MILITARY SCIENCE

Rocket to Carry Troops

Future military troops may be transported by rocket ships that travel 17,000 miles per hour and require only a small patch of ground for landing on collapsible legs.

➤ REMOTE brush-fire wars may some day be handled by a full battalion of troops that can be literally rocketed anywhere in the world within three-quarters of an hour.

The Intercontinental Ballistic Transport (ICBT), based on the design of a reusable booster rocket, could carry more than 132 tons of men or equipment at average speeds of 17,000 miles an hour. Since a velocity of 18,000 miles per hour sends objects into orbit, the ICBT would be traveling at the maximum possible speed for a surface-to-surface vehicle.

Today's jet transport planes, flying at 550 miles an hour, can travel from Los Angeles to Singapore in about 13½ hours. The forthcoming supersonic transports (SST's), capable of two and one-half times the speed of sound, will still take almost four and one-half hours. The ICBT, however, carrying six times as many persons as the SST's, could make the same trip in 39 minutes.

In addition, the "troop-missile" would require no landing strip at its destination. Only a patch of desert or an area of jungle partially cleared with bayonets would be necessary for the vehicle to touch down on its four collapsible legs.

"Operation Big Lift," in October of last year, carried 15,700 troops and 500 tons of cargo between Texas and airfields in Germany, France, Scotland, Spain and England. The operation required 235 separate flights, each consuming 10 hours, and was considered highly successful in view of a total time of 63 hours.

However, "Ithacus," designed by Philip Bono of Douglas Aircraft Company, could reduce the number of trips to 17 and cut the flight time by 95%.

Ithacus would carry its passengers flat on their backs lying on couches, 200 to a deck. The six decks stacked vertically in the rocket would be connected by conventional stairways.

Equipment and supplies would be carried in compartments around the edges of the 70-foot decks. There would be three exit doors at each level for rapid unloading of troops.

The four-man crew would ride in a special, self-contained rocket capsule, which could jettison itself from the main ship, in the event of a launch abort. For use only on cargo missions, the crew capsule would be powered by small, solid-fuel rocket motors.

"We don't recommend building Ithacus from scratch, however," Mr. Bono told SCIENCE SERVICE. "Its development depends on the development of a reusable booster." If Ithacus were approached without first having a retrievable booster rocket, said Mr. Bono, costs would approach $5.4 billion for research and development.

A reusable booster would be valuable anyway, he said, since 80% of the cost of such a project goes for the actual flying vehicle, with only 20% for propellants and ground support equipment.

The design for Ithacus was based on an earlier design for just such a rocket. Called ROMBUS, for Reusable Orbital Module: Booster and Utility Shuttle, it could fall safely on land or water, after automatically jettisoning its hydrogen fuel tanks. ROMBUS would restart its engine in flight, and use the reverse thrust to provide a relatively "soft" landing.

In the event of a possible landing in water, either ROMBUS or Ithacus, could automatically inflate four buoyant spheres fastened to the extendable legs of the booster. They would be inflated after the fuel tanks were released, and would keep the craft floating in a nose-up position in the water.

A reusable booster has to be designed from the ground up, Mr. Bono said. Today's boosters, like the Saturn I, are not strong enough to stand the forces of landing.

During the original development of the Saturn I, he said, the National Aeronautics and Space Administration thought that it would be worthwhile to recover the boosters after use. It turned out, however, that the rocket would not survive the beating of the waves or the corrosion of the salt.

"Ithacus could evolve into the most revolutionary advance in military transportation since the airplane," said Mr. Bono at the annual meeting of the American Institute of Aeronautics and Astronautics in Washington, D. C.

• Science News Letter, 86:50 July 25, 1964

TECHNOLOGY

Paper-Thin Glass Makes Tough Protective Armor

➤ FIFTY GLASS SHEETS, each thinner than an ordinary piece of paper, when connected together form a transparent shield to be used for everything from porthole windows of space ships to bullet-proof armor for military personnel.

The flexible glass sheets, only two-thousandths of an inch thick, are connected or laminated by an adhesive in layers of at least 50 to form a one-half-inch thick transparent structure. Four-fifths of the thickness is actually the adhesive.

This glass armor, developed by Dr. Lawrence J. Broutman, engineer of the Illinois Institute of Technology Research Institute, is tougher and lighter than conventional laminated glass that uses quarter-inch-thick glass plate. The new glass can also be made into an assortment of shapes.

• Science News Letter, 86:50 July 25, 1964

SPACE

Rocket Engine of Future?

See Front Cover

➤ ELECTRIC ROCKET engines, of the type that may provide the push for future missions into deep space, are being tested in actual flight.

Electrostatic ion engines emit a stream of ions at velocities up to 100,000 miles per hour, giving a greater "specific impulse," an efficiency, or miles-per-gallon type, figure for rockets.

Two engines are being tested in the NASA operation called SERT I (Space Electric Rocket Test). They will develop very low thrust during the test, however, since a small amount is sufficient for the test. One engine, seen on this week's front cover, designed by the National Aeronautics and Space Administration's Lewis Research Center, will produce about .001 pounds of thrust, using cesium as a fuel. The other, propelled by mercury, will develop slightly over .006 pounds. It was built by Hughes Aircraft Company, Malibu, California.

The test flight is for the purpose of verifying that ion engines can produce thrust in space. This is possible only if the positive ion exhaust beam can be neutralized. This is done by injecting a stream of electrons into the ion beam as it leaves the back of the engine. Studies done in ground chambers indicate that the technique works. Ground tests are not conclusive, since in an earthbound vacuum chamber, the walls themselves can sometimes emit electrons.

If SERT I works, further development of ion engines can continue in ground chambers. Otherwise, a series of flight tests may prove necessary.

NASA's Office of Advanced Research and Technology is studying three types of electric engines. In addition to SERT I's ion engines in which the fuel is ionized and then accelerated by electrostatic fields, there are electrothermal engines, which use electricity to heat the fuel, causing it to expand through a thrust nozzle, similar to a chemical rocket.

The third type is called an electromagnetic (plasma) engine. Here the propellant is changed into an electrically conducting gas and then accelerated by passing through magnetic fields.

SERT I was scheduled to be launched from Wallops Island, Va., aboard a four-stage solid-fuel Scout rocket. The ion engines were programed to run consecutively for 20 minutes each in the course of the flight, covering 2000 miles and reaching a maximum altitude of about 2500 miles.

• Science News Letter, 86:50 July 25, 1964