

TASK FORCE SLIDE USAF C-130 SKI TESTS

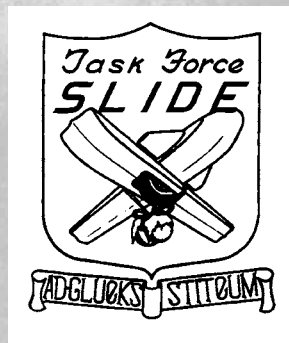
by Kent A. Mitchell

Shortly after the Lockheed C-130A *Hercules* became operational in the U.S. Air Force inventory, the manufacturer submitted a proposal to the military to develop a ski-wheel landing gear for the aircraft. The Air Force was interested in such an aircraft configuration to support its operations in arctic areas and the U.S. Navy wanted several to support their seven stations in Antarctica.

Given a go-ahead, Lockheed made a prototype installation on Air Force C-130A tail number 55-021. A company press release dated January 29, 1957 announced that the ski-and-wheel equipped aircraft had made its first flight from Dobbins Air Force Base which adjoined the Lockheed plant at Marietta, Georgia. Piloted by Leo J. Sullivan, the company's chief engineering test pilot, the aircraft was flown for 51 minutes in the "wheels down, skis up" configuration. A television camera, mounted in a two-foot diameter fiber glass pod under the right wing outboard of the No.4 engine, monitored the in-flight behavior of the skis. The camera was connected to a 10-inch TV screen on a table inside the cargo compartment and watched by the flight test engineer. Candy-cane stripes were painted on the skis for better TV visibility. In addition, observers were stationed in the open paratroop doors of the *Hercules* to watch the aft ends of the 19.5 ft. long skis during the flight.

Lockheed began testing the skis by landing on snow and ice beginning in late February 1957 at Bemidji, Minnesota. As a result of these tests, it was decided that some modifications to the skis were required. The modifications to the skis included a lengthened nose section and a vee-bottom bow in place of the blunt, flat-bottom bow. The main gear ski system was altered to assure a level attitude of the skis during extension and retraction. The nose ski system was also modified to assure a level attitude of the ski during extension and retraction as well as to eliminate a nose wheel shimmy.

The ski modifications having been made, the aircraft was turned over to the Air Force's Wright Air Development Center who scheduled it for testing during the next snow season at Bemidji beginning about January 1, 1958 through April 15. The objective of the test program was to determine the func-



Crossed skis were used in the Task Force Slide logo. (Fitzwater Collection)



tional capabilities, applied structural loads, and performance of the C-130A modified prototype ski-wheel installation. The results of the tests would be used in determining a standard design for future C-130 ski-wheel installations.

Major Charles E. Fitzwater was named to be the flight test pilot and act as the Commander of the project, to be known as U.S. Air Force Task Force Slide. Major Fitzwater was selected for this job because of his previous aircraft-on-ski experience at Bemidji as test pilot on the Grumman SA-16A in 1956 and the Fairchild C-123J prototype in 1957.

The civilian airport at Bemidji was used as a home base for all snow work which was conducted on frozen lakes within a 50 nautical mile radius of Bemidji. Prior to the departure of the C-130A from the Bemidji airport for a test flight, a ski-equipped Cessna 180 aircraft (operated with a contract by the airport operator) was dispatched to the operating area to check snow conditions, wind and ice thickness. The light plane was also used as liaison support to and from the test site and to obtain the C-130A takeoff and landing distances.



A total of 18 hours and 10 minutes of flight testing was accomplished during which 46 ski landings and 47 ski takeoffs were made, including four RATO (rocket assisted take off) takeoffs. One landing was made on the snow with the skis retracted.

Landings and takeoffs presented no particular operational problems. The pilot technique used for the ski takeoffs and landings was similar to that normally used for maximum performance of the aircraft. No unusual control forces or their handling problems were encountered during the tests. The aircraft exhibited a tendency to skid during the landing made with the skis retracted. This was probably because the wheels penetrated the thin snow through to the ice, and lacked the directional stability of the skis.

During the initial flight of the aircraft on skis at Bemidji, which was conducted on 50% bare, rough ice at a gross weight of 85,000 pounds, permanent deformation to the main skis in the tangent area of their bows occurred. That damage consisted of buckling and slight tears to its internal webbing. The

Lockheed drawing of their proposed ski-and-wheel equipped C-130 Hercules transport. (Lockheed Aircraft Corporation Photo No. RE 3360)

deformation progressed slightly during the next flight, which was conducted at 90,000 pounds gross weight. The condition was inspected after each succeeding flight but no further progression was observed. In addition to the reported deformation, the cap strips on the inboard edges of the main skis popped rivets at numerous points periodically throughout the tests. The cap strips were secured by the addition of numerous Jobolts. All ski repairs were accomplished without the use of wing jacks. Jacking of the aircraft was accomplished by the use of twelve 3-inch by 8-inch timbers 10-feet long. The procedure used consisted of placing timbers under a ski when it was in the "ski retracted" position and then extending the skis. That caused the wheels to raise off the ground as the skis extended. More timbers were placed under the wheels and the skis were

further retracted. The procedure was repeated until the aircraft was raised to the required height to enable repairs.

The following data presents some averages of the observed ski takeoffs and landings at each gross weight condition:

Gross Weight (lbs)	Takeoff Distance (Ft)	Landing Distance (Ft)
89,000	1,190	1,170
107,000	1,480	1,160
108,000	1,670	1,170
109,000	1,720	1,310
122,000	2,440	1,385
RATO Takeoffs		
88,000	850	
107,000	950	
122,000	1,460	

In the formal flight test report dated February 26, 1958, the task force test team made the following conclusions:

- a. The aircraft and skis performed satisfactorily under the conditions encountered.
- b. The skis and the ski system could be maintained in the field by an operational unit.
- c. On the snow conditions encountered during the course of the test, the nose steering was ineffective and could only be used as an assist. Asymmetric power was necessary to maneuver the aircraft during taxiing.
- d. The ski down-and-locked indicator system was unsatisfactory.
- e. The normal ski positioning system would not jack the aircraft at gross weight above 108,000 lbs.
- f. The internal structure of the skis, at the station just forward of the wheel cut out area, would be damaged under loads imposed during certain landing conditions on rough bare ice.
- g. The configuration of the RATO mounting hooks and latches was unsatisfactory.

h. Water formed by condensation in the hydraulic reservoirs could freeze and cause the ski selector valves to malfunction.

i. Use of eight RATO bottles decreased required takeoff distance by about 40%.

j. The use of maximum propeller reversing just after touchdown on all landings resulted in an average landing distance of 1250 feet for all gross weight conditions.

Because of unusually mild climatic conditions at Bemidji that year, the snow cover on the lakes during all the testing was thin and remained fairly constant regardless of the operating area chosen. The snow consisted of one medium hard layer of dry crystals and varied in depth from 3 to 5 inches. Consequently, a decision was made to continue further testing by Task Force Slide on the Greenland Ice Cap.

The test team arrived at Thule Air Force Base in Greenland on March 28, 1958. After offloading some equipment and prior to beginning their tests, the C-130A was pressed into service to deliver some Royal Canadian Air Force cargo to Lake Hazen, Ellsmere Island on March 29. A ski landing was made on the snow at the site, where the temperature was -45 degrees F. During preparation for departure, the No.4 engine had a "hot start." The crew was unable to control the engine's temperature and the turbine was damaged. Consequently, a three-engine ski takeoff was made with a gross weight of 100,000 lbs. which required a takeoff run of approximately 5000 ft. on the snow.

Back at Thule, the crew had to wait until a built-up replacement engine could be obtained from the Lockheed factory at Marietta, Georgia. The engine was flown in on April 5. Working outside in the cold, the crew had the new engine installed and running on the evening of the 8th. By that time, Major Fitzwater had to request an extension of their orders, which were due to expire on April 11, before the ski test project could continue.

With the aircraft and paper work back in order, the task force departed for Sondrestrom Air Force Base in southern Greenland,



Opposite: First flight photo (released January 29, 1957) of C-130A s/n 55-021 equipped with skis. (Lockheed Aircraft Corporation Photo No. RE 3513-2) **Right:** C-130A pilot Maj. Fitzwater and crew are greeted by airport "mascot" upon arrival at Bemidji, Minnesota. (Lockheed Aircraft Corporation Photo No. RE 4400-1) **Right lower:** High-speed taxi run on Lake Bemidji throws a lot of snow into the air. (USAF Photo, Fitzwater Collection)

which would be their operational base for ski tests on the ice cap.

Four missions were flown out of Sondrestrom AFB during which 34 successful ski landings and takeoffs were made at various sites on the Greenland Ice Cap. The majority of the takeoffs were made at the C-130A's design gross weight of 108,000 lbs. at 0 degrees F and 10,000 feet above sea level. The ground run distances were measured on four takeoffs and three landings using a tracked snow vehicle with a calibrated odometer. Weather data and snow conditions were taken using thermometers, a calibrated altimeter, and a hand-held wind vane and anemometer. The time required to take off and land was recorded for each run. A total of 39 hours and 45 minutes was flown during the period which ended on April 18, 1958.

On the 35th takeoff, the nose gear was damaged which upon the next landing collapsed and protruded up through the fuselage. In his written statement for inclusion in the accident report, Major Fitzwater described what happened:

"I was flying the aircraft making the 35th take off when the nose ski struck a snow drift which was about 2 feet high. I attempted to raise the nose ski over this drift but there was not sufficient elevator power to do so. This condition had been experienced before without any damage to the aircraft. The take off was completed and a routine landing was made. When visibility was restored from the blowing snow after prop reversal it was observed that the aircraft was in a nose low attitude. Investigation revealed that the nose gear had collapsed rearward being pushed up and back into the cargo compartment. The nose of the aircraft was resting on the nose ski. In order to save the aircraft and to prevent the exposure of 14 persons to the Ice Cap element, a decision was made to attempt to fly the aircraft back to Sondrestrom Air Base. A take off was made without the use of the electrical or utility hydraulic systems.

"After the aircraft was airborne parts of the electrical system were turned on to make radio contact with C-123J number 393 which was flying as safety in the general vicinity. This radio contact was made and an emergency was declared. The C-123 informed Sondrestrom Air Base of our emergency and requested that 1200 feet of foam be laid on the runway.

"During the take off, flight to Sondrestrom and landing, all personnel with the exception of myself, the copilot and system engineer were in the aft cargo compartment. In flight two persons were used to replenish the booster hydraulic system with 12 gallons of hydraulic fluid in order to maintain the flight controls.

"The flight to Sondrestrom was made without incident and a landing was made without further damage to the aircraft. All 14 persons on board evacuated the aircraft in nine seconds in a very orderly manner."

As a result of the described incident, his commanding officer at the Wright Air Development Center, Colonel Joseph



Davis, Jr., made a recommendation that Major Fitzwater be awarded the Distinguished Flying Cross. The proposed citation to accompany the award read:

"Major Charles E. Fitzwater distinguished himself by an extraordinary feat of airmanship, 18 April 1958, when he successfully handled an aircraft incident on the Greenland Ice Cap. As Project Test Pilot of a highly experimental C-130A aircraft, he discovered that during a landing on the Ice Cap the nose gear of his aircraft collapsed rearward and was pushed up and back into the interior of the fuselage, breaking hydraulic lines, electrical equipment and binding control cables. Major Fitzwater displayed superb airmanship, and acted in the best interest of the USAF when he made an immediate decision to fly this aircraft, with limited flight controls, to an Air Base 200 miles away. By his heroic efforts he saved the lives of 14 personnel from Ice Cap elements, and an extremely experimental high priority aircraft."

Because of the damage to the test aircraft, the Greenland ski tests were considered finished. A summary of the test results in the preliminary Flight Test Report for the ski installation evaluation contained the following remarks: The ground handling characteristics on skis of the test aircraft were found to be satisfactory with the exception of the large turning radius required. The turning radius was limited by the nose ski safety cables. Asymmetric power and nose ski steering was used to turn the aircraft when taxiing.

Ski landings were made using 100% flaps and touching down in a nose high attitude at an indicated airspeed of about 90 knots.

The optimum pilot technique for ski takeoffs at the 10,000



foot level on the Ice Cap was as follows:

- a. Flaps set at 100%.
- b. Maximum available power applied and directional control maintained with nose ski steering.
- c. No attempt was made to lift the nose ski until an indicated airspeed of 65 knots was reached. Then full elevator was used to lift the nose ski, and the aircraft rapidly accelerated to take-off velocity.

Several problem areas were encountered with the aircraft's systems during the arctic ski tests:

- a. The landing gear struts lost pressure both during flight and while on the ground as a result of using ordinary compressed air to service them containing moisture which froze. No nitrogen was available at Sondrestrom AFB, Greenland.

- b. During one engine start (at Lake Hazen), the Gas Turbine Compressor (GTC) stopped running because of low battery voltage. That caused an engine overtemperature condition. Heat was applied to the battery compartment which restored enough battery power to run the GTC allowing the remaining three engines to be started. (The GTC, located in the forward left wheel well, supplies compressed air for engine starting and for ground operation of other systems.)

- c. Upon attempting to work on the APN-59 navigational, search, and weather radar set, it was found necessary to remove the nose ski fairing before removing the radome.

- d. In order to change a tire on the test aircraft the correspond-

ing ski had to be removed. If quick disconnect hydraulic lines were used the time required to change a tire would be greatly reduced, as the hydraulic system would not need bleeding.

- e. Maintenance on the skis would be facilitated if each ski could be cycled independently. Also, if one ski was determined unsafe while in flight, it would be advantageous to be able to cycle only that ski.

- f. The nose ski shimmy damper was found to be effective for wheel operation. However, when operating on skis, the damper would dig into the snow causing an additional drag which lengthened the takeoff run.

- g. The ski down indicator only indicated that the skis had bottomed. It would be possible to lose hydraulic pressure in the ski system and still have a safe indication. If an unsafe condition existed, it was usually impossible to tell which ski had malfunctioned as there was only one safe indication for all three skis.

It was recommended that the Mechanical Branch of the Aircraft Laboratory at Wright-Patterson AFB perform analysis of the problem areas and initiate corrective action for incorporation in production ski-equipped aircraft.

Twelve ski-equipped C-130A aircraft were scheduled to be operated by the 61st Troop Carrier Squadron of the Tactical Air Command from Sondrestrom AFB to two sites on the Greenland Ice Cap. Prior to their departure for Greenland, the squadron crews were to receive familiarization training at

Opposite left: Maj. Fitzwater on final approach to a frozen lake in Minnesota. (Lockheed Aircraft Corporation Photo No. RE 4537-2) **Opposite right:** The C-130A casts a shadow a few seconds from touchdown on Lake Bemidji. (USAF Photo, Fitzwater Collection) **Opposite lower:** Maj. Fitzwater makes a smooth three-point landing. (USAF Photo, Fitzwater Collection) **Right:** Task Force Slide team member seen taking a snow-ice core sample at a ski test site. (USAF Photo, Fitzwater Collection) **Right lower:** A portable weather station was used by the C-130BL Task Force Slide III test team. (USAF Photo, Fitzwater Collection)

Bemidji, Minnesota. The squadron had no previous cold weather experience with the C-130. Major Fitzwater was assigned temporary duty (TDY) with the 61st to act as Technical Advisor and Instructor Pilot during the period between January 21, 1959 to February 27. In addition, he was authorized to perform tests of the modifications made to the production aircraft as a result of his testing of the prototype. Many of the changes incorporated in the production aircraft had never been flight tested.

Upon completion of the assignment at Bemidji, Major Fitzwater was issued orders to spend 31 days TDY in Greenland to assist the 61st to become operational with their ski-equipped C-130s,

The mission of the 61st Troop Carrier Squadron in Greenland was the complete airlift of personnel and material for the construction of two new sites on the Greenland Ice Cap. Those sites were part of the eastern extension of the Distant Early Warning system (DEW line). The sites were identified as "Dye 2" and "Dye 3" and were located approximately 100 nautical miles (elevation 7650 ft.) and 200 nautical miles (elevation 8700 ft.) east of Sondrestrom. The mission required airlifting a total of some 13,000 tons between April 1, 1959 and November 1 of that year. That was the first time that an undertaking of such a magnitude had ever been attempted by airlift to such a remote environment. Although heavy equipment drops by parachute into remote areas of the arctic and antarctic had been made in the past with limited success, for this mission the feasibility of air dropping structural steel beams 40 feet long, weighing 29,000 pounds was completely out of the question. However, with the advent of the ski-equipped C-130, an airlift had become a reality.

But Major Fitzwater had some misgivings concerning the airlift operation. In a "memo for the record" letter, he wrote:

- a. Flight testing of the prototype ski C-130 in the ice cap environment was conducted at design gross weight of 108,000 pounds and was terminated prior to completion of the program due to failure of the nose gear supporting structure.
- b. The production aircraft which the 61st Troop Carrier Squadron are operating had never been flight tested on skis.
- c. The experience level of the pilots on ski-equipped aircraft was very limited and there were no personnel with previous ice cap experience.
- d. Ski landings were being made at gross weights of approximately 120,000 pounds, regardless of the roughness of the snow. (The maximum gross weight overload for that aircraft was 124,000 pounds.)

The first two ski C-130s arrived at Sondrestrom on March 20 and 21 with an operational readiness date of April 1. The 10 day period between March 21 and April 1 was not spent "feel-





Left: Close-up view of Jamesway Hut erection. (USAF Photo 61-2190) **Left lower:** Interior view of Task Force Slide data reduction hut showing Lockheed engineers reading oscillograph data (USAF Photo No. 61-2218) **Opposite:** Blast off! The C-130A could take off in 850 feet using the RATO bottles. (USAF Photo, Fitzwater Collection)



ing out” the aircraft by the crews. Instead, the first mission was flown on March 23 to locate the Dye 2 site and offload 10 contractor personnel to survey the area and equipment that had been in place since the previous summer. An identical mission was flown to the Dye 3 site the following day. A recommendation was made to the Commander of the 61st (by Major Fitzwater) that he concentrate on training three of the most experienced crews to the point that they could adequately evaluate weather, snow and depth perception phenomena peculiar to ice cap operations. The recommendation was not put into effect. In fact, Fitzwater complained, the squadron flying training officer (one of the two instructor pilots) did not even receive a supervised flight to the Ice Cap. Until a major accident occurred, the majority of the pilots had only one supervised flight to each site. The pilots were not given an opportunity to observe with a supervisor the phenomenon mentioned previously; therefore, the pilots could not be expected to adequately evaluate the snow conditions prior to landing. Other recommendations made by Major Fitzwater were never put into effect. The recommendations included:

a. Reduction of the fuel load from 32,000 pounds for a 1.5 hour to 3 hour flight to a more realistic figure to lower the aircraft’s gross weight.

b. Scheduling Major Fitzwater to make the initial flight of the day to each site for evaluation of weather and snow conditions.

c. Placing a supply of RATO bottles at each site to reduce take off runs under unusual conditions.

A problem with the ski system operation soon became

apparent on some aircraft. Frequently, the main skis failed to remain in the completely extended position at all gross weights and center-of-gravity locations. In some cases the skis would not remain extended even with the cargo offloaded. To Major Fitzwater, that indicated a malfunction of the hydraulic dump valves or the electrical system. However, at the insistence of supervisory personnel of the 61st, the Lockheed Field Service Representative contacted the company in Georgia via amateur radio for a possible solution to the problem. In a few hours, Lockheed advised to increase the system hydraulic pressure from 1535 psi to 2000 psi and the air charge from 1435 psi to 1900 psi. That recommendation was made by Lockheed engineers who had no knowledge of the rough snow conditions where the aircraft were operated. At that time Major Fitzwater pointed out that the increased pressures would practically eliminate any longitudinal shock absorbing for the main skis. He was completely ignored and without approval from the Air Materiel Command or the Air Research and Development Command the pressures were raised. Two aircraft so configured were dispatched to Dye 3 (with inexperienced crews) and upon landing each sustained major damage of a like

nature to the main skis. In both cases, the damage was failure of the aft hydraulic actuator pinion at the point where it attached to the ski. That permitted the ski to retract and in one case split a ski longitudinally. In the other case the main ski was not damaged as extensively, however, there was serious damage to the nose gear due to improper technique by the pilot to maintain directional control. The nose gear traveled aft approximately 20 inches and ruptured a forward fuselage bulkhead.

Three days later another C-130 was dispatched to Dye 3 and made a normal touchdown on the main skis parallel to some new snow ridges that had formed from some previous high wind conditions. However, the pilot permitted the nose ski to make contact with an old snow ridge that was approximately 60 degrees to his landing track. The extremely hard contact sheared the nose gear completely from the aircraft inflicting major damage. The old snow ridge was difficult to detect by an inexperienced observer—however the ridge was pointed out to three people by Major Fitzwater flying over the area 30 minutes after the accident. An accident board was convened at Sondrestrom, consisting of Tactical Air Command personnel, which found the primary cause of the accident to be material failure. Major Fitzwater was not consulted by the board.

Further upsetting Fitzwater, the Commander of the 61st Troop Carrier Squadron felt that it was necessary that operational techniques be revised from those in the aircraft flight manual (T.O. 1C-130A-1A) which had been determined by actual flight tests in the field.



The major returned to his home base from Greenland not being very happy with the Tactical Air Command.

A meeting was held at Wright-Patterson AFB on September 10, 1959 with interested agencies in attendance to discuss the U.S. Navy's requirements for the procurement of four UV-1L aircraft (C-130Bs equipped with a ski-wheel landing gear configuration. The Air Force designation for this model was the C-130D. Later, the Navy also used the same designation and both services utilized a common Flight Manual. Still later, the Navy model was designated the C-130BL). Representatives of the Navy outlined briefly the operational requirements of the UV-1L aircraft:

- a. The aircraft would be operating from the Antarctic region with fuel requirements for a maximum range of 2200 nautical miles and holding for two hours.

- b. Highest elevation for take-off and landings would be 9200 feet.

- c. Prepared snow/ice runways would be provided so that the aircraft would be operating from relatively smooth surfaces.

- d. The aircraft should have the capabilities of performing any aerial drop mission.

- e. It was important that the aircraft be delivered on schedule, as the antarctic operation was scheduled to start in November 1960 (Project "Deep Freeze").

It was decided that the All Weather Flight Test agency of the Wright Air Development Center would have primary responsibility for conduct of Air Force flight tests (on behalf of the Navy) of the production Navy aircraft with other agencies providing liaison and support. Once again, Major Fitzwater was assigned as test pilot and commander of the Joint Task Force for these tests to be known as "Slide III."

To investigate if any takeoff limitations existed due to the increased forward center of gravity—high gross weight combinations of the later model aircraft configuration, a test plan was developed to conduct tests first with the prototype C-130 ski-equipped aircraft (55-021)—again at Bemidji, Minnesota. The second phase of the ski tests were conducted under actual on-site snow-ice conditions in the antarctic utilizing the first Navy production aircraft (Air Force tail number 59-5922)

which was available at the Lockheed factory during September 1960. Note: The aircraft, Lockheed's number 3562, carried Bureau of Naval Operations number 148318.

Because Bemidji was at a lower elevation than the 9,000 ft. antarctic operational site, the higher elevation was simulated by using reduced power during the takeoff tests. Along with developing center-of-gravity (c.g.)—gross weight envelope limits, other parameters to be determined included takeoff distances, rotation speeds, lift-off speeds, and aircraft handling characteristics. The data was incorporated in the C-130D flight manual to augment the ski test data previously obtained in 1957 and 1958. The c.g. and gross weight limits would be used on the Navy C-130BL aircraft until those aircraft could actually be tested in the antarctic and data evaluated. A total of 37 takeoff runs were made (three were aborted) and 15 hours and 10 minutes of flight time was recorded at Bemidji between January 22 and March 3, 1960. Due to relatively mild weather during the tests no deep or rough snow conditions existed which limited the program. However, the following conclusions were reached:

- a. The results of the program were obtained on relatively ideal snow conditions. Deep, wet, and rough snow would further reduce the aircraft's performance.

- b. The forward c.g. limits for the C-130D (operating on wheels) were too far forward for ski operation when attempting takeoffs at high altitude runways where power would be reduced.

- c. The aircraft, operating at reduced power, would not take off within a 10,000 ft. run with a c.g. near the forward limit at gross weights of 105,000 lbs. or greater.

- d. The use of RATO would supply sufficient power for takeoff with a c.g. near the forward limit and gross weights of 105,000 or greater.

Three takeoffs had to be aborted after running in excess of 10,000 ft. on 3 to 5 inches of packed granular snow and the aircraft's airspeed would not accelerate above 70-76 knots. It was apparent that there was a definite area that needed to be tested extensively on the C-130BL aircraft, i.e., high gross weight (120,000 lbs. or greater), forward c.g. takeoffs from



high altitude runways. It was also apparent that a difficult problem existed and extreme caution would have to be taken during testing for those particular conditions.

During the summer of 1960, the Navy prepositioned spare parts to support the three C-130BLs to be used by U.S. Navy Air Development Squadron Six (VX-6) to airlift supplies for Project "Deep Freeze" and the "Slide III" test aircraft. Assistance to the test team was to be rendered by VX-6 in the form of maintenance capability (personnel and facilities) during the testing.

The Flight Test Plan called for test locations at McMurdo Sound, Byrd Station, and South Pole Station, Antarctica. Initially, all test flying was to be conducted at the inhabited area (McMurdo Sound) until the ski-gear was proved to be functionally sound. Only then would flights be made to Byrd Station or the South Pole to test the aircraft under operational conditions. It was also recommended that the three operational C-130BL aircraft be restricted to the C-130D c.g. and gross weight limits until the design c.g. limits of the C-130BL were tested thoroughly on the Slide III test aircraft.

Although the Slide III C-130BL had been scheduled to depart the U.S. for Antarctica in mid-October, because of various delays, the aircraft did not take off from Wright-Patterson until October 27. The aircraft arrived at its next-to-last stop, Christchurch, New Zealand, on November 3 (via Travis AFB, California; Hickam AFB, Hawaii; Canton Island; and Nondi airport at Fiji).

Upon arrival at the U.S. installation at Christchurch the crew found "...a very confused situation"—there were no living quarters available on the airfield or in town. The nearest billets were at Burnham New Zealand Army Camp, 20 miles south. The quarters were very sub-standard, without heat or mess facilities. Transportation (bus) to the field was twice daily. An automobile promised by the Navy was not there. Postflight maintenance and test instrumentation calibration was begun on the C-130BL, but was hindered by the lack of a ground power cart. The Navy had only one power cart and it was being used on their P-7V aircraft. The requested 10,000 lbs. of lead-shot ballast weight for c.g. tests to be furnished by the Navy turned

Above: The C-130A arrived at Thule, Greenland March 28, 1958. (USAF photo, Fitzwater Collection) **Opposite top:** C-130BL test team poses just prior to their takeoff for Antarctica from Wright-Patterson AFB, Ohio. Task Force Commander Maj. Fitzwater is at far left. (USAF Photo, Fitzwater Collection) **Opposite lower:** An aerial view of Williams Field looks toward Ross Island. The test skiway used by the task force is at the right. The entire area is located on 17 to 22 feet of permanent sea ice. (USAF Photo, Fitzwater Collection)

out to be 15 practice bombs filled with BB's and 7,500 lbs. of 7 x 7 x 3/4-inch steel plates. Neither form of ballast was considered acceptable as safety would be compromised both on the ground and in the air—especially at forward c.g. locations. Matters got worse.

A message from VX-6 stated that the conditions at McMurdo were so crowded that they could not accept the Slide III project and that their departure from New Zealand should be postponed indefinitely. Unofficial word was that personnel were sleeping in shifts in the available beds. In addition, the Jamesway Huts that were to be provided to the Task Force for the test data processing and data reduction personnel had not been shipped from Christchurch. There was also the question whether JP-4 fuel would be available for the test aircraft until supply ships arrived in late December. Also, the Navy only had two power carts at McMurdo, Sound with one in commission. The test aircraft would require a power cart at all times that it was on the ground. Major Fitzwater complained in his activity report that "The test program appears to have the lowest priority."

Indeed, Fitzwater found out that the Navy in Antarctica were under the impression that they would remove the instrumentation from the test aircraft as soon as possible and use the aircraft for logistic support. They had received no instructions that the Task Force would return the aircraft to the U.S. They also believed that they had operational control of the aircraft and the Slide III personnel were attached to VX-6—rather than just providing support as agreed upon in the January 26, 1960 Joint Test Directive 59-155.

November 10th found the Slide III crew idly standing by at Christchurch. At that point Major Fitzwater made radio contact with Navy Captain Munson, VX-6 Commander at McMurdo Sound. The major again stated the test support requirements which had previously been agreed upon as far back as November 1959. At that, Captain Munson recommended that four members of the Task Force make a flight to McMurdo for another coordination meeting. Consequently, Fitzwater, Lt. Commander Potter (VX-6), Mr. Gillich (Lockheed), and Mr. Dees (Lockheed) departed Christchurch at 2230 hours aboard a USAF C-124 and arrived at McMurdo at 1030 hours on November 11.

Upon arrival, a tour was made of the base camp and landing strip and conditions were found to be as stated—extremely overcrowded with no hope of improvement until a USAF C-124 squadron departed approximately as late as December 10. Upon that organization's departure, adequate quarters and support equipment would be available for the Task Force and a three month period would still be available for completion of the C-130BL testing before McMurdo Sound closed for the winter season.

A conference with Captain Munson and Rear Admiral Tyree, senior Navy officer in Antarctica, and the Task Force representatives, led to the agreement that VX-6 was willing to comply with provisions of the Joint Task Directive 59-155, but that Captain Munson would retain reporting custody of the test aircraft and the Air Force would, however, be accountable for any accident responsibilities. Also during the conference, Admiral Tyree emphasized that he did not want any ballast at McMurdo in the form of practice bombs due to international implications. Major Fitzwater passed Admiral Tyree's remarks concerning the practice bombs on to the Navy at Christchurch, however, the bombs were shipped by air to McMurdo the next day. Major Fitzwater and party returned to Christchurch on November 12.

For the remainder of November and the first week of December, Fitzwater kept the Slide III crew occupied performing minor maintenance and repairs on the C-130BL and checking the test instrumentation. Two local shake-down flights were completed at Christchurch during the period and the aircraft remained in excellent condition.

Finally after all of the delays, which then included weather, the test aircraft and crew arrived at Williams Field in Antarctica on the 9th of December after 7-1/2 hours of flight. After settling in their assigned barracks, the crew spent several days erecting the Jamesway Huts (which had been flown in on other Navy aircraft) to house a photo processing lab and data reduction personnel at the test site, and recalibrated the test instrumentation. Other team members completed a 50-hour postflight inspection of the test aircraft.



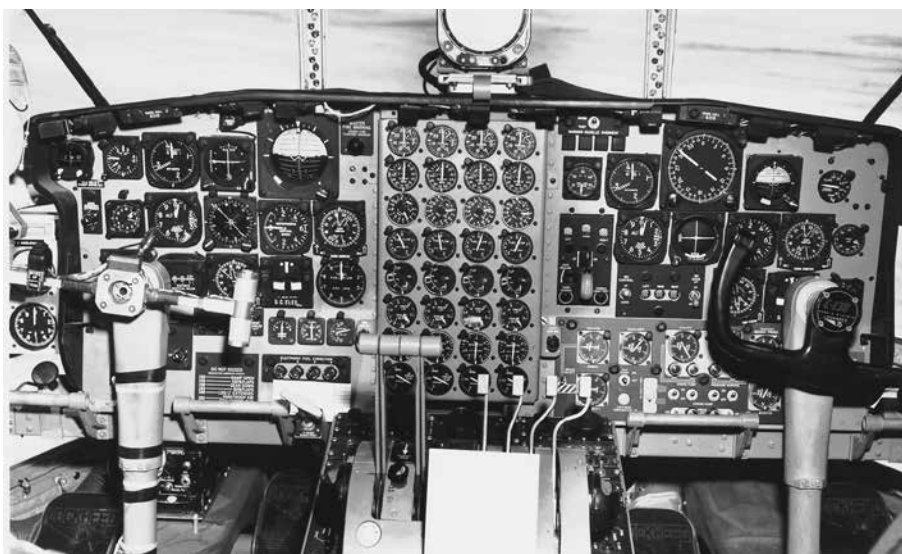
A 1 hour and 10 minute local flight was made on December 14 to become familiar with the area and to check the test instrumentation in flight. Upon landing the oscillograph data was processed and it was evident that adjustments were required. After that was accomplished, unfavorable weather prevented a second shake-down flight until December 19. Fitzwater commented in his activity report that the aircraft and instrumentation appeared "... to be in surprisingly good condition considering the aircraft had not been hangared since its departure from Marietta."

Fitzwater also reported that he had learned that the crews flying the three operational C-130BL aircraft were "As suspected with the short props on the C-130B the Navy has been having difficulty in making ski takeoffs under soft snow conditions." He decided that one of the first missions would be to determine the optimum techniques for takeoff under poor conditions of sliding snow.

It was also reported that the weather was far from ideal for test conditions. The overcasts and broken cloud conditions resulted in the loss of depth perception for ski landings. The wind was also another problem, in that each day it had been



Left: The No.3 propeller was damaged during circular taxi tests at high speeds of approximately 30 to 50 knots. Nine days were required to transport a replacement prop from New Zealand to McMurdo because of high en route winds. When the new prop was installed, the engine was found to be damaged. The aircraft had to be flown to New Zealand for an engine change. (USAF Photo No. 61-2202) **Left center:** Cockpit view of C-130BL test aircraft showing installation of elevator force measurement control wheel in the pilot's position. (USAF Photo No. 61-2199) **Left lower:** Close-up front view of nose ski on the C-130BL. (USAF Photo No. 61-2195) **Opposite:** Three-quarter view of the C-130BL test aircraft at Williams Field, McMurdo Sound, Antarctica. (USAF Photo, Fitzwater Collection)



well above the recommended 10% of lift off speed for performance and loads testing.

At last, data gathering test flights were begun on December 22. The first tests, made at 108,000 lbs. gross weight, were done to determine if airspeed stagnated during the takeoff runs as had previously occurred at Bemidji. However, the snow in Antarctica was considerably drier than that in Minnesota which resulted in an improvement in takeoff performance. The shortest takeoffs were after ground runs of 3500 feet using 100% flap settings. The second series of tests were done with a forward c.g. configuration, also at 108,000 lbs. gross weight, and good data was obtained.

One hour of flight tests at a mid c.g. location were logged on December 23 after a long delay waiting for the availability of a ground power cart needed to start the engines.

Tests were delayed until the evening of the 25th because of high winds and overcast sky conditions which caused poor terrain definition and depth perception for the pilot. One hour and 25 minutes of tests were conducted at an aft c.g. configuration.

All of the tests thus far were conducted on the smooth snow of the semi-prepared "skiway" at Williams Field. It had been decided that it was logical to do the smooth snow tests first, gradually increasing the gross weights, so as to verify the maximum gross weight of the C-130BL to 135,000 lbs. on skis in a





minimum amount of time. That was considered necessary in view of the short time remaining until the end of the Antarctica summer season and the expected poor flying weather during the months of January and February 1961.

The Slide III crew found, in spite of the 24 hours of daylight in Antarctica at that time of year, it was unpractical to attempt to fly more than one data flight per day. That was particularly true in the Photography Section of the Task Force team which should have had twice the personnel that they did.

Tests continued to be delayed due to ground power cart problems—either it was being used by other aircraft or it wouldn't operate. Further delays were caused by the other Navy (nontest) C-130s blocking the refueling pit.

The lead shot ballast was still a problem. Some 5,000 lbs. in bags were at the main camp but there was no transportation available to move them the 4-1/2 miles to the test site. Another 5,000 lbs. of ballast remained to be shipped from New Zealand. Without the ballast, the crew would have been unable to reach the required gross weights to complete the tests.

Another area of concern for Major Fitzwater was a JP-4 fuel shortage. Instead of the 35,000 gallons that was supposed to have been reserved for the test aircraft, on December 29 the Navy was asking if 11,000 gallons would be enough until a tanker ship arrived on January 6. Using a rule of thumb of 1000 gallons consumed per day, Fitzwater figured that—considering the possibility of weather-caused flight delays—he probably could get by with that amount of fuel. However, if the weather turned out to be good, Slide III tests would have to be suspended. After a 1 hour and 30 minute flight on January 2, 1961, the major was told that the test site fuel bladder was empty. An additional day of testing was completed using fuel already aboard the aircraft. For the testing on January 4, the aircraft was refueled by draining 5000 lbs. of JP-4 from the fuel line which connected the test site fuel bladder to the base tank farm

several miles away.

As part of the Flight Plan being followed by the crew, the next series of tests were to determine the side loads imposed on the C-130BL ski landing gear during turns when taxiing at high speeds. The plan called for the aircraft to turn in 400 ft. and 200 ft. circles at various speeds from 21 to 48 mph. The test target was to obtain an accelerometer side-load reading of 0.5-g during the turns. That objective could not be met, however, since the aircraft skidded sideways in the area's soft, dry and powdery snow at any higher than 0.2-g readings.

During one taxi turn test on January 5 the nose ski, being deflected in the turn, directed a steady stream of snow into the No.3 propeller and engine air intake causing a flame-out. The test was terminated when it was observed that the blade angles were unsymmetrical on the four propeller blades. After taxiing back to the parking area, it was further observed that the prop blades had been rotated to positions that exceeded the limits of the pitch control gears. Since repairs were not practical in the field, a replacement propeller and tools were requested to be sent from Christchurch. Nine days were required to air transport the replacement prop from New Zealand because of delays caused by high en route winds.

The replacement prop arrived via C-130 from Christchurch on Sunday, January 15. The old prop was removed and the new prop was installed by 1800 hours. An engine run verified that the new prop was OK—but the engine was not. A visual inspection revealed that the engine's main shaft had a permanent set of about 3-degrees. This damage required an engine replacement—which would have to be done at Christchurch. The aircraft departed Williams Field on January 17 and the engine change was accomplished by the 22nd. While at Christchurch, Fitzwater had some repairs made to the test instrumentation installed on the skis which had suffered some damage from ice. Because of the instrumentation repairs and poor weather conditions,



Fitzwater and crew were unable to return to McMurdo until February 6. Test flights resumed the next day.

Because of the time lost due to the repairs and weather, it was decided to eliminate three items on the Test Plan for tests at intermediate gross weights and instead proceed to tests at the full 135,000 lbs. gross weight. It was also decided to delete the tests scheduled to be performed at Byrd Station and South Pole Station as called for in the Test Plan. The primary concern was that the remaining tests be completed before the mandatory cutoff date for the program which had been established as February 15. That date was based on the availability of transportation back to the U.S. for personnel of the Task Force and to make room at McMurdo for an influx of personnel from outlying sites. Task Force Slide III flew right down to the wire, making the last test flight on February 14, 1961.

Between February 9 to the 14th, Fitzwater had made 19 ski takeoffs and landings at 135,000 lbs., including one takeoff employing RATO bottles.

Having completed the tests, preparations were begun to leave for home. However, because the other C-130BL aircraft were still flying operational missions to Byrd Station, the Navy requested that the test aircraft stand-by for use if an emergency arose. On Saturday, February 18, 17 Lockheed and USAF Task Force Slide III personnel departed McMurdo aboard a Navy C-121. Fitzwater and his flight crew took off for Christchurch in the test aircraft on February 21. After a 7 hour and 12 minute flight, the crew remained over night (RON) in New Zealand before departing for Hickham AFB, Hawaii, via the Fiji Islands on February 22. Again, after RON at Hickham, the crew flew a 13 hour and 54 minute flight and arrived at Wright-Patterson AFB on February 23. An air speed system re-calibration was performed there during a 3 hour flight on March 3. Finally, the aircraft was ferried to the Lockheed Aircraft Corporation in Georgia on March 10, where the test instrumentation was

removed and rework was performed to return the plane to the latest production configuration. Thus, the flying portion of Task Force Slide came to an end.

The Lockheed Engineering Flight Test Operational Report, dated May 26, 1961, stated that "The C-130BL is considered operationally suitable for use in the Antarctic under the conditions the U.S. Navy intends to operate the airplane." Lockheed employees continued the deduction of the aircraft loads oscillograph data obtained during the testing and forwarded the results to the Air Force in September 1961.

In the Air Force Flight and Engineering Test Report, prepared by the group at Wright-Patterson AFB and dated November 16, 1961, the following conclusions were reached:

a. The c.g. limits of the C-130BL (those used during the tests) are satisfactory for operation of the C-130BL from semi-prepared skiways.

b. Takeoff performance is greatly reduced by deep, wet snow, and one of the following techniques should be used to obtain the best possible performance: (1) Use RATO and fire the rockets at the stagnation airspeed; (2) Taxi back and forth to pack a takeoff track; (3) Rock the aircraft longitudinally, using a pumping motion on the control column, to increase lift, reduce drag, and therefore accelerate the aircraft to lift-off speed.

c. Exact takeoff performance on skis is unpredictable and varies greatly from day to day.

It was also noted that the nose ski was relatively ineffective for steering on any snow surfaces.

POSTSCRIPT

Shortly after his return from Antarctica, Major Fitzwater was transferred to the 1001st Operations Group (Headquarters Command, USAF) at Andrews AFB, Maryland, near Washington, D.C., effective June 14, 1961. There, not to his liking, the major found that his duties consisted of flying a

Opposite: The C-130BL is seen in the “skis down – wheels down” configuration. (Lockheed Aircraft Corporation Photo No. ER 4847) **Right top:** The Polaris Snow-Traveller shows its snow profile indicator installation. (USAF Photo No. 61-2211) **Right center:** Last minute checks are made prior to a RATO takeoff. (USAF Photo, Fitzwater Collection) **Right lower:** Antarctic test site location of sink speed recorder, showing camera, control equipment, and snow profile indicator. (USAF Photo No. 61-2207)

desk. However, in 1962 Fitzwater was promoted to Lieutenant Colonel and, according to the Aircrew Standardization/Evaluation Records in his Personnel File, he was able to maintain his annual pilot proficiency in the Group’s C-54.

Then, on November 6, 1963, Lt. Col. Fitzwater was admitted to the USAF Hospital at Andrews AFB diagnosed as having sciatica (pain along the course of a sciatic nerve, i.e., pain in the lower back) and he was grounded until the last day of February 1964. Effective March 1, 1964, he was removed from flying status. With that, Fitzwater decided it was time to submit his papers for retirement from the military. So, on May 31, 1965, after 25 years of service, he retired—but not from flying. Fitzwater had accepted a position with Fairchild Hiller in nearby Maryland at Hagerstown. There, he was a test pilot on the various models of the single-engine turboprop Porter STOL aircraft (including on floats and armed military gunship versions) and the YC-119K prototype Shadow gunship. His second career once again took Fitzwater all over the globe, this time demonstrating Fairchild aircraft. By 1973, tired of traveling, he retired once more, but again—not from flying. He bought a sailplane and continued to fly for recreation.

Charles E. Fitzwater died April 16, 1991. He was 71 years old. Burial was in Arlington National Cemetery. □

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