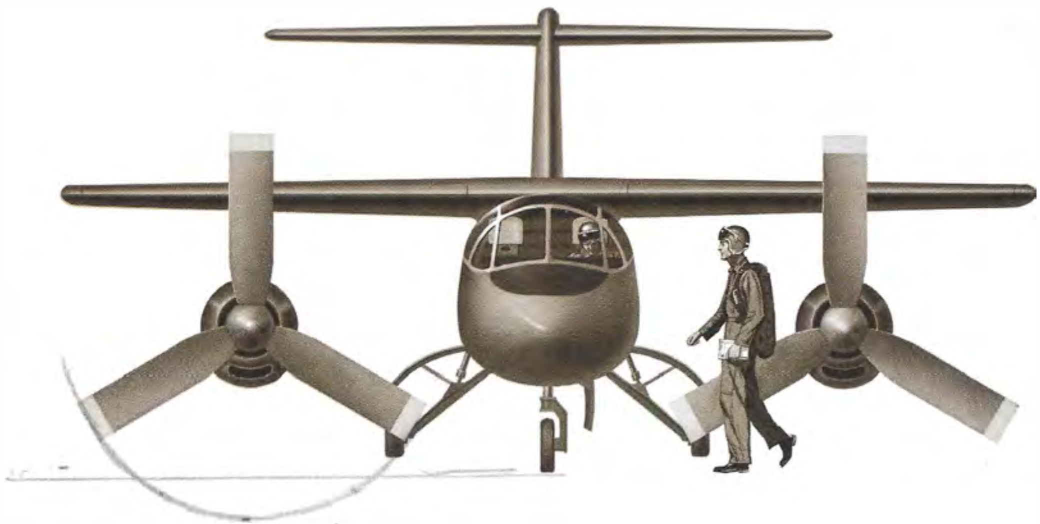
LOCKHEED CL-379—A NEW VTOL-STOL

TEST BED RESEARCH AIRCRAFT FOR THE U.S. ARMY



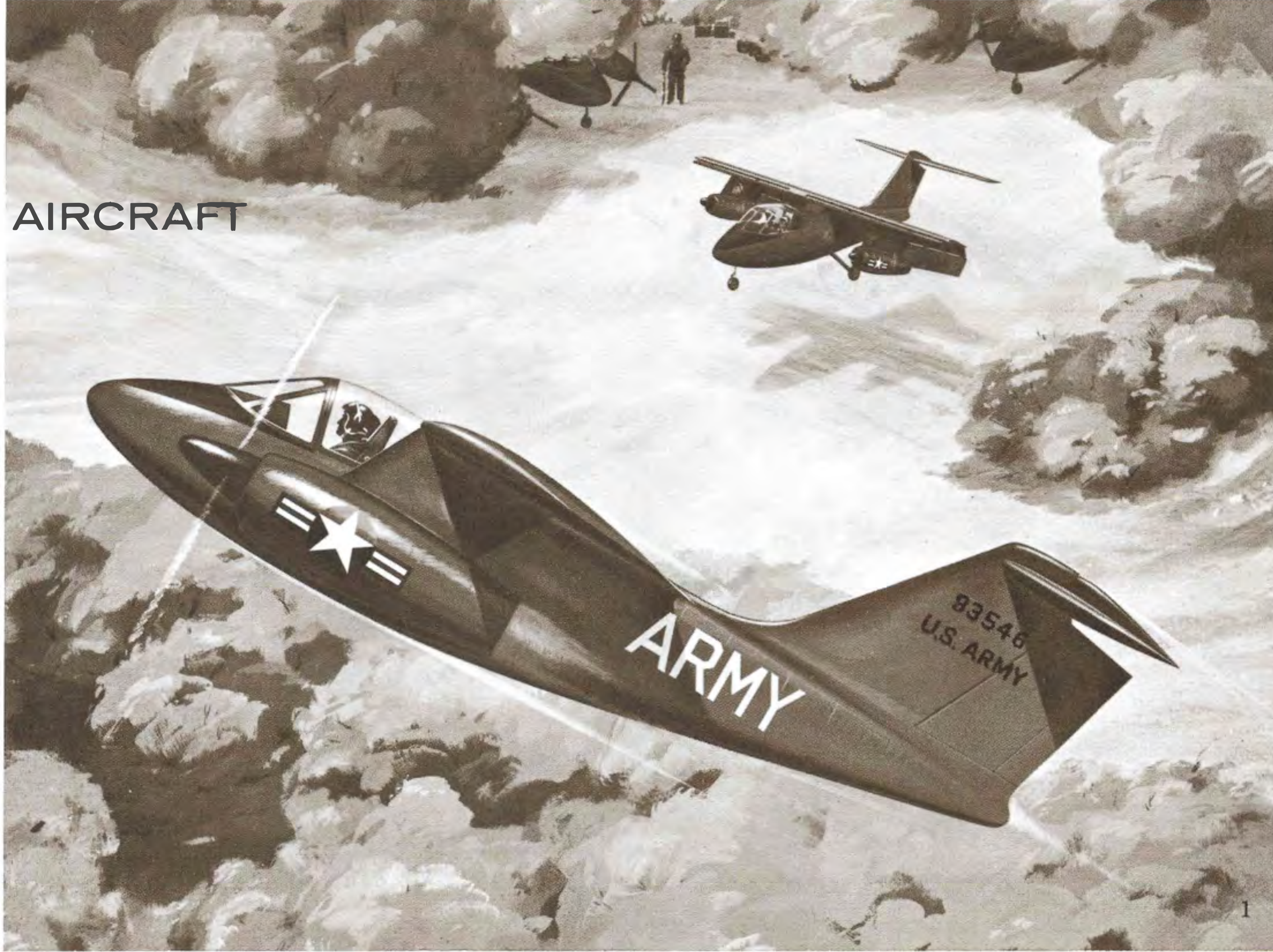
LOCKHEED CL-379
THE IDEAL VTOL-STOL

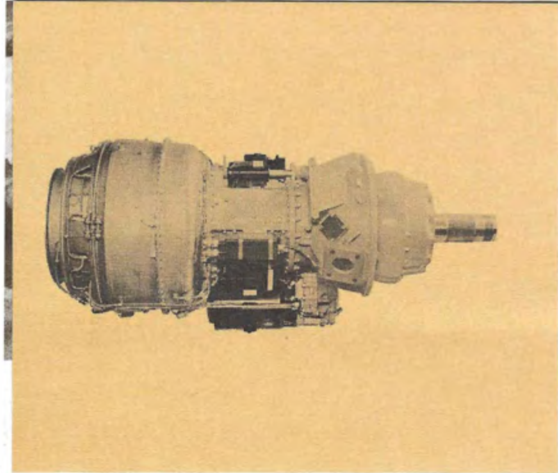
The airplane test bed design presented herein represents an ideal configuration for extensive analyses and testing of the VTOL-STOL principles. During the design of this airplane, both turboprop and turbojet versions were considered, the turboprop version being selected because of distinct advantages in range, weight, minimum surface erosion, and handling characteristics at low speeds and low altitudes.

The CL 379 achieves vertical take-off and landing through a dual combination of the deflected slipstream and tilt-wing principles. Vertical lift is obtained by increasing the wing incidence about 20 degrees, and by using a relatively simple flap system to provide moderate slipstream deflection. This concept avoids the control problems, high loads, and excessive buffeting associated with the pure tilt wing, and it does not require the extremely complicated flap geometry characteristics of pure deflected slipstream airplanes. In addition, it is well-suited to STOL operations and normal flight performance is affected a negligible amount by VTOL requirements.

In addition to serving as a test vehicle for this approach to VTOL, the proposed aircraft constitutes a back-up program for test bed aircraft presently under U. S. Army contract. It is believed that this proposed dual approach to VTOL, augmented by the advanced nature of the CL-379, will not duplicate present Army efforts and will result in the ultimate aircraft of this type.

ARMY AIRCRAFT



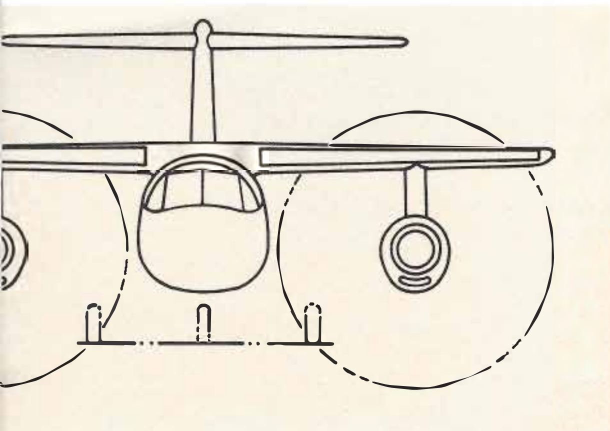


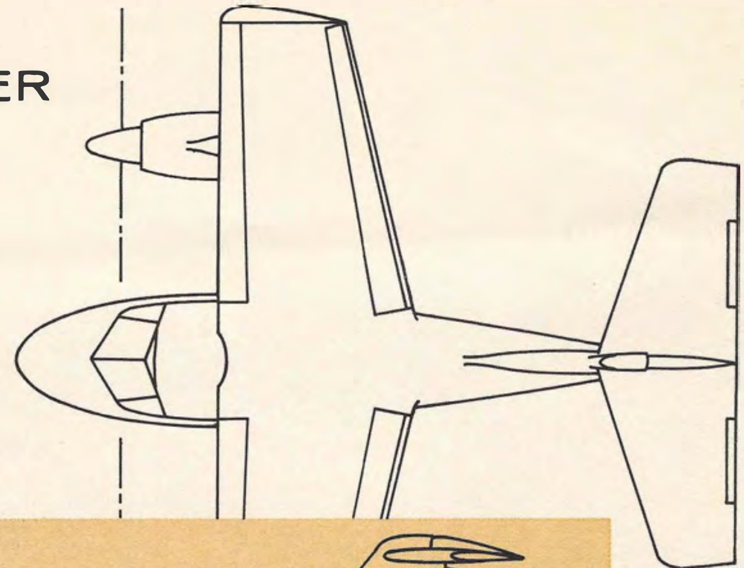
SMALLER THAN AN L-19 — FASTER

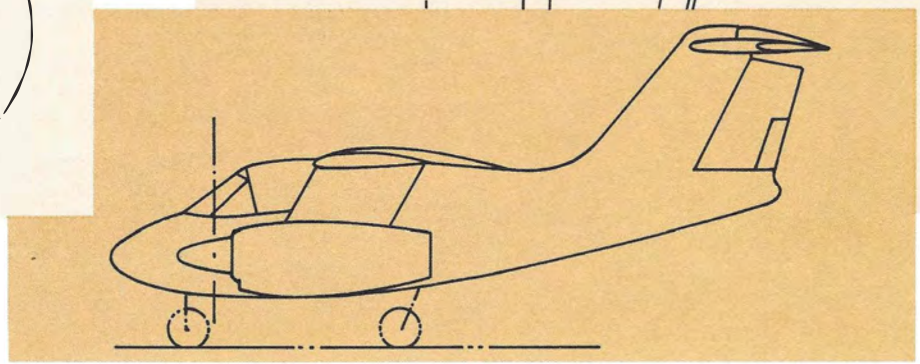
Some of the advantages of this multi-purpose modern aircraft can be shown by summarizing the airplane's capabilities, i.e.:

- VTOL permits operation from extremely rugged terrain.
- STOL permits substantially increasing useful load and/or fuel.
- Two-place for training, observation and a variety of other operations not possible with a single crew member.
- Maximum simplicity for easy, economical maintenance and servicing.
- Superior flight characteristics during vertical take-off and landing.

THAN A WORLD WAR II FIGHTER



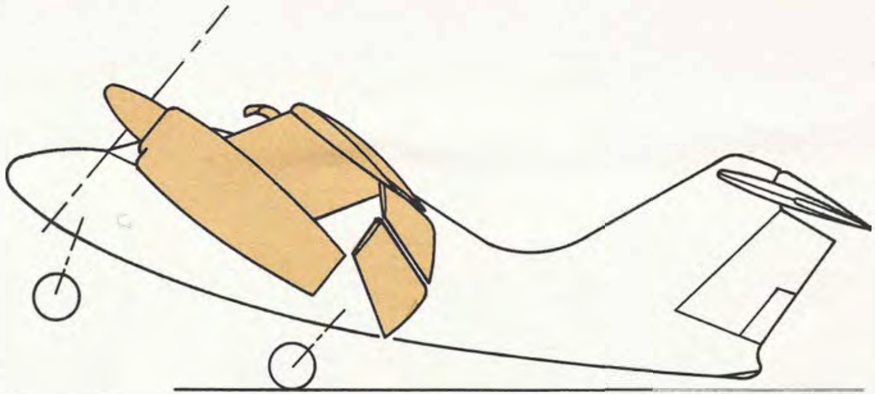




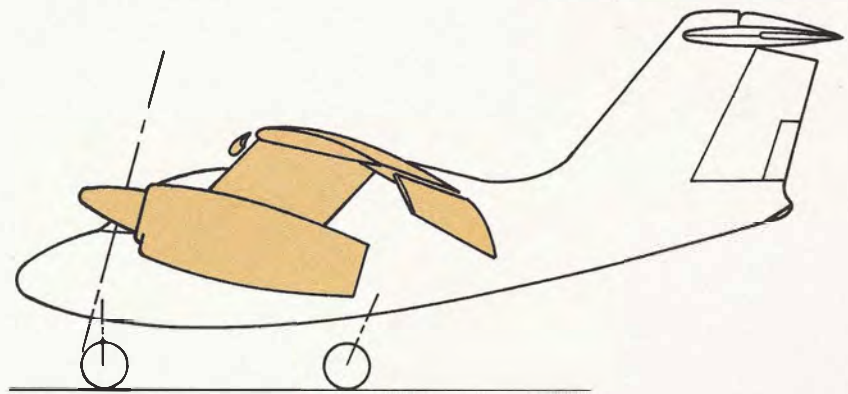
THE CL-379 DESIGN INCORPORATES FEATURES IDEALLY SUITED TO THE VTOL-STOL

* High wing for maximum ground clearance.
* Turboprop power for best propulsive efficiency.
* Tricycle landing gear for effective ground maneuverability and rough landings.
* Large-diameter, lightly loaded, opposite-rotating propellers for optimum control, stability, and lift characteristics in hovering flight.
* All-movable stabilizer for positive control at low forward speeds.
* Variable tilt wing, powerplant, and propellers to complement slipstream deflection.
* Positive control in roll, pitch, and yaw during hovering and slow speed.
* Upward ejection provisions for safe, low-altitude escape.
* Operation from unprepared terrain with little or no surface erosion.
* Minimum maintenance requirements through design simplicity and application of proven features.

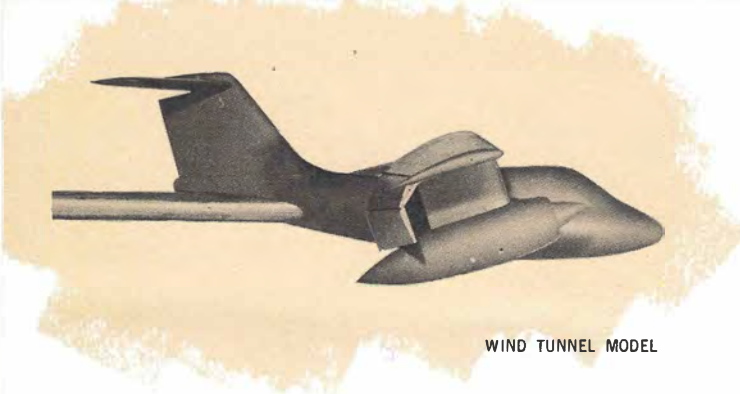
CONCEPT



VTOL
POSITION



STOL
POSITION

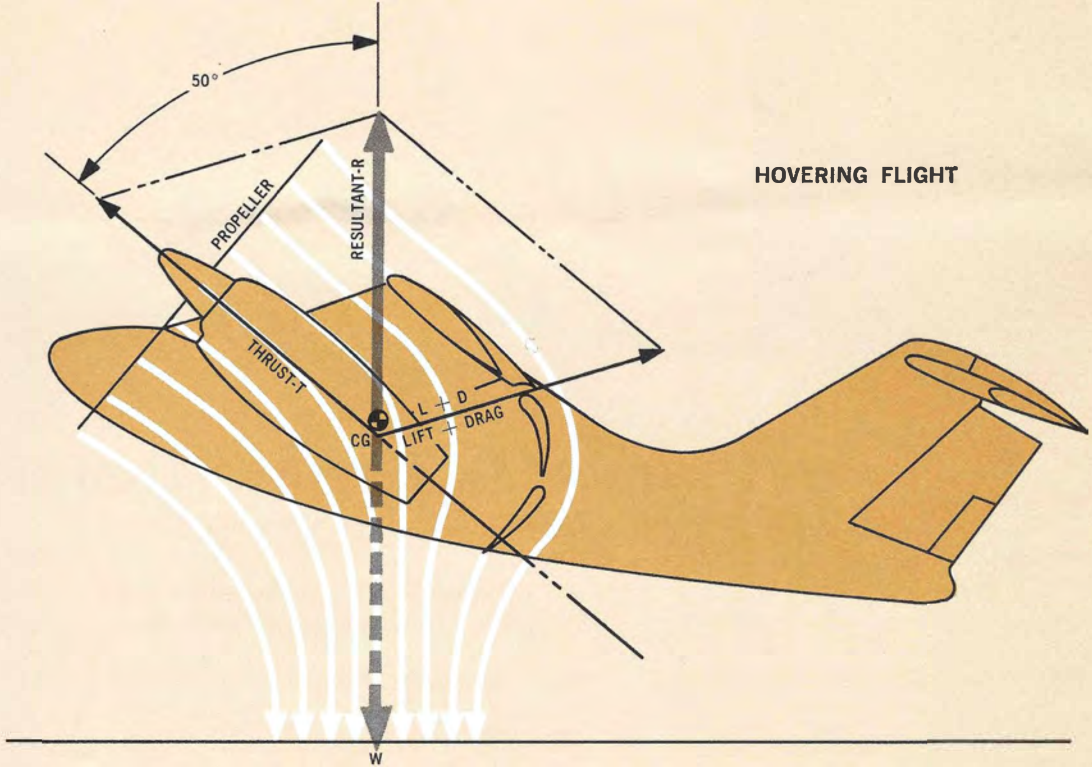


WIND TUNNEL MODEL

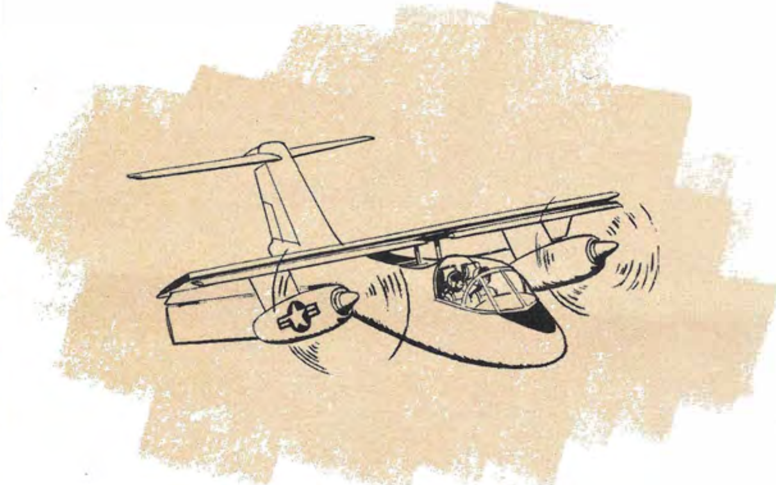
INTEGRATED LIFT AND PROPULSION

Geometry of VTOL Principle

- Variable tilt wing, powerplant and propeller.
- Double telescoping slotted flaps.
- Lowered thrust line balancing flap nose-down moment.
- All-movable "T" tail in undisturbed airflow for optimum transition control.

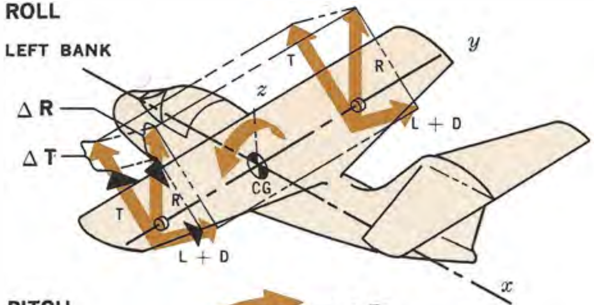


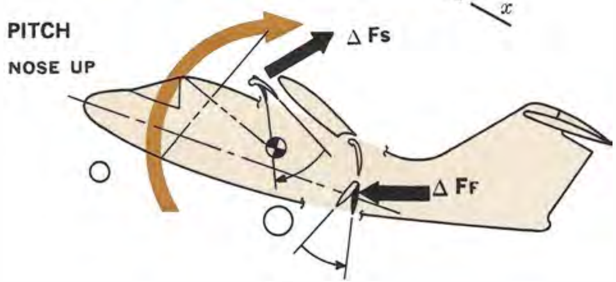
HOVERING FLIGHT



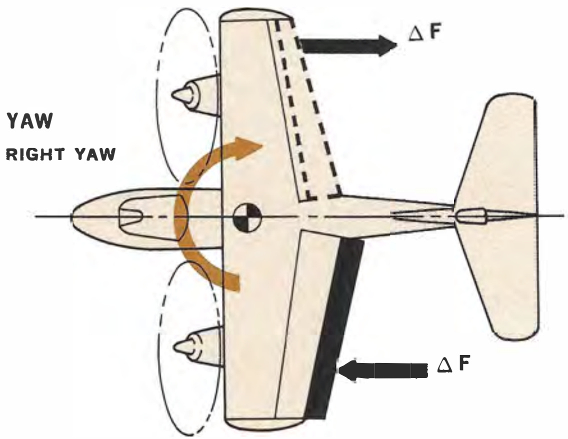
HOVERING MANEUVERABILITY ASSURED BY

The following means of providing hovering control, as well as other operations and systems, are being evaluated at the Lockheed Aerodynamics Laboratory to insure that the CL-379 is readily controllable during low speed flight:





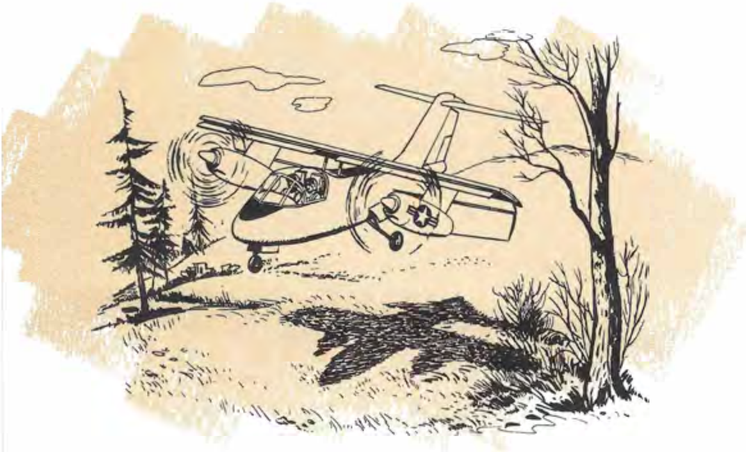
ADVANCED DESIGN AERODYNAMIC CONTROLS



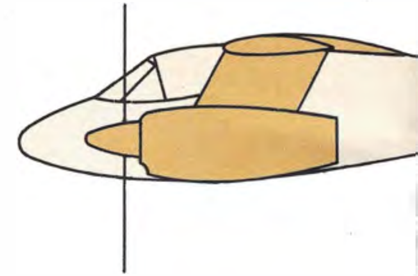
ROLL—controlled by differential pitch of propellers, or spoilers in flap system.

PITCH—controlled by motion of flap sections augmented by opposite motion of leading edge slat.

YAW— controlled by differential motion of flap sections.



5

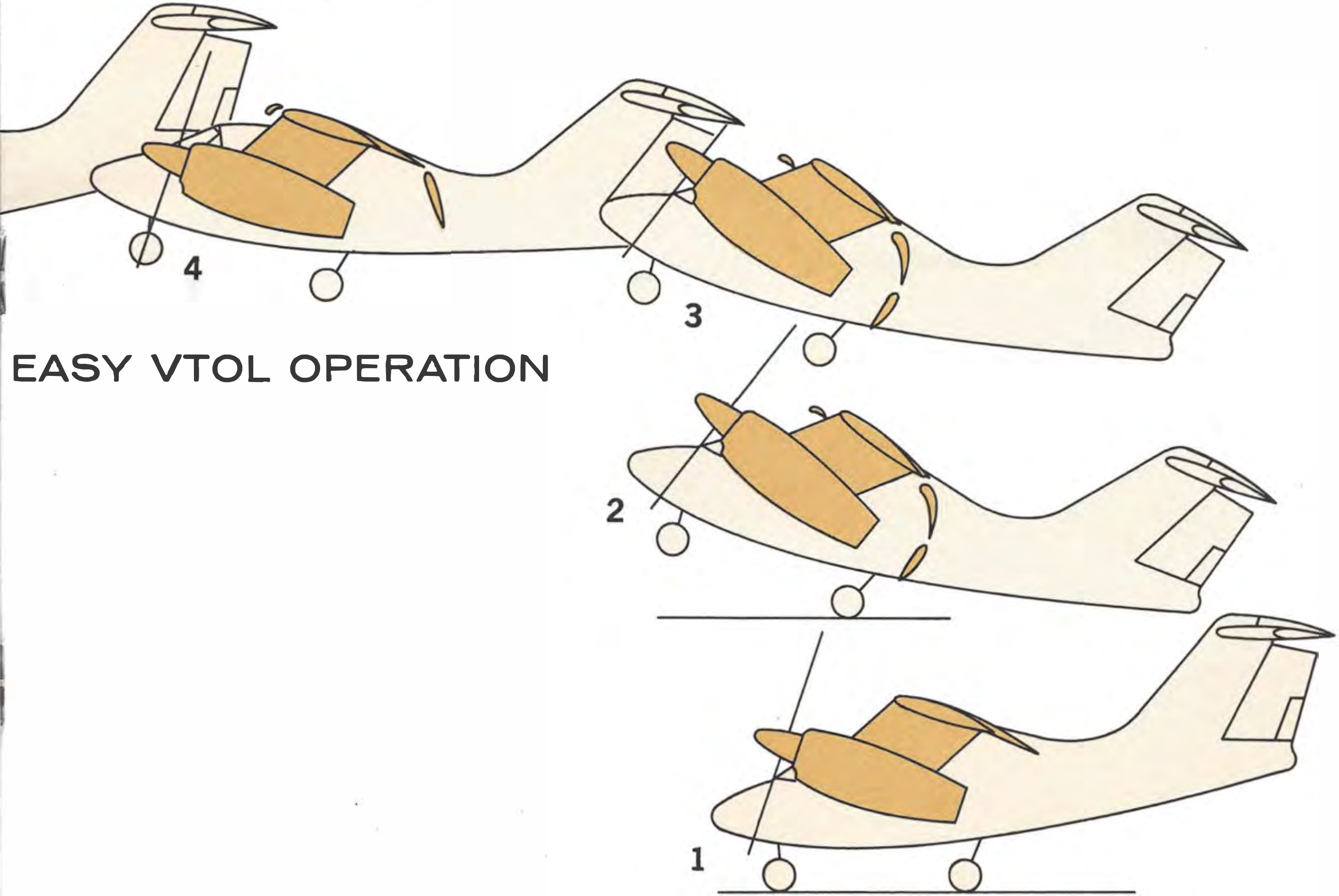


SPECIFICALLY DESIGNED FOR

VTOL Take-Off Procedure

1. Start engines with airplane level, wing at zero incidence, propellers and wheels braked. Raise wing incidence to full-up position, release propeller brake, and perform functional checks.
2. Extend flaps and slats to VTOL position and advance throttle. Pull back on stick to raise nose to 20°, release parking brake, and further advance throttle to take-off setting.
3. Take-off.
4. Start transition to forward flight at proper altitude by reducing flap setting and nose up attitude.
5. As speed increases reduce wing incidence to zero and retract gear.

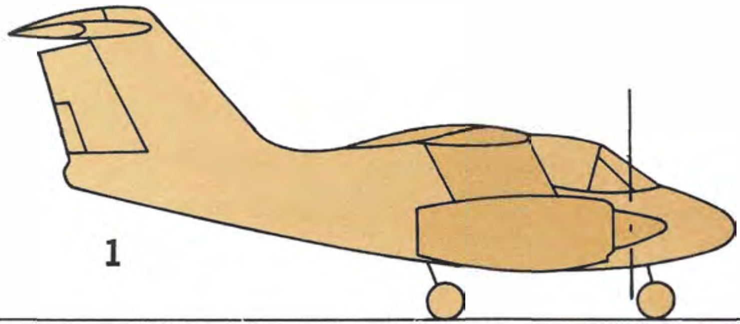
EASY VTOL OPERATION



STOL OPERATION FOR INCREASED

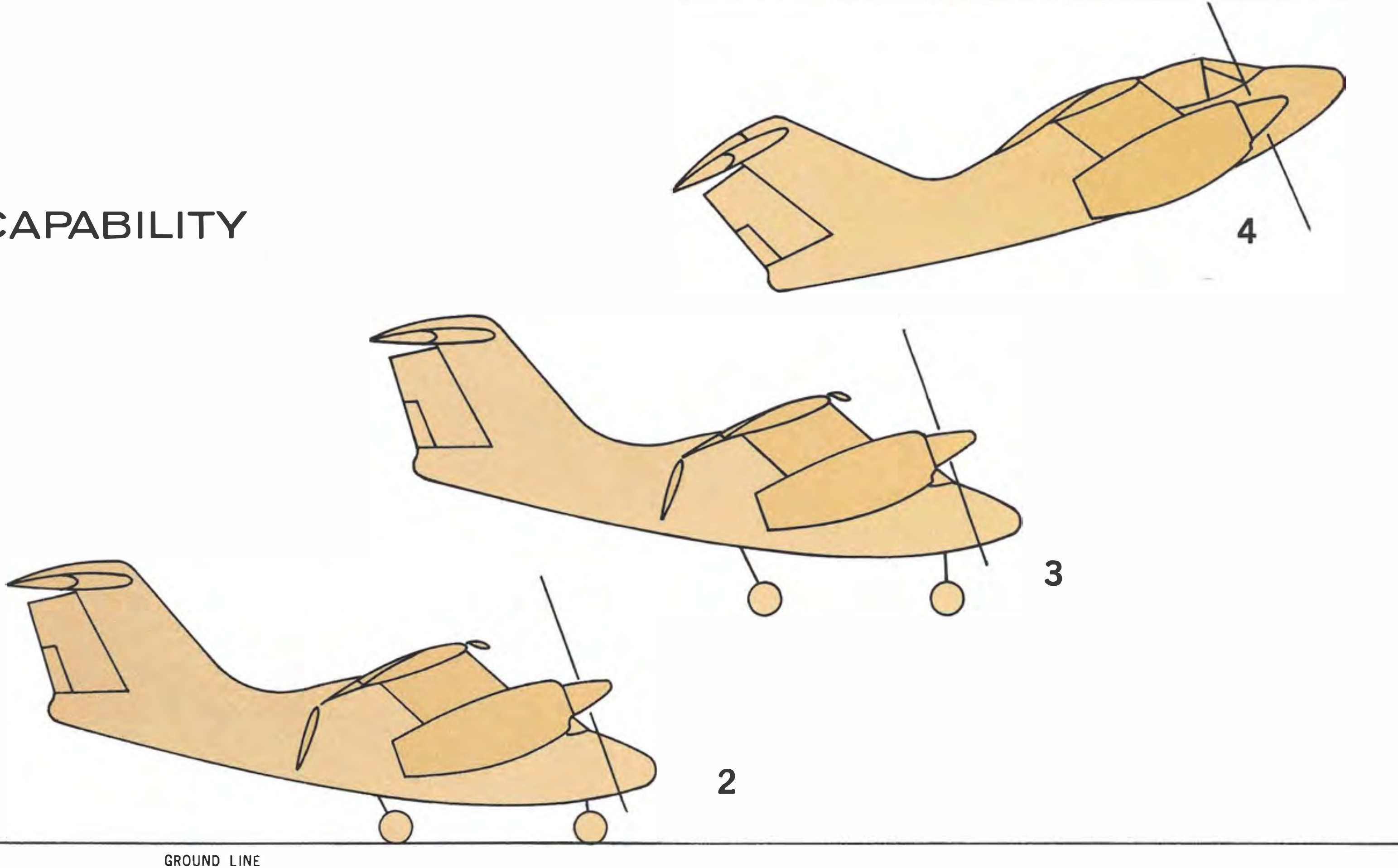
STOL Take-Off Procedure

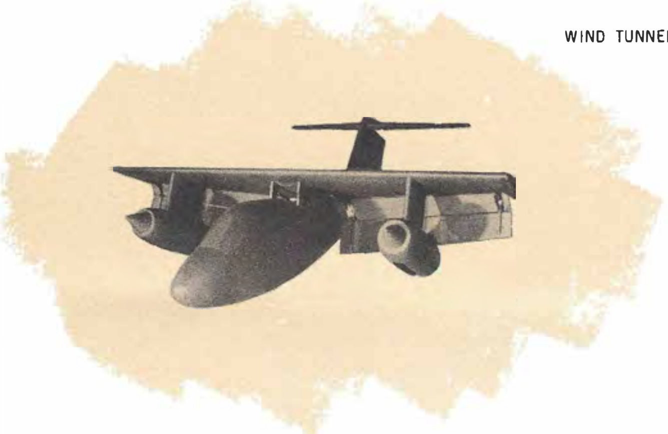
1. Start engines with airplane level, wing at zero incidence, and propellers and wheels braked. Raise wing incidence to STOL position, release propeller brake and perform functional check.
2. Extend flaps to STOL position, release wheel brakes, advance throttles to take-off position and start take-off run.
3. Complete take-off.
4. After take-off retract gear, reduce incidence, retract flaps, and establish normal climb.



1

CAPABILITY



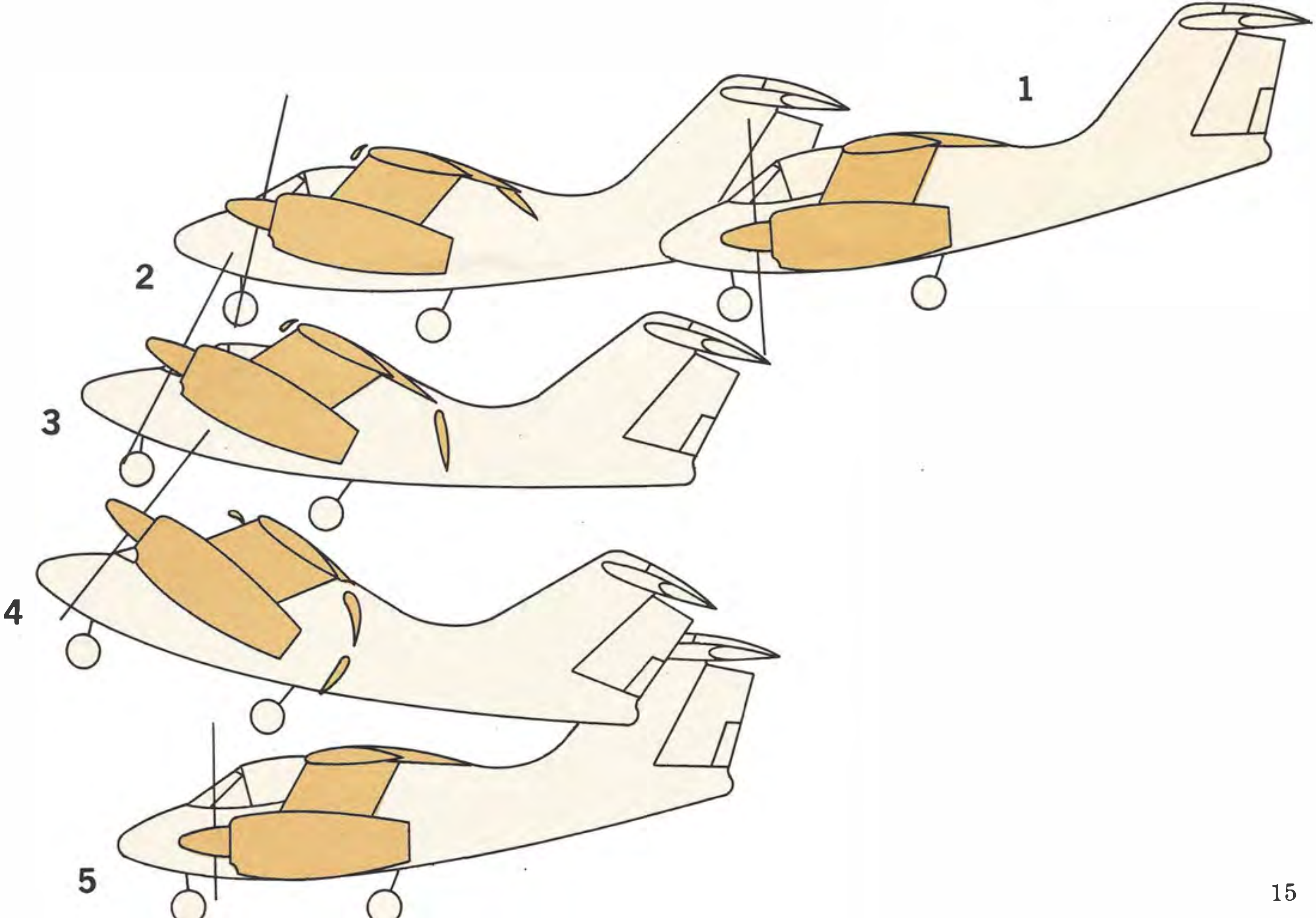


WIND TUNNEL MODEL

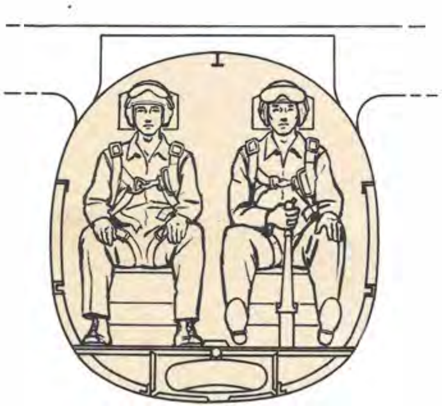
POSITIVE CONTROL FOR STEEP GRADIENT DESCENT

VTOL Landing Procedure

1. Let down, lower gear and extend flaps to approach position.
2. As speed reduces, increase power and lower flaps to landing setting and increase wing incidence.
3. As speed is reduced, gradually flare to 20° nose up attitude and continue to increase power until hovering over landing spot.
4. Reduce power slightly to complete vertical landing.
5. Apply brakes, reduce power, retract flaps, brake props, lower wing incidence, and shut down.



1
2
3
4
5

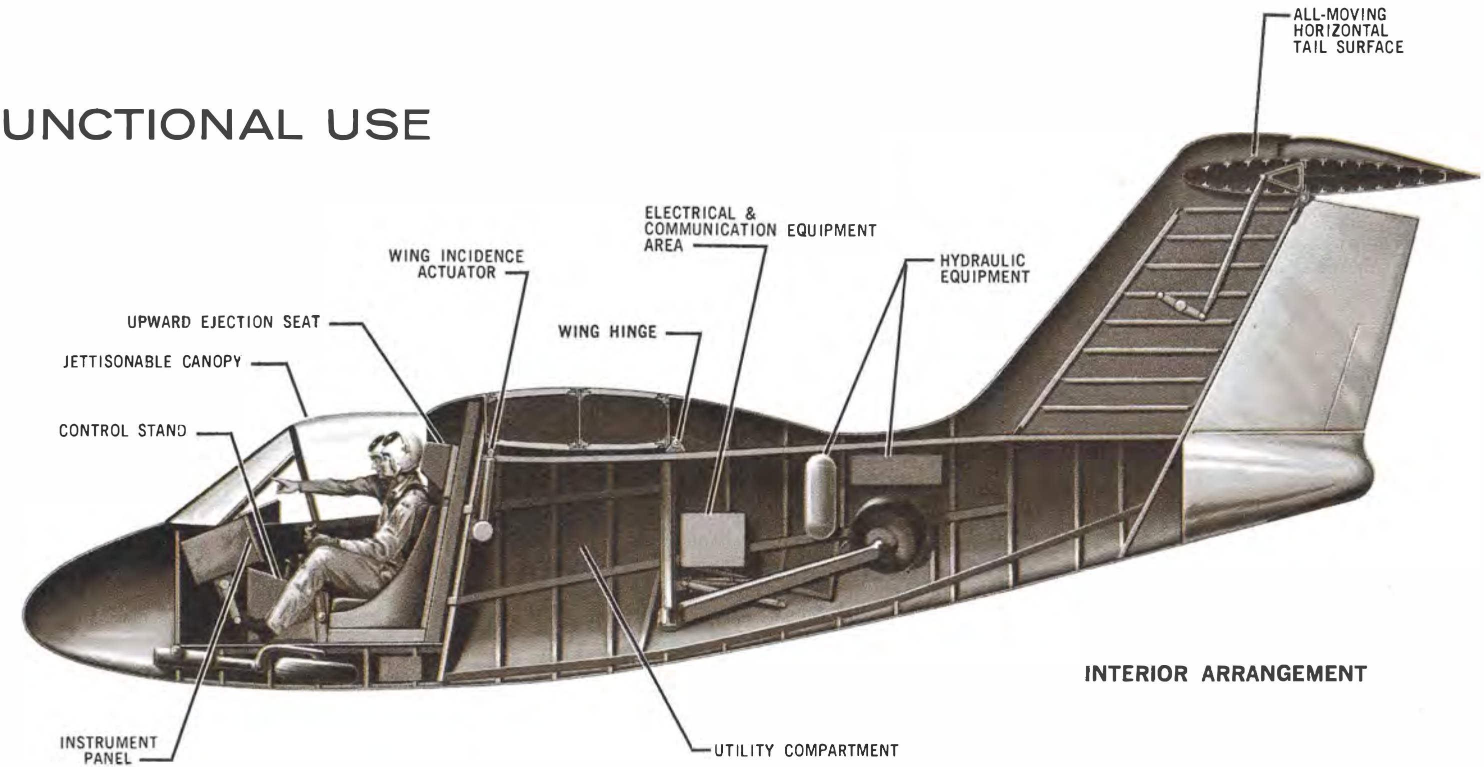


DESIGNED FOR MAXIMUM

INTERIOR ARRANGEMENT— The design incorporates the following:

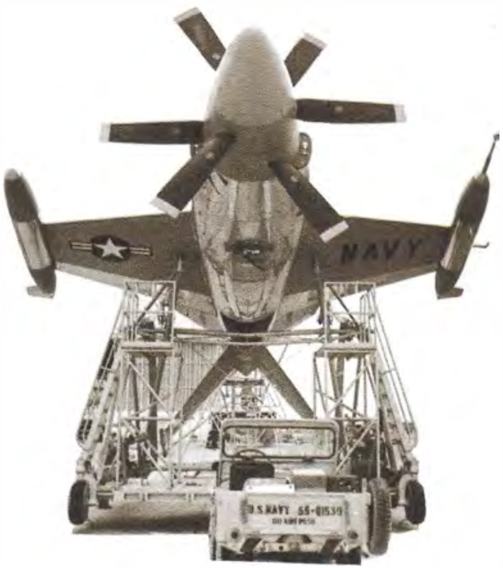
- ✶ Conventional fuselage with provisions for a two-place, side-by-side cockpit with upward ejection seats.
- ✶ 3000 psi hydraulic system.
- ✶ Crossfeed fuel system with wing tanks.
- ✶ Forward retracting main and aft retracting nose gear.
- ✶ Ample space for installation of a large amount of electronic equipment to meet customer requirements for research and test operations.

FUNCTIONAL USE



INTERIOR ARRANGEMENT

LOCKHEED VTOL-STOL AND TURBOPROP EXPE



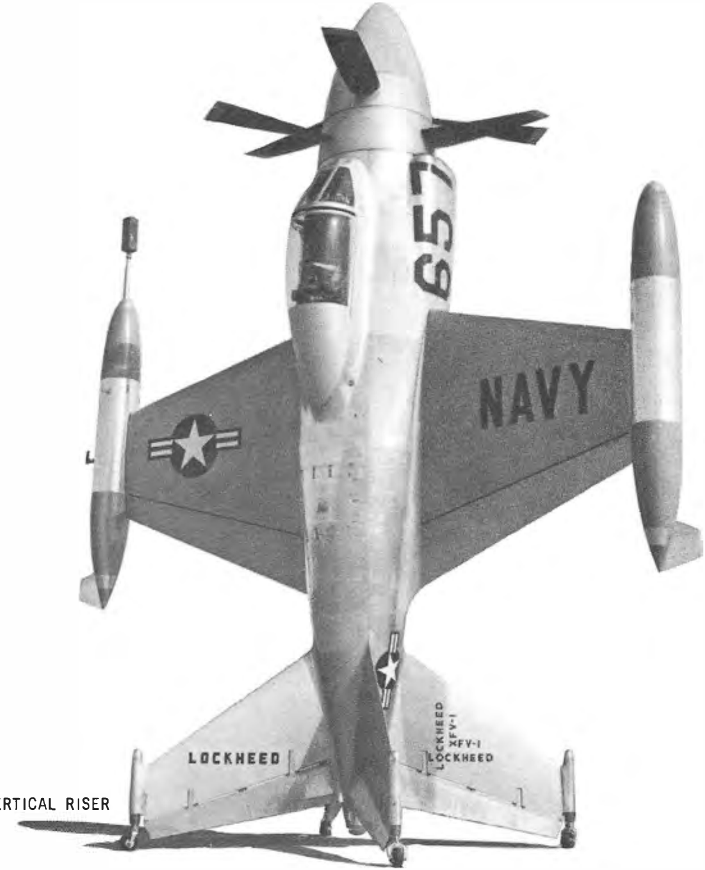
Lockheed is a seasoned leader in VTOL/STOL research, design, and testing—having designed and flown a VTO airplane, the XFV-1, as early as 1950. Since that time, a constant research program has been in progress in order to determine the optimum VTOL/STOL design. Included among the VTOL configurations studied are the following: (1) Jet fighter (2) turboprop transports (3) jet bomber (4) turboprop freighter (5) advanced helicopter.

Always the leader in turboprop design, Lockheed has designed, built, and delivered more turbo-prop airplanes than any other aircraft manufacturer. To date Lockheed installed turboprop powerplants have accumulated a total of more than 250,000 hours of operating time, conclusively indicating Lockheed's unequaled experience in this field.

RIENCE

TURBOPROP C-130
HERCULES

TURBOPROP ELECTRA



XFV-1 VERTICAL RISER

LOCKHEED DEVELOPMENT CAPABILITY

Using "teamwork" operations, Lockheed has demonstrated its capability to produce a wide variety of prototype aircraft in record time. Some of the better known examples are illustrated on these pages. Such short time spans reflect Lockheed's comprehensive technical and manufacturing capabilities for rapid development.

XF-104
Starfighter
Completed in 12 months

JETSTAR
Utility Transport
Completed in 8 months

T-33
Two-Place Trainer
Completed in 8 months

Look to Lockheed for Leadership...

F-80
Shooting Star
Completed in 7 months

THE LOCKHEED CL-379

a new  *approach to the VTOL-STOL concept*

LR 13112 • LOCKHEED AIRCRAFT CORPORATION • CALIFORNIA DIVISION • June 18, 1958