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File No. 3-0757

AIRCRAFT ACCIDENT REPORT

LEHIGH ACRES DEVELOPMENT, INC.

MARTIN 404, N40412

ATLANTA, GEORGIA

MAY 30, 1970

Adopted: SEPTEMBER 30, 1970

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D. C. 20591

REPORT NUMBER: NTSB-AAR-70-25

LEHIGH ACRES DEVELOPMENT, INC.
MARTIN 404. N40412
ATLANTA, GEORGIA
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SYNOPSIS

① Lehigh Acres Development, Inc., Flight 701, a Martin 404 N40412, departed from Runway 2 Right at DeKalb-Peachtree Airport, Chamblee, Georgia, at 0916 e.d.t. on an Instrument Flight Rules flight plan to Fort Myers, Florida. Two pilots, two cabin attendants and 29 passengers were on board. The aircraft had been fueled to approximately 800 gallons prior to departure. The weather at the time of takeoff was: Measured 400 feet overcast, visibility 1 mile with very light rain and fog.

Atlanta Departure Control established radar and radio contact with the flight 1 minute after takeoff. During the climb, there was a loss of power from the No. 2 engine. This loss rapidly deteriorated to the extent that little useful power was being developed. While the crew was working to correct the discrepancy with the No. 2 engine, the No. 1 engine lost power. The crew declared an emergency and reported that they were going down. Departure Control attempted to vector the aircraft to the Atlanta International Airport for an emergency landing.

② When the aircraft descended below the overcast, the pilot observed Interstate Highway 285 just below and decided to make an emergency landing on the median strip, heading west. Touchdown on the highway occurred at approximately 0930.

The aircraft skidded along the highway for approximately one-half mile, struck the side of the Moreland Avenue bridge, and came to rest on top of the bridge. As the aircraft proceeded along the highway, it struck an automobile that was traveling east and inflicted fatal injuries to the five occupants. One passenger in the aircraft received fatal injuries. The two pilots and one flight attendant received serious injuries. Twenty-seven passengers received injuries requiring medical treatment or hospitalization. The aircraft was destroyed by impact; no fire developed.

The Safety Board determines that the probable cause of this accident was the loss of effective engine power because of ~~improper~~ fuel having been placed in the tanks by relatively untrained personnel. A contributing factor was that the flightcrew did not detect the error.

On the basis of this investigation, the Board has recommended to the Administrator, Federal Aviation Administration, that Parts 23, 25, 27 and 29 of the Federal Aviation Regulations and Advisory Circular 20-43a be amended to provide a more adequate color coding system for aircraft refueling. (See Appendix D.)

1. INVESTIGATION

1.1 History of Flight

Lehigh Acres Development, Inc., Flight 701, a Martin 404, N40412, operating under the provisions of Part 91, Federal Aviation Regulations, was engaged in the conveyance of prospective land buyers on an inspection tour.

At 0916 e.d.t., 1/ following a normal engine start and runup, Flight 701 made a takeoff from Runway 2 Right, DeKalb-Peachtree Airport, Chamblee, Georgia. Departure was on an Instrument Flight Rules (IFR) flight plan to Page Field, Fort Myers, Florida. Atlanta Departure Control established radio contact with the flight one minute after takeoff. During the climb to 4,000 feet assigned altitude, the crew contacted Atlanta Departure Control and radar identification was established by that facility.

During the climb, using climb power, the No. 2 engine lost power. The BMP 2/ instrument reading dropped to 100 horsepower and the fuel flow indication decreased below normal. The crew suspected carburetor icing. Carburetor heat was applied, the electric fuel boost pump was turned on, and the power of the No. 1 engine was advanced to METO 3/. When the crew observed that the No. 2 engine cylinder head temperature had increased to 300°C., the maximum instrument reading, the cowl flaps were opened and the engine primer was used in an attempt to increase the power of the No. 2 engine.

At 0921, the crew declared an emergency and requested a clearance to Atlanta International Airport. The crew was given a vector heading of 250°. At 0922, they were given a vector heading of 200° to avoid high antennas.

At approximately 0927, the crew noted that the cylinder head temperature indication for the No. 1 engine was rising rapidly, and the first officer opened the cowl flaps. A short time later, a definite yaw was felt by the crew and total power of No. 1 engine was lost. At this time, the position of the aircraft was 7 miles northeast of the Atlanta Airport.

1/ All times used herein are eastern daylight time, based on the 24-hour clock.
2/ Brake mean effective pressure.
3/ Maximum except take off.

At 0928, the crew reported that they were unable to maintain altitude and that they were over an expressway. Immediately thereafter, they stated "going down." At this time, the aircraft was on a heading of 270° and 6½ miles northeast of Atlanta Airport.

After 0929, attempts made to contact the flight were unsuccessful.

The captain landed the aircraft on the only suitable terrain, which was the median strip of Interstate Highway 285. The aircraft touched down on a heading of 260°, proceeded in a straight line for 1,200 feet, and then started a gradual turn to the left. It crossed the eastbound lane approximately 400 feet east of Moreland Avenue, struck an automobile with five occupants, slid up an embankment, and contacted the structure of a bridge over Highway 285 at Moreland Avenue. The aircraft went over the bridge abutment and stopped on Moreland Avenue perpendicular to the roadway.

Witnesses reported that both engines were malfunctioning just prior to the landing on the highway.

The accident occurred during daylight at approximately 0930. The accident site was located at latitude 33° 41' 12" N. and longitude 84° 18' 30" W. at a terrain elevation of approximately 1,075 feet. This location was approximately 6 miles northeast of Atlanta International Airport.

1.2 Injuries to Persons

<u>Injuries</u>	28 <u>crew</u>	93 <u>Passengers</u>	57 <u>Others</u>
Fatal	01	13	5
Nonfatal	3	27	0
None	1	1	0

1.3 Damage to Aircraft

The aircraft was destroyed by impact

1.4 Other Damage

One automobile was destroyed. A highway marker was destroyed and there was minor damage to a highway structure.

1.5 Crew Information

The crew was certificated properly and qualified for the flight. (For details see Appendix B.)

1.6 Aircraft Information

The aircraft was mechanically and structurally airworthy at the time of departure from DeKalb-Peachtree Airport and has been maintained in accordance with the applicable Federal Aviation Administration (FAA) and company regulations. The gross takeoff weight of the aircraft was 43,500

pounds, and the weight and balance were calculated to have been within limits at both the takeoff and the time of the accident.

Immediately prior to takeoff, the aircraft was serviced with 200 gallons of Jet A grade aviation fuel and 57 quarts of grade 50 regular oil. The 200 gallons of jet fuel were added to approximately 600 gallons of 100/130-grade aviation fuel which was on board prior to the servicing. The aircraft engines are certificated to use 100/130-octane grade fuel. (For detailed aircraft information see Appendix C.)

1.7 Meteorological Information

Morning surface weather charts showed a large high pressure area centered off the southern New England coast, with a high-pressure ridge extending from the center southwestward through the Atlanta Coastal States into the Lower Mississippi Valley and central Texas. A broad, moist, generally easterly flow of air was shown over much of the southeastern quarter of the country. Over parts of this area, considerable low cloudiness, some fog and rain were reported.

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Following are official surface weather observations for May 30, 1970, from the locations and at the times indicated:

DeKalb-Peachtree

0856, measured 400 feet overcast, visibility 1 mile, very light rain, fog, wind 090° 10 knots, altimeter setting 30.25 inches.

Atlanta Airport

0855, measured 500 broken, 700 broken, 900 overcast, visibility 2½ miles, light rain, fog, temperature 66°F., dew point 64°F., wind 090° 16 knots, gusts to 22 knots, altimeter setting 30.22 inches.

The captain obtained a preflight weather briefing prior to departure and as the emergency was developing, the first officer asked for and was given Atlanta Airport and DeKalb-Peachtree weather which was: Atlanta - 500 feet broken, 700 feet broken, 900 feet overcast, 2½ miles visibility; DeKalb-Peachtree - 400 feet overcast and 2 miles visibility.

The Atlanta terminal forecast issued at 0645, valid for 12-hour period beginning at 0700 was, in part, as follows:

0700-1200

Ceiling 500 feet overcast, 5 miles, wind 100°, 10 knots, occasional ceiling 500, 3 miles, light rain, fog.

The forecast for Fort Myers issued at 0645, valid for a 12-hour period beginning at 0700 was, in part, as follows:

0700-1300

2,000 scattered, ceiling 10,000 broken, 7 miles, occasional ceiling 2,000 broken, 4 miles, light rain showers.

1.8 Aids to Navigation

All navigation aids were operating normally.

1.9 Communications

There was no radio communication difficulty between the flight and the various FAA communicators.

1.10 Aerodrome and Ground Facilities

Not applicable to this accident.

1.11 Flight Recorders

No flight or voice recorders were installed or required.

1.12 Wreckage

The impact with the bridge sectionalized the left wing into three parts and separated the fuselage between stations 536 and 701. Parts of the left wing and the empennage were located adjacent to and under the bridge.

The left propeller struck the ground and separated from the left engine at a point 1,900 feet from initial touchdown.

Evidence indicates the right main and nose landing gear were down and locked and remained down until the aircraft had crossed the east-bound traffic lane. It was determined that the wing flaps were retracted throughout the landing.

Examination of structures and systems revealed no malfunction or failure prior to impact.

The aircraft was equipped with two Pratt & Whitney R2800 CB17 engines. Investigation into the reason for power loss disclosed that the aircraft had been fueled with 200 gallons of Jet A Fuel prior to its departure from DeKalb-Peachtree Airport. It was determined that 100 gallons of Jet A fuel were added to each tank for a total reported fuel load of 800 gallons.

The cover plates for the overwing fuel filler caps were each marked as follows:

"Fuel - 100 OCTANE MIN.
685 U. S. GAL."

Both cover plate markings were stamped, unpainted aluminum, and were legible at the time of wreckage examination.

Internal inspection of both engines revealed evidence of severe detonation. Pistons showed severe heat damage and the spark plugs had been operating at temperatures above their designed operating temperature range.

1.13 Fire

Some witnesses reported seeing fire and smoke coming from the engines; however, no evidence of fire was found outside the engine combustion chambers and exhaust system.

1.14 Survival Aspects

This was a survivable accident.

The aircraft was equipped with 40 passenger seats. The nine rear seats were not occupied. The passengers had been briefed by the cabin attendants prior to takeoff regarding emergency exits and were instructed to fasten their seatbelts.

Evacuation of the occupants was through the left front cabin door and through the aft end of the cabin where the fuselage separated. Outside help was on the scene within a few minutes.

About one-third of the passenger seat frames were broken and detached from the floor.

Injuries to the survivors included contusions, abrasions, lacerations, fractured ribs, limbs, vertebra, and pelvis.

Surviving passengers stated they had no warning of any kind from the crew regarding the emergency or impending crash landing. Some of the passengers suspected a crash when they observed their proximity to the ground, trees and highway.

1.15 Tests and Research

Fuel samples were taken from both fuel tanks, the fuel inlet lines to carburetors and the fuel strainer cavities in carburetors. The samples were analyzed by a fuel and lubrication technology laboratory where it was confirmed that the 100/130-octane fuel was contaminated by jet fuel.

1.16 Other Information

① Records dated May 30, 1970 supplied by the fuel vendor, show that N4041 was serviced with 200 gallons of Jet A fuel and 57 quarts of reciprocating engine type oil. The fuel tank truck used for the servicing displayed the words TURBO FUEL in large letters on both sides of the vehicle. The right side displayed in two places the words "JET A" in large letters. ②

The company involved in the fueling operation had been in business under the present management for 5 years. Employment during this period

had grown from 20 to 40 personnel. Fuel sales by the company had increased from 20,000 to 78,000 gallons per month for the 5-year period.

② [The company had no formalized training program or checkout procedures for the linemen who perform fueling operations. The manager stated that new employees are on-the-job trained with experienced linemen.]

Two linemen were involved in the fueling of N40412. One, a full-time employee aged 22, had worked for the company since August 1969, and had previous experience with a fixed-base operation at another location. He had served 4 years in the Navy and, at one time, had been a helicopter gunner. The other, aged 19, and a high school graduate, was a part-time employee and had been with the company since December 1969. He worked for the company 16 to 20 hours each weekend and attended a technical school during the week days in preparation for an aircraft powerplant and aircraft mechanic rating.

The aircraft was fueled with hose and nozzle through the tank filler inlet on top of each wing. The full-time employee operated the truck and fueling unit, and the part-time employee handled the fuel nozzle on the top of the wings. Both employees stated that they knew they were servicing the aircraft with Jet A fuel. The lineman who handled the nozzle on top of the wings stated that he did not notice any marking on the fuel caps to indicate tank capacity or type fuel. Moderate rain was falling during the fueling operation.

Another lineman, employed by another company, was present during the first part of the fueling operation. He stated that he saw the Jet A marking on the fuel truck doing the servicing.

③ [The manager stated that the linemen knew that they were delivering jet fuel and that the error was in aircraft and engine recognition. The company had recently fueled a number of Convairs which had been converted to turbo-propeller engines requiring jet fuel. The manager did not remember any Servicing of Martin 404 aircraft by his company. The other lineman, who was the senior employee and brought the service unit to the aircraft, stated, "I have seen planes similar that took Jet A turbo fuel so I assumed this was the proper fuel."]]

as [The captain instructed the first officer to observe the refueling operation, which he did from a position under the wing of the aircraft and in the adjacent hangar area. While in these positions, the first officer observed the amount of fuel dispersed from the fuel truck. To the right of the fuel meter, the fuel tank was placarded TURBO FUEL FLAMMABLE.

At the completion of the fueling, the captain signed the fuel credit sale slip, on which was recorded, in part, "...fuel grade JET, quantity 200, price .46 amount 68.00."

The unit price of 100/130 octane fuel is 46 cents and the unit price of Jet A fuel is 34 cents. The \$68 amount was calculated to be 200 gallons

of Jet A fuel.]

The first officer drained the fuel sumps and did not detect any water or other contamination. The full-time lineman stated that **he**, at the captain's request, drained the fuel sumps and noted that the fuel had kerosene in it because it was very "slippery."

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

The investigation revealed that the aircraft was mechanically and structurally airworthy at the time of departure from DeKalb-Peachtree Airport. There was **no** failure of the airframe, flight control system, or aircraft systems. There was **no** fire or explosion before or after impact. The crew was certificated properly, qualified and experienced for the operation. Weather was involved to the extent that there is a reasonable probability that the flight could have reached Atlanta Airport in clear, calm conditions. The weather was above minimums for the operation in progress.

The passengers received no warning of the impending crash from the flightcrew. The crew, **no** doubt, was preoccupied with the malfunctioning engines, communications, and weather.

The aircraft was serviced with 200 gallons of Jet A fuel prior to its departure from DeKalb-Peachtree Airport. One hundred gallons of Jet A fuel were serviced into each of the aircraft's two fuel tanks. The introduction of the jet fuel resulted in a fuel mixture that was not compatible with the engines installed. The introduction of the jet fuel lowered the octane rating of the fuel resulting in high operating temperatures, severe detonation, and extensive and sustained power loss.

While engine operation was adequate to accomplish a successful take-off with the utilization of the water injection system, the termination of water supply to the engine subsequent to takeoff resulted in immediate manifestation of the detonation and/or preignition conditions. The apparent inability of the flightcrew to recognize immediately the symptoms of detonation, or to assess the cause for this condition, prompted the application of carburetor heat which further elevated induction temperature and contributed to even more adverse detonation condition. Cylinder head temperatures of both engines attained the 300° C. gage limit as a result of the detonation and/or preignition. Again the action taken in opening the cowl flaps, in an effort to rectify this indication, was responsible for increasing drag which adversely affected the critical thrust/drag configuration of the aircraft.

① There was **no** clear understanding between the crew and the fuel service personnel regarding the type of fuel to be delivered.

It is apparent that the linemen had not received sufficient training or experience to recognize the fuel requirements of the aircraft. Both

linemen knew they were servicing the aircraft with jet fuel; therefore, they evidently did not identify the type aircraft or engines installed. The mere fact that they added 57 quarts of reciprocating engine oil should have alerted them to their error.

The first officer, had he been observant, could have seen the fuel servicing unit markings.

The price of the fuel delivered and the type fuel "JET" on the sales invoice should have alerted the captain of the servicing error.]

2.2 Conclusions

(a) Findings

1. The flightcrew members were certificated properly and qualified for the operation involved.
2. The aircraft was airworthy both mechanically and structurally. Its gross weight and center of gravity were within limits at time of departure.
3. There was no indication of mechanical failure or malfunction of the aircraft structure or systems.
4. The aircraft was operated in Instrument Meteorological Conditions (IMC), while on an IFR clearance.
5. There were no difficulties with navigational aids, communications, or ground based radar equipment.
6. There was no clear understanding between the crew and fuel service personnel regarding the type of fuel to be delivered.
7. The aircraft was serviced with 200 gallons of Jet A fuel which diluted and lowered the octane rating of the fuel on board to a point that it was not compatible with the engines installed.
8. The fuel service unit was marked conspicuously to indicate that it contained jet fuel. The aircraft fuel cap cover plates were likewise marked legibly to indicate the type of fuel required.
9. Both engines failed to produce adequate power during climb because of overheat and severe detonation.
10. It is apparent that the linemen had not received sufficient training or experience to recognize the fuel requirements of the aircraft. The fact that they added 57 quarts of reciprocating engine oil should have alerted them to their error.
11. The first officer who was monitoring the fueling operation failed to observe the improper fueling of the aircraft.

12. The first officer who personally drained the fuel tank sumps, failed to detect the presence of an oily substance as did the fueler.

(b) Probable Cause

The Safety Board determines that the probable cause of this accident was the loss of effective engine power because of improper fuel having been placed in the tanks by relatively untrained personnel. A contributing factor was that the flightcrew did not detect the error.

3. RECOMMENDATIONS

On the basis of this investigation, the Board has recommended to the Administrator, Federal Aviation Administration, that Parts 23, 25, 27 and 29 of the Federal Aviation Regulations and Advisory Circular 20-43a be amended to provide a more adequate color coding system for aircraft refueling. (See appendix D.)

I BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/ JOHN H. REED
Chairman

/s/ OSCAR M. LAUREL
Member

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

Isabel A. Burgess, Member, did not participate in the adoption of this report.

September 30, 1970.

INVESTIGATION AND HEARING1. Investigation

The Board received notification of the accident at approximately 1045 a.m., May 30, 1970, from the Federal Aviation Administration. An investigating team was dispatched immediately to the scene of the accident. Working groups were established to conduct the factfinding processes in the areas of: Operations, Air Traffic Control, Weather, Structures, Systems, Powerplants, Witnesses, and Human Factors.

Participants in the investigation were representatives of the Federal Aviation Administration, Pratt & Whitney Aircraft, Airwork Service Division.

The on-scene phase of the investigation lasted approximately 5 days.

2. Public Hearing

A public hearing was not held in connection with the investigation of this accident.

3. Preliminary Reports

There were no preliminary reports issued in connection with this accident.

Crew Information

Captain James A. Cannin, aged 57, held Airline Transport Pilot certificate No. 57806. He also held ratings in Douglas DC-3, DC-4, DC-6-7, Martin 202/404 and Curtiss C-46. Airplane single- and multi-engine land.

The following additional pilot data were obtained from the operator:

Total pilot-in-command time	25,871:11 hours
Total pilot time in Martin 202/404	1,216:25 hours
Duty time last 24 hours prior to accident	10:15 hours
Rest period last 24 hours prior to accident	13:45 hours

His first-class medical certificate was dated January 19, 1970 with no limitations.

First Officer Robert A. Feldmiller, aged 46, held Airline Transport Pilot Certificate No. 499388. He also held type ratings in airplane multiengine land and Martin 202/404 with commercial privileges in airplane single-engine land.

The following additional pilot data were obtained from the operator:

Total pilot time	4,221:00 hours
Total pilot time in Martin 202/404	1,718:00 hours
Duty time last 24 hours prior to accident	15:30 hours
Rest period last 24 hours prior to accident	8:30 hours

First Officer Feldmiller also held Flight Engineer certificate No. 1582319.

His first-class medical certificate was dated February 20, 1970. Limitations: Holder shall possess correcting glasses for near vision while exercising the privileges of his airman's certificate.

Aircraft Information

The aircraft was a Martin Model 404, N40412, manufacturer's serial No. 14116.

The aircraft was owned by Florida Aircraft Leasing Corporation, 3450 S. W. 11th Terrace, Fort Lauderdale, Florida 33315.

The aircraft was being operated by Lehigh Acres Development, Inc., with headquarters at Lehigh Acres, Florida 33936.

The aircraft had accumulated a total service time of 21,613:18 hours prior to the departure of Flight 701 on May 30, 1970. The last annual inspection was completed May 22, 1970, and the aircraft had flown 17:06 hours since this inspection.

The aircraft was powered by two Pratt & Whitney CB17 engines. The No. 1 engine, serial No. P28445, had accumulated a total of 4,675:03 hours since new and 675:03 hours since overhaul. The No. 2 engine, serial No. P31187, had accumulated 1705:18 hours since overhaul.

The aircraft was equipped with Hamilton Standard Propellers Model 43360. The No. 1 propeller had accumulated 675:03 hours since overhaul. The No. 2 propeller had accumulated 1,705:18 hours since overhaul.



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APPENDIX D

DEPARTMENT OF TRANSPORTATION
NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20591

October 6, 1970

OFFICE OF
THE CHAIRMAN

Honorable John H. Shaffer
Administrator
Federal Aviation Administration
Department of Transportation
Washington, D. C. 20590

Dear Mr Shaffer:

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Our investigation of the Lehigh Acres Development, Inc., accident involving their Martin 404, N40412, at Atlanta, Georgia, on May 30, 1970, revealed several items that compromise safety. The crux of the accident was that a servicing unit operator refueled N40412 with 200 gallons of Jet Grade A Fuel from a tanker marked "Jet Grade A;" the first officer watched the operation from beneath the wing; later the captain signed a fuel chit for Jet Grade A fuel.

We believe that more adequate color-coding might have prevented this accident and recommend that you:

1. Amend Parts 23, 25, 27, and 29 to require the appropriately colored circle around each filler opening in addition to the presently required minimum fuel grade markings on each aircraft. The colored circle should correspond to the fuel color and should be placed on a slightly larger white circle to assure ease of differentiation between the color of the aircraft and the color of the fuel circle.
2. Require painting of existing aircraft within a year after the date of publication of the amendments to Parts 23, 25, 27, and 29.
3. Add another paragraph to the "Markings" section of Advisory Circular 20-43a suggesting that refueling nozzles be marked with the prescribed color code.

Sincerely yours,

s/John H. Reed

John H. Reed
Chairman