



THE CONVAIR

# YC-131C Turboliners

by Nicholas M. Williams

In the summer of 1954, two piston-engined Convair-Liner 340s were converted to military YC-131Cs by substituting their P&W R-2800 Double Wasp engines with Allison YT-56-A-3 turboprop powerplants. The YC-131Cs became America's first twin-engine turboprop military transports, among the first of many Air Force flying testbeds built to prove the feasibility of the turboprop engine in military aviation. The success of their pioneering efforts can be seen today throughout the world in the form of thousands of Allison-engined aircraft: the Lockheed C-130 Hercules, L-188 Electra, P-3 Orion, Grumman E-2 Hawkeye, C-2 Greyhound, and Convair 580.

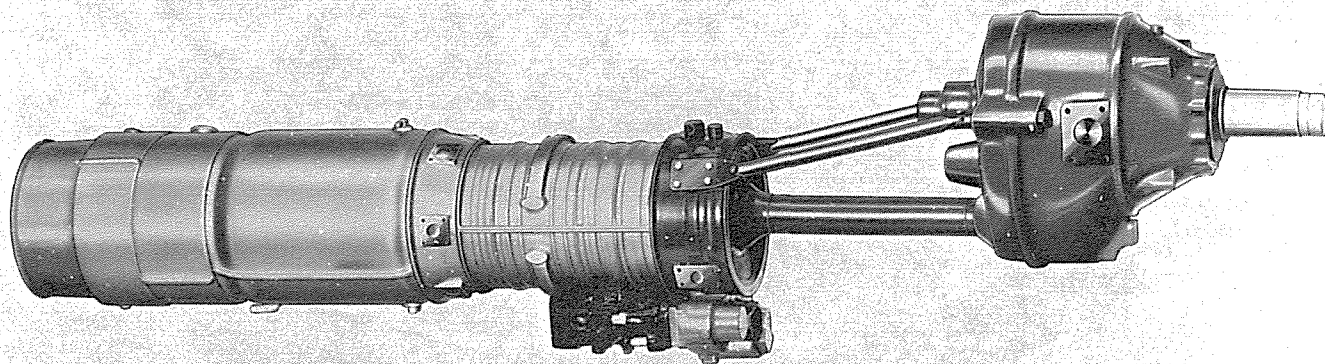
During the early 1950s, turboprop engine development in this country—as had happened earlier with the turbojet—lagged behind that of Europe. The Consolidated Vultee Aircraft Corpora-

tion of San Diego (Convair) was the nation's most experienced builder using this type of powerplant. Its XP-81, powered by both turbojet and turboprop engines, first flew in 1945. The Convair Turboliner, the prototype Convair-Liner 240 reengined with Allison 501-A4 (T-38) turboprops, flew with these engines in December 1950, becoming America's first turboprop transport. Convair also had designed the world's first turboprop flying boat, the Navy's XP5Y-1 (R3Y-1/2), powered by four Allison T-40 engines.

While the advantages of the turboprop engine were well known to Convair and the Air Force, its reliability in long-term service was an unproven factor. In 1951, the Air Force became interested in the military usefulness of Allison's T-38 engine, and on October 22 announced the production of a number of T-29Es,

Convair 340s reengined with the T-38, to be used as bombardier and navigator trainers.<sup>1</sup> Unfortunately, this contract was later canceled before design work could be completed or production begun.<sup>2</sup>

This setback did not diminish the Air Force's interest in accelerating the development of the turboprop engine, and a second contract was signed with Convair for the conversion of two standard Convair-Liner 340s to the newest Allison turboprop powerplant, the T-56. Acquisition price for each airplane, designated YC-131C, was \$2,733,609. Due to budget restrictions the Air Force made it clear that time and money were at a premium for the project, so the program made maximum use of the partial existing design of the previous Air Force turboprop proposal. As Convair Project Engineer Bernie J. Simons later re-



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The Allison T-56 Turboprop engine delivered up to 3,750 eshp, although the prototype YT-56-A-3 as used on the YC-131Cs was restricted to 3,250 eshp. (Air Force)

marked, "The basic premise upon which the contract was based was speed of accomplishment at minimum cost. It was stipulated that only those changes absolutely necessary be made to the standard airplane to effect this modification."<sup>3</sup>

Convair's Model 340 was chosen for this modification for several reasons of economy: its flight characteristics and performance had been demonstrated in airline use, maintenance problems on the airframe and systems were at a minimum, pilot checkout procedures would be reduced in light of the Air Force's experience with the T-29 and C-131 aircraft already in their inventory, and logistical support on the airplanes would be aided for similar reasons.

The first airplane picked for conversion was 340-36, s/n 91, registered N5511K, which had been ordered by Hawaiian Airlines (their sixth following N5506K/5510K delivered), but canceled prior to delivery. Convair completed N5511K on June 22, 1953, and flew it to their Fort Worth plant for conversion on July 31. The second airframe, 340-64, s/n 131, was manufactured on November 5, 1953, and registered as N8422H. This airplane was flown to the Fort Worth plant on November 19 for conversion to a YC-131C.<sup>4</sup> Prior to this flight to Fort Worth, all passenger seats and buffet installations were removed from both aircraft.

Upon their arrival at Fort Worth, the

job of removing the reciprocating engines and nacelles, tail surfaces, and portions of systems not required by the Allison engines was begun immediately, while design work for replacement items was started. The Model 340's original landing gear doors were retained and new monocoque engine nacelles were installed. These featured large hinged panels on the top of each nacelle for access to the aft section of the engines, and a panel in the lower nacelle forward of the wing providing access to the engine and propeller reduction gear housing.

Along with new engine mounts, Convair installed a conventional stainless steel vertical firewall to isolate the engine's compressor section from the burner section, the firewall continuing to the bottom of the nacelle to isolate the wheel wells from the compressor section. A horizontal firewall was used to shield the structural wing box from engine heat and to prevent hot exhaust gases from contacting the wing structure and landing flaps.

The YC-131C's new engines were Allison YT-56-A-3 turboprops rated at 3,750 equivalent shaft horsepower for the production engine, although the YC-131C program called for their operation at a restricted power of 3,250 eshp. These engines featured a 14-stage axial flow compressor driven by a four-stage turbine. Each engine drove an Aero

Products three-blade, 13 1/2-foot diameter, full-feathering, reversible pitch propeller through an extension shaft and reduction gear assembly which lowered the 13,820 rpm engine speed to a propeller speed of 1,106 rpm. These propellers could be used either in a controllable pitch mode for engine starting and taxiing, or as a constant speed propeller during flight. An electronic governor achieved constant speed by automatically varying the propeller blade pitch in response to any powerplant speed change. An automatic feathering system was available if desired by the pilot, the propeller feathering whenever the engine speed dropped below 13,000 rpm with the throttle above two-thirds open position, with an interlock preventing both engines from feathering simultaneously. The CV-340's standard reciprocating engine controls (throttle, propeller, mixture, carburetor heat, etc.) were replaced by a power lever and a propeller condition lever. The power lever controlled both engine and propeller operation from "ground idle" and "flight idle" positions to "takeoff" and "full reverse" positions. The propeller condition lever was used during airstarts and feathering operations. In the interests of economy, the engine nose cowls were made of fiberglass, and inlet air duct anti-icing requirements were waived since the YC-131Cs were considered to be "fair weather" engine testbeds.<sup>5</sup>

Beyond minor changes to the engine instruments, fuel and oil systems, and electrical and hydraulic systems, the only external modifications made to the basic CV-340 involved enlarging the tail and horizontal stabilizer to allow for the turboprop's increased horsepower. The horizontal stabilizer's span was increased 40 inches by splicing a 20-inch extension to each tip, and new sealed-balance elevators with 22 percent additional area were installed. Likewise, the height of the fin was increased 12 inches and a new rudder was built featuring a 25 percent increase in area. Servo and trim tabs also were redesigned.<sup>6</sup>

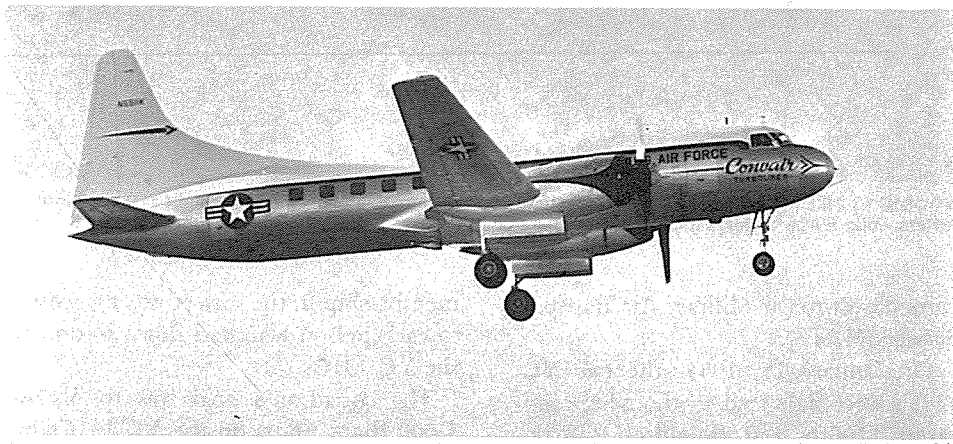
All modifications to these aircraft resulted in a weight reduction of 2,015 pounds below the standard CV-340 airframe. Both aircraft received CAA certification for a gross weight of 47,000 pounds, 6,200 pounds below the commercial CV-340, but since the YC-131Cs were test aircraft there was no immediate need to increase their gross weight allowance.

The first YC-131C, 53-7886 (s/n 91), made its maiden flight with the Allison YT-56 engines on May 20, 1954. The airplane took off from Carswell AFB, Texas, for a 16-minute flight, returned for servicing, and took off again for a longer test hop.<sup>7</sup>

At this time, the YC-131C carried standard Air Force markings but retained its civil registration number, N5511K. Before turning this first YC-131C over to the Air Force, Convair initiated a flight test program to demonstrate the airplane's stability and control characteristics and powerplant reliability. In 11 flights totaling 23 hours, several minor problems arose with the YT-56 engines, including turbine bearing seal failures, turbine wheel vibration during engine starts, and occasional fuel regulator and propeller feathering difficulties. However, these problems were solved in short order and Convair was able to extend their testing to evaluate engine power and other measurements of engine performance. The second YC-131C, 53-7887, made its first turboprop flight on June 29, 1954, joining the Convair-Air Force test program. Earlier, the Air Force had requested bids from several airlines for conducting the service testing of these aircraft, but the few bids received were for more than it would have cost the Air Force, and the job was



Convair YC-131Cs 53-7886/7887 of the 1700th Test Squadron (Turboprop), 1700th Air Transport Group, Continental Division of MATS. (Air Force courtesy of Robert F. Dorr)



The first YC-131C, 53-7886, carried its original civil registration number, N5511K, during early test flights with the YT-56 engine. (Convair 9466 courtesy of Charles E. Stewart)



YC-131C 53-7886 with test instrumentation on right wingtip. The YC-131Cs featured a 40-inch extension to horizontal stabilizer and a 12-inch tail extension. (Air Force courtesy of Robert F. Dorr)



YC-131C 53-7886 carrying standard Military Air Transport Service markings of the Continental Division: tail band is dark blue with yellow borders and white letters while MATS emblem is blue and yellow. (Air Force 26687 courtesy of Robert F. Dorr)

turned over to the Military Air Transport Service (MATS).

On January 15, 1955, the two YC-131Cs were delivered to the newly activated 1700th Test Squadron (Turboprop), of the 1700th Air Transport Group, attached to the Continental Division of MATS at Kelly AFB, San Antonio, Texas. Commanded by Lt. Col. Samuel C. Burgess, this squadron was formed solely to service test new turboprop-powered aircraft. Scheduled to arrive later in the year were two Boeing YC-97Js and two Lockheed YC-121Fs powered by Pratt & Whitney T-34 engines.<sup>8</sup> Squadron personnel had received intensive training on the new turboprops at Convair, Allison, and Edwards AFB, and spirit was high to prove these engines for Air Force use. Col. Claude W. Smith, Commander of the 1700th Air Transport Group, even founded a society "dedicated to the advancement of turbine-powered transport aircraft, whose range of power, versatility and economy of operation are as limitless as the winds of Aeolus." The Order of Heron of Alexandria, as the society was called, was named after the Greek mathematician and scholar credited with developing the first known turbine, the Aeolipile. A certificate of

membership in the society was presented to each person who had flown in one of the YC-131Cs.

The squadron's goal was to obtain 3,000 flight hours on the YC-131Cs by January 31, 1956. This was accomplished by using the aircraft in an "airline-type" operation beginning May 1, flying scheduled and non-scheduled routes from Kelly AFB, which served as both operating and maintenance headquarters, to Travis AFB, California (via Williams AFB, Arizona) and Andrews AFB, Maryland (via Brookley AFB, Alabama).

Early in the program, the accumulation of flight hours was hampered by a shortage of YT-56 engines. The original allocation of eight engines, including the four installed in the aircraft, was eventually raised to 12 and finally to 20. Also, the initial engine overhaul time on the early YT-56s was short, but was increased from 50 hours for the prototype to 150 hours by June 1955 and to 200 hours by the end of the program.<sup>9</sup> During overhaul, each engine had to be flown to the Allison plant in Indianapolis for complete teardown and evaluation.

In spite of these restrictions, throughout 1955 the YC-131Cs set new records for utilization. At the start of the pro-

gram from January to April 1955, daily utilization rates on the YC-131Cs were below four hours, but in May they jumped to 6.2 hours and by June had reached nearly eight hours per day. When flights to Travis and Andrews AFB were not scheduled, crews took their airplanes for extended cruises over the Texas countryside. The net result was a series of newly set records for twin-engined aircraft. While the 1,519-mile flight from Kelly AFB to Andrews AFB was usually made in a little over four hours (cruising at 21,000 feet at 320 mph), in the summer of 1955 a YC-131C made a 2,400-mile flight from Seattle, Washington, to Kelly AFB in six hours 15 minutes, averaging over 380 mph! In June, a YC-131C logged 19 hours 35 minutes of flight time in a 24-hour period, but this mark was pushed to 19 hours 55 minutes by YC-131C, 53-7887, on August 20, 21 hours 30 minutes by the same airplane a few days later, and 23 hours 10 minutes set by *both* YC-131Cs on September 1, 1955, during a claimed world's record performance by turboprop aircraft. For this last record, both aircraft made four flights and were refueled three times during the same 24-hour period for a total air time of 46 hours 20 minutes.<sup>10</sup>

The 1700th Test Squadron's goal of

3,000 flight hours with the two YC-131Cs was successfully accomplished in a little less than eight months. At the conclusion of their service test assignments the YC-131Cs began flying standard MATS transport missions. However, on August 9, 1957, YC-131C 53-7886 was leased to the General Motors Corporation for developmental testing of Allison's 501-D13, the civil version of the T-56. This engine was rated at 3,750 eshp and used a 13-foot 6-inch diameter, four-bladed Aeroproducts A644FN-606A propeller. After conversion to this powerplant on October 23, 1957, General Motors flew the airplane from November 1 to January 23, 1958, in a project called "Operation Hourglass." This project duplicated commercial airline schedules by averaging 12 flight hours a day in 649 flights to 77 cities. At the completion of the program, the YC-131C (as was painted on its tail in bold letters with an appropriate figure of an hourglass) "completed 1000 hours of flight in 84 days without engine or prop change." YC-131C 53-7886 was re-engined with Allison 501-D26 turbo-props and continued in the service of General Motors for developmental testing of the Convair Model 580, the above-mentioned inscription on the airplane's tail having been removed by April 1959.

At approximately the same time, YC-131C 53-7887 was fitted with an extremely large radar nose, but nothing has come to light regarding this modification or its purpose. By late 1959, 53-7887 had outlived its usefulness to the Air Force and was flown to Davis-Monthan AFB, Arizona, for open storage with the 2704th Air Force Aircraft Storage and Disposition Group. The airplane was offered for a sealed bid sale (with 1,937 total airframe hours) on April 27, 1960, but was withdrawn before this date.<sup>11</sup>

On April 14, 1960, both YC-131Cs were purchased from the Air Force by the Federal Aviation Agency in Washington, D.C., on a no-charge "where-is as-is" agreement. At the time of transfer on July 15, 53-7886 was located at the Allison Division plant in Indianapolis, the purchase not including the airplane's Allison test engines and propellers,<sup>12</sup> while 53-7887 was transferred to the FAA on August 18 from Davis-Monthan AFB.<sup>13</sup> The first YC-131C was registered as N454 to the FAA Aircraft Engineering Section at the National Avi-



YC-131C 53-7887 at Edwards AFB, California, for safety flight tests. Note wingtip pitot tube. (Air Force K9724)



YC-131C 53-7886 showing lengthened horizontal stabilizers and exhaust outlets for YT-56 engines. (Convair N36291 via Charles E. Stewart)



Convair YC-131C 53-7886 at McCarran Field, Las Vegas, Nevada, in April 1958 after completion of "Operation Hourglass" with 3,750 eshp Allison 501-D13 turboprop engines and Aeroproducts propellers. (Paul Stevens)

YC-131C, 53-7886, landing at Palm Springs Airport in 1959 with port engine feathered. This airplane was used briefly by Pacific Aeromotive Engineering Corp. for preliminary development testing on the Allison 501-D13 civil certification program.  
(PacAero courtesy of Don Landis)



Convair YC-131C 53-7886 was registered as N970L while operated by the LTV Aerospace Corporation, the airplane being trimmed in turquoise and gold.  
(Vought Corp. 10,136-73 via Paul Bower)

ation Facilities Experimental Center in Atlantic City, New Jersey, on December 2, 1960,<sup>14</sup> while 53-7887 was registered as N9988Z.

The FAA considered converting the two YC-131Cs to the commercial Convair 580 configuration, as they eventually did with their fleet of five C-131Es, but this was found to be too costly. The aircraft were stored at the FAA Aero Center in Oklahoma City, Oklahoma, where N9988Z was used for parts on the FAA C-131/T-29 fleet.<sup>15</sup> The YC-131Cs were decommissioned by the FAA on October 13, 1964, and sold as surplus to the Texas Sun Beechcraft Co. of Dallas, Texas, N454 going for \$131,733 and N9988Z for \$71,139. N9988Z was retained by Texas Sun Beechcraft until it was sold to Houston Aviation Products in January 1974 and scrapped.

Texas Sun Beech apparently did not consider the conversion of N454 to the CV-580 standard too expensive, and by August 9, 1967, had the airplane converted and certificated as a "CV-770," although this designation is unofficial. The airplane, now registered in an experimental category as N454X, also was given a plush VIP interior and nose radar installation in preparation for use as a corporation executive transport. To date, this airplane has flown as a corporation executive transport in several guises and registration numbers for a variety of owners. On August 12, 1970, N454X was sold to the Texstar Corporation in an all-white livery. On October 18, 1971, it was sold to the LTV Aerospace Corporation who, in May 1972, re-registered the airplane as N970L and trimmed it in turquoise and gold. The YC-131C was again re-registered in 1975 as N630V and transferred in 1976 to the Vought Corporation, a Ling-Temco-Vought subsidiary, the airplane now painted in a blue, gold and white scheme. In September 1977 the YC-131C was sold to Walston Aviation Sales, Inc., and resold in April 1978 to U.S. Aviation Enterprises, Inc., only to return to Walston in June 1978.<sup>16</sup>

In August 1978, N630V was sold to its current owner, Alton Box Board Co. of St. Louis, Missouri, who re-registered the airplane as N600AB. Based at Lambert Field in St. Louis, the YC-131C was most recently re-registered as N400AB. Today, this airplane continues to fly as one of many Convair turboprop-powered executive transports, but with a unique his-



YC-131C 53-7887 at Davis-Monthan AFB in April 1961 shortly before its transfer to the Federal Aviation Agency. This airplane retained its T-56 engines while undergoing extensive nose radar modifications. (Douglas D. Olson)



YC-131C 53-7886 was used briefly by the Federal Aviation Agency as N454, but was considered too costly to bring up to CV-580 standard. Note fleet number 46 on aircraft in this October 1961 photo, while the number 23 has been removed from fuselage. (J.A. Morrow via Ted Gibson)



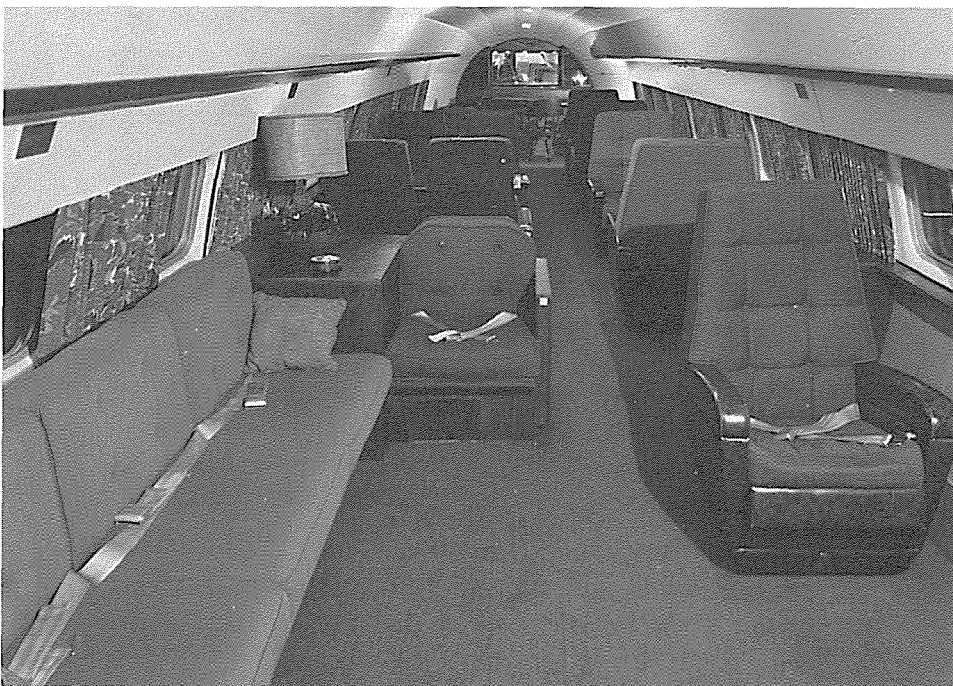
Convair YC-131C 53-7887 while registered as N9988Z at the FAA "graveyard" at Will Rogers Field, Oklahoma City, Oklahoma, in September 1962. (George W. Pennick)



YC-131C 53-7886 was purchased from the FAA by Texas Sun Beechcraft and converted to a Convair 580, although its designation is reportedly "CV-770." Note new nose radar installation in this July 1970 photo, and "experimental" stenciled by doorway of N454X. (Bob Garrard via Ted Gibson)



YC-131C 53-7886 was transferred to the Vought Corporation in 1976, re-registered as N630V, and repainted in white with blue and gold trim. N630V later was owned by Walston Aviation Sales, Inc., and U.S. Aviation Enterprises, Inc. (Vought Corp. 10,251-76 via Paul Bower)



The interior of YC-131C/CV-770 N630V looking aft in this 1977 photo shows yellow/orange/brown color scheme. Note mirrored bar at rear of cabin. (Vought Corp. 10,005-77 via Paul Bower)



YC-131C/CV-770 53-7886 was most recently re-registered to Alton Box Board as N400AB, as is shown here at Yukon, Oklahoma, in February 1980. (Page via Charles E. Stewart)

tory in being the sole remaining Air Force YC-131C Turboliner.

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