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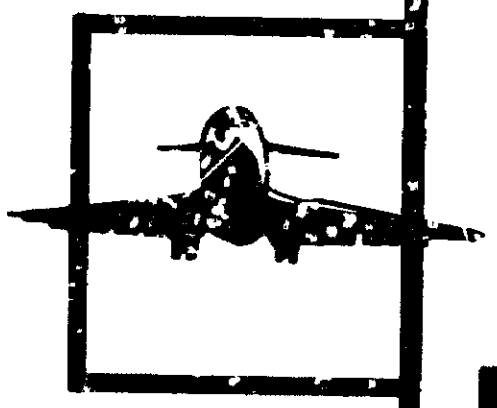

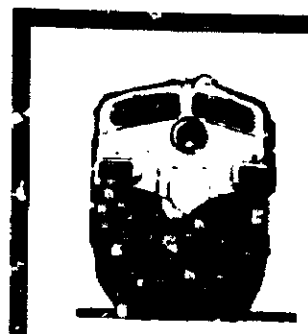

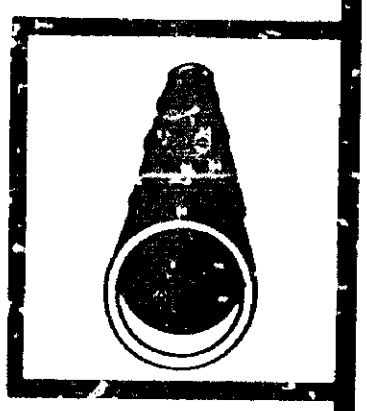

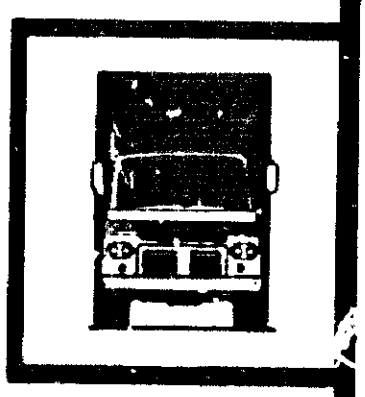

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

KELLOGG COMPANY
AVIONS MARCEL DASSAULT BREGUET
FALCON 10, N253K
MEIGS FIELD
CHICAGO, ILLINOIS
JANUARY 30, 1980

NTSB-AAR-81-6

UNITED STATES GOVERNMENT

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16. Abstract

At 1548:35 c.s.t., on January 30, 1980, a Kellogg Company Falcon 10, N253K, crashed into Lake Michigan just after an attempted takeoff from runway 18 at Meigs Field, Chicago, Illinois. The aircraft came to rest in 25 feet of water about 300 feet from the departure end of the runway. Of the four passengers and two crewmembers aboard, one passenger and one crewmember were killed. The other four persons were injured seriously. The aircraft was destroyed.

The National Transportation Safety Board determines that the probable cause of the accident was the flightcrew's failure to release the parking brake before the takeoff roll was started, which resulted in significant wheel/brake drag and a nosedown pitching moment that inhibited the aircraft's capability to effect a normal acceleration and rotation for takeoff. Contributing to the accident was the lack of adequate company checklist procedures to insure the timely release of the parking brakes.

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

Adopted: May 12, 1981

KELLOGG COMPANY
AVIONS MARCEL DASSAULT BREGUET FALCON 10, N253K
MEIGS FIELD
CHICAGO, ILLINOIS
JANUARY 30, 1980

SYNOPSIS

At 1548:35 c.s.t., on January 30, 1980, a Kellogg Company Falcon 10, N253K, crashed into Lake Michigan shortly after an attempted takeoff from runway 18 at Meigs Field, Chicago, Illinois. The aircraft came to rest in 25 feet of water about 300 feet from the departure end of the runway. Of the four passengers and two crewmembers aboard, one passenger and one crewmember were killed. The other four persons were injured seriously. The aircraft was destroyed.

The National Transportation Safety Board determines that the probable cause of the accident was the flightcrew's failure to release the parking brake before the takeoff roll was started, which resulted in significant wheel/brake drag and a nosedown pitching moment that inhibited the aircraft's capability to effect a normal acceleration and rotation for takeoff. Contributing to the accident was the lack of adequate company checklist procedures to insure the timely release of the parking brakes.

1. FACTUAL INFORMATION

1.1 History of the Flight

On January 30, 1980, a Kellogg Company Avions Marcel Dassault Breguet Falcon 10, N253K, was operated to provide round-trip transportation for company executives from Battle Creek, Michigan, to Meigs Field, Chicago, Illinois. At 0600, 1/N253K departed Battle Creek with four passengers and two pilots on board. Both pilots held air transport pilot ratings and both were type rated to act as pilot-in-command of the aircraft.

N253K landed at Meigs Field about 0715. The flightcrew reported no aircraft malfunctions or discrepancies. Arrangements were made between the flightcrew and the passengers to depart about 1500 that afternoon for the return flight to Battle Creek.

About 1400, both pilots went to the aircraft to sweep dry, powdered snow from the wings in preparation for flight. Because of its height above the ground, the horizontal

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

stabilizer could not be swept. The copilot used deicing fluid to remove a small ridge of slush which had accumulated at the rear of the leading edge flap. No other ice or slush accumulations were observed on the wing surfaces.

About 1420, the pilots received a telephone call from the passengers to inform them that their business was not completed and takeoff time would have to be delayed 1 hour. About 1530, the four passengers and the pilot who was to act as pilot-in-command on the return flight boarded the aircraft. The pilot who was to act as copilot brushed a light cover of fresh fallen snow from the wings.

At 1543:44, the copilot of N253K told Meigs Tower that the aircraft was ready to taxi for takeoff. The tower replied, ". . . taxi runway one eight, wind one four zero at five, altimeter three zero three eight, indefinite ceiling eight hundred, sky obscured, visibility one mile in light snow showers." The copilot acknowledged the transmission. In a postaccident interview, the pilot stated that he released the parking brake, which had been set for engine start, and began the taxi to runway 18. The pilot stated further that during the taxi he was required to taxi around an aircraft parked on the taxiway and required to hold short of the active runway because of a landing aircraft. During the hold, he used the brake pedals to keep the aircraft stopped and did not activate the parking brake. At 1545:57, Meigs Tower called N253K and stated, "Falcon five three into position and hold. . . ." According to the pilot, he taxied into position for takeoff on runway 18 and again stopped and held the aircraft by use of the brake pedals.

The pretakeoff crew briefing included the review of the applicable takeoff speeds 2/ and the aborted takeoff procedures. These speeds, as computed by the flightcrew, were: V1--100 knots; VR--107 knots; and V2--108 knots. At that time, both pilots agreed that if anything happened after the aircraft had attained and/or passed V1 speed the takeoff would be continued.

At 1547:43, Meigs Tower again called N253K and said ". . . and five three kilo . . . cleared for takeoff, wind one two zero at seven." Four seconds later, the pilot acknowledged, "Five three kilo rolling."

The pilot of N253K stated that he ran the engines up to 80 percent power, checked the other engine instruments, placed the throttles "full forward," and released the brakes. He said that ". . . everything went normally . . . accelerated nicely up to V1, and at V1 it would not -- it just stopped accelerating -- and we were hanging between V1 and VR . . . and from that point, after it hit V1, [the aircraft] didn't accelerate." After what the pilot thought was a "couple of seconds," a decision was made that ". . . we have to go. And you could tell right then it was going to be very, very close . . . and the airspeed indicator just crept up to V2. We had about five hundred feet of runway left." The highest speed that the pilot could recall seeing on his airspeed indicator was 107 knots.

The pilot stated that he pulled the nose of the aircraft up and it came up sluggishly. He also recalled using only the control force or position which he normally used to rotate the aircraft on other takeoffs, and he did not use any stabilizer trim to assist him during rotation. As the aircraft's nose came up, the airspeed decreased slightly and it became very difficult to hold the nose off the runway. He stated, "By that

2/ V1 - takeoff decision speed; VR - rotation speed; and V2 - takeoff safety speed.

time we just skidded--we were right off the end of the runway. I know the nose was up when we went off the end of the runway but then immediately came down, and we went nose first into the water."

At 1548:35, N253K ran off the south end of runway 18 and into Lake Michigan. It came to rest submerged in 25 feet of water about 300 feet from the departure end of the runway.

Meigs Tower personnel and other witnesses stated that as N253K accelerated down runway 18 it never rotated fully. The main landing gear were still on the runway surface when the aircraft reached the end of the runway. Because of the poor visibility, no one saw the aircraft enter the water.

The accident occurred during the hours of daylight at latitude 40°51' 51"N and longitude 87°36' 30"W.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others	Total
Fatal	1	1	0	2
Serious	1	3	0	4
Minor/None	0	0	0	0
Total	2	4	0	6

1.3 Damage to Aircraft

The aircraft was destroyed.

1.4 Other Damage

None.

1.5 Personnel Information

Both crewmembers were trained and certificated in accordance with current regulations. (See appendix B.)

1.6 Aircraft Information

N253K was certificated and maintained in accordance with current regulations. The aircraft was manufactured by Avions Marcel Dassault Breguet of France. It was delivered to Falcon Jet, Teterboro, New Jersey, about March 16, 1974, and was sold to the Kellogg Company of Battle Creek on May 30, 1974. (See appendix C.)

The Falcon 10 aircraft is equipped with an emergency/parking brake system, which operates from pressure supplied from the No. 2 hydraulic system directly to the wheel brakes through a proportional selector valve that is mounted in the lower left side of the nose section. Pressure to the emergency/park brake system is controlled by a lever which is located at the upper left corner of the center control pedestal, the lever is adjacent to the pilot's right knee. (See figure 1.)

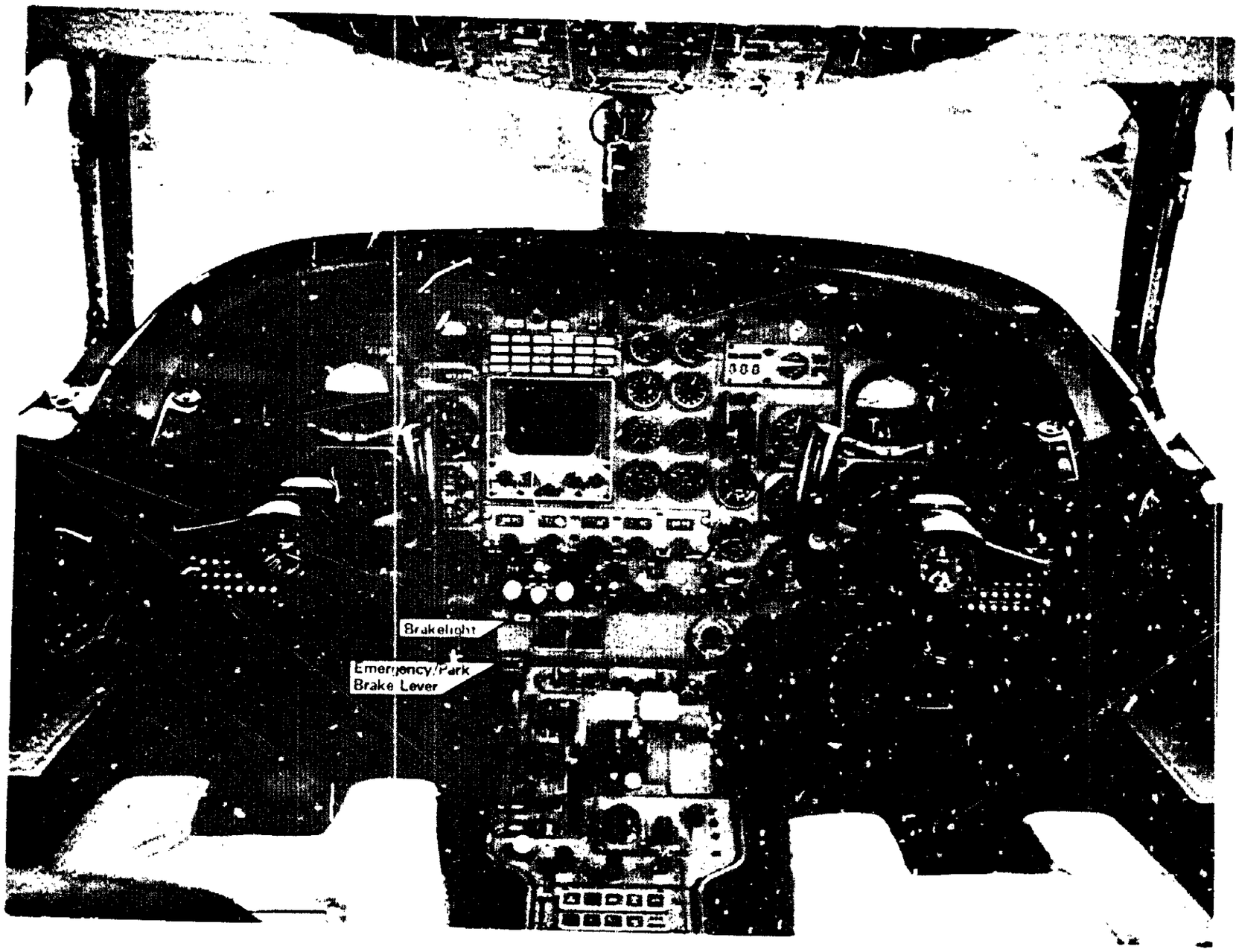

Figure 1.-- Cockpit controls in Falcon 10 aircraft.

The quadrant in which the lever moves fore and aft has three positions in which it can be secured: "Off," which relieves all hydraulic pressure to the brakes; "Park", which supplies one-third system pressure to the brakes; or "Emergency," which supplies full system pressure to the brakes. The lever will remain in any of the three positions whenever the latch on the lever is engaged and seated in the desired slot in the quadrant. Additionally, hydraulic pressure can be supplied to the emergency/park brake system through the proportional selector valve by not allowing the latch to become engaged in any of the slots in the quadrant. By using the emergency/park brake lever rather than the brake pedals to the normal brake system, positive, even braking action can be attained easily. When the lever is seated in the park position, a brake light located on the instrument panel, just forward of the pilot's right knee, will illuminate. The bulb and the filament for this light were examined, and no definitive information was obtained as to whether the bulb was functional before the accident.

1.7 Meteorological Information

The official weather observation taken by Meigs Field tower personnel at 1456 was:

> Indefinite ceiling 800 ft, sky obscured; visibility--1 mi in light snow; temperature --22° F; dewpoint--16° F; wind--120° at 6 kn; altimeter setting—30.29 inHg.

The tower log which showed the recorded snowfall intensity revealed that light snow with intermittent light snow showers had been falling since 0850. The pilot of N253K estimated the snow depth on the runway at the time of takeoff to be about 1 inch. A Meigs Field employee estimated the snow depth at less than 2 inches. The employee stated further that the snow was very dry and powdery and that there was no value in plowing snow of this type and depth.

The pilot stated that there was no slush or standing puddles of water on the runway when N253K started its takeoff roll. He stated that the snow on the runway was not considered to be a hazard or to have any affect on the normal takeoff performance of the aircraft.

1.8 Aids to Navigation

Not applicable.

1.9 Communications

There were no reported communications difficulties.

1.10 Aerodrome Information

Meigs Field is located on the west shore of Lake Michigan just east of downtown Chicago. Runway 18/36, the only runway at the airport, is asphalt paved and is 3,948 feet long and 100 feet wide. The threshold at the north end of the runway is displaced 549 feet for landings to the south; however, the displaced section can be used for takeoff to the south.

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

N253K struck the water in a relatively flat attitude about 300 feet from the departure end of runway 18 at Meigs Field and, in a few minutes, sank to a depth of about 25 feet. A crash boat from the Chicago Fire Department located the wreckage about 1300 on January 31, 1980.

During the wreckage recovery operations, the aircraft was hooked by chains from a barge and was dragged underwater to within 40 feet of the runway. Three attempts to raise the aircraft were made because the lifting lines snapped during the first two attempts and allowed the wreckage to fall back into the water. On the third attempt, the aircraft was raised and the wreckage was moved to a hangar for inspection. During the recovery operation, the right wing leading edge flap, the outboard section of the horizontal stabilizer, and the fillet area near the fuselage on both engine pylons were damaged.

When it was pulled from the water, the aircraft's configuration was:

Flaps	15°
Leading edge slats	Extended
Horizontal stabilizer	Takeoff position
Thrust reversers	Stowed
Throttles	Idle stops
Airbrakes	Stowed
Main landing gear	Down and locked
Nose landing gear	Missing (not recovered)
Tires	Deflated (except No. 2)
Wheel rims	Damaged

The emergency/park brake handle was found aft of the intermediate (parking) position and the top of the handle was bent to the left.

All equipment which was attached to the lower section of the fuselage forward of the wing, including the structure below the floorline of the cockpit and cabin, was missing; however, the section was later recovered.

Both powerplants were damaged from the impact and water; however, there was no indication of preimpact failure of either powerplant or its associated components.

All flight controls and their associated systems were recovered and none showed evidence of preimpact failure or malfunction.

1.13 Medical and Pathological Information

Postmortem examination of the copilot and a review of the medical records of the pilot revealed no evidence of any medical problems that would have affected their

performance. Toxicological analysis of the copilot's blood sample showed no acidic, neutral, or basic drugs, no alcohol, and no carbon monoxide present.

The copilot died from impact trauma. His injuries included fractures of facial and chest bones, dislocation of cervical vertebra, and laceration of the spinal cord. The pilot's injuries consisted of multiple fractures of the legs and several bruises and lacerations.

The passenger died from drowning after successfully evacuating the aircraft. The three surviving passengers received various injuries and suffered some exposure from the cold, icy water of Lake Michigan.

1.14 Fire

There was no fire.

1.15 Survival Aspects

This was a partially survivable accident. With the exception of the lower nose and cockpit area, the structural integrity of the fuselage was not compromised. All passenger and crew restraints functioned normally. All seats remained secured during the rapid deceleration. Two passengers, who were seated facing aft, stated that they felt very little deceleration force.

According to the passengers, there was no panic among the occupants in the cabin after the aircraft came to rest in the water. The cabin emergency lighting functioned normally and no problems were encountered in removing the overwing escape hatch. All four passengers left the aircraft through the hatch. The pilot stated that he escaped by swimming down through the hole in the bottom of the cockpit and around the side of the aircraft nose. The surviving passengers and the pilot stayed afloat by treading water, by standing on large chunks of ice, and by clinging to the floatable seat cushions.

A Chicago Fire Department helicopter responded immediately to the crash alarm from Meigs Tower and was over the crash site within 3 minutes. The helicopter crew located the wreckage, spotted the survivors, and rescued the pilot and three passengers. When the fourth passenger was seen struggling in the water, a fire department captain jumped into the water from the helicopter to assist but was unable to reach the passenger in time.

1.16 Tests and Research

1.16.1 Aircraft Performance Analysis

The following takeoff conditions were used by the Safety Board to compute aircraft performance:

Aircraft gross weight	15,340 pounds
Aircraft center of gravity	22 percent MAC
Ambient air temperature	22° F
Field pressure altitude	490 feet
Wind	0

Runway slope	0
Flaps	15° with slats extended
Gear	Down
Anti-ice	Off
Takeoff thrust	Both engines

Based on the above data, the following takeoff performance for N253K on the day of the accident was computed:

Stall speed (VS)	91 KIAS (knots indicated airspeed)
Decision speed (V1)	101 KIAS
Rotation speed (VR)	108 KIAS
Takeoff safety speed (V2)	110 KIAS
Maximum brake energy speed (VMBE)	172 KIAS
Maximum takeoff weight for field length	17,995 pounds
Takeoff balance field length	2,890 feet
Accelerate stop distance	2,960 feet
Takeoff distance	2,450 feet
Takeoff run	2,110 feet

The pilot stated that the "airspeed indicator just crept up to V 2. We had about five hundred feet of runway left." At this point, the aircraft would have used about 3,400 feet of the available runway. The performance data indicate that this aircraft should have had a takeoff run of about 2,110 feet.

1.16.2 Examination and Testing of the Brake Systems

The brake control valve, which is located near the nose landing gear, was not recovered. The emergency/parking brake control handle was attached to the pedestal. The teleforce cable attachment point was bent and broken. The detent at the intermediate (park) position exhibited deformation. The Nos. 2 and 3 brake assemblies were disassembled for a visual examination. There was no evidence of overheating, and both assemblies appeared to be in serviceable condition. The left and right skid control system return line filters were removed for examination and found to be clean.

Examinations of the four wheels revealed no evidence of overheating. The fuse plugs in all four wheels were intact.

All four brake assemblies were hydraulically tested in both modes and functioned satisfactorily. No leakage was noted. Examination of all four brakes revealed 60 to 70 percent wear and no evidence of gross overheating. Examinations of the remaining brake systems and linkages did not reveal any evidence of preimpact operating difficulties.

Taxi tests revealed that a Falcon 10 aircraft can be taxied easily with the parking brake set.

1.16.3 Brake Discs and Wear Pads

The brake discs and wear pads from N253K and a baseline wear pad 3/ were examined at the Goodyear Aerospace Corporation under the supervision of the Safety Board. The following significant observations were made: 4/

> None of the brakes appear to have experienced extreme heat. Some discs showed signs of local high temperatures as witnessed by the copper on the disc face. . . .
>
> Wear pads from both the brakes indicate that part or all of the wear pad surface has seen temperatures beyond 1600° F. The difference between the two (2) brakes is in the cooling rates after exposure to heat; the baseline wear pad having a slower cooling rate than the subject wear pads.

A separate test of the brake wear pads from the four brake stationary discs on N253K and, for comparison, a representative new brake wear pad was conducted at the Safety Board's metallurgical laboratory in Washington, D.C. The least amount of wear was noted on the pads from the Nos. 1 and 2 brakes and the most amount of wear was found on the Nos. 3 and 4 brakes. Wear was uneven on all the pads, with the predominance of wear either on one side or along the bottom area of the pad. The pads from the Nos. 3 and 4 brakes had copper transferred onto their surfaces in the area of maximum wear.

The wear pads were manufactured from Timken Roller Bearing Company "17-22-A" S-type steel which was quenched and tempered to a hardness range of 30 to 35 Rockwell "C." To produce this hardness, a tempering temperature between 1,150° F and 1,250° F was used.

The wear pad from the No. 1 brake gave Rockwell "C" hardness readings throughout, which were consistent with that required for a new wear pad. Hardness readings obtained from the representative wear pads from brake discs Nos. 2, 3, and 4 gave values above Rockwell "C" 50 in the areas corresponding to maximum wear.

All of the wear pads were subjected to microstructural examination. A microstructure indicative of tempered martensite throughout the specimen was found on the new wear pad and the wear pad from brake disc No. 1. The wear pads from the Nos. 2, 3, and 4 brakes contained areas with a microstructure having varying depths of a partially or totally transformed structure typical of that which was burned and cooled quickly (untempered martensite).

1.16.4 Landing Gear and Tires

When the aircraft was removed from Lake Michigan, the main landing gears were in the down and locked position. The nose landing gear and the extreme lower

---

3/ The baseline wear pad was taken from a Falcon 10 brake system which had overheated in service and had cooled under normal conditions.
4/ Goodyear Aerospace Report No. PSE 380-1, March 25, 1980.

forward fuselage structure aft of the nose section had separated from the aircraft and were not recovered.

The examination revealed some small areas of rubber reversion, 5/ mostly on the tread shoulders of the Nos. 1, 2, and 3 tires. The Nos. 1 and 2 tires exhibited scratch and wear marks running parallel to the tread grooves in the areas of rubber reversion. The area of rubber reversion on the No. 3 tire had been nearly worn away. The No. 4 tire showed no areas of rubber reversion.

1.16.5 Emergency/Park Brake System

On May 23, 1980, the left lower part of the nose section was recovered from Lake Michigan. The section contained the broken teleforce cable, emergency/parking brake accumulator, pressure switch, pressure relief valve, and proportional selector valve. The section was taken to Wisconsin Industrial Testing, Milwaukee, Wisconsin, where the proportional selector valve was X-rayed while still mounted on the bulkhead. The X-ray revealed no broken springs and the ball valve plunger was seated firmly.

Later, the section was taken to Appleton, Wisconsin, where a functional test of the proportional selector valve, pressure switch, and accumulator was made. The gage on the accumulator showed that 20 psi pressure remained. The hydraulic pressure supply line was connected to a pressure supply line and a direct reading gage was connected to the fitting which supplies proportional pressure to the wheel brakes. Two-hundred psi was applied to the valve. No leaks were noted in any of the hydraulic lines and no pressure leaked through to the gage. Five-hundred psi was then built up in the valve. The end of the teleforce cable was pulled toward the open position. Pressure proportional to the pull force on the cable was noted on the direct reading gage.

The pressure switch was tested by using an ohm meter. Continuity within the pressure switch was established by increasing and decreasing accumulator pressure. One-thousand eight hundred fifty pounds of pressure was built up in the accumulator. No leaks were noted, and when the proportional selector valve was pulled full open full accumulator pressure was noted on the gage.

1.16.6 Examination of Emergency/Park Brake Lever and Quadrant

The emergency/park brake lever and quadrant were examined in the Safety Board's metallurgical laboratory. The examination showed that the scratches and deformations found on the brake lever latch tooth were identical in shape and size with those indentations found in the locking finger on the quadrant for the park (intermediate) brake lever position.

1.17 Other Information

1.17.1 Flightcrew Checklists

A review of the company-prepared flightcrew checklist, approved by the Federal Aviation Administration (FAA) and used by the pilots of N253K, revealed several

5/ Deterioration of rubber caused by the friction produced when the tire is in a skidding condition.

variations from the checklist suggested in the manufacturer's aircraft flight manual. These variations appear on pages 6 and 7 of the company checklist and pages 4-11 and 4-12 of the checklist in the flight manual. The specific differences are as follows:

1. Section 4, page 11 of the manufacturer's flight manual, "Leaving the Parking Area," shows five items to be accomplished. Four of these items refer to the brakes. The section marked "Taxi Check" on page 6 of the company checklist does not list two of the items, one of which calls for "brake light . . . out."

2. Section 4, page 11, of the manufacturer's flight manual, "Pretakeoff," and section 4, page 12, "Line Up," clearly emphasize that a positive check is to be made for "brake light . . . out." The sections "Before Takeoff" and "Line Up" of the company-prepared checklist do not call for a final "brake light . . . out" check to be made by the flightcrew before the application of power for takeoff.

1.17.2 Operational Instructions Manual—Cold Weather Conditions

Section 11L, pages 1-030(7) and (8), of the Falcon 10 Operational Instructions Manual contains the following information concerning takeoffs conducted on snow:

> 3. Take-off and dry snow
>
> No take-off run corrections are necessary when there is less than 1.2 inches (30 mm) dry snow.

No area of the manufacturer's flight manual addressed any correction for conditions with dry snow deeper than 1.2 inches.

1.18 Useful or Effective Investigation Techniques

No new or unusual investigation techniques were used during this investigation.

2. ANALYSIS

2.1 General

The pilot and copilot were properly certificated and qualified in accordance with company and FAA requirements and regulations. There was no evidence of a preexisting medical problem that could have affected either pilot's performance.

The aircraft was certificated and maintained in accordance with applicable regulations. There was no evidence of preimpact failure, malfunction, or abnormality of the aircraft's airframe, systems, or powerplants.

The aircraft's takeoff gross weight and center of gravity were within the prescribed limits. The performance data showed that the aircraft was capable of operating from the 3,945-foot-long runway at Meigs Field.

Three of the four main landing gear tires were found to have slight reverted rubber damage of a nature that is not unusual in normal aircraft operation. For tire rubber to "revert" from a polymer to a monomer, the wheel upon which the tire is mounted must have no rotation and be travelling over a wet surface. During the process, there will be almost no braking force and friction levels will be virtually identical to those of a free-rolling tire. Because of the slight extent and nature of reverted rubber damage and the fact that brake evidence supports a finding that the wheels were rolling during the accident sequence, this damage, if caused during this takeoff attempt, could only have helped the situation by decreasing braking forces, and the damage is not considered significant to this accident.

2.2 Runway Condition

The Safety Board could not determine accurately the depth of snow on the runway. The Meigs Field tower personnel were not required to record snow depth. Observations of the pilot of N253K and those of a Meigs Field employee, whose normal duties would have been to plow the runway during heavy snowfall, placed the depth between 1 and 2 inches of very fine, dry snow. The Safety Board does not believe that this snow would have significantly affected the aircraft's takeoff performance; however, stopping performance would have been affected.

2.3 Aircraft Performance

The pilot stated that acceleration appeared normal until V1 speed had been attained, so there was no reason to consider rejecting the takeoff before that time. Examination of the two powerplants showed that they were capable of developing the power required for takeoff, and interviews with the pilot and passengers revealed no abnormalities in the powerplants' operation.

The evidence uncovered in this accident indicated the presence of a wheel drag force which was unknown to the pilots, which was acting upon the wheels throughout the entire takeoff roll, and which reduced substantially normal aircraft acceleration. Conclusive evidence that the brake lever was in the park position during takeoff was discovered during the metallurgical examination of the brake lever. This examination showed that the indentations on the parking position tooth and its corresponding lock finger were identical in size and shape. It is unlikely that these indentations could have resulted from the normal operation of the brake lever in the park position. This type of damage would have had to occur as the result of a large force applied to this mechanism which caused the parking brake lever to separate while it was engaged in its locked position. Therefore, the Safety Board believes that the brake lever was set and locked in the park position when the damage occurred.

The metallurgical examination showed that brake pads taken from the aircraft were of a structure and hardness which could only have occurred if they had been heated to about 1,600° F followed by a rapid quenching process. This process would not have occurred in the brake pads under normal operating conditions. It could only have occurred if the brake pads were heated to a high temperature, such as that which would be produced if the parking brake were set, and then quenched rapidly, such as that which would occur when the brake pads came in contact with the cold, icy water of Lake Michigan.

Therefore, the Safety Board believes that the flightcrew of N253K set the parking brake sometime between the time they entered the aircraft for flight and the time they started the takeoff roll and that they did not release the parking brake to continue toward takeoff. Taxi tests showed that the aircraft can be taxied easily with the parking brake set. Heat produced by the pads rubbing against the brake plate would have caused the pads to expand, thus producing more drag, particularly as the aircraft reached higher speeds. The Safety Board concludes that the effects of the partial brake pressure and the heat-expanded brake pads rubbing against the brake plates caused enough drag on the wheels to reduce significantly the aircraft's acceleration rate.

Although it may have appeared normal to the flightcrew, the Safety Board cannot accept fully that normal acceleration to V1 speed was attained. As the drag produced by the brakes increased, the rate of acceleration had to decrease and the time and distance to reach V1 speed could not have been normal. However, because of the lack of precise information which a flight data recorder would have provided, the Safety Board was unable to determine with any degree of accuracy what the penalties imposed on speed and acceleration rate would have been.

Although these precise values could not be ascertained, the aircraft did reach a speed where some rotation was possible, as was attested to by the pilot and the Meigs Field tower personnel. The Safety Board was concerned, therefore, as to the reason(s) why more rotation--to the 16° pitch attitude required for liftoff--was not attained. In this case an additional force offers a possible explanation--a nosedown pitching moment caused by the wheel/brake drag.

Using the limited aircraft data available, moment calculations were performed in an attempt to determine whether the aircraft had the capability to rotate for takeoff if the pilot had used the full pitch control authority of the aircraft. These calculations included the effect of the additional brake drag imposed by the set parking brake. It was found, however, that without specific acceleration data, such as that which would have been provided by a flight data recorder, these calculations ultimately proved inconclusive and, therefore, the rotational capability question could not be resolved.

Other factors, such as snow on the runway, could be suggested to explain the aircraft's slow acceleration, and other factors, such as ice on the horizontal stabilizer, could be suggested to explain the failure of the aircraft to rotate normally. However, there was no evidence, to support either of these premises. The evidence shows that the parking brake was on when the aircraft attempted to take off. The Safety Board believes that the additional drag and the nosedown pitching moment which would have resulted from a set parking brake during takeoff explains both the slow acceleration and the aircraft's failure to rotate normally.

2.4 Company Procedures

Although both pilots of N253K were responsible for insuring that the parking brake was released once it had been set, the Safety Board believes that the flightcrew checklist used by the pilots contributed to their oversight. The manufacturer's aircraft flight manual stated that at least once during the "Taxi Check" and twice during the "Before Takeoff" and the "Line Up" check, the flightcrew should make a positive check for "brake light . . . out." However, these three items had not been made a part of the flightcrew checklist that was prepared by the company using the flight manual as a guide.

The Safety Board believes that if these items had been included on the flightcrew checklist, the crew probably would have detected and released the parking brake before the takeoff roll was commenced and the accident might have been averted.

3. CONCLUSIONS

3.1 Findings

1. Both pilots were properly certificated and qualified.

2. The aircraft was properly certificated and maintained.

3. There was no evidence of preimpact failure or malfunction of the aircraft's airframe, systems, or powerplants.

4. Weather hazards such as snow, slush, or standing water did not contribute to the accident.

5. The parking brake was engaged sometime between the flightcrew's entrance into the aircraft and the start of the takeoff roll.

6. The flightcrew checklist did not have entries which required the pilots to check for the release of the parking brake.

7. Pressure from the emergency/park brake system was being applied to the brakes throughout the takeoff roll.

8. The emergency/park brake handle was found aft of the intermediate (parking) position and the top of the handle was bent to the left.

9. The evidence showed that the scratches and deformations found on the brake lever latch tooth were identical in shape and size with those indentations found in the locking finger on the quadrant for the park (intermediate) brake lever position.

10. Aircraft acceleration beyond the V1 speed was reduced significantly by wheel/brake drag.

11. The added drag resulted in a nosedown pitching moment and significantly degraded aircraft acceleration.

12. The aircraft did rotate; however, this rotation was not sufficient to enable the aircraft to become airborne.

13. Under normal conditions, the aircraft was capable of taking off from the 3,945-foot-long runway.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the flightcrew's failure to release the parking brake before the

takeoff roll was started, which resulted in significant wheel/brake drag and a nosedown pitching moment that inhibited the aircraft's capability to effect a normal acceleration and rotation for takeoff. Contributing to the accident was the lack of adequate company checklist procedures to insure the timely release of the parking brakes.

4. SAFETY RECOMMENDATIONS

During its investigation of this accident, the Safety Board issued the following recommendations to the Federal Aviation Administration on March 26, 1981:

Issue an airworthiness directive to move the emergency/park brake light on all Falcon 10 aircraft from its present location to a location on the pilot's instrument panel where it can be monitored more readily by both pilots when seated normally in the cockpit. (Class II, Priority Action) (A-81-32)

Review the checklists of all Falcon 10 operators to insure that they include checks that the parking brake is released and the emergency/park brake light is "out" before taxi and before takeoff. (Class II, Priority Action) (A-81-33)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ PATRICIA A. GOLDMAN
Member

/s/ G. H. PATRICK BURSLEY
Member

JAMES B. KING, Chairman, did not participate.

FRANCIS H. McADAMS, Member, dissented:

I cannot agree with the majority decision in this case. The Board acted before hearing all of the evidence since it refused to consider proper and legitimate post-investigation comments filed by the Kellogg Company on May 8, 1981. The Board apparently believed these comments could not be considered because they were ex parte communications. I do not agree. They were not ex parte under existing Board rules since they were filed for the record. Additionally, under the Board rules, investigations are never officially closed but are kept open for the submission of new and pertinent evidence by any interested person.

May 12, 1981

5. APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

Investigation

The Safety Board was notified of the accident about 1615 on January 30, 1980. An investigator from the Safety Board's Chicago Field Office was dispatched immediately to the scene. A systems specialist and a powerplants specialist from the Safety Board's Washington, D.C., Headquarters arrived in Chicago the following day.

Participants in the onscene investigation included representatives of the Federal Aviation Administration; Dassault International, Inc.; Falcon Jet Corporation; Air Research Manufacturing Company; and the Kellogg Company.

Public Hearing

No public hearing was held in conjunction with this accident.

APPENDIX B

PERSONNEL INFORMATION

David P. Stryker

David P. Stryker, 37, held Airline Transport Pilot Certificate No. 1947165 for airplane single- and multiengine land. He was type rated in the Falcon 10 and in the Falcon 20. He held a first-class medical certificate dated January 11, 1980, with no limitations.

Mr. Stryker had received recurrent training in the Falcon 10 on April 17, 1979, and a recurrent flight check on April 20, 1979. At the time of the accident, he had accumulated 3,453.7 total flight-hours, 635.1 hours of which were in the Falcon 10. During the 90-day period before the accident he had flown 80.3 hours. He had received more than 10 hours of rest before reporting to work on the day of the accident.

Norman J. Warner

Norman J. Warner, 46, held Airline Transport Pilot Certificate No. 1365160 for airplane multiengine land. He also held commercial privileges for airplane single-engine land. He was type rated in the Falcon 10 and in the Falcon 20. He held a first-class medical certificate dated November 17, 1979, with the limitation that near-vision lenses were required for flight.

Mr. Warner had received recurrent training in the Falcon 10 on April 8, 1979. At the time of the accident, he had accumulated 8,845 total flight-hours, 1,163.6 hours of which were in the Falcon 10. He had received more than 10 hours of rest before reporting to work on the day of the accident.

APPENDIX C

AIRCRAFT INFORMATION

Avions Marcel Dassault Breguet Falcon 10, N253K, serial No. 349, was owned and operated by the Kellogg Company of Battle Creek, Michigan. At the time of the accident, the aircraft had accumulated 3,196.8 flight-hours. The last major inspection and the last line inspection of the aircraft were conducted on July 27, 1978, and January 17, 1980, respectively.

The aircraft was equipped with two Garrett Air Research, TFE 731-2-1C turbofan engines. The left engine, serial No. P73146C, had a total time of 3,131.8 hours. The right engine, serial No. P73121C, had a total time of 2,771.7 hours. Neither engine had been overhauled.

ERRATA SHEET

THE FOLLOWING ERRATA IS ISSUED FOR A PREVIOUSLY DISTRIBUTED - ACCIDENT REPORT:

AIRCRAFT ACCIDENT REPORT

NATIONAL AIRLINES, INC.,
BOEING 727-235, N4744NA
ESCAMBIA BAY
PENSACOLA, FLORIDA
MAY 8, 1978

REVISIONS ADOPTED
APRIL 10, 1981

The following changes, additions, and deletions are to be inserted into the subject report:

On the Technical Report and Documentation Page, page 1, and page 35: In the probable cause, delete the last sentence of the first paragraph and insert the following:

The captain and first officer did not check or utilize all instruments available for altitude awareness and, therefore, did not configure the aircraft properly and in a timely manner for the approach. The captain failed to comply with the company's GPWS flightcrew response procedures in a timely manner after the warning began. The flight engineer turned off the GPWS warning 9 seconds after it began without the captain's knowledge or consent.

Page 4, last line: change 124 kn to 127 kn.

Page 17, line 14: after "flightcrew," insert the following:

"WHEN GPWS WARNING OCCURS, VISUAL AND AURAL-
Positive action to alter the flightpath and
stop the warning should be initiated immediately."

The flightcrew procedure then described the glide slope warning parameters (Mode 5) and two examples wherein the GPWS will not provide a warning. Neither of these two examples were pertinent to the accident. The final portion of the procedure reads as follows: (Continue with existing text).

Page 32, line 26: After "belief," insert the following:

However the evidence showed that his belief was mistaken; the flight engineer inhibited the GPWS without the captain's knowledge or consent. (Continue with the remainder of the text).

Page 33, line 24: After line 24, insert the following new paragraph:

The evidence concerning the 9-second descent after the GPWS terrain warning began showed that the captain did not comply with the National Airlines' GPWS flightcrew response procedures. Since

there was enough time for the captain and first officer to try to analyze the cause of the terrain warning, there was also more than adequate time for the captain to stop the descent, alter the aircraft's flightpath, and silence the terrain warning in accordance with the company's procedures. Had he taken this action in the timely manner called for by the procedure—"positive action to alter the flightpath and stop the warning should be initiated immediately"—the flight engineer's subsequent action would never have taken place, and the accident should have been avoided.

Page 34: After the present finding No. 8, insert the following new findings:

9. The captain did not comply with the company's GPWS flightcrew response procedures in a timely manner after the GPWS warning began.

10. The flight engineer inhibited the GPWS without the captain's knowledge or consent. The system was turned off 9 seconds after the warning began.

Page 34: Change the present finding No. 9 to No. 11.

Page 38, line 7: Delete the last sentence in this paragraph which begins, "The captain testified...."

Page 46, Appendix F: At 2020:15 CAM, delete the second "pull up."

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