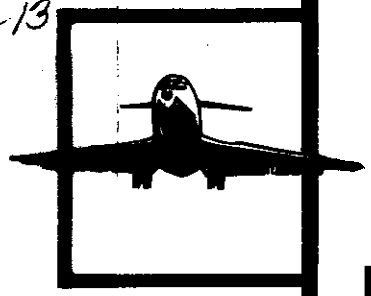

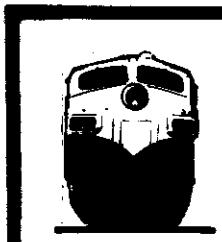

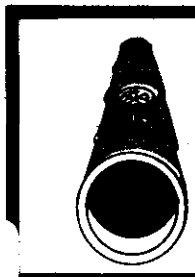

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

SWIFT AIRE LINES, INC.
NORD 262, N418SA
MARINA DEL REY, CALIFORNIA
MARCH 10,1979

NTSB-AAR-79-13

c.1

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15. Supplementary Notes

16. Abstract

About 1752 P.s.t., on March 10, 1979, Swift Aire Lines, Inc., Flight 235, an Aerospatiale Nord 262, N418SA, ditched in the Santa Monica Bay near Marina Del Rey, California, shortly after takeoff from Los Angeles International Airport. Flight 231 was a scheduled commuter airline passenger flight from Los Angeles, California, to Santa Maria, California, with four passengers and three crewmembers on board. Two crewmembers and one passenger died when they were unable to get out of the aircraft.

The National Transportation Safety Board determines that the probable cause of the accident was the flightcrew's mismanagement of an emergency procedure following an autofeather of the right propeller which resulted in their shutting down the remaining engine. Contributing to the accident was the unavailability of vital restart information to the crew.

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

Adopted: August 16, 1979

SWIFT AIRE LINES, INC.
NORD 262, N418SA
MARINA DEL REY, CALIFORNIA
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SYNOPSIS

About 1752 P.s.t., on March 10, 1979, Swift Aire Lines, Inc., Flight 235, an Aerospatiale Nord 262, N418SA, ditched in the Santa Monica Bay, near Marina Del Rey, California, shortly after takeoff from Los Angeles International Airport. Flight 235 was a scheduled commuter airline passenger flight from Los Angeles, California, to Santa Maria, California, with four passengers and three crewmembers on board. Two crewmembers and one passenger died when they were unable to get out of the aircraft.

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1. FACTUAL INFORMATION

1.1 History of the Flight

On March 10, 1979, Swift Aire Lines, Inc., Flight 235, an Aerospatiale Nord 262, N418SA, was being operated as a scheduled passenger flight from Los Angeles, California, to Santa Maria, California.

1

About 1745 P.s.t., 1/ Flight 235 departed the commuter passenger terminal at the Los Angeles International Airport to taxi to the end of runway 24L via the parallel taxiway. The flight was operating on an instrument flight rules (IFR) flight plan; there were four passengers and three crewmembers on board.

1/ All times herein are Pacific standard time, based on the 24-hour clock.

At 1748:11, the crew reported that it was ready for takeoff, and at 1749:04, the flight was cleared to taxi into position on runway 24L and hold. At 1749:34, the tower controller cleared the flight for takeoff and cautioned "possible turbulence, preceding heavy departure. You'll be more than 6 miles in trail." The crew acknowledged the clearance and began the takeoff roll.

At 1750:27, the flight was changed over to the departure control radio frequency. At 1751:08, the crew of Flight 235 reported, "We got an emergency, we are going down." The departure controller asked if the flight wanted to return to land. At 1751:14, the crew replied, "We lost both of them."

Witnesses who were located along the flightpath of the aircraft at the time of the accident stated that when the aircraft lifted off the runway exhaust smoke from both engines was visible, and when the aircraft crossed the departure end of the runway, the right propeller was observed slowing to a stop. As the aircraft crossed the shoreline, popping sounds were heard from the left engine, and the aircraft stopped climbing and turned north paralleling the shoreline. The witnesses did not hear any engine sounds after the aircraft turned parallel to the shoreline. The witnesses also stated that as the aircraft flew north along the shoreline it descended in a wings-level attitude, it contacted the water smoothly, bounced twice, impacted the water in a nosedown attitude, and sank almost immediately.

The flight attendant, who was seated in a rear passenger seat during the takeoff, said that she listened to the crew over the intercom until she heard the gear-up call by the captain and that, until the gear-up call, everything had been normal. At that point, she removed her headset. .Shortly thereafter, she noticed that there was no engine noise, and she looked out of the window. Seeing that the aircraft was over water, she then briefed the passengers on crash landing and ditching procedures. She stated that before the aircraft struck the water, the crew had given her two aural warnings of an emergency landing.

One passenger stated that acceleration was good during the takeoff and climb out to about 300 to 400 ft. He said that shortly after he heard the landing gear go up, he heard a pop, and the right engine lost power and stopped running. This was followed by an increase in power on the left engine, and the aircraft continued to climb momentarily. Then, as it leveled off, the left engine quit. He said it appeared that the captain tried to restart the left engine.

The accident occurred during the hours of dusk. The coordinates of the accident site are 33°27'N and 118°27'W.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Other
Fatal	2	1	0
Serious	0	0	0
Minor/None	1	3	0

1.3 Damage to Aircraft

The aircraft was destroyed.

1.4 Other Damage

None

1.5 Personnel Information

The three crewmembers were trained and certificated in accordance with current regulations. (See Appendix B.)

1.6 Aircraft Information

N418SA, an Aerospatiale Nord 262, was certificated, maintained, and equipped in accordance with Federal Aviation Administration (FAA) requirements. (See Appendix C.)

The maximum allowable takeoff gross weight for the aircraft was 23,370 lbs. The fore and aft center of gravity (c.g.) limits were 12 to 30 percent of the mean aerodynamic chord (M.A.C.). The estimated takeoff weight at Los Angeles was about 19,593 lbs with a c.g. at 22.6 percent M.A.C. At the time of the accident, about 2,200 lbs of Jet A-1 fuel were on board the aircraft. No additional fuel was loaded in Los Angeles. Based on the aircraft weight at takeoff, the V_1 speed and V_2 speed for a no-flap takeoff would have been 97 kns and 100 kns, respectively.

1.7 Meteorological Information

The surface weather observations for the Los Angeles International Airport, Los Angeles, California, were as follows:

1751: sky condition--18,000 ft scattered, 25,000 ft scattered; visibility--14 mi; temperature--57°F; dewpoint--51°F; wind--250° at 8 kns; altimeter setting--30.15 in.

1800: sky condition--18,000 ft scattered, 25,000 ft scattered; visibility--12 mi; temperature--56°F; dewpoint--51°F; wind--260° at 6 kns; altimeter setting--30.16 in.

1.8 Aids to Navigation

Not applicable.

1.9 Communications

There were no reported communications difficulties.

1.10 Aerodrome Information

Runway 24L at Los Angeles International Airport is constructed of an asphalt-concrete composition. It is a grooved surface and is 10,285 ft long and 150 ft wide. The elevation at the approach end is 111 ft above m.s.l.; there is an average downhill gradient of 0.12 percent toward the departure end.

1.11 Flight Recorders

The aircraft was not equipped with a cockpit voice or a flight data recorder; neither was required.

1.12 Wreckage and Impact Information

The aircraft hit the water with the landing gear retracted-and the wing flaps extended to 35°; the aircraft bounced twice and came to rest in about 18 ft of water. The aircraft sank almost immediately in a nose-low attitude. The wings and tail remained above water. The extent of structural damage sustained by the aircraft as a result of impact forces could not be determined fully because the aircraft was damaged extensively during rescue efforts and during recovery of the wreckage.

Photographs taken before the wreckage recovery effort show the cockpit area partially separated from the fuselage near the production break located slightly forward of the emergency exit windows. (See figure 1.) From this production break rearward, the aircraft remained intact. The front, center, and aft fuselage underside structure was not visible in the photographs and was not examined before wreckage recovery commenced; therefore, impact damage to this structure could not be determined with any degree of certainty.

The following pertinent data derived from the wreckage are considered to be reliable:

- o Flap setting--35°
- o Landing gear position--retracted
- o Right fuel firewall shutoff valve--closed
- o Left fuel firewall shutoff valve--three-fourths open
- o Cockpit rotary checklist--climb checklist (landing gear item)

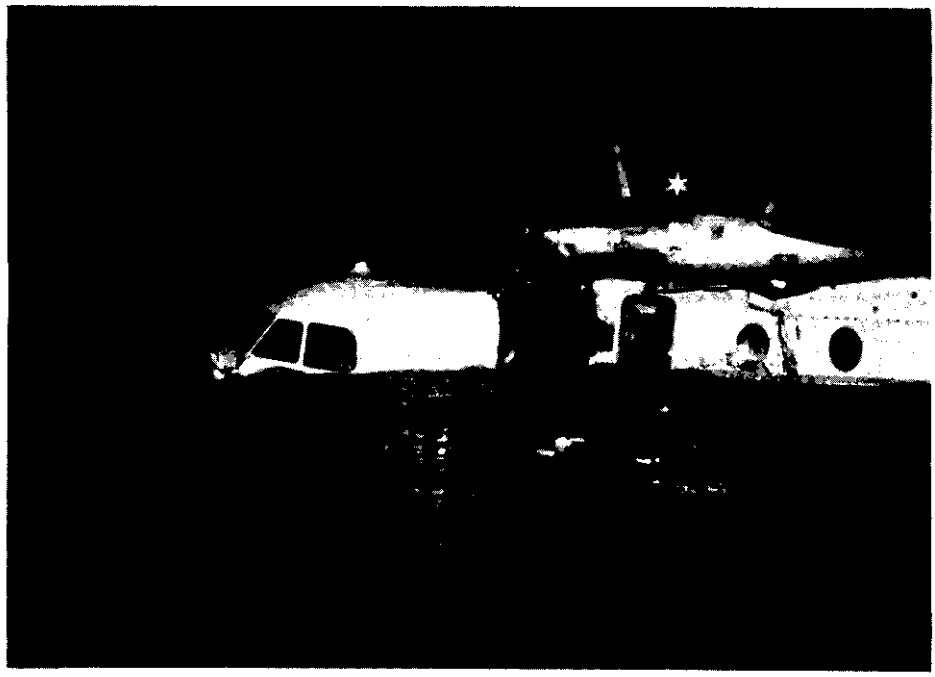

Figure 1. Aircraft wreckage before recovery from the surf. Note that the cockpit area has separated from the remainder of the aircraft.

Both engines and propellers were still attached to the aircraft. The right propeller was in the full feather position, and the left propeller was in the flight fine pitch position. One blade tip on each propeller was curled rearward slightly. Both engines and associated propeller system components were removed from the aircraft and shipped to the Turbomeca Factory in France for disassembly and examination. A broken rubber hose that connected the propeller pressure pitot mast to the right autofeather selector was examined at the U.S. Bureau of Standards.

1.13 Medical and Pathological Information

Postmortem and toxicological examinations of the flightcrew disclosed no evidence of factors which would have affected its ability to operate the aircraft.

Autopsies of the two crewmembers and one passenger disclosed that each had died from drowning. The captain suffered the only traumatic injury; a fractured right femur.

The flightcrew's medical records revealed no evidence of medical problems that might have affected crew performance. The captain held waiver No. 40637415 for amblyopia - defective distant vision.

1.14 Fire

There was no fire.

1.15 Survival Aspects

This was a survivable accident. The structural integrity of the aircraft was compromised when the fuselage partially broke open, in the area of the first row of seats, on impact with the water. This break in the structure allowed water to enter the aircraft rapidly and limited the time available to successfully evacuate the aircraft.

None of the aircraft interior components were reported to have loosened during the ditching, except the seat cushions (flotation devices) that were seen floating on the water. The aircraft was equipped with an emergency lighting system. Additionally, there were no reported restraint system failures in the cabin, and the captain's restraint system was still attached when he was removed from the wreckage. The first officer's seatbelt and shoulder harness were not connected; however, there was no evidence of any failure, The passenger who drowned was not restrained in her seat; however, her seatbelt was reportedly fastened at the start of the takeoff. She was found in the cabin.

Before the plane hit the water, the flight attendant briefed the passengers in ditching and crash-landing procedures which included directions on how to get out of the aircraft. When the aircraft came to rest in the water, the flight attendant and a passenger opened the main cabin entry door and assisted two passengers out of the aircraft. Once outside the aircraft, the flight attendant saw one of the passengers on the wing. She notified persons at the crash scene that three persons were still in the aircraft. The passenger that was seen on the wing left the plane through the break in the forward fuselage. Because of the extensive destruction to the cockpit during the wreckage recovery, the Safety Board could not determine why the flightcrew did not get out of the aircraft. The two pilots as well as the fatally injured passenger reportedly knew how to swim.

As the occupants evacuated the aircraft, they were picked up by pleasure boats in the area. When Coast Guard and Harbor patrol boats arrived, all of the survivors had been rescued from the water. Initial attempts to rescue the remaining occupants of the aircraft were unsuccessful, and it was several hours before they were removed from the aircraft.

1.16 Tests and Research

1.16.1 Powerplants and Propellers

The Safety Board examined the engines at the Turbomeca factory in Tarnos, France, on April 11, 1979. The magnesium-constructed components of both engines, which did not have a protective coating, featured extensive seawater corrosive-type damage.

All of the reduction and accessory drive gears of both engines were intact and undamaged; none of these gears were rubbed or marked rotationally.

Both engines' axial and centrifugal compressors were intact and undamaged; no rotational rub marks were found on either assembly. There was no evidence of fire or overheat.

The rotating and stationary components of the second- and third-stage turbine assemblies of both engines were intact and undamaged. None of these components had any evidence of rotational contact marks. All bearings in both engines were intact, undamaged, and rotated freely. All components in the propeller feathering pumps and propeller governors of the left and right propellers were intact and undamaged, except for the effects of seawater corrosion and sand deposits. All components installed within the propeller autofeather selectors of the left and right propellers were intact and undamaged, except for the effects of seawater corrosion.

The autofeathering selector cases and the pressure sensing unit diaphragms were pressure checked for leaks. There was no evidence of leakage in these components.

1.16.2 Examination of Damaged Propeller Pitot Air Pressure Line

The failed section of the right propeller pitot pressure line was submitted to the National Bureau of Standards for analysis to determine whether it failed before the autofeather of the right engine or if it failed as a result of the accident.

While the test results were inconclusive, they did show that the hose had deteriorated due to contact with hydrocarbon fuel or solvent and was susceptible to a spontaneous rupture or leak.

1.16.3 Special Investigation of Nord 262 Inadvertent Autofeathers

After the powerplant inspection of the Swift Aire Nord 262 engines in France, the Safety Board learned of a meeting that was held at the French Embassy in Washington on March 2, 1979, during which time Ransome Airlines, a Nord 262 operator reported that they had experienced **50** to 60 inadvertent autofeathers. This meeting resulted in a lengthy telegram to the French Aviation Authorities and a followup meeting between Aerospatiale, Ransome, and Altair Airlines, another Nord 262 operator. Aerospatiale concluded from its data that there was no problem with the autofeather system. In an effort to determine the significance of the problem, the Safety Board conducted a special investigation at the Ransome Airlines facility in North Philadelphia, Pennsylvania, on May 25, 1979. The 50 to **60** reported autofeathers could not be substantiated. Twenty inadvertent autofeathers were reported for

the time period September 1, 1978, to May 25, 1979. (See Appendix E.) None of these reported problems were entered into the FAA Service Difficulty Report Program. The Safety Board was informed by the FAA principal maintenance inspector assigned to Ransome Airlines that these problems were not required to be reported since they did not occur in flight. Swift Aire Lines reported only one inadvertent autofeather during the same time period. The accident aircraft did not have a history of autofeather problems.

Autofeather Propeller Pressure Hose Inspection:

During the investigation, the Safety Board found that the autofeather propeller pressure hoses are pressure checked at each engine visually inspected every 275 hrs. Ronsome Airlines indicated that these inspection cycles mean that the hoses are pressure checked about once every 10 months.

Before the accident, Swift Aire pressure checked the hoses once every 1,000 hrs. The hoses on the accident aircraft were last inspected 833.2 hrs before the accident. Swift Aire now pressure checks the hoses once every 1,000 hrs and visually checks them once every 500 hrs.

Engine Runups:

As a result of the problems experienced with the autofeather system, Ransome Airlines initiated engine runups and autofeather checks before the first flight of the day, when the temperature is below 32°F. Several of the above-mentioned autofeathers were identified during these runups.

Hose Life:

The hoses are condition change items. This could mean that they are not changed until they cause an inadvertent autofeather. Swift Aire now changes the hoses once every 5 years. Aerospatiale service letter 5-2, January 23, 1979, specifies an operational life of 12 years for the hose.

1.16.4 Nord 262 Takeoff and Climb Performance

A performance study of Flight 235's takeoff, climb, and descent was conducted to identify the differences between expected performance and the aircraft's actual reported performance.

The Los Angeles TRACON 2/ recorded ARTS-I11 3/ data (time, location, and altitude) for Flight 235 during the climb to 700 ft and descent through 300 ft. (See figure 2.) During the 32-sec climb from 200 to 700 ft, the groundspeed averaged 145 kns (150 KIAS). The average groundspeed during 10 sec of level flight at 700 ft was 110 kns (115 KIAS). The average groundspeed decreased to 103 kns (108 KIAS) during the 18-sec descent to 300 ft. The average rate of descent was 1,270 f.p.m. The estimated time from 700 ft to impact was 32 sec.

After the accident, the two-engine climb performance was recorded for six similarly loaded Nord 262 flights. (See figure 2.) These aircraft gained about 800 ft of altitude at the end of the runway and 1,200 ft at the shoreline. The expected single-engine climb performance data were extracted from the Nord 262 performance manual. (See figure 2). For Flight 235's takeoff conditons, the calculated single-engine climb gradient was 310 ft per nautical mile. This would mean that the aircraft should have crossed the departure end of the runway at an altitude of about 550 ft, or 250 ft higher than its actual crossing altitude.

The recorded ATC radar data and voice communications between the flight and the Los Angeles departure controller were correlated based on the crew transmission, "...we got an emergency two thirty-five, we're going down." Investigators assumed that this transmission was made when the aircraft reached 700 ft. During the 10-sec interval that the aircraft was at 700 ft, the crew transmitted, 'We lost both of em." The aircraft immediately began to descend.

1.16.5 Special Engine Restart Requirements

During a technical review meeting held to discuss the facts, conditions, and circumstances of the accident, the following important points regarding airborne engine restarts were identified. These data were not contained in the Nord 262's flight manual.

1. Once an engine has been shut down, it is possible to restart in the air in 9 to 10 sec.

2. Once the electric fuel shutoff valve has been energized to the closed position, it cannot be stopped or reversed by power lever application. It can only be reopened by making a normal engine start.

2/ Terminal radar approach control (TRACON). An FAA air traffic control facility using radar and air/ground communications to provide approach control serices to aircraft arriving/departing or transiting the airspace controlled by the facility.

3/ Automated Radar Terminal System (ARTS). ARTS III detects, tracks, and predicts secondary radar derived aircraft targets. These are displayed by means of computer generated symbols and alphanumeric characters depicting flight identification, aircraft altitude, and flight plan data.

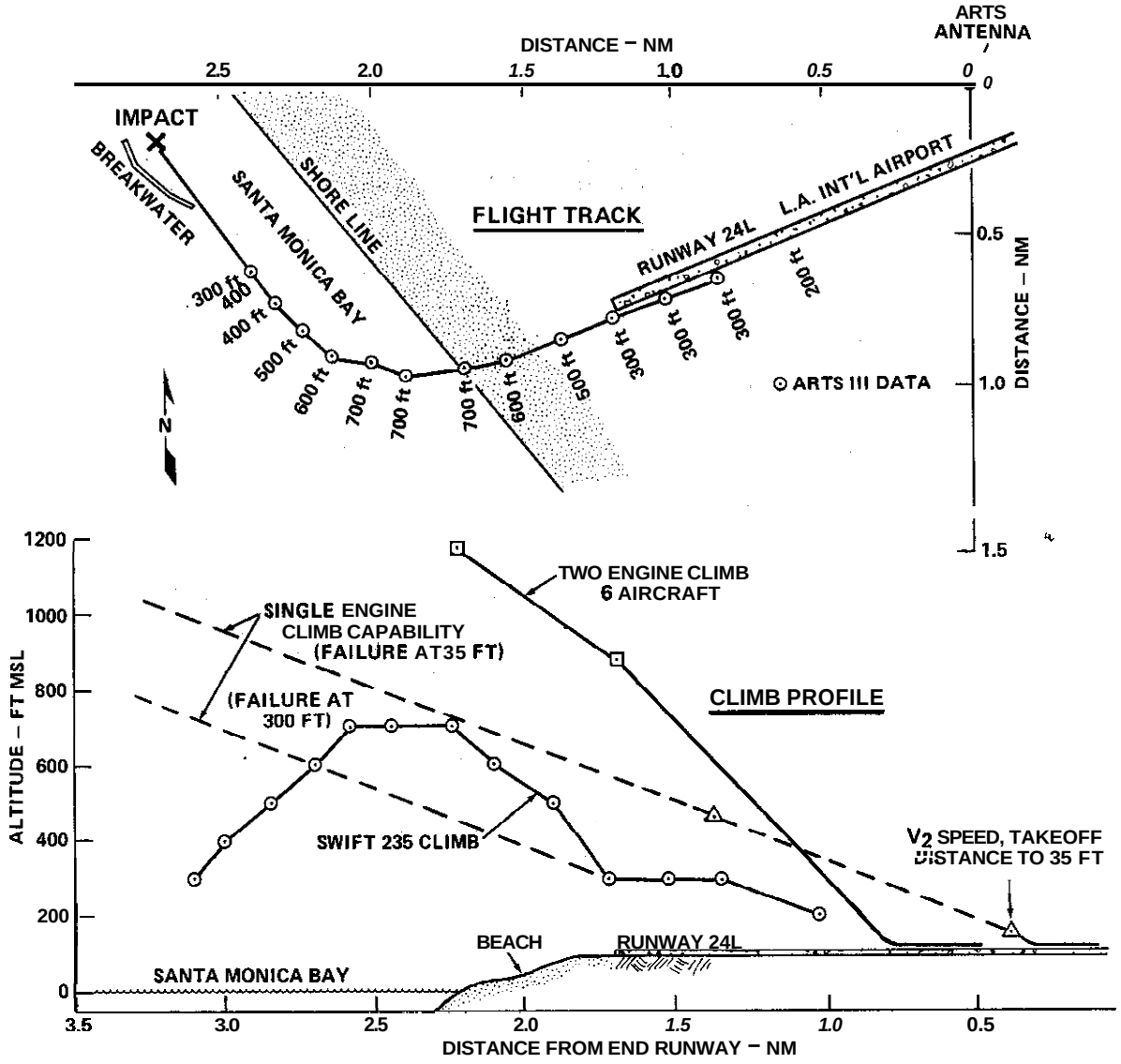

Figure 2. Flight track and climb profile Swift Aire Lines, Inc., N418SA, Los Angeles, California, March 10, 1978.

3. To restart an engine while airborne, the propeller must first be feathered and the normal engine start sequence initiated.

1.17 Additional Information

1.17.1 Swift Aire Nord 262 Operations Manual Excerpts

Propeller Controls

The propeller controls are located to the right of the captain's power levers (on the pedestal) and are not duplicated. During its travel, each lever actuates a rack and pinion system causing movement of a slide valve in the propeller governor. At the top of each lever is a warning light. When illuminated, it indicates that the corresponding propeller has been feathered and that the propeller lever should be moved to the feather position (full aft) to manually lock the prop governor in the feather position.

Auto Feather System

The purpose of the automatic feathering system is to free the pilot from all the manual feathering operatdons when an engine failure occurs at take-off.

Its operation is based on the difference between the ram air pressure existing aft of the propellers and the ambient ram air pressure.

The system consists of an air system and an electrical system.

Auto Feather System

This system includes:

Three pitot tubes, one of which is installed on the fuselage in front of frame A and gives the total pressure (+P), the other two are installed on the top of the engine nacelles behind the propeller rotation area and give the pressure due to propeller rotation (pP).

Two independent systems, +P and pP, supply pressure to the two automatic feathering capsules which are located on either side of the fuselage center line.

Auto Feather Electrical System

There are two independent electrical auto feathering systems, one for each engine. Both systems are identical in terms of components and operation. The system can only be armed with the engine running at takeoff power.

In case of power drop during take-off, the green light related to the failed engine comes off, the capsule directs an electric signal to the electric feathering pump and closes the fuel shut-off valve. This stops any power delivered by the turbine, which stops, gradually braked by the propeller. This sequence takes 8 seconds to be completed. When one propeller has been feathered, the automatic feathering system of the other propeller is automatically disconnected.

Note: In case of manual or automatic feathering, the fuel shut-off valve closes automatically. This is duplicated by a relief valve which cuts-off instantaneously, the fuel supply to the engine during closing of the fuel shut-off valve.

NORMAL OPERATING PROCEDURES ABBREVIATED CHECKLISTS

CLIME CHECKLIST

1.	#Landing gear	-UP
2.	#Flaps	-Up
3.	#Water/methanol pumps	-Off
4.	#Pressurization	-Set
5.	Boost Pumps (one pair)	-Off
6.	#Auto-feather	*Off
7.	A.C. selector switch	-Alternator
8.	No Smoking Sign	*As Required
9.	#Landing lights	*As Required
10.	#Windshield Heat	*As Required

EMERGENCY PROCEDURES

GENERAL

The urgency of certain emergencies such as fire require immediate and instinctive actions by the crew. These checklist items are in bold print and will be memorized by the crewmember. During an emergency, the Captain will call out the bold print items and the applicable crewmember, as indicated after each checklist item, will take the necessary action. Following completion of the bold print items, the remaining portions of the checklist will be completed as soon as time permits.

ENGINE FAILURE/FIRE IN-FLIGHT

GENERAL

Engine failures are caused by many different malfunctions which may or may not result in a fire. It is good operating practice to treat all engine failures as potential fires. This checklist is based on that premise and all nine checklist items must be committed to memory. After a power failure or engine fire occurs, maintain controlled flight. Hold the aircraft straight and level and determine which engine has failed by observing fuel flow, EGT and torque. Visually check engine for fire and check fire warning light. The auto-feather circuit, when armed, will feather the propeller if a power failure occurs. When positive identification is made of failed engine or engine fire, proceed as follows:

SPECIAL EMERGENCY PROCEDURES

AUTOMATIC FEATHERING

1. Approximately 8 seconds after the propeller starts to feather, the feathering completed light (amber on top of prop lever) comes on.

2. Operation of the feathering completed light indicates to the pilot that the feathering cycle has been completed and that he should do the following:

   a) Set the engine power lever to STOP.

   b) Set the propeller control lever to FEATHER.

   c) Turn the automatic feathering switch OFF.

DITCHING

Before impact:

a) Feather both propellers

b) Close fuel valves

c) Cut the grouped master switches by pushing down bar

d) Hit the water at IAS 85 kts.

NORD 262 EMERGENCY PROCEDURES CHECKLIST

ENGINE FAILURE/FIRE IN-FLIGHT

CHALLENGE	RESPONSE	
1. FEATHER BUTTON	DEPRESS	(CP)
2. POWER GEAR 6 FLAPS	AS REQUIRED	(CP)
3. POWER LEVER	CUT-OFF	(CP)
4. PROP LEVER	FEATHER POSITION	(CP)
5. FUEL ISOLATION VALVE	CLOSED	(CP)
6. FUEL BOOST PUMPS	OFF	(CP)
7. HYDRAULIC PUMP	OFF	(CP)
8. ENGINE FIRE EXTINGUISHER	STANDBY FOR FIRE	(CP)
9. SINGLE ENGINE CLEAN-UP CHECKLIST	STANDBY	(CP)

RESTARTING ENGINE

CHALLENGE	RESPONSE	
1. Feather Circuit Breaker	Checked In	(CP)
2. EGT	Below 200°	(P)
3. Fuel Isolation Valve	Open	(CP)
4. Fuel Boost Pump	On	(CP)
5. Hydraulic Pump	ON	(CP)
6. Start Clear Switch	Start	(CP)
7. Prop Control Lever	Max RPM	(P)
8. Power Lever	Green Light	(P)
9. Starter Button	Depress	(CP)
10. Feather Button	Monitor	(CP)
CAUTION: Maximum engine windmill time is 15 seconds.		
11. AVM 6 Engine Instruments	Checked	(P 6 CP)
12. Starter Cut Out	Out at 45% or RPM	(P)
13. RPM Stabilized	Stabilize	(P)
14. Generator	ON	(P)
15. Alternator	ON	(CP)
16. Alternator Manual Transfer	Off	(CP)
17. P-2 Valves	Open	(CP)
18. Engine Deicing	As Required	(CP)

1.17.2 Revised Swift Aire Nord 262 Operations Manual Excerpts- Revised After the Accident

ENGINE FAILURE/FIRE IN-FLIGHT

GENERAL

With the auto feather system armed during takeoff, the propeller will feather automatically if a power failure occurs. If an auto feather occurs prior to V_1, the takeoff will be aborted and the aircraft stopped on the runway. If it occurs after V_1, the takeoff will be continued and a climb established at V_2. If an engine fire is not present in the failed engine, only the first two check list items will be immediately accomplished. Primary emphasis must always be given to maintaining controlled flight.

When the aircraft reaches a safe altitude to circle and land, the Captain and First Officer will carefully identify the failed engine by observing fuel flow, egt. torque and RPM. The remaining seven check list items will then be performed slowly and deliberately on the failed engine using extreme caution not to retard the power lever or close the fuel isolation valve on the good engine. The pilot flying the aircraft will guard the power lever of the good engine and will carefully monitor and cross-check the engine shut down. To retard the wrong power lever or close the wrong fuel isolation valve will result in a double engine failure with insufficient altitude to accomplish a relight.

NOTE: A minimum of 2,000 feet of altitude above the terrain is required to accomplish a relight after both engines have failed.

WARNING: Prior to completion of the full engine shut-down check list and prior to placing the prop lever in the full aft position it is possible for the propeller of the failed engine to start rotating and come out of feather. If this occurs, it will be necessary to momentarily depress the feather button of the failed engine to re-feather the propeller. Caution must be used to insure that the wrong feather button is not depressed.

When an engine fire is confirmed at takeoff or at any time during flight, it will be necessary for the crew to accomplish all nine check list items as soon as possible. Great care must be used in running the check list and accomplishing feathering and shut-down of the engine fire or failed engine. The pilot flying the aircraft will guard the power levers of the good engine and will carefully cross-check and monitor the shut-down of the engine fire or failed engine.

WARNING: Before accomplishing the following check list items, the failed engine must be positively identified. Engine shutdown procedures must be carefully cross-checked by both pilots and shutdown procedures accomplished only on the engine fire or failed engine. To close the wrong power lever, pull back the wrong prop lever or close the wrong fuel isolation valve will result in a double engine failure.

1.18 New Investigative Techniques

None.

2. ANALYSIS

General

The aircraft was certificated, equipped, and maintained in accordance with applicable regulations and approved procedures. The gross weight and c.g. were within prescribed limits. Meteorological conditions were excellent and did not adversely affect the flight.

The pilots were properly certificated and had received the training and off-duty time prescribed by applicable regulations. There was no indication of any preexisting medical problem that would have affected the crew's performance of their duties. Although the captain had a waiver for defective distant vision in the left eye, no evidence was found to suggest that his defective vision contributed to the accident.

The Engine Shutdown Sequence

Based on passenger and witness statements and the position of the cockpit rotary checklist, the Safety Board concludes that after the landing gear retraction following takeoff, the right propeller feathered inadvertently, and the engine ceased to operate. The flight profile derived from radar data supports the Safety Board's conclusion because it shows that the aircraft never achieved two-engine climb performance after takeoff. Since the engine ceased operation before the autofeather system was disarmed as part of the climb checklist, the engine shutdown probably was the result of a propeller autofeather.

Within seconds after the right propeller autofeathered, the left engine ceased operation. The evidence shows that the left propeller was not feathered after engine shutdown but continued to windmill in the flight fine pitch position until the aircraft impacted the water.

Engine Examination

Disassembly and examinations of both engines established that there was no evidence of failure or malfunction and that both engines were capable of normal operation. Since there was no evidence to contradict the presumption that the pilots did not purposely shut down both engines, the shutdowns must be considered inadvertent.

Because the first event in the accident chain was an autofeather of the right propeller, the possible reasons for an autofeather were examined. The right engine electric fuel shutoff valve was found in the closed position, indicating that either the power lever had been placed in the off position, the propeller had been feathered, or the valve had failed. A detailed inspection showed that the valve was not defective, and no engine condition was found to support a need for intentional feathering. Therefore, although the final position of the power lever is not known, the Safety Board believes that the valve was most probably closed during an autofeather sequence.

Detailed examinations of the fuel control and the feathering pump established no evidence of failure or malfunction. Although the propeller relay box was not recovered, the fact that the left propeller was found in the flight fine pitch position (a selection function of the relay) and the fact that both propellers did not autofeather (a selector function), indicate that at least part of the relay functioned normally. However, because the relay was not recovered, the Safety Board could not eliminate the possibility that the relay box malfunctioned.

The remaining system components that could cause a propeller to autofeather are the autofeather selector or the propeller pressure input to the selector. The selector was found to be operable and the pitot mast that senses propeller pressure was free of obstructions. However, the rubber air line that connects the pitot mast to the selector was broken and the material badly deteriorated. The deterioration weakened the line so that it could have failed at any time. If the line was broken or leaking at the start of the takeoff roll, the propeller would have autofeathered immediately. Since it did not, the break could have occurred during the takeoff roll or when the aircraft hit the water. Moreover, a leak could have developed during the takeoff roll. Although the Safety Board could not determine conclusively when the hose failed, a leak in the deteriorated hose was considered to be the most plausible reason for the autofeather of the right propeller.

Before the accident, the propeller pressure hoses were a conditon change item. This would mean that if a problem was not detected during an inspection, the hose might not be changed until it caused an inadvertent autofeather. After the accident, the company maintenance procedures were changed, and the hoses are now changed 5 years from the manufacture date of the hose.

A disassembly and examination of the left engine and propeller system established that there was no evidence of an engine malfunction or failure that would cause the engine to shut down in flight. Although fuel contamination could have caused the engine to shut down, the aircraft was not refueled in Los Angeles and had flown without problems from Santa Maria to Los Angeles. The Safety Board, therefore, concludes that contaminated fuel was not a factor. In view of the lack of evidence to support a failure of the left engine, the Safety Board considered the factors that might possibly cause the crew to shut down the remaining engine.

Under the circumstances, an engine fire or false indication of a fire would warrant a shutdown of the remaining engine. However, the fire bottle was not fired, and there was no evidence of fire or overheat conditions. Therefore, the Safety Board concludes that the left engine was not shut down because of an actual or false indication of fire.

An automatic engine vibration monitor alert might cause the crew to shut down an engine in flight; however, it would not be a sufficient reason to shut down the only operating engine. Moreover, there was no evidence within the engine that such a conditon existed. Therefore, the Safety Board concludes that the condition of the aircraft's airframe, engines, and instruments were not factors in the accident.

Pilot Involvement

Based on the evidence, the Safety Board concludes that the only remaining alternative is that one of the pilots erroneously shut down the left engine and could not restart it. Most probably, the captain was flying the aircraft. According to company policy, pilots alternate flight segments, and the first officer had flown the flight segment from Santa Maria to Los Angeles. Additionally, most of the recorded radio transmissions were made by the copilot which indicates that he was not flying the aircraft.

The Swift Aire Lines company procedures specify that the pilot who is flying the aircraft calls off the procedural actions during an emergency and that the nonflying pilot performs the specified actions. For an autofeather emergency, the procedures specify that when the feathering completed light comes on (8 sec after the feathering cycle is initiated), the power lever is to be placed in the stop position, and the propeller control lever is to be moved to the feather position. In the accident situation, these actions normally would have been performed by the copilot (the nonflying pilot).

The copilot's side of the center pedestal has a set of power levers, but they cannot be placed in the off position. Therefore, to perform the specified actions following an autofeather emergency, the copilot must reach across the center pedestal and use the captain's power and propeller control levers. This action would probably not cause confusion because these control levers are readily accessible to the copilot; however, the possibility exists that the flightcrew did not properly identify the failed engine as the right engine before the left power lever was placed in the stop position. If this occurred, the left engine would have ceased operation. The left engine's electric fuel shutoff valve was found in the off position, which means that at some point, the left power lever was placed in the stop position. The Safety Board believes that this occurred after the right propeller autofeathered rather than during preparation for the aircraft ditching. The ditching procedure specifies that the propellers are to be feathered and does not mention the power levers. If the flightcrew had performed the ditching checklist before impact, both propellers would have been feathered.

The aircraft operations manual emergency procedures for an autofeather or engine failure did not contain any guidance for the pilot alerting him to the importance of positively identifying the failed engine before placing the power lever in the off position. Additionally, the autofeather emergency procedure implied that immediately following the completion of the feathering cycle, the power lever should be placed in the stop position. The Safety Board questioned these procedures during the investigation and subsequently the manual was changed.

The engine failure emergency procedure was changed to contain a warning to positively identify the failed engine before taking corrective action. Additionally, the manual was revised to emphasize that securing the engine after its failure on takeoff should be done after a safe altitude has been reached for the aircraft to circle for a landing. The Safety Board believes that these procedural changes should eliminate confusion and help prevent an inadvertent engine shutdown when performing emergency actions following an autofeather.

Once the left engine's electric fuel valve was closed, the only way that the valve could be reopened was by operation of the appropriate controls through a normal engine start cycle. One passenger observed what appeared to be an unsuccessful restart attempt. This would have been a normal reaction if the engine had been inadvertently shut down; however, the attempted restart was unsuccessful because the crew did not feather the propeller before attempting the restart.

The aircraft operations manual states that battery engine starts can take up to 45 sec. This is not the case for an airborne start attempt. The Safety Board determined that an airborne restart

takes **9** to **10** sec. Since crew training included actual engine restarts after a propeller had been feathered, the crewmembers should have known this information even though it was not contained in the aircraft operations manual. Therefore, the crew would have had enough time to get a restart and avoid ditching if the inadvertent engine shutdown had been recognized immediately and the propeller had been feathered before the restart attempt.

The aircraft's operations manual does not specify that feathering the propeller is a prerequisite to getting an airborne restart and does not contain any information regarding the time required to get an airborne restart. Additionally, engine shutdowns during crew training include feathering the propellers since engine out procedures are practiced, and all restarts are made from the feathered condition. Crew training does not include engine restarts following the inadvertent shutdown of an engine with the propeller unfeathered. Based on the available evidence, the Safety Board concludes that the flightcrew of Flight 235 probably did not know that propeller feathering was a prerequisite to a successful airborne engine restart. Such information is vital to the safe operation of the aircraft.

Survivability

The aircraft was ditched in the water about **30** sec after the left engine ceased operation. During that time, the flightcrew signaled to the flight attendant that an emergency crash landing was imminent, and she was able to brief the passengers before water impact.

Although an accurate assessment of the impact and deceleration forces could not be made, the forces were of sufficient magnitude to cause a break in the fuselage and to cause the flight attendant to jackknife and hit her head on the floor.

Once the aircraft came to rest in the water, survivability was dependent on the time interval before sinking, the speed with which the occupants exited the aircraft, and their timely rescue by several small boats in the area.

Once the fuselage opened, the cabin filled with water rapidly. Since the aircraft sank in about **18** ft of water almost immediately after impact, the cockpit crewmembers were probably trapped in the cockpit by the rapid rush of water. Postmortem examinations disclosed that they died from drowning. Although personal flotation devices (seat cushions) were seen floating in the vicinity of the wreckage, there were no reports of their use by any of the survivors.

In addition to the flightcrew, a female passenger also drowned. She was found out of her seat. The Safety Board believes that due to the rapid rush of water and the probable low level of illumination in the cabin that would have been present at night under water even with operable emergency lights, the passenger became disoriented and was not able to find an exit.

3. CONCLUSIONS

3.1 Findings

1. The aircraft was certificated and maintained according to approved procedures.

2. There was no evidence of a malfunction or failure of the aircraft's structure, flight instruments, or engines that would have affected the performance of the aircraft.

3. The accident was survivable.

4. All crewmembers were certificated and qualified for the flight.

5. Shortly after landing gear retraction, the tight propeller autofeathered and the engine shut down.

6. The right engine shutdown was followed closely by the shutdown of the left engine.

7. A leak or break in the propeller pressure line to the autofeather selector probably caused the right propeller to autofeather and the engine to shut down.

8. The left engine was shut down inadvertently.

9. The left engine probably was shut down because the flightcrew failed to properly identify the engine on which the autofeather occurred and moved the left power lever to the stop position.

10. A possible restart attempt was not successful because the flightcrew was probably unaware that feathering the propeller was a prerequisite to a successful airborne restart.

11. The engine restart procedures contained in the aircraft operations manual did not contain sufficient information to effect a restart from an unfeathered condition.

12. After the left engine was shut down, there was enough altitude and time available for the crew to get a restart.

13. The fatalities occurred when the crewmembers and passenger became trapped or disoriented, or both, by the fast, rushing water that entered the aircraft after it was ditched in the Santa Monica Bay.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the flightcrew's mismanagement of an emergency procedure following an autofeather of the right propeller which resulted in their shutting down the remaining engine. Contributing to the accident was the unavailability of vital restart information to the crew.

4. SAFETY RECOMMENDATIONS

None

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ PATRICIA A. GOLDMAN
Member

/s/ G. H. PATRICK BURSLN
Member

FRANCIS H. McADAMS, Member, did not participate.

August 16, 1979

5. APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The Safety Board was notified of the accident about 1800, on March 10, 1979. The investigation team went immediately to the scene. Working groups were established for operations/witnesses/air traffic control, structures/systems/powerplants/maintenance records, and human factors.

Participants in the on-scene investigation included representatives of the Federal Aviation Administration, Aerospatiale, Turbomeca, French Inspector General of Civil Aviation, and Swift Aire Lines, Inc.

2. Public Hearing

No public hearing or depositions were conducted.

APPENDIX B

PERSONNEL INFORMATION

Captain Phillip E. Felig

Captain Felig, 43, was employed by Swift Aire Lines, Inc., on February 26, 1977. He was upgraded as a captain on the Nord 262 on February 21, 1978. His last proficiency check on the Nord 262 was completed on August 22, 1978. He was also qualified as a DH-114 captain. He held airline transport pilot certificate No. 1601195 with a Nord 262-type rating issued February 18, 1978. He had a first-class medical certificate dated October 9, 1978, with the limitation "Holder shall wear lenses for near and distant vision while exercising the privileges of his airman certificate." He also held waiver No. 40637415 for amblyopia-defective distant vision.

Captain Felig had accumulated 8,500 flying hrs, 879 hrs of which were in the Nord 262 and 1,154 hrs of which were in the DH-114. He had logged 276 hrs, including 228 hrs in the Nord 262 in the last 90 days. He was assigned as a proficiency-line check pilot on October 15, 1978. He had been on duty 9.1 hrs in the 24 hrs preceding the accident.

First Officer John W. Seszko

First Officer Seszko, 38, was employed by Swift Aire Lines, Inc., on November 18, 1976. His last proficiency check in the Nord 262 was completed on October 10, 1978. He completed his initial training in the Nord 262 on October 12, 1978. He was also qualified on the DH-114. He held airline transport pilot certificate No. 1714040 with ratings for airplane single-engine, multiengine, land, and commercial privileges. He had a first-class medical certificate dated May 5, 1978, with no limitations.

First Officer Seszko had accumulated 5,600 flying hrs, 424 hrs of which were in the Nord 262 and 1,870 hrs of which were in the DH-114. He had logged 272 hrs in the Nord 262 in the past 90 days. He had not flown the DH-114 in the previous 90 days. He had been on duty 10.1 hrs in the 24 hrs preceding the accident.

Flight Attendant Linda Riedel

Flight Attendant Riedel, 26, was employed by Swift Aire Lines, Inc., in September 1978. She completed 2 weeks of initial training before flying as a crewmember. She was upgraded to the Nord 262 in November 1978, and was dual qualified on both the Nord 262 and the DH-114.

APPENDIX C

AIRCRAFT INFORMATION

The aircraft, N418SA, was an Aerospatiale Nord 262-A33. It was manufactured in 1967. The total airframe hours since new was 11,300. The last line maintenance had been accomplished 130 hrs before the accident.

N418SA was powered by two Turbomeca Bastan V1-CL turboprop engines. Pertinent engine data are as follows:

Position	Serial No.	Total Time (Hrs)	Hours Since Overhaul
1	313	7,494.0	2,065.1
2	186	7,883.5	1,716.7

APPENDIX D

SWIFT AIRE ACCIDENT

PERTINENT ATC TRANSMISSIONS

TIME	IDENT.	
1748:11	SWT 235	and swift aire two thirty five in sequence
1749:04	LAX LC-2	swift aire two thirty five runway two four left taxi into position and hold
1749:07	SWT 235	swift aire two thirty five
1749:34	LAX LC-2	swift aire two thirty five los ah caution possible turbulence preceding heavy departure you'll be more than six miles in trail clear for takeoff
1749:40	SWT 235	swift aire two thirty five's rollin
1750:27	LAX LC-2	swift aire two thirty five contact departures one two five point two good day
1750:31	SWT 235	swift aire uh two thirty five
1750:46	SWT 235	and departures swift aire two thir
1750:53	LAX DR-2	swift aire two thirty five los angeles departure control radar contact turn right heading two eight zero when receiving suitable cleared direct ventura maintain six thousand
1751:08	SWT 235	ah we got an emergency two thirty five we're goin down
1751:12	LAX DR-2	you want to return to land
1751:14	SWT 235	we lost both of em
1751:15	LAX DR-2	o k
1751:17	LAX DR-2	can you stop that cessna
1751:19	LAX LC-2	ah cessna eight hotel juliet can you cancel your takeoff clearance sir
1751:24	LAX DR-2	swift aire is landin on the beach
1751:25	LAX LC-2	o k
1751:31	SWT 235	we're goin down
1751:32	LAX DR-2	o k you gonna land on the beach
1751:34	SWT 235	(unintelligible) the water
1751:35	LAX DR-2	o k

APPENDIX E

RANSOME AIRLINES INADVERTENT AUTOFEATHERS AND DISCREPANCY REPORTS
SEPTEMBER 1, 1978, TO MAY 25, 1979

Date	Aircraft Registration No.	Event	Corrective Action
9/30/78	N26215	Engine autofeathered on takeoff	Replaced autofeather capsule
11/13/79	N26217	Right engine autofeather heat line cracked	Removed and repaired crack
12/12/78	N26203	No. 2 engine autofeathered on takeoff. No autofeather arm light observed	Ops check okay
12/29/78	N26203	Right engine feathered during full power autofeather check	Ops check okay. Blew air through all lines and replaced left autofeather capsule
1/3179	N26210	Autofeather before takeoff	Drained water from total pressure
1/25/79	N2.6210	Right autofeather bleed air supply line broken	Line repaired
2/4/79	N26203	Left engine auto feathered on takeoff. Took wt. restriction	Drained all lines
2/5/79	N26203	Right engine auto-, feathered on takeoff. Took wt restriction	Replaced right autofeather capsule
2/9/79	N26203	Left engine autofeathered on runup	Replaced left engine autofeather capsule

2/9/79	N26203	Left engine auto-feathered at beginning of takeoff roll	Replaced prop relay box
2/9/79	N26215	Autofeather right armed light blinked on takeoff roll	Replaced prop relay control
2/14/79	N26203	Right engine auto-feathered on takeoff roll. Took wt penalty	Blew out prop pressure and total pressure lines
2/18/79	N26210	No. 1 engine auto-feathered on takeoff roll on ground at 85 kns wind 090° to runway at 18 kns	Drained water from system
2/22/79	N26215	Right autofeather pitot heat inop	Repaired system
2/23/79	N26217	Right engine auto-feather mast bleed air line broken	Repaired line
2/27/79	N26203	Drained water from pitot mast on two separate flights--did not cause auto-feather	Noted
3/16/79	N26203	Left autofeather green light did not come on on first flight. On runup at PNI left engine autofeathered immed. After moving power lever past climb detent on two out of two attempts.	Blew out system. Ops check okay
4/22/79	N26215	On takeoff left auto-feather is 4 sec longer in arming	Replaced prop control box

4/25/79	N26203	Autofeather No. 2 arms 4 sec after left side	Replaced prop relay box
5/13/79	N26224	Right autofeather inop. Took wt penalty	Replaced right micro switch [Banana Box]