department is responsible for the correct preparation of a weight and balance form for each and every flight. The Operations Manual and hearing testimony make it clear that the captain is responsible to determine if the figures reflected by the load manifest place the aircraft within its prescribed weight and balance limitations but that load control personnel are responsible for the actual loading of the aircraft, which includes the correctness of the weights and the proper placement of the cargo and baggage as well as the proper seating of the passengers.

The loading manifest given to the crew by load control at San Juan appeared to be correct and showed that the aircraft was within its weight and balance limits. The crew had no reason to suspect that the correct information had not been conveyed to St. Croix by routine departure message. Unfortunately, the departure message did not list the 560 lbs in bin "B," nor was this information given to the St. Croix load control agent when the agent called San Juan load control for the departure information. Accordingly, flight planning was begun at St. Croix using the incomplete information taken from the departure message and not on the correct information contained in the load manifest and its attached customs declaration. During deposition, the captain testified that he could not recall what information he or his first officer transmitted to St. Croix during the flight's routine inbound contact with St. Croix.

Testimony indicated that it is not unusual for the DH-114 to be light on its nose gear and therefore leave the ground intermittently during taxi. Testimony also indicated that it would be difficult for the crew to detect a nose-wheel skip.

In view of the foregoing, the Safety Board concludes that the crew acted in accordance with existing instructions and could not reasonably have been expected to discover the weight and balance problem before becoming airborne. After becoming airborne, the problem became apparent but there was not sufficient time and altitude to effect recovery.

PRINAIR's Role

Evidence indicates that PRINAIR had been well aware of its load control problems for more than 7 years before the accident. At times, PRINAIR would take positive action to rectify the problems by sending management personnel to the station involved either to give training or to take disciplinary action, or both. Although PRINAIR management sent memoranda to the stations, after a period of satisfactory load control, the problems would recur. Although the carrier's memoranda refer to isolated instances, loading problems were found to have occurred frequently at almost every PRINAIR station.

The St. Croix station had frequent and continuing load control problems, probably because of the many extended daily flights through St. Croix en route to such places as St. Maarten, St. Kitts, and others. These flights require heavy fuel loads and always carry a large number of passengers and baggage.

Flight 610 was a source of concern to a former St. Croix station manager, who stated that during his tenure from 1971 to 1978 there were numerous problems at St. Croix. These problems, he said, stemmed from the manner in which San Juan sent incorrect departure messages and dispatched aircraft to St. Croix which were overweight and which had c.g.'s outside allowable limits. Although this concern was brought to the attention of PRINAIR management, the problem was not satisfactorily resolved.

The misloading problem was repeatedly brought to the attention of both PRINAIR and the FAA by the Airline Pilots Association's Central Air Safety Chairman for PRINAIR. While conducting an extensive safety program, he and the other pilots documented many of the loading discrepancies and informed PRINAIR and the FAA about them. Yet, when faced with such information, the company failed to take the required action to remedy the hazardous situation. In many cases, load manifests were deliberately falsified; there were serious incidents involving misloading. These incidents should have alerted PRINAIR management of the need for drastic corrective action to prevent serious accidents.

In addition, the carrier failed to properly comply with the weight and balance provisions of its agreement of September 26, 1979, with the FAA. PRINAIR management's disregard for critical safety measures even after a fatal accident is difficult to comprehend. In fact, it was not until PRINAIR's operating certificate was suspended that it took intensive measures to comply with safe operating procedures and FAA regulations. Therefore, the Safety Board concludes that the failure of the carrier to take timely and effective action to eliminate recurrent weight and balance errors directly contributed to the cause of this accident.

FAA Surveillance

Testimony and investigative evidence clearly indicate that the FAA was aware of PRINAIR's chronic misloading problems. In conjunction with its own surveillance findings, it was continually being apprised of such problems by pilots and through informal discussions between PRINAIR personnel and inspectors.

In 1975 when some of the most flagrant loading violations were taking place, an FAA inspection team gave PRINAIR favorable grades. The president of PRINAIR wrote an article for the carrier's house organ and stated, "Our excellent rating for the third straight year resulted in a recommendation by the inspection team to have minimum FAA surveillance on PRINAIR by the San Juan FAA office."

Review of some of the FAA's inspection reports indicates that PRINAIR does a satisfactory job in most respects in managing an airline. This was also confirmed by testimony by FAA witnesses during the hearing. However, positive action was not taken by the FAA to require PRINAIR to correct its loading problems. This area of PRINAIR's operation showed lack of management control which seriously compromised safety. It should have been clear to FAA representatives after the Beef Island incident that the misloading was indicative of a need for further investigation into this aspect of PRINAIR's operation. It also should have prompted increased surveillance. A review of the assignments of the FAA inspectors assigned to San Juan's FAA office indicates that their workload was such that it would have been difficult for them to maintain adequate surveillance of all carriers or even to maintain the standard of inspection required by the FAA's own orders and regulations. However, this does not relieve the FAA of any of its responsibilities. Surveillance and enforcement is a primary responsibility of the FAA. In this case, as well as others in the Caribbean, the Safety Board is greatly concerned as to the depth of FAA's surveillance and its attitude toward violations of safety regulations and standards.

PRINAIR is the world's largest commuter airline, yet at the time of the accident, it did not have a full-time FAA operations inspector or a full-time maintenance inspector assigned to it. Air carriers operating under 14 CFR 121 have these full-time FAA inspectors even though many of them do not have such extensive and diverse operations or as many aircraft as PRINAIR. A FAA Special Evaluation of the air taxi operators in the Caribbean area conducted August 23, 1979, by the San Juan FSDO showed that many of the carriers, including PRINAIR, had deficient weight and balance procedures. Increased FAA surveillance of PRINAIR and of other such Part 135 is vital. The fact that a carrier holds a Part 135 certificate does not release the FAA of its responsibility for comprehensive surveillance.

In view of the foregoing, the Safety Board believes FAA surveillance of an area critical to the safety of flight was inadequate.

Survivability

Although Federal Aviation Regulations do not require that medical personnel be stationed at an airport, the regulations do require that they be available readily. FAR 139.55 states that airport operators must demonstrate that their Emergency Plans provide for transportation and medical assistance for the

maximum number of persons that can be carried on board the largest passenger-carrying aircraft served by the airport. The Alexander Hamilton Airport Emergency Plan, approved by the FAA, does in theory provide for this level of assistance. Yet, in the case of this accident, medical assistance arrived about 25 minutes after the accident. By that time, the last surviving passenger had already been transported to a hospital. The reason for the delayed response appears to be the fact that outside medical assistance was first requested via the local civil defense radio, because the only means of communication that could be used by the airport was the telephone. The Safety Board believes that a better communication system from the airport to support agencies would have resulted in a more prompt response.

Although inadequate coordination on the part of the crash/fire/rescue crew did not contribute to the severity of the injuries, the delayed response should have been avoided. Since the fire chief was not on duty, the acting chief assumed responsibility and he may not have been adequately prepared to assume that responsibility. Further, the crew was not trained to handle the confusion associated with the volunteer efforts of numerous personnel from other airlines. The Safety Board believes that the lack of assertive leadership by the crash/fire/rescue crew further added to the confusion.

The accident was partially survivable. Based on the probable impact parameters and the observed damage to the fuselage structure and the interior of the cabin, the forces experienced by the survivors probably did not exceed 10 g's. This estimate was based on the damage to the seats which remained attached to the floor and walls in the aft cabin and on the extent of the injuries received by the survivors.

A consistent injury pattern was observed in the eight fatally injured occupants. These injuries consisted of flailed chests and rupture or laceration of internal organs (aorta, heart, and liver). Such injuries are consistent with crushing of the body by aircraft structure. Seven of the eight fatalities were seated in the forward part of the aircraft -- in the cockpit and in the first four rows of seats. Five of these persons were located on the right side, which is the side of the aircraft that first contacted the ground.

All but one fatality was associated with seat failures, however, these failures did not contribute to the injuries. The seat failures resulted from the destruction of their attachment points. The cause of death of the one exception, the occupant of seat 6A, cannot be explained. Although his seat did not fail, he received internal injuries almost identical to those received by the other fatality injured persons. A reasonable explanation may be that this passenger did not have his seatbelt fastened and was thrown forward.

Of the 8 fabric to metal type seatbelts and 11 metal to metal type belts, only one seatbelt -- on seat 10A -- had failed. The point of failure was at the connection to the aft bulkhead. The occupant of this seat received only minor injuries.

The captain survived because his seat remained attached to the cockpit bulkhead. He also may have been protected from more severe injury by the cushioning effect of the first officer's body next to his. The Safety Board believes

that a shoulder harness would have lessened the extensive injuries received by the captain. However, this same restraint would not have saved the first officer's life. Nevertheless, the Safety Board is concerned that exemptions are delaying the universal installation of shoulder harnesses for pilots. (Safety Recommendation A-79-70). Specifically the Safety Board recommended, "Strictly enforce the compliance date for the installation of shoulder harnesses as required by 14 CFR 135.171 (Class II, Priority Action)." FAA responded that exemptions were necessary because of supply and installation problems encountered by Part 135 operators.

Increased restraint in the form of some upper torso harness also may have been beneficial to those passengers who were seated on the left side of the cabin. Such restraint would have restricted the flailing motion of the upper body, and thereby prevented impact with obstacles in the immediate environment, such as seatbacks and other passengers. However, the passengers on the right side of the fuselage probably would not have benefited from upper torso restraint because of the lateral forces experienced and their proximity to the right cabin wall.

3. CONCLUSIONS

3.1 Findings

1. The flightcrew was properly certificated and qualified.
2. The aircraft was properly certificated and maintained according to approved procedures.
3. There were no airframe, control systems or surfaces or power-plant malfunctions prior to impact.
4. The aircraft was 1,060 lbs overweight and its c.g. was about 8 ins. aft of its allowable limit when it crashed.
5. Upon becoming airborne, the aircraft became uncontrollable, stalled, and crashed because it was misloaded.
6. PRINAIR load control at San Juan failed to relay the correct departure loading information to St. Croix load control.
7. St. Croix load control improperly loaded the aircraft due in part at least to incorrect information supplied by San Juan as a basis.
8. The crew was not aware of the misloading and the flight schedule did not permit them time to check the conformance of the loading to the weight and balance manifest.
9. The captain is responsible for insuring that the load control computations reflected on the loading manifest place the aircraft weight and balance within allowable limits.
10. The carrier's load control department personnel are responsible for loading the aircraft and preparing the loading manifest correctly.

11. The carrier's load control personnel misloaded the aircraft.
12. The carrier's management was aware of its history of load control discrepancies and failed to implement adequate procedures to rectify chronic misloading.
13. The carrier's action after the accident did not prevent continued load control discrepancies.
14. The carrier had its operating certificate suspended after failing to comply with some of the provisions of a postaccident letter of agreement with the FAA.
15. The carrier was reissued its operating certificate when it began to comply with the conditions imposed by the FAA to reinstitute the certificate.
16. The FAA was aware of the history of deficient load control of PRINAIR operations but it did not take sufficient actions to remedy the situation before the accident.
17. FAA surveillance and enforcement actions involving PRINAIR were not effective before the accident.
18. The FAA did not increase its surveillance when serious incidents occurred which were caused by load control deficiencies.
19. The aircraft crashed adjacent to the airport's firehouse.
20. The first persons to arrive at the crash scene were employees of companies located at the airport.
21. Port Authority firemen arrived at the accident scene shortly after the first persons arrived and began rescue operations immediately.
22. Confusion existed at the scene because the firemen failed to take positive control.
23. The injuries to the captain would have been lessened if a shoulder harness had been installed at his position and he had used it.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the pilot's loss of control of the aircraft after takeoff because of the aircraft's grossly overweight and out-of-balance condition which resulted from misloading by the company's load control personnel. The misloading was due to the failure of the company to supervise and to enforce its loading procedures. The Safety Board also determines that inadequate surveillance and enforcement by the FAA were causal factors in this accident.

4. SAFETY RECOMMENDATIONS

Conduct extensive and frequent training for crash/fire/rescue personnel to insure that each individual understands his duties and responsibilities and insure that training stresses the need for positive leadership which is critical to efficient crash/fire/rescue response. (Class II, Priority Action) (A-80-16)

Expand the provisions of the emergency plans of its airports to provide for the orderly incorporation of the services of line personnel of tenant organizations, and train such personnel. (Class II, Priority Action) (A-80-17)

Establish an emergency communications system that will provide immediate and discrete contact with those agencies to be notified during emergency situations. (Class II, Priority Action) (A-80-18)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES. B. KING
Chairman

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ G.H. PATRICK BURSLEY
Member

PATRICIA A. GOLDMAN, Member, did not participate.

March 28, 1980

APPENDIX A
INVESTIGATION AND HEARING

1. **Investigation**

The National Transportation Safety Board was notified of the accident about 1000 e.d.t., on July 24, 1979, and immediately dispatched an investigative team to the scene. Investigative groups were established for operations/air traffic control/weather/witnesses, aircraft structures, aircraft systems, powerplants, human factors, and maintenance records. A performance study was conducted at a later date by the Safety Board.

Parties to the investigation were the Federal Aviation Administration, Puerto Rico International Airlines, Inc., Airline Pilot's Association, Teledyne Continental Motors and Hartzell Propeller, Inc.

2. **Public Hearing**

A 3 1/2 day public hearing was held in San Juan, Puerto Rico, beginning October 23, 1979. Parties represented at the hearing were the Federal Aviation Administration, Puerto Rico International Airlines, Inc., the Airline Pilot's Association, and the Virgin Islands Port Authority.

APPENDIX B
PERSONNEL INFORMATION

Captain Jose Eugenio Rivera, 46, was employed by Puerto Rico International Airlines, Inc. (PRINAIR) on January 8, 1968. He held Airline Transport Pilot Certificate No. 1530884 with an aircraft multiengine land rating and commercial privileges in aircraft single-engine land. He was type rated in the DH-114. His first-class medical certificate was issued April 10, 1979, with the limitation to "have available glasses for near vision while flying." He had more than 10 hours rest before reporting for duty on the day of the accident.

Captain Rivera had a total of 15,710 flight hours, 11,454 hours of which were in DH-114 aircraft. During the last 90 days, he had flown 236:24 hours, all of which were in the DH-114. During the last 24 hours, he had flown 3:23 hours. At the time of the accident, the captain had been on duty about 2:22 hours, 53 minutes of which were flight time. His last proficiency/line check was on July 3, 1979.

First Officer William G. Pineiro, 32, was employed by PRINAIR on June 1, 1977. He held Commercial Pilot Certificate No. 581821715 with commercial, airplane, and single and multiengine land, and instrument privileges. His first-class medical certificate was issued February 22, 1979, with no limitations. He had more than 10 hours of rest before reporting for duty on the day of the accident.

First Officer Pineiro had a total of 5,292 flight-hours 3,150 of which were in the DH-114. During the last 90 days, he had flown 361:34 hours, all of which were in the DH-114. During the last 24 hours, he had flown 53 minutes. At the time of the accident, he had been on duty about 2:22 hours, 53 minutes of which were flight time. His last proficiency/line check was on July 3, 1979.

**APPENDIX C
AIRCRAFT INFORMATION**

1. History of Heron DH-114

The Heron was manufactured by deHavilland Aircraft Co., England and certificated under Civil Air Regulation 10 on June 24, 1957. The certification basis was the British Civil Airworthiness Requirements of 1948 and with the "special requirements notified by the United States Government to the Government of the United Kingdom and conforms to TC-816. The original aircraft was powered by four 250 h.p. (takeoff rating) deHavilland Gipsy Queen engines fitted with two bladed feathering propellers of 84-in. diameter.

PRINAIR operated the Heron under 14 CFR 135 as a series 2X designation with a gross weight limit of 12,499 lbs. Its aircraft had incorporated the necessary modifications to operate as series 2A, 2DA aircraft at 13,500 lbs with the rear c.g. limit unchanged. PRINAIR plans to start operating at 13,500 lbs during the latter part of 1979.

Supplemental type certificate SA 1685WE, allowing installation of four Continental IO-520-E engines on DH-114 Heron Series 2A, 2DA, 2X aircraft was issued by the FAA's Engineering Division, Western Region to PRINAIR on June 28, 1968. The principal differences between these engines and the original deHavilland Gipsy Queen engines is the added horse power, lighter weight and higher r.p.m. limit. The three-blade propellers on the newer engines are 7.38 ins. smaller in diameter than the original two-blade propellers.

N575PR, S/N 14125, was owned and operated by PRINAIR. It was originally under Danish registry as "OY-AFN." On September 25, 1968, it was purchased by PRINAIR and was issued a Standard Airworthiness Certificate on November 18, 1968. As of July 24, 1979, it had been flown 23,045:55. The last annual inspection was accomplished on July 18, 1979.

The first available aircraft logbook started on January 12, 1971. On February 10, 1971, with a total time of 5152:53 hours, the aircraft underwent extensive modifications at Caribbean Aircraft Development, Inc., in Opa Locka, Florida.

Some of the modifications were.

- (1) In accordance with STC SA 1685WE-
 - (a) Installation of four Continental IO-520E engines
 - (b) Installation of four Hartzell EHC-A3VF-2B propellers.
- (2) Installation of additional cabin windows and emergency exits per SA 1729WE.
- (3) Installation of an aft cabin bulkhead in accordance with ATS drawing No. 1021A.
- (4) Installation of seat in accordance with ATS drawing No. 1024.

The records reviewed documented maintenance and modifications accomplished on the aircraft, engines, and components. The aircraft maintenance and flight logs were checked and found satisfactory. The maintenance checks and inspections were shown to have been completed within their specified time limits. The records disclosed no discrepancies that could contribute to any failure or malfunction of the aircraft, powerplants, or components. The maintenance records indicated the aircraft was continuously maintained in accordance with FAA rules and regulations.

The applicable Airworthiness Directives reviewed were found to be complied with. Service Difficulty Reports and Mechanical Interruption Summary Reports for a 1-year period were reviewed and found satisfactory.

From January 23, 1979, until May 11, 1979, there were numerous logbook entries regarding buffeting of the aircraft as it passed through about 90 kns. Numerous test flights were performed and rigging checked and, in some cases, the aircraft was rerigged. Pilot complaints regarding buffeting ceased after May 11, 1979, after rerigging of the right flap and repair of the right inboard leading edge of the wing.

Statistical data on the engines and propeller follow:

ENGINES

<u>Position</u>	<u>Serial No.</u>	<u>New</u>	<u>Installation</u>	<u>Time Since Last Inspection</u>
1	556349	2,988:55	1529:55	79:45
2	556350	2,993:25	1529:55	37:00
3	164272	9,879:10	656:10	79:45
4	164149	10,478:00	656:10	37:00

PROPELLERS

<u>Position</u>	<u>Serial No.</u>	<u>Overhaul</u>	<u>Installation</u>	<u>Time Since Last Inspection</u>
1	CC-208	702	702	79:45
2	CC-150	1802:50	656:10	37:00
3	CC-113	771:40	656:10	79:45
4	CC-224	1757:05	656:10	37:00

APPENDIX D

PUERTO RICO INTERNATIONAL AIRLINES INC.	CHAPTER	III
	SECTION	3.30
	PAGE	13
	ISSUED	July 1979
OPERATIONS MANUAL	SUPERSEDES	Rev 125

GENERAL POLICIES

FLIGHT PREPARATION - OPERATIONS

.50 WEIGHT AND BALANCE PROCEDURE

The importance of proper loading of an aircraft should be realized by pilots and ground personnel. An airplane can be loaded within the maximum weight limitation yet be unairworthy because of improper placement of the load that may cause it to be out of balance.

Good loading gives good aerodynamic qualities which in turn means efficient operation.

1. The Captain is responsible for the proper loading of the aircraft.
2. The Weight and Balance Form shall be completed and signed by the Captain or his Agent before each passenger carrying flight. This form is to be on file for a period of at least 30 days.
3. Each passenger over the age of two (2) years must occupy a seat with a belt.
4. Load Control Department is responsible for the correct preparation of a weight and balance Form for each and every flight.

San Juan, St. Thomas, Mayaguez and St. Croix:

Counter personnel is responsible for asking passenger correct weight, if any doubt exist passenger is asked to step on scale. Correct weight is then called in the Load Control Department for seat assignment. In cases where passengers has hand carried articles or an infant, this weight is included with passenger's weight. A color coded destination tag with the flight number is placed on each piece of checked baggage. The bags are then transferred to the baggage make up area.

Baggage make up area is responsible for the sorting and loading of local and interline baggage. Baggage is sorted according to Flight Number, destination and marked either Bin "A" or "B". Baggage loaded in bin "A" will be of group 2 using an average weight of 15 pounds. Baggage loaded in bin "B" will use an average weight of 30 pounds. This includes baggage of groups 1 and 2.

Actual weight will be used for U.S. Mail, Cargo, and baggage not listed in groups 1 and 2. In addition, baggage suspected to weigh more than 50 pounds, shall be weighed. Actual weight will be used in cases were baggage exceed the fifty pounds limitations. When actual weights are used the bag tag will reflect each piece weight.

PUERTO RICO INTERNATIONAL AIRLINES INC. OPERATIONS MANUAL	CHAPTER	XXI
	SECTION	3.50
	PAGE	13 A
	ISSUED	July 1979
	SUPersedes	

50

WEIGHT AND BALANCE (Cont'd)

Baggage make up area will advise Load Control of number of bags loaded in each bin for every flights using the average weight method plus the actual weight and number of pieces of U. S. Mail, Cargo and Baggage not listed in groups 1 and 2. A record is kept of baggage loaded on aircraft thus providing Load Control with exact number of pieces and destination.

Once Counter Agent calls Load Control giving the weight of passenger, a seat is assigned. The weight of passenger and moment is entered in Weight and Balance Form. Load Control Agent calls baggage make up area for exact number of pieces and distribution of bags. All columns are added and totaled. Center of gravity limits for the gross weight are obtained from Weight and Moments Chart and entered in Weight and Balance Form.

When operating an empty aircraft, 300 lbs. of ballast must be loaded in Bin "E" (-- baggage compartment). Load Control or Agent must notify Operations for proper loading.

Corrections made on Weight and Balance Form:

Last minute corrections to the Weight and Balance Form may be necessary. These corrections may be made at departure gate by Agent on duty. Weight and Balance form is now ready for Captain's or designated Agent's signature.

Preparation of Weight and Balance Form at Departure Gate:

During hours when Load Control Department is closed, departure Gate Agent is responsible for preparation of Weight and Balance Form. Counter Agent at this time works in coordination with departure Gate Agent for assignment. Agent observes the same procedures followed by Stations that do not have a separate Load Control Department, with the exception of baggage distribution. For this information baggage make up area is called.

Preparations of Weight and Balance Form- All other Stations

Stations not having a separate Load Control Department, prepare Weight and Balance Form following the procedures stated below:

Ask passengers his weight, if any doubt exist as of weight, ask passenger to step on scale. In cases where passenger has hand carried articles or an infant, this weight is included with passenger weight. Assign passenger a seat, according to his weight, enter weight in Weight and Balance Form and its Moment.

PUERTO RICO INTERNATIONAL AIRLINES INC.	CHAPTER	III
	SECTION	3.50
	PAGE	13 B
	ISSUED	July 19179
	SUPERSEDES	Rec 127
OPERATIONS MANUAL		

.50 WEIGHT AND BALANCE (CONT'D)

A color coded destination tag with the flight number is placed on each piece of checked baggage. Bin where baggage is to be loaded is written on tag. Ramp Agent is responsible for following instructions on tag and loading baggage and mail aboard the aircraft according to these instructions.

If any changes in the distribution of baggage are to be made, Ramp Personnel is notified immediately. Weight and Balance Form is now totaled, following procedures and signed by Captain or Designated Agent.

Baggage loaded in bin "A" will be of group 2, using an average weight of 15 pounds. Baggage loaded in bin "B" will use an average weight of 30 pounds. This includes baggage of groups 1 and 2.

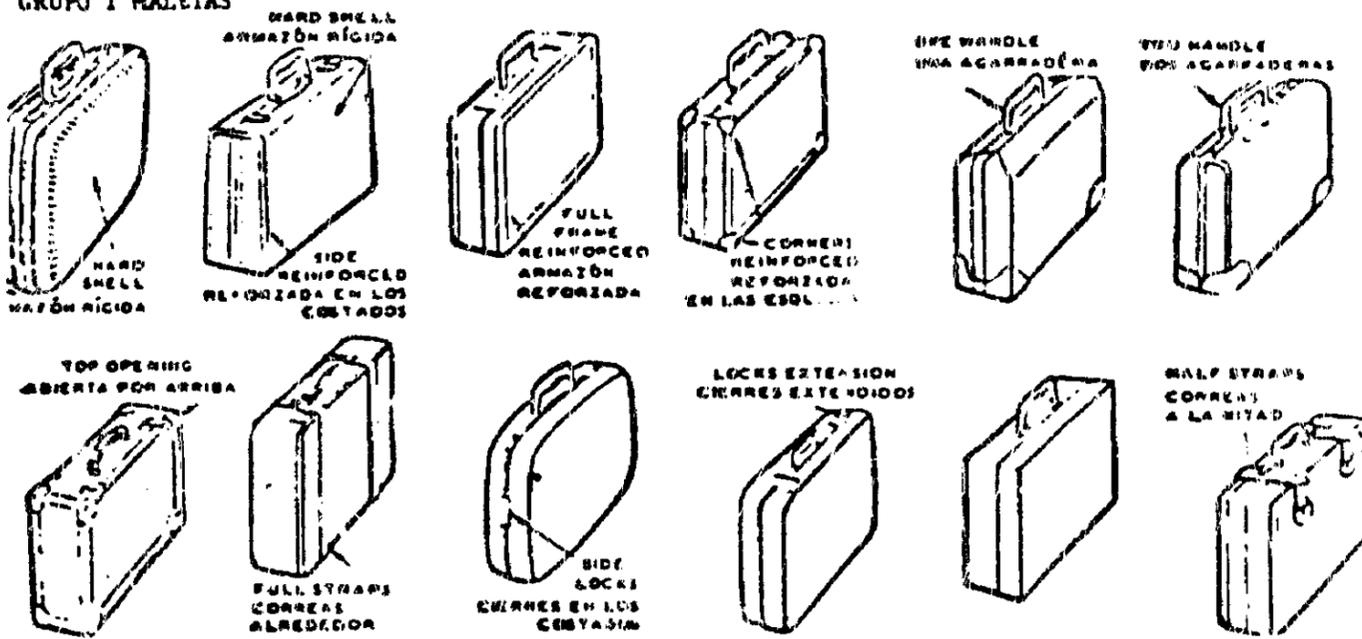
Actual weight will be used for U.S. Mail, Cargo and baggage not listed in groups 1 and 2. In addition baggage suspected to weight more than 50 pounds shall be weighed. Actual weight will be used in cases where baggage exceeds the 50 pound limitation. When actual weights are used the bag tag will reflect each piece weight.

5. One copy of the Weight and Balance manifest shall be carried on the flight and one copy shall be filed at the Administrative office of PRINAIR. If passengers and baggage are picked up en route, the manifest will be modified to reflect the Weight and Balance CG. changes. A copy of the modified manifest is sent to the home office via a following flight.
6. The printed copy of the Weight and Balance used by PRINAIR will be used for this purpose. A copy of this form is included. (See Chapter IV, Section 4.31, page 9- Passenger Manifest)
7. If cargo Bin "B" is loaded to capacity, placard indicating that rear divan will not be used during this flight will be visible to the occupants. This will be done by the Captain or his Agent utilizing the placard provided in the rear bulkhead.

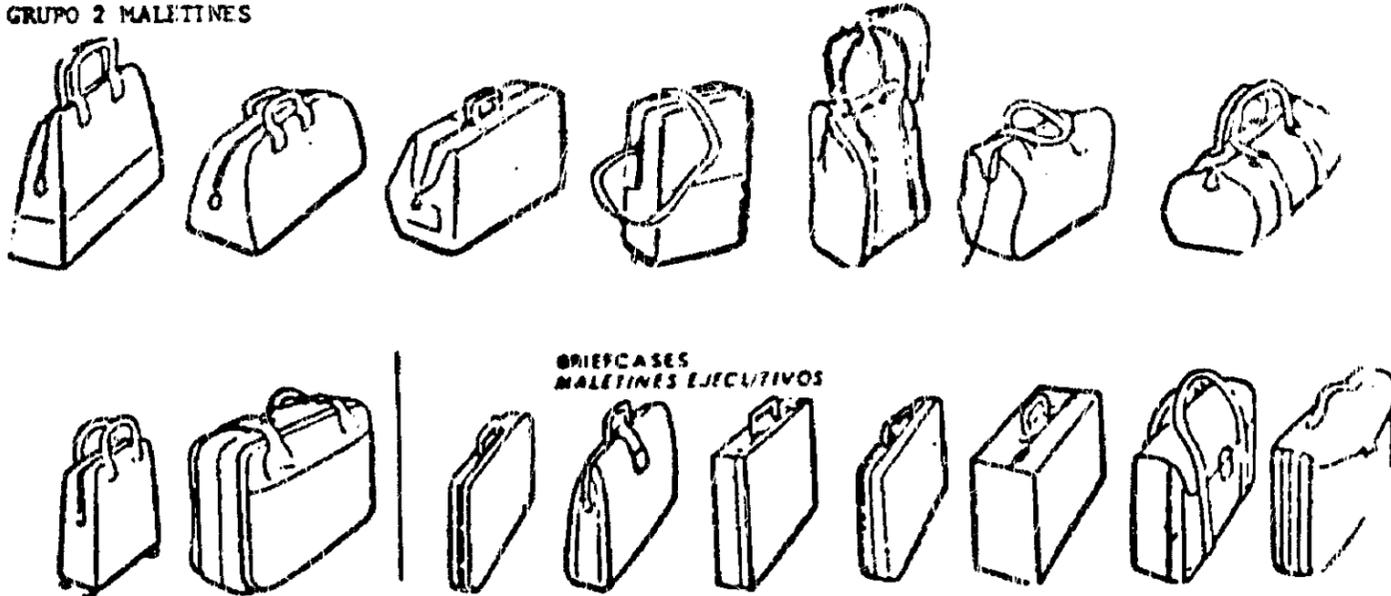
PUERTO RICO INTERNATIONAL AIRLINES INC. OPERATIONS MANUAL	CHAPTER III
	SECTION 3.50
	PAGE 13 C
	ISSUED July 1979 SUPERSEDES

The baggage identification charts depicted below will identify groups 1 and 2 of baggage described in this Section.

GROUP 1 SUITCASES
GRUPO 1 MALETAS



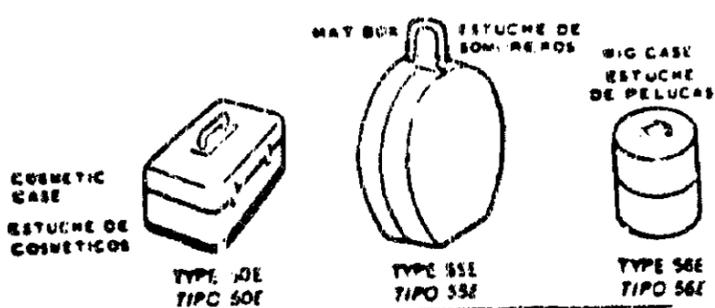
GROUP 2 SATCHELS
GRUPO 2 MALETINES



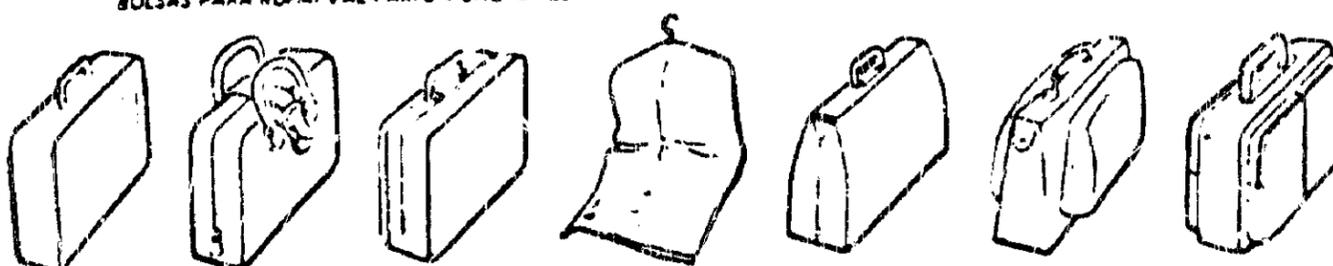
PUERTO RICO INTERNATIONAL AIRLINES INC. OPERATIONS MANUAL	CHAPTER	1.1
	SECTION	3.50
	PAGE	13 D
	ISSUED	July 1975
SUPERSEDES		

Baggage identification charts (Cont'd)

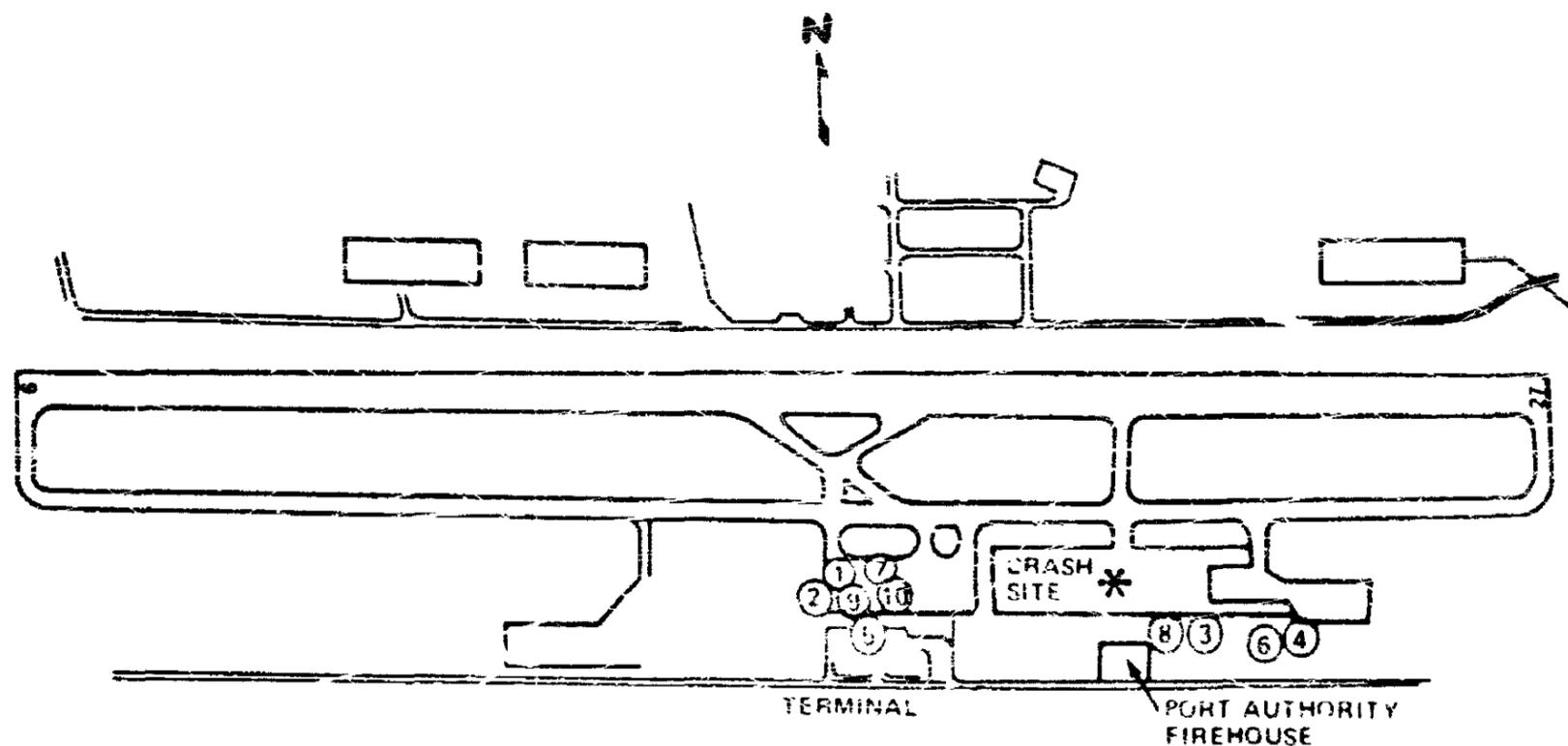
GROUP 2
GRUPO 2



GARMENT BAG / VAL-PAK / B-4 BAG / UNDERSEAT BAG
BOLSAS PARA ROPA / VAL-PAK / B-4 BAG / MALETA PARA DEBAJO DEL ASIENTO



REV: 179



WITNESS LIST:

1. Roberto Cruz
2. Ralph J. Blanchard
3. William T. Kelly
4. Frank Redfield
5. James Johnstor
6. Isaac Espinosa
7. Juan Villanueva, Jr.
8. Moran U. Richards
9. Juan M. Vega
10. Stanley A. Farrelly

**NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.**

CRASH SITE/WITNESS LOCATION CHART

**PRINAIR FLIGHT NO. 610
ALEXANDER HAMILTON AIRPORT
ST. CROIX U.S. VIRGIN ISLANDS**

APPENDIX F
FAA'S EMERGENCY ORDER OF SUSPENSION
TO PRINAIR



September 26, 1979

Mr. Leonard Davis
Chief
Federal Aviation Agency
Flight Standards Division
Room 203A
International Airport
Isla Verde, Puerto Rico 00913



Dear Mr. Davis:

In reference to our meeting of this date, in which a letter of agreement between PRINAIR and the FAA was discussed, we wish to express the following procedures:

An agreement between PRINAIR and the FAA is entered with the understanding that they are above and beyond the requirements of the FAA regulations.

IMMEDIATELY:

1. Systemwide implementation of the San Juan method of control of the loading of the airplanes (48 hrs STT, SYX, PSE, MAZ) (72 hrs. SDQ, BJS, SEM, SKB, PIP, ANU).
2. Supervisor will check manifest against the adding machine tape, verify the accuracy and initial the tape.
3. The Captain or First Officer (when delegated by the Captain) will ensure that the adding machine tape is attached to the manifest and is initialed by a supervisor.
4. A crewmember must be present while the airplane is being loaded.
5. Evidence of weighing scale calibration is to be kept at each station.
6. Signs will be posted at each station notifying passengers they are limited to one piece of carry on luggage.

LONG RANGE:

1. Aircraft loading and preparation of the manifest will be under the control of the Flight Operations Department.

(Cont...)

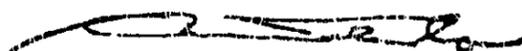
Mr. Leonard Davis
FAA
September 26, 1979
Page 2

2. Company Certificate will be issued to a person upon completion of weight and balance training conducted by the Flight Operations Department.
3. No person may serve as a manifest preparer unless he has been certified as having completed the weight and balance training.

The above listed items cannot be unilaterally withdrawn.

Sincerely yours,

PUERTO RICO INTERNATIONAL AIRLINES INC.



Cesar Toledo
President

CI/lx

I CONCUR



Leonard Davis
Chief, Flight Standards

APPENDIX G

Agreement Between PRINAIR and FAA

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Southern Region
P.O. Box 20636
Atlanta, GA 30320



October 25, 1979

Puerto Rico International Airlines
International Airport
Isla Verde, Puerto Rico 00913

EMERGENCY ORDER OF SUSPENSION

As result of series of investigations, the Administrator finds that safety in air transportation and the public interest require the suspension of Air Taxi Commercial Operator Certificate No. 61-SO-26 held by Puerto Rico International Airlines (hereafter Prinair) by reason of the following:

1. Prinair now holds and at all times pertinent herein has held Air Taxi Commercial Operator Certificate No. 61-SO-26.
2. On the following occasions, Prinair operated DeHavilland Hexon DH-114 passenger carrying flights in air transportation subject to FAR Part 135 on the date indicated when the total weight of the loaded aircraft was not contained on the load manifest contrary to and in violation of FAR Section 135.83(c):

<u>Date</u>	<u>Aircraft</u>	<u>Flight #</u>
July 1, 1979	N561PR	164
July 1, 1979	N572PR	721
July 1, 1979	N583PR	583
July 2, 1979	N720PR	577
July 8, 1979	N561PR	542
July 8, 1979	N562PR	207
July 9, 1979	N573PR	274
July 9, 1979	N577PR	651
July 9, 1979	N561PR	295
July 10, 1979	N561PR	144
July 10, 1979	N561PR	136
July 13, 1979	N586PR	304
July 13, 1979	N578PR	185
July 15, 1979	N580PR	70
July 16, 1979	N561PR	255
July 16, 1979	N581PR	2200

2

July 17, 1979	N505PR	448
July 17, 1979	N580PR	271
July 23, 1979	N576PR	181
July 23, 1979	N573PR	841
July 23, 1979	N561PR	407
August 20, 1979	N561PR	233
August 20, 1979	N561PR	265
August 23, 1979	N570PR	610

3. Airworthiness Directive 77-14-07 requires reinspection of the external clamp and blade of the Hartzell propellers each 32 hours time in service. On the following flights Prinair failed to comply with the above Airworthiness Directive because at the time of each passenger carrying flight in air transportation Prinair had failed to inspect each aircraft involved within the 32 hour interval required by Airworthiness Directive 77-14-07 contrary to and in violation of FAR Section 39.3:

<u>Date</u>	<u>Aircraft #</u>	<u>Flight #</u>
September 19, 1979	N573PR	296
		297
September 11, 1979	N583PR	185
		186
		317
		378
September 15, 1979	N580PR	26
		2291
		246
		247

4. Airworthiness Directive 75-16-22 requires inspection and replacement, if required, of crankshaft counterweight pins and bushings each 1500-hour interval of time in service. On the 119 passenger carrying flights in air transportation listed below, Prinair failed to comply with Airworthiness Directive 75-16-22 in that at the time of each flight Prinair failed to inspect the aircraft involved within the 1500-hour interval contrary to and in violation of FAR Section 39.3:

3

<u>DATE</u>	<u>AIRCRAFT NO.</u>	<u>FLIGHT NO.</u>	<u>FROM</u>	<u>TO</u>	<u>ENGINE POSITION</u>
March 27, 1979	N576PR	946	SDQ	MAZ	4
		354	MAZ	SJU	
		2578	SJU	STT	
		2579	STT	SJU	
March 17, 1979	N551PR	071	ANU	SXM	2
		071	SXM	STX	
		071	STX	SJU	
		3444	SJU	STX	
		3445	STX	SJU	
March 18, 1979	N551PR	720	SJU	EIS	
		720	EIS	SXM	
		720	SXM	PIP	
		721	PIP	SXM	
		721	SXM	EIS	
		721	EIS	STT	
		721	STT	SJU	
		278	SJU	STT	
		279	STT	SJU	
		452	SJU	STX	
		453	STX	SJU	
		185	SJU	PSE	
186	PSE	SJU			
March 19, 1979	N551PR	2200	SJU	STT	
		03	STT	STX	
		04	STX	STT	
March 19, 1979	N551PR	07	STT	STX	2
		4413	STX	SJU	
		424	SJU	STX	
		425	STX	SJU	
		432	SJU	STX	
		433	STX	SJU	
		274	SJU	STT	
		275	STT	SJU	
		288	SJU	STT	
289	STT	SJU			
February 2, 1979	N583PR	22	STX	STT	3
		23	STT	STX	
		26	STX	STT	
		2291	STT	SJU	
		375	SJU	MAZ	
		376	MAZ	SJU	

APPENDIX G

-46-

4

<u>DATE</u>	<u>AIRCRAFT NO.</u>	<u>FLIGHT NO.</u>	<u>FROM</u>	<u>TO</u>	<u>ENGINE POSITION</u>
August 10, 1979	N586PR	840	SKB	STX	2
		840	STX	SJU	
		3448	SJU	STX	
		3449	STX	SJU	
April 29, 1979	N585PR	37	MAZ	SJU	4
April 30, 1979		3943	SJU	SDQ	
3944		SDQ	SJU		
May 30, 1979	N578PR	720	SJU	EIS	3
		720	EPS	SXW	
		720	SXW	PTP	
		721	PTP	SXM	
		721	SXM	EIS	
		721	EIS	STT	
		721	STT	SJU	
		276	SJU	STT	
		277	STT	SJU	
May 15, 1979	N572PR	281	STT	SJU	1
		280	SJU	STT	
		71	STX	SJU	
		71	SXM	STX	
		71	ANU	SXM	
May 16, 1979	N572PR	129	SJU	PSE	2
		130	PSE	SJU	
		232	SJU	STT	
		233	STT	SJU	
		270	SJU	STT	
		271	STT	SJU	
		288	SJU	STT	
		289	STT	SJU	
May 15, 1979	N572PK	281	STT	SJU	1
		280	SJU	STT	
		71	STX	SJU	
		71	SXM	STX	
		71	ANU	SXM	
Jan. 9, 1979	N557PR	3442	SJU	STX	1
		343	STX	SJU	

5

<u>DATE</u>	<u>AIRCRAFT NO.</u>	<u>FLIGHT NO.</u>	<u>FROM</u>	<u>TO</u>	<u>ENGINE POSITION</u>
June 4, 1979	N583PR	2259	STT	SJU	2
		163	SJU	PSE	
		164	PSE	SJU	
		444	SJU	STX	
		445	STX	SJU	
Aug. 20, 1979	N577PR	405	STX	SJU	2
		216	STX	STT	
		317	STT	SJU	
		232	SJU	STT	
		233	STT	SJU	
		327	SJU	MAZ	
		328	MAZ	SJU	
		432	SJU	STX	
		433	STX	SJU	
		179	SJU	PSE	
		180	PSE	SJU	
		448	SJU	STX	
		449	STX	SJU	
June 7, 1979	N564PR	220	SJU	STT	2
		221	SJU	STT	
		236	SJU	STT	
		237	STT	SJU	
		341	SJU	MAZ	
		342	MAZ	SJU	
		270	SJU	STT	
		271	STT	SJU	
June 6, 1979	N564PR	365	SJU	MAZ	4
		366	MAZ	SJU	
June 4, 1979	N578PR	610	STX	SKB	2
		610	SKB	SXM	
		610	SXM	STT	
		610	STT	SJU	
		260	SJU	STT	
		261	STT	SJU	
		270	SJU	STT	
		271	STT	SJU	
		2578	SJU	STT	
		2579	STT	SJU	
		452	SJU	STX	
		453	SJU	SJU	
		185	SJU	PSE	
186	PSE	SJU			

6

5. On the following occasions Prinair failed to maintain records containing the total time in service of the airframe of the following Prinair aircraft contrary to and in violation of FAR Section 91.173(a)(2):

1.	N553PR	Jan. 30, 1978 to Jan. 3, 1979
2.	N578PR	Oct. 24, 1978 to April 24, 1979
3.	N583PR	July 14, 1978 to June 3, 1979
4.	N586PR	Jan. 4, 1979 to June 21, 1979
5.	N564PR	Sept. 14, 1978 to Aug. 5, 1979
6.	N557PR	Feb. 20, 1977 to Dec. 19, 1978
7.	N576PR	April 12, 1977 to May 23, 1979
8.	N577PR	Jan. 14, 1979 to Aug. 15, 1979
9.	N585PR	March 9, 1979 to April 23, 1979
10.	N551PR	Aug. 29, 1978 to March 17, 1979
11.	N575PR	Aug. 13, 1977 to June 28, 1978
12.	N572PR	Oct. 28, 1978 to May 10, 1979
13.	N573PR	July 7, 1978 to July 28, 1979
14.	N561PR	Oct. 17, 1978 to Nov. 13, 1978

6. During the period from July 1, 1979 to August 23, 1979 Prinair operated its DeHavilland Heron DH-114 on the following passenger flights in air transportation when the weight of the aircraft exceeded maximum allowable gross certificated take-off weight contrary to and in violation of Federal Aviation Regulation (hereinafter FAR) Sections 91.121(a) and 135.9:

<u>Date</u>	<u>Aircraft</u>	<u>Flight #</u>
July 1, 1979	N583PR	266
July 1, 1979	N561PR	164
July 1, 1979	N572PR	721
July 2, 1979	N577PR	720
July 8, 1979	N562PR	207
July 9, 1979	N561PR	452
July 9, 1979	N573PR	264
July 10, 1979	N561PR	144

7

<u>Date</u>	<u>Aircraft</u>	<u>Flight #</u>
July 15, 1979	N580PR	70
July 16, 1979	N561PR	253
July 17, 1979	N585PR	448
July 17, 1979	N580PR	271
July 23, 1979	N561PR	233
July 23, 1979	N561PR	407
July 23, 1979	N576PR	181
August 10, 1979	N561PR	265
August 13, 1979	N570PR	610

7. On or about August 5, 1977, Prinair operated a DeHavilland Heron DH-114 aircraft on a flight originating from Beef Island Airport, Tortola, BVI with the intended destination of St. Maarten, N.A. at a time when the aircraft weight exceeded the maximum allowable gross certified take-off weight and the center of gravity was aft of allowable limits.

a. During the course of the climb out the aircraft pitched up to an abnormal attitude.

b. To compensate for the abnormal pitch up, the captain applied full forward elevator in an attempt to correct the pitch without success.

c. Ultimately the captain ordered passengers in the rear of the aircraft to move forward so as to readjust the center of gravity so that a landing could be effected.

d. During the remainder of the flight, including touch down and roll out, the passengers remained standing in the forward portion of the aircraft cabin, without seats or seat belts.

e. The aircraft stopped at the extreme end of the departure end of the runway and the aircraft came to rest on the main landing gear and the tail.

8. On or about February 10, 1978, Prinair operated one of its DeHavilland Heron DH-114 aircraft on a passenger carrying flight originating from San Juan International

8

Airport while the aircraft weight was so distributed that the center of gravity was aft of allowable limits contrary to and in violation of FAR Sections 91.9, 91.31(a) and 135.9.

a. After lift off the aircraft assumed a nose high and abnormal attitude.

b. In order to correct the situation, the captain elected to abort the take off and land straight ahead on the same runway.

9. On July 24, 1979, Prinair operated flight 610 from St. Croix, VI with an intended destination of St. Kitts, BWI while the aircraft exceeded the maximum allowable gross certificated take off weight and the center of gravity was aft of allowable limits, resulting in a loss of control after take off and crash of the aircraft with serious injuries and loss of life of the passengers and crew, contrary to and in violation of FAR Sections 91.9, 91.31(a) and 135.9.

10. As results of the allegations in the preceding paragraphs, Prinair and the Federal Aviation Administration entered into an agreement on September 26, 1979, in which Prinair agreed to do a number of things to improve its operation in the weight and balance area. A copy of that agreement is annexed hereto and made a part hereof.

11. Spot checks and ongoing investigations by the FAA disclosed that Prinair has failed or refused to abide by the terms of the agreement referenced in paragraph 10 by reason of the following circumstances:

a. On October 24, 1979, Prinair aircraft were loaded for flights 296 and 185 when neither crew member was present at the aircraft to observe the loading. Interviews with the crews of each flight disclosed that they were unaware of any company policy or requirement that a crew member must be present at the aircraft at the time of loading in accordance with the September 26, 1979, Federal Aviation Administration/Prinair Agreement. Inspection of the Prinair ticket counter, load control center, passenger loading area, and pilot lounge and discussions with Prinair employees at these locations, disclosed that Prinair had failed to act to inform its personnel of the requirements outlined in the September 26, 1979 agreement.

9

b. On October 25, 1979, three Prinair flights were observed being loaded without a crew member being present at the aircraft at Harry S. Truman Airport, St. Thomas, V.I.

c. On October 24, 1979, Prinair personnel at St. Croix improperly designated passenger seating arrangement by reversing the seats of two passengers.

d. On October 25, 1979, Prinair flights 7 and 211 were loaded at the Harry S. Truman Airport, St. Thomas, VI without a crew member being present at the aircraft to observe the loading.

e. On October 25, 1979, Prinair flights 312 and 314 were loaded at Mani Airport, Mayaguez, Puerto Rico, without a crewmember being present at the aircraft to observe the loading.

f. On October 25, 1979, evidence of weighing scale calibrations were not kept at the Prinair facilities at the Mani Airport, Mayaguez, Puerto Rico.

g. On October 25, 1979, no sign notifying passengers of the one carryon baggage limitation.

h. On October 25, 1979, no evidence of weighing scale calibration was kept at the Prinair station at the Alexander Hamilton Airport, St. Croix, VI.

i. On October 25, 1979, no evidence of weighing scale calibration was kept at the Prinair station at the Mercedita Airport, Ponce, Puerto Rico.

j. On October 25, 1979, no evidence of weighing scale calibration was kept at the Prinair station at the Harry Truman Airport, St. Thomas, VI.

12. On October 23, 1979, while enroute from San Juan to St. Thomas, Prinair flight 272 failed to maintain the required separation from clouds while operating under Visual Flight Rules (VFR), contrary to and in violation of FAR Section 91.105(a).

10

13. On October 24, 1979, while enroute from San Juan to St. Croix, Prinair flight 420 failed to maintain the required separation from clouds while operating under Visual Flight Rules (VFR) contrary to and in violation of FAR section 91.105(a).

14. On October 24, 1979, the crew operating Prinair flight 445 on a passenger carrying flight from St. Croix, VI to San Juan, P.R., without using the required check list during the engine starting, taxi, takeoff and climb out segment of the flight.

As a result of the foregoing, the Administrator has determined that safety in air transportation in the public interest requires the suspension of the air taxi commercial operator certificate No. 61-SO-26 held by Prinair until such time as the above discrepancies are corrected and Prinair is found by the Administrator to be in full compliance with the applicable Federal Aviation Regulations. In order to comply the company must, at least:

1. All Prinair flight crew members must successfully complete oral and flight examinations administered by FAA inspectors.
2. Prinair must redesign the load control personnel training program so as to insure proper loading and recording of weights of Prinair aircraft and thereafter fully train all personnel involved in accordance therewith.
3. Prinair must redesign the airworthiness directive record keeping and control system so as to insure compliance with all applicable airworthiness directives.

The Administrator further finds that an emergency requiring immediate action exists in respect to safety in air transportation and accordingly this order shall be effective immediately.

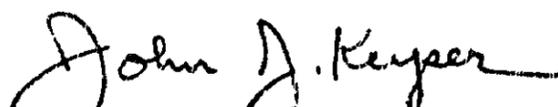
NOW THEREBY it is ordered pursuant to the authority vested in the Administrator by Sections 609 and 1005 of the Federal Aviation Act of 1958 as amended, that the air taxi commercial operator certificate No. 61-SO-26 be and hereby is suspended until such time as the above mentioned discrepancies are corrected and Prinair is found by the Administrator to be in full compliance with the applicable Federal Aviation Regulations. It is further ordered that said certificate be surrendered to the undersigned immediately.

11

You may appeal from this order in accordance with the paragraph below.

APPEAL

You may appeal from this order within ten days from the date it is served by filing a notice of appeal with the Office of the Administrative Law Judges, National Transportation Safety Board, Post Office Box 13269, L'Enfant Plaza Station, Washington, D.C. 20024. However, due to the fact that your certificate has been suspended on an emergency basis, the suspension will remain in effect during the pendency of any proceedings before the National Transportation Safety Board. Part 821 Board's rules of practices 49 CFR 821 applies to such an appeal. In the event you appeal, a duplicate of your notice of appeal should be furnished this office.


JOHN J. KEYSER
Regional Counsel

Enclosure

APPENDIX H

AGREEMENT

Between

PUERTO RICO INTERNATIONAL AIRLINES
(PRINAIR)

and

THE FEDERAL AVIATION ADMINISTRATION
(FAA)

It is mutually agreed between the parties to this agreement that in the event that PRINAIR successfully completes the following terms and requirements, FAA will withdraw the Emergency Order of Suspension of PRINAIR's Air Taxi Commercial Operator Certificate No. 61-50-26 dated October 25, 1979:

1. PILOTS

- A. All available pilots will be instructed at a PRINAIR meeting with FAA assistance concerning at least.
 1. Importance of following all FAR's and PRINAIR policies and practices, especially with respect to weight and balance; and
 2. Crew responsibility to be present at the aircraft and observe the loading of passengers, cargo, and baggage aboard the aircraft until,
 - a. recertification under new Part 135; and
 - b. all load personnel have been trained pursuant to an FAA approved program referred to in hereof.
- B. Six crews will be satisfactorily complete as crews a special flying check administered by FAA:
 1. Such tests will be conducted as soon as possible.
 2. The six crews shall be selected in a mutually agreeable manner designed to assure a fair sample.
 3. AT PRINAIR's request such special flying checks shall be combined with periodic proficiency checks.

- C. All available pilots shall be administered a written test or tests covering aircraft systems and weight and balance. The tests shall relate to PRINAIR's operations and shall be administered and graded by PRINAIR.
- D. No pilot shall fly the line until he has accomplished A and C satisfactorily.

II. LOAD CONTROL

- A. All available station personnel involved in computing weight and balance or preparing or verifying load manifests shall be trained by a special course observed by FAA.
- B. On or about November 1, 1979 PRINAIR shall begin training all such station personnel pursuant to a new training program to have been approved by FAA.
- C. PRINAIR will publish and from time to time revise a list of Authorized Load Control Agents. All PRINAIR flight crews and other personnel shall be instructed that no one other than an Authorized Load Control Agent is permitted to prepare or verify a manifest. Authorized Load Control Agents must have completed the special or the approved course.

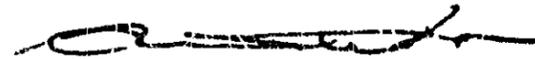
III. MECHANICAL

FAA shall review and find satisfactory PRINAIR's air worthiness directive control system.

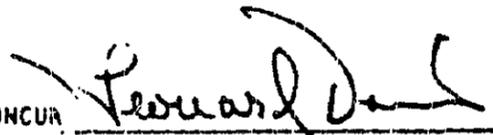
IV. GENERAL

- A. PRINAIR shall not later than Monday, October 29, 1979 advising all employees of the substance of this Agreement.
- B. It shall be PRINAIR policy that violation of this Agreement or of FARs shall be cause for disciplinary action.

PUERTO RICO INTERNATIONAL AIRLINES INC.



Cesar Toledo
President

CONCUR 
Leonard Davis
Chief, Flight Standards

Date: October 28, 1979