SA-347

File No. 2-1754

CIVIL AERONAUTICS BOARD

AIRCRAFT ACCIDENT REPORT

ADOPTED. June 13, 1960 **RELEASED** June 20, 1960

BOEING AIRPLANE COMPANY, BOEING 707-227, N 7071,
NEAR ARLINGTON, WASHINGTON, OCTOBER 19, 1959

SYNOPSIS

On October 19, 1959, at 1620 P s t., a Boeing 707-227, N 7071, crashed and burned in the Stillaguamish River about 10 miles northeast of Arlington, Washington. Four of the eight occupants aboard received fatal injuries; one of the four survivors received serious injuries.

A Boeing Airplane Company test pilot was acting as an instructor-pilot on a demonstration and acceptance flight prior to the aircraft being delivered to the customer The company was also utilizing this flight time for flight instruction purposes in qualifying airline personnel in the aircraft.

The instructor-pilot demonstrated several maneuvers, including Dutch Rolls, to a pilot-trainee, an airline captain who was making his first training flight prior to checkout on the Boeing 707

The instructor-pilot initiated a Dutch Roll in which the roll-bank angle of the aircraft reached 40 to 60 degrees. This bank angle is in excess of limitations set by the company for demonstration of this maneuver The pilot-trainee, who was to make the recovery, rolled full right aileron control while the right bank was still increasing. The aircraft immediately yawed and rolled violently to the right The instructor-pilot immediately rolled in full opposite aileron The airplane stopped its right roll at a point well past a vertical bank and then rolled to the left even more violently. Several gyrations followed and after control of the aircraft was regained, it was determined that three of the four engines had separated from the aircraft and it was on fire. The fire rapidly reduced controllability of the aircraft and an emergency landing was attempted, however, the aircraft struck trees and crashed short of the intended landing area because power on the engine remaining had to be shut down to keep the aircraft wings level

Subsequent to this accident the Boeing Airplane Company flight training syllabus was revised to reemphasize the maximum roll-bank angles permissible for the Dutch Roll maneuver. In addition, demonstration of the Dutch Roll has been put off until a later time in the curriculum so the pilot-trainees will have more flight experience before practicing the maneuver

Investigation

N 7071 was a new model of the Boeing 707 series aircraft on which FAA type certification flight tests had just been completed Final certification was awaiting verification of these test results and the aircraft meanwhile was being

operated on an experimental certificate of airworthiness. The flight of October 19, 1959, was one of a series of flights to demonstrate to the purchaser that the aircraft met the performance qualities guaranteed by the manufacturer, and to train the Braniff pilots.

The crew for this flight, which consisted of R. H. Baum, BAC (Boeing Airplane Company), instructor-pilot, Captains J A Berke and M F. Staley, BNF (Braniff Airways), copilots, and G. C. Hagan, BAC, flight engineer, all received fatal injuries when the aircraft struck the ground. The following personnel who were listed as passengers on the flight plan received minor to serious injuries at ground impact A. C. Krause, BNF flight engineer, F. W. Symmank, BNF technical instructor, W J. Allsopp, BAC pilot; and W H Huebner, FAA Air Carrier Operations inspector

Mr. Baum, as pilot in command, conducted a preflight briefing of the crew. Takeoff data and takeoff procedures were discussed along with the maneuvers which were to be performed An IFR (instrument flight rules) flight plan was filed for an estimated departure at 1330 P. s t 1/ The aircraft was serviced with sufficient fuel for five hours. Its gross weight was 208,000 pounds and the center of gravity located at 26.5 percent MAC (mean aerodynamic chord).

Shortly before departure the IFR flight plan was canceled and the flight proceeded according to VFR (visual flight rules) for an estimated 4-hour and 15-minute flight. Captain Berke, who was making his first flight in the aircraft, occupied the left seat and Mr. Baum the right Mr Krause was performing the duties of flight engineer

After takeoff the flight proceeded normally through a series of maneuvers which were first demonstrated by Mr. Baum and then executed by Captain Berke Several Dutch Rolls2/ in a clean configuration were initiated and the proper recovery was demonstrated by Baum. Captain Berke then made several recoveries from Dutch Rolls in this configuration.

Following this, the aircraft was slowed to 155 knots and 40 degrees of flaps were lowered Captain Berke then made recoveries from a series of Dutch Rolls in this configuration which were initiated by Mr Baum. During these rolls, angles of bank greater than 25 degrees were permitted to develop.3/ Mr. Allsopp stated that he leaned over to Mr Baum and reminded him of the bank-angle restriction. He said Baum indicated that he was aware of the restriction

As all of Berke's recoveries up to this time had been made from the left (nose-left position), Baum suggested that a recovery be made from the right (nose-right) Baum then initiated another Dutch Roll in which the angle of bank was quite large Survivors estimated the aircraft rolled 40 to 60 degrees. Before attempting recovery, Berke allowed the aircraft to complete several oscillations in each of which the roll-bank angle reached 40 to 60 degrees.

The survivors stated that Berke initiated recovery while the right bank was still increasing They said he applied full right aileron control while the

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1/ All times herein are Pacific standard based on the 24-hour clock
2/ See Attachment "A "
3/ The BAC 707 training manual restricts the Dutch Roll maneuver to a desired maximum roll-bank angle of 15 degrees and an absolute maximum of 25 degrees.

right wing was still moving downward The airplane immediately yawed heavily to the right and rolled rapidly to the right, well beyond a 90-degree bank

Immediately after Berke had applied right aileron and early in the yaw-roll movement of the aircraft, Baum took the controls and applied full left aileron At this time the aircraft was rolling to the right. The roll stopped after the wings had passed the vertical and then rolled back to the left even more rapidly and violently than to the right The survivors stated during these two rotations sounds were heard which could have been the engines separating from the aircraft They also stated that during these rolls the thrust levers were seen to snap and the cables go slack

The movements of the airplane which followed were described as "spins" or "snap rolls." Although the exact number of rotations could not be determined, the survivors were in agreement that the aircraft rotated to the left and that the rate of roll finally slowed almost to a stop with the aircraft in an inverted nosedown attitude The left roll was continued and the recovery was made to an upright position with the aircraft in a medium dive

A normal pullout was made from the dive, during which it was noted that the engine instruments indicated complete absence of thrust on engines Nos. 1, 2, and 4. In addition, the thrust levers and start levers for engines Nos. 1, 2, and 4 were completely slack. Flight Engineer Krause also reported a complete loss of electrical power.

During most of the flight and throughout the uncontrolled gyrations of the aircraft, all eight occupants were on the flight deck. Immediately after control was gained, Mr Huebner went aft to determine what, if any, damage had been sustained He stated that No. 1 and No. 4 engines were gone and there were small fires in the areas where the engines had been. He said No. 2 engine was also on fire and it appeared that the forward mount had failed and the engine was hanging down at an angle with the tailpipe pointed into the flap.

Huebner went back to the flight deck and informed the pilots of his observations. Shortly after this Mr Allsopp stated that he saw a very large fire burning the area of the No. 2 engine and that that engine, as well as Nos. 1 and 4, was gone The aircraft by this time had descended through the overcast and he suggested that an immediate ditching be made in Lake Cavenaugh, which was very close. Baum, who had taken over the controls at the first upset, was apparently looking for a more suitable landing area or attempting to reach an airfield nearby and continued his circle east of the lake 4/

During this time Mr Hagan took over the flight engineer's station. The four survivors - Krause, Symmank, Allsopp, and Huebner - then took ditching positions in the rear of the aircraft. The fire emanating from the area of No 2 engine continued to burn fiercely. It was seen to burn a hole in the flaps and to consume most of the left inboard aileron It also burned through the top wing surface and the survivors stated that they could see the structure in the interior of the wing.

4/ See Attachment "B."

Weather was not a factor in this accident although a thin broken to overcast cloud coverage existed over the entire area with ceilings reported as about 4,000 feet. A number of ground witnesses saw the aircraft after it had emerged from this overcast in its descent The probable flight path of N 7071, depicted in Attachment "B" to this report, is based on evaluation of the sightings of these witnesses.

Several witnesses located west of the final crash site described hearing the aircraft on an easterly heading in or above the clouds. They reported hearing an unusual sound similar to that of an aircraft breaking the sound barrier Shortly after hearing this sound they saw three objects fall out of the overcast. These objects were located and proved to be engines Nos. 1, 2, and 4 The sound of a jet engine continued and the aircraft was seen to emerge from the base of the clouds on a northeasterly heading It was on fire and descending. Other witnesses, located several miles farther east, saw the burning aircraft, still descending, make a sweeping left turn, passing near the east end of Lake Cavenaugh and straightening out on a southeasterly heading of about 110 degrees. They said that during this turn they heard an explosion-like noise and the jet engine sound then ceased The only sound which could be heard after this was a loud whistling noise Several of these witnesses who were familiar with the Boeing 707 stated that there was only one engine on the aircraft and that a severe fire was burning in the area where the No. 2 engine had been One witness said that the fire had burned away a large portion of the trailing edge of the wing in the area of the No. 2 engine.

The aircraft continued on its southeasterly heading down Deer Creek and then made a gradual right turn to a heading of 230 degrees. By this time it had descended almost to treetop level. The aircraft continued on the heading of 230 degrees for about one mile, during which it descended until it contacted treetops and crashed in the Stillaguamish River bed approximately one-half mile short of a large open field which had undoubtedly been selected by Baum for the crash landing.

The first contact with treetops 110 feet high was on the north side of the river and nearly 1,400 feet from the point at which the fuselage struck the ground Four hundred feet from this first contact the aircraft struck another row of trees along the north bank of the river, at a height of about 90 feet. The swath cut through these trees, which varied in diameter from 7 to 13 inches, was approximately the width of the wing span and showed that the aircraft was in a wings-level attitude A section of the left wing tip, 16 feet long, was severed by contact with these trees. As the aircraft continued across the river the left wing, which was dropping rapidly, cut a path inclined at an angle of 45 to 50 degrees through more trees on the south bank. Toward the end of this cut through the trees, the left wing contacted the ground gouging several long ditches in the sandy soil As the aircraft continued its forward travel, the left wing broke up progressively until finally the fuselage struck the ground.

The forward portion of the fuselage (station 960 forward) was almost completely destroyed by the impact and intense ground fire which followed The aft fuselage, where the survivors were located, broke off just to the rear of the trailing edge of the wing and skidded out into the middle of the river Although it was badly damaged by inflight fire and ground impact, it was intact and was not subjected to the ground fire which consumed most of the other wreckage.

The section of the left wing tip, severed by contact with the trees on the north side of the river, came to rest across the river approximately 50 feet before the first of the gouges which were dug in the ground by the remaining wing structure The wing, from the point at which the tip was severed inboard to the landing gear beaver tail strap, was broken up and sections were scattered along the ground path Most of these pieces received damage from ground fire and large areas were consumed completely Inboard of the beaver tail the box section was nearly intact but partially consumed by ground fire, as was the center box section and inboard 30 feet of the right wing. The remainder of this wing was broken into two major pieces which were partially consumed in ground fire.

There was extensive inflight fire damage to the left wing in the area of the No. 2 engine, to the entire left side of the aft fuselage, and to the left side of the empennage.

The wing upper skin from the area of the aft end of the over wing pylon strap was identified This skin was badly wrinkled by heat over each fuel vent channel and the skin over one was ruptured for a length of three feet The edges of the rupture were curled outward, were very fibrous, and were heavily sooted, indicating that an explosion had occurred. In addition, rivets in the area which attached the skin to the vent were failed in tension.

From the rear spar aft, the wing trailing edge and flight controls were severely burned. The left inboard aileron and the entire trailing edge structure nearby were consumed except for small fragments The inboard half of the No. 2 and the outboard half of the No 3 spoilers were partly consumed The outboard two feet of the No. 2 flap cove lip door was heavily sooted and a few small holes were burned in the skin. The internal structure in this area was consumed. The lower trailing edge just forward of the door was burned through and blackened.

The outer closing rib on the No. 2 flap was heat wrinkled. The flap lower surface was lightly sooted and the upper surface was heavily sooted The inboard corner of the No. 1 flap was badly burned and three feet of its upper surface was consumed. It was determined that the flaps were extended approximately 28 degrees at impact. The left inboard spoiler valve fell from the aircraft about one mile from the crash site It had large deposits of "runback" (solidified) aluminum on its lower side The aileron trim mechanism and the aileron bellcranks also had these runback deposits on them. All control components in the area and even the rear wing spar web vertical stiffeners were badly burned by inflight fire.

The left side of the aft fuselage was heavily sooted and all of the windows were heat checked In addition, paint on the rear loading door and on the fuselage aft to the stabilizer was blistered Just forward of the vertical fin, light sooting angled across the fuselage top centerline and back along the upper right side of the tail cone and lower third of the right side of the vertical fin

The lower half of the left side of the vertical fin was lightly sooted and paint was blistered and scorched The lower balance panel covers were heat wrinkled The lower half of the rudder was severely heat wrinkled The left side of the tab was also heat wrinkled and heavily sooted. The right side of the rudder tab was lightly sooted from smoke which was drawn through the tab hinge, indicating right rudder trim during the fire

The left horizontal stabilizer and elevator were sooted and heat wrinkled on the upper and lower surfaces. In addition, the severe fire from the left wing burned through the upper skin between the internal stiffeners

Three of the four powerplants, with a major part of their pylons attached, separated from the aircraft in flight. They were found one to one and one-half miles northwest of the main wreckage. The Nos. 1 and 4 engines, with their nacelles, broke from the airplane in the outboard directions The No. 2 engine, with its nacelle, broke partially outboard but appeared to have rotated downward and rearward during its separation from the aircraft. The No 3 engine remained attached to the aircraft until impact. It was found at the main wreckage site. Investigation revealed that there were little or no indications of inflight fire damage to engines Nos. 1, 3, and 4. However, the cowling which fell with the No. 2 engine showed evidence of heavy smoke and sooting prior to impact

The damage found on all four engines was the result of impact or minor ground fire. No evidence of operational distress or malfunction prior to impact with the ground was found. In addition, indications were found on all four engines that they were rotating very slowly, if at all, at impact.

During the public hearing a Boeing witness testified that pilots who have had an engineering background or test-pilot experience in the Armed Forces are selected as test pilots for Boeing These pilots are then given extensive ground school training and flight experience under the supervision of instructor-pilots He said before a pilot could be released as an instructor he had to have a check ride and approval by the Chief of Flight Test or his designee He further stated that Baum had met all of these requirements and was considered fully qualified to conduct this particular flight

The witness then described the company checkout and training program for airline personnel He said the airline pilots would have had the 707 training syllabus for a considerable length of time prior to the beginning of flight training and would also have completed the ground school courses. A briefing would be conducted prior to flight which was a general review of the entire training syllabus. Immediately before each flight an additional briefing would be held to cover item by item the maneuvers to be accomplished

The witness stated that the Dutch Roll characteristic is present in all large aircraft but is more pronounced in those with swept-back wings like the 707 It is most likely to be encountered during approach to landing when the aircraft is at slow speed with a high coefficient of lift and in rough or turbulent air. He said the characteristic constituted a minor annoyance to pilots and slight discomfort to passengers and it was therefore desirable to give instructions in recovery technique. All Boeing flight personnel had been informed that the desired maximum roll-bank angle in this maneuver was 15 degrees and that the absolute maximum was 25 degrees These restrictions were not imposed because of a structural limitation on the aircraft, but because the maneuver and its recovery could be satisfactorily demonstrated with these conservative limitations Subsequent to the accident Boeing re-emphasized the roll-bank angle limitations and deleted demonstration of the maneuver with flaps down because recovery can be demonstrated equally as well in the clean configuration In addition, the Dutch Roll training has been moved back in the training program so that the trainee will be more familiar with the characteristics of the airplane when the maneuver is demonstrated.

A flight recorder was installed in the aircraft but was not in operation during this flight Civil Air Regulations require the flight recorder to be in use during scheduled passenger operations only

Analysis

There is little question that the violent gyrations of N 7071 which followed the improper Dutch Roll recovery attempt resulted in the separation of the three engines and the inflight fire. A safety factor is designed into the nacelle supporting structure so that, in the event of abnormal loading, it will fail before destructive loads are transmitted to the aircraft wing. Separation of engines from the aircraft is therefore expected when the aircraft is subjected to high abnormal loadings such as occurred in this case.

It is equally clear that the Dutch Rolls being performed reached angles of bank far in excess of the limitations established by the company Responsibility for the safety of this aircraft rested solely on the instructor-pilot. The Board can find no valid reason for Mr. Baum initiating the final Dutch Roll so violently No training advantage could be gained by conducting these maneuvers at the extreme angles of bank reached Baum certainly should have been aware of this and he was admittedly aware of the company's restrictions In addition, it was surely less than prudent to permit a pilot with no previous experience in the airplane to attempt a recovery from this extreme maneuver.

The severity of the gyrations to which the aircraft was subjected developed loads greater than the design strength of the nacelle pylon structure After the three engines were lost and while the flaps were still extended 40 degrees, the airplane was committed to land The flaps may have been raised to the 28-degree position intentionally so that full outboard aileron effectiveness would be available during the landing. It is possible that in this configuration, with power available from the No. 3 engine, the airplane could have flown at least long enough to reach a suitable airport for a crash landing However, the intense fire which is believed to have come from a ruptured fuel line, was threatening the left wing and made an immediate landing mandatory

Lateral control with flaps down at least 28 degrees is provided by the following: Outboard ailerons, 40 percent, outboard spoilers, 30 percent, inboard ailerons, 15 percent, and inboard spoilers, 15 percent The outboard ailerons are moved by means of a cable bus arrangement actuated by movement of the inboard ailerons. As the fire gradually destroyed the inboard left aileron and the flight control components in that area, the outboard ailerons were lost Loss of electrical power cut out the auxiliary hydraulic system which operates the inboard spoilers and the rudder boost When the left inboard aileron was consumed the only lateral control remaining to keep the heavily damaged left wing up came from the right inboard aileron (7-1/2 percent) and possibly the right outboard spoilers (30 percent). Lift on the left wing was seriously impaired because of the loss of approximately 35 square feet of upper surface which was burned through, the additional fire damage to the flaps which reduced their effectiveness, the extra drag from the No 2 pylon stub, and the spoiler effect on the upper wing surface caused by the ruptured skin over the fuel vent channels.

This drag, coupled with any appreciable thrust from the No 3 engine, would force the left wing down. In view of the limited aileron control available, considerable right rudder would be required to induce a yaw to the right to assist in holding the wing up. However, with the rudder boost inoperative, there would not be sufficient rudder control available to induce enough yaw to counteract these forces. It is therefore apparent that the No 3 engine was shut down prior to impact so as to be able to keep the wings level with the minimum amount of control available. This is also supported by the fact that the engine had almost stopped rotating at impact

When the aircraft hit the trees on the north bank of the river and a 16-foot section of the left wing was severed, the control available was insufficient to maintain the wings level As it crossed the river, the aircraft rolled rapidly to the left to a bank angle of approximately 55 degrees and crashed on the south bank.

Conclusions

The Board concludes that this accident was the result of the structural failure of the Nos. 1, 2, and 4 nacelle pylons, and the fire in the area where the No. 2 nacelle broke off It also concludes the nacelles failed as a result of overloads imposed on them during several violent uncontrolled gyrations which were encountered when the pilot-trainee applied improper control movement in an attempt to recover from a Dutch Roll

The Board further concludes that the instructor-pilot initiated the Dutch Roll to an angle of bank far in excess of the limitations imposed by the company. In addition, the instructor-pilot was fully aware of these limitations and was, in fact, reminded of them during this flight Even so he permitted the pilot-trainee, who was on his first training flight, to attempt recoveries from these extreme maneuvers

It concludes that after control of the aircraft had been regained, Mr. Baum had selected an excellent clear area for the imminent crash landing but failed to make it by one-half mile because the No. 3 engine had to be shut down prematurely to keep the wings level.

Subsequent to the accident the company revised its training syllabus to reduce the possibility of recurrence of a similar accident The limitations on angle of bank for the Dutch Roll maneuver have been re-emphasized to all company pilot personnel. In addition, Dutch Roll familiarization has been delayed so that the pilot-trainee will have more experience in the aircraft prior to attempting this maneuver.

The company has also incorporated a full-time boosted rudder system in the aircraft In addition, it has increased the vertical stabilizer area and has added a ventral fin These changes are anticipated to substantially increase the low speed control characteristics of the aircraft.

Probable Cause

The Board determines that the probable cause of this accident was the structural failures induced during an improper recovery attempt from a Dutch Roll which exceeded the angle-of-bank limits prescribed by the company

BY THE CIVIL AERONAUTICS BOARD

/s/ WHITNEY GILLILLAND
Chairman

/s/ CHAN GURNEY
Vice Chairman

/s/ G. JOSEPH MINETTI
Member

/s/ ALAN S. BOYD
Member

SUPPLEMENTAL DATA

Investigation and Hearing

The Civil Aeronautics Board was notified of this accident at 1800, October 19, 1959. An investigation was immediately initiated in accordance with the provisions of Title VII of the Federal Aviation Act of 1958. A public hearing was ordered by the Board and held at the Olympic Hotel, Seattle, Washington, on November 19, 1959.

Flight Personnel

Mr. Russel H. Baum, age 32, was employed by Boeing Airplane Company, June 7, 1957, as a Test Pilot "B." He was promoted May 2, 1958, to Experimental Test Pilot "B." He held an FAA airline transport pilot certificate with a rating in the B-707. His total flying time was 5,015 hours, of which 369 were in the 707. His latest FAA class I physical was taken June 2, 1959. Mr. Baum had received a total of 86 hours of ground school instruction on the 707, plus a cockpit and systems familiarization class on the KC-135. According to testimony of a Boeing Airplane Company employee, Mr. Baum was fully qualified to act as instructor-pilot on the 707.

Captain John A. Berke, age 49, was employed by Braniff Airways April 15, 1936, was promoted to captain in April 1938, and to check pilot January 1, 1958. He had a valid FAA airline transport pilot certificate with ratings in the DC-3, DC-4, DC-6, DC-7, and L-188 aircraft. Captain Berke had a total of 23,563 flying hours. His latest first-class physical examination was taken April 3, 1959. Captain Berke had completed the Boeing Airplane Company pilot training ground school course which consisted of 160 hours of instruction. This was his first training flight in preparation for checkout in the aircraft.

Captain M. Frank Staley, Jr., age 43, was employed by Braniff Airways August 18, 1939. He was promoted to captain November 1, 1942, and to check pilot August 28, 1959. He held a valid airline transport pilot certificate with ratings in the DC-3, DC-6, DC-7, and L-188. Captain Staley had accumulated 20,450 flying hours. His last first-class physical was taken June 23, 1959. Captain Staley had completed the Boeing Airplane Company pilot ground school training course of 160 hours of instruction. This was his first training flight in preparation for checkout in the Boeing 707.

Flight Engineer George C. Hagan, age 28, was employed by Boeing May 11, 1959, as a Flight Test Analyst "A." He held a valid FAA flight engineer certificate. His last second-class physical examination was taken May 27, 1959. He had accumulated a total of 1,260 flight hours, of which, as of August 29, 1959, about 90 had been in the Boeing 707. Mr. Hagan had completed a training course, consisting of 152 hours for flight crew ground instructors, June 12, 1959.

The Aircraft

N 7071, a Boeing 707-227, serial number 17691, was manufactured June 11, 1959. It was owned and was being operated by the Boeing Airplane Company, Renton, Washington. The aircraft was a new model on which about 173 flying hours had been accumulated for the purpose of qualifying it for certification by the FAA. The airplane was equipped with four Pratt and Whitney turbojet, model JT4A-3 engines.

ATTACHMENT "A"

Explanation of the Dutch Roll

The term Dutch Roll applies to a wallowing motion characteristic of swept-wing aircraft. During this motion the aircraft rolls right and left around the longitudinal axis while yawing right and left around the vertical axis. Angle of bank and degree of yaw are dependent upon the amount of force applied in initiating the Dutch Roll.

Normally the motion is caused by turbulent air or lateral overcontrol. The low lateral directional damping of swept-wing design allows the motion to continue at slow i. a. s.

Compensating for the Dutch Roll may be made by simply keeping the wings level. When the airplane is rolling one direction or another, the aileron should be used to stop the roll and keep the wings level.

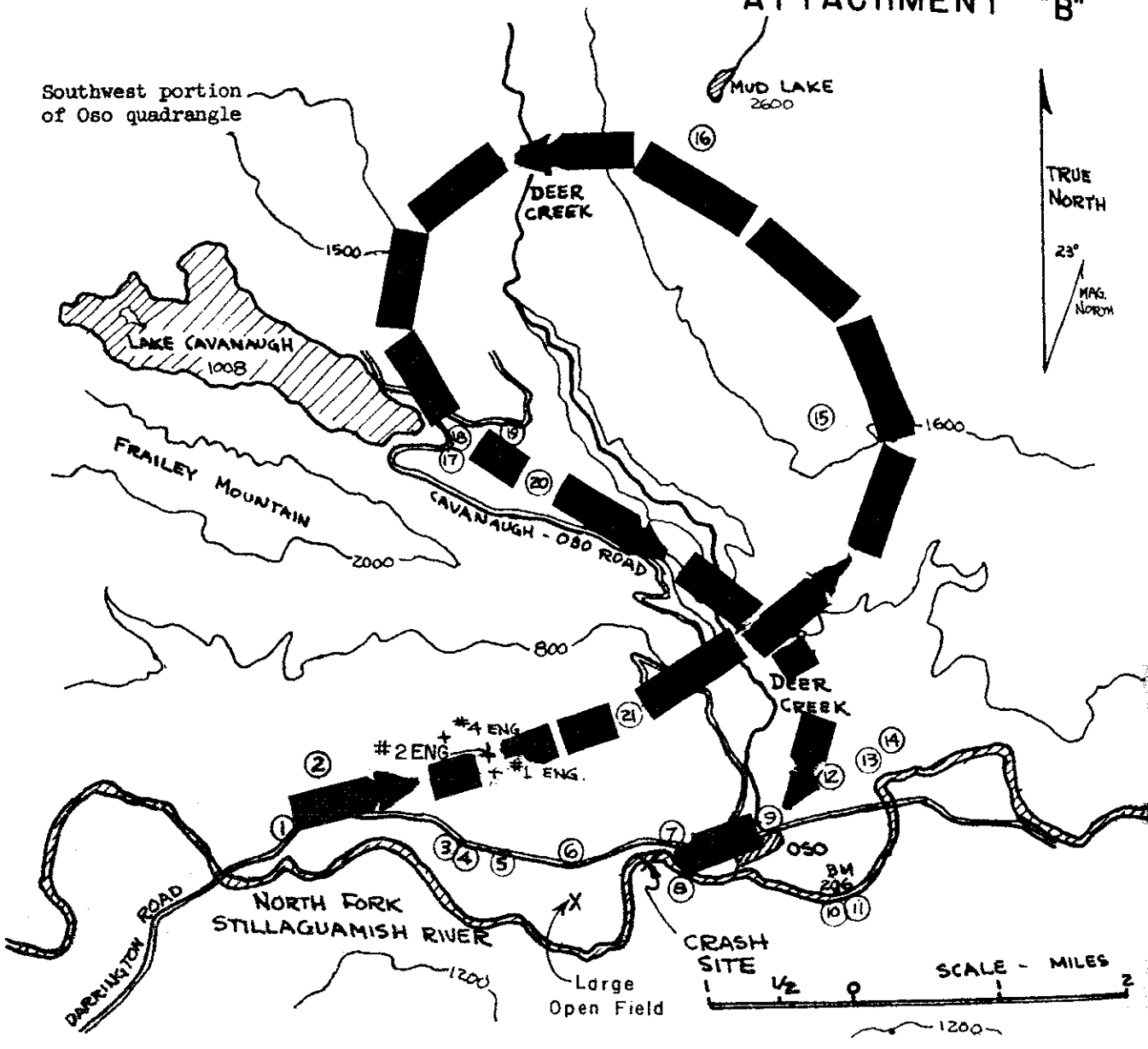
Another method is to apply cross-control. For example, if the aircraft is Dutch Rolling, left rudder and right aileron should be applied when the nose has started to swing from left to right with control forces slowly relieved as the aircraft's yaw angle diminishes.

Rudder application must be applied in the right direction or the Dutch Roll will be further aggravated. If there is uncertainty as to the rudder required, application of aileron only is recommended for recovery.

The damping in the lateral-directional mode is lowest when the angle of attack is high, so that at low indicated airspeeds with flaps up or down, the Dutch Roll will seem to be more pronounced. At high indicated airspeeds the natural yaw-damping forces minimize or tend to zero out any Dutch Roll tendencies.

The purpose of Dutch Roll familiarization is to introduce to the pilots who are generally not acquainted with swept-wing airplanes this inherent characteristic peculiar to the design.

ATTACHMENT "B"



CIRCLED NUMBERS INDICATE LOCATION OF EYE WITNESSES.

Accident involving Aircraft N 7071
occurred one mile west of Oso,
Washington, on October 19, 1959

Prepared by
Civil Aeronautics Board
Bureau of Safety

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