

OUR

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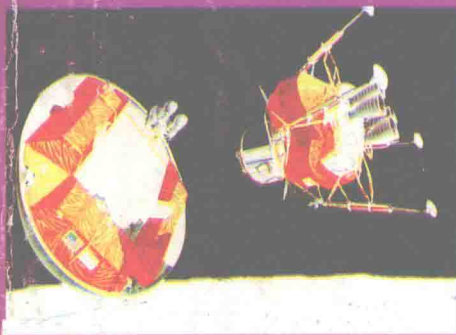
FUTURE

人类征服太空的历程 英汉读本

未来的太空计划

广西科学技术出版社

IN SPACE



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未来的太空计划

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Our Future in SPACE

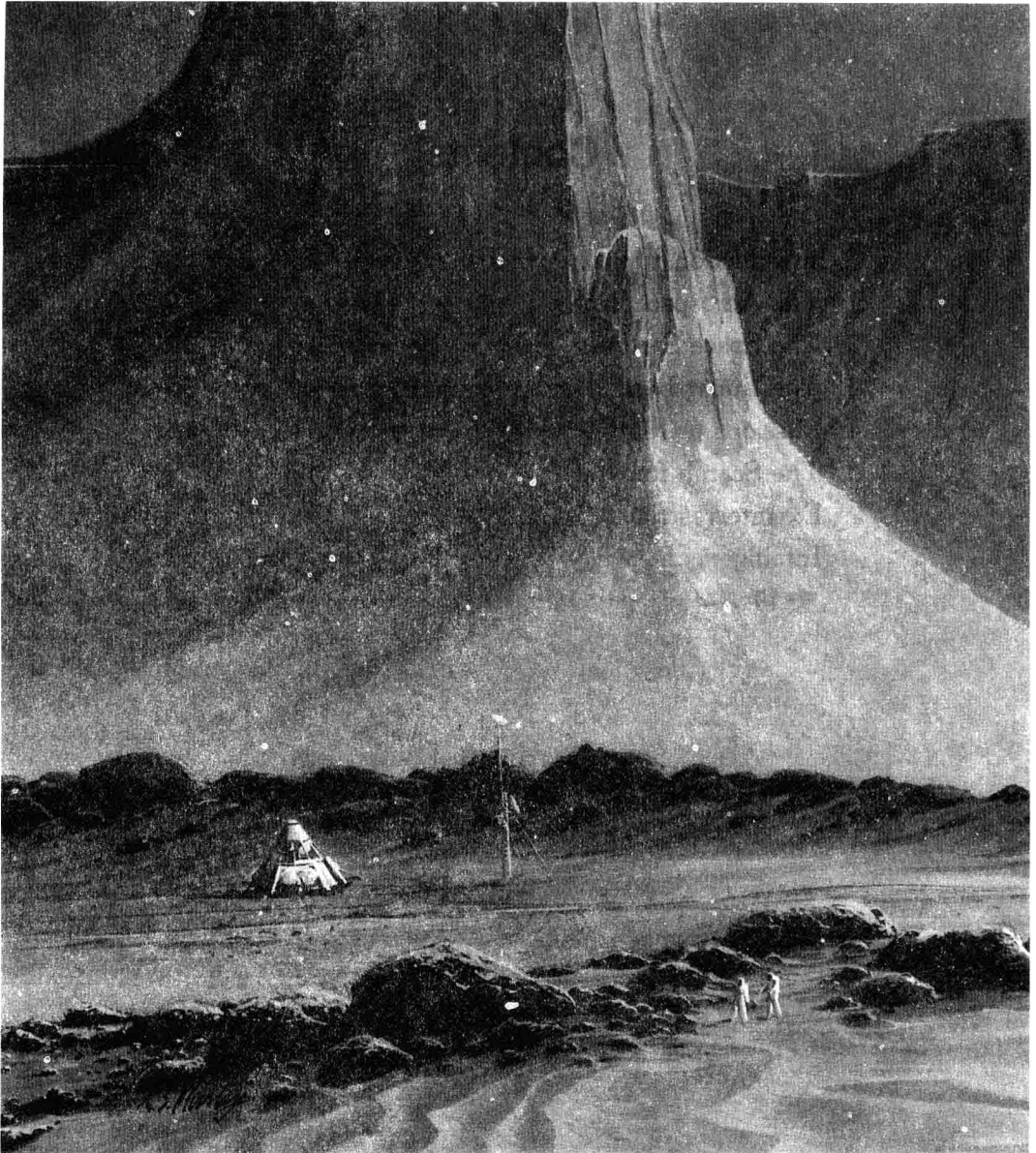
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In this artist's concept of Mars, astronauts, lower right, explore the planet's surface.

Introduction

A dream can be about anything. It need not be practical or sensible. It need not even be possible, for it is only an idea. For centuries people watched the birds and dreamed of some day being able to fly in the air. Now, as people gaze at the stars and planets, their dreams are often about living and working in space, about trips to Mars and to planets even farther away, and about meeting those beings who may already live out there.

It wasn't until the late 18th century that humans were able to realize the dream of flying in the air. In 1783 a hot-air balloon designed by the Montgolfier brothers lifted off from Paris, France, with two passengers aboard. It took humans on their first journey through the sky. Less than 200 years later, in 1961, Soviet cosmonaut Yuri Gagarin fulfilled the other dream when he made the first journey into space. In a spaceship called *Vostok I*, Gagarin blasted into the darkness of space and orbited the Earth.

Without dreams, people would still be tromping across fields and over hills, never more than a few miles from

home. But because of human curiosity, each time a person realizes one dream, at least one more quickly takes its place. In 1969 three men traveled 240,000 miles (386,160 kilometers) to the Moon. Humans immediately began dreaming of a flight to Mars, more than 35 million miles (56 million km) away.

Dreams are only the beginning of every space project. If a dream is to become a reality, it must stand a fair chance of success, and it must involve serious planning. Planning must then be followed by a large investment of money, because space experiments and trips cost far more than any balloon or airplane experiments ever did. The cost of a new space project must be weighed against its possible benefits: Will it be more worthwhile than spending the money on Earthbound scientific research? Will it help humankind more than spending the money on pollution control, low-cost housing, or the war on drugs?

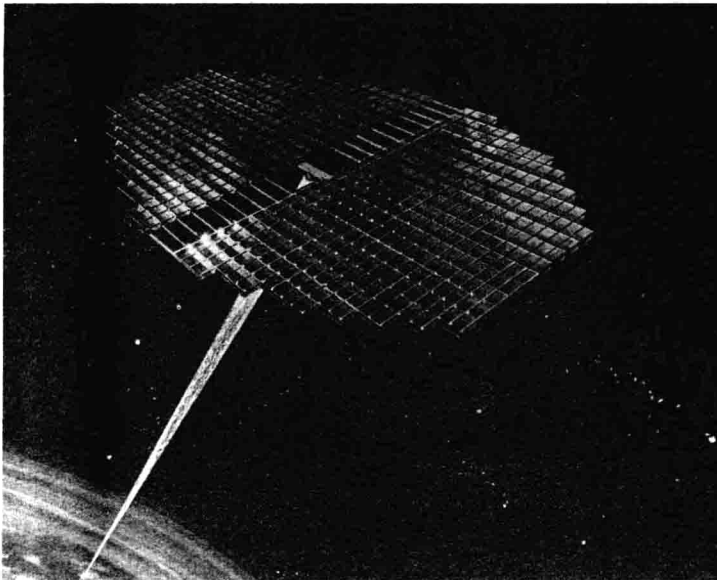
Almost no space projects offer a quick "payoff." It may take many years of hard work to produce any results of obvious value. Some projects, such as

the Project Apollo landings on the Moon, may never have a direct impact. Of course, when Christopher Columbus set sail from Spain in 1492 and discovered the Americas, the effect of his discovery on the entire world wasn't understood until many years later.

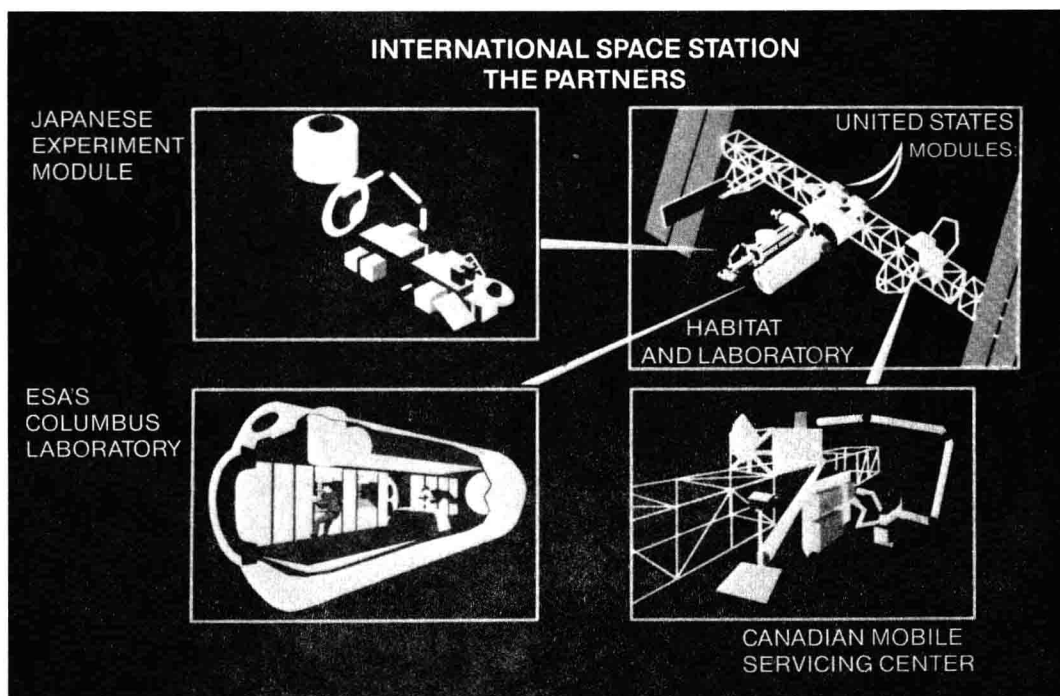
We can look back on the first few decades of the space program and see some benefits: development of new materials, advance warning of hurricanes, and verification of arms control treaties. But when our space projects were being planned, they seemed as

much like adventures as serious research. No doubt benefits from many of tomorrow's experiments will develop the same way.

One thing is very clear about future space research and travel: It will be even more expensive than in the past. It will be so expensive that few countries will be able to afford anything but small projects. Only the United States and Russia (the former Soviet Union) have their own major space programs. A group of countries in Europe has formed the European Space Agency (ESA) to share the cost of space



This is an artist's concept of a power conversion system. The structure collects pollution-free energy from the Sun and then transmits the energy to Earth in the form of microwaves.

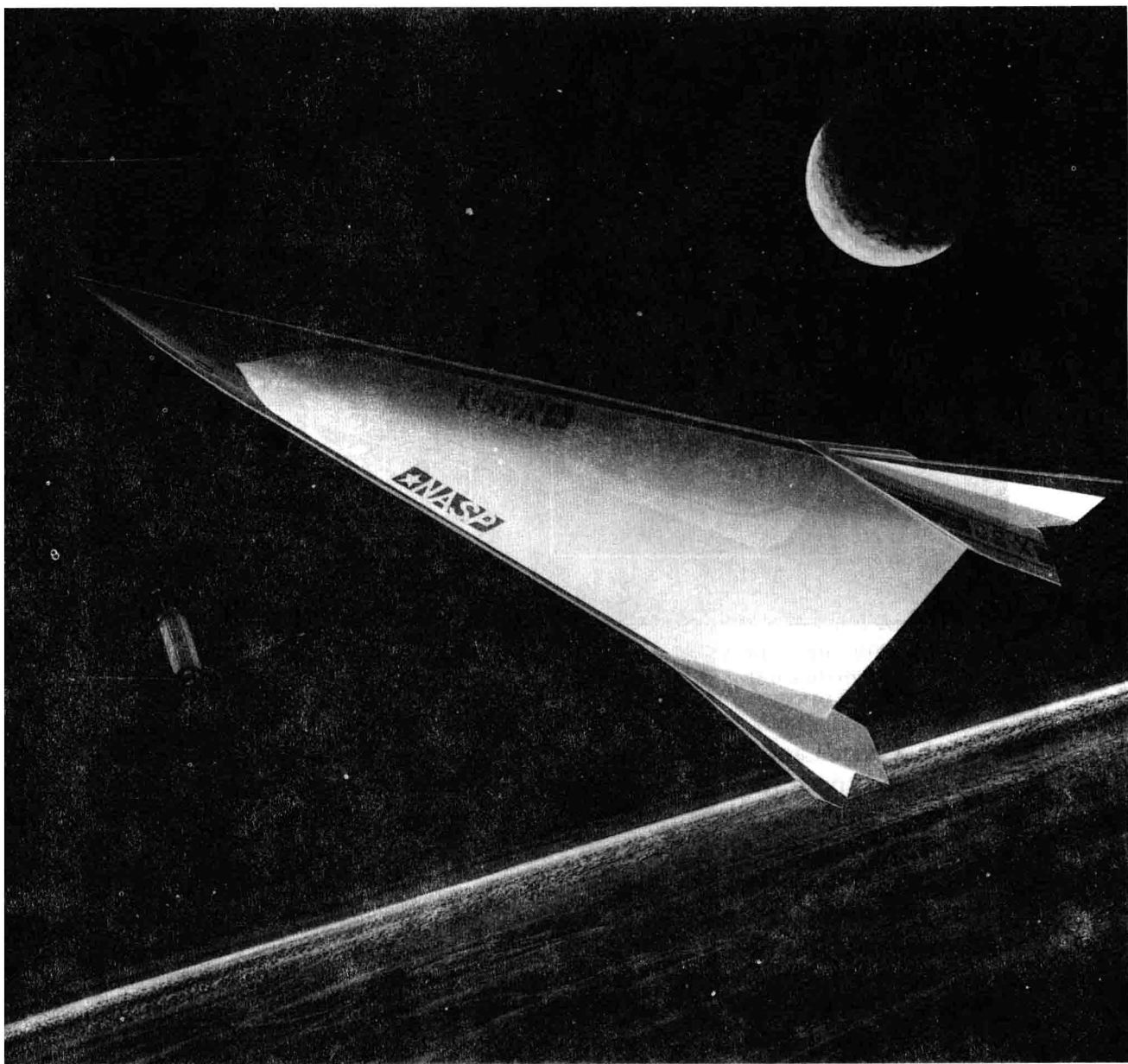


Space station Freedom is an example of different countries working together on a major space project. The international space station would consist of four modules and a servicing center.

research. Canada and Japan also conduct limited space research. International cooperation is growing rapidly, and some of the biggest projects of the future may well turn out to be joint projects of two, three, or even of all five space programs.

Every new project is based on years of research. In many cases, new projects will require building bigger spacecraft that can carry people and equipment

for experiments that take a long time to perform. In other cases, research will require completely new technology and brand new ideas. While that research is taking place, men and women will also be dreaming of projects for the middle of the 21st century and beyond. They will dream just as people did long ago when they watched and envied the birds.



The Aerospaceplane

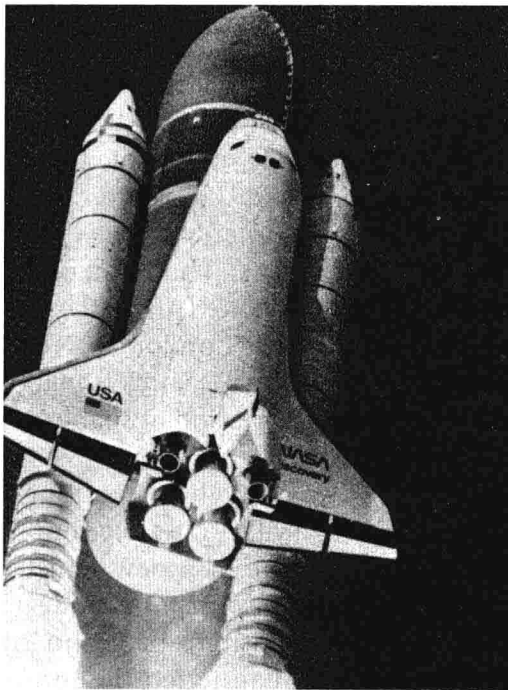
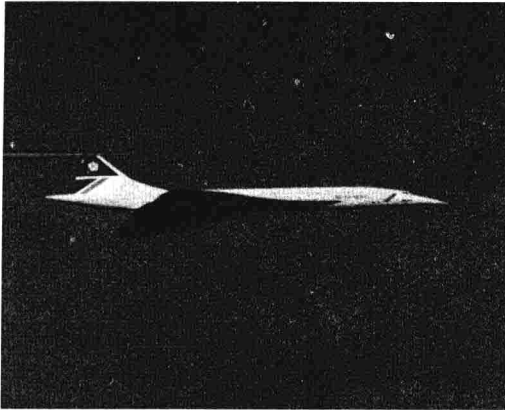
Ever since the Wright brothers flew their first airplane at 20 miles per hour (32 km/h) in 1903, people have wanted to fly faster. Not only is speed thrilling, it is also a very good way to get places in a hurry. When traveling in the air, a vehicle needs both power and streamlining to move fast. In space, power is most important.

Our first taste of real speed came in 1947. In the rocket-powered Bell X-1 airplane, Chuck Yeager broke the “sound barrier” by traveling faster than the speed of sound, also called Mach 1. (The actual speed of sound depends on the altitude and the temperature of the air. At 40,000 feet [12,192 meters], for example, the speed of sound is normally 660 mph, or 1,062 km/h. Mach 1 would then equal 660 mph.) By 1967, W. J. Knight had flown Mach 6.7 (6.7 times the speed of sound) in the

North American X-15. These flights were made at very high altitudes, where there was so little air that the airplanes behaved almost like spacecraft.

The first Concorde supersonic transport (SST) flew in 1969. Soon after that, it was used by commercial airlines for long-distance flights. The Concorde transports people across the Atlantic Ocean from Paris or London to New York or Washington at Mach 2. It made high-speed transportation available to travelers.

The next step in high-speed, long-distance travel—and it was a big step—was the space shuttle. This new vehicle is also called an *aerospacecraft*, since it is able to operate both in space and in the atmosphere. Launched by enormously powerful boosters into Earth orbit, it returns to land on a long runway as a powerless glider does.



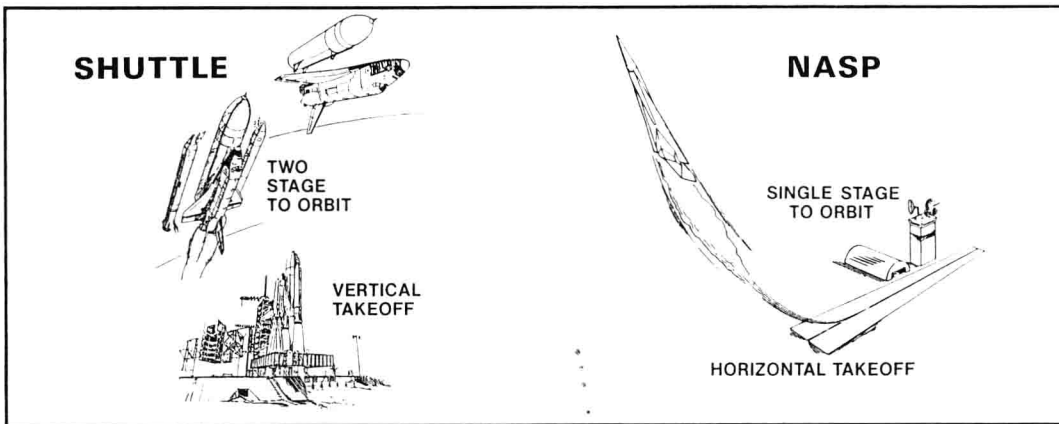
The Concorde SST, top, and the space shuttle Discovery, bottom, represent two important steps in high-speed travel.

During the gliding part of its flight, it travels as fast as Mach 25, as it enters the atmosphere at an altitude of 50 miles (80 km). To protect the shuttle from the great heat caused by the friction of air against its outer surface, its most important areas are covered with special heat-resistant tiles.

While plans are being made to design and build larger and faster supersonic airliners, the real dreamers are hard at work on a long-range project that will make all other aircraft seem old-fashioned. It is the *aerospaceplane*. The United States calls it the National AeroSpace Plane (NASP), Great Britain calls it HOTOL, and Germany calls it the Sanger II. Whatever it's called, it's revolutionary.

The aerospaceplane will take off and land on a standard runway and fly more or less directly into orbit. The American and British aerospaceplanes will be SSTO (single stage to orbit), which means they will require no boosters. The German design requires a booster craft to launch.

There are several possible uses for this new type of Earth-to-space vehicle. It could replace the shuttle in ferrying astronauts and cargo to a space station in Earth orbit. It could become an orbiting spacecraft. It could be an



extremely fast airliner, capable of flying from New York to Tokyo in two hours at Mach 25.

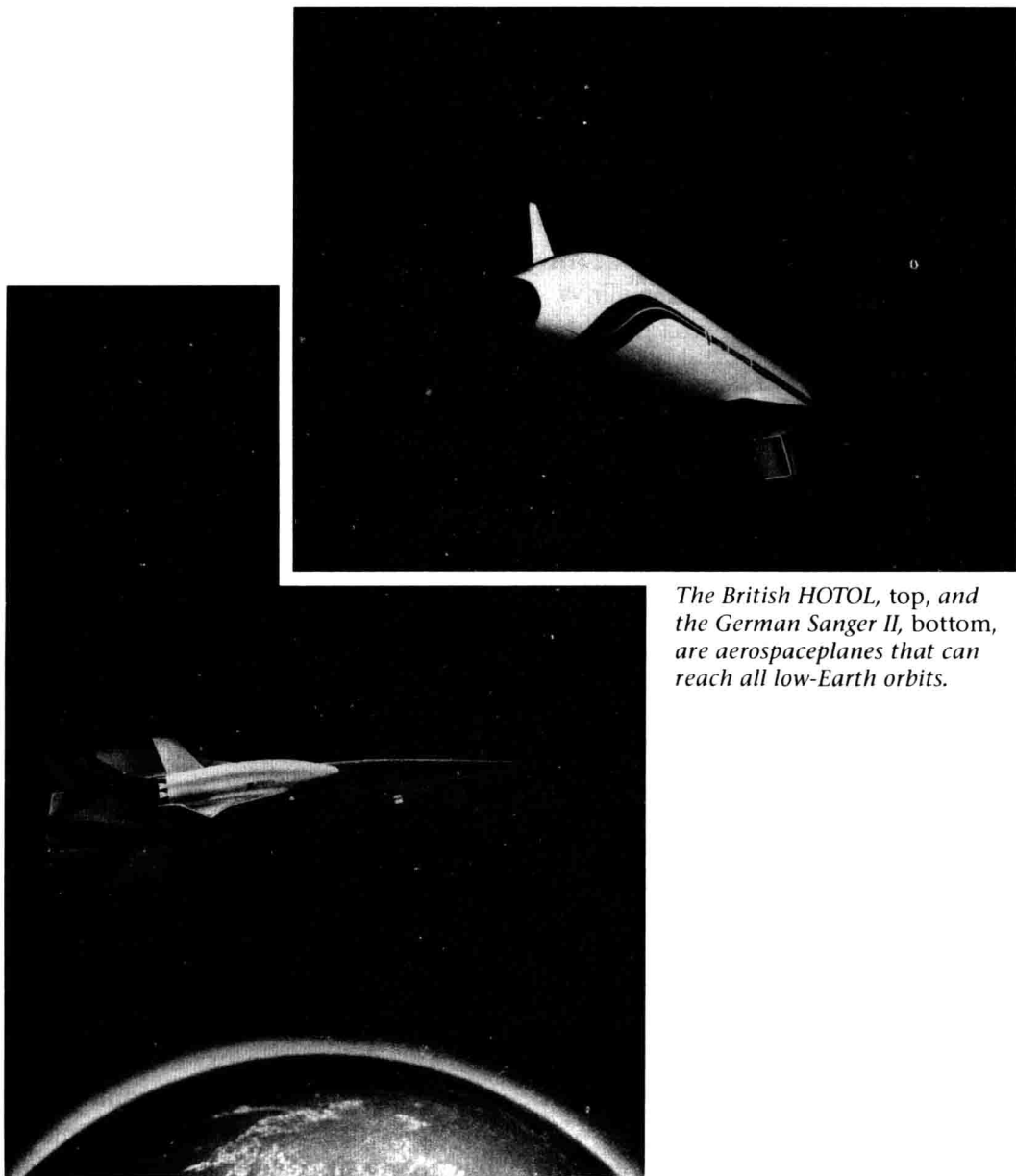
Design of the Aerospaceplane

Generally, the current designs for aerospaceplanes look a lot like the Concorde SST, with a long, needle-like nose, sharply swept-back delta (triangular) wings, and engines tucked under the fuselage, or body. This shape works well at the very different speeds the craft must fly: a couple of hundred miles (or kilometers) per hour during takeoffs and landings and several thousand miles (or kilometers) per hour when cruising long distances.

The wings of the aerospaceplane

would be steeply swept back to keep them inside the cone of the shock wave created when the plane's nose cuts through the air. The plane may even have a *blended* wing and fuselage. That means the flat-topped fuselage shape would merge with the wing. It would be hard to tell where one stopped and the other began.

The aerospaceplane would also need unusual engines. The Concorde SST uses fairly ordinary turbojet engines, much like those on any modern jet airliner. Turbojet engines don't use much fuel, but they can only work well up to about Mach 5. Rocket engines can operate at almost any speed in airless space, but they use tremendous amounts of fuel. An aerospaceplane has to fly at a very high speed and



The British HOTOL, top, and the German Sanger II, bottom, are aerospaceplanes that can reach all low-Earth orbits.

The X-15 in its Mach 6.7 configuration



altitude, but if it used huge amounts of fuel, it would be too expensive to fly. Clearly, some new kind of engine is needed.

The SCRAMJET engine may solve the problem. It would be built right into the underside of the aerospaceplane and would use sections of the airplane as part of the engine. As the air passed under the front part of the fuselage, it would be slowed and then compressed. It would then enter the engine nacelle, or housing, where it would be mixed with fuel and exploded. The terribly hot exhaust would shoot

out the back of the engine and be shaped for maximum thrust by the rear part of the fuselage bottom. If the SCRAMJET engine works as well as engineers hope, it could be the answer to a lot of problems connected with flying at very high speeds.

Operation of the Aerospaceplane

The aerospaceplane would work much like today's airliners—not like the space shuttle, which requires millions of dollars worth of special equipment

and a crew of hundreds of people to prepare it for launch. The aerospaceplane would load up, taxi out to the runway, turn its engines up to full power, take off, and head directly for space. After hours or days at extreme altitudes, it would fly back to Earth and land on the same runway it had used for takeoff.

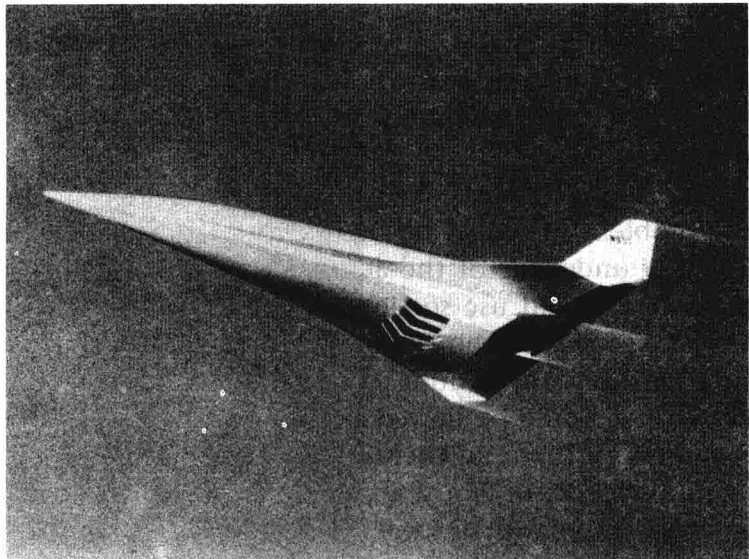
Although there would be scientific and military uses for them, aerospaceplanes could also be used as commercial airliners. An aerospaceplane used as an airliner would be called a *hypersonic transport*. It would cruise at hypersonic speed, which is over Mach 5. Such an

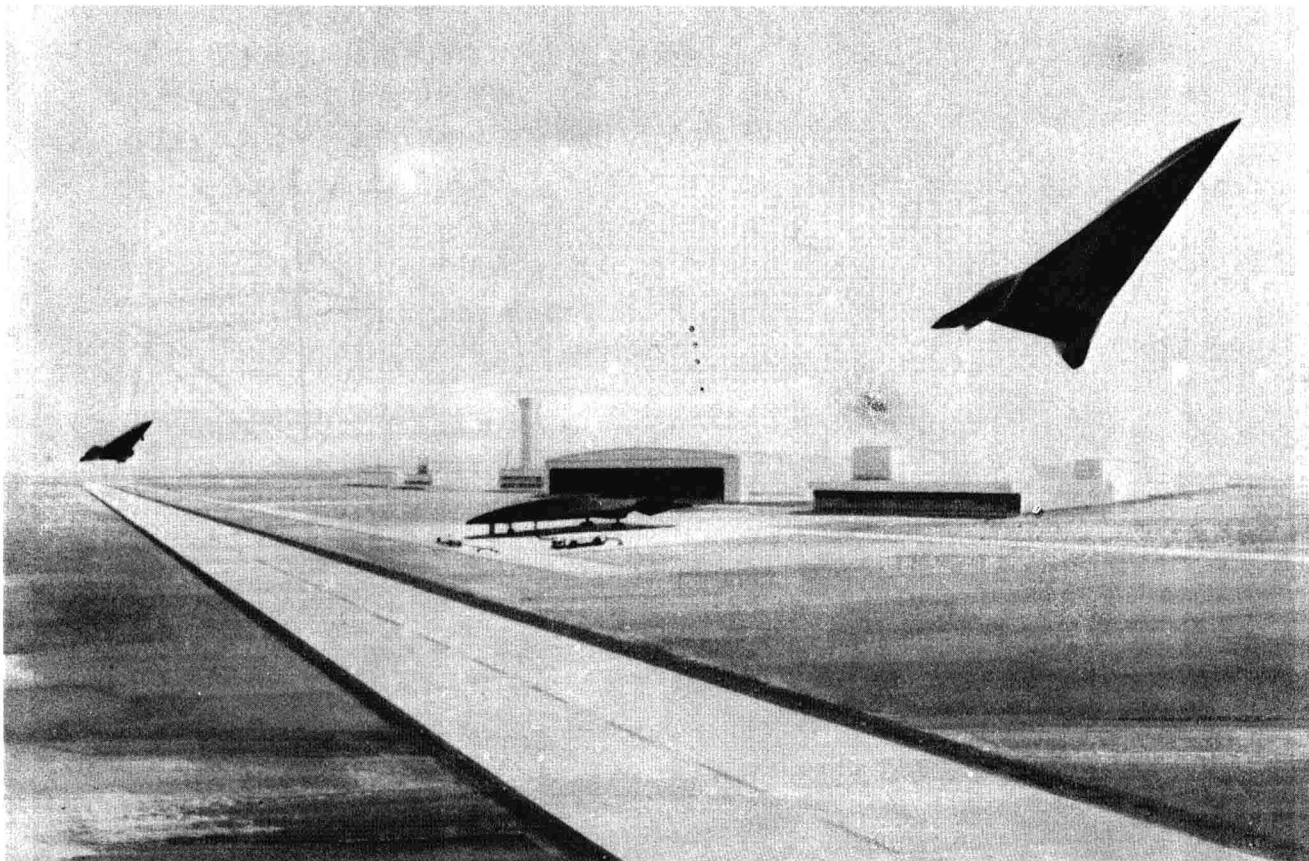
airliner may cruise as fast as Mach 12 in the atmosphere and as fast as Mach 25 in orbit. It would be able to carry at least 200 passengers on very long flights, such as across the Pacific Ocean. It wouldn't make sense to use an aerospaceplane for short trips because it would have to spend most of the flight at low speeds and low altitudes, where it doesn't work efficiently.

Testing the Ideas

Before building a full-size aerospaceplane, ideas must be tested with research airplanes. The experimental X-30 is

This underside view of an aerospaceplane shows the engine inlets. This design has winglets at its wingtips to improve efficiency.





In this artist's rendition, the National AeroSpace Plane is used as an airliner. One plane is taking off, one is landing, and another is being serviced.

being built to test the planned design for the aerospaceplane and the SCRAMJET engine. The engine would use hydrogen fuel instead of the usual gasoline or kerosene used in other airplanes. The X-30 is due to fly in the late 1990s.

If it flies the way the supercomputers used in its design predict it will, then the United States would probably go ahead and build the first full-size National AeroSpace Planes.