

## CIVIL AERONAUTICS BOARD

**ACCIDENT INVESTIGATION REPORT**

Adopted: January 14, 1953

Released: January 16, 1953

THE FLYING TIGER LINE, INC. - GRAND ISLAND, NEBRASKA, AUGUST 21, 1952

The Accident

A C-46F aircraft, N 67983, owned and operated by The Flying Tiger Line, Inc., made an emergency landing with the landing gear retracted in a field  $1\frac{1}{4}$  about  $\frac{3}{4}$  of a mile southwest of the Grand Island, Nebraska Airport at 1738<sup>00</sup>, on August 21, 1952. Both pilots, the only occupants, were uninjured. The aircraft was substantially damaged.

History of the Flight

This was a scheduled cargo flight designated as No. 165. It originated at New York, New York, and had as its destination Burbank, California. This segment of the flight extended between Chicago, Illinois, and Denver, Colorado with a planned refueling stop at Grand Island, Nebraska. Captain R. G. Clark and Copilot C. E. Burke comprised the crew. Departure from Chicago was at 1325, and the flight was routine in all respects to Grand Island where a landing was made at 1645.

At Grand Island the aircraft's cargo was not changed; however, fuel was added which brought the gross weight of the aircraft to 47,089 pounds, 911 pounds less than the certificated maximum allowable gross weight. The load was properly distributed with respect to the center of gravity of the aircraft. Prior to departure, a VFR (Visual Flight Rules) flight plan which designated the destination as Denver, Colorado, was filed with Air Route Traffic Control. The estimated elapsed time was two hours, with three hours and 30 minutes of fuel aboard.

At 1727, after completing the cockpit check list and normal engine run-up, the aircraft took off from Runway 3. Captain Clark occupied the left pilot's seat and the copilot was seated on the right side. After takeoff, a left climbing turn was made to an indicated altitude of 2,900 (the elevation of the Grand Island Airport is 1,846 feet above MSL). Captain Clark stated that after the turn was completed and in the vicinity of the range station (located 1-7/10 miles north of the airport on a bearing of 345 degrees) he fully retarded the throttle and propeller control of the right engine and called for the single-engine check list. At this time he told the copilot not to shut the fuel off or pull the firewall shut-off valve out. At the same time he also requested the copilot to call the Grand Island communications radio station<sup>2/</sup> and advise

<sup>1/</sup> All times referred to herein are Central Standard and based on the 24-hour clock.

<sup>2/</sup> There was no Control Tower in operation.

that he intended to return and make a single-engine landing on Runway 3. The captain testified that he actually intended only to make an approach. The copilot then read the single-engine check list, and the aircraft was trimmed for single-engine flight. The captain then feathered the right propeller. The air speed at that time was approximately 140 miles per hour and the left engine was operating at 42" of Hg. and 2400 RPM.

The aircraft was turned toward the airport with the intention of making a close-in pattern. During this turn, the air speed decreased to 120 miles per hour and the altitude to approximately 600 feet above the ground. Power on the left engine was then advanced to 44" and 2550 RPM Meto power (maximum continuous). With the aircraft still losing altitude at a rate of approximately 200 feet per minute and with the air speed approximately 120 miles per hour, the captain placed the throttle and propeller control of the left engine to the fully advanced position. Maximum manifold pressure obtained was 47" and 2750 RPM. By this time the air speed had dropped to nearly 105 miles per hour and the altitude was about 300 feet above the terrain. From the time of feathering, the aircraft lost altitude at a rate varying between 200 and 500 feet per minute. The captain then ordered the copilot to unfeather the right propeller; all efforts by the copilot to do this were unsuccessful. When about 1/2 mile west of the airport and approximately 200 feet above the ground, the captain began a left turn toward the runway. During this turn, with the landing gear and flaps in the retracted position and the air speed between 80-85 miles per hour, he felt the aircraft "buffet." Unable to complete the turn, the aircraft was landed straight ahead in a cornfield approximately 4,620 feet southwest of the airport. The aircraft skidded approximately 850 feet on a heading of 135 degrees, and turned 100 degrees to the left just before coming to a stop. All electrical switches were then shut off, and the crew evacuated through their respective windows. No one was injured; however, the aircraft sustained major damage.

At the time of the accident, the local weather was scattered clouds 20,000 feet, visibility 15 miles, temperature 78, dewpoint 48, and wind east-northeast 16 miles per hour, barometric pressure 30.08.

### Investigation

Investigation revealed that damage to the aircraft was confined largely to the bottom of the fuselage, engine nacelles, and the propeller blades; minor damage occurred to portions of the empennage and the wings.

Both landing gear wheel doors of the left nacelle were torn off and the engine cowl was distorted. The right nacelle was badly damaged forward of Station 88 (near the firewall); the right engine was torn from the nacelle at this point and was found lodged at the fuselage. The landing gear was fully retracted and was not damaged.

There was no evidence of any structural failure of any portions of the aircraft prior to impact.

The left engine sustained no visible damage; however, the tachometer generator and the hydraulic pump were broken from their respective mounts.

A disassembly and inspection of both engines showed these engines capable of functioning in a normal manner.

All blades of the left propeller were twisted and bent. One blade of the left propeller was broken off at the hub; the remaining two blades were badly damaged. Examination of the right propeller dome disclosed a considerable amount of oil at the rear of the piston and none at its front (normal for a fully feathered position). This indicated that the propeller had been feathered but that unfeathering had not been started. The propeller blades were found in the fully feathered position. The feathering system of the right propeller was subsequently bench checked and with the exception of the wiring in the vicinity of the junction box at Station 88 which was destroyed at impact, it was found capable of normal operation. No evidence was found which would explain why this propeller would not unfeather.

The aircraft's maintenance records were reviewed and these indicated that normal inspections and maintenance had been performed. All airworthiness directives had been complied with.

According to the captain, the feathering mechanism of both propellers was checked at Chicago as a part of the before take-off check, and both systems functioned in a normal manner; a similar check was not made before departing Grand Island. He also said that he decided, before leaving Chicago, to practice a simulated single-engine approach to the Grand Island Airport; however, he did not advise the copilot of his intention. Prior to departing Grand Island he did not determine the density altitude. (It was approximately 4000 feet).

Both engines functioned in a normal manner during the engine run-up check prior to taking off at Grand Island, and there was no indication during the subsequent flight of any malfunctioning. One hundred octane fuel was used throughout the flight at Grand Island.

The aircraft did not appear to be sluggish on the take-off and climb out. During the single engine portion of the flight, the left engine's manifold pressure gauge and tachometer (the only available instruments which indicate power being developed) registered normally for respective power settings. The captain said that the indicated air speed was 140 miles per hour when the right propeller was feathered and that the left engine was operating at 42" of Hg. and 2400 RPM. During the feathering operation, a left turn was executed and in this turn the air speed decreased from 140 to 120 miles per hour and 400 feet in altitude was lost. Metro power (maximum continuous, 44" of Hg. and 2550 RPM) was then applied but the aircraft continued to lose air speed and altitude. Nearing 300 feet above the ground with the air speed then about 105 miles per hour, full power was applied, and at that time the copilot was requested to unfeather the right propeller. The captain also said that with the exception of the short time during the initial left turn, the attitude of the aircraft was either one of level flight or slightly nose high. Referring to his inability to unfeather the right propeller, the copilot said: "I had gone down the unfeathering check list but did not have time to finish it as we were losing altitude and I was trying to get the right engine unfeathered. I tried repeatedly to unfeather the right engine with no results."

A review of the company's training procedures and methods revealed that the majority of pilot flight training consisted of "en route" training. All pilots are initially employed as copilots and as such are given both ground school and flight qualification training before assignment on scheduled flights. When up-graded to captains, all pilots attend ground school where they are taught familiarization of the aircraft to be flown and its components. Following this study, pilots receive comprehensive flight training in the same type aircraft and upon its completion, a final examination in the form of a captain's acceptance and route check is given. According to the company's flight manual, both copilots and captains are required to take two hours of training each month in a Link Trainer besides one hour of actual or simulated instrument practice during each scheduled flight. It is also customary for pilots to maintain proficiency by practicing for approximately 15 minutes of each flight any flight maneuvers considered necessary. Captain Clark, in anticipation of an impending six months check, was practicing when the accident occurred.

Prior to the accident, no instructions had been issued pilots prohibiting the feathering of a propeller during simulated single-engine practice; however, subsequent to the accident the company issued a bulletin to all pilots prohibiting the feathering of a propeller during such a maneuver unless a check pilot was aboard and then only after a minimum altitude of 4000 feet above the ground was reached.

As a result of this accident, Captain Clark was, on September 1, placed on copilot status and at his request was transferred to the Pacific Division as copilot of DC-4 equipment on November 6, 1952. Upon completing some additional domestic C-46 copilot time and successfully accomplishing a pilot check flight he may be returned to captain status on C-46 equipment.

As a part of the investigation of this accident, several C-46 pilots testified that the C-46F when loaded to 48,000 pounds had marginal single engine performance. Also, even when flying at a density altitude below 7,600 feet under these conditions the aircraft would not always maintain altitude. This was true, they said, even when the engine instruments indicated that full power was being developed by the good engine. These witnesses said that when the aircraft was loaded to 48,000 pounds (maximum allowable gross weight) a very high degree of pilot proficiency was needed due to the marginal single-engine performance and the lack of an allowable margin of safety for pilot error.

According to the en route performance chart contained in the company's Airplane Manual, the aircraft should have been capable of the following performance: At a density altitude of approximately 4000 feet, one engine operating at Meto power, the propeller of the other engine feathered, gear and flaps up, cowl flaps 20° open, weight 47,089, indicated air speed 130 miles per hour, the aircraft should climb at a rate of approximately 175 feet per

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3/ The company claimed that the C-46 aircraft in the en route climb configuration, Meto power, and loaded to 48,000 pounds, would climb at a low rate on a single engine at a density altitude of 7,600 feet. To create a safety margin, the company ordered that when necessary to take off at a density altitude above 7,600 feet, the load must be decreased by 200 pounds for each additional 100 feet above this altitude.

minute. This aircraft, in the same configuration, should climb at a rate of 110 feet per minute under the existing temperature of 78° F.

### Analysis

In considering the facts and conditions surrounding this accident, the failure of the captain to check the density altitude prior to take-off can certainly be questioned, since this omission prevented him from knowing what single-engine performance could be expected. He further displayed poor judgment in actually feathering the propeller at such a low altitude and with the aircraft loaded nearly to its allowable gross weight. Although the company had not issued instructions prohibiting the actual feathering of a propeller during simulated single-engine flight, it had every reason to believe that a qualified pilot would not have done so under the existing conditions. The accepted and safer procedure is to reduce power to the near zero thrust condition. Then, in the event it is needed, power is immediately available.

The captain was also aware that with a C-46 aircraft loaded to 47,089 pounds, gear and flaps up and flying on a single-engine, it is difficult to maintain level flight at an air speed appreciably below 130 miles per hour and with less than Meto power being developed by the engine being used. In this case, the aircraft had an air speed of 140 miles per hour at the beginning of the feathering operation and initial left turn, and when Meto power was not applied, crucial air speed and altitude were lost. With the air speed nearing 120 miles per hour and with the aircraft still losing altitude at an appreciable rate, it is doubtful if even the immediate application of take-off power would have prevented a continuing loss of altitude. Also, no effort to make available the maximum power by unfeathering the right propeller was made until the aircraft had descended to an altitude of approximately 300 feet above the ground. At this low altitude and with the aircraft descending rapidly, it is doubtful if there would have been sufficient time to completely unfeather before contacting the ground. The copilot stated that he used the proper technique attempting to unfeather this propeller; however, the propeller, upon examination, was found to still be in the fully feathered position.

The captain said that perhaps the left engine was not delivering the amount of power commensurate with the engine instrument indications after the right engine's propeller was feathered. Although this cannot be accurately checked, it was established that the left engine was functioning normally immediately prior to the feathering and that it ran smoothly until power was reduced for landing. It is therefore unreasonable to assume that there was any appreciable deterioration in power from this engine.

### Findings

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

1. The aircraft, the crew and the carrier were properly certificated.
2. Weather was not considered a factor in this accident.
3. At the time of take-off from Grand Island, the aircraft weighed 47,089 pounds, 911 pounds below the maximum allowable gross weight.

4. Prior to departing Grand Island, the captain did not determine the density altitude.

5. The captain decided to simulate a single engine approach to the Grand Island Airport.

6. The right propeller was feathered at an indicated air speed of 140 miles per hour and an indicated altitude of 2,900 feet, which is approximately 1,000 feet above the terrain.

7. Mto power was not applied to the left engine until the air speed had dropped to 120 miles per hour, and no attempt was made to put the right engine into operation until the air speed was down to approximately 105 miles per hour and the altitude of the aircraft about 300 feet above the ground.

8. During the period of single-engine operation, the air speed decreased from 140 miles per hour to 80-85 miles per hour.

9. After unsuccessful attempts were made to place the right engine in operation, the aircraft was landed in a corn field with the landing gear and flaps in a fully retracted position.

Probable Cause

The Board determines that the probable cause of this accident was the captain's action, under the existing conditions, in voluntarily committing the flight to single-engine operation, and subsequent poor judgment and technique while attempting to effect recovery.

BY THE CIVIL AERONAUTICS BOARD:

/s/ OSWALD RYAN

/s/ JOSH LEE

/s/ JOSEPH P. ADAMS

/s/ CHAN GURNEY

## S U P P L E M E N T A L   D A T A

### Investigation and Hearing

The Civil Aeronautics Board received notification of the accident at 2000, August 21, 1952, from the Civil Aeronautics Administration Communications station at Kansas City, Missouri. An investigation was immediately initiated under the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. A special investigation was ordered by the Board and was held September 11, 16 and 22, 1952, at Kansas City, Kansas; Denver, Colorado, and Santa Monica, California, respectively.

### Air Carrier

The Flying Tiger Line, Inc., is a scheduled air carrier incorporated in the state of Delaware with its principal business office at Burbank, California. It operated under a currently effective certificate of public convenience and necessity issued by the Civil Aeronautics Board and an air carrier operating certificate issued by the Civil Aeronautics Administration. These certificates authorize the company to transport cargo by air over numerous routes within the continental limits of the United States including the route involved.

### Flight Personnel

Captain R. G. Clark, age 34, held a currently effective airline transport pilot rating with an appropriate rating for the subject aircraft. He had been employed by The Flying Tiger Line since 1951. He had a total of approximately 4800 hours flying time of which 740 hours had been in C-46 type aircraft. He had received his last instrument and equipment check on January 23, 1952. He had passed his last CAA physical examination on April 7, 1952.

Copilot C. E. Burke, age 30, was employed by The Flying Tiger Line on June 18, 1952. He held a currently effective airline transport pilot rating. He had a total of 2700 hours flying time of which 125 hours were in C-46 type aircraft. He had passed his last CAA physical examination on June 17, 1952.

### The Aircraft

N 67983, a Curtiss-Wright C-46F aircraft, was manufactured September 23, 1943, and had a total of 3908 flying hours. It was equipped with two Pratt and Whitney R-2800-75 engines. The left engine had a total of 407 hours since overhaul and the right engine had a total of 197 hours since overhaul. The engines were equipped with Hamilton Standard Hydromatic propellers, model 23E50-473, with 6491A-6 blades - modified clipped type.