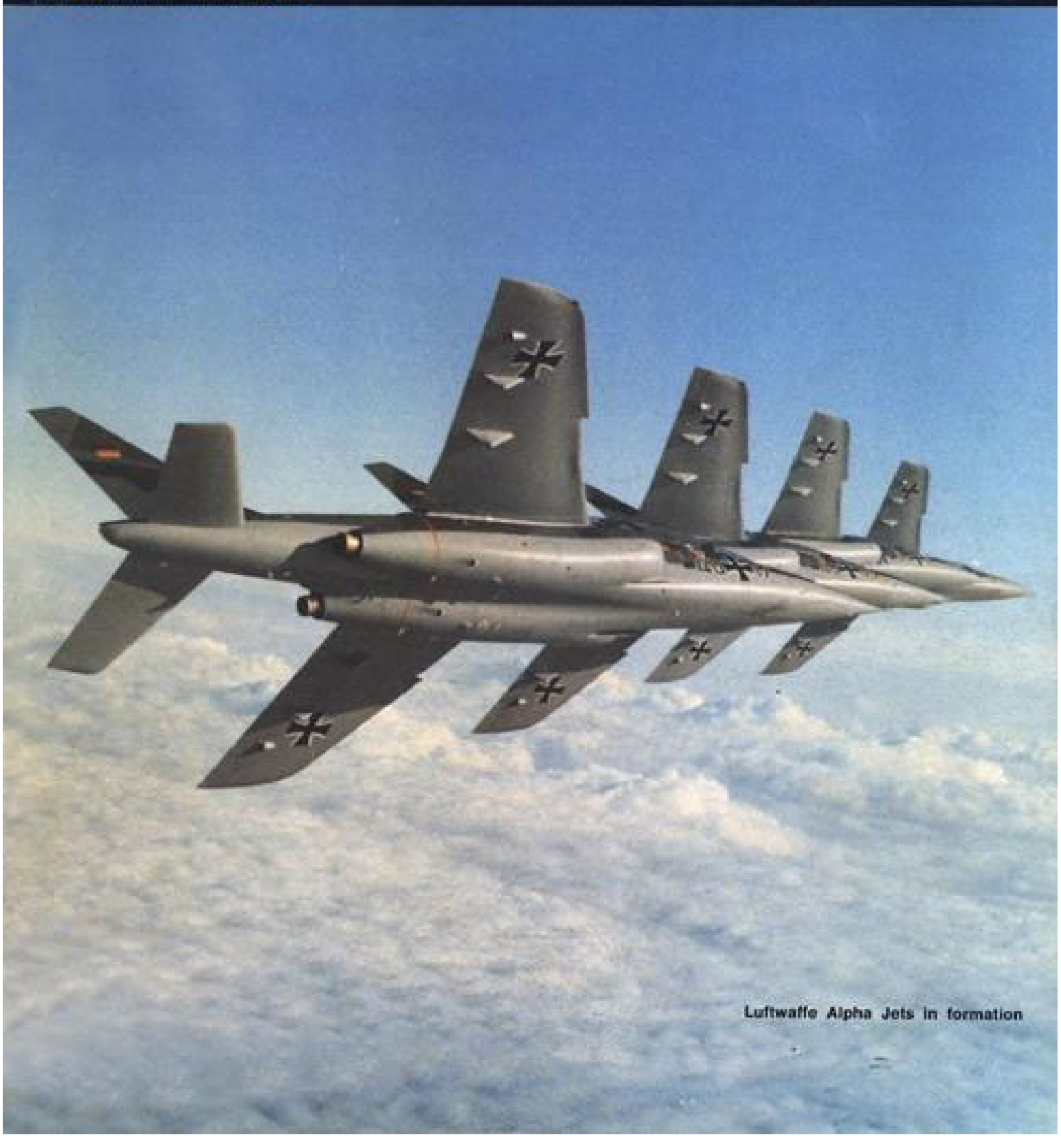
April 21, 1980

Aviation Week & Space Technology

A McGraw-Hill Publication $2.00

HANOVER AIR SHOW



Luftwaffe Alpha Jets in formation

NTSB Cites Violations in Antilles Crash

(Following is the conclusion of the National Transportation Safety Board report on the Sept. 2, 1978 crash of an Antilles Air Boats Grumman G21A while on a flight from St. Croix to St. Thomas, Virgin Islands, killing the captain and three passengers. First part appeared in AVIATION WEEK & SPACE TECHNOLOGY Apr. 14, p. 64.)

In the reworked areas of the right propeller blades, the leading edge contour was not preserved, but appeared to be a flat, slightly sloped surface. This surface was not blended smoothly into the curvature of the camber surface. An alteration of the leading edge contour altered the airfoil significantly and could decrease propeller efficiency greatly. The original planform did not preserve the original blade shape. Instead, the leading edge swept back to a rounded tip. According to the propeller manufacturer, the amount of material removed and the reworked planform would reduce the propeller activity factor by 12%. (A nondimensional parameter used in propeller design which defines the relationship between propeller diameter and blade width.) This reduction would reduce propeller thrust for a given horsepower, particularly at lower airspeeds.

The operator's maintenance personnel produced a template which had been used as the limiting profile for blade rework. Neither the maintenance personnel nor the FAA maintenance inspector assigned to Antilles Air Boats could explain the use for the template. Neither written instructions nor procedures for propeller rework and use of the template were available in the maintenance section.

A propeller manufacturer's drawing was found which defined blade profile and rework limits. It had been provided by the manufacturer for use as a pattern for a blade rework template. However, the template used by Antilles did not match the profile shown on the drawing and exceeded the limits on the drawing by about 5 in. spanwise at the tip.

Additional Information

Company Management. Antilles Air Boats, Inc., transported about 266,000 passengers in 1977. The company employed about 175 employes and operated 15 to 18 aircraft. The company had maintenance bases in St. Croix, in St. Thomas and in San Juan.

Antilles Air Boats, Inc., was established by the president-general manager who was also the captain of Flight 941 at the time of the accident. A vice president-assistant general manager was appointed to assist the president. There was also a chief pilot. The president supervised the maintenance program, and according to the vice president, made virtually all decisions regarding the flight operations of the company. There was no designated director of maintenance, although the company had three maintenance facilities. In addition, the president was also president of Caribbean Airmotive, Inc., an FAA-approved engine overhaul and repair station. Testimony at the public hearing indicated that almost all decision-making authority rested with the persons in the three top management positions.

The vice-president-assistant general manager stated that the president of Antilles Air Boats, ". . . was basically a one-man company. When he was here, there wasn't any doubt as to who was the president of the company, who was the general manager, who was the vice president of operations, who was the chief of maintenance, who was the director of traffic and sales."

Testimony by the vice president and the maintenance coordinator indicated that the president would disregard regulations, at times, in order to meet scheduling requirements. This testimony was substantiated by N7777V's knowingly being flown beyond the scheduled inspection time, by the lack of routine records and by documents in the FAA file on Antilles Air Boats. The vice president stated that he and other selected captains had flown aircraft on which inspections were overdue with the open or tacit approval of the president. He also stated, "Well, by and large, any time an aircraft was flown beyond an inspection, it was basically directed by [the president]. In most cases, when [the president] was here, he was the person who flew the aircraft."

Operational Procedures. Before a flight, each captain was required to inspect the aircraft logbook to determine the airworthiness of the aircraft and to insure that sufficient aircraft flight time was available to complete the trip without exceeding a scheduled maintenance inspection. A Daily Maintenance Log Form, M2-9 and a maintenance release was contained in every logbook which included this information. The maintenance release was signed each day by a licensed mechanic to certify that the aircraft was airworthy. After each flight, the log was completed by the captain to show the time flown on that flight. The time shown on the log was the scheduled flight time and not the actual flight time.

Once preflight planning was accomplished, the captain of each flight was required by FAA-approved Operations Specifications to brief passengers before takeoff. The Operations Specifications state, in part:

"Briefing of Passengers:

"Before beginning each flight, the pilot-in-command shall orally brief all passengers on the following:

(a) Location and use of life jackets on overwater flights.

(b) Use of seat belts.

(c) When smoking is prohibited.

(d) Location and detailed operations of regular emergency exits, including cautioning against inadvertent opening of these exits in flight.

(e) Passenger interference with operation of flight controls."

In regard to landing and single-engine operations, the Airplane Operating Manual states, in part:

"A. Final Approach

60-deg. flaps will be used except in cases of smooth water when 30 deg. may be used. No-flap landings will not be attempted under any conditions, except for inoperative flaps.

B. Landing

Check as per checklist will be completed prior to final approach. About 15 in. manifold pressure and a speed of 90 mph. produces best results. Downwind landings will not be a practice: however, sometimes they are necessary. Downwind landings will not be attempted in winds in excess of 10 kt. If bad bounce is made, use power to either recover to a normal position to land, or to go around for a new approach. This airplane has sufficient power to recover from almost any position into which it might bounce.

C. Single-Engine Flight

With 8,000-lb. gross load, with smooth paint and smooth air, the single-engine ceiling can be maintained at 6,000 ft., although the plane will not climb up to this ceiling. Any unfavorable change to these conditions greatly reduces the ceiling. To secure best single-engine flight, increase the operating engine to maximum rpm. and manifold pressure."

The company's chief pilot stated that normal procedure for an open sea landing was to get parallel to the swells before arriving at 200 ft. above the surface and as directly into the wind as possible. Full flaps were to be used on all landings.

Pilot Training. Antilles Air Boats attempted to hire pilots with 20 or more years of aviation experience and with high total and single-engine flight time. The initial G21A checkout included at least 200 water landings in order to familiarize the new captain with a wide variety of surface conditions. In addition, the new captain received flight training, equipment and procedures checkouts, and ground school. Annually, captains receive a proficiency flight check; equipment and ground school; a written examination of the aircraft procedures and regulations; and a route check. Emergencies, including single-engine operation, were included in the training. Training was conducted by an FAA company-designated check airman.

The vice president-operations, who was also chief pilot, stated that before the accident, the company instructed its captains that, if single-engine flight could not be maintained, the aircraft could be descended to within 20 ft. of the water. At this point, the aircraft would enter ground effect. (A change in the three-dimensional flow pattern of air when an aircraft nears the ground. The local airflow cannot have a vertical component at the ground plane, thus, the restricted air flow alters the wing upwash, downwash and tip vortices.) The aircraft would pick up a few additional knots of airspeed while being flown in ground effect. This procedure, according to the chief pilot, was in the training manual and was demonstrated on all proficiency flight checks. He stated that while it was to be used only "when all else failed," he had believed it to be effective regardless of the sea conditions.

The president of Antilles Air Boats also believed that an aircraft could be flown successfully in ground effect. In a Mar. 2, 1976, St. Croix Times article, he stated, "Subsiding air always 'bottoms out' above the surface of the sea or land, more than sufficient to sustain a fully loaded Goose flying on one engine to its destination. It is the conviction of those of us who have long-time service in the Goose that the aircraft could have proceeded to St. Croix if it had descended to 'ground effect' level at approximately 50 ft. above the sea where unstable, descending air bottoms out."

As a result of the accident on Sept. 2, 1978, the company has changed its position on the

procedure. The procedure is no longer taught or advocated, since according to the chief pilot, it is not effective unless the water surface is calm.

Antilles Air Boats Maintenance Program. At the time of the accident, there was no director of maintenance, because the president-general manager supervised the maintenance functions. The primary maintenance facilities were at St. Croix and St. Thomas. A licensed mechanic supervised each station during both the day shift (0600-1400) and the night shift (1400-2300). Engine overhauls were performed at San Juan by Caribbean Airmotive, Inc., a FAA-approved repair station.

The maintenance functions and schedules were coordinated from the St. Croix station by the maintenance coordinator. His duties were, in part: Maintain all aircraft, engine and propeller records; collect the Daily Maintenance Log Form, M2-9, and post the recorded flight times to the logbooks to determine the hours remaining until scheduled inspection; enter the hours flown in the engine and propeller logbooks; prepare on a daily basis the Aircraft Status Sheets to show the total time, time to inspection, and the next scheduled inspection for all the aircraft. Other duties included maintaning a Kardex filing system for serviceable parts tags, Form 337s, Supplemental Type Certificates (STCs), and Airworthiness Directives (ADs).

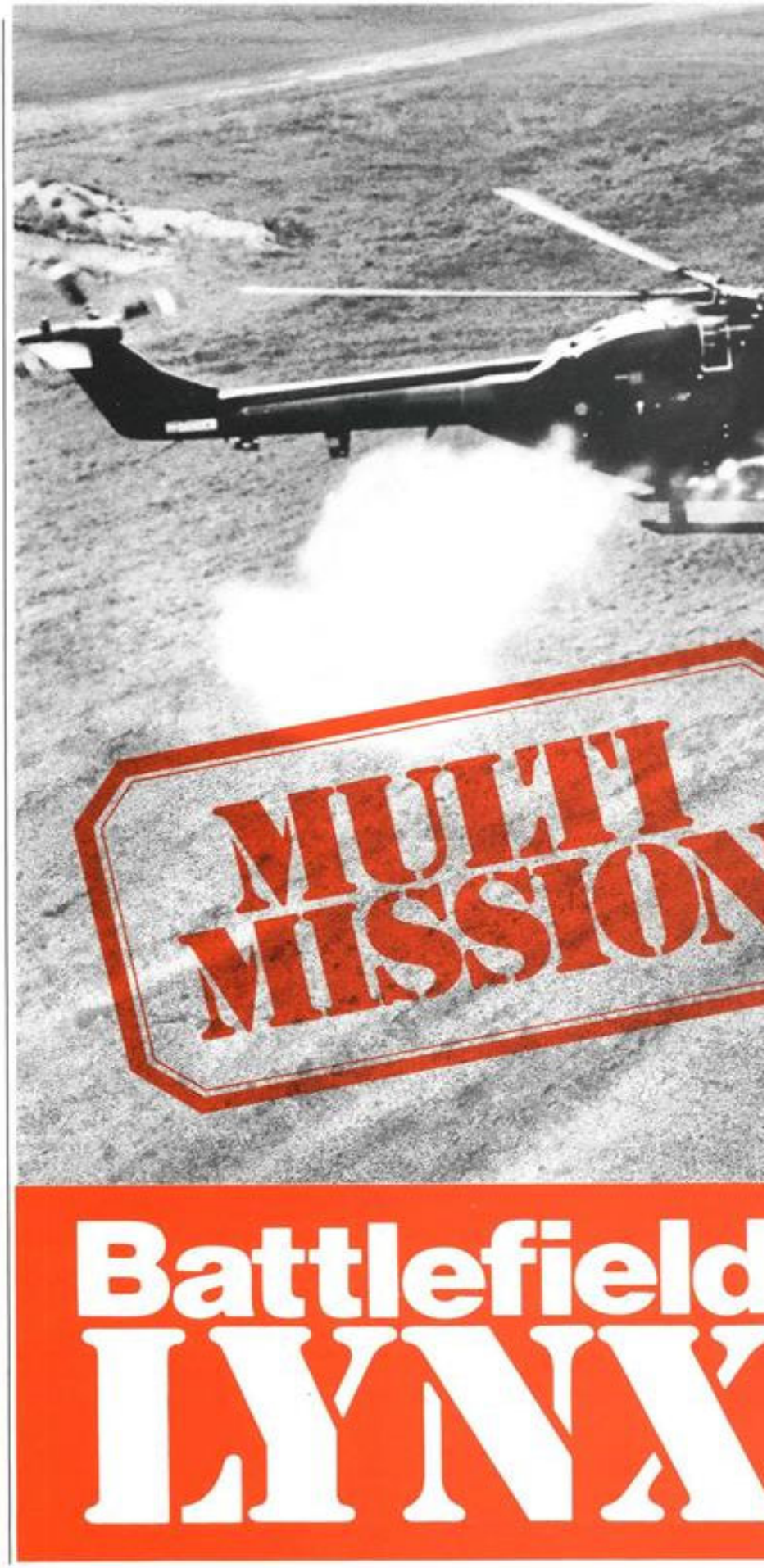
In addition to the missing logsheets for N7777V and the incorrect propeller logbooks, about 75% of the index cards in the Kardex file either had no entries or contained entries four years old or older. Many of the serviceable parts tags did not relate to parts actually on aircraft, while some Form 337s, STCs, and ADs were misssing.

The maintenance coordinator maintained aircraft, engine and propeller logbooks based on daily input from the logsheets from each aircraft. At the end of each day, the logsheets would be forwarded to the Maintenance Coordinator for posting. Since the accuracy of the logbooks, the maintenance production schedule and the scheduling of aircraft depended on the information contained on the logsheets, they were essential to the safe operation of the company.

The maintenance inspection schedule was based on a 50-hr. interval. A 10-% margin was allowed on either side of the 50-hr. point for initiation of an inspection. Line mechanics inspected aircraft daily before they were released to the Operations Dept. Under a six-part inspection program, either an engine or airframe inspection was conducted every 50 hr.

The last engine inspection that N7777V underwent was a 5C inspection on Aug. 10, 1978. It also had 1C and 3C engine inspections on June 21, 1978, and July 11, 1978. Cylinder hold-down studs were supposed to be inspected during 1C, 3C, and 5C inspections for security. The next scheduled inspection for N7777V was a 6C airframe inspection.

History of Left Engine of N7777V. The engine was a Pratt & Whitney Wasp Jr., R985-AN-14B, Serial No. 19309. The engine was installed on N7777V on Mar. 25, 1978, at the Antilles Air Boats maintenance facility at St. Croix. The engine historical records were incomplete. However, information provided by the company indicated that the engine had 361.05 hr. when it was installed on N7777V, and a total of 898.8 hr. on Aug. 27, 1978. Since the 22.7 hr. flown after Aug. 27 were not recorded in the aircraft records, the actual total time on the engine



was about 921.5 hr. The engine was part of a two-engine purchase made from a California-based aircraft parts company.

The purchase was arranged by the general manager of Caribbean Airmotive, Inc., through an aircraft parts supplier.

The engines had been bought by the California firm from the French Air Force. All logbooks and records were in French. A control sheet was prepared by the French air force which listed the total time of the engines, the time since overhaul (TSO) and the date of the overhaul. The control sheet listed the engine as having 361.05 hr. since the last overhaul on Sept. 29, 1967. The fact that the overhaul was conducted at a non-FAA-certificated repair station in France was not noted on the control sheet. This information was available only from the engine logbook.

The general manager, Caribbean Airmotive, Inc., and the parts supplier selected the two engines with primary consideration given to low time. The engines were visually inspected. An official of the California aircraft parts company and the parts supplier who located the engines stated that the sale to Antilles Air Boats, through Caribbean Airmotive, Inc., was on an "as is" basis. The engines were not overhauled before delivery to Caribbean Airmotive, Inc. The parts supplier stated that he believed that the engines would be inspected and overhauled before installation, or that they would be used as core engines.

The engines were delivered to Caribbean Airmotive, Inc., San Juan, on Mar. 10, 1978, with the engine and overhaul records. Although Caribbean Airmotive's general manager could not read French, an employe who could read French offered to review the records with her husband, who was an FAA maintenance inspector. The FAA inspector reviewed the logs with the assistance of his wife and returned them to Caribbean Airmotive, Inc. According to the general manager, the FAA inspector told him that "[the records] were complete and that the times were correct as to the [times since overhaul]." The parts supplier, however, stated that the general manager of Caribbean Airmotive, Inc., told him the FAA inspector had questions about the engine times and logs.

The FAA inspector was not acting as a representative of the FAA when he reviewed the logbooks. He stated that when he returned the logbooks, he told the general manager the following:

- The information in one logbook should not be trusted because of discrepancies noted.
- The second engine was out of time.
- The French repair station, which overhauled the engines, was not an FAA-approved overhaul station.
- Both engines should be considered core or run-out engines.
- There were some entries in the logbooks which did not appear authentic.
- There was reason to doubt AD and service bulletin compliance.

Furthermore, he stated that he advised the general manager that the engines should not be placed in service in their present condition.

The general manager, the FAA inspector and the parts supplier all stated that the only information the general manager of Caribbean Airmotive, Inc., received regarding the engines, engine times, ADs, or logbook validity was the information passed by the FAA inspector after he and his wife reviewed the records. However, the original French logbook for the accident engine could not be produced by the general manager, Caribbean Airmotive, Inc. He stated

Battlefield Lynx,
Britain's world beating advanced technology helicopter.

Fast, agile, all weather, twin engined.

Battlefield Lynx, able to put men and equipment right on the spot, wherever, whatever.

Battlefield Lynx, the complete trouble shooter, in full production to meet orders from armed forces throughout the world.

Westland®
WESTLAND HELICOPTERS YEOVIL ENGLAND

Circle Number 199 on Reader Service Card

that he gave them to the parts supplier to be translated. The logbooks for both engines did turn up in the offices of Caribbean Airmotive about three months after the accident. Notes made by the FAA inspector were still attached. The substance of the notes substantiated the FAA inspector's statement.

On Mar. 14, 1978, the accident engine was placed on a test stand and operated. The general manager of Caribbean Airmotive, Inc., stated that after the performance test, "The engine run was very good, all temperature and rpm. was normal." The engine logbook, which was prepared by Caribbean Airmotive, Inc., indicated that on Mar. 14, the engine had 361.05 hr. The engine ran 1 hr. that day. Under remarks, the following statement was recorded: "Installed on test stand—ran engine. Checked for oil leaks—O. K." The logbook bore the stamp of the repair station and the certification that the engine was repaired and inspected in accordance with regulations and was returned for service. No work order or FAA Form 337 accompanied the engine when it was sent to Antilles Air Boats, although 14 CFR 43, Appendix B, requires one or the other on file with the aircraft records. There was no reference to compliance with appropriate ADs or service bulletins (SBs).

The Antilles Air Boats maintenance coordinator stated that when the engine was received, the logbook had the stamp of the FAA-approved repair station. This stamp verified to him that the engine was airworthy. After the engine was installed on N7777V, it operated normally until the day of the accident.

Violation and Enforcement History. The FAA Flight Standards District Office (FSDO) at San Juan, P. R., held the air taxi operations certificate for Antilles Air Boats and Caribbean Airmotive, Inc., and was responsible for the surveillance of the operators. The FSDO has 10 inspectors assigned, and maintains 46 air taxi certificates. A maintenance and an operations inspector were assigned to insure Antilles Air Boats operated in compliance with 14 CFR 135. The inspectors were also assigned to survey other air taxi operators. For example, the maintenance inspector was assigned four additional air taxi operators to inspect. This inspector stated that he was able, because of his workload, to inspect the three Antilles maintenance bases about once a month.

The most recent FAA special inspection of Antilles Air Boats was in June, 1978. As a result of that inspection, a letter was sent to the president of Antilles Air Boats listing 13 findings that were being evaluated for possible violation proceedings. The findings included: Use of noncertificated maintenance personnel in situations requiring certificated mechanics; operation of a G21A aircraft for 31 days in an unairworthy condition because of severe corrosion; the absence of records to show compliance with specific ADs for inspection of aileron hinge brackets on G-73 aircraft and cylinders on G21 aircraft; inadequate recordkeeping; improper maintenance procedures on scheduled maintenance inspections; aircraft equipment lists not current; and improper propeller installation.

The investigation report, which was the basis for the 13 findings, concluded, "Our inspection reveals that Antilles Air Boats, Inc., is in noncompliance with the Federal Aviation Regulations primarily in the maintenance area. Many of the problems can be attributed to the lack of a director of maintenance. This has resulted in a lack of leadership and coordination within the maintenance organization." As a result of this investigation an Enforcement Investigative Report was filed by the San Juan FSDO and a $6,000 civil penalty was recommended.

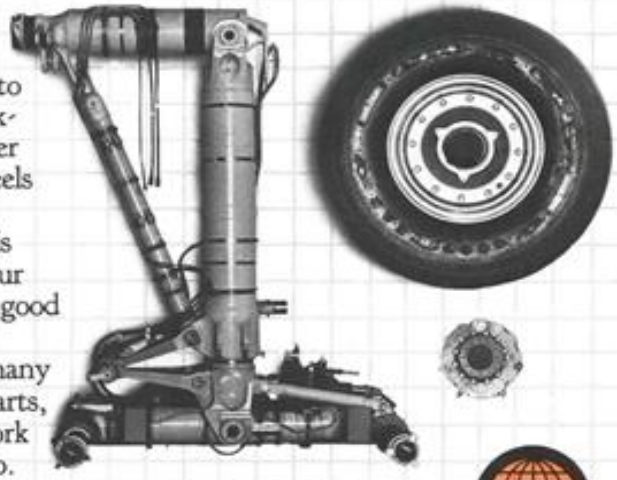
On Mar. 21, 1978, the San Juan FSDO filed an Enforcement Investigative Report which recommended a $6,800 civil penalty. This report resulted from a Mar. 13, 1978, inspection which revealed that 68 flights with G21A aircraft were flown in excess of the allowable gross takeoff weight because the weight and balance forms had been prepared improperly.

There had been no final disposition of either of these enforcement actions by the FAA on Sept. 2, 1978. However, they were included in a compromise agreement and $100,000 civil penalty assessed against the company on Sept. 8, 1978.

On Sept. 28, 1977, the FAA formally notified Antilles Air Boats of the result of the surveillance conducted in March, 1977. The investigation concluded that "Antilles Air Boats operated unairworthy aircraft in its air taxi operation" during the period noted. Six violations were filed, and Antilles Air Boats was "subject to a civil penalty of not to exceed $1,000 for each violation of the regulations." The FAA Southern Regional counsel stated, however, that the FAA "would be willing to accept an offer in compromise in the amount of $1,000 in full settlement of those violations. On Aug. 7, 1978, the FAA Regional counsel accepted a compromise offer of $500 in full settlement. The violations resulted from a lack of records for major modification of aircraft; N7777V was operated with the right propeller beyond maximum allowable wear limits; and incomplete logbook entries.

On May 5, 1977, Antilles Air Boats was

Here's why we've landed so many new clients.



We've got the wheels, brakes and landing gear to do it with.

Virtually everything it takes to touch down a Boeing 720-707, Lockheed Electra, YS-11, or so many other commercial aircraft. BAC-1-11 wheels and brakes are also in stock.

What's more, nearly all of it is available for immediate delivery. Our off-the-shelf support capability is as good as you'll find anywhere.

Aviation Sales can supply so many of your other needs as well. For parts, rotables or entire systems. We'll work with you on an exchange basis, too.

And we've got 24 hour A.O.G. service. Just call 305-592-4055.

At Aviation Sales, we'll do whatever it takes to land your business.

Aviation Sales Company, Inc. We'd like to support you.

P.O. Box 522914 Miami, Florida 33152. Telephone: (305) 592-4055. Telex 51-5547.

instructed to correct several deficiencies found during an FAA inspection, although no legal enforcement action was recommended. However, the letter to the company stated, "It appears that most of these deficiencies are similar to discrepancies noted during the last SWAP (special) Inspection." (That investigation had been conducted in May, 1975).

In addition to the Sept. 2, 1978, accident, Antilles Air Boats had a fatal accident on Apr. 5, 1978, and a nonfatal accident on May 18, 1977. There were four incidents reported for 1977 and 1978.

On Dec. 17 and 18, 1976, the president of Antilles Air Boats piloted an S-25 Sandringham aircraft while carrying passengers ticketed on a U.S. certificated air carrier between St. Thomas and St. Croix. The S-25 was operated by Antilles Air Boats, Ltd., a company owned by the president of Antilles Air Boats, Inc., but based in the British Virgin Islands. The aircraft was not of United States registry and was not authorized for use by Antilles Air Boats, Inc. In addition, the S-25 was a large airplane—over 12,500 lb,—and Antilles Air Boats, Inc., was authorized to operate only small aircraft. The subsequent investigation revealed that the S-25 Sandringham had been operated about 40 times on passenger revenue and nonrevenue flights, including a Jan. 28, 1977, flight carrying passengers ticketed on another U.S. certificated air carrier.

The president of Antilles Air Boats acknowledged that he had operated the S-25 as charged on Dec. 17 and 18, 1976. He stated that he used the S-25 because an "emergency" existed. The emergency was the lack of other transportation back to St. Croix, and the lack of hotel accommodations on St. Thomas. As a result of these flights, the chief, San Juan FSDO, sent the following message to the chief, Flight Standards Div. Southern Region:

"[The president] had been counseled on numerous occasions on the need to obtain proper certification in order to operate the S-25 commercially in the USA. We believe he will continue to operate the S-25 regulations to the contrary notwithstanding.

"We recommend that a cease and desist order be issued."

Instead of a cease and desist order, on Aug. 4, 1977, the FAA Southern Regional counsel sent a letter to the president of Antilles Air Boats, Inc., stating:

"As a result, you have committed violations of Sections 61.3(b) and 135.9 of the Federal Aviation Regulations.

"Under Section 901(a) of the Federal Aviation Act of 1958, you are subject to a civil penalty of not to exceed $1,000 for each violation. However, after having carefully considered all of the circumstances of this case, we would be willing to accept an offer in compromise in the amount of $500 in full settlement of those violations. Enclosed is a copy of the compromise procedure."

A total of $1,500 in civil penalties was assessed as a result.

As a result of the Sept. 2, 1978, accident, on Sept. 8, 1978, the FAA Southern Region Flight Standards and Regional counsel representatives met with the management of Antilles Air Boats to discuss unresolved investigative reports and the conditions discovered during the investigation. A $100,000 civil penalty was levied. However, a compromise was again reached. A letter of agreement was signed between the two parties, and the fine was reduced to $10,000 with the remainder held in abeyance. The $10,000 fine was settlement for five previous Enforcement Investigative Reports which had been filed by the San Juan FSDO. Included in these reports were the 13 violations discovered in the June, 1978, special inspection ($6,000 recommended fine); the 68 weight and balance violations of Mar. 21, 1978, ($6,800 recommended fine); and the six violations of Sept. 28, 1977, ($6,000 fine possible). According to FAA correspondence, "Ten thousand is to be paid and $90,000 will be held in abeyance, providing they (Antilles Air Boats) continue to comply with the Federal Aviation Regulations referenced in the investigative reports to the satisfaction of FAA inspectors."

The chief, San Juan FSDO, stated that as a result of the evidence discovered during their investigation of the Sept. 2, 1978, accident, Antilles Air Boats, as a corporate entity, has openly disregarded the regulations.

Analysis

General. The weather was not a factor in the accident, although the 12- to 15-kt. wind resulted in a choppy sea state with 5- to 6-ft. waves. Although these waves made the initial contact more critical than on smooth, protected water, they were not a factor in the accident.

The aircraft was not certificated properly, since STC SA 3630 WE, which increased the operating weight of N7777V to 8,750 lb., was not an adequate supplemental type certificate. However, Antilles Air Boats was not aware of that fact and had met all the requirements of the STC to increase the gross weight of N7777V.

The safety board is concerned with the lack of management quality control which went into the testing and approval of the STC, as well as the lack of an accurate recording procedure during the actual test flight. We can find no justification for the FAA's approving a request for a 9% weight increase for a 45-year-old aircraft without first evaluating the expected performance and test parameters more carefully. . . .

The safety board finds the overall attitude of the FAA toward the development, testing and approval of the STC to be deficient, and we are alarmed with the apparent lack of concern for the safety aspects of the STC for several reasons: (1) It was common knowledge that the aircraft would be used in passenger operations; (2) the aircraft, which had operated at 8,000 lb. or below for 45 years would now, with no significant changes, be operated at a 9% heavier weight; (3) there were no performance data available to predict G21A performance at 8,000 lb. or at weights above 8,000 lb.; and (4) the performance of the aircraft was the primary concern for approval of the STC, yet the proper weight was never determined and the one test flight climb was, in the words of the chief, Flight Test Branch, an engine cooling test.

The lack of FAA quality control and responsible management is further indicated by the fact that the project manager prepared the type inspection authorization, conducted the test and issued the STC with no reveiw of the work. When the review was conducted seven months later, the work was still approved although the reviewing authority has stated that "there were concerns about whether the STC had been properly determined." The chief, Western Region Flight Test Branch, went on to approve the type inspection report on Nov. 13, 1978, although he was aware of the Antilles accident and the Nov. 5 accident. He stated that he did not consider withholding approval of the STC since there were only minor discrepancies in the "less-than-rigorous evaluation" of the STC. Once the decision was made to revalidate STC SA 3630 WE, he did not consider temporarily withdrawing the STC until the revalidation was accomplished. He stated, "We had insufficient grounds to cancel the STC at that time, yet, there were concerns about whether the STC had been properly determined." The safety board believes that sufficient reason existed to temporarily suspend the STC. The welfare of the public does not allow any safety concerns to go uncorrected. In this instance, sufficient doubt concerning STC SA 3630 WE existed by Nov. 13, 1978, yet the type inspection report was approved and the STC was not canceled until Feb. 26, 1979.

In view of the lack of adequate historical G21A performance data for any gross weight and the conflicting information which resulted from the four recent G21A flight tests, the safety board concludes that a reasonable doubt exists concerning the safe performance capability of the aircraft. We are aware that modified versions of the aircraft are operating at weights up to 9,000 lb.; however, adequate performance data do not exist to support that weight.

In addition to the deficient STC, the safety board concludes that N7777V was not maintained properly and was not airworthy. Nevertheless, Antilles used this aircraft in revenue operations, and company management and personnel conducted such operations in violation of federal regulations and company policies. The board concludes that such an operation was conducted with complete disregard for public safety. . . .

The left engine was not airworthy, although this fact may not have been known to the maintenance personnel who serviced the aircraft. The engine had been in storage for over 10 years since its last overhaul. It was then installed on N7777V, without an adequate inspection or overhaul and without an adequate review of its logbooks or records.

Finally, the propellers of N7777V had not been maintained properly. The right propeller had been reworked and dressed to eliminate nicks and corrosion and to restore the smooth airfoil contours. The rework operations had altered the propeller shape and the leading edge contour had not been restored. The alteration of the propeller reduced its efficiency to the extent that thrust at maximum horsepower was reduced. The loss of thrust was a significant factor in the ability to sustain single-engine flight. Therefore, N7777V may not have had the required single-engine performance to meet the certification standards.

After takeoff from St. Croix, the flight to St. Thomas was uneventful and conducted at an altitude of 1,700 ft. About 5 mi. south of St. Thomas, the No. 5 cylinder and piston separated from the left engine. The engine failed, and the cowling came off the engine when the piston separated. At 1017:00, the captain contacted St. Thomas tower and stated that he had lost the left engine, so the engine probably failed about 1016:00.

According to passenger statements and the position of the left propeller and propeller controls, the captain feathered the left propeller immediately and shut the engine down according to proper emergency procedures. He simultaneously applied full power to the right engine. Apparently, the captain believed that the aircraft could maintain the cruising altitude in that configuration, since at 1017:09, he informed St. Thomas tower that he intended to land in the designated single-engine area in West Gregerie Channel. This area was so designated because it offered protected waters. By

1019:02, the captain probably realized that the aircraft would not maintain sufficient altitude to reach the landing area in the channel. The passenger in the right cockpit seat stated that after the engine failed, the aircraft began a steady descent to the water at a 300- to 400-fpm. rate of descent.

At 1021:06, the aircraft touched down in the water. Therefore, the aircraft was airborne between 4 and 5 min. after the engine failed. From a cruising altitude of 1,700 ft., the rate of descent would have been between 425 and 340 fpm., which coincides with that recalled by the passenger and flight tests conducted after the accident.

According to company procedures, the pilot should have positioned the aircraft so that before reaching 200 ft. above the water, he would be in a position to land as directly into the wind as possible. The aircraft struck the water in a northwesterly direction, and no attempt was made to position the aircraft into the wind although ample time and altitude were available for the 180-deg. turn.

While readying the aircraft for an emergency landing, the pilot was required to inform passengers to prepare for an emergency landing. The captain did not warn the passengers that an emergency landing was being made. Finally, company procedures and the aircraft operating manual require full flaps for all landings. Evidence indicates that the captian failed to extend the flaps at any time during the descent to the water.

Based on the foregoing, the wreckage information and the fact that passengers observed the right engine operating at full power when the aircraft struck the water, the safety board concludes that the captain did not attempt an emergency landing after he determined that single-engine flight was not possible. Rather, the captain, an experienced and proficient seaplane pilot, decided that single-engine flight could be conducted in ground effect. This procedure was included in the company training program and endorsed by the captain as an effective technique regardless of the sea state. This would require that the aircraft be flown to within about 50 ft. of the surface of the water.

The captain exhibited poor judgment when he elected to disregard company emergency procedures in favor of his personal techniques. Although he personally believed that he could fly in ground effect, he should have considered the effect of the lost cowling and the gross weight of the aircraft in his decision. His responsibility was to the passengers, and he should have doubted the capability of N7777V sufficiently to have made an emergency landing. Furthermore, even after he had decided to fly in ground effect, ample time was available for the captain to instruct his passengers to don the life vests and to make them aware of the locations of emergency exits. The captain again exhibited poor judgment when he did not prepare his passengers for the possibility that the aircraft would strike the water.

When the aircraft struck the water with full power on the right engine, asymmetrical impact loads resulted which contributed to the complete cartwheel and breakup of the aircraft. When the captain realized he could not fly in ground effect, he should have reduced the power on the right engine. Had he done so, the safety board believes that the aircraft may have remained more intact and that more passengers would have survived. In addition, the downwind landing at a groundspeed of about 115 kt. more than doubled the kinetic energy to be dissipated had the captain made an approach into the wind at a groundspeed of approximately 75 kt.

Single-Engine Performance of G21A. After the left engine failed, the controlling event of the accident sequence was the inability of the aircraft to maintain altitude in a single-engine configuration. Although the loss of an engine was a serious emergency, the captain's experience and training should have enabled him to control the situation successfully. His initial transmission that he intended to land in West Gregerie Channel indicated that he had the aircraft under control without a serious doubt about the capability of the aircraft. However, based on survivors' statements and the subsequent transmissions to the air traffic control tower, the aircraft began an immediate descent to the ocean.

Although Antilles' pilots testified that they had flown the aircraft at 8,200 lb. on a single engine with no problem, the FAA does not have any conclusive single-engine performance data for the G21A aircraft. The initial Bulletin 7A certification criteria did not require specific rates, and the four FAA flight tests between April, 1978, and February, 1979, did not produce reliable data. However, FAA-produced performance data do indicate that a well maintained G21A could meet the climb requirements of Bulletin 7A at 8,150 lb. using 400 brake horsepower. No other reference weights exist. However, it was likely that the pilot of N7777V used the full 450 brake horsepower capability of the right engine when the left engine failed. This, plus the fact that the aircraft did not need to climb but only maintain level flight, could possibly have provided the thrust necessary to maintain level flight if no other conditions existed which would affect the thrust-drag ratio. However, since no proven performance data exist, the board cannot conclude that a G21A can maintain level flight at the 8,200-lb. accident weight condition.

Since N7777V began an immediate descent after the loss of the left engine, other factors must have affected its single-engine capability. One such factor was the loss of the engine cowl on the left engine. Studies performed on the Grumman G21A aircraft reveal that the loss of an engine cowl increases total drag by about 10%. A second such factor was the reduction of the activity factor of the right propeller by about 12%.

The safety board was not able to determine the performance capability of the right engine. However, at the time of the accident, the temperature was 88F at sea level and 79F at 1,700 ft. Therefore, the right engine would not have been capable of operating at maximum rated power. This, coupled with the reduced propeller efficiency, would have degraded the overall single-engine performance of N7777V and would have resulted in the 300- to 400-fpm. rate of descent. Under these conditions, it was not likely that ground effect over the rough water surface could have offset the rate of descent.

Company Operations. The president of Antilles Air Boats, who was also the captain of the accident aircraft, controlled the management of the company and directed virtually all aspects of company operations. Although there were managers responsible for operations and training, they had little authority and usually only implemented decisions made by the president. The president's attitude and philosophy toward FAA regulations and company procedures undermined any effort to effectively manage the company. As a result, company personnel looked to the president for guidance on the operational and maintenance functions rather than to the applicable regulations, and key managers themselves violated company procedures and federal regulations in order to meet operational requirements.

The president encouraged an attitude among pilots and mechanics that regulations and approved company procedures could be disregarded if an operational need arose. This attitude was evident by the falsification of logbooks and records in connection with this accident and on other occasions, by deliberately flying aircraft beyond scheduled inspections, by the Sandringham S-25 violations and by the continuing nature of the violations which were processed against Antilles Air Boats over the past three years.

Management also lacked proper emphasis on supervision of the operating areas. For example, there was no full time director of maintenance. Although the president filled this position, he was too deeply involved in other company areas to give the position adequate attention. The vice president and the director of operations were the only senior managers, but they flew about 80 hr. a month in scheduled flight operations. The lack of control was especially critical, since there were three maintenance facilities to coordinate and supervise. The result was that recordkeeping was disorganized or nonexistent, which led to improper entries or no entries in logbooks, improper use of repair parts tags and an inadequate maintenance records system. In addition, there were instances where FAA violations were issued because unlicensed mechanics had signed off work which required the signature of a licensed mechanic. Finally, testimony by a maintenance supervisor and the maintenance coordinator revealed that mechanics falsified logbooks or released unairworthy aircraft for revenue operations.

The safety board firmly believes that a company which transports about 266,000 passengers a year requires a full-time management effort in order to insure an adequate level of safety. The FAA noted the managerial deficiency in a letter to Antilles Air Boats in which the FAA cited the lack of a director of maintenance as an underlying reason for the recurring maintenance deficiencies.

The maintenance program contributed directly to the accident of N7777V. The No. 5 cylinder failed when the hold-down studs were failed by low-stress, high-cycle fatigue. The metallurgist's report indicated that the fractures of the No. 2 and 3 studs were old fractures, and that they were probably present when the engine underwent its last inspection. The severe fretting on the cylinder pad face and the high-cycle fatigue failure of the studs indicate that the cylinder was loose on the pad for a considerable length of time before the failure. The looseness of the cylinder resulted from the loss of clamping force of the hold-down nuts because the crack was progressing in the stud. The safety board concludes that the events leading to the cylinder failure developed over the period of time during which N7777V underwent 10 engine and airframe inspections. A competent maintenance program would have identified the impending failure. The inadequate test and inspection procedures of Caribbean Airmotive, Inc., were causal to the accident, since the deficiencies in the engine should have been discovered before the engine was installed on N7777V. However, since the president of Antilles Air Boats was also the president of Caribbean Airmotive, Inc., there was probably a lack of emphasis on safe and proper maintenance procedures involved in the acceptance of the engine.

The maintenance operation also failed to

properly maintain the right propeller of N7777V. The inadequate propeller maintenance resulted from a lack of training on the use of a manufacturer-supplied propeller rework limit drawing and on the consequences of improperly shaped propellers.

FAA Surveillance. FAA's surveillance and enforcement activities of Antilles Air Boats also contributed to the accident. The surveillance activities of the San Juan FSDO were inadequate. While the work accomplished by the two inspectors assigned to Antilles Air Boats was conscientious and thorough, it was inadequate and ineffective because of the amount of surveillance that was required and because their surveillance activities were not followed up or supported by higher levels of FAA management. The passenger volume, separate maintenance and operations bases, and the number of aircraft and employes made effective surveillance difficult when only two inspectors were assigned to the Antilles certificate on a part-time basis. The surveillance effort was made more difficult by the recurring deficiencies, since the lack of corrective action resulted in an increasing workload on the assigned inspectors. The number of processed violations and letters of correction generated by the two inspectors indicate that a sincere surveillance effort was attempted.

In addition, the surveillance program should have detected the inadequate propeller maintenance practices and the faulty maintenance records and logbooks. The safety board is concerned that if inspection visits were limited to one per month, sufficient time probably was not available to study the maintenance practices in sufficient depth to uncover the deficiencies and deceptions by Antilles' employes.

The safety board has discovered inadequate FAA surveillance during several recent aircraft accident investigations ("Aircraft Accident Report: Air East, Inc., B99A, Johnstown-Cambria County Airport, Johnstown, Pa., Jan. 6, 1974" (NTSB-AAR-75-3). "Aircraft Accident Report: Atlantic City Airlines, Inc., DHC-6, Cape May County Airport, N. J., Dec. 12, 1976" (NTSB-AAR-77-12). "Aircraft Accident Report: Alaska Aeronautical Industries, Inc., DHC-6-200, near Iliamna, Alaska, Sept. 6, 1977" (NTSB-AAR-78-5). "Aircraft Accident Report: Columbia Pacific Airlines, Beech 99, Richland, Wash., Feb. 10, 1978" (NTSB-AAR-78-15).) Safety Recommendations A-78-37 through -41, issued on May 17, 1978, addressed the issues of inadequate FAA surveillance, ineffective company management and the need to review the effectiveness of maintenance programs. These recommendations also apply to many aspects of this accident. Ample evidence was available to alert FAA management of the San Juan FSDO, at the area manager level and at the Southern Region Flight Standards level to cause immediate and positive action to determine the nature and the extent of Antilles' deficiencies. The number of violations and the timeframe of the violation history should have prompted FAA to reassess its surveillance and manpower needs.

FAA's enforcement of violations was ineffective. A review of the enforcement activities for the past three years indicates that in every instance where a civil penalty was recommended, a compromise settlement between the Southern Regional counsel and the company was reached. Violations which could have resulted in $1,000 civil fines were often settled for $500 or less, and the length of time for the actual settlement was frequently more than six months.

The violations resulting from the Dec. 17-18, 1977, flights of the Sandringham S-25 were accompanied by a recommendation from the San Juan FSDO Chief that a cease and desist order be issued. However, the Southern Regional counsel accepted $1,500 in full settlement. The company had earned more than that amount by operating the aircraft illegally.

After the Sept. 2, 1978, accident, the FAA again compromised with Antilles Air Boats. Although the FAA levied a $100,000 civil penalty against Antilles Air Boats for unresolved investigative reports, only $10,000 was to be paid and $90,000 was held in abeyance. In addition, a letter of agreement was signed which imposed maintenance and operational restrictions.

The FAA enforcement actions did not effectively deter violation of regulations; the actions of Antilles Air Boats attest to this fact. The recommended enforcement action was compromised regularly by Southern Region officials, with no significant protest from the area manager or the San Juan FSDO. Ultimately, the apparent policy of continual compromise on civil penalties rendered the FAA's enforcement process ineffective and resulted in the recurrence of deficiencies in the Antilles Air Boats programs. Coupled with the compromise of civil penalties, the followup of recommended violations by the Southern Region Flight Standards and Regional counsel personnel was not conducted in a timely manner, which further weakened the enforcement process.

The captain possessed the proper pilot certificate and ratings for the flight and was trained properly. While he held a valid medical certificate, he did not meet the medical qualifications for a first- or second-class medical certificate because of his distant vision. His distant vision was 20/40 uncorrected, but the issuing physician did not impose a limitation which required him to wear corrective lenses to improve it to 20/20. However, 14 CFR 67.25 states that if the error is not detected within 60 days, the medical certificate is valid.

The captain had been issued five consecutive medical certificates without the proper limitations. The proper limitations required him to wear corrective lenses for distant vision and to possess corrective lenses for near vision. Since he never had a limitation imposed for distant vision, it is possible that the aviation medical examiner who issued the medical certificates never informed the captain that his distant vision had deteriorated beyond the 20/20 limit required for a first- or second-class medical certificate. If the captain was not aware of the distant vision problem and actually did wear corrective lenses as required by his May 9, 1978, medical certificate, his distant vision could have worsened.

The errors and inconsistencies evident in the review of the captain's last five physical examinations indicate that the aviation medical examiner was careless in issuing the medical certificates, or he was not knowledgeable of the requirements for a first- and second-class medical certificate. Furthermore, none of the errors was detected in the FAA-administered medical review process, which resulted in the validation of the certificates although the captain could not qualify without corrective lenses. The safety board concludes that the knowledge of some aviation medical examiners of the requirements of 14 CFR 67 may be deficient, or that they are not enforcing the required medical standards when administering physical examinations. The

Custom File Cases or Binders

Attractive, durable heavy weight, custom designed file cases or binders will protect your copies of AVIATION WEEK, conserve space, reduce clutter and speed referrals to back issues.

Two file cases or binders will hold one year's issues. Use file cases for occasional reference and filing. Use binders for regular reference use. Binders have heavy metal binding to hold each issue securely.

PRICES:

Qty.	File Cases	Binders
1	$ 4.95	$ 6.50
2	$ 9.90	$13.00
4	$19.00	$25.00
6	$24.00	$36.00

OUTSIDE THE USA: ADD $1.00 PER FILE OR BINDER FOR SHIPMENTS.

AVIATION WEEK, P.O. Box 5120, Philadelphia, Pa. 19141 AW421A
My check or money order for $_____ is enclosed.
Please ship immediately:
_____File Cases _____Binders
Name_____
Address_____
City_____State_____
Zip or Postal Code_____Country_____

FAA medical review system was deficient because the errors on the captain's last five medical certificates were not discovered.

Survivability. The preflight briefing of the passengers by the captain was inadequate. The FAA-required passenger briefing, as contained in the company operations specifications, included specific items which had to be presented orally before each flight. Every passenger, with one exception, stated that the briefing contained only the direction to fasten seatbelts. No mention was made of emergency exits or the location and use of life jackets.

The accident was survivable. The passengers and the captain died from drowning and not from traumatic injuries. The safety board believes that the survival rate would have been greater if the passengers had donned life vests before the aircraft struck the water. In addition to a lack of traumatic injuries, the seatbelts where the nonsurvivors had been seated were unlatched, indicating that these passengers were conscious after the aircraft broke open. It is conceivable that all the passengers would have survived, except possibly the one who was found tangled in the wreckage.

The captain's seatbelt broke loose from the seat frame during impact, so his state of consciousness could not be determined from the position of his seatbelt. Contusions, lacerations and abrasions to his head and face could indicate that he struck his head and was unconscious as a result of the impact and breakup of the aircraft. If shoulder harnesses were installed and worn, and had the seatbelt not failed, the captain may not have sustained these head and face injuries.

Conclusions

Findings:

- The captain was trained properly for the flight.
- The captain held a valid medical certificate, although he did not meet the qualifications for a first- or second-class medical certificate, since the FAA review process did not discover the errors in the last physical examination.
- The preflight planning was improper, since an unairworthy aircraft was knowingly scheduled and accepted for the flight.
- The maintenance release was falsified by a licensed mechanic who certified the aircraft was airworthy.
- The total times in the logbook were falsified with the knowledge of management, supervisors and licensed personnel.
- The captain did not adequtely brief passengers before the flight.
- The left engine failed when the No. 5 cylinder and piston separated from the engine causing the engine cowl to separate.
- The STC which allowed the aircraft to operate above 8,000 lb. was deficient.
- The FAA did not conduct adequate tests in order to approve STC SA 3630 WE and did not exert adequate management, review and quality controls of the STC.
- The added drag caused by the loss of the cowling and the decreased efficiency of the right propeller made it impossible to maintain level single-engine flight.
- The aircraft was airborne between 4 and 5 min. after the engine failed. The rate of descent after the engine failure was between 340 fpm. and 425 fpm.
- After the engine failed, the captain did not warn or brief the passengers concerning life vests, emergency exits or the developing situation.
- When the captain realized level flight could not be maintained, he decided to fly the aircraft in ground effect.
- Single-engine flight could not be maintained in ground effect.
- The use of life vests would have increased the survival rate.
- The aircraft broke up after touchdown with full power on the right engine; the left wing float struck the water causing the aircraft to cartwheel.
- Company policy and decisions were made by the president, who violated or condoned violations of the regulations in the interest of company objectives.
- Key company managers, supervisors, and licensed employes were aware of falsification of records and violations of approved maintenance procedures and federal regulations.
- N7777V was flown about 22.5 hr. beyond the scheduled inspection time with the knowledge of certain key managers, supervisors and licensed personnel.
- The maintenance program was inadequate because it lacked control and quality standards to insure that an aircraft was airworthy before being released for operational use.
- Maintenance employes knowingly falsified logbooks and presented the logbooks to FAA inspectors during normal FAA surveillance.
- The condition which caused the No. 5 cylinder to fail should have been identified during the inspection process.
- Improper maintenance techniques and training resulted in the right propeller's being reworked in a manner which reduced the efficiency of the propeller.
- FAA surveillance should have detected the improper propeller maintenance and the falsified logbook records.
- FAA surveillance and enforcement were not effective because of the workload of the local inspectors and because FSDO, the area manager, and the Southern Region Flight Standards Div. did not support the local effort.
- The area manager and the Southern Region Flight Standards Div. did not monitor adequately the enforcement and surveillance of the FSDO.
- The FAA Southern Region enforcement process was compromised to the extent that it did not deter violation of the regulations.
- The general manager, Caribbean Airmotive, Inc., was informed that the left engine was not to be considered a reliable, serviceable engine without a complete inspection or overhaul before it was sent to Antilles Air Boats, Inc.
- The left engine was certified serviceable by Caribbean Airmotive, Inc., without an adequate inspection.

Probable Cause. The National Transportation Safety Board determines that the probable cause of the accident was the inability of the aircraft to sustain single-engine flight and the captain's decision to attempt to fly the aircraft in ground effect rather than attempt an open sea emergency landing.

The NTSB finds that single-engine flight was not possible at any altitude because of the drag induced by the loss of the engine cowl, the decreased efficiency of the improperly maintained right propeller and the overgrossed condition which resulted from a deficient FAA supplemental type certificate.

Contributing to the accident were the company's inadequate maintenance program, the management influence which resulted in the disregard of Federal Aviation Regulations and FAA-approved company maintenance policies, inadequate FAA surveillance of the airline and deficient enforcement procedures.

Contributing to the fatalities in this survivable accident was the captain's failure to brief passengers properly on emergency procedures.

Safety Recommendations

As a result of the safety board's investigation, the FAA Southern Region conducted a special investigation of the operations and maintenance procedures of Antilles Air Boats, Inc. The restrictions which were imposed by the FAA included retesting of all Antilles pilots in single-engine emergency procedures, a reduced interval for inspection of aircraft, reorganization of the operations and maintenance programs and a general upgrade of maintenance facilities.

Also as a result of its investigation, the safety board issued these safety recommendations to the Federal Aviation Administration:

. . . on May 4, 1979:

"Require that all aircraft maintenance logbook sheets be numbered consecutively (Class 2, Priority Action) (A-79-11)."

. . . on May 9, 1979:

"Strengthen surveillance and enforcement programs directed toward Part 135 operators to: (1) Provide adequate staffing for FAA facilities charged with surveillance of Part 135 operators; (2) assure uniform application of surveillance and enforcement procedures; and (3) upgrade enforcement procedures and actions in order to provide a viable deterrent to future violations (Class 2, Priority Action) (A-79-31)."

. . . on July 12, 1979:

"Determine the performance data for Grumman G21A aircraft at current operating weights to insure that the appropriate certification requirements can be satisfied (Class 2, Priority Action) (A-79-56).

"Insure that procedures for the proper development, testing, review and quality control for the issuance of supplemental type certificates are complied with in each FAA Region (Class 3, Longer Term Action) (A-79-57)."

On May 17, 1978, the safety board issued Safety Recommendations A-78-37 through -41 in connection with a commuter airline accident which occurred on Sept. 6, 1977. The recommendations are applicable to this investigation; thus, the safety board reiterates that the Federal Aviation Administration should:

"Revise the surveillance requirements of commuter airlines by FAA inspectors to provide more stringent monitoring (Class 2, Priority Action) (A-78-37).

"Identify FAA offices responsible for the surveillance of large numbers of air taxi/commuter operators and insure that adequate inspectors are assigned to monitor properly each operator (Class 2, Priority Action) (A-78-38).

"Review the flight operations and training manuals of all commuter airlines to insure that the requirements of 14 CFR 135 are met and practiced (Class 2, Priority Action) (A-78-39).

"Amend 14 CFR 135.27 to require that flight operations manuals specify: (1) The duties and responsibilities of key management personnel, and (2) positive means to insure the control of flights by company management as well as by the pilots (Class 2, Priority Action) (A-78-40).

"Review the maintenance procedures of air taxi and commuter airlines operators to evaluate the effectiveness of those procedures and to insure adequate company control (Class 2, Priority Action) (A-78-41)."