

Will the first American to orbit our planet return alive? Yes, says this leading space expert; here's the step-by-step plan for the pioneering man-shot

The Goal: The ultimate goal of Project Mercury is to put a man into orbit around the earth. This orbit will not be very high, between 100 and 200 miles up. The manned capsule will thus be safely inside the so-called radiation shell or Van Allen layer. How long the man will be in orbit hinges on a decision still to be made: whether the first orbital flight should include a sleeping period (while in orbit) for the astronaut.

If it should be decided to do without a sleeping period for the first try, the capsule will be in orbit for about nine hours; that means it will complete six circuits around the earth. If, on the other hand, it should be decided to incorporate a sleeping period, the capsule might stay in orbit for as long as 24 hours.

At the end of either period, the astronaut will cause his capsule to break out of the orbit by firing a rocket charge in the direction of the capsule's movement. This retarding rocket will cause the capsule to go into a new orbit in the lower, denser layers of the earth's atmosphere.

The Man: As is well known, seven volunteers were selected for the experiment after medical men had certified they were physically and mentally fit for the experiment. It is worth noting that these seven were the "cream of the crop." The others of the 60 tested fell slightly short of the chosen seven in one way or another.

As medical experts had insisted all along, none of them is very tall (the originally planned upper limit of 5 feet, 10 inches was raised by one inch) because tall, gangling men do not stand physical strain as well as cowboy movies would have you believe. Nor are they very young; experience and mature judgment count for far more than a possible fraction-of-a-second delay in reaction speed.

As for tests they underwent—aside from medical tests—these were based on what would happen to them in orbital flight. It would begin with the high acceleration of the rocket take-off and especially its initial climb. During the climb, the pilot will feel as if he weighed up to five times as much as he really does. Fortunately, all he has to do during this period is endure the acceleration.

Such acceleration can be duplicated in a large centrifuge, and all the candidates went through this test and will repeat it in training.

As soon as the carrying rocket—an Atlas—has used up its fuel, the acceleration will drop to zero. In everyday language, this means that the astronaut will feel weightless. Such weightlessness can be produced in the atmosphere by means of a jet airplane. The plane is first put into a power dive to build up speed, then the nose is pulled up and the engine cut simultaneously. The plane then flies through an arc like a thrown stone, and for about half a minute everything in the plane is weightless.

After breaking out of the orbit, there will be the slowing down inside the atmosphere. This, though technically called deceleration, will feel like acceleration to the astronaut. It will differ from the acceleration of climb in intensity and duration. During the climb, acceleration is high but lasts only a few minutes. During the slowing down in the atmosphere, deceleration will not be

very high but will last for half an hour or more.

The Capsule: High accelerations and even long-lasting low accelerations are best endured in a supine or semi-supine position. For best resistance, the man should be in about the position one assumes in a contour chair. The space capsule is built with this in mind. When it is carried up into space by the Atlas rocket, it will actually be upside down—that is, the end which will be the "front" when the capsule re-enters the atmosphere will be at the bottom. The other end will be protected by a nose cone which later will be shed.

The astronaut will be on his back during take-off to help him withstand the acceleration without "blacking out." The capsule has to provide the following for the man inside: enough oxygen to last at least three times as long as he is actually expected to be inside the capsule; and a means of removing the carbon dioxide he produces by his breathing.

The capsule must also be air-conditioned. Contrary to popular opinion, things get quite warm in space near the earth, as the artificial satellite Explorer I reported. When Explorer I went through the earth's shadow, the temperature dropped to about 45 degrees F. When the satellite was on the earth's sunward side, the temperature went up to 85 degrees F. This sounds like a nice temperature range, a bit chilly at one end and a trifle too warm at the other. But Explorer I did not contain life. Man produces considerable heat himself; and if nothing were done about it, the low temperature in the manned capsule would probably be 80 and the high 120 degrees F.

The Preliminaries: Selecting the astronauts after thorough testing was only one step in the long list of preliminaries. The capsule needs testing, too, for stability during flight through the atmosphere and for stability when it finally floats in the ocean. At the moment, six shots are planned just for preliminary testing of the capsule. Since Atlas rockets are costly, these six shots will be made with a specially built rocket nicknamed Little Joe. Little Joe consists of four solid-fuel Sergeant rockets clustered together in a metal shell. For at least four of these shots, simplified versions of the capsule will be used, minus two-way radiophone and air conditioning, which are not needed for these tests. One or two shots will use the real capsule with full instrumentation.

After that there will be a number of shots of real capsules by means of Redstone rockets, which are cheaper than Atlas rockets. The Redstone will carry the capsules (with the simulated weight of a man) to about 130 miles from Cape Canaveral out into the Atlantic. But the sensations will be the same as in an Atlas shot, though of shorter duration. In these shots will be a chimpanzee or monkey, and all seven astronauts will probably experience this flight.

There will also be capsule shots using the Jupiter missile which recently carried monkeys Able and Baker on a 1,700-mile flight 300 miles into space. The re-entry strain in these trips will be greater than in an actual orbital shot because they re-

enter at a steeper angle.

The successful return of Able and Baker indicates that since the Jupiter re-entry can be survived, the Atlas traveller will be safe.

Finally, there will be actual orbital shots by means of Atlas rockets—first a capsule with instruments only; then a capsule with an ape; then repeats; and finally the man.

The Flight: The actual flight, when it comes, will be routine to all concerned, since they will have been through many tests simulating all possible conditions.

The procedure of the final shot will be much the same as when Project Score (the Atlas rocket with a tape recorder) was put into orbit. After two minutes of burning and at a height of about 50 miles, the Atlas booster will be left behind. The missile itself will continue to a height of 100 miles or so, going into a low orbit around the earth. Once that is accomplished, the astronaut has his first job—separating the capsule from the top of the Atlas rocket. Now he orbits by himself, being weightless, of course.

Since he must eventually re-enter the atmosphere with the bottom of the capsule forming the front end, he has to turn the capsule around. This can be done by using jets of compressed air, something already well tested in missiles and in one artificial satellite, Discoverer II. While in orbit, the astronaut can have radio-telephone contact with home base and with tracking stations. He may be asked to describe what he sees—how the sky looks when it is black and all the stars are out; how the earth looks from 150 miles up.

The astronaut will take time out to eat, again describing his sensations. Finally, the order will come to return, and the astronaut will press the firing button of the retarding rocket. If for some reason he should be incapacitated, this retro-rocket can be fired from earth stations.

Since the capsule, in its flight through the atmosphere, must push air out of the way just like a missile nose, it will gradually lose speed and come closer and closer to the ground. When the altitude is below 20 miles, a drag chute will be thrown out to steady the capsule in flight and help reduce its speed. The pull of the drag chute will also start releasing "chaff"—little strips of aluminum foil which give a good echo in a radar set, enabling radars to track the flight path.

The capsule is then still moving at supersonic speed. But it slows down steadily, soon flying at less than the speed of sound. When the capsule is below 20,000 feet, the main parachute will be thrown out, slowing the capsule to about 20 miles an hour. Then the capsule will land—and to be sure that it doesn't strike a minor obstacle, it will land in the ocean.

Next, auxiliary devices will go into action. Compartments will open to the sea to spread a large patch of dye. A radio antenna will push itself out and broadcast. Lights atop the capsule will flash. The astronaut will probably be picked up in about half an hour. And if, in response to all the congratulations he will receive, he should say he really didn't do very much, he will be wrong, of course. But he'll probably mean it.