UNITED STATES ARMY AVIATION BOARD
Fort Rucker, Alabama

ATBG-SEC-AVN-663

27 JUL 1962

SUBJECT: Informal Evaluation of the Cessna Model 185 and L-28A (Helio Courier Model 395) Airplanes

TO: President
United States Army Tactical Mobility Requirements Board
ATTN: Colonel Rankin
Fort Bragg, North Carolina

1. AUTHORITY.

a. Directive. Telephone conversation between Colonel Cassidy, MD, USCONARC, Fort Monroe, Virginia and Colonel Rankin, President, US Army Aviation Board, Fort Rucker, Alabama.

b. Purpose. To conduct an informal evaluation of the Cessna Model 185 and the Helio L-28A Airplanes.

2. DESCRIPTION OF MATERIEL.

a. Cessna 185. The Cessna Model 185 is a six-place, all-metal, high wing monoplane (see inclosure 1). It is powered by a Continental I0-470-F fuel injection engine turning a two-bladed Hartzell constant-speed propeller 88 inches in diameter. Entrance to the cabin is by means of the forward doors located on either side of the airplane. The pilot's and copilot's seats are individually adjustable fore and aft to permit access to the rear cabin area. A baggage compartment is provided aft of the cabin and is accessible through a door on the left side of the fuselage. Although not tested during this evaluation, an all fiberglas cargo pack is available which can be fastened to the bottom of the fuselage to provide an extra 14.3 cubic feet of cargo space with a capacity of 300 pounds. Dual flight controls are provided, to include toe brakes. Slotted flaps are hand operated by a lever and are capable of 40 degree deflection in increments of 10 degrees.

Rudder and elevator trim devices are provided. Crosswind landing gear with locking provision is incorporated. The test airplane was equipped with long range gasoline tanks of 84 gallons capacity and can be equipped with standard tanks of 65 gallons capacity. Following are descriptive parameters:

Gross weight	3,200 pounds
Empty weight	1,625 pounds
Useful load	1,575 pounds
Wing span	35.77 feet
Wing area	173.84 square feet
Length	25.5 feet
Height to top of vertical stabilizer	7.5 feet
Wheel tread	91 inches
Fuel capacity (long range tanks)	504 pounds
Takeoff power	260 h.p.

b. L-28A. The airplane tested was the USAF L-28A, a military version of Helio Courier Model 395. It is a fully cantilever high wing monoplane of all-metal construction (see inclosure 2). It is powered by a Lycoming GO-480-G106 engine turning a three-bladed Hartzell constant-speed propeller 96 inches in diameter. It is a five-place airplane with two tandem side-by-side seats and a fifth seat in the rear of the cabin area. The pilot's seat is ground adjustable vertically. Entrance to the front seat is through the left front door and to the rear seats through the right rear door. An open baggage compartment is located behind the rear seat. Dual flight controls are provided except that toe brakes are provided for the pilot's position only. Slotted flaps are actuated by means of a hand crank, eighteen revolutions of the crank being required to obtain the full flap deflection of 40 degrees. Full span leading edge slats are provided as additional high lift devices. Short span Frieze ailerons, which are fabric covered, are used for lateral control in conjunction with leading edge interceptors (spoilers). Pitch control is obtained with an all-moving

horizontal tail and only pitch trim is provided. Crosswind landing gear with locking provision is incorporated. Following are descriptive parameters:

Gross weight	3,000 pounds
Empty weight	2,173 pounds
Useful load	827 pounds
Wing span	39 feet
Wing area	231 square feet
Length	30 feet
Height to top of vertical stabilizer	8 feet 1 inch
Wheel tread	108 inches
Fuel capacity	360 pounds
Takeoff power	295 h.p.

3. SUMMARY OF TESTS. A limited evaluation of the Cessna Model 185 (N4050Y) and L-28A (SN 62-3604) airplanes was conducted by the US Army Aviation Board during the period 11-18 July 1962. The evaluation included consideration of general characteristics and evaluation of flight characteristics and performance at the design takeoff gross weight for each airplane, respectively.

a. General Characteristics.

(1) Cabin and Cockpit. Photographs of the cockpits are attached as inclosures 3 and 4.

(a) Cessna 185. Entrance and exit was facilitated by the provision of a step for each door. Forward movement of the seats and the size of the entrance door provided adequate area for loading of such items as cases of "C" rations and 5-gallon cans. The rear seats were readily removable; however, there were no provisions for security of cargo. One litter patient could be transported. The seat configurations were not conducive to the use of back-type parachutes. Seat belts were provided for each seat, and the fore and aft adjustments of the pilot's seats appeared adequate. Ground ventilation was available through the window of each side door. In-flight ventilation from individually

adjustable inlets was satisfactory. Outside visibility from the forward seats was adequate for ground operations and aerial observation. Overhead observation was restricted due to the lack of overhead windows. Controls, knobs, and switches were accessible to the occupants of either forward seat. Cockpit and instrument lighting was adequate.

(b) L-28A. A step was provided for the forward door to facilitate entrance and exit. A step was not provided nor required for the rear door. The rear door was of sufficient size to permit loading of such items as cases of "C" rations and 5-gallon cans. The rear seats (three) were readily removable; however, there were no cargo tie-down provisions. One litter patient could be transported. Each seat was equipped with a safety belt and the seats were compatible with the back-type parachute. The sole adjustment (vertical) of the pilot's seat was considered a limitation. Ground ventilation through the single window on the pilot's door was inadequate. In-flight ventilation through the individually adjustable inlets was adequate. Ground visibility over the nose was severely limited. In cruise flight, observation to the front and side from the forward seats was adequate. Overhead visibility was restricted due to the absence of overhead windows. Controls, knobs, and switches were accessible to the occupant of either forward seat. The single set of toe brakes located on the left side of the cockpit restricted ground operations from the right seat. Instrument and cockpit lighting was adequate.

(2) Communication and Navigation Equipment. Each airplane was equipped with minimum essential flight instruments and radio aids for the conduct of instrument flight.

(a) Cessna 185. The airplane was equipped with a commercial type VHF transmitter-receiver and an OMNI localizer converter indicator. Ninety crystal controlled channels were provided for transmission and 190 channels for reception.

(b) L-28A. A UHF transmitter-receiver with 8 preset channels was installed for radio communication. A 190 channel VHF communication and navigation receiver was also installed.

(3) Ruggedness. The all-metal construction (except for the fabric covered ailerons of the L-28A) should contribute to the durability

of both airplanes. Based on numerous takeoffs and landings at design gross weight that were accomplished during the evaluation, it appears that the landing gear and braking systems of both airplanes are sufficiently rugged for field use.

(4) Ground Handling and Taxiing.

(a) At gross weight each airplane could be easily moved over smooth, firm surfaces by two men. The airplanes could be towed by a 1/2-ton truck. Neither airplane was compatible with the Universal tow bar because of the lack of adaptor units on the main landing gear.

(b) Taxiing was accomplished primarily with the crosswind landing gear of both airplanes in the locked position. No difficulty was encountered with either airplane in crosswinds up to 12 knots. The steerable tail wheel of the Cessna 185 aided in ground maneuverability.

b. Flight Characteristics.

(1) Cessna 185. The airplane was easily trimmed for straight and level flight, and control in light turbulence was maintained with little effort. Stalling characteristics were satisfactory. Warning of an impending stall was by means of a stall-warning horn which was activated approximately 10 knots above the stall speed. Buffet onset occurred at approximately 3 to 5 knots above the stall speed. There was a tendency during stalls for one wing to drop prior to the nose-down pitch. Normal recovery techniques were effective.

(2) L-28A. Pitch trim was provided in the cockpit and was highly sensitive. Roll and yaw trim controls were not provided. As a result, control pressures were required to maintain straight and level flight under varying load conditions. The airplane was very sensitive to light air turbulence which resulted in excessive control manipulation to maintain altitude and heading. The airplane could not be stalled completely with any combination of power and flaps. With the stick full back, settling occurred within the IAS range of 30-41 knots, dependent on the power and flap settings. Although rudder control was limited,

aileron control was effective throughout the stall. The airplane did not have a tendency to fall off on either wing and normal stall recovery procedures were effective.

c. Performance.

(1) Takeoffs and Landings. No unusual flight characteristics or control problems were encountered with either airplane during normal takeoffs and landings, to include limited crosswind operations. Accordingly, emphasis was placed on maximum performance takeoffs and landings at the design gross takeoff weight. Comparative performance data is presented for the Cessna 185, L-28A, L-20A, and L-19E airplanes in inclosure 5. Inclosure 6 is a composite of four photographs showing the takeoff flight path of all four airplanes and is based on a common starting point. Inclosures 7, 8, 9, and 10 are attached as quick reference charts for all four airplanes.

(a) Cessna 185. For maximum performance takeoffs, flaps were lowered to 20 degrees and the brakes released after full power was obtained. Rotation was initiated at approximately 43 knots indicated air speed (IAS) and the climb was accomplished at 52 knots IAS. For landing, full flaps (40 degrees) and an IAS of 52 knots was used on the approach. The rate of descent was controlled with power. Minimum landing roll was obtained by retracting the flaps and reducing the power to idle immediately prior to touchdown and applying brakes concurrently with touchdown. Under the existing climatic conditions, takeoffs averaged 1,115 feet and landing 959 feet over a 50-foot barrier. Control was adequate throughout.

(b) L-28A. For maximum performance takeoffs, full flaps (40 degrees) were utilized and the brakes released after full power was obtained. Rotation was initiated at 35 knots IAS and the climb was accomplished at the same IAS. For landing, full flaps were used while maintaining 40 knots IAS on approach and controlling the rate of descent with power. Approximately 20 feet above the intended touchdown point, power was reduced to idle and the roundout was completed. Control was adequate throughout. Under the existing climatic

conditions, takeoffs averaged 686 feet and landings 611 feet over a 50-foot barrier. The following undesirable characteristics were noted:

1. The maximum flap extended speed could be easily exceeded during climb-out due to the time required to raise the flaps (18 turns of the crank).

2. The nose-high attitude during the approach restricted the pilot's view of the intended point of touchdown.

(2) Climb Performance. Climbs were made to a density altitude of 12,000 feet (climb to service ceiling was not accomplished due to the lack of oxygen equipment). The best rate of climb for the Cessna 185 was 850 feet per minute at an IAS of 82 knots and for the L-28A, 900 feet per minute at an IAS of 78 knots (see inclosure 1).

(3) Cruise Performance.

(a) Cessna 185. Flights were made at a pressure altitude of 1,300 feet. The outside air temperature (OAT) was 83°F. With a power setting of 70 percent, an average true airspeed of 130 knots was achieved. Fuel mixture was adjusted to 13.2 gallons per hour (a computer was provided with the test airplane to aid in determination of appropriate power settings and best power mixture).

(b) L-28A. Flights were made at a pressure altitude of 1,300 feet utilizing 70 percent power with an OAT of 77°F. The resultant average true airspeed was 122 knots. The rate of fuel consumption was determined to be 15 gallons per hour.

(4) Range and Endurance. The following is based on data obtained during the conduct of the evaluation and on data presented by the Operator's Manual for each airplane.

(a) Cessna 185. The Cessna 185 with a crew of two and full fuel and oil has a maximum payload of approximately 690 pounds and a radius of action of approximately 385 nautical miles with 30 minutes reserve. The above is based on flights at 70 percent power and an average true air speed of 130 knots. As stated in the Operator's

Manual the airplane has a range of 820 nautical miles at 144 knots, using 75 percent power at 7,000 feet, without reserve. When flown at the power setting corresponding to optimum range at 10,000 feet and no reserve fuel, an endurance of 9.3 hours and a range of 1,070 nautical miles is obtained.

(b) L-28A. The L-28A with a crew of two and full fuel and oil has a maximum payload of approximately 100 pounds and a radius of action of 205 nautical miles with a 30 minute reserve. This is based on data obtained during the evaluation with 70 percent of power settings and an average true air speed of 122 knots. As stated in the Operator's Manual, the L-28A has a range of 570 nautical miles at 134 knots TAS at 6,500 feet with no reserve. At the maximum endurance power setting at an altitude of 10,000 feet, and at 61 knots TAS an endurance of 6.67 hours and a range of 406 nautical miles is obtained.

d. Servicing. In both airplanes, the gasoline filler necks, located on top of the wings, were of sufficient size to accommodate standard refueling nozzles, and grounding receptacles were provided. Neither airplane had steps to assist in reaching the filler necks. Access to the dip stick and oil filler caps was through doors on the engine cowling. A step was required to reach the oil filler access door on both airplanes, however, the dip stick for the Cessna 185 could be reached from the ground.

e. Maintenance. No attempt was made to conduct a maintenance evaluation of either airplane; however, the following adverse characteristics were noted:

(1) Cessna 185.

(a) There are no quick access provisions for inspection of the engine.

(b) The engine cowling must be removed in order to drain the engine oil (approximately .15 man-hours for removal).

(c) Access to the avionics equipment requires removal of the upholstery in the after cabin area.

(d) There is no battery quick-disconnect.

(2) L-28A.

(a) Access to the engine oil drain valve requires removal of the engine cowling (approximately .5 man-hours).

(b) An external power receptacle is not provided.

(c) There is no battery quick-disconnect and the battery is not readily accessible.

4. DISCUSSION.

a. Addition of the usual electronic package for airplanes of this weight class, in either case, would reduce the payload substantially. Neither airplane offers a significant advantage over the Army's L-20 except for the landing and takeoff performance of the L-28A. There are no provisions for attachment of external loads for either airplane, although the Cessna Aircraft Company indicates the Cessna 185 can be provided with this capability. It appears that either airplane would be suitable for parachute jumping and aerial delivery of internally transported loads.

b. The 12-volt electrical systems of these airplanes would create additional supply and maintenance problems should they be procured for Army use.

c. The data reported herein for the L-28A and Cessna 185 was obtained at the maximum gross weight of each airplane. Under these conditions, the Cessna 185 carried approximately 500 pounds more payload and 145 pounds more fuel than the L-28A. Following is comparative landing and takeoff distance for these two airplanes under the same useful load conditions, i.e., crew of two, full oil, 360 pounds of fuel (60 gallons) and a payload of 100 pounds. The data for the L-28A

was taken from the Fairchild Flight Analyzer. The data for the Cessna 185 is estimated for the same climatic conditions and pilot techniques, and using Cessna chart data corrected to conditions existing at Fort Rucker:

	L-28A	Cessna 185
LANDING		
Over 50-foot barrier (ft.)	611	840
Ground run (ft.)	160	280
TAKEOFF		
Over 50-foot barrier (ft.)	686	855
Ground run (ft.)	355	510

6. CONCLUSIONS. It is concluded that:

a. Neither the Cessna 185 nor the Helio L-28A is suitable as a replacement for observation and utility airplanes in the Army inventory; therefore they do not warrant further consideration for Army tactical use.

b. The Cessna 185 could be used as a utility airplane for special missions where payload, range, and endurance demand primary consideration and takeoff and landing performance is a secondary consideration.

c. The Helio L-28A could be used as a utility airplane for special missions where takeoff and landing performance demand primary consideration and payload, range, and endurance are secondary considerations.

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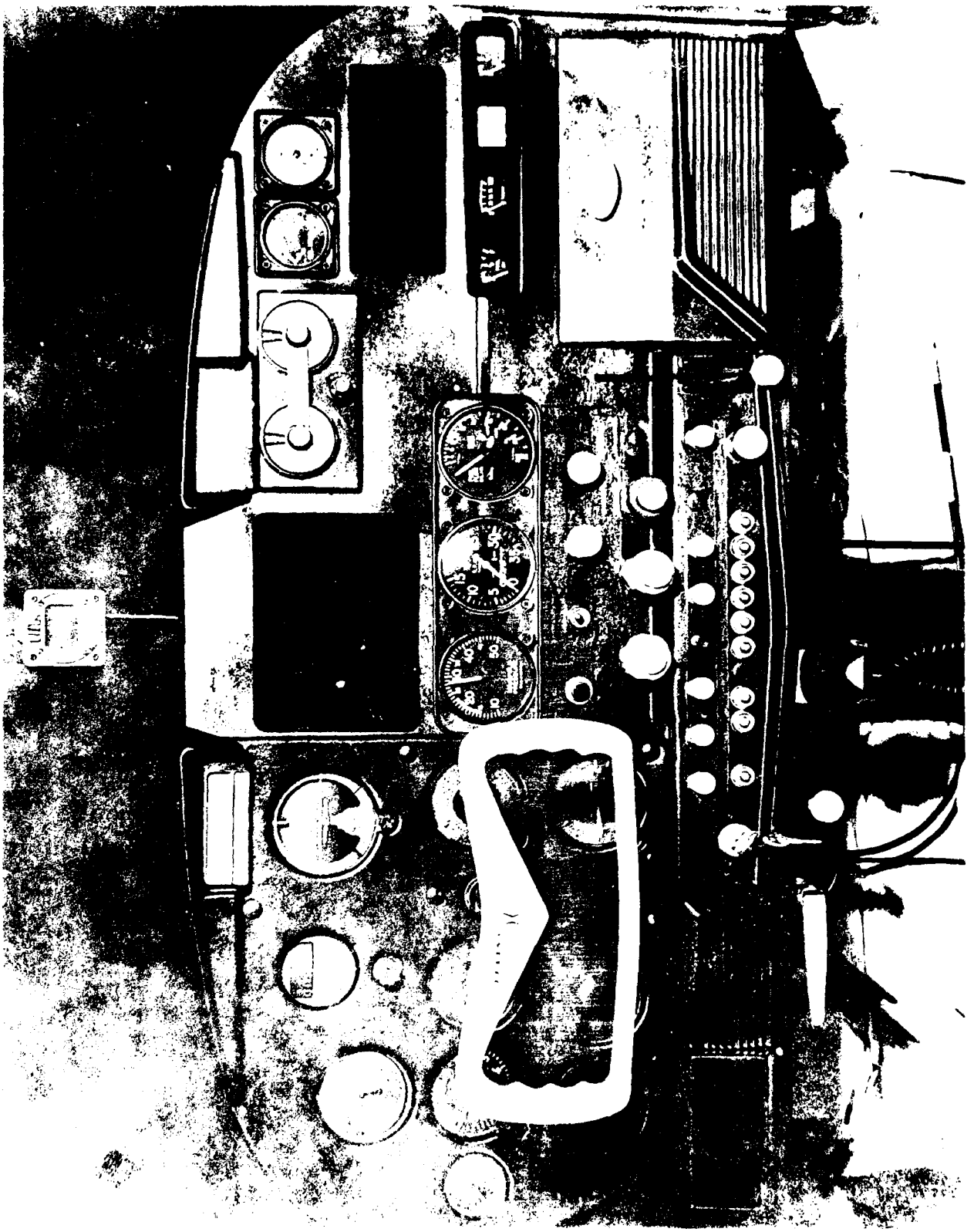
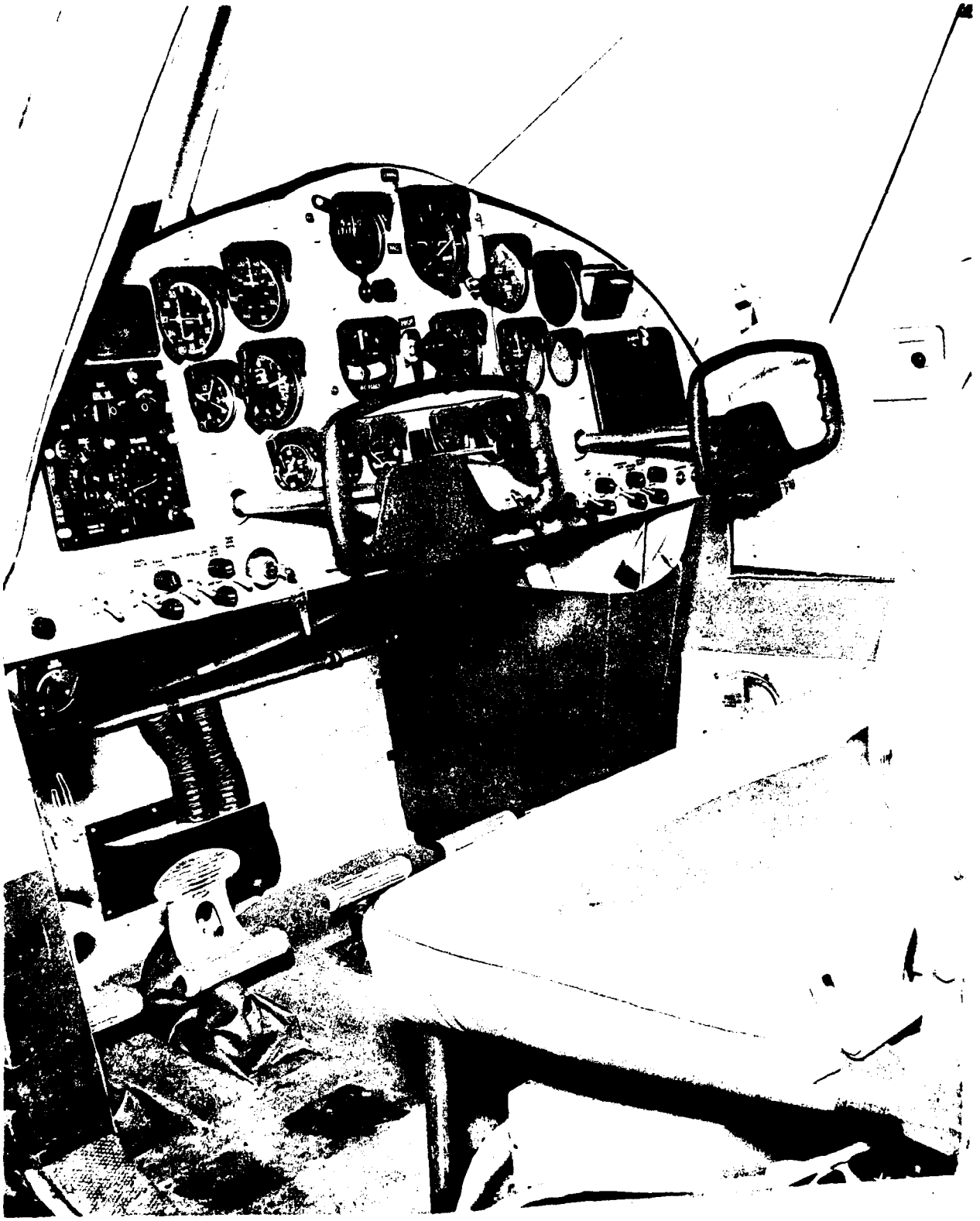
JOHN L. ROWAN
Lt Colonel, Artillery
Acting President

Incl 1 CESSNA 185

Incl 2 HELIO L-28A



Incl 3 CESSNA 185



Incl 4 HELIO L-28A

TAKE-OFFS & LANDINGS

Average climatic conditions for the following were:

Density Altitude - 1900 feet

Temperature - 83°F

Headwind Component - 2 knots

TAKE-OFFS	GROUND ROLL	TOTAL OVER 50 FEET
L-28A	355	686
Cessna 185	730	1115
L-19E	472	800
L-20A	608	896
LANDINGS		
L-28A	160	611
Cessna 185	389	959
L-19E	288	1002
L-20A	434	1081

NOTE 1: The data presented above is an average of three take-offs and landings for each airplane obtained by use of a Fairchild Flight Analyzer.

NOTE 2: All four airplanes were at their respective gross weights.

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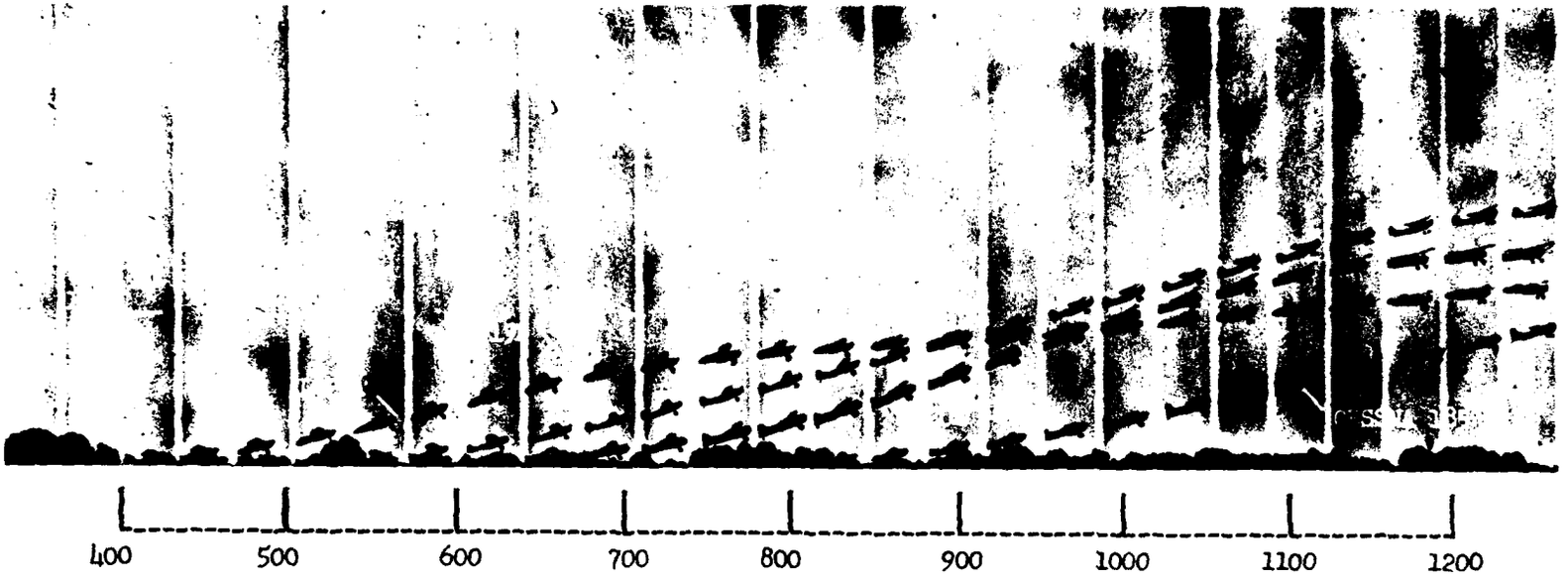


Distance From Start - Ft.

TAKEOFF COMPARISON

QUICK REFERENCE DATA CHART

MODEL & TITLE: Cessna Model 185, Skywagon

TYPE: Utility airplane

CONFIGURATION: High Wing, single engine monoplane

DESCRIPTION: The Cessna Model 185 is a high wing monoplane of all-metal construction. It is powered by a Continental I0-470-F engine of 260 horsepower and a constant-speed Hartzell propeller. Maximum seating is six place with alternate arrangements for cargo loads. A fiberglas cargo pack is available which attaches to the bottom of the fuselage for additional cargo carrying capability.

DATA:

Gross Weight: 3200 pounds

Empty Weight: 1625 pounds

Useful Load: 1575 pounds

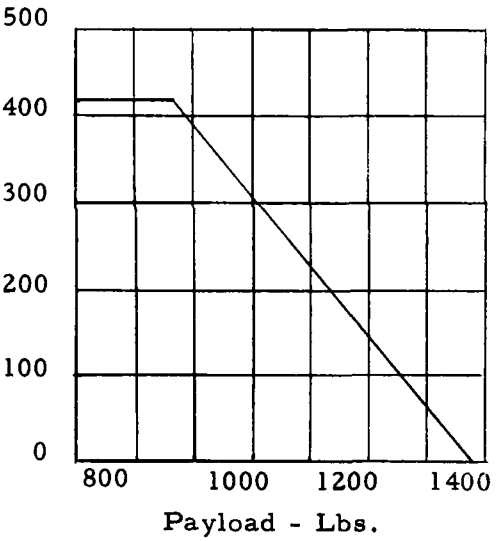
Cruise Speed: 130 K @ 70% power
P. A. = 1300 ft

Max Speed: 149 knots

Cruise Fuel Consumption: 13.2 gallons (79.2 pounds) per hour

Cruise Range: 800 nm

Fuel Capacity 100/130 alt 115/145): 84 gallons (504 pounds)



*Takeoff Distance Over 50 Feet: 1115 feet

*Landing Distance Over 50 Feet: 959 feet

*Measured under the following climatic conditions:

Density Altitude	Temperature	Headwind Component
1900 feet	83°F.	2 knots

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QUICK REFERENCE DATA CHART

MODEL & TITLE: Helio Courier Model 395, Super Courier

TYPE: STOL Utility Airplane

CONFIGURATION: High wing single engine

DESCRIPTION: The Helio Model 395, designated the L-28A by USAF, is a fully cantilevered highwing monoplane of all-metal construction with the exception of the short span ailerons which are fabric covered. It is powered by a Lycoming GO-480-G1D6 engine rated at 295 horsepower and a three bladed constant speed Hartzell Propeller. Passenger accommodations are made for five with alternate arrangements for interior cargo provisions.

DATA:

Gross Weight: 3,000 pounds

Empty Weight: 2,173 pounds

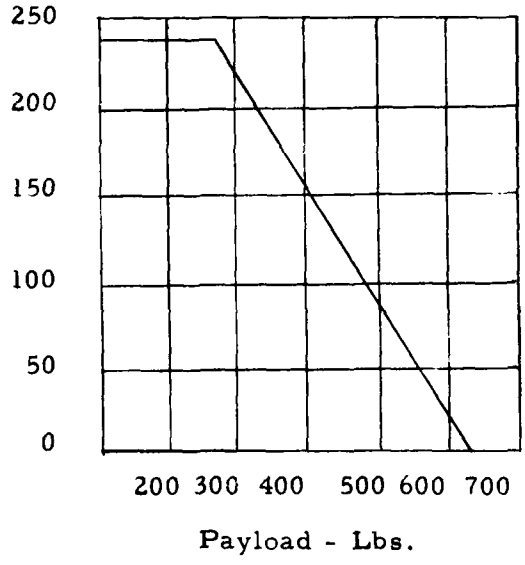
Useful Load: 827 pounds

Cruise Speed @ 1,300 ft hp: 122 knots

Max Speed: 153 knots

Cruise Fuel Consumption: 15 gallons (90 pounds) per hour

Fuel Capacity 100/130 60 gallons
Alt 115/145: (360 pounds)



Cruise Range: 470 N. M.

*Takeoff Distance over 50 Feet: 686 feet

*Landing Distance over 50 Feet: 611 feet

*Obtained under the following climatic conditions:

Density Altitude	Temperature	Headwind Component
1,900 feet	83°F.	2 knots

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QUICK REFERENCE DATA CHART

MODEL & TITLE: deHavilland L-20A "Beaver"

TYPE: Utility

CONFIGURATION: High wing monoplane

DESCRIPTION: The L-20A utility airplane is an all-metal high wing monoplane powered by a single Pratt & Whitney Wasp Junior engine, driving a Hamilton-Standard constant-speed propeller. The airplane is designed to carry a pilot and five passengers. It utilizes a non-retractable landing gear which may be modified to accept a twin float installation for operation from water, or a ski installation for operations from snow and ice.

DATA:

Gross Weight: 5100 pounds

Empty Weight: 3252 pounds

Useful Load: 1848 pounds

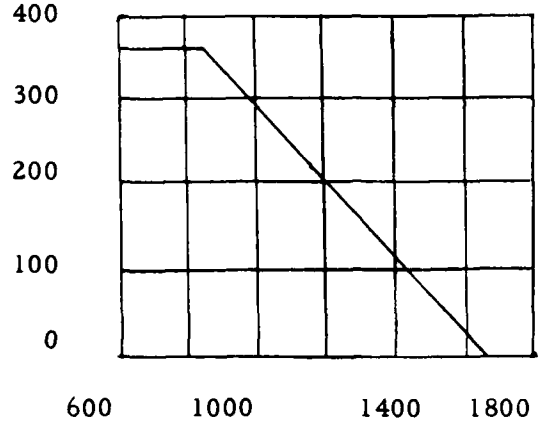
Cruise Speed @ S. L. 109 knots

Max Speed: 134 knots

Cruise Fuel Consumption: 21 gallons (126 pounds) per hour

Fuel Capacity: 138 gallons
80/87 (Alt 91/96) (828 pounds)

Cruise Range: 724 NM



* Take off Distance over 50 feet: 896 feet

* Landing Distance over 50 feet: 1081 feet

* Obtained under the following climatic conditions:

Density Altitide	Temperature	Headwind Component
1900 feet	83°F.	2 knots

COMMENTS: The L-20A (Beaver) has been a standard Army utility airplane for approximately 12 years. The airplane has performed well in the combat environment to include courier service, messenger service, light cargo transport, light supply dropping and bombing, paratroop dropping, casualty evacuation, reconnaissance, photographic missions, radio relay and column control, wire laying, and aerial observation.

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QUICK REFERENCE DATA CHART

MODEL & TITLE: Cessna L-19E, Bird Dog

TYPE: Liaison Airplane

CONFIGURATION: High wing, single engine monoplane

DESCRIPTION: The Cessna L-19( ) is a high wing monoplane of all metal construction. It is powered by a Continental 0-470-11 engine of 213 horsepower and McCauley fixed pitch propeller. Seating accommodations are provided for the pilot and one passenger. A small baggage stowage compartment is available behind the passenger/observer seat.

DATA:

Gross Weight: 2165 pounds (for barrier operations)

Empty Weight: 1612 pounds

Useful Load: 553 pounds

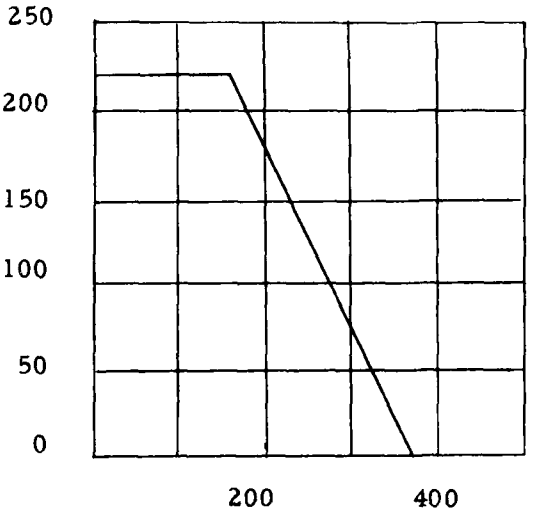
Cruise Speed: 87 knots

Max Speed: 116 knots

Cruise Fuel Consumption: 7.9 gallons (47.4 pounds) per hour

Cruise Range: 435 NM

Fuel Capacity: 42 gallons (252 pounds)
80/87 (Alt 90/96)



*Takeoff Distance over 50 feet: 800 feet

*Landing Distance over 50 feet: 1002 feet

*Measured under the following climatic conditions:

Density Altitude	Temperature	Headwind component
1900 feet	83°F.	2 knots

COMMENTS: The Cessna L-19( ) airplane is currently in the Army inventory and has proven itself under combat conditions. This aircraft will eventually be replaced by the LOH when it becomes available.

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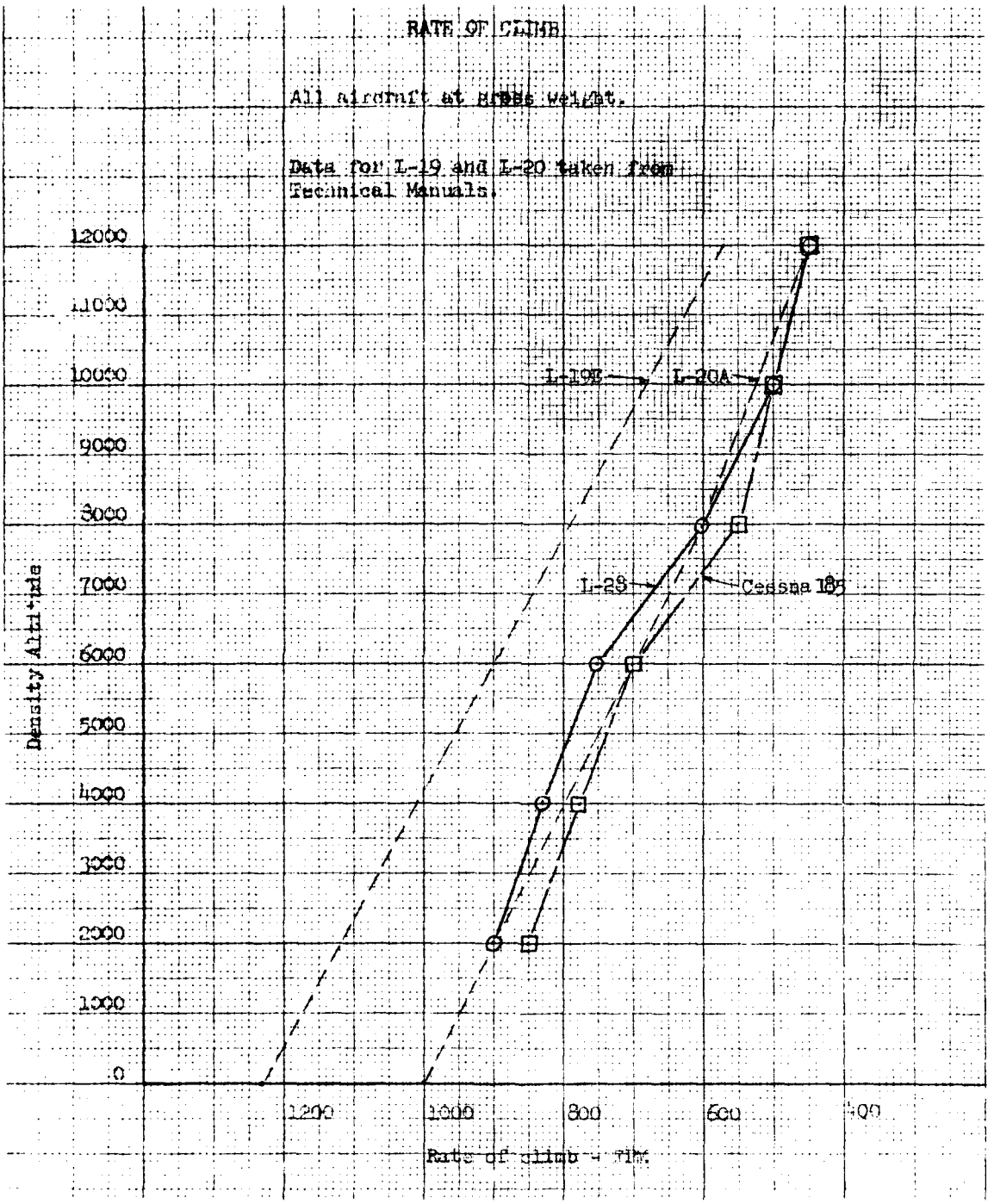
RATE OF CLIMB
All aircraft at gross weight.
Data for L-19 and L-20 taken from Technical Manuals.
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Density Altitude
L-19E
L-20A
L-23
Cessna 185
1200
1000
800
600
400
Rate of climb - fpm

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