

## AERONAUTICS

# Wings of the Future

The 20th century demand for speed and increasing ground traffic problems are pushing traveler and transport up off the ground and into the air faster and higher than ever.

By ELIZABETH HALL

## See Front Cover

► NEW AND UNCONVENTIONAL vehicles that enable travelers to avoid crowded cities and congested highways are changing the look and the pace of modern transportation.

Upon looking at the engineer's drawing board and military experimental research test vehicles, it seems that travelers and transports in the year 2000 will have almost sprouted wings. For most of these new machines are not bound to the millions of miles of concrete runways, asphalt roads and steel tracks now transporting travelers where they want to go.

Instead they fly anywhere from two feet off the ground to 50 miles above the earth at speeds varying from 16 to 16,000 miles per hour.

Even craft limited strictly to water are getting their hulls up out of the water and "flying" at unbelievable maritime speeds.

Because of the millions of dollars required for research and development of these "winged" craft, commercial transportation developments in the United States are dependent on Government contracts awarded to industry through the U.S. Department of Defense. Although most of the new vehicles now being designed have military applications at present, their commercial value is just as plain.

## Personalized Rocket Belts

Personalized rocket belts may aid the traffic jammed commuter of the future by letting him fly to his destination. By means of portable rocket equipment carried on his back, a man can fly 40 miles per hour in free and controlled flight as high as 60 feet. Primarily designed for maneuvering in space and on lunar or other planetary surfaces, the rocket belt has a vital future on earth.

Invented by Wendell F. Moore of Textron's Bell Aerosystems Company, Buffalo, N. Y., military use of the belt would include transporting infantry soldiers over obstacles such as rivers, mine fields and barbed wire or permitting assault troops to fly from an amphibian to shore.

For mass transportation there are air cushion vehicles or ground effects machines (GEM) that use huge fans to draw air downward and up underneath the machine and create a cushion of air several feet high. GEM can travel over land, water, ice, marsh, mud or desert from 60 to more than 100 miles an hour since all surface friction is eliminated.

The high speeds reached by these machines, also known as hovercraft, make them ideal in a military sense for amphibious landing operations, antisubmarine warfare and mine detection. Commercially, these vehicles which are half-boat and half-airplane make excellent ferries, as well as a means for reaching areas not easily accessible by boat, car or plane.

In Great Britain, where GEMs are more developed than in the U.S., a 27-ton hovercraft, the SRN-2 manufactured by Westland Aircraft Ltd., Yeovil, Somerset, England, ferried more than 4,000 passengers over 5,000 miles in the course of a summer between the Isle of Wight and Portsmouth. It accomplished the normal hour and a half trip in eight minutes.

## Hydroskimmer for Navy

In the U.S., a huge 22½-ton Hydroskimmer, among others, has been developed for the U.S. Navy Bureau of Ships by Bell Aerosystems. This craft has achieved better than 80 miles an hour on Lake Erie at altitudes of more than three feet.

Although there has been much speculation on individual, wheel-less air cushion vehicles in this country, experimental industrial research has indicated they are not technically feasible on the highway.

Hovercraft experts predict the eventuality of natural high-speed hoverways for

short haul hops between major cities, especially in the northeast corridor from Washington, D. C., to Boston, Mass., where intercity traffic is crowded and airports are located far from the heart of a city.

At present, hovercraft could operate on major waterways either between cities or between sections of a city, for example, as on Washington's Potomac River and on Pittsburgh's Golden Triangle. Because they "fly" on land as well as water, hovercraft need no dock or deep channel but can ride right up onto the shore.

## Ocean-Going Hovercraft

Ocean-going hovercraft are also a possibility. An engineering formula shows that a machine roughly 300 feet in diameter would ride approximately 30 feet above the ocean waves.

New means of high-speed mass transportation operating strictly on the water include the hydrofoil craft, a ship that flies above the surface on underwater wings attached to the hull by struts, and Hydro-keel vessels, boats that pump a film of air beneath the hull to raise the boat out of the water.

Both of these boats reach speeds of 50 knots and both have marine military applications as high-speed war vessels invulnerable to sub torpedoes and mined waters.

The hydrofoil "wing" itself is shaped like an airplane wing to create an area of low pressure on its upper side as it moves, thus lifting the ship out of the water. The first ocean-going Hydrofoil, the HS Denison built by Grumman Aircraft Engineering Corporation, Bethpage, N. Y., for the



Bell Aerosystems Company

*MEN FROM MARS?—No, just two company engineers experimenting with the rocket belt by flying over the plant. The rocket belt may some day help commuters avoid traffic jams.*

U.S. Maritime Administration, speeds 50 knots in nine-foot waves.

The Hydrokeel vessel usually has two side keels. Blowers in the bow of the boat pump air underneath the hull between the keels so that the main body of the boat rides above the water on an air pocket, with the propellers and rudders beneath the water.

The Anti-Friction Hull Corporation, Laurel, Md., has built four Hydrokeel-type craft, including a 38-foot experimental cruiser.

## No Runways Needed

For more than half a century aircraft have freed man from the earth but, as one great inventor is reputed to have said, "the airplane will only be half invented until it can take off and land without runways."

The military need for VTOL (vertical takeoff and landing) aircraft has grown out of increasing guerrilla-type warfare in the jungle, desert or icy far north. Aircraft must be able to fly low, land on rough terrain and take off again without miles of concrete runways.

Commercially the landing strips now required by jet airplanes and other aircraft mean that the airport must be located far away from the city. Air travelers spend much of their time getting to and from the airport.

The helicopter, which is a little more than 20 years old, was the first successful VTOL aircraft. And as long as there are requirements calling for distances less than 100 miles, speeds not more than 160 miles per hour, heavy moving jobs and hovering for long periods of time, the helicopter will not be replaced.

## Commercial VTOL

VTOL planes, however, combine the vertical takeoff and hovering ability of the helicopter with the range and speed of conventional aircraft. VTOL can fill a major gap in the transportation spectrum—short haul distances, at speeds of 350 to 400 miles per hour.

VTOL craft could operate directly from downtown commercial areas and carry passengers directly to nearby major cities or to outlying airports, for cross country and intercontinental flights.

In order to achieve vertical flight, a huge amount of downward flowing air, or thrust, in relation to the plane's weight, is needed to lift it off the ground. Once the plane is airborne, there must be some transition to horizontal flight.

Aircraft achieve thrust by rotors, propellers, ducted fans or turbojets. Some VTOL designs have a dual propulsion system in which one means of thrust provides the lift and another provides horizontal flight. In another design, thrust from a fixed propulsion system is deflected downward by vanes or wing flaps that can be adjusted to different angles.

A third system has a moveable propulsion system. When tilted at a 90-degree angle it lifts the aircraft and then returns to its normal vertical position for horizontal flight.

At present, VTOL craft exist for military use only, most of which, in the U.S., are still in the experimental stage.

As soon as the millions of dollars poured into this field of research by the military have fully developed the vertical takeoff art, the heyday of commercial VTOL is expected to begin. Farsighted engineers even predict supersonic VTOL aircraft for commercial transportation to different continents.

## Future of Airports

The economically minded citizen may wonder about the future of the acres of concrete now surrounding airports. They may be located far from the city but they will never be completely obsolete. Engineers have included them in drawing board plans for a hypersonic aircraft that travels 16,000 miles an hour compared to the supersonic craft currently being discussed that travels 2,000 miles an hour.

The hypersonic airliner in a piggy-back position, as shown in the artist's concept on this week's front cover, would travel 50 miles above the earth and take you to any point on earth in a little more than an hour.

It would be launched from a piggy-back position on top of a manned, recoverable air-breathing booster traveling at an altitude of 120,000 feet at supersonic speeds of more than 5,000 miles per hour. The booster would then return for another launch.

A rocket in the transport would accelerate it to its near-orbital speed and would then be turned off, enabling the plane to glide about 10,000 miles before reentering the atmosphere. Commercial use of this transport has been predicted for the 1980 to 1990 era.

By the year 2000 the look and the pace of transportation will be entirely different from what it is today. By that time interplanetary travel may be as common as intercontinental travel is now. And traffic congestion in outer space instead of city streets the number one transportation problem.

• Science News Letter, 85:298 May 9, 1964

## Nature Note

### Wild Ginger

► IN THE PAST a child complaining of a stomachache might be served a cup of wild ginger tea made from the boiled roots of *Asarum canadense*.

Pioneers were shown by the Indians that the roots boiled in a rich sugar syrup were a palatable substitute for tropical ginger or as a tonic.

Its medical properties were well known to the Indians who also used it to conceal the flavor of slightly spoiled fish or meat.

Wild ginger is found in moist woods throughout the eastern United States. In the April-May period, beneath the pair of heart-shaped hairy leaves, several brown-purple bell-shaped flowers may be found. They often are concealed beneath last year's leaf mold.

The root is actually a rhizome, a thickened, elongated and horizontally growing structure distinguished from true roots by its buds and nodes. It is dug in the spring, cleaned, dried, and used as an aromatic bitter.

• Science News Letter, 85:299 May 9, 1964

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