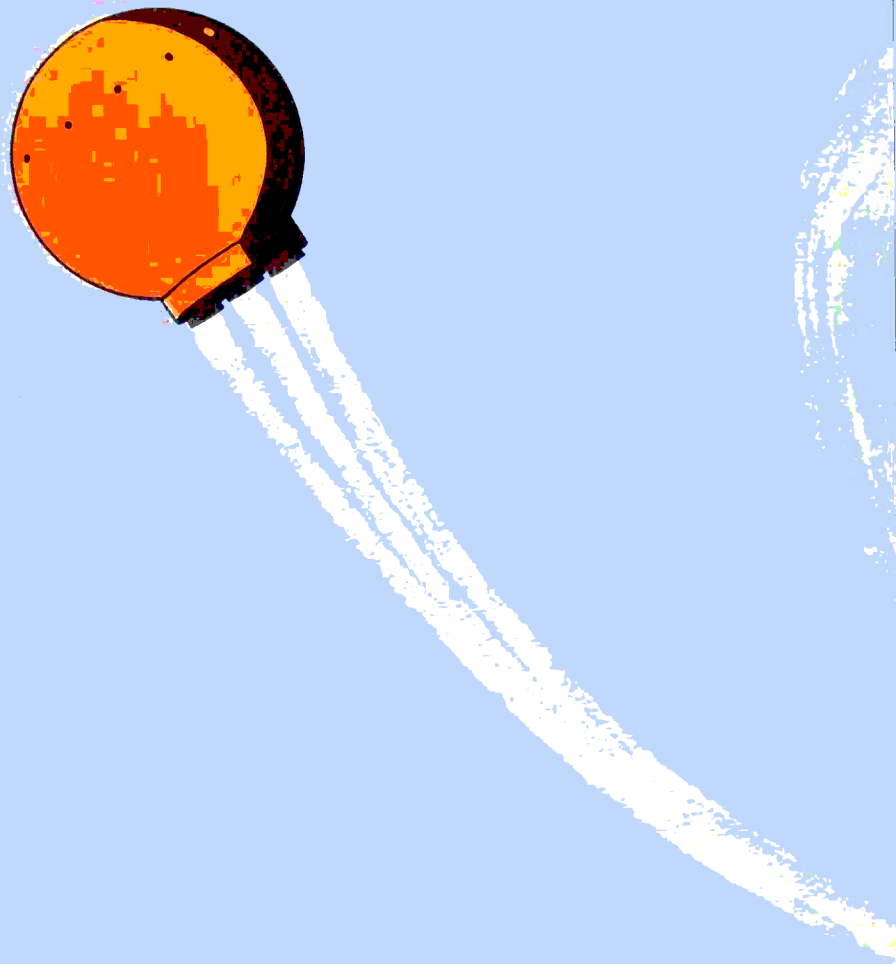
SPEEDING INTO SPACE



MARIE NEURATH

Speeding into Space



ISOTYPE FIRST PUBLISHED 1954 PRINTED IN GREAT BRITAIN BY GRAPHIC REPRODUCTIONS LTD.

Speeding into Space

Marie Neurath



LOTHROP, LEE & SHEPARD 419 FOURTH AVENUE NEW YORK 16 · NEW YORK A CHANTICLEER EDITION

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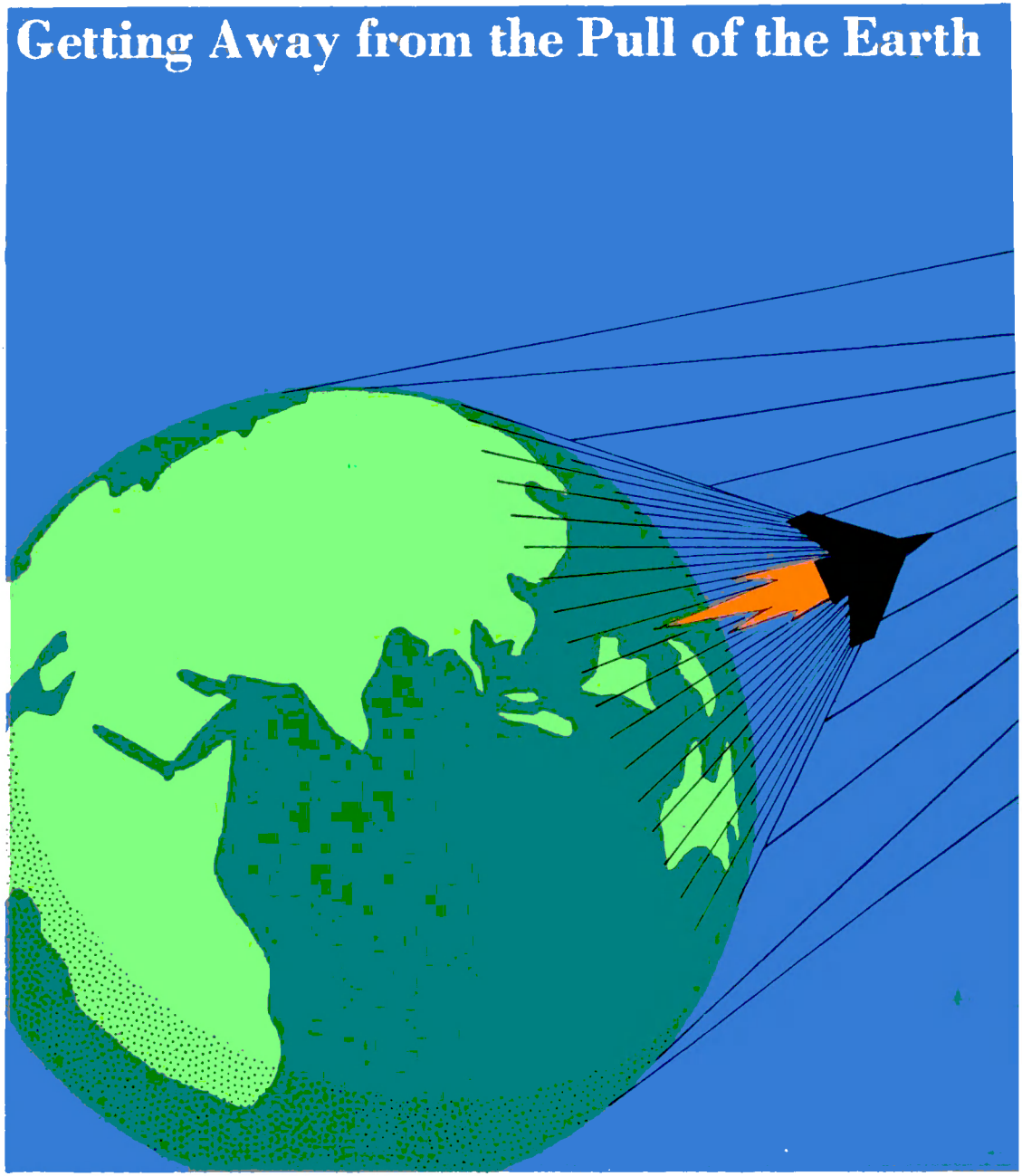
The pictures and text of this book have been carefully examined by Kenneth W. Gatland, a founder-member of the British Interplanetary Society and author of "Space Travel"

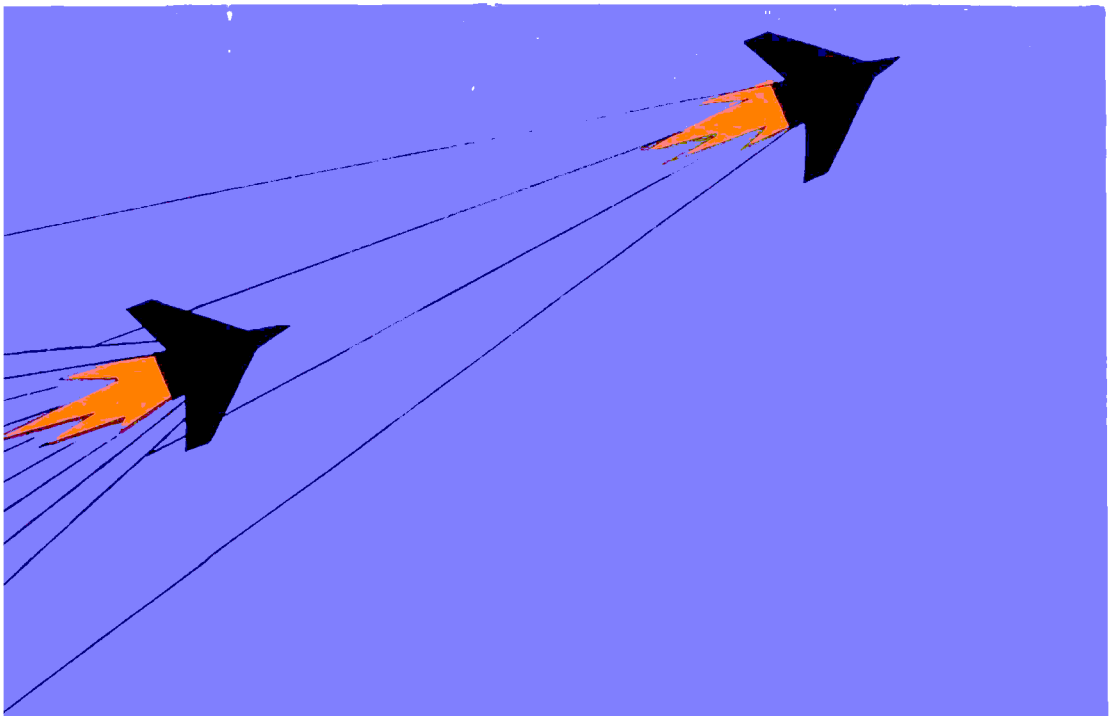
A Thousand Times Farther than Ever Before



Men have never yet travelled far from the Earth : a few feet on horse-back, a few miles in balloons and airplanes. No more. Double rockets have soared two hundred and fifty miles away but have never carried passengers. Even our Earth's nearest neighbor, the Moon, is a thousand times farther than that. Shall we ever reach it ?

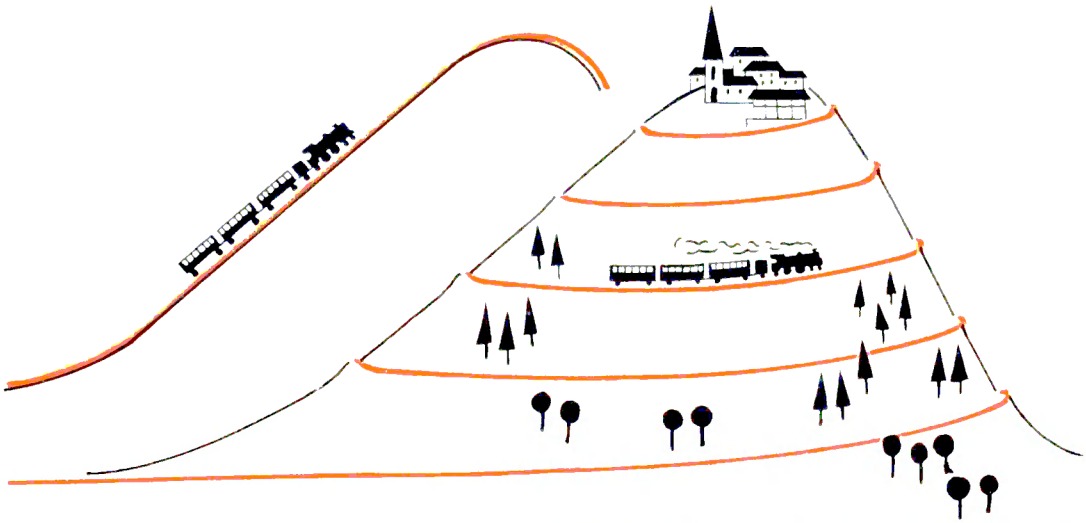
Getting Away from the Pull of the Earth



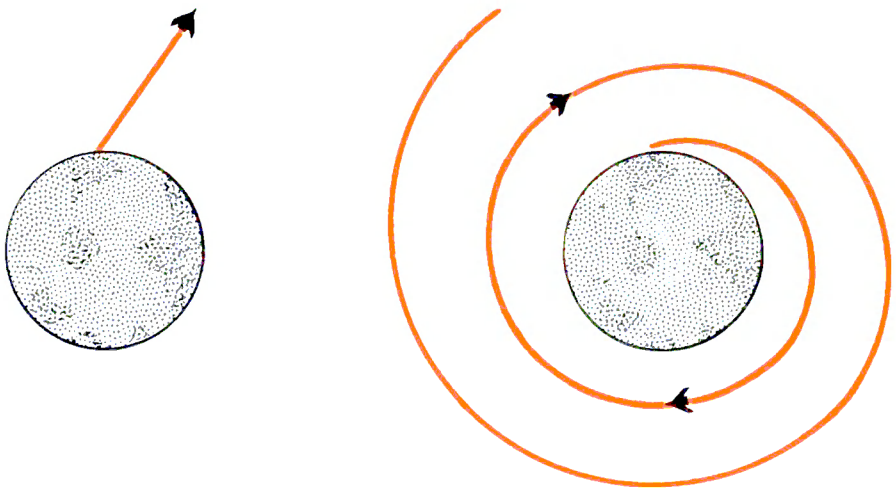


n this book we shall see how the journey may some day be made. The hardest art will be getting away from the Earth. When a space-ship first takes off, the Earth will pull strongly against it. It will need tremendous power and a great deal f fuel to overcome the Earth's pull. But the farther it travels from the centre of he Earth, the weaker the pull becomes. Twice as far away it is only a quarter as trong; three times as far away it is only a ninth part as strong.

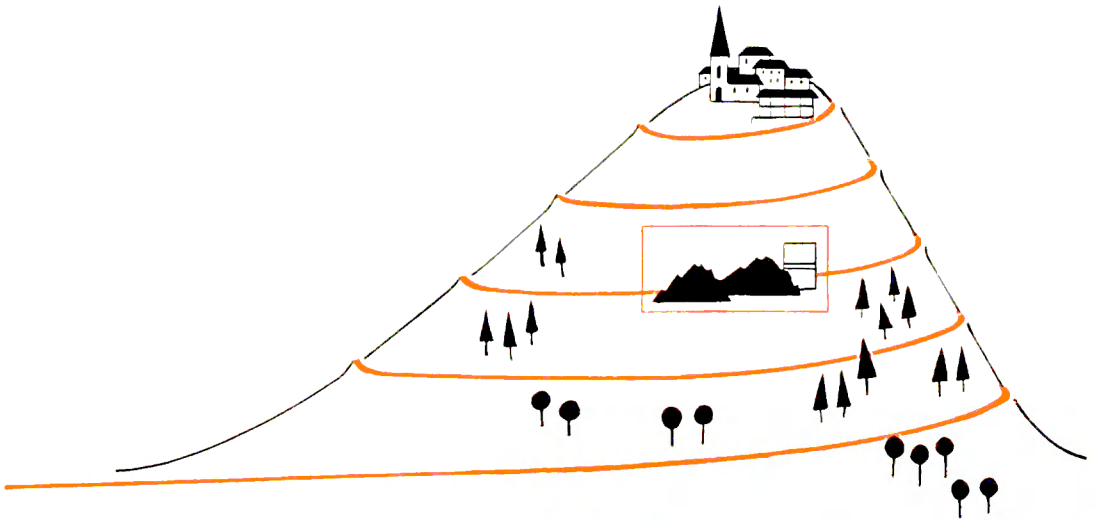
The Spiral Course that Makes the Clir



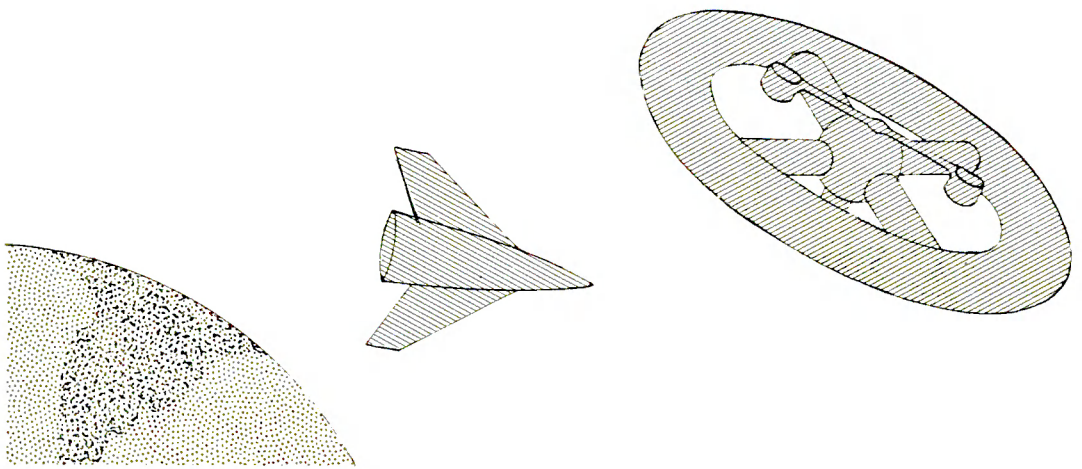
A train climbing a mountain also has to overcome the pull towards the centre of the Earth. It could never climb straight up the steep face, but by taking a long, spiral route it can reach the top. A space-ship might overcome the Earth's pull in the same way. Instead of flying straight up, it could travel in a spiral.



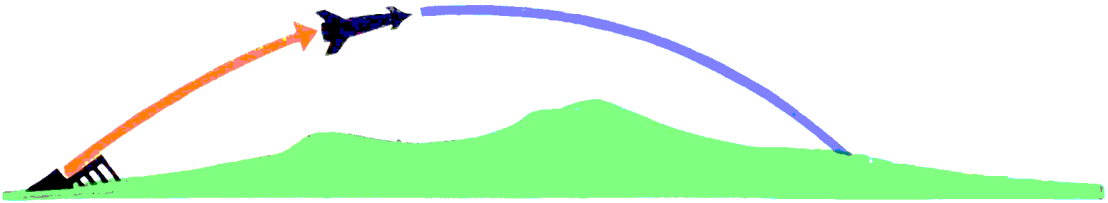
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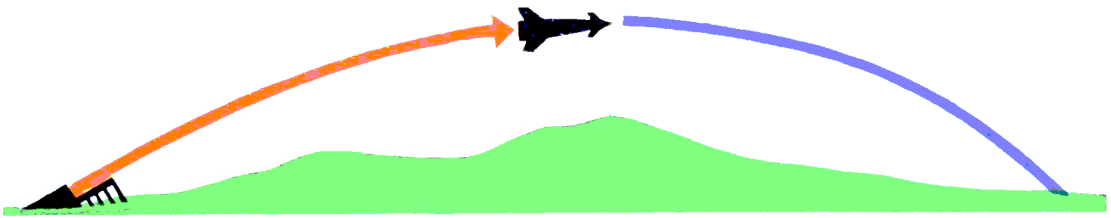
On the slope of a high mountain there is sometimes a station where passengers can change to another kind of train to complete their journey, and where fuel is stored. We shall see that it may one day be possible to build stations in space for the same kind of purpose.



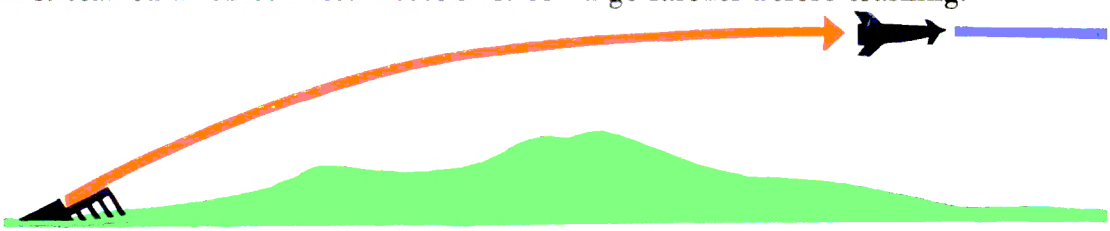
Flying too Fast to Fall



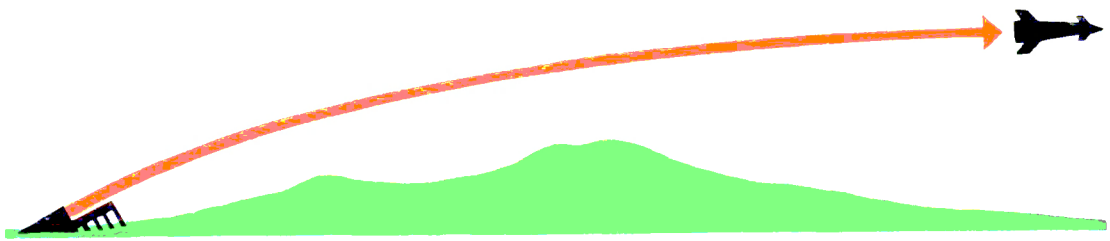
If this space-ship were to start off at two miles a second (which is seven thousand miles an hour), it would soon be pulled back to Earth.



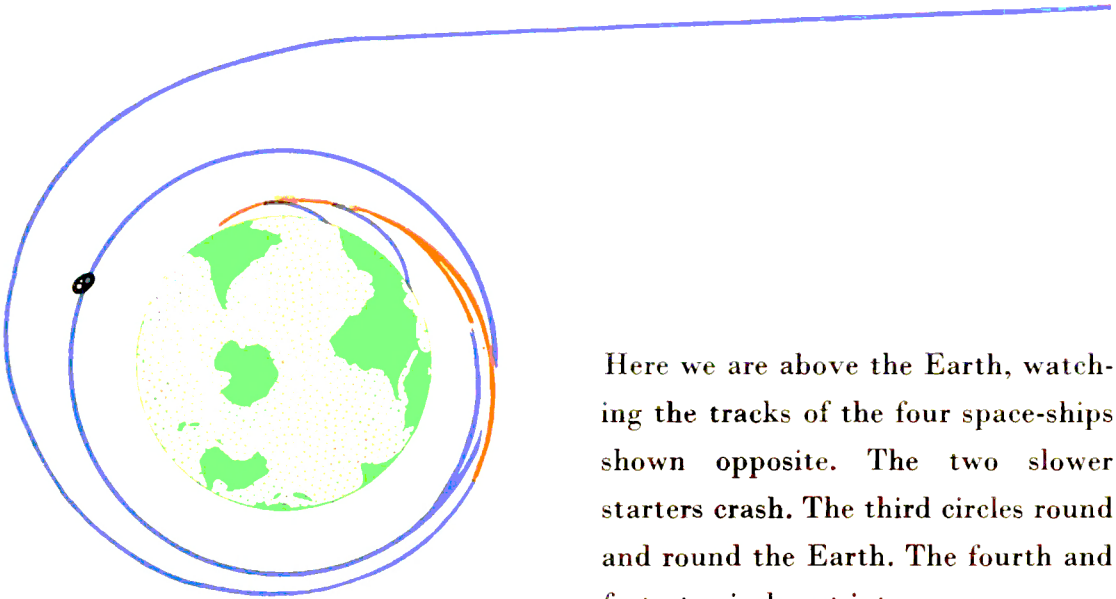
If it started at three miles a second it could go farther before crashing.



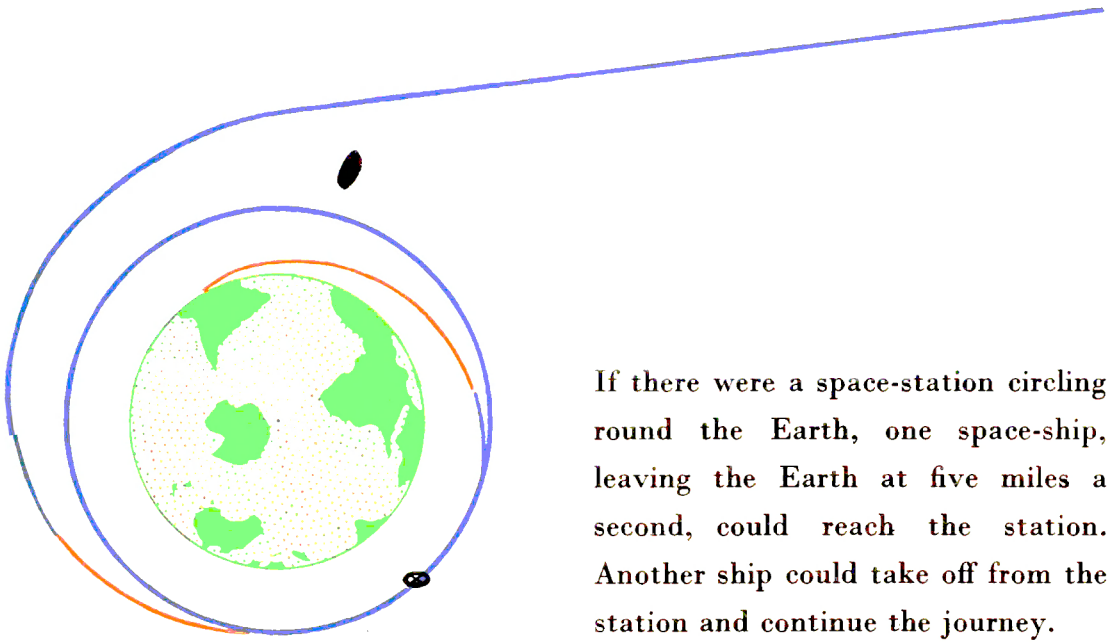
If it started at about five miles a second it could keep circling round the Earth just as the Moon itself does – *and with its engines shut off*.



If it started faster still, it could keep on moving farther from the Earth.

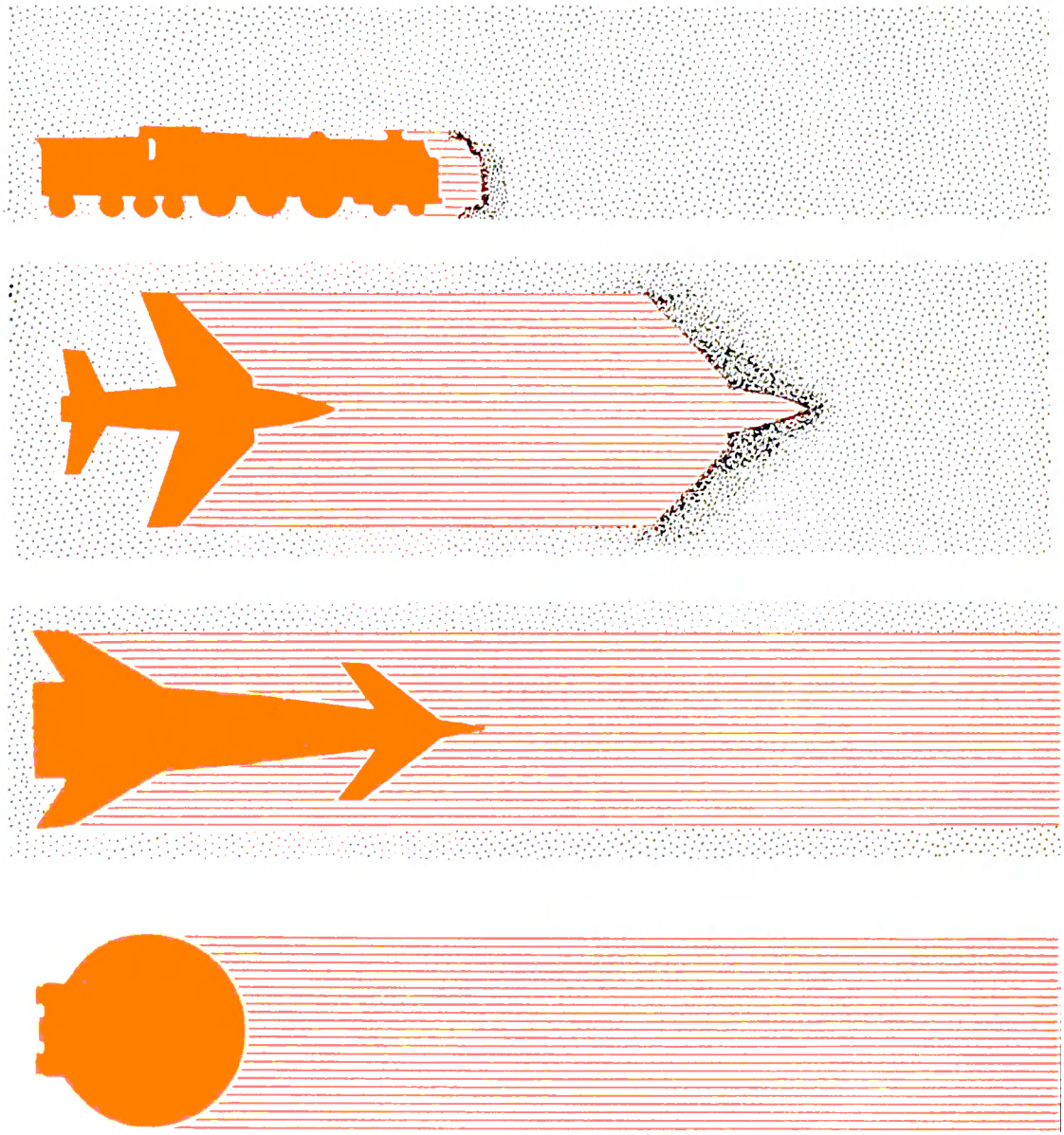


Here we are above the Earth, watching the tracks of the four space-ships shown opposite. The two slower starters crash. The third circles round and round the Earth. The fourth and fastest spirals out into space.



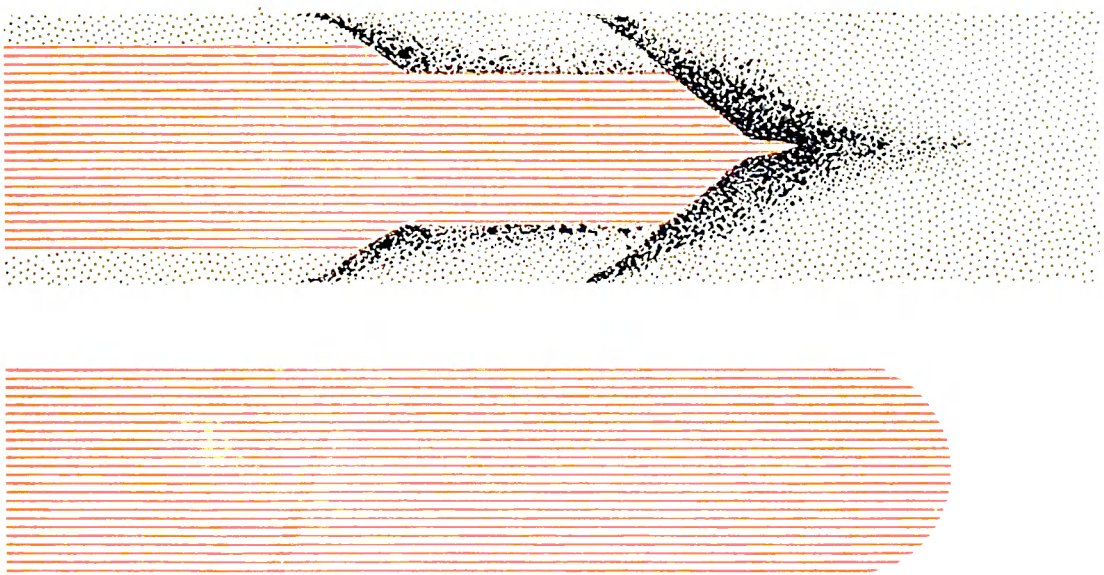
If there were a space-station circling round the Earth, one space-ship, leaving the Earth at five miles a second, could reach the station. Another ship could take off from the station and continue the journey.

Shaped Like an Arrow to Cut Through t

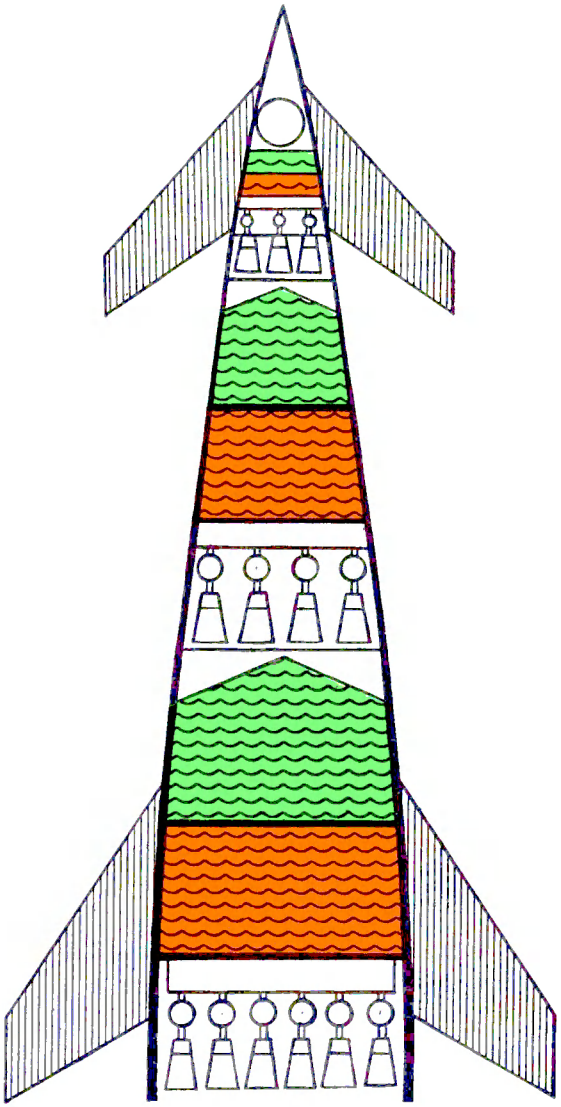


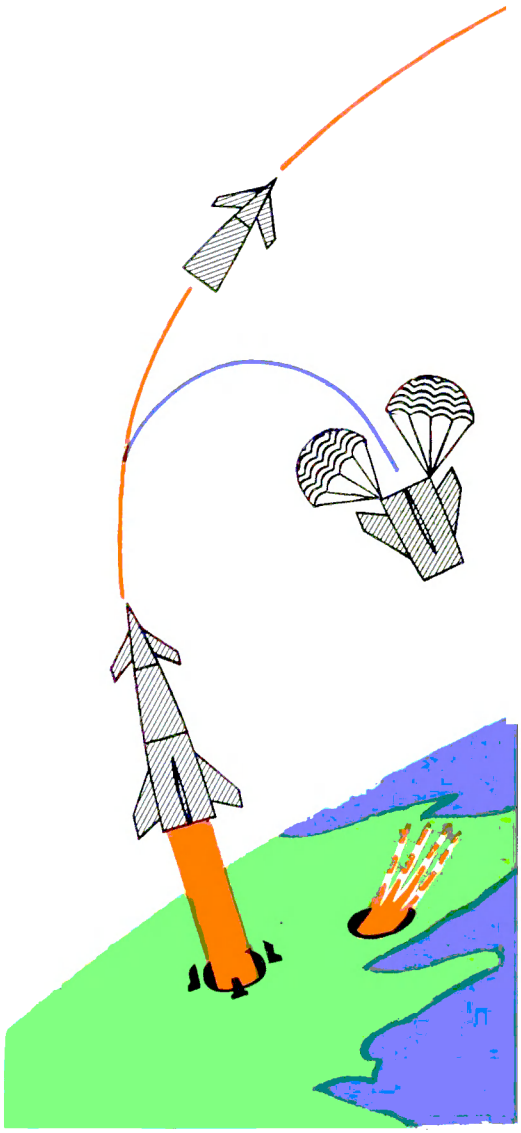
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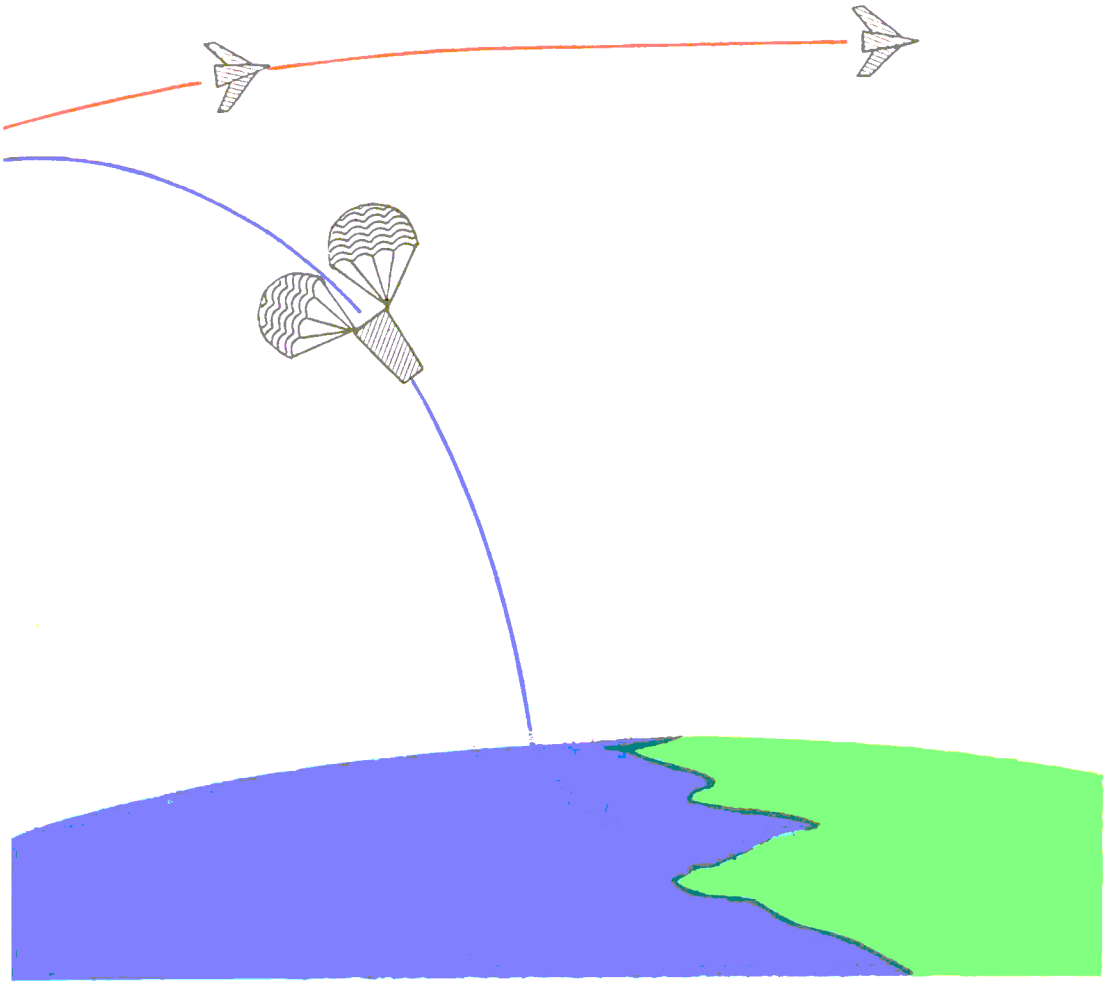
Sometimes when a wind is blowing we have to work hard to walk against it. An express train has to work hard to push through the air even where there is no wind. If the fastest trains and motor cars are made smooth, or streamlined, their task is easier. A jet plane flies so fast that it must work very hard, and a space-ship, when it leaves the Earth, will cut through the air so quickly that it must work much harder still. So the jet plane and the space-ship are shaped like an arrow, to help them to cut through as easily as possible. But a ship taking off from a space-station to continue the journey would travel only in empty space and would not have to work against air at all. It could be any shape we liked to make it.



Dropping the Fuel Tanks to Lighten the Lo

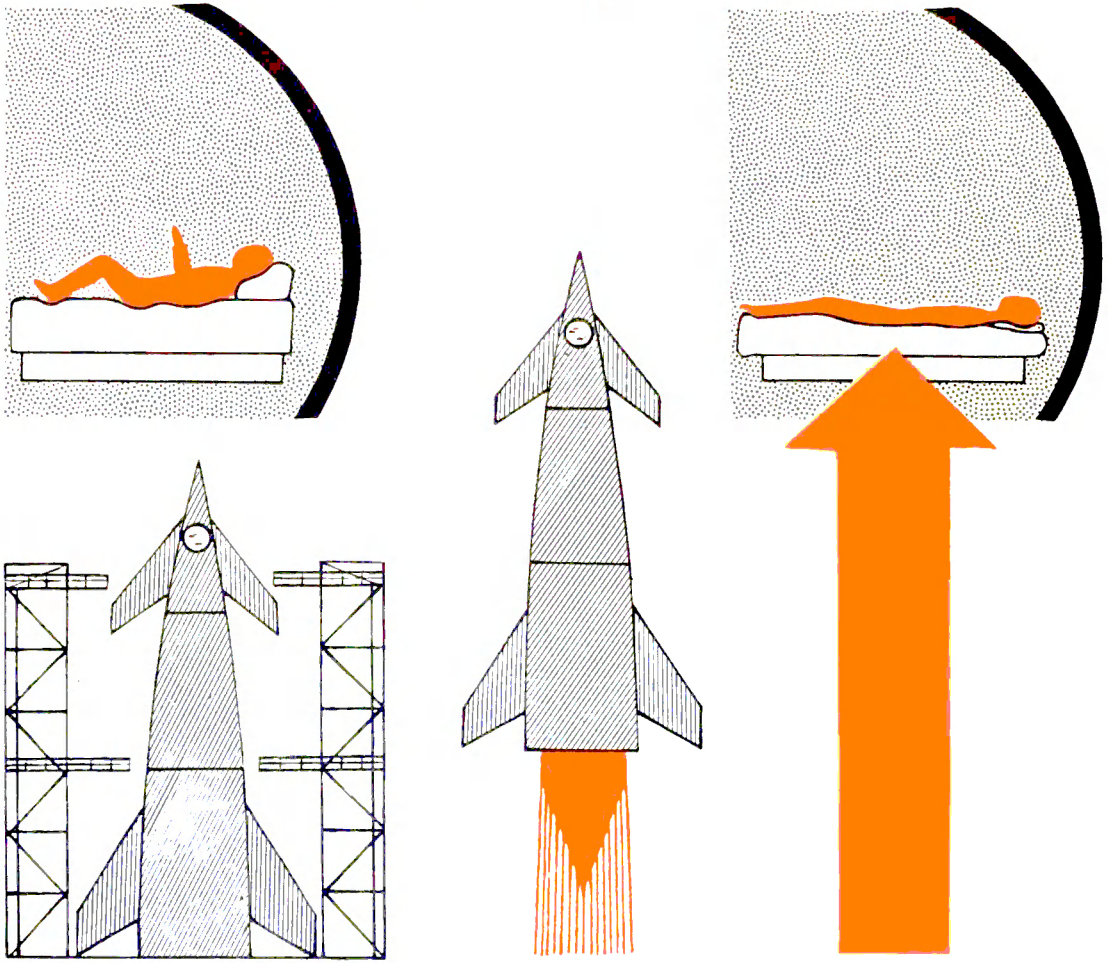




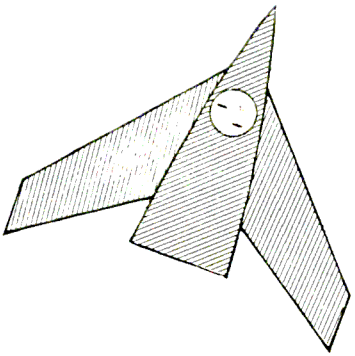


As a space-ship takes off, a great jet of hot gases will rush from its engines. A channel cut through the ground will lead the gases safely away. To overcome the first strong pull of the Earth, the ship will carry huge quantities of fuel (and oxygen for it to burn with) stored in six separate tanks. As the two larger double tanks become empty they will break off and glide to Earth on parachutes, leaving the ship much lighter. By then the ship will be far away, where the Earth's pull is weaker. The fuel and oxygen in the smallest tank will be all it needs.

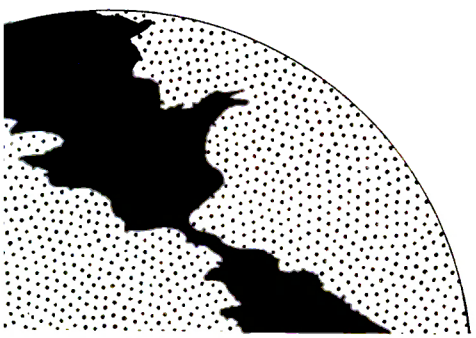
When a Man Will Weigh Nothing at All



Lying on his bunk before the trip begins, a man will be pressed against the mattress by the pull of the Earth. Suddenly, with a roar, the ship will rise into the air. The bunk and the mattress will be jerked upwards with the ship, and the mattress will press against the man, making him feel heavier.

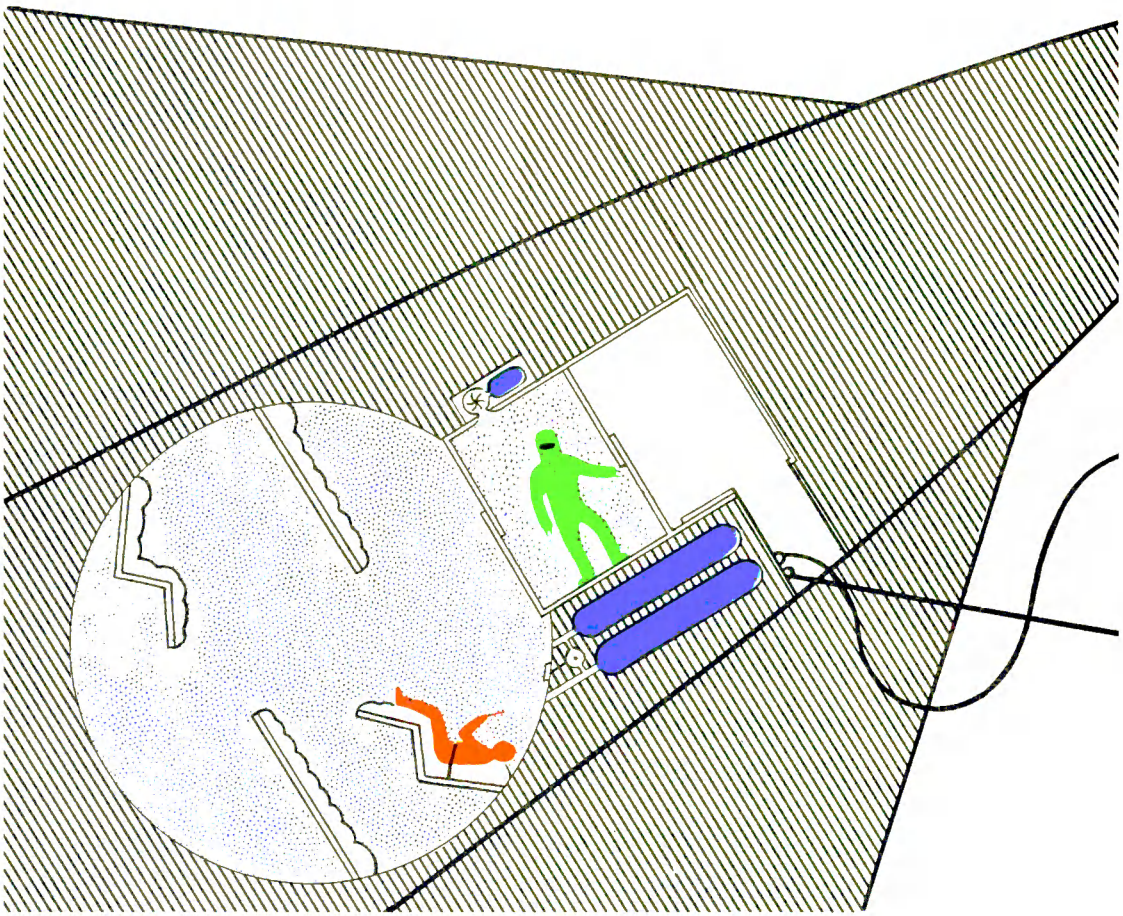




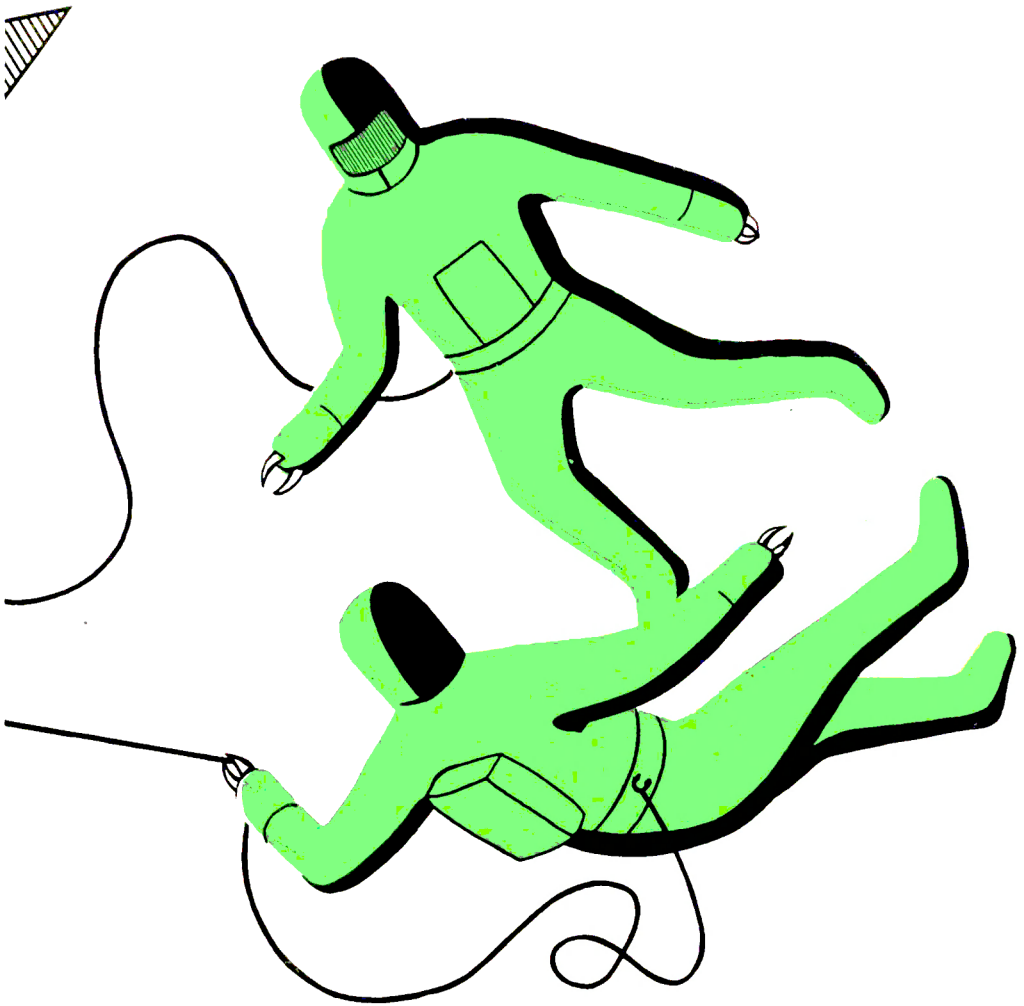


Once the ship is moving so fast that the Earth's pull cannot draw it back, it will keep up that speed without its engines, because there will be no air around it to slow it down. The man inside the ship will be moving at the same speed and the Earth's pull cannot draw him back either. He will not press against the mattress and the mattress will not press against him. He will feel no weight at all. To move, he will have to push against the wall or against something fixed to the ship.

Stepping Out into Empty Space

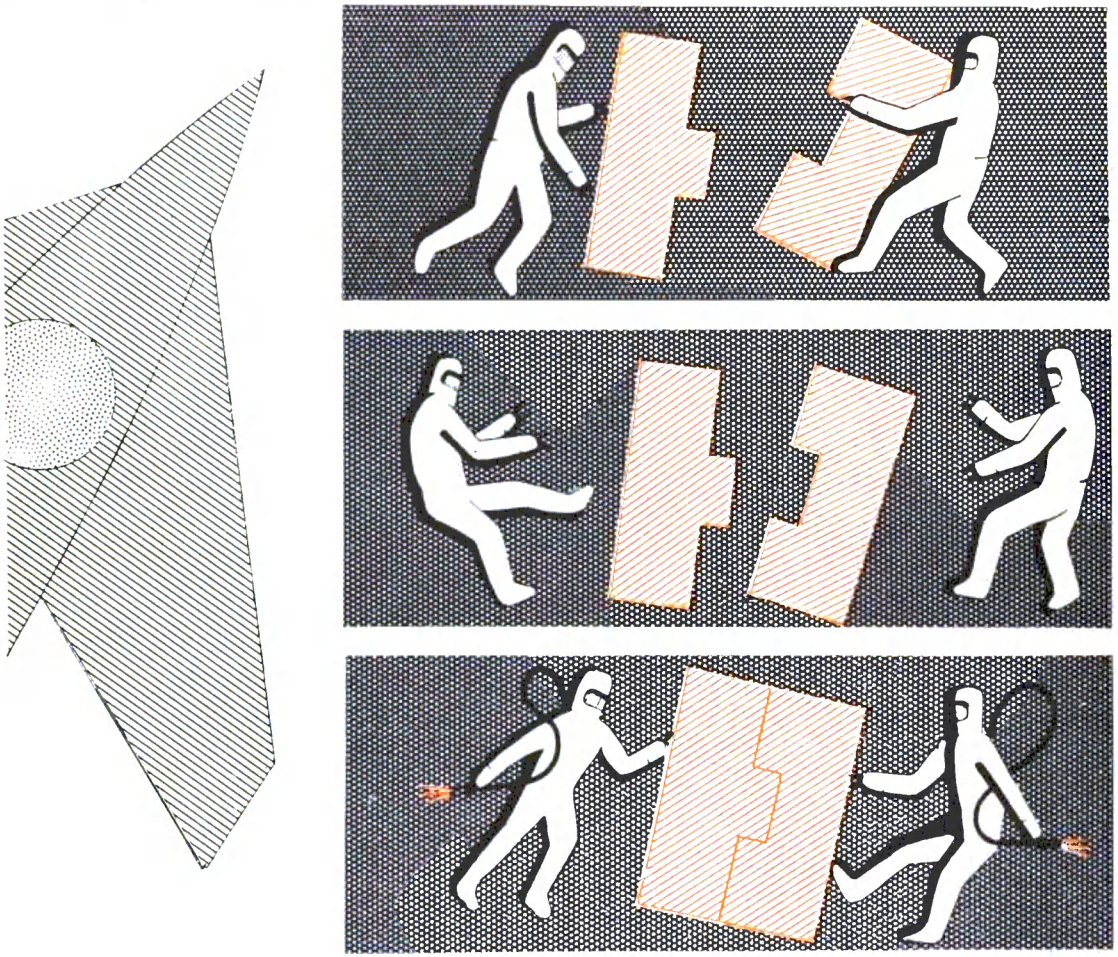


Even if a man leaves the ship he will go on moving at the same speed as the ship. Yet he will not notice he is moving, for he will pass nothing which is standing still and there will be no wind rushing past. But if somebody throws a ball at him he may float off never to return. He must be tied to the ship by a rope. Since the rope has no weight it may curve in any direction.



No man dare step out just as he is. Inside the ship he has air to breathe. Outside there is nothing. So first he enters a room with a door at each end and puts on a strongly built suit, rather like a diver's, with air inside it. Then, closing the second door behind him, he passes through another room and out into space. Thus very little air escapes from the ship.

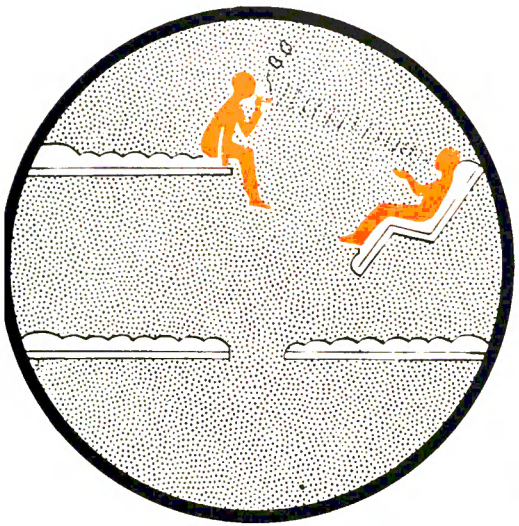
Firing a Pistol to Move About



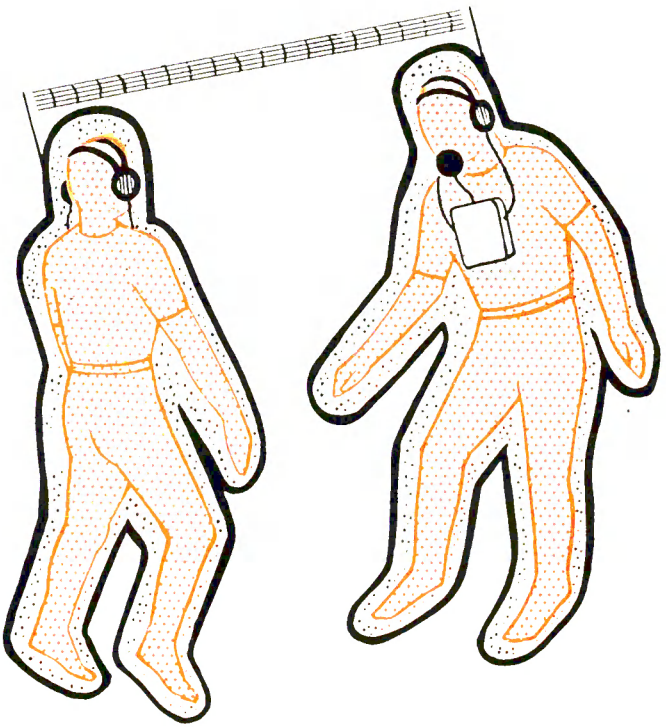
How can people build a station in space, where everything behaves as if it had no weight? If a man pushes a piece of metal forward, he will be pushed backwards as well. To overcome this, he must fire a jet-pistol behind him. Then the man and the weight will move forward.

Speaking Where Voices Cannot Carry

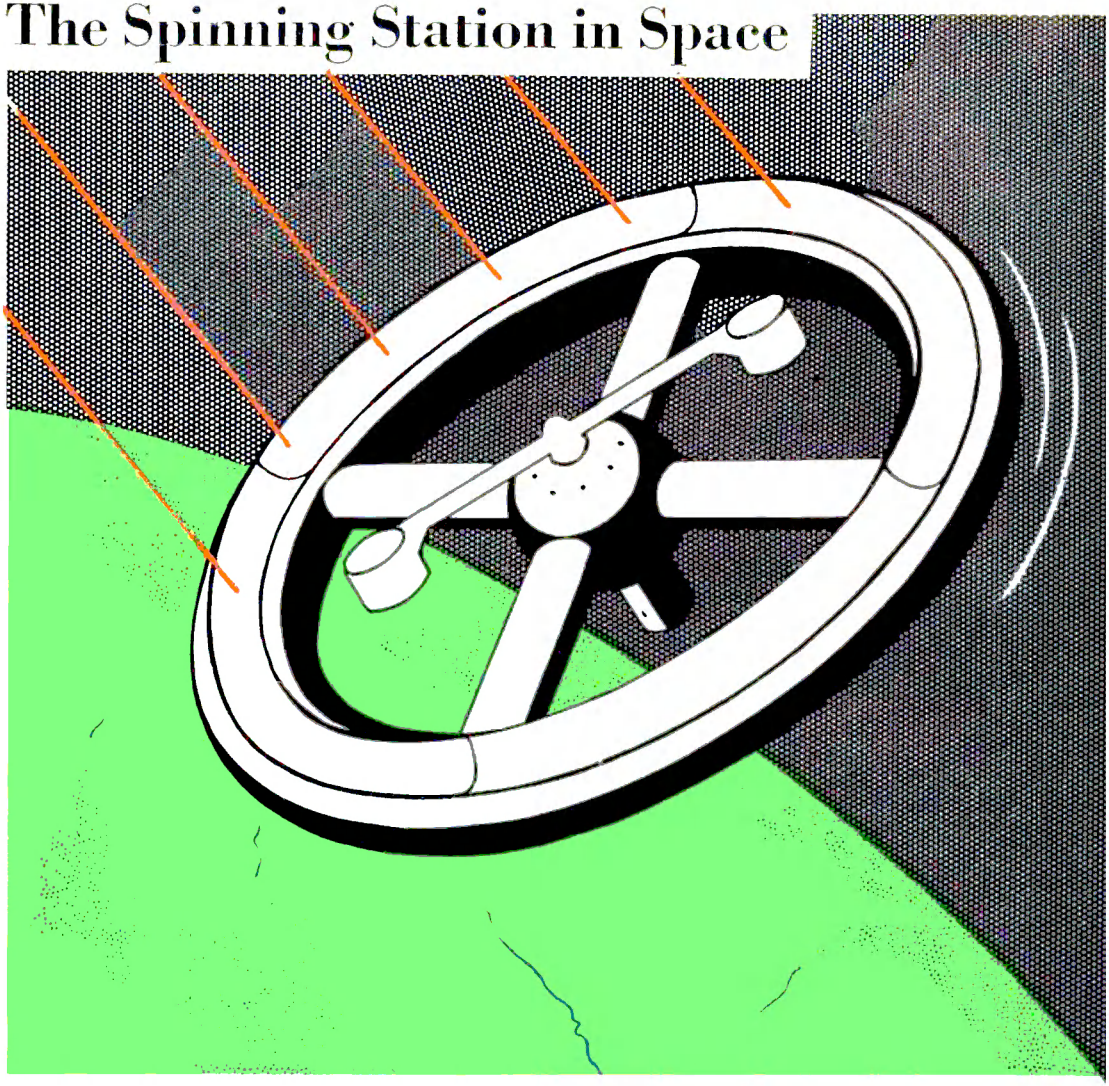
When we speak, the sound of our voices is carried by waves in the air. Inside a space-ship people will be able to speak to each other quite naturally, because there will be air. ("Good air", or oxygen, will enter the ship from a container; "bad air", or carbon-dioxide, will be drawn out.)



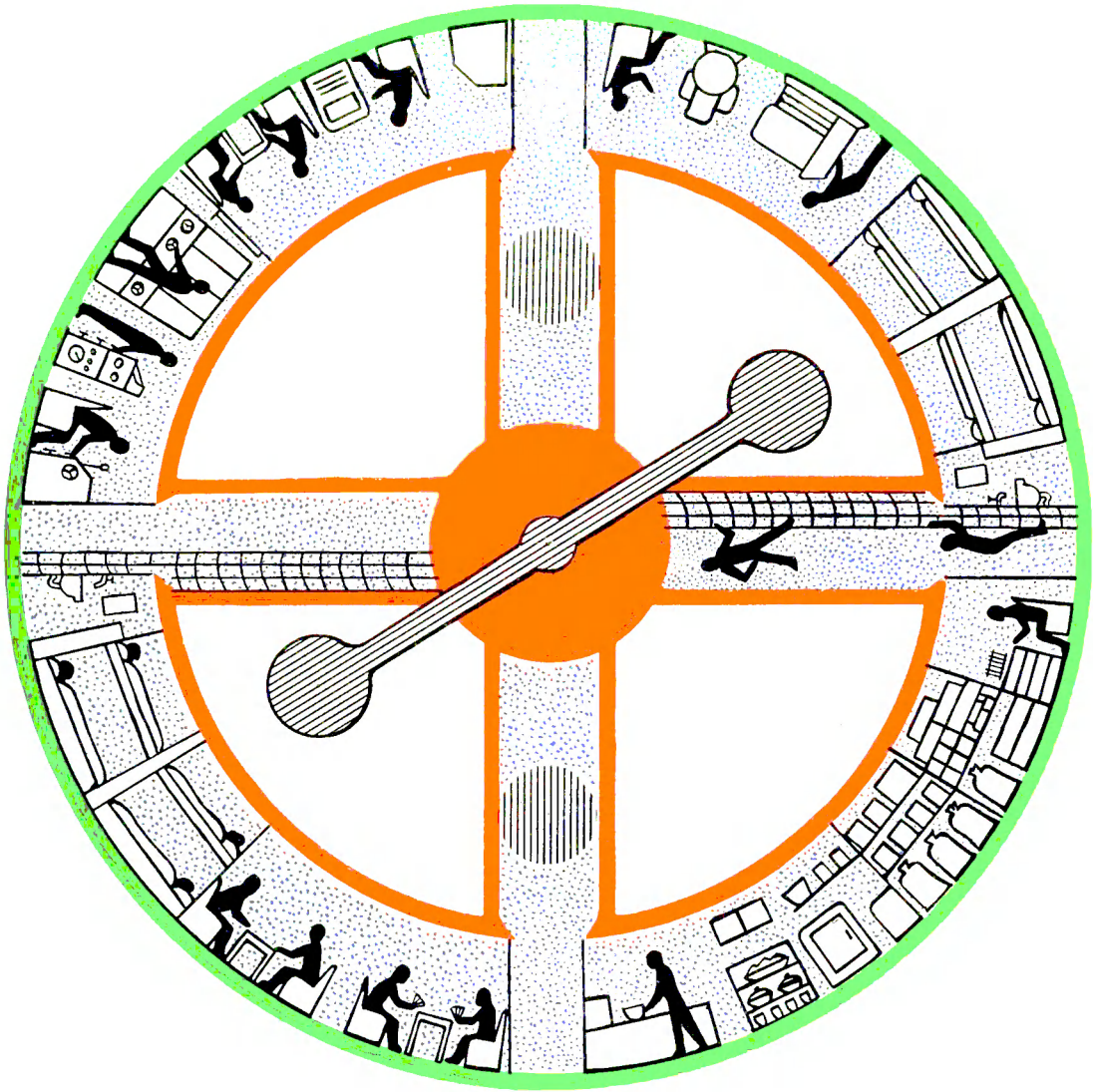
In space, where the builders of the station must work, the only air will be that inside their space-suits. Voices would carry no farther than the linings. To speak to each other, workmen will need walkie-talkie wireless sets. Then the sound will be carried by wireless waves, which do not need air to travel in.



The Spinning Station in Space

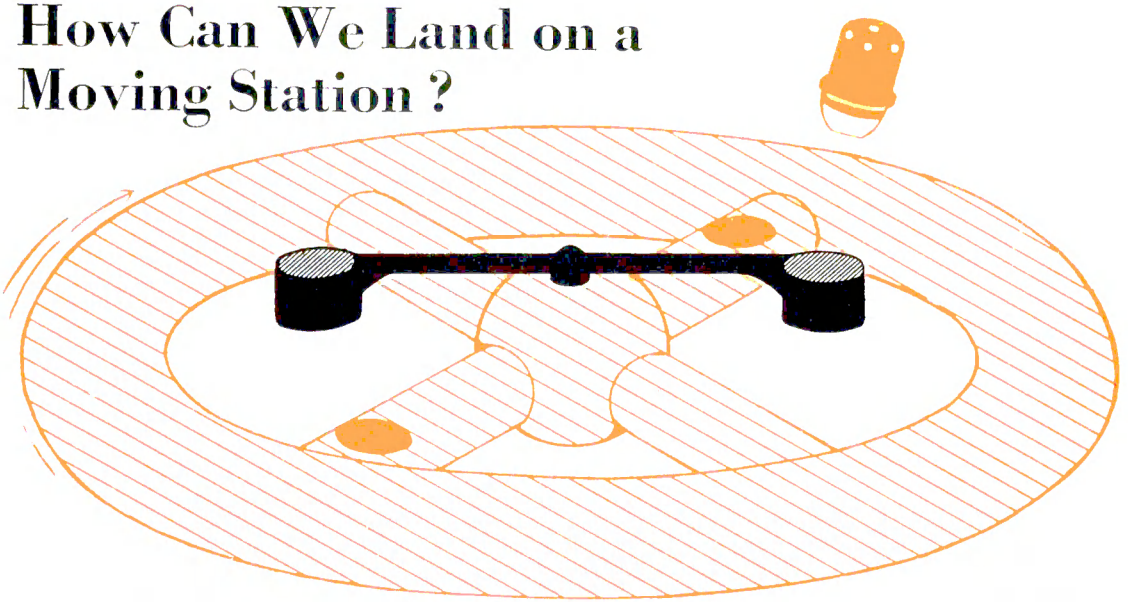


The completed space-station may look like the wheel of some gigantic car. Besides circling round the Earth it will also spin like a gramophone turntable. The long arm will *not* spin (we shall see why later). A huge mirror could collect heat from the sun's rays to be turned into electricity to use inside the station.

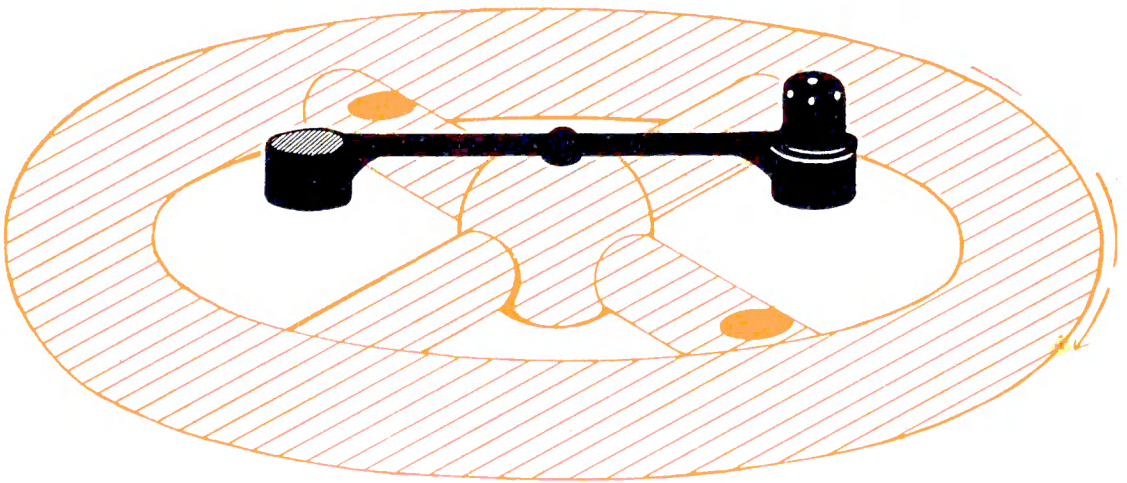


The spin of the station will push everything inside it towards the outer edge. People will feel weightless no longer, as they will while moving freely in space. They, and all the things they need to use, will be pressed firmly towards the "rim", which will serve as a floor. To reach the hub will be like climbing upstairs.

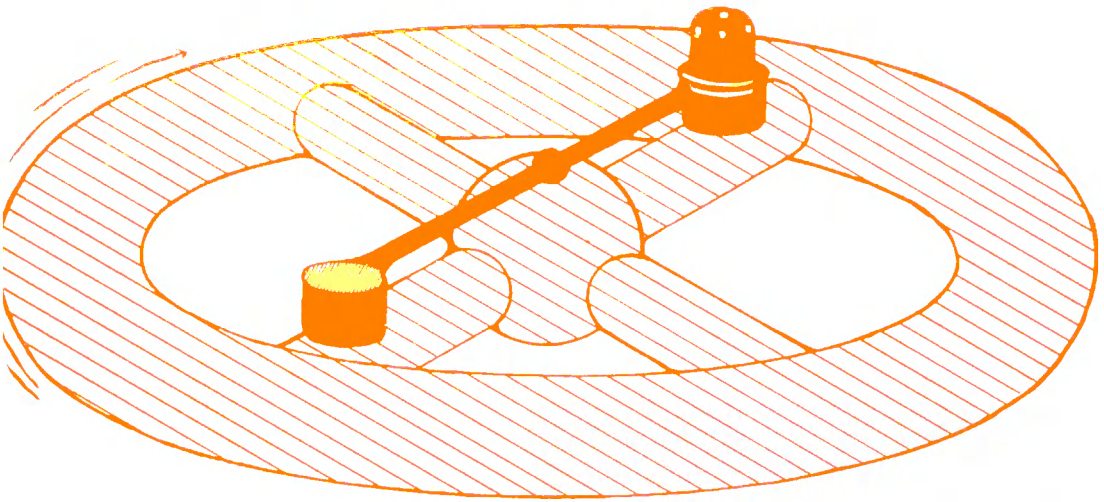
How Can We Land on a Moving Station?



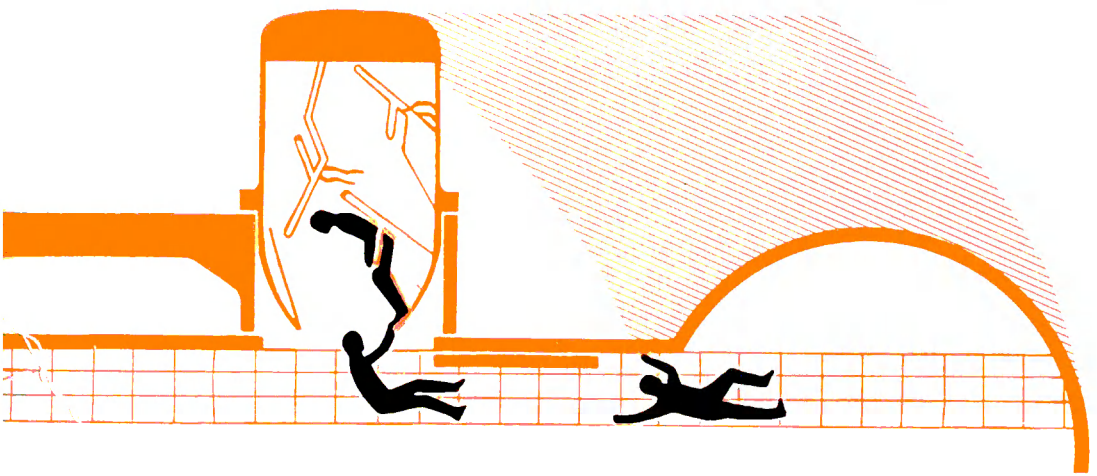
The arm which does not spin (shown black) is used for landing. Steering towards the cup-shaped part is a "space-taxi", carrying passengers from a ship.



Round the middle of the taxi runs a thick metal band. As the taxi goes nose-first into the "cup", this band presses tightly against the rim.

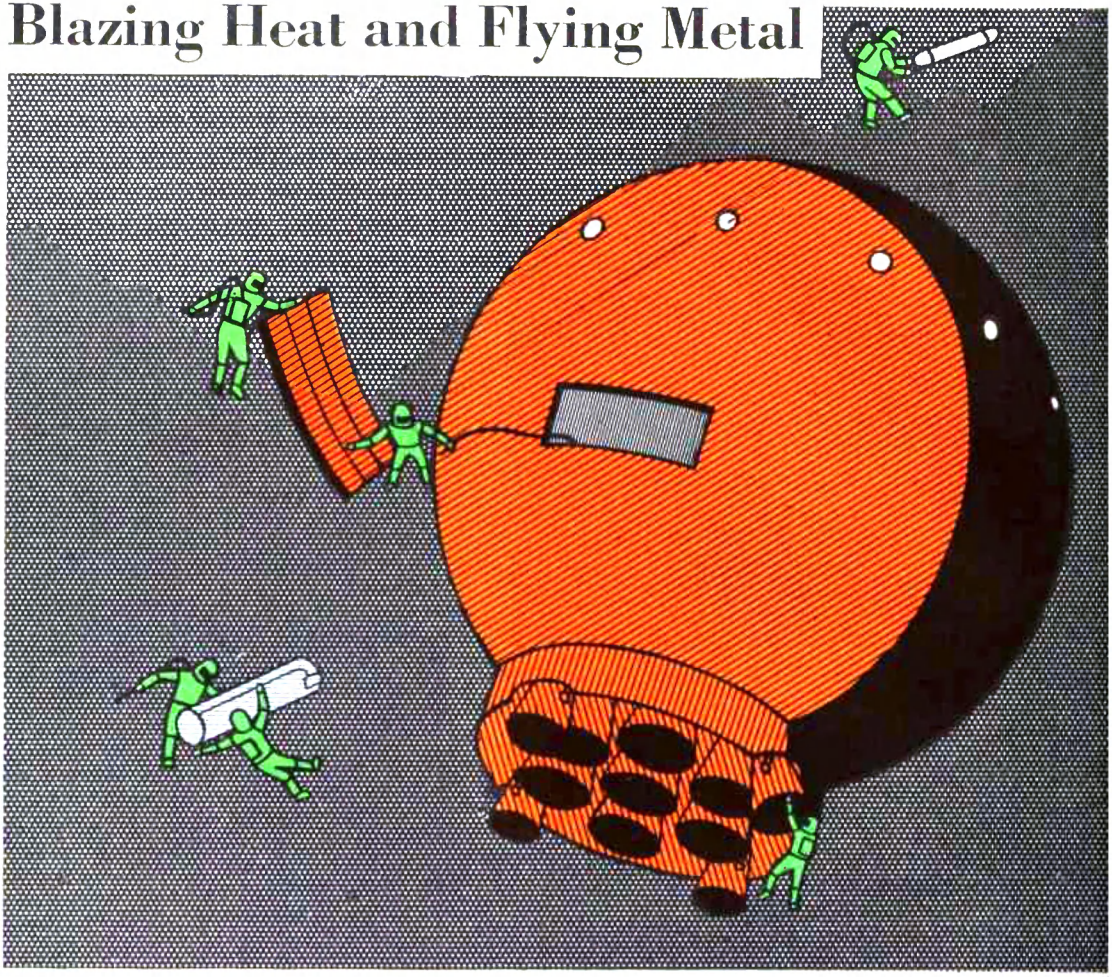


When the arm (now shown orange) is directly above one "spoke", machinery sets t spinning in time with the station. Doors open between station and cup.

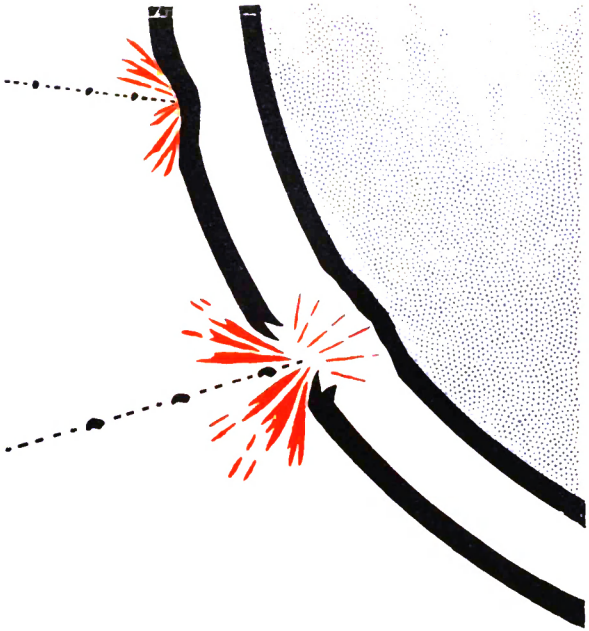


Air passing into the cup cannot escape into space because the taxi makes an air-ight fit. Passengers can safely leave the taxi and enter the station.

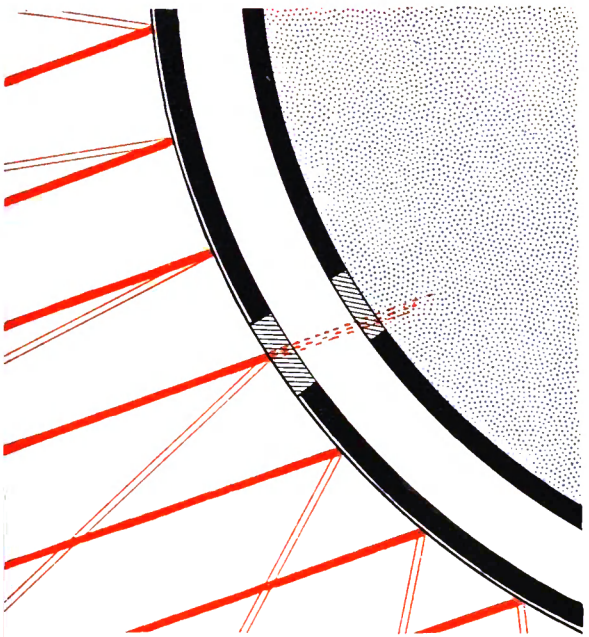
Blazing Heat and Flying Metal



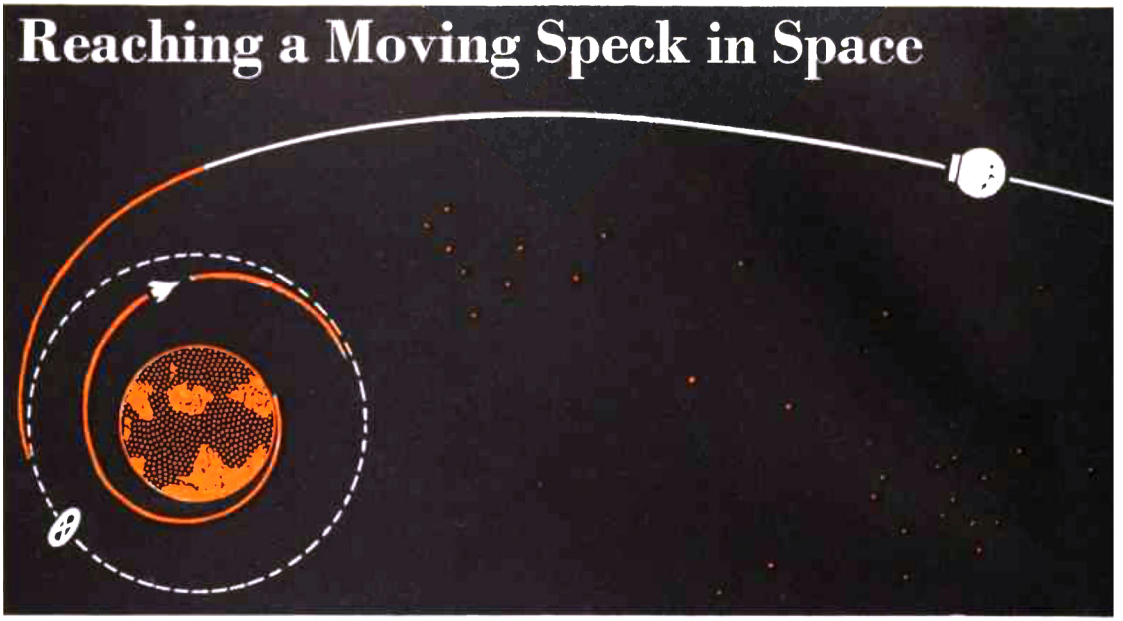
The ship which makes the second and longest part of the journey may look like a gigantic metal ball, with a cluster of rockets at its base. How could it turn? Some rockets could be on a swivel; the pilot could steer by changing the direction of the jets. A ship like this, which is not streamlined, could not be taken through the air round the Earth. So it would be put together, and fitted out with all the stores it needs, in space.



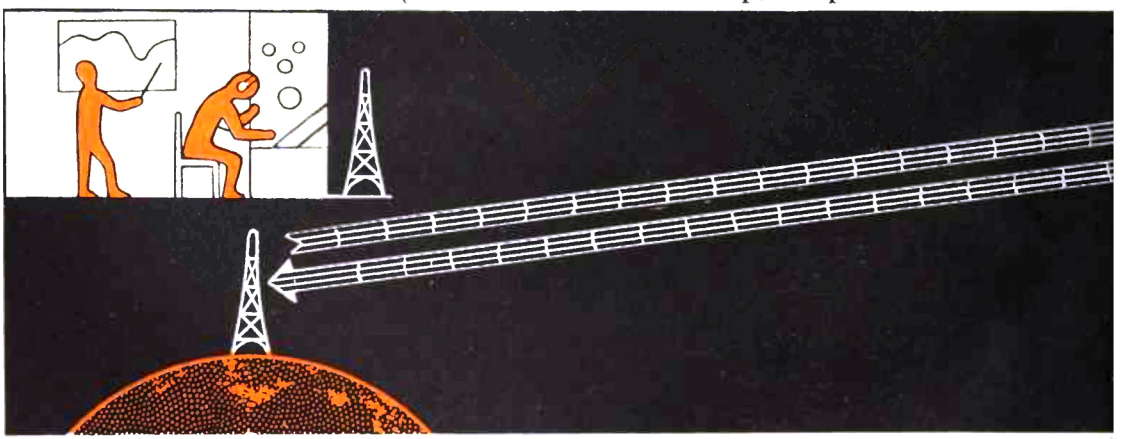
How could we guard against being hit by meteorites – bits of iron hurtling through space at high speed? We couldn't, but the ship could have a double wall. Most meteorites would not get through the outer wall, but some might pierce it. If so, most would be so worn away and slowed down that they could not break through the inner wall.



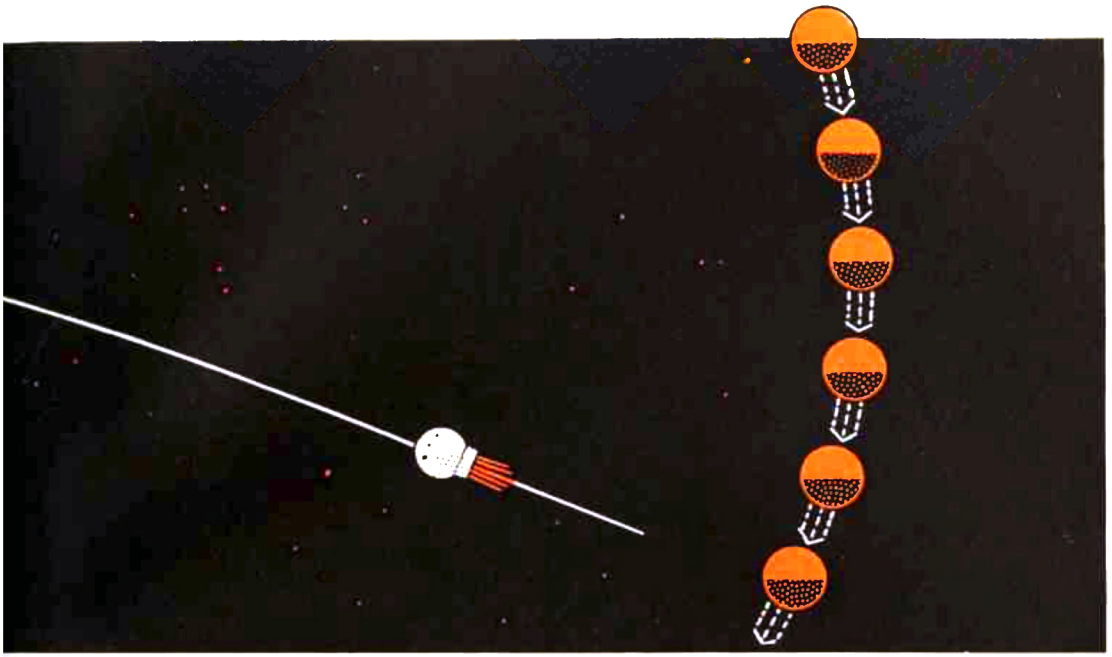
With no air to disperse them, the sun's rays would beat on the space-ship with great power. Although the ship's highly polished surface would reflect back much of the heat, the outer wall would still become too hot. To keep the ship cool inside there will be a vacuum between the two walls, just as there is in a Thermos flask. Small double windows will let in some light.



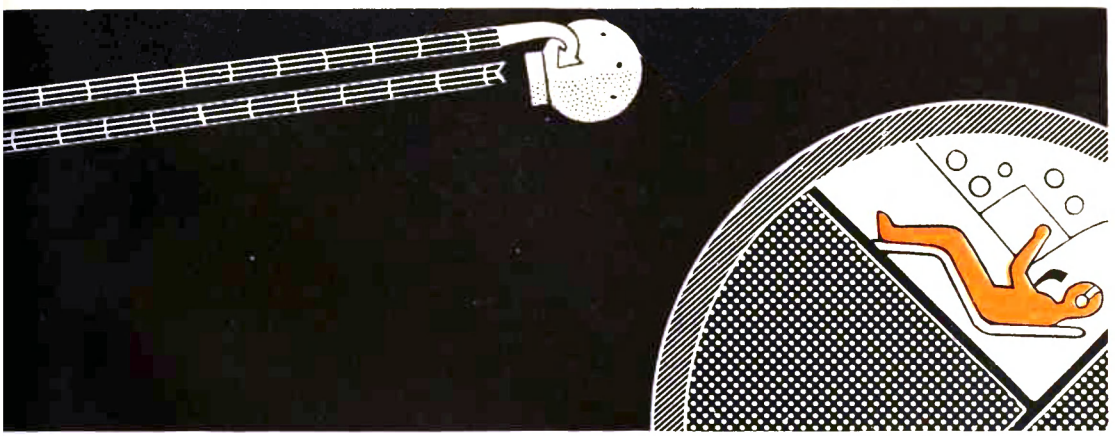
The long journey from space-station to Moon might take about five days. But during that time the Moon itself will travel many thousands of miles on its way round the Earth. Once the engines have started his ship, the pilot would not steer



In space the Moon is no more than a tiny, moving speck. If the space-pilot made even the smallest error in working out the Moon's position he might never reach it.

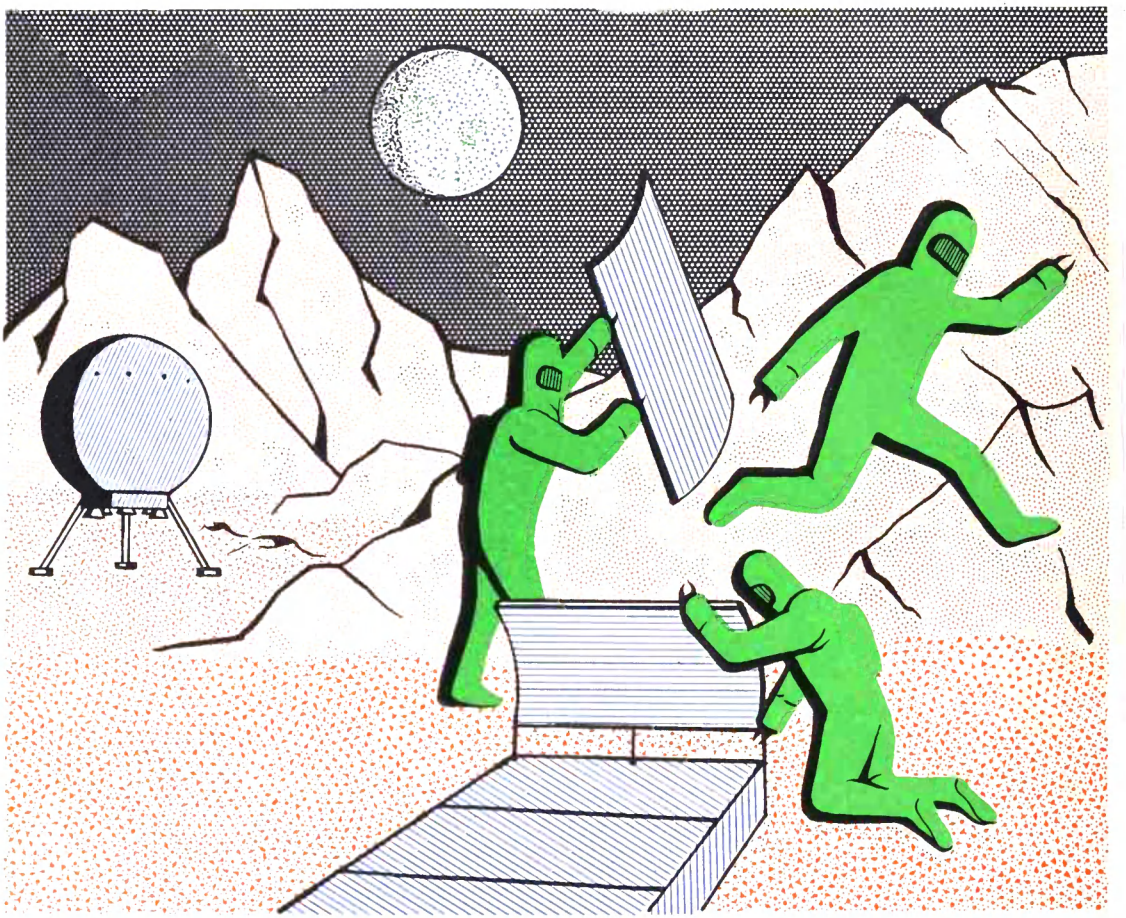


towards the point where the Moon was at the moment of starting, but to the point where it would be five days later. Before landing, the ship would reverse and use the thrust of its engines to stop it being pulled too rapidly to the Moon.



On the Earth, experts would check his figures with the help of modern calculating machines. He would keep in touch with them by radio.

Strange Worlds which Men May One Day S

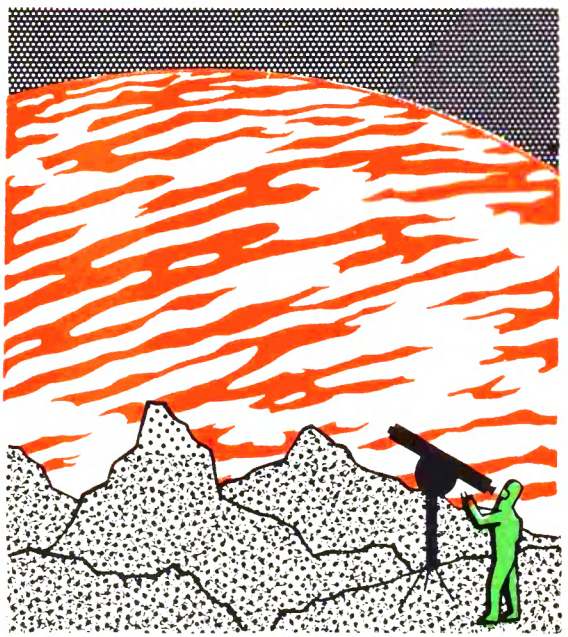


If travellers reach the Moon, what will they see and do there? Because there is no air, they can never take off their space-suits. And with no air to scatter the sunlight, the sky will look black, as everywhere in space, with our Earth shining in it like a huge bluish-green ball. The pull of the Moon is not nearly as strong as that of the Earth, so everything will seem lighter. People will carry with ease things which they could scarcely lift on Earth.

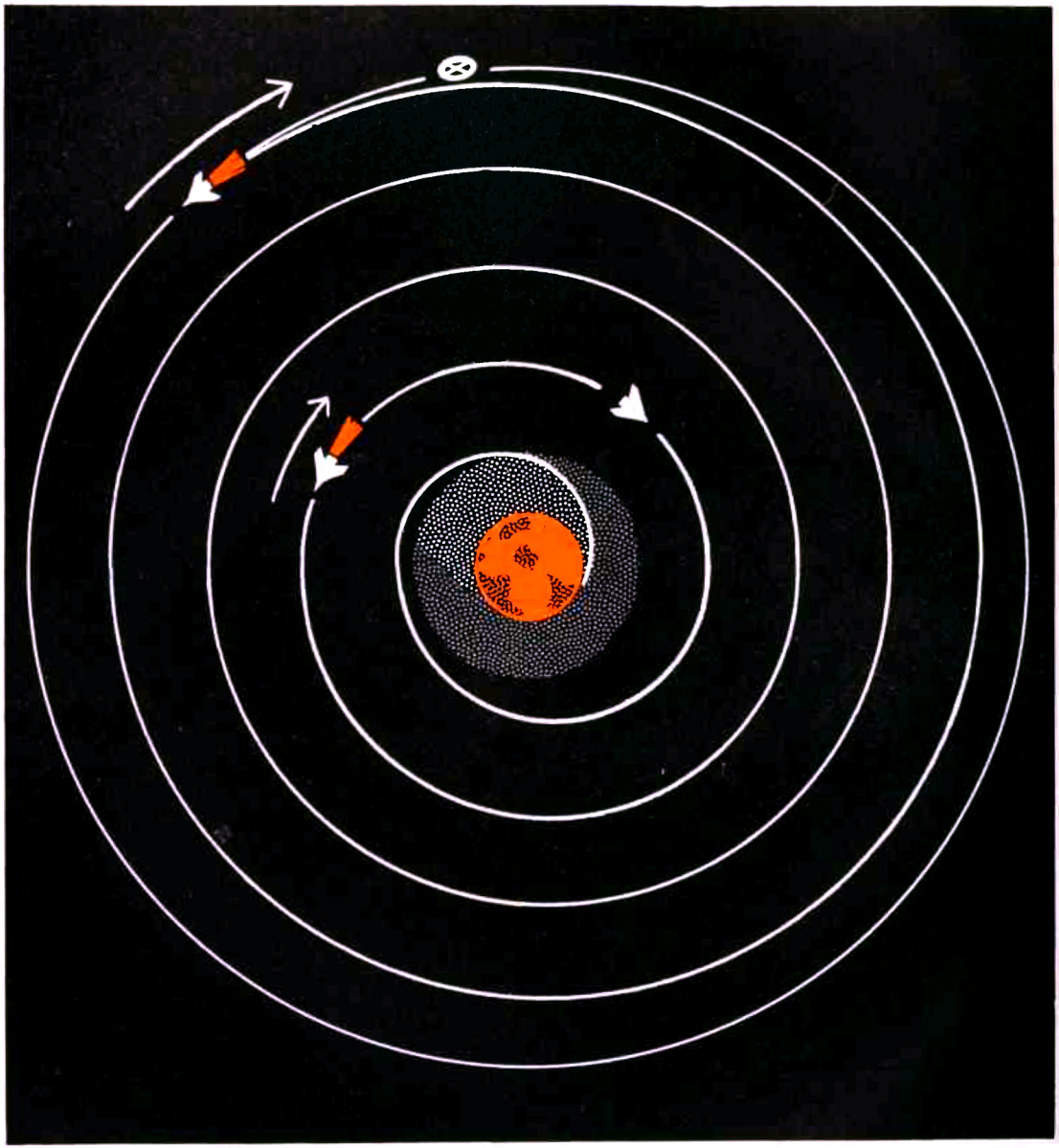


But space travellers may visit other worlds than the Moon. Most likely they would feel more at home on Mars than on Venus, which is nearer to us. The atmosphere of Mars is probably similar to our own, but much too thin to breathe. Some astronomers believe visitors may also find green plants growing on Mars.

Perhaps men will never visit Jupiter. The climate is far colder than at our Poles, and the heavy atmosphere contains poisonous gases. It is so vast, and its pull is so powerful, that a strong man could hardly lift his feet from the ground. But one day men may stand on one of the moons that circle round Jupiter and see the giant planet close up, in the sky.

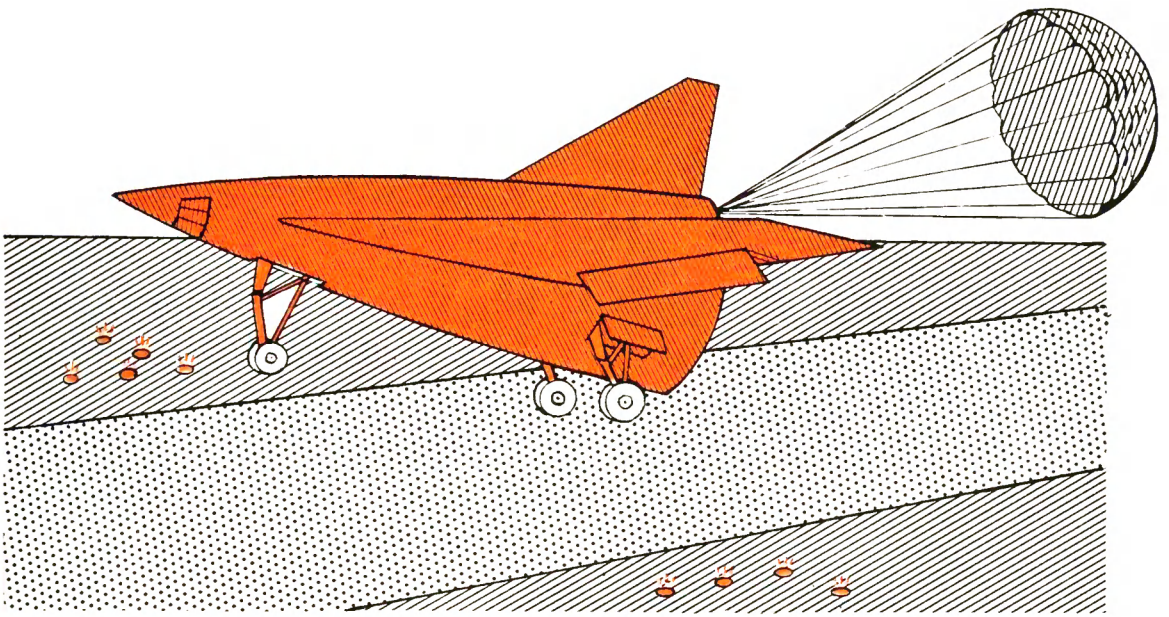


Slowing Down the Journey Home



Imagine you are on a ship just beginning the last stage of the homeward journey – from space-station to Earth. Before the ship leaves the station, both ship and station are moving so fast that the Earth cannot pull them down. *So the ship must begin slowing down from the moment it starts.* This it does by pushing with its jets in the opposite way to that in which the station is moving. Then the ship continues in the same way as the station, but more slowly. It spirals downwards, still tail first, using its jets as a brake against the growing pull of the Earth.

When the ship enters the air it must go slower still, or it may become hot and catch fire. So it turns nose-first (to make use of its streamlining) and trails out parachutes to slow it down. Finally the pilot lowers the undercarriage and the ship glides down on to the runway.

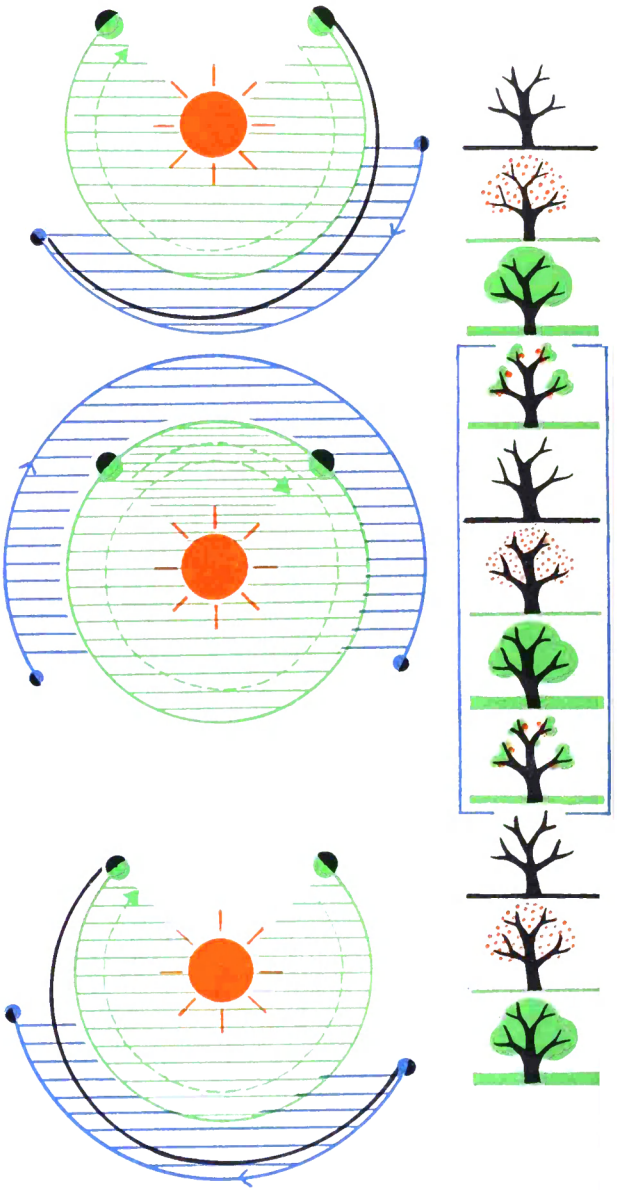


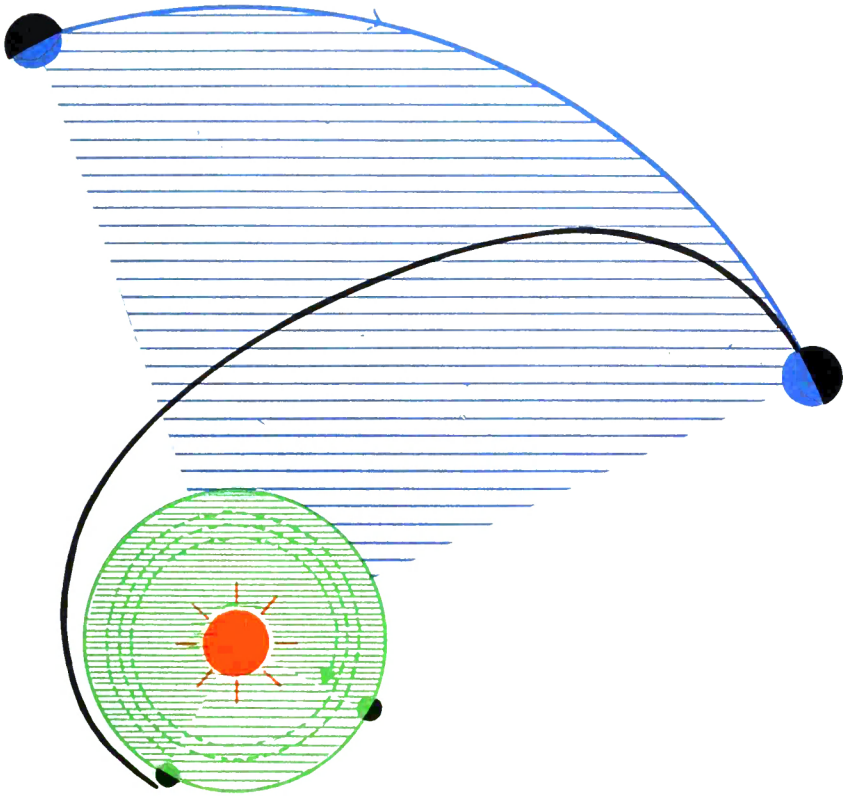
From Moving Earth to Moving Planets

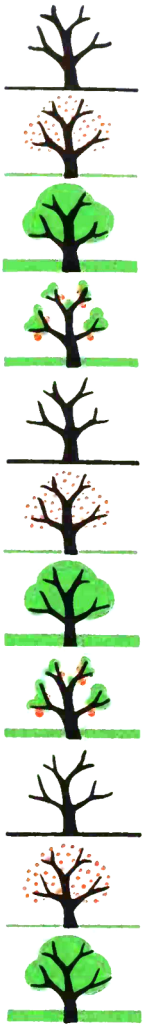
Our Earth (shown green) and Mars (shown blue) both move round the Sun, but Mars has farther to travel and takes almost twice as long to make the complete circle. To keep their journey as short as possible, the travellers of the future will set off for Mars when that planet is well "ahead" of the Earth. Their long voyage, shown by the black line, will take about nine months. During that time the Earth will have made three-quarters of its journey round the Sun, overtaking Mars.

To make the shortest possible journey home, travellers will have to wait fifteen months, until the Earth and Mars are back roughly where they were when the outward voyage started. By then Mars will have completed one circle round the Sun; the Earth will have completed two.

The return journey will take another nine months.

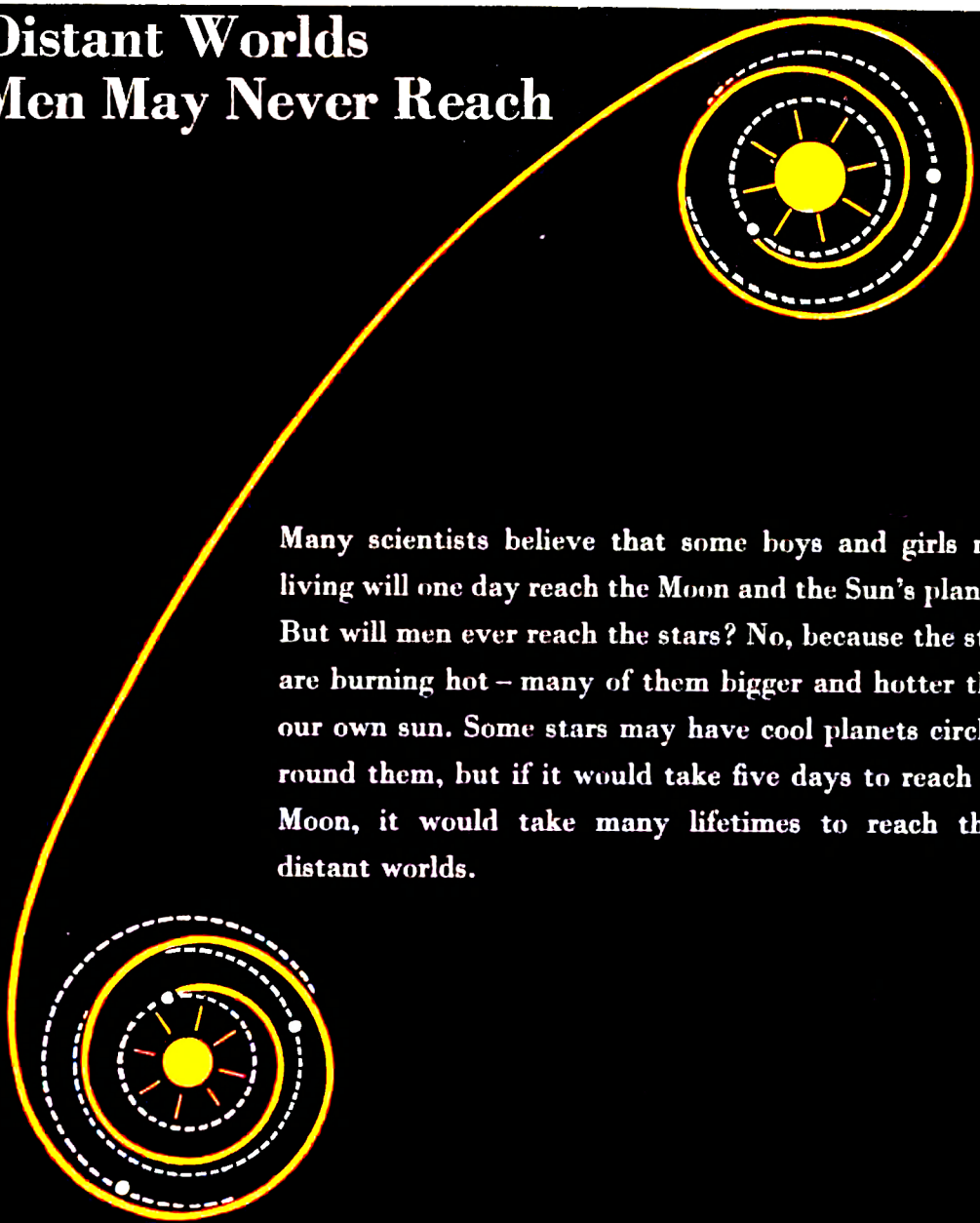






The great planet Jupiter takes a much longer and slower journey round the Sun than Mars does. It is so far away that the voyage would take nearly three years; in that time Jupiter would have done less than a quarter of its tremendous journey. But the Earth would have circled round the Sun almost three times!

Distant Worlds Men May Never Reach



Many scientists believe that some boys and girls now living will one day reach the Moon and the Sun's planets. But will men ever reach the stars? No, because the stars are burning hot – many of them bigger and hotter than our own sun. Some stars may have cool planets circling round them, but if it would take five days to reach the Moon, it would take many lifetimes to reach these distant worlds.