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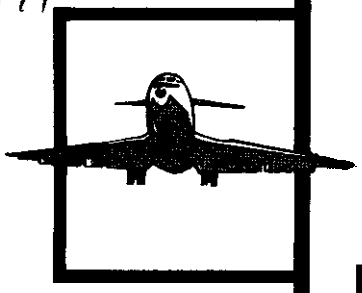

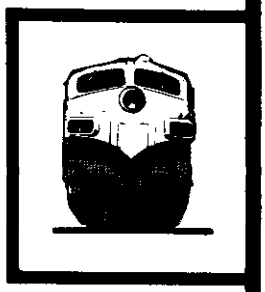

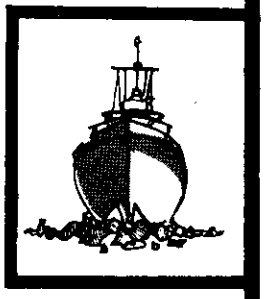

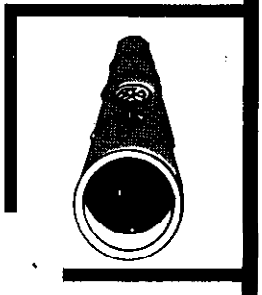

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

AIRTRADERS INTERNATIONAL
LOCKHEED 1049H, N74CA
COLUMBUS, INDIANA
JUNE 22,1980

NTSB-AAR-80-14

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

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15. Supplementary Notes

16. Abstract

About 1359 e.s.t., on June 22, 1980, Air Traders International, Lockheed 1049H, N74CA, crashed in a soybean field shortly after takeoff from runway 22 at Columbus Bakalar Airport, Columbus, Indiana. The intended destination of the flight was Seattle, Washington. A flightcrew of three and five passengers were onboard the aircraft which was carrying a cargo of aircraft spare parts. Two flight crewmembers and one passenger were killed. The aircraft was substantially damaged during the accident sequence and was destroyed by postaccident ground fire.

The National Transportation Safety Board determines that the probable cause of the accident was the flightcrew's inadequate and uncoordinated response to the No. 2 engine fire warning. The flight engineer failed to correct a gradual power decay on the other engines which occurred while he was retarding the No. 2 engine throttle, and the power decay went uncorrected by the pilot and copilot. The lack of coordination and the lack of corrective action may have been caused by the lack of recent flightcrew experience in the L-1049 aircraft. Contributing to the accident was the aircraft's over maximum gross takeoff weight, the crew's use of less than full power for takeoff, and the use of less than takeoff cowl flaps which precluded adequate engine cooling.

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

Adopted: December 23,1980

AIR TRADERS INTERNATIONAL
LOCKHEED 1049H, N74CA
COLUMBUS, INDIANA
JUNE 22,1980

SYNOPSIS

About 1359 e.s.t., on June 22, 1980, Air Traders International, Lockheed 1049H, N74CA, crashed in a soybean field shortly after takeoff from runway 22 at Columbus Bakalar Airport, Columbus, Indiana. The intended destination of the flight was Seattle, Washington. A flightcrew of three and five passengers were onboard the aircraft which was carrying a cargo of aircraft spare parts. Two flight crewmembers and one passenger were killed. The aircraft was substantially damaged during the accident sequence and was destroyed by pastaccident ground fire.

The National Transportation Safety Board determines that the probable cause of the accident was the flightcrew's inadequate and uncoordinated response to the No. 2 engine fire warning. The flight engineer failed to correct a gradual power decay on the other engines which occurred while he was retarding the No. 2 engine throttle, and the power decay went uncorrected by the pilot and copilot. The lack of coordination and the lack of corrective action may have been caused by the lack of recent flightcrew experience in the L-1049 aircraft. Contributing to the accident was the aircraft's over maximum gross takeoff weight, the crew's use of less than full power for takeoff, and the use of less than takeoff cowl flaps which precluded adequate engine cooling.

FACTUAL INFORMATION

1.1 History of the Flight

On June 22, 1980, a Lockheed Super Constellation 1049H, N74CA, was being operated by Air Traders International, Inc. of Incline Village, Nevada, on a ferry flight under 14 CFR 91. The flight was to transport the aircraft from Columbus, Indiana, to Seattle, Washington, for maintenance work and FAA inspection. The aircraft would have then been flown to Dillingham, Alaska, to train prospective employees and to place the aircraft into operation for transporting fish between Alaska and western Pacific Ocean locations during the summer season. The two owners of the aircraft were not qualified nor certified to fly the aircraft; however they had hired a flightcrew to fly the aircraft to Alaska and check out Air Traders employees on the Constellation aircraft.

The copilot called the Indianapolis Flight Service Station (FSS) at 1339 e.s.t., 1/ and requested and received a weather briefing for a flight originating at Columbus Bakalar Airport to Seattle-Tacoma International Airport. However, he did not file a flight plan but stated that, if one were needed, he would file it during the flight.

Meanwhile the aircraft had been preflighted and the crew's baggage and tools had been loaded. The flightcrew consisted of the pilot, the copilot and the flight engineer. The copilot was seated in the left seat, the pilot-in-command in the right seat, and the flight engineer in his station seat. One of the company's owners was sitting in the observer's seat behind the pilot seat. A company employee (mechanic/flight engineer trainee) was seated on the cockpit floor next to the flight engineer's panel. A prospective employee (mechanic) was standing between the cockpit doorway and the flight engineer's console. Another company employee (pilot trainee) was standing, looking through the cockpit access door from the passenger cabin. Another prospective employee (mechanic) was seated in the aisle seat in the last row of three double airline seats in the passenger compartment. A large dog was aboard; however, its location within the aircraft could not be verified. The remainder of the passenger compartment was loaded with personal belongings, mechanic tool chests, aircraft records, and aircraft spare parts.

All four engines were started without difficulty, and the aircraft taxied at approximately 1350 to a point on the taxiway short of runway 22 where a complete engine runup was performed. All the engine readings were within limits with the exception of the No. 2 engine. When the flight engineer checked the left magneto of the No. 2 engine at barometric pressure, the trainee flight engineer noticed a 100 BMEP 2/ drop. The normal drop is 7 to 8 BMEP. The No. 2 engine was then run up to approximately 40 inHg manifold pressure. The mixture was leaned to correct the spark plug fouling problem, and again the engine was run up to barometric pressure. The discrepancy appeared to have been cleared.

After the engine runup was completed satisfactorily, a crewmember called Columbus Bakalar UNICOM 3/ on frequency 122.8 MHz and advised that N74CA was taking off on Runway 22, which is 6,425 feet long. This transmission was acknowledged by UNICOM. Witnesses aboard the aircraft stated that the flightcrew did not have a pretakeoff crew briefing. The copilot taxied onto the runway, advanced the throttles between 38 and 40 inHg., and told the flight engineer to assume control of the engine controls.

According to witnesses aboard the aircraft, the flight engineer advanced the throttles on all four engines for takeoff. Normal takeoff power settings for the engines on this aircraft are 57 inHg. and 2,900 revolutions per minute (rpm), using high octane aviation fuel (115/145). However, lower takeoff power settings for this flight were to be used because the aircraft was using lower octane fuel (100/130). Therefore, maximum takeoff power settings were 51 inHg manifold pressure and 2,900 rpm. The same witnesses stated that the highest manifold pressure setting that they saw on the gauges was 48 inHg. during the takeoff run.

1/ All times herein are eastern standard time, based on the 24-hour clock.
2/ Brake mean effective pressure - measured in pounds per square inch.
3/ UNICOM - a nongovernment air/ground radio communications facility which may provide advisory service at certain airports.

Ground witnesses reported seeing white smoke coming from the No. 2 engine throughout the takeoff run, and photographs of the aircraft taken during takeoff substantiated these observations.

The aircraft was rotated and ground witnesses stated that they saw the nosewheel come off the ground momentarily, between 4,000 and 4,200 feet down the runway. The nosewheel came off the ground again between 4,500 and 5,000 feet and the aircraft became airborne between 5,625 and 6,275 feet down the runway in a nose high pitch attitude. Upon call out from the copilot, the pilot immediately retracted the landing gear after liftoff.

Witnesses in the cockpit or observing the cockpit from the cabin door stated that, at or just after liftoff, the fire warning light and the alarm bell for zone No. 1, No. 2 engine activated. They stated that the flight eneineer retarded the No. 2 throttle. and the light went out and the alarm bell stopped. Coincidentally, they noticed that the No. 2 engine rpm was about 1,700 and that the manifold pressures on the Nos. 1, 3, and 4 engines indicated between 35 and 37 inHg. About the same time, the flight engineer stated "I've got it;" however, none of the witnesses noted any throttle movement on either the pilots or flight enginer's pedestal. The witnesses also stated that the aircraft was still in a positive attitude and flying when they felt a lurch followed by intermittent, loud rapping sounds. The aircraft crashed into a soybean field in a nose high attitude, slid on its belly through the soybean field into a cornfield, and continued into a small stand of trees. The aircraft wings broke off and the wreckage burst into fire.

The aircraft crashed at 1359 at latitude 39° 15 N and 085° 54 W at an elevation of about 650 feet, approximately 4,600 feet beyond the departure end of the runway. (See figure 1.)

12 Injuries to Persons

Injuries	Crew	Passengers	Other
Fatal	2	1	0
Serious	0	0	0
Minor/None	1	4	0

1.3 Damage to Aircraft

The aircraft was destroyed by impact and ground fire.

1.4 Other Damage

There was impact damage to the soybean and cornfields. About 1 acre of forest was destroyed by fire.

15 Personnel Information

The flightcrew arrived in Columbus for the ferry flight on June 21, 1980.

The pilot, the copilot, and the flight engineer were properly certificated and medically qualified. However, according to records, neither pilot was properly qualified by recency of experience to serve as a crewmember in the operation of large aircraft. The copilot, who survived the accident, stated that the pilot, his father, had last flown an L-1049 aircraft on a ferry flight from Arizona to California approximately 1 year before the accident. The copilot also stated that he had not flown an L-1049 in 4 or 5 years. Neither the pilot nor the copilot had complied with the requirements of 14 CFR 61.55, 61.57, and 61.58 which specify qualifications, recency of experience, and proficiency check requirements for pilots and copilots. The flight engineer's most recent experience was on the McDonnell Douglas DC-8 aircraft and no records were found to verify that he had complied with the flight engineer's, currency requirements of 14 CFR 91.211. (See appendix B.)

16 Aircraft Information

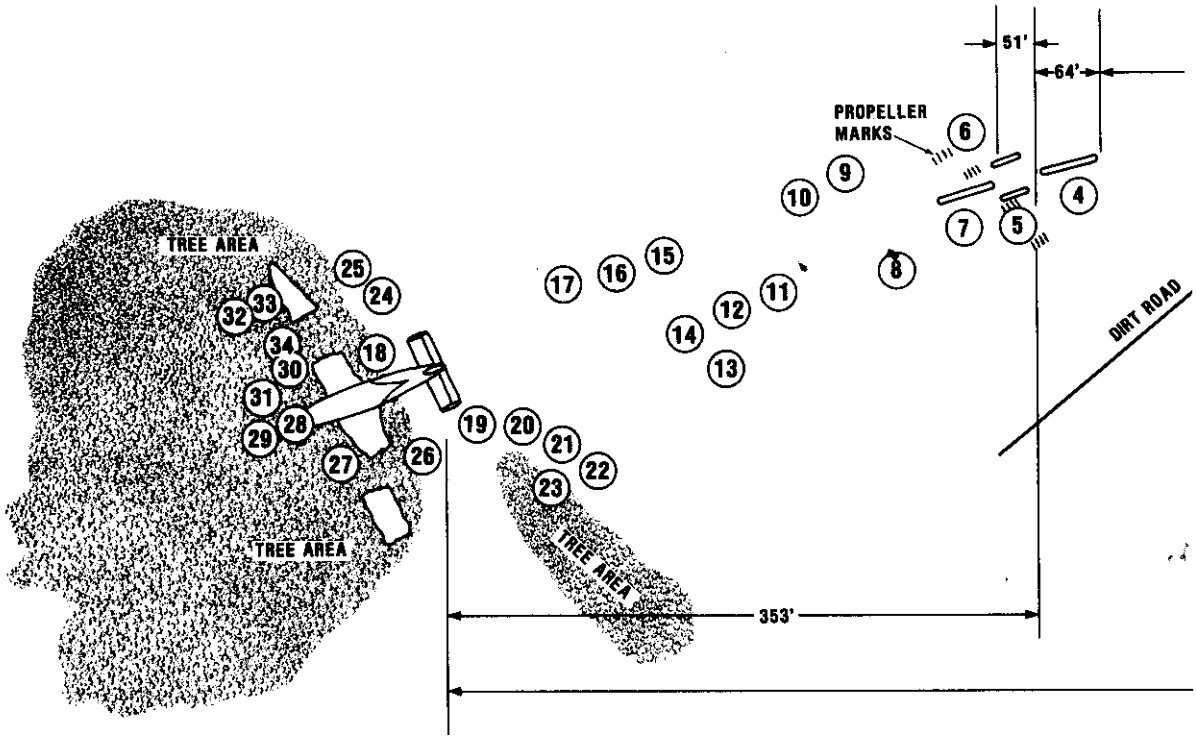
The aircraft was purchased by Air Traders International from Central American Airways Flying Service, Louisville, Kentucky, on May 15, 1980, with Rhoades Aircraft Sales, Columbus, Indiana, acting as the sales agent. The last previous known flight of the aircraft was in October 1978 when the aircraft arrived at the Columbus Bakalar Airport on a ferry permit. Personnel at Rhoades Aircraft stated that the engines were run up occasionally, but the aircraft was not flown.

On May 31, 1980, several Air Traders flight and maintenance crew arrived at Columbus in a Convair 240, twin engine aircraft, that had been traded as part of the purchase price for N74CA. At the time, the newly purchased aircraft was loaded with aircraft spare parts (two complete engines, one disassembled engine, four propeller domes, tires, wheels, hydraulic pumps, radios, alternators, rudders, and numerous other parts), records, and tools that had been included with the purchase of the aircraft. Loading of the aircraft was supervised by the flight engineer. The previous aircraft owners estimated the weight of the spare parts at 16,000 pounds. However, no parts were weighed before they were loaded nor were any documents available to verify the weights of the parts.

The aircraft was refueled on May 31, 1980, with 4,098 gallons of 100/130 octane aviation fuel. According to the flight engineer trainee, the aircraft fuel tanks were full at the time.

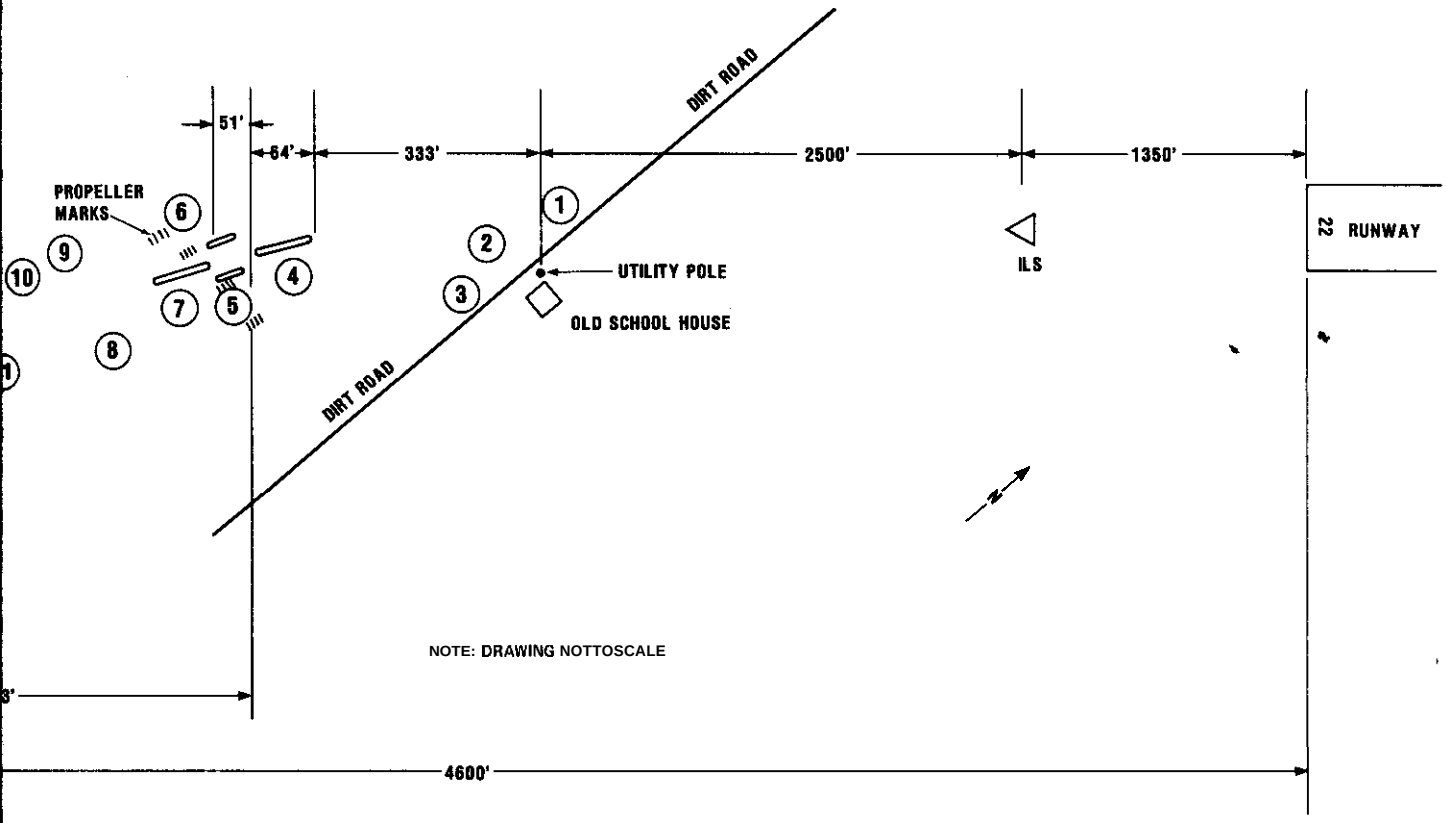
After the loading and refueling were completed, the aircraft engines were started for the trip to Alaska. Major problems developed which indicated a prolonged maintenance delay before the aircraft would be airworthy. At that time, the flightcrew departed, leaving three Air Traders personnel, three helpers, and various Rhoades Aircraft personnel to repair and make the aircraft ready for flight. During the following 3 weeks, the No. 1 engine was changed, the friction lock on the flight engineer's throttle quadrant was disassembled and repaired, numerous minor discrepancies were corrected, and the aircraft was cleaned.

After the maintenance was performed, the aircraft engines were run up on June 20, 1980, by the coowner, a pilot trainee, and an engineer trainee to insure that the aircraft was ready for flight. All systems checked normally with



LEGEND:

1. UTILITY POLE
2. 3' SECTION OF UTILITY POLE
3. UTILITY CABLES
4. INITIAL FUSELAGE GROUND IMPACT MARK
5. LEFT LOWER RUDDER IMPACT MARK
6. RIGHT LOWER RUDDER IMPACT MARK
7. SECOND FUSELAGE IMPACT MARK
8. No. 2 PROPELLER MOTOR
9. SECTION OF MAIN GEAR DOOR
10. ENGINECOWLSECTIONS
11. PROPELLER MOTOR
12. ENGINE "A" HYDRAULIC PUMP
13. COWL FLAP ACTUATOR
14. ENGINE COWL SECTION
15. FLUX GATE COMPASS
16. ENGINE OIL COOLER
17. PROPELLER MOTOR
18. EMPENNAGEIFUSELAGE
19. PROPELLER "B"
20. ENGINE "A"
21. ENGINE "B"
22. COMPLETE ENGINE COWL ASSEMBLY
23. LEFT WING TIP
24. WING FLAPSECTION
25. NACELLE SECTION
26. WING FLAP SECTION
27. LEFT MAIN GEAR STI
28. PORTION OF THROTT
29. RADAR ANTENNA
30. PROPELLER "C"
31. ENGINE "C"
32. ENGINE "D"
33. PROPELLER "D"



A" HYDRAULIC PUMP
AP ACTUATOR
OWL SECTION
TE COMPASS
IL COOLER
ER MOTOR
GE/FUSELAGE
ER "B"
A"
B"
E ENGINE COWL ASSEMBLY

23. LEFT WING TIP
24. WING FLAPSECTION
25. NACELLE SECTION
26. WING FLAPSECTION
27. LEFT MAIN GEAR STRUT ASSEMBLY
28. PORTION OF THROTTLE QUADRANT
29. RADAR ANTENNA
30. PROPELLER "C"
31. ENGINE "C"
32. ENGINE "D"
33. PROPELLER "D"

Figure 1

Wreckage Distribution Chon

Air Traders International
Lockheed L—1049H, N74CA
June 22,1980

the exception of the No. 2 engine oil cooler door which was inoperative and stuck in the closed position, causing the No. 2 engine oil temperature to rise rapidly. For this reason, the No. 2 engine was shut down.

After the runup was completed, the crew decided to taxi the aircraft at high speed on runway 31 for crew training and familiarization, and to check the aircraft by accelerating to 60 miles, per hour and stopping using brakes and reverse. The No. 2 engine was feathered, and the crew decided only to use the Nos. 1 and 4 engines which were advanced to 40 inHg. manifold pressure. The aircraft was accelerated to about 60 mph. The taxi run was aborted and the Nos. 1 and 4 engines were placed in reverse thrust. However, the crew was not able to stop the aircraft on the runway, and it continued into a farm field. The crew continued to taxi the aircraft out of the field and back onto the airport to its parking area on the ramp.

[This incident'was not reported to anyone, no damage was found, and the only maintenance performed on the aircraft was a crew inspection for landing gear damage, popped rivets, or wrinkling. The aircraft was then washed down in preparation for flight.

It was determined that the No. 1 engine had not gone into reverse pitch during the taxi run abort because of a broken electrical connection. The discrepancy was corrected before the departure on June 22, 1980. The No. 2 engine oil cooler door was also repaired. (See appendix C.)

1.6.1 Weight and Balance Data

The maximum allowable takeoff gross weight of this aircraft using 100/130 octane fuel was 120,000 pounds. The reduction of maximum takeoff gross weight was due to the degraded engine performance involved in the use of lower octane fuel. The maximum allowable takeoff gross weight was further reduced to 117,840 pounds because of the high ambient air temperature which was 86° F.

The flight engineer trainee stated that weight and balance calculations were made by the flight engineer. However, data used by the crew for weight and balance could not be confirmed because no copies of weight and balance forms were filed before the flight and none were recovered from the wreckage. Data supplied by witnesses and other sources were used to figure best case/worst case weight and balance data.

According to Central American Airways, Flying Service, the empty weight of the aircraft was 71,733 pounds.

Fuel

When the aircraft was last fueled on May 31, 1980, the wing tanks were filled to capacity and there was 167 gallons of fuel in the fuselage tank for a total of 6,030 gallons of fuel. The aircraft engines were run up on June 20 and 22, and there were additional runups involved in the No. 1 engine change. About 280 gallons of fuel were used for these checks.

Fuel Estimates at Takeoff:

5,000 gallons - crew (flight engineer)
5,200 gallons - crew (pilot employee)
5,500 gallons - maintenance supervisor (Rhoades Aviation)
5,750 gallons - investigation team

cargo

Cargo debris retrieved from the passenger compartment after the accident weighed at 12,540 pounds. Investigators estimated that 75 percent of the cargo was recovered and that 25 percent was destroyed by fire or was not recoverable.

Cargo Weight Estimates at Takeoff:

13,500 lbs - crew (flight engineer)
16,000 lbs - previous owner of cargo, also, professional loaders
16,720 lbs - investigation team

Personal belongings for company employees plus three other persons were loaded on the aircraft on June 22, 1980. Basic operating weight (BOW) is estimated as follows:

Aircraft Weight	Pounds
Aircraft Empty Weight	71,738
Engine Oil	1,200
Auxiliary Oil	337
Personal Baggage (8 X 44)	350
Personnel (8 X 165)	1,320
Parachute	20
Dog	40
Basic Operating Weight (BOW)	75,000

Estimate of Gross Takeoff Weights:

BOW		Fuel		Cargo		Total
		5,000 gal at 6 lbs/gal				
75,000	+	30,000	+	13,500	=	118,500 pounds - Flight engineer
		5,200 at 6 lbs/gal				
75,000	+	31,200	+	16,000	=	122,200 pounds - Pilot employee
		5,500 at 6 lbs/gal				
75,000	+	33,000	+	16,000	=	124,000 pounds - Maintenance supervisor/ previous owner
		5,750 at 6 lbs/gal				
75,000	+	34,500	+	16,720	=	126,220 pounds - Investigation Team

1.7 Meteorological Information

The weather observations taken at 1355 at Indianapolis, Indiana, 50 miles away, and the closest reporting point were: ceiling--25,000 thin broken, visibility--20 miles; temperature--82° F; dewpoint 55° F; wind--190° magnetic, 6 knots. The temperature at Columbus, Indiana, was 86' F, and the wind was about the same as that at Indianapolis.

1.8 Aids to Navigation

Not applicable.

1.9 Communications

The only known transmission from the aircraft was to Bakalar UNICOM and that transmission was normal in volume and clarity.

1.10 Aerodrome Information

The Columbus Bakalar Airport is operated as a 14 CFR 139 certificated airport with a limited certificate.

The airport is served by three runways. Runway 4-22 is 6,425 feet long and 150 feet wide, with 1,000 feet of sod overrun on runway 22. It is equipped with HIRL, MALSR and VASI-L. 4/ Field elevation is 656 feet mean sea level.

A UNICOM radio is operated by Rhoades Aircraft on frequency 122.8 Mhz. No control tower or flight service station is located at the airport.

1.11 Flight Recorders

The aircraft was not equipped, nor was it required to be equipped, with a cockpit voice recorder or a flight data recorder.

1.12 Wreckage and Impact Information

The aircraft initially hit a 35-foot utility pole and clipped the upper portion of the pole. The utility pole was about 3,850 feet from the end of runway 22. The clipped section of the pole and associated electrical cables landed in an adjacent farm field.

The aircraft initially hit the ground 333 feet down the flightpath from the utility pole. The aft fuselage made a scar about 64 feet long and the right lower and left lower rudder assemblies then made ground contact. A second fuselage contact occurred about 51 feet from the end of the initial fuselage ground contact scar and continued to where the aircraft came to rest. There was a series of four slash marks corresponding to the aircraft propellers in this area of the pattern.

4/ HIRL - High Intensity Runway Lights. MALSR - Medium Intensity Approach Lighting System with runway alignment indicators. VASI-L - Visual Approach Slope Indicators (left side of runway only).

The aircraft settled in a thickly wooded area. The diameter of the trees ranged from about 6 to 24 inches. The left and right wings, the cockpit, and the forward fuselage area sustained severe impact damage in a generally rearward direction. Postimpact ground fire consumed portions of both wing assemblies and the forward fuselage structure.

Most of the cabin structural elements forward of the empennage were destroyed by fire. All fracture surfaces were consistent with ground impact, and there was no evidence of preimpact structural failure. The fuselage from aft bulkhead rearward, including the empennage, was intact; however, the left vertical fin, rudder assembly, and outboard portion of the horizontal stabilizer and elevator assembly were subjected to fire and heat,

The forward fuselage structure, including windshields, cockpit seats, yoke assemblies, instrumentpanels, engine pedestals, flight engineer's station, and floor structure, could not be identified. The cockpit area was subjected to severe and extensive tree impact damage and, for the most part, was consumed by the postimpact ground fire. Only bits and pieces of the cockpit were identified. The complete upper cabin structure from the cockpit aft to the rear pressure bulkhead was, for the most part, consumed by fire.

Only the right wing tip and the area inboard of the No. 3 engine were intact. The inboard nacelle structure was separated from the right wing inboard panel, the No. 3 engine was separated from the nacelle, and the No. 3 propeller was separated from the engine. The No. 4 engine was separated from the oubboard nacelle and was positioned between the separated nacelle and wing wreckage. The propeller remained attached to the engine.

The left wing tip was separated and found among trees and brush just to the left of the empennage. The Nos. 1 and 2 engines and propellers had separated from the wing. The flap roller assembly, located on the left wing inboard flap, was intact and within its associated operating channel. The roller assembly was positioned about. 34 inches from the forward or retract end of the channel. This measurement relates to a flap extension of about 60 percent, which is the takeoff position for the aircraft.

The left main landing gear assembly was damaged; however, examination indicated that the gear was retracted at impact. The right main gear assembly was retracted within its nacelle wheel box structure. The nose gear assembly was retracted within the nose wheel box structure.

Control cable continuity could be established from the control and surface components in the empennage forward to and through the aft pressure bulkhead pressure seals. Because of the separation of both the left and the right wing assemblies and the destruction of the forward fuselage area, control cable continuity could not be established in these areas.

The engine hydraulic pump was intact on the No. 2 engine, separated from the No. 1 engine, burned away on the No. 3 engine, and intact on the No. 4 engine. The tail cone assembly was removed to examine the rudder and elevator control systems. There was no indication of preimpact discrepancy or malfunction.

1.13 Medical and Pathological Information

Postmortem examinations of the pilot, the flight engineer, and the passenger were performed by the Bartholomew County Medical Examiner, Columbus, Indiana. Thermal injuries to the bodies precluded any determination of traumatic impact injuries. Witnesses stated that the pilot and flight engineer were injured when a tree penetrated the cockpit.

Toxicological specimens for both crewmembers and the passenger were screened by the Civil Aeromedical Institute for acidic and neutral drugs, basic drugs, and ethyl alcohol. The results were negative. Carbon monoxide samplings for both crewmembers were less than 1 percent saturation; however, the sample for the passenger indicated 75 percent saturation and a cyanide level of 1.80 ug/ml (microgram/milliliter).

All survivors sustained minor cuts, bruises, and abrasions. By 1600 on the day of the accident, they had been treated at the Bartholomew County Hospital and released.

1.14 Fire

The Columbus Fire Department received notification of the plane crash at 1400, and two engines, one car, and one medical unit were dispatched to the accident site. A second alarm was requested at 1404, and a third engine was dispatched. At 1406, the battalion chief on the scene requested extra manpower, and at 1418 a mutual aid request was directed to the surrounding communities. The fire was brought under control at 1648. The last body was recovered at 1845. Ten fire departments with 27 units and 97 personnel responded to the accident and expended 49,000 gallons of water and 165 gallons of foam..

Columbus Police Department officers who witnessed the accident immediately assumed crowd control duty at the scene. Columbus policemen and Bartholomew County Sheriff Deputies provided round-the-clock security during the field phase of the investigation.

1.15 Survival Aspects

The copilot survived the accident with only minor injuries. He stated that the airspeed was about 130 mph when the aircraft started to buffet, followed by settling and sinking of the aircraft until it struck level ground shortly thereafter. The flightpath angle was 6° down as calculated from utility pole strike height to initial ground impact. The aircraft attitude at impact was wings level and slightly nose high as indicated by the ground scars. The initial ground scars were made by the aft lower fuselage. The second ground scars show that the aircraft was still wings level but the pitch attitude was slightly higher as indicated by scars produced by the right and left lower rudder assemblies. The aircraft maintained about the same heading throughout the ground skid.

After the aircraft came to rest, the copilot, who was in the left pilot seat, helped to breakout the left rear cockpit window and escaped through the

opening. The coowner and the two company employees, who were riding in the cockpit, also evacuated through the same window.

The company employee in the aisle seat front row said that his seat pitched forward when it was struck from behind. He said that he was trapped between the seatback and the cabin/cockpit bulkhead and called for help. However, the other survivers could not reach him because the cargo had broken loose and shifted forward, blocking the cockpit door. He said that at the time he could see and feel the fire, he was able to free his leg. He then put both legs through a hole in the bulkhead near the floor and was able to squeeze feet first into the cockpit. He evacuated through the same window as the others.

1.16 Tests and Research

1.16.1 Powerplants Examination

Engine No. 1

The No. 1 engine was separated from the nacelle and all cowling was separated. The propeller shaft was separated from the case and remained with the propeller. The reduction gear remained on the engine. All cylinders remained on the engine and appeared undamaged except for bent cooling fins and some fractured valve rocker arm covers.

At least one spark plug was removed from each cylinder. All were in good condition and several appeared new. All accessories, except the hydraulic pump remained mounted on the accessory gearbox. The hydraulic pump was broken off through its mounting flange and all accessories were damaged by ground fire. There was no evidence of internal engine failure and all exhaust and intake stacks were in place and secured. Some intake pipes and cooling air blast tubes were melted from ground fire. The main oil screen and scavenge oil screens were free of foreign particles. The rear oil sump was full of oil which still had the dark green color of new oil.

Engine No. 2

The No. 2 engine was separated from the wing and all cowling was separated. The cowling was destroyed by ground fire in the wreckage of the left wing. The engine was standing upright on its front end behind the wreckage. The reduction gear planetary assembly, a portion of the gearbox, and the propeller shaft had separated from the engine and remained with the propeller. Four front row cylinders, Nos. 10, 12, 14, and 16, were severely damaged by fire with fins, heads, and rocker boxes partly melted. However, all valves, springs, and rocker arms in these cylinders were intact.

All the induction pipes and exhaust stacks were in place and securely mounted. One exhaust stack assembly, located between cylinders Nos. 5, 6, and 7, and the power recovery turbine (PRT), was partially separated at two slip joints. None of the exhaust stacks had any cracks, burn-throughs, or broken flanges or studs. Several intake pipes and two PRT cooling air blast tubes were melted by ground fire.

All accessories remained mounted on the accessory gearbox and all were damaged by ground fire. The distributors, propeller alternator, and junction box mounted on the reduction gearbox were destroyed by fire. The accessory gearbox, the blower case, the blower impeller, and the diffuser appeared to be undamaged.

The rear sump was undamaged. It contained oil, and the main oil screen and the scavenge screen were free of foreign material. Although damaged, the fire seal remained mounted on the engine.

The cylinders were removed for internal engine examination. There were no internal failures. The crankshaft and all connecting rods and pistons were intact and all appeared oil-wetted. All the articulating rods were free to move on the knuckle pins. All pistons were intact with no evidence of holes or burn-through. There was no-peening or scouring on any piston and all moved freely on the wrist pins. Two pistons, Nos. 14 and 16, had wrinkles and distorted crowns. These had been subjected to intense heat from ground fire. The rings were seized in these pistons and were a dark blue color. All cylinders appeared normal with no sign of scoring, blow-by, or combustion chamber distress. All spark plugs were in good condition with proper gaps and were approved types.

No. 3 Engine

The No. 3 engine remained on its mount, sitting upright on the ground in approximately the correct position relative to the right wing. All adjacent engine support structure and cowling was destroyed by fire. The accessory case, blower case, impeller, diffuser, and all accessories were completely destroyed by ground fire. There was no apparent external evidence of an internal failure. The cylinders remained firmly attached to the crankcase.

The reduction gearbox was broken off. The propeller shaft and reduction gear planetary assembly remained with the propeller. The distributors were severely damaged by fire and the propeller junction box was destroyed.

No. 4 Engine

The No. 4 engine was separated from the right wing and lying in its remains. The cowling was completely consumed by fire. The reduction gearbox was consumed by fire. The reduction gear assembly and propeller shaft remained intact and in place on the engine. The propeller remained on the propeller shaft. Several cylinders on both the front and rear rows were severely damaged by ground fire with melted heads and rocker box covers.

The accessory gearbox and blower case were intact but fire damaged. All accessories were mounted on the gearbox and fire damaged. All exhaust stacks were intact and in place. Numerous intake pipes were melted by ground fire.

Cowl Flaps

During the examination of the wreckage at the accident site, the extension of the cowl flap actuating rods was measured on all four nacelles. The

rods on the Nos. 1, 2, and 3 nacelles were extended 7 inches, as measured from the end of the motor housing to the end of the rod. The measurement on the No. 4 nacelle was 9 inches. The measurements were taken on the inboard actuator rods on engines Nos. 1 and 2, on the outboard rod on engine No. 3, and on the inboard rod on engine No. 4.

For comparison, measurements were taken on another L-1049H. The cowl flaps were set to the takeoff position by reference to the indicator on the flight engineer's panel and measurements were made on a No. 2 nacelle inboard actuator and a No. 3 nacelle outboard actuator to the beginning of the threads at the end of the rod. On the No. 2 nacelle, the measurement was 7 1/4 inches, and on the No. 3 nacelle, the measurement was 7 inches. The length of threads on the rod was approximately 1 1/2 inches. Therefore, if measured to the end of the rod, extension would have been about 8 1/2 to 8 3/4 inches for the takeoff position setting.

Propellers

The Nos. 1, 2, and 3 propellers were separated from their respective engines when the reduction gearboxes were fractured. The propeller shaft of each remained with the propellers. The No. 4 propeller remained mounted on the No. 4 engine.

The motor, brake, and speed reducer assemblies were separated from all four propellers by fracture through the speed reducer housings at the mounting flange. Only three of these assemblies were recovered. In each-of the three assemblies, the increase rpm cam segments were positioned against the low pitch stop limit switches. The No. 2 propeller motor and the speed reducer assembly was identified by matching fracture surfaces of the housing with the mounting flange still attached to the No. 2 propeller hub.

The blades on all four propellers remained in the hubs. All were severely bent and twisted, generally opposite the direction of rotation and in an increase pitch direction. The blades of the No. 4 propeller were all bent rearward toward the thrust face and slightly twisted toward a decrease pitch.

Slash marks along the wreckage path were identified from their relative positions as being propeller blade impact marks. Those marks were identified as being from the Nos. 1, 3, and 4 propellers and had a spacing of about 37 inches between consecutive slashes, while the marks of the No. 2 propeller were spaced about 47 to 49 inches apart.

Fuel System

The fuel system was almost entirely consumed by fire. All wing fuel tanks were destroyed and all in-tank fuel boost pumps were partially melted and the motors were severely damaged by fire. All the fuel selector valves in the nacelles were melted. The only fuel valves which could be identified were the fuel dump valves. These were all in the closed position.

Power Recovery Turbine Examination

Statements taken from witnesses and photographs of the aircraft during the takeoff roll indicated heavy white smoke coming from the No. 2 engine during the takeoff roll. In an effort to determine the source of the smoke, the three PRTs from the No. 2 engine were taken to a repair and overhaul facility for disassembly and examination.

The No. 1 PRT (right side of the engine) turbine blades were broken off at the tips. The fractured surfaces were eroded and dark colored. The shaft had some free play at the upper end and the upper shaft journal and upper bushing were deeply scored. The inlet guide vanes were nicked and peened and several had bowed trailing edges.

There was a heavy rub on the exhaust side of the turbine disk just below the rim and some evidence of rub on the rim. The carbon oil seal and seal plates were in good condition. The upper end of the shaft support was heavily grooved and matched the lands of the vibration damper labyrinth seal. There was no evidence of oil leakage beyond the carbon seal and bellows.

Three blade tip trailing edges of the No. 2 PRT were broken off. There was slight rub on the disk rim on the discharge side. The carbon seal, seal plates, bellows assembly, and vibration damper were in good condition. The upper end of the shaft support was grooved and worn, matching the lands of the vibration damper labyrinth seal. The shaft journals and bushings were lightly scored; however, there was no play between the journals and bushings.

The No. 3 PRT (top centerline of engine) was relatively undamaged with a few nicked leading edges. The wheel rim, cooling air hood, and cooling air impeller had heavy coke deposits. The through bolt and interior bore of the shafts were heavily coated with an oily sludge. The shaft support, shaft bushings, and shaft journals were in good condition. The carbon seal and seal plates were also undamaged, with slight wear patterns.

The vibrations damper assembly was in good condition. The upper oil seal bellows was oil coated on the air side. The bellows was checked in a fixture, using air pressure and immersed in water, which disclosed a crack in one of the convolutions allowing leakage from the oil side to the air side. The bellows of the other two PRTs were similarly checked and no leaks were found.

1.17 Additional Information

1.17.1 Takeoff Performance Data

The maximum allowable takeoff gross weight for the Lockheed 1049H using 100/130 octane fuel as shown in the aircraft performance charts is 120,000 pounds. The charts were extrapolated for a takeoff gross weight of 126,220 pounds resulting in the following estimated data.

Aircraft Gross Weight	126,220 pounds
Temperature	86° F
Effective Headwind	5 knots
Field Elevation	656 feet
Density Altitude	1.800 feet
V_1	126 mph/111 knots
V_2	137 mph/121 knots
Runway Required for Takeoff	6,250 feet
To V_1 and stop on runway	5,825 feet
Rate of climb: 139 mph (V2); No. 1 prop feathered; gear down; 60% flaps, METO power	241 feet per minute

1.17.2 Takeoff and Climb Procedures

An FAA-approved Lockheed 1049 operators manual, dated September 1, 1964, states, in part:

1. Pilot briefs crew of takeoff procedure.

2. Pilot advises Flight Engineer that he will take power to approximately 35" and then call for max. power. Flight Engineer follows through on throttles with palm of left hand, and sets max. power on command.

   NOTE: Pilot keeps right hand on throttles until V_1 in order to be prepared to abort takeoff if necessary.

3. Flight Engineer acknowledges command, replying, "max. power." After max. power is set, the Flight Engineer monitors engine instruments. If any malfuction occurs during takeoff, the Flight Engineer will advise, so that the Pilot can take immediate corrective action.

4. Pilot maintains directional control up to approximately 55 knots by use of nose wheel steering. At this point rudder control commences to become effective, so directional control during the remaining portion of the takeoff run should be maintained by the use of rudders, permitting nose wheel to caster freely.

5. In case of refused takeoff, Pilot will close throttles and reverse with right hand, operate nose steering with left hand. Co-pilot will hold yoke forward with both hands to minimize control buffeting and increase effectiveness of nose steering.

6. Co-pilot will call out V_1 and V_2.

7. When Cc–pilot calls out V_1. Pilot shifts left hand to control column, holding column lightly, allowing the elevators to trail until approximately 5 to 10 knots below V_2. At this speed, Pilot should apply slight nose–up trim to lighten load on nose wheel in anticipation of a smooth transition to additional back pressure on the control column when V_2 is reached.

NOTE: Nose-high attitude between V_1 and V_2 should be avoided, since it will increase the runway length required for the takeoff.

8. Aircraft is lifted off at V_2. Make smooth transition.

9. When airborne, the Pilot calls for "Gear Up," by means of both verbal and hand signal. Co–pilot acknowledge command by repeating "Gear Up," then places the gear handle to the UP position.

1.18 New Investigative Techniques

None

2. ANALYSIS

2.1 The Aircraft

The aircraft was properly certificated. Since all of the aircraft's maintenance records were aboard when the aircraft crashed and were destroyed in the ensuing ground fire, it could not be determined if the aircraft had been maintained in accordance with approved procedures. In interviews with company maintenance employees after the accident, they stated that there were no known aircraft discrepancies before the flight.

There was no evidence of preimpact failure or malfunction of the aircraft structure, flight controls, or systems.

2.2 The Flightcrew

The pilot, the copilot, and the flight engineer were properly certificated to fly the ferry flight mission and held current medical certificates. The pilot–in– command had not flown an L-1049 in 1 year, and the copilot had not flown an L-1049 aircraft in over 4 years. Consequently, neither was current in accordance with recency of experience requirements, and the mast recent experience the two pilots could have had together was over 4 years earlier. While it was not determined when the flight engineer had last flown the L-1049, his most recent experience was on the McDonnell Douglas DC–8.

The lack of currency and the fact that the flightcrew did not have a comprehensive pretakeoff briefing concerning crew duties may have accounted for the lack of coordination and positive actions during the takeoff and accident sequence.

According to Lockheed performance charts for the L-1049H aircraft, the engines on the aircraft should have been able to develop **51** inHg. manifold pressure and 2,900 rpm for takeoff in the atmospheric conditions at the time of the accident and using 100/130 octane fuel. Witnesses who were in the cockpit and observing engine instruments during the runup and takeoff roll stated that they did not see the flight engineer set the manifold pressure above **48** inHg; although the propellers did attain 2,900 rpm. The surviving crewmember could not offer any reasons why the flightcrew elected to takeoff using reduced power. According to witnesses, after the flight engineer retarded the **No.** 2 throttle and the fire warning bell and light went out, they noticed that the manifold pressures on the Nos. **1,** 3 and 4 engines indicated between **35** and **37** inHg. Witnesses also stated that they had no explanation for the further reduced power settings other than the throttles may have crept back. Recent maintenance had been performed on the throttle friction lock. The flight engineer did state, "I've got it," apparently referring to the throttles, just before the aircraft hit the powerline and settled into the field. None of the survivors noticed the pilot or copilot make any power adjustments during the flight.

The Safety Board concludes that the flightcrew was not current in the L–1049H aircraft and that their response to the fire warning on the **No.** 2 engine was not coordinated nor timely.

3.3 Powerplant Failure

Witnesses stated that all engine operation were normal until just after landing gear retraction, when a No. 2 engine zone No. **1** fire warning occurred, and heavy white smoke was seen coming from the No. **2** engine upper power recovery turbine. The flight engineer then reduced power on the No. 2 engine, and shortly thereafter, other personnel in the cockpit observed reduced manifold pressures on the other three engines to be below the original takeoff setting.

The examination of all engines confirmed that there were no massive failures or any discrepancy which could have caused a fire warning. The No. **2** engine showed no evidence of any inflight fire in the power section forward of the fire seal. The only fire damage was from intense ground fire which consumed the magnesium nose case and damaged the forward portion of three front cylinders. An inflight fire in the power section would also have caused damage to the rear cylinders and the ignition harness. No such damage was found.

The examination of the No. 2 engine PRTs showed that they were capable of operation. The heavy coke buildup in the No. **3** PRT, along with the leak found in the **oil** seal bellows, confirmed an oil leak into the exhaust gas path and accounted for the heavy white smoke described by witnesses and confirmed by photographs of the aircraft during the takeoff roll. The smoke was visible through the entire takeoff although the fire warning occurred only after gear retraction. Therefore, with the oil confined to the normal exhaust gas path, it could not have caused the fire warning.

Measurements taken from another L-1049 indicated that when the cowl flaps are in the takeoff position, the cowl flap actuator rod is extended about 8 1/2 to 8 3/4 inches from the motor housing to the end of the rod. Since the rods on engine nacelles Nos. 1, 2, and 3 were extended 7 inches, and the rod on nacelle No. 4 was extended 9 inches, the Safety Board concludes that the cowl flaps on Nos. 1, 2, and 3 were open to less than the takeoff position when the accident occurred.

According to Lockheed and other experienced Constellation flightcrews, a fire warning on takeoff, without an actual fire, is not an uncommon occurrence and it is caused by inadequate cooling air flow when cowl flaps are not opened soon enough or far enough. Multiple or prolonged ground engine runups and high ambient temperatures contribute to the frequency of the fire warnings.

In the absence of any evidence of No. 2 engine power section failure or fire in that zone, it is apparent that the fire warning was caused by inadequate cooling air flow. The engine was run up twice just before takeoff, the second time with a lean mixture to clear fouled spark plugs. This could cause a temperature rise under the cowling with little air flow as the aircraft was stationary. The pilot taxied onto the runway immediately after the runups and advanced the throttles to takeoff power, causing a further rise in engine temperature. The cowl flaps may have been opened, but not to the takeoff position. Since no exhaust joint separations or leaks were found, the most likely reason for the fire warning was an excessive temperature rise under the cowling during takeoff, following two successive high power runups. The use of less than takeoff cowl flaps and the high ambient temperature may have contributed to the temperature rise.

Although much of the throttle linkage and operating cables were destroyed, nothing was found to indicate a reason for the reduction of manifold pressure on the other three engines after the No. 2 throttle was retarded. However, because all three manifold pressure indications were low, the reason had to be something common to all engines. The most obvious item common to all engines is the throttle quadrant in the cockpit. During the preparation of the aircraft for this ferry flight, the engineer's throttle quadrant had been completely disassembled to repair the friction lock, which had been inoperative. A witness, who was also taking instruction for a flight engineer rating, stated that after the repair, he and the flight engineer were satisfied with the throttle friction lock. However, since the throttle quadrant was destroyed in the fire, its actual condition could not be determined. If the throttle friction was restraining the throttles during takeoff, the flight engineer would have had to release the friction lock when he retarded the No. 2 throttle. When the No. 2 throttle was retarded, either drag on the partially released friction caused the other throttles to come back, or the friction was released completely and the three throttles crept back while the engineer was involved with the fire warning. None of the witnesses saw either the pilot or the copilot manipulating the engine controls during this time.

The Safety Board concludes that the No. 2 engine did not have an inflight fire or malfunction, that the fire warning was caused by insufficient cooling, and that the white smoke resulted from an oil leak in the No. 3 PRT.

2.4 Aircraft Gross Weight

The maximum gross takeoff weight allowable was reduced from 140,000 to 120,000 pounds because the aircraft was fueled with 100/130 octane aviation fuel instead of 115/145 octane aviation fuel. The maximum allowable takeoff gross weight was further reduced to 117,840 pounds because of atmospheric conditions (high ambient temperature and altitude).

The procedures used to load the spare aircraft parts and cargo aboard the aircraft were not in accordance with accepted practices. Large items of cargo, such as builtup spare engines, were not weighed before stowage on the aircraft. The previous owner of the aircraft estimated that the cargo weighed over 16,000 pounds. About 12,540 pounds of cargo was recovered from the burned aircraft and using a generous recovery percentage of 75 percent, the cargo weight was estimated at 16,720 pounds. Although the Safety Board believes that a more realistic cargo recovery percentage would be between 50 to 70 percent, the 75 percent figure was purposely selected as a conservative measure.

The aircraft was refueled with 4,098 gallons of aviation fuel on May 31, 1980. Witnesses stated that this refueling "topped off" the tanks and that the aircraft was "essentially full" at that time, The only fuel expended until the accident date was for runups, maintenance checks on the No.1 engine, and the taxi check. Consequently, the Safety Board believes that the most accurate estimate of the fuel onboard at the time of the accident was 5,750 gallons, or 34,500 pounds.

The Safety Board concludes that the gross weight of the aircraft was about 126,220 pounds at takeoff, about 8,380 pounds over the allowable maximum gross weight of 117,840 pounds. Information extrapolated from the Lockheed 1049H performance charts indicates that the aircraft was capable of climbing at a rate of about 241 feet per minute at a gross weight of 126,220 pounds with one engine out.

2.5 survival Aspects

Initial ground impact was in level and relatively soft plowed ground. The aircraft was in a slightly nose high attitude and descending on a flightpath of about 6°. Since the altitude could not be held and the descent angle was shallow, the airspeed was above stall speed but below climb speed, probably in the range of 110 to 130 mph. The vertical impact forces were about the same as in a hard landing. Initially, the horizontal force was also relatively minor as the aircraft skidded across the field. Even as the aircraft began impacting the trees, the overall airframe deceleration forces which were applied to the occupants were in the survivable range. However, the aircraft struck a tree which entered the cockpit longitudinally into the copilot and flight engineer positions. Localized decelerative forces at those positions were extremely high as the tree penetrated the area and the cockpit structure collapsed. Thus, the death of both the pilot-in-command and the flight engineer resulted from traumatic injuries. The toxicological analyses indicating a low level of carbon monoxide in each crewmember further substantiates this since much higher levels would be present if either were alive during the postcrash fire. Toxicological evidence in the form of an extremely high carbon monoxide level indicates that the passenger died as a

result of the fire and smoke and was probably trapped in the cabin by shifting cargo or knocked unconscious by it.

The moderate impact forces involved in this crash were evident by the minor bruises and abrasions sustained by the survivors, including those who were not seated or secured with restraints.

In light of the extremely high decelerative forces and the resultant localized destruction of the cockpit area on the one hand and the otherwise generally moderate deceleration forces imposed on the remainder of the airframe and the cabin occupants, the accident was considered to be partially survivable.

3. CONCLUSIONS

3.1 Findings

1. The pilot, the copilot, and the flight engineer were properly certificated and medically qualified.

2. The pilot and copilot did not meet aircraft currency requirements for this flight. The flight engineers most recent experience was on the McDonnell Douglas DC-8.

3. The aircraft was properly certificated. All of the, aircraft's engine/maintenance records were destroyed by postcrash fire.

4. Weather was not a factor in this accident.

5. There was no evidence of preimpact failure or malfunction of the aircraft structure, flight controls, or systems.

6. The aircraft was using 100/130 octane aviation fuel.

7. Cargo weights were estimated since no weight and balance form was filed for this flight. The maximum allowable aircraft takeoff gross weight was exceeded by about 8,380 lbs.

8. The flightcrew did not perform a pretakeoff emergency procedures briefing.

9. The maximum engine power available was not used on takeoff.

10. The No. 2 engine trailed white smoke throughout the takeoff, liftoff, and initial climb. The smoke was probably caused by a leaking oil seal on one of the power recovery turbines.

11. Although the No. 2 engine fire warning occurred shortly after liftoff, there was no evidence of failure or inflight fire in the No. 2 engine. The fire warning was caused by inadequate engine cooling air flow.

12. The manifold pressure on engines Nos. 1, 3, and 4 decreased to 35 to 37 inHg. after the throttle was retarded on the No. 2 engine. There were no failures or malfunctions of the Nos. 1, 3, and 4 engines.

13. The aircraft was capable of climbing at a rate of 241 feet per minute at a gross weight of 126,200 pounds with one engine propeller feathered.

14. The cowl flaps were not open to the takeoff position.

15. The aircraft struck a utility pole 35 feet above ground level, 3,850 feet beyond the departure end of runway 22.

16. The aircraft crashed 4,183 feet from the end of runway 22, slid, and came to rest in a wooded area 4,600 feet from the end of the runway.

17. The aircraft was destroyed as a result of impact forces and postcrash fire.

18. The accident was partially survivable.

32 Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the flightcrew's inadequate and uncoordinated response to the No. 2 engine fire warning. The flight engineer failed to correct a gradual power decay on the other engines which occurred while he was retarding the No. 2 engine throttle, and the power decay went uncorrected by the pilot and copilot. The lack of coordination and the lack of corrective action may have been caused by the lack of recent flightcrew experience in the L-1049 aircraft. Contributing to the accident was the aircraft's over maximum *gross* takeoff weight, the crew's use of less than full power for takeoff, and the use of less than takeoff cowl flaps which precluded adequate engine cooling.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ PATRICIA A. GOLDMAN
Member

/s/ G.H. PATRICK BURSLEY
Member

ELWOOD T. DRIVER, Vice Chairman, did not participate.

December 23, 1980

4. APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The Safety Board was notified of the accident about 1600 on June 22, 1980. An investigator from the Safety Board's Chicago Field Office went directly to the scene, and an investigation team from the Washington, D.C., headquarters was dispatched at 0900 on June 23, 1980, to Columbus, Indiana. Working groups were established for operations, structures/systems, powerplants, human factors, and witnesses.

Participation in the on-scene investigation included representatives of the Federal Aviation Administration and Lockheed Aircraft Corporation.

2. Public Hearing

No public hearing or depositions were held.

APPENDIX B

PERSONNEL INFORMATION

Pilot Herman R. Salmon

Mr. Salmon, 66, held airline transport certificate No. 46959, issued November 21, 1979, with ratings for airplane multiengine land, L-188, L-1049, L-18, DC-3, DC-GB, and C-240, 340, and 440. He also held a commercial pilot certificate with airplane single engine land, airplane multiengine sea and rotorcraft-helicopter.

Mr. Salmon was Chief Engineering Test Pilot for Lockheed Aircraft Corporation before he retired and had flown engineering test flights for certification of the Constellation aircraft. He had about 17,250 total flying hours and 2,000+ hours in Constellations.

Mr. Salmon held a current first class medical certificate, No. 1374479, issued on December 10, 1979, with the following limitations and no waivers. "Holder shall wear glasses that correct for distant and near vision while exercising the privileges of his airman certificate." His distant vision was 20/50 both eyes corrected to 20/20; near vision was 20/180 corected to 20/20. A review of his FAA medical examinations from August 10, 1976, revealed nothing of significance.

Copilot Randall R. Salmon

Mr. Salmon, 40, held commercial pilot certificate No. 1725483, issued July 31, 1978, with airplane single/multiengine land privileges and an L-188 type rating. He also had a flight instructor certificate with airplane single/multiengine land privileges.

Mr. Salmon had about 8,000 total flying hours and 50 to 100 hours in Constellations. He held a current second class medical certificate, No. 857784, which was issued on January 14, 1980; it showed no limitations or waivers. A review of his FAA medical examinations from July 29, 1966, revealed nothing of significance except for a record of an aircraft accident which occurred on January 26, 1976, near Tuscon, Arizona.

Flight Engineer Leland J. Sanders

Mr. Sanders, 54, held commercial pilot certificate No. 1534092 with airplane single engine land and instrument privileges, issued on August 3, 1971. In addition, he held an airframe and powerplant mechanic certificate, No. 1236876, issued on the same date and a flight engineers certificate authorizing him to operate reciprocating, turbopropeller, and turbojet aircraft, also issued on August 3, 1971.

Mr. Sanders had accrued about 20,060 total flying hours, but it could not be determined how much time he had flown in the L-1049, or when he had last flown an L-1049.

His first class medical certificate was issued on May 13, 1980, with the limitation that the holder shall wear lenses that correct far, near, and distant vision while exercising the privileges of his airman certificate.

APPENDIX C

AIRCRAFT INFORMATION

Lockheed 1049H, N74CA, serial No. 4850, model No. 10494107-06-170, was owned and operated by several airlines, cargo carriers, and commercial operators before it was purchased by Air Traders International, Inc., on June 6, 1980. The aircraft was delivered from the factory on January 21, 1959.

All of the aircraft maintenance records were onboard at the time of the accident and were destroyed in the postcrash fire. The Air Traders mechanic/flight engineer trainee recalled that the last progressive inspection performed on the aircraft was in late 1978. He also recalled that the No. 1 engine had about 800 total hours and zero time since overhaul, the No. 2 engine had about 1,200 hours since overhaul and the Nos. 3 and 4 engines had fewer hours than the No. 2 engine. He also stated that the Nos. 2 and 3 propellers were recently overhauled and that the aircraft had a total airframe time of over 20,000 hours. The previous owner and Air Traders employees stated that all applicable Airworthiness Directives had been complied with.

Only two engine data plates were recovered. The data plates for engines Nos. 3 and 4 were not found. Propeller serial numbers could not be determined.

Engines:

Position	Model	Serial Number
1	R3350-42	530472
2	988TC 18EA6	708803
3	988 TC 18EA6	Unknown
4	988 TC 18EA6	Unknown