

B-111
Docket No. AC-3

Adopted. June 3, 1943

Released. June 18, 1943

REPORT OF THE CIVIL AERONAUTICS BOARD

On the investigation of an accident involving aircraft of United States registry NC 41380 in the Bay of Explois, Bonaville, Newfoundland, on October 3, 1942

An accident, involving an aircraft of United States registry, NC 41880 a Vought Sikorsky 44A flying boat, occurred in the Bay of Exploits, Botwood, Newfoundland, at about 7:05 p.m., local Botwood time, on October 3, 1942, and resulted in fatal injuries to five members of the crew and six passengers; serious injuries to three crew members and five passengers, and minor injuries to two crew and fifteen passengers. One member of the crew escaped injury. The aircraft,^{1/} which was being operated in scheduled air carrier service between New York, N. Y. and Foynes, Eire, with a scheduled stop at Botwood, was derelished. A magisterial hearing was conducted by H. A. L. Pattison, representing the Newfoundland government, at the Royal Canadian Air Force seaplane station at Botwood. The following personnel of the Safety Bureau of the Civil Aeronautics Board were present: William K. Andrews, Chief, Investigation Section, Allen P. Bourdon, Senior Air Safety Investigator, and W. E. Koneczny, Air Safety Specialist. A private hearing^{2/} in connection with this accident was held by representatives of the Safety Bureau, Civil Aeronautics Board, at Washington, D. C. on October 12, and at New York, N.Y. on October 15, 16, 17 and 26, and November 13.

The aircraft, NC 41880, operated by American Export Airlines, Inc.,^{3/} was a 39-passenger Vought Sikorsky, model 44A, flying boat. It was powered by four Pratt and Whitney S1C3C, 1200 h. p. engines, equipped with Hamilton Standard, constant speed, hydromatic, full-feathering propellers

^{1/} At the time of the accident this aircraft was being operated under a temporary airworthiness certificate, issued by the Civil Aeronautics Administration, pending the formal issuance of a type certificate for subject model

^{2/} Private hearings are held when, for reasons of National security, public hearings are inadvisable

^{3/} Hereinafter referred to as American Export

The captain, Joseph Harold Wilson, held an airline transport pilot certificate with 850-6300 h.p. multi-engine land and sea ratings. Wilson had been employed as a captain by American Export since April 1, 1942. He had served in the U. S. Army Air Corps for three years, between 1934 and 1937, and had flown for Eastern Airlines, Inc. for about five years, three as a copilot and two as a captain. Wilson had logged approximately 6000 hours of flight time, of which about 400 hours had been accumulated on flying boats. After receiving the curriculum prescribed by American Export, which included about 40 hours of flight training in PBV twin-engined flying boats, and approximately 20 hours in Vought Sikorsky 44A type flying boats, he made two round trips between New York and Foynes, Eire, one as first officer and one as assistant navigator, as a part of his VS-44A flight training. Since that time he had made four round trips as a captain between New York and Foynes and this was his fifth in that capacity. His last physical examination, required by the Civil Air Regulations, was completed on May 9, 1942.

First Officer Robert D. Lindsay held an airline transport pilot certificate with 1050-3150 h p multi-engine land and sea ratings. He had accumulated a total of 3350 hours of flying time, about 345 of which were on flying boats. He had been in the employ of American Export approximately six months. As part of his training by American Export, he had received about 45 hours in PBV flying boats and approximately 150 hours in the type of aircraft involved. This was Lindsay's first trip as first officer. His last physical examination, required by the Civil Air Regulations, was completed on May 14, 1942.

Weather

Apparently the weather had no bearing on the accident. The official weather report at Botwood was ceiling and visibility unlimited, sea calm with light ripples, wind N 0-5 m.p h.

Events Preceding the Accident

Trip 71 arrived at Botwood at approximately 5:00 p.m. local Botwood time, on October 3, and was moored to a buoy adjacent to the R.C.A.F. seaplane station pier. After the passengers had been taken ashore, fuel was taken on board, 450 gallons being placed in each outboard tank and a quantity sufficient to bring the total capacity to 1500 gallons was placed in the center tank. Captain Wilson then obtained clearance to proceed to Gander Bay, Newfoundland, where repairs could be made to a cracked exhaust stack bracket, and where the passengers and crew could be quartered for the night. The captain boarded the plane to make the usual preflight cockpit checks and the passengers embarked about 10 minutes later. First Officer Lindsay remained on shore, assisting American Export's station representative with the weight and balance reports. Lindsay then boarded the aircraft, instructed the stewardess on the seating arrangement of the passengers, and remained in the cabin to personally supervise the seating. The seating arrangement was 8 passengers in Compartment 1, 8 in No. 2, 8 in No. 3, and 2 in No. 4. In this position the c.g. location was 23.4, which was within allowable limits. Weight at the time of take-off from Botwood was 23,309 kilos (approximately 51,390 pounds). The maximum permissible weight for this aircraft is 57,800 pounds. During this time, the engines had been started and the captain had taxied to the take-off area.

After the engines were warmed, and the take-off area had been patrolled for floating obstructions by the station launch, the captain gave the order to "stand by for take-off"

The Flight

The take-off run was made in a northerly direction. As the aircraft came up onto the step, the nose dropped and the plane began to porpoise. On the second or third porpoise the plane left the water, and after

reaching an altitude of about 10 feet, it settled back on the water with a light skip, and took off again at a nose-high angle of about 30° . After reaching an altitude of approximately 35 feet, the plane leveled off, then gradually nosed down, becoming so nose-heavy that according to the captain he could not check its further downward path. It crashed into the water at an angle variously estimated to have been between 15° and 45° . The surviving passengers and crew were picked up by the R.C.A.F. station launch, and two small power boats, which arrived at the scene of the accident a few minutes later.

Due to the prevailing confusion, it is difficult, if not impossible, to get from the testimony of the witnesses a very definite visualization of the wreckage as it appeared immediately following the impact. It is known that the forward portion of the hull was demolished by the impact. The remaining portion broke in two at a point just aft of the rear wing spar and settled into the water in a nearly horizontal position. The wing, with engines attached, assumed a nearly vertical position with relation to the wing chord-line axis. What was left of the hull forward of this break remained attached to the wing section and all remained partially afloat for some time after the accident.

Recovery and Salvage of the Wreckage

The accident occurred approximately 1 mile north of Killick Island, in water about 180 feet in depth. Rescue work was carried out at this point, following which an immediate attempt was made to tow the wreckage to shore.

However, before reaching shore the aircraft sank in about 40 feet of water. Salvage operations were undertaken as soon as the necessary equipment could be obtained and continued with partial success until October 22, 1942, at which time all further efforts were suspended. The forward portion of the hull from the bow aft to the pilots' compartment, including the complete instrument panel, was not recovered; neither was the complete empennage, which was accidentally severed from the rear portion of the hull during salvage operations. All four propellers were broken away from the engines and were not recovered.

The rudder and elevator control cables were found still attached to their respective places on the rudder pedals and control column. The cables farther aft in the hull section were severed either by the impact or during salvaging operations. The trim tab indicators were found and their settings were noted as follows: Elevator 0° , rudder $4\frac{1}{2}^{\circ}$, "left" turn position; aileron 9° , right wing "down" position. The wing flaps were found still properly attached to the wing assembly and in the full 35° "down" position. The left wing flap was badly damaged, probably as the result of salvaging operations, the right flap was only slightly damaged.

Witnesses

At the several sessions of the hearing held in connection with this accident, 31 witnesses testified. Most of this testimony, with the exception of that of the crew, was confined almost entirely to impressions of the action of the aircraft during the take-off and subsequent crash, and to rescue operations which followed. However, the captain, first officer, and several other members of the crew who took an active part in

the flight operation, were rescued and, after recovering from injuries, were able to appear at the hearing and gave some very pertinent testimony.

Captain Wilson testified that he proceeded to the pilots' compartment, where he was seated for a period of about ten minutes making the usual and necessary cockpit check before leaving the mooring for the take-off area. He stated that he checked, among other things, the engine switches, automatic pilot, trim tabs, flap selector switch, and the flaps themselves. He stated further that in a talk with Captain Blair, American Export's chief pilot, a few days before leaving on this trip, Blair expressed himself as believing that in taking off with less than full gross load, "it would be a better policy" not to use flaps. On the subject take-off, the weight was about 6000 pounds under the allowable gross. Therefore, it was not the captain's intention to use any flap at all. He also stated that, "In taking off with 10° flaps, that is full gross take-off, the flap control switch is usually placed in the flight position. That is where I always place it, so that just one turn of the switch will have to be made in order to get the 10° flaps. When I am not using the flaps, however, I always make it a point to leave it in the off position."

When questioned regarding the position of the flap switch prior to the take-off, the captain testified, "The flap switch was in the off position; and, at the beginning of the take-off, the indicator, which is right in front of the instrument panel, was in the zero position."

Prior to going aboard the aircraft, the captain had instructed First Officer Lindsay, who was the last person to embark, to personally see that the seating of all passengers prior to take-off was in accordance with

information contained in the weight and balance sheet. It appears that after all passengers and crew were aboard, the engines were started and the aircraft left the mooring with the captain at the controls while the first officer was back in the cabin making the necessary check of passenger seating. The captain taxied the aircraft to the approximate point of intended take-off, where one or two circles were made on the water while waiting for one of the engines to reach the required temperature.

First Officer Lindsay testified that just as the aircraft reached the position where the take-off was to start, he arrived on the flight deck and took his seat on the right side when, he stated, he fastened his safety belt and "went through as much of my normal cockpit check as I could before we were ready for take-off." He stated that while surveying the cockpit he looked out at the wing, as he normally does just before take-off, and detected that there was some flap down but he could not attest to how much "because I didn't have time to look at the gauge that showed how much they were down. I would say that they were not full down." When asked if he did not think it strange that some degree of flap was being used on the take-off from Botwood, he replied, "The only question that arose in my mind was whether the captain had intended to use flaps, inasmuch as he had not mentioned to me prior to starting the take-off run that he was going to use flaps. In other words, I felt, if he was going to use flaps, he would have told me how much and probably would have asked me to turn them down." When questioned, "Did you call it to the captain's attention that the flaps were down?" Lindsay answered, "No, sir, I didn't. He was just starting to feed the power to the airplane at that time. I turned to shout at him and ask him whether he intended to use flaps. He had his

headset on, and then I was going to put my hand on his and stop him from putting further power on. At that instant, however, the thought occurred to me that I myself had pulled the flaps clear up to zero at the landing, and I felt that the only way they could have gotten down was for him to have put them down before I reached the cockpit. I therefore assumed that it was his own doing, and that there was nothing for me to do in the matter."

From further testimony of the first officer, it is apparent that he was not sufficiently familiar with the operation of the flap control switch. When asked if he had operated the flaps for the captain while landing earlier that day on the ^{flight's} arrival from New York, he answered, "Yes, . . . full flap for landing . . . 35 degrees." When asked what he did to get full flap, he answered that he turned the knob in a CLOCKWISE direction to the stop. This actually puts the switch in the "landing" or 20° position, yet he was of the opinion that it was the 35° position and that 35° flap was used for landing. As a matter of fact, to put the switch in the 35° position from any other position on the dial, you must rotate the knob in a COUNTER-CLOCKWISE direction to the stop (3:00 o'clock).

Donald H. Goodman, second officer and navigator of the subject flight, testified that he was seated at the navigator's table when the aircraft left the buoy and the engines were started, after which the aircraft was taxied out into the take-off area, where each engine was run up, and the magnetoes and propellers were checked. He stated, "It is the navigator's job to time the take-off and get the wind direction and velocity and the state of the sea, the swell and waves, so I made those observations, and I suppose the time of the take-off was from the time the manifold pressure has reached 30 inches, which I watched. When they reached 30 inches, I snapped the watch to start the take-off time; and then, because I happened to be

interested in the effect of flap for take-off, I turned in my seat and looked back and watched the flaps come down. I noticed that the flaps were part way down, a very short distance, it appeared." He further stated that he "thought the flaps were moving at the time " He testified that at this time he turned around and looked forward again and "as the speed picked up, it started to porpoise like. It was very, very small and not particularly noticeable, no more than it had been on other take-offs. It porpoised, I think it was, about three times. I wouldn't say whether three or four times, and I believe it was the third time it left the water very slightly, probably three, four, or six inches, and then came back and slapped the water again, and then jumped some, probably 30 feet in the air, and at this altitude it leveled out, apparently looked like it was going to fly. At least it felt like it to me, it certainly was not stalled. It was hanging there with sufficient flying speed and then it just nosed over and headed for the water."

Flap Control

Examination of the wings immediately after they were recovered from the water revealed all flaps to be fully deflected to 35°, and the conclusion was reached that they must have been in this position at the time of the aircraft's impact with the water. The flap control system on this airplane is of the electrically operated type. The flap selector switch located on the instrument panel is wired to the electrical portion of the system, located within the wing immediately aft of the rear spar, just above the cabin ceiling. This part of the flap mechanism consists of an electric motor, timer, and the up and down relays. This reversible motor operates the flaps through a series of gears, sprockets, chains, and actuating screw-type jack-struts. The latter are considered sufficiently irreversible to preclude the possibility of the flaps being deflected by any means other than the operation of the electric motor. That the flaps were not deflected by external forces at the time of impact was further evidenced by the position of the electric timer which was also found at 35° - flaps fully down.

The crash so completely demolished the aircraft that the flaps could not have been actuated in any manner whatsoever after the impact.

The possibility of a short circuit in this switch or in any other part of the electrical system which would in any manner operate the flap operating mechanism has been thoroughly explored but seems very remote.

The flap selector switch has six positions. The 20° position is located comparatively at 1:00 o'clock on the dial; the 10° position at 12:00 o'clock, "Flight" at 11:00 o'clock, "Raise" at 10:00 o'clock, "Off" at 9:00 o'clock; and the 35° position at 8:00 o'clock.

The flap selector switch, as originally installed, was of somewhat different design than the one being used on the subject flight. On the former switch the "off" was located on a relative point of the clock dial at 9:00 o'clock; " 10° " at 11:00 o'clock; " 20° " at 1:00 o'clock, and " 35° " at 3:00 o'clock. As a safety measure, this switch was redesigned and on June 3, 1942 the new switch was installed. This new design added a "flight" and a "raise" position, both of which operated the flaps to result in 0° setting. The "off" position then was to permit the stopping of the flaps at any point the operator desired from 0° to 35° . The 35° position was changed to 8:00 o'clock, which was below the "flight" and "raise" and "off", at the lowest position of the dial. In addition, a safety stop-spring arrangement was provided so that in order to put the switch on "raise", "off" or " 35° ", it was necessary for the operator to release the stop-spring. It appears from the testimony that this stop-spring had not been on the switch for sometime previous to the accident and it could not be ascertained whether it had been broken off or had been taken off. Furthermore, the captain and first officer testified that they had no recollection of there ever having been a stop-spring on the flap control

switch on any of this model airplane which they had flown. However, it was determined that these new switches with the stop-spring had been installed on all of these planes. (See sketches of old and new switches on page 11A.)

CONCLUSIONS

When the captain gave the order to "stand by for take-off", he had finished warming the engines, the take-off area had been patrolled, his usual preflight cockpit check had been made, and he was all ready for take-off when the first officer entered the cockpit.

The first officer stated that after he had taken his seat and fastened his safety belt, he only had time to complete a part of his cockpit check before the captain commenced the take-off. When he glanced out at the right wing and observed the flaps in a slightly down position, the take-off run was already under way. This and other of his statements indicate that whatever cockpit check he made was done very hurriedly and was not completed before the take-off. From his testimony, it is apparent that he was not thoroughly familiar with the location of the 35° flap position on the flap selector switch and it is entirely possible that he hurriedly moved the switch from "off" to "35°", which was the next and last position on the switch.

The instrument panel sank with the bow of the hull and was not recovered. It carried the flap selector switch mounted on a metal box, the top of which is about 15 inches above the floor of the cockpit. (See photograph, page 12A.)

The location of the flap selector switch on this instrument panel and the proximity of the instrument panel to the first officer's seat make necessary the consideration of the possibility that the first officer may have inadvertently struck this switch with his foot as he raised his foot

over the instrument panel to take his seat. It would have taken only a small force to move this switch the short distance necessary to change it from "off" to "35°" and, furthermore, the switch knob rotates in the same direction of the motion that would be taken by the first officer's foot as he was seating himself. The possibility of this theory was tried out in a similar aircraft and it was found that the switch could have been actuated in this manner.

The first officer observed the flaps only slightly down at the start of the take-off. The navigator also observed the flaps only slightly down at the start of the take-off and he thought they were moving downward. When the wing was recovered after the ~~accident~~, the flaps were in the 35° full-down position and all of the electrical flap operating mechanism indicated that the flaps were in the 35° position. The time required for the flaps to move from 0° to 35° is about 30 seconds. The take-off time for this aircraft under the subject conditions was approximately 30 seconds. It seems, therefore, that the flap operating switch was actuated, by one means or another, at the start of the take-off run.

Findings

1. The accident occurred during take-off approximately 7:05 p.m., local Botwood time, on October 3, 1942, resulting in fatal injuries to five members of the crew and six passengers, serious injury to three crew members and five passengers, and minor injuries to two crew members and fifteen passengers. One member of the crew escaped injury. The aircraft, a 39-passenger Vought-Sikorsky 44A flying boat, NC 41880, was completely demolished.

2. The aircraft was being operated under a temporary airworthiness certificate issued by the Civil Aeronautics Administration pending issuance of type certificate for the subject model.

3. The captain and first officer were physically qualified and properly certificated to perform their duties on the subject flight.

4. The trip was being operated in scheduled air carrier service between New York, N. Y. and Foynes, Eire, with a scheduled stop at Botwood, en route.

5. The weather was favorable for the flight and had no bearing on the accident.

6. There was evidence that although the captain had intended to take off with the flaps fully retracted, the flaps were set in operation from the "off" position to the full 35° down position in some undetermined manner at the start of the take-off.

7. Testimony of First Officer Lindsay indicated that he was not familiar with the details of the flap switch operation and that his pre-flight cockpit check was made hurriedly at the start of the take-off run.

8. There was no evidence of failure or malfunctioning of any part of the aircraft prior to the accident.

9. The flap control switch had been equipped with a safety stop to prevent an inadvertent application of 35° flaps, but the evidence indicates that this safety stop had been broken or removed sometime previous to the subject flight.

PROBABLE CAUSE: Inadvertent actuation of the wing flaps to the full 35° "down" position during the take-off run, thereby rendering the aircraft excessively nose-heavy and uncontrollable.

CONTRIBUTING FACTOR: Absence of the required stop-spring on the flap control switch which was for the sole purpose of preventing inadvertent application of the 35° flap.

RECOMMENDATION.

It has been recommended that the Civil Aeronautics Administration check any of this type aircraft engaged in commercial operation and require the safety stop-spring to be reinstalled on the flap selector switch.

APPROVED.

/s/ L. Welch Pogue
L. Welch Pogue

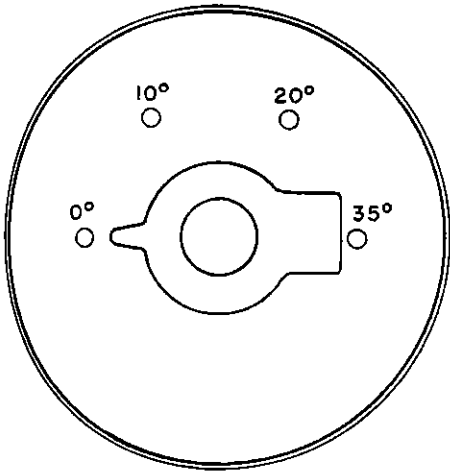
/s/ Harilee Branch
Harilee Branch

/s/ Josh Lee
Josh Lee

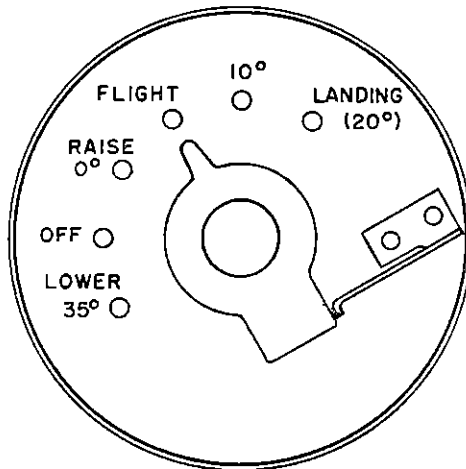
Warner and Ryan, Members of the Board, did not take part in the decision.

FLAP SELECTOR SWITCH

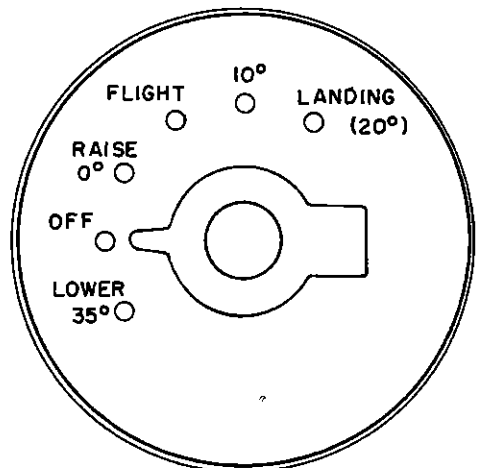
VS-4401



ORIGINAL SWITCH
WHICH WAS DISCARDED

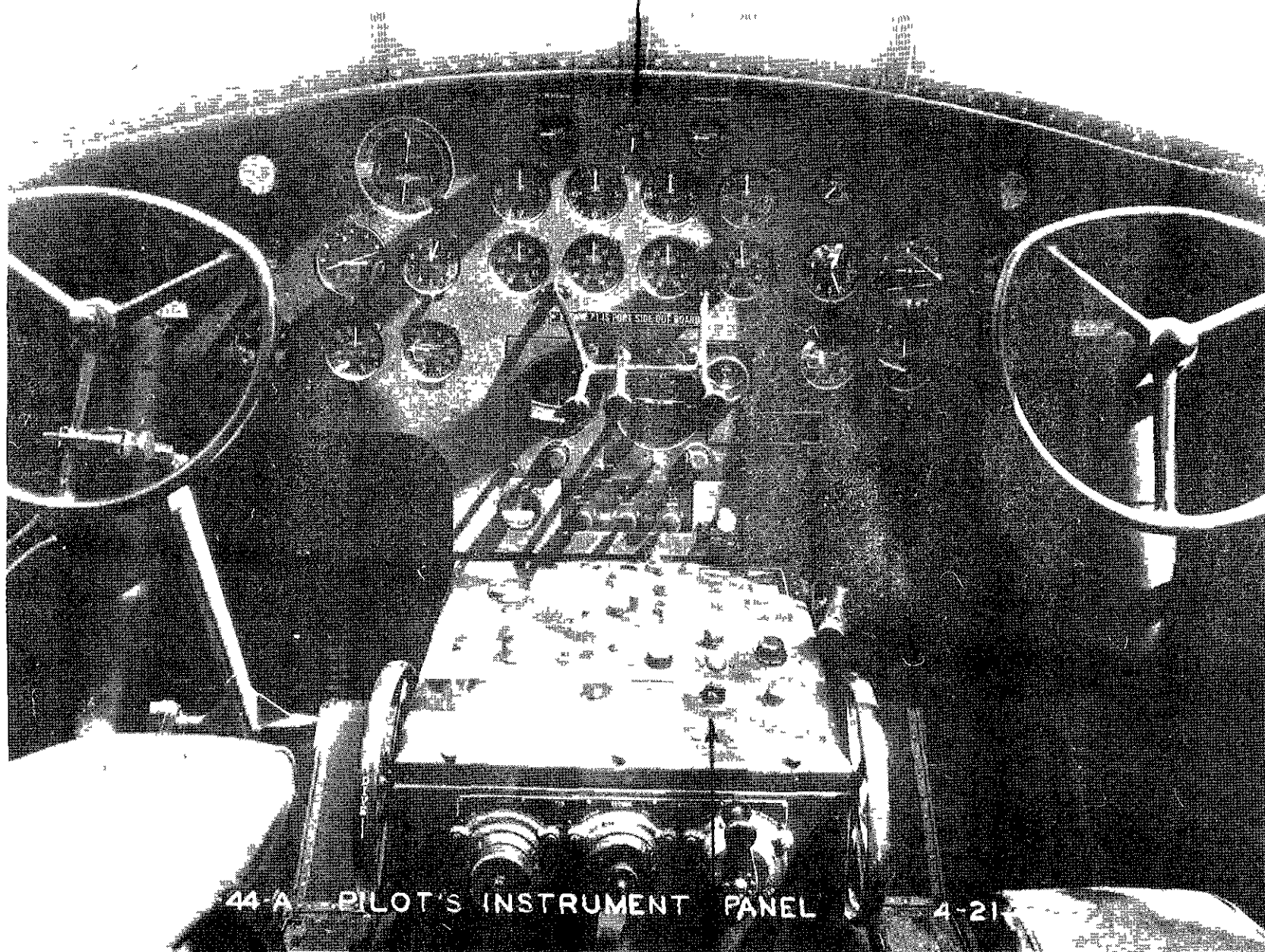


NEW SWITCH AS IT WAS
INSTALLED (WITH STOP)



SWITCH AS IT WAS ON
SUBJECT FLIGHT
(NO STOP)

Flap Position Indicator



44-A PILOT'S INSTRUMENT PANEL 4-21