

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: February 15, 1957

Released: February 21, 1957

THE CRANE COMPANY, LOCKHEED PV-1, N 64001,
NEAR JEFFERSONVILLE, INDIANA, MAY 15, 1956

The Accident

A Lockheed PV-1, N 64001, owned and operated by the Crane Company, crashed near Jeffersonville, Indiana, on May 15, 1956, about 1038.^{1/} All eight occupants - six passengers and two pilots - were killed and the aircraft was destroyed by impact. Fire did not follow.

History of the Flight

The flight was for the purpose of transporting six Crane officials from Chicago, Illinois, to Louisville, Kentucky, to attend a business convention. Departure was from O'Hare-Chicago International Airport on a VFR flight plan (changed en route to IFR) with the Crane Company's Chief Pilot Randolph A. Mulherin in command, and Robert H. Robinette, also a Crane pilot, as copilot. Gross weight upon departure was estimated to be 27,360 pounds; the maximum permissible takeoff weight was 31,000 pounds.

Shortly after takeoff the pilot gave a routine report to Chicago radio of his time off as 0908 and his estimated elapsed flight time as one hour and 20 minutes. He did not request weather information at that time. Other radio contacts followed as the flight progressed, the final one being at 1034 over the Jeffersonville intersection. An approach was then started from that point to the Standiford Airport, 6-9/10 miles distant. During this approach the aircraft struck trees and crashed at a point one-half mile north of the Jeffersonville intersection. (See attachment A, showing standard No. 2 ILS approach for Standiford Airport, with crash site marked.)

Investigation

From the Jeffersonville intersection to Standiford Airport the course is 190 degrees. The direction of impact was about 175 degrees; the vertical angle was 48 degrees below the horizontal. Just before striking the ground the aircraft tore through trees and then passed, nearly on its right side, between two others 18 feet apart. (The span of the aircraft is 65-1/2 feet.) A large, open field was directly ahead.

Impact marks and distribution of the wreckage indicated that the aircraft first contacted the ground on its right wing and side, cartwheeling over the

^{1/} Times herein are eastern standard based on the 24-hour clock; distances are in nautical miles.

nose onto the left wing. Both engines tore free. The right engine bounced, or was dragged by sliding debris, from its self-made ground gouge and came to rest adjacent to the left engine. Practically all wreckage was in a space 66 feet long and 20 feet wide, with a few parts or components beyond and short of that area. From the first contact with trees to the most distant piece of wreckage was 425 feet. Fuel had sprayed and killed the foliage of nearby trees and remained in ground hollows in appreciable quantities. There was no evidence of sustained or flash fire in any portion of the wreckage.

Study of the severely distorted and fragmentary wreckage indicated that the landing gear and wing flaps were retracted at time of impact. Nothing whatever was found to indicate or even suggest that there had been any malfunctioning of the airframe or of any of its components or controls prior to impact.

Although much of the radio equipment of the aircraft was damaged almost beyond recognition it was possible to determine some of the precrash settings.

The red ADF control head was set at 360 kc. The selector switch was on compass position. The Louisville, Kentucky, low frequency range is 359 kc. The green ADF control head was completely disintegrated and no reading was obtainable; however, the selector switch was on compass position. The ADF radio compass azimuth scale was completely destroyed.

The No. 1 omni bearing course selector indicated 330 degrees. The localizer and glide path needle were destroyed. The No. 2 omni bearing course selector was destroyed. (The outbound radial from the Louisville VOR to the Jeffersonville intersection is 332 degrees.)

The VHF NAV-1 omni was tuned to 110.3 mc. The ILS localizer frequency at Standiford Airport, Louisville, Kentucky, is 110.3 mc. The VHF NAV-2 omni was set at 112.1 mc. The frequency of the Louisville omni range is 112.1 mc.

The VHF transmitter selector was on 121 mc. The last digit following 121 was not legible. The communications emergency frequency is 121.5 mc. The Standiford ground control frequency is 121.9 mc. The VHF receiver was tuned to 120.0 mc. (The Standiford approach control frequency is 120.3 mc.)

Investigation disclosed that all pertinent ground radio facilities were functioning normally at the time of the accident.

Both carburetor heat controls were found in the direct or ram air position (carburetor heat controls "off"). These controls lock into detents. The force of ground impact dislodged the right carburetor heat control only slightly from its detent.

The carburetor heat control quadrant had not been modified on this installation to permit intermediate positions (varying amounts of heat) as it had by individual operators of many similar aircraft. Both the modified and the unmodified installations are considered airworthy. Use of full carburetor heat on final approach is not recommended for the subject type engines as severe detonation can occur if a go-around is necessary. Carburetor heat is customarily used if induction icing is anticipated.

Radio contacts between the aircraft and ground stations during the flight were as follows:

At 0938 the flight called Lafayette,^{2/} giving a routine position report and requesting Lafayette, Indianapolis, and Louisville weather. The 0930 sequence reports for Lafayette and Indianapolis were given the pilot. However, as the 0930 sequence from Louisville was not available the 0830 sequence was given and the pilot was so advised. At 1000 the flight called Indianapolis radio and reported: Over Indianapolis at 3,000 feet VFR flight plan from O'Hare to Louisville, request an IFR clearance via Victor Airway 53 at 4,000 feet. The flight was advised to contact Indianapolis ARTC on 124.9 mc. Indianapolis ARTC then cleared the flight to Houston intersection via Victor Airway 53 to maintain 3,000 feet. (Houston intersection is 44 miles south-southeast of the Indianapolis VOR on Victor 53 at the intersection of the 075-degree radial of the Scotland VOR. Shortly thereafter the flight was cleared to the Henryville intersection via Victor Airway 53 to maintain 5,000 feet, to contact Standiford approach control (Louisville) five minutes north of Henryville, and to report passing Houston intersection. (Henryville is on Victor 53 at the intersection of the 241-degree radial of the Cincinnati VOR at a point 38 miles south-southeast of Houston intersection and 21 miles direct from Standiford.)

At 1022 the flight called Louisville approach control for further clearance and was cleared over Henryville to the Jeffersonville intersection to maintain 5,000 feet and to report passing Henryville. The distance from Henryville to the Jeffersonville intersection is 14 miles. At 1029 the flight reported passing Henryville, was cleared to descend to 2,600 feet, and reported leaving 5,000 feet. Very shortly thereafter Louisville asked the pilot if he would accept an ILS back course approach. The pilot then asked for the Louisville weather which was given him as: Measured 500 variable broken, 800 overcast; visibility two miles; light rain and fog. The pilot then advised that he would accept this type of approach and at 1034 was cleared to the minimum altitude of 2,100 feet m. s. l. Also at 1034 the flight reported over Jeffersonville intersection and reported leaving 2,600 feet. No difficulty or irregularity was mentioned. The course from Jeffersonville intersection to Standiford is 190 degrees. The 1034 transmission was the last heard from the flight which crashed about 1038, as approximated from impact-stopped watches and ground witnesses. The applicable weather minimums for the subject approach were 500 feet ceiling and one mile visibility. The elevation of the Standiford Airport and the terrain at the crash site is about 500 feet m. s. l.

Statements were taken from six persons on the ground within a half mile or less of the crash site. No other witnesses could be found and there may have been no other for these reasons: The area is rural and sparsely settled,

^{2/} The aircraft number was copied by Lafayette as N 64201 rather than 6400 however, as pilot advised "en route O'Hare to Louisville," and as there was no other traffic at this time, it signifies this contact was from the Crane Company, Ventura.

rain was falling at the time so that most people would normally be indoors, and the aircraft was visible below the clouds for only a short period while visibility was restricted to about two miles. Some of these persons briefly saw the aircraft below the overcast just before the crash and some heard it. One of the six had a private pilot's certificate and had flown about 600 hours; the other five had no aeronautical experience.

Testimony of witnesses, other than the private pilot, varies considerably and is without full consensus. But from it some strong probabilities emerge. First, the engine (s) noise did not sound normal, but was variously described as irregular, labored, or as if backfiring. Second, the aircraft was extremely low, described as just above the trees, twice the height of a silo, etc., just before the crash. The left engine, although described by one witness as stopped, was later found not to be damaged internally, and therefore was free to windmill. Just prior to impact, the aircraft's speed was low and decreasing with the nose up. The final dive into the ground was abrupt and steep. The private pilot did not see but only heard the aircraft. He deduced, from the change in sound, that during a 360-degree turn, which was made in the general area where a left procedure turn would normally be made, one engine stopped firing and the other " began terrific labor "

As stated previously, the flight departed from Chicago at 0908, and the estimated time of arrival at Standiford Airport was 1028. The actual elapsed time to the accident scene (1034) was six minutes in excess of this e. t. a., although the flight was still seven miles from its intended destination. The en route distance from point of takeoff to the accident scene was 245 miles, an average groundspeed of 163 knots.

All fuel tanks had been filled to capacity of 1,066 gallons on the day preceding the accident and the aircraft was then flown two hours. Fuel was not added for the subject flight on the following day. The estimated gross weight at the time of departure was 27,360 pounds. The maximum permissible takeoff weight is 31,000 pounds, and the maximum allowable landing weight is 26,500 pounds. The weight at the time of the accident, based on fuel burnoff, is estimated as 25,740 pounds. Since the fuel capacity is 1,066 gallons it appears that there were some 436 gallons aboard the aircraft at the time of the crash.

Examination of the powerplants was conducted as thoroughly as their badly damaged condition would allow. There was no indication of internal failure in either powerplant except for an irregularity in the left carburetor assembly which will be detailed later. There was no evidence of lack of lubrication in either powerplant.

All propeller blades were bent in varying degrees, some slightly forward and some rearward. Some of these bends were caused by contact with trees prior to as well as after impact.

The shim plates of both propellers were examined carefully to determine the propeller pitch at impact. However, there were so many marks on these plates that the original position could not be determined except for one blade of the right propeller which appeared to have been at 14 degrees. Both propeller domes were positioned in the high r.p.m. range and indicated the

position of the blade angle to be 19 degrees on the left propeller and 14 degrees on the right at impact.

Examination of components of the left propeller feathering system revealed them to be extensively damaged during impact; however, inspection revealed no evidence to indicate failure of inflight operation.

The right engine propeller shaft splines were appreciably distorted indicating high rotational forces at the moment of impact. This type of damage was not found in the left engine.

The left carburetor idle control valve linkage had become detached from the carburetor at the throttle shaft end. This fork end of the linkage was spread open slightly beyond its normal opening with no appreciable marks of impact damage. There was no visual evidence of elongation of the bolt holes in the fork. A 3/16 steel bolt with a cotter-keyed castellated nut is used to attach this aluminum alloy fork to the throttle shaft linkage. Any impact loads sufficient to remove the bolt from this linkage would be expected to mutilate the aluminum alloy fork.

The design of the carburetion system is such that the idle valve will close to the idle position and pass to the carburetor only enough fuel to allow idling when this throttle linkage is disconnected.

This disconnected fork was the only significant irregularity found in either powerplant. Examination of the various other accessories of both engines necessary for power output, as well as bench testing of those that were sufficiently free of impact damage, revealed no pertinent irregularities.

Computed temperatures based on upper air observations indicate the temperature at 49° F. at 5,000 feet, and 58° F. at 1,000 feet m. s. l. for the time and place of the accident and over the latter portion of the route flown.

The records show that the left engine and its accessories were overhauled by a CAA approved repair station March 18, 1955. At the time of the accident the engine had acquired 234 hours since that overhaul. On January 20, 1956, the last 100-hour periodic inspection was made. During this inspection no irregularities were noted. The engine had acquired approximately 80 hours since this last 100-hour periodic inspection, and the last 33 of these hours were after the Crane Company purchased the aircraft. During the Crane Company's brief ownership of this aircraft no inspections involving the subject carburetor linkage were required other than normal, routine inspections; these were made without any irregularities being noted. Examination of all available maintenance records of the aircraft and of both powerplants indicated no significant discrepancies or omissions. All maintenance was current as far as could be determined.

A scheduled air carrier took off from the Standiford Airport and at an altitude of 3,000 feet m. s. l. passed closely adjacent to the crash site three to five minutes after the accident occurred. Its captain stated: "We were on solid instruments throughout the climb to 6,000 feet, encountering moderate to heavy rain, but no turbulence. The outside air temperature was well above freezing. All Louisville navigational facilities appeared to be operating normally."

The subject aircraft was delivered to the Crane Company by its former owner, the Columbia-Geneva Steel Corporation, in March 1956. The Steel Corporation pilot who delivered the aircraft at Chicago flew with Messrs. Mulherin and Robinette on a number of subsequent flights. This pilot stated: "I had warned them (Mulherin and Robinette) on the Florida trip about the engines having a tendency to ice up in clouds. Robinette was sitting in the copilot's seat when I first put the carburetor heat on. He asked if what I was doing was prescribed by Pratt and Whitney and I assured him that it was. He said that he would be sure and remember to use carburetor pre-heat when necessary. Carburetor ice in these engines was easy to detect and eliminate. The first indication was a surging of the propellers, then a backfiring of the engines. Applying the carburetor heat always cleared out the ice and never did we resort to alcohol to melt the ice. Our procedure was to use carburetor heat when icing conditions were suspected."

During rain, aircraft engines of this type will sometimes manifest irregularities of operation similar to those caused by induction icing. The remedy for such irregularities is the same as for induction icing difficulties, i. e., to apply carburetor heat.

At the time of this accident Pilot Mulherin had a total of nine PV-1 flight hours, all in the subject aircraft. This nine hours included his rating checkflight with a CAA inspector, which he passed satisfactorily.

Analysis

The final message from the aircraft was at 1034, four minutes before the crash, and gave no inkling of trouble. We must, therefore, assume that Pilot Mulherin was not in any serious difficulty at that time for if he had been the tower undoubtedly would have been so advised.

The import of that portion of Investigation dealing with the radio equipment of the aircraft is that Pilot Mulherin in all probability was conducting the latter portion of his flight in accordance with established instrument approach procedures and that his radio equipment was properly tuned and functioning. Likewise, it appears that the pertinent ground radio facilities were also functioning normally.

It appears that after starting the instrument approach, as shown on attachment A, the left engine lost all but idling power. The left carburetor idle control valve linkage fork must have suddenly become disconnected, without warning, at this time. It would normally be at about this time that power changes (throttle movements) would be made and the aforementioned bolt could then have come out. What may well have happened is that Pilot Mulherin changed throttle settings, experienced a sharp yaw to the left due to windmilling of the left propeller, spent the next several seconds trimming the aircraft to offset the resulting drag, and then attempted to determine the trouble. During this short and critical period, to continue with the premise, and at low altitude, the speed of the aircraft continually decreased until control was lost as it struck trees and then dived into the ground.

As stated, the left propeller was found not feathered. Examination of the feathering mechanism of the impact-damaged propeller revealed no indication of malfunction or failure. Functional tests of the mechanism of the left propeller's feathering system could not be made. It is possible that the propeller could not be feathered because of a malfunction in its feathering system. However, it appears that there was barely time - if indeed there was actually enough time - in which to evaluate the situation and then feather.

The existing air conditions would not have formed wing ice, and this possibility appeared definitely not to have been a factor. Induction system icing was considered but in view of the existing temperatures this occurrence is discounted. Witnesses reported the noise of irregular engine operation. This could not be accounted for from the physical evidence. As mentioned under Investigation, however, erratic engine operation and loss of power when flying through rain sometimes occurs and may have occurred to the right engine in this instance. This condition can be minimized by the use of carburetor heat which in effect furnishes, to some degree, sheltered air. In this instance, if such were occurring, it is hardly understandable why the use of carburetor heat was not resorted to.

When the idle mixture linkage became disconnected it appears reasonable to assume that the resultant leaning effect could very well cause erratic sounding engine operation, particularly if throttle movement was resorted to by the pilot in an attempt to restore power.

The fact that the left propeller was not feathered is resolved around two possibilities: One, that a malfunction in the system existed prior to the accident and impact damage precluded any functional testing of the system; and two, that the flight crew did not recognize the need to feather the propeller since the left powerplant instrumentation indicated a near normal engine operation.

Mulherin, although a pilot of long and diversified experience and fine reputation, was nevertheless relatively inexperienced with the subject airplane. The large, open field directly and immediately ahead of the crash site suggests that he may have made an attempt to reach it in lieu of the airport.

Findings

On the basis of all available evidence the Board finds that:

1. The aircraft and the crew were properly certificated.
2. Pilot Mulherin was relatively inexperienced with the subject model aircraft.
3. The left engine suddenly lost all power because of a disconnected carburetor control.

4. The left propeller was found not feathered.
5. Examination of the right engine revealed no significant defect.
6. Altitude could not be maintained and the aircraft struck high trees and then plunged steeply to the ground.

Probable Cause

The Board determines that the probable cause of this accident was a critical loss of altitude, due to a complete power loss from the left engine and the drag of its windmilling propeller.

BY THE CIVIL AERONAUTICS BOARD:

/s/ JAMES R. DURFEE
/s/ CHAN GURNEY
/s/ HARMAR D. DENNY
/s/ G. JOSEPH MINETTI

S U P P L E M E N T A L D A T A

Investigation

The Civil Aeronautics Board was notified of this accident by telephone shortly after occurrence. An investigation was immediately started in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. Depositions were taken at Louisville, Kentucky, on July 25, 1956, Cicero, Illinois, July 27, 1956, and Washington, D.C., September 10, 1956.

Aircraft Owner

The Crane Company, a large manufacturer of plumbing supplies, maintains its principal office at Chicago, Illinois. At the time of this accident it owned three transport-type aircraft, including the subject PV-1, all used in the furtherance of company business.

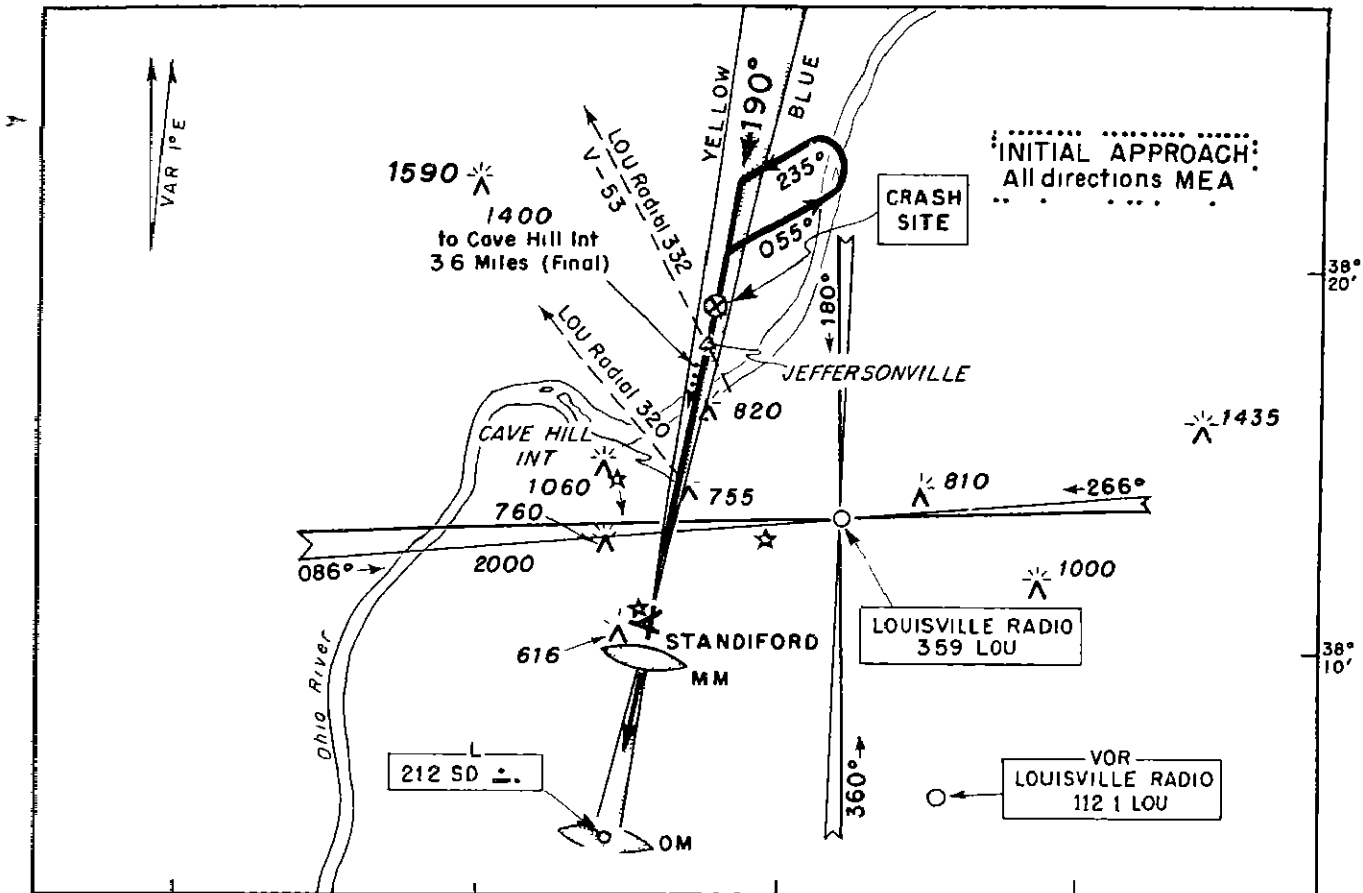
Flight Personnel

Randolph A. Mulherin, age 54, held a currently effective airman certificate with an airline transport rating and type rating for the PV-1. He had been employed by the Crane Company since August 1950, and was currently the company's chief pilot. Mr. Mulherin's pilot experience was both extensive and diverse, totaling some 17,600 hours. The record indicates that he had flown 279 hours during the previous six months, 44 hours during the previous 30 days, and three hours and 30 minutes during the preceding 24 hours. His last physical examination, on March 23, 1956, was satisfactory. Mr. Mulherin's pilot experience on PV-1 aircraft totaled only nine hours, all on the subject PV-1. This nine hours included his being checked for the type rating, which was done only shortly before this accident.

Robert H. Robinette, age 28, had been employed by the Crane Company since October 1950. His total piloting experience was 2,297 hours, of which 29 hours had been in PV-1's. His time in the last 90 days, 30 days, and 24 hours was much like that of Mr. Mulherin, with whom he flew frequently. Mr. Robinette's last physical examination on April 5, 1956, was satisfactory. He also held a currently effective airman certificate with an airline transport and other pertinent ratings.

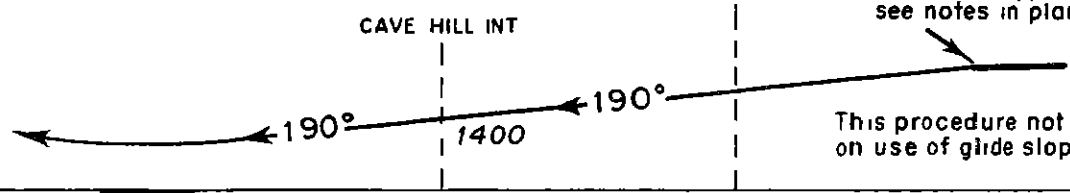
The Aircraft

Lockheed PV-1, serial number 5326, N 64001, was built as a military aircraft and was converted to the executive version in June 1949, by the Flying Tiger Line, Inc., at the Lockheed Air Terminal, Burbank, California. The aircraft was purchased by the Crane Company in March 1956 from the Columbia-Geneva Steel Corporation. Records indicate that its total time in the military service was 281 hours, in the service of the Columbia-Geneva Steel Corporation 2,795 hours, and in the Crane Company's service 33 hours. Engines were Pratt and Whitney R-2800-31. The left engine had a total time of 962 hours; the right engine had a total time of 930 hours. Times since overhaul were 234 hours and 287 hours, and since the last 100-hour check 81 hours and 80 hours for the left and right engines, respectively. Propellers were Hamilton Standard, model 23E50-505 with model 6491A-485 blades.



MISSED APPROACH
 CLIMB TO 2100 ON S COURSE ILS TO LOM, if not contact authorized minimums within 3.4 miles after passing Cave Hill Int

PROCEDURE TURN
 East side N course
 2000 within 10 miles of Jeffersonville Int



MINIMA

FIELD ELEV 497

	DAY		NIGHT		
	MIN ALT	CEIL VIS	MIN ALT	CEIL VIS	
STRAIGHT-IN	997	500-1	997	500-1	
CIRCLING	997	500-1½	997	500-1½	
RATE OF DESCENT FROM CAVE HILL INT					
KNOTS	90	100	110	120	130
FEET/MIN	400	445	490	535	580
MPH	100	110	120	130	140
FEET/MIN	385	425	465	505	540

ATTACHMENT A
 PV-1 N 64001
 THE CRANE CO
 NEAR
 JEFFERSONVILLE, IND.
 May 15, 1956

SOURCE AL-239-ILS-2 OF 3 MAY 1956