Apollo and Beyond—Buzz Aldrin

Buzz Aldrin inside the Apollo 11 Lunar Module on 20 July 1969. This image was taken by Neil Armstrong, mission commander, before the two astronauts landed on the Moon. NASA Image 69-HC-893.

I got involved with spaceflight in a peculiar way. I graduated from West Point at a time when there was no Air Force Academy. I went in the Air Force at the time of the Korean War, and while there, I shot down a couple of MIGs. Years later, this led me to want to look at the extension of air travel into space. At MIT, I worked on intercepting other spacecraft.

Based upon that education, I got into the space program, not by route of the test pilot school. I was involved in a more esoteric, egg-headed approach. I did help to train the people who were on the first rendezvous missions.

I was slated initially on the backup crew for Gemini 10. That meant that I would skip two missions, and then I would fly on the prime crew with the next one. The only trouble was there was no Gemini 13. Because of a tragic aircraft accident that took the lives of the primary crew on Gemini 9, they had to make some crew adjustments. So Jim Lovell and I flew on Gemini 12. On that mission, I was able to take my SCUBA-diving expertise and training underwater for spacewalking and helped to teach some of the Navy people how to do spacewalks. Then, in the infinite wisdom of the Air Force, I was asked to command the test pilot school after I left NASA, even though I had never been through any test pilot training.

After awhile, I took what I did at MIT and developed the idea of cycling orbits. As an extension of rendezvous, I extended that to the situation of going to Mars. Finally I got around to writing a science-fiction story about going to the stars. I would recommend that you take a look at that because there's an awful lot of what I think we could be doing in the near future that is in that book.[1] In this story, the first human crews reach the moons of Mars in December 2018, fifty years after the crew of Apollo 8 reached the Moon. That is still a valid target that I think we can move toward.

Because of the cost of launching rockets, it looked to me as though there might be a need for some improvements in the Shuttle system. So I embarked on looking at fly-back boosters for the Shuttle. Those are pretty big machines, so we backed off looking at the Zenit as a reusable propulsion module inside of an airplane, and we started looking at Atlas 3.

I put together a company called Starcraft Boosters about four or five years ago. Then I also realized that a lot of people want to get into space. So I formed a nonprofit company called Share Space. I'd like to share some of my thoughts about what Share Space and our nation could do together.

Forty years ago, President Kennedy responded to Soviet space exploits by setting a course for the Moon. A similar bold stroke is required to answer the Soviet Union's inauguration of passenger travel to the International Space Station.

Passenger space travel is a huge potential market—big enough to justify the creation of reusable launch vehicles. Their low cost and high reliability will give the nation that develops them enormous commercial and military advantages over nations that continue to rely on today's space launchers.

1. Buzz Aldrin and John Barnes, *Encounter with Tiber* (New York: Warner Books, 1997).

Current systems fail 5 percent of the time on cargo flights and 1 percent of the time on crude flights, and they are very expensive, on the order of $5,000 to $10,000 per pound of cargo or people sent to orbit. Embracing passenger space travel, which leads to reusable vehicles, will reduce failure rates and costs by one or two orders of magnitude. The Share Space Foundation wants to ensure that America reaps the benefits of passenger space travel.

A near-term step is using the Space Shuttle to carry out economic and medical research on passenger space travel. Each year, more spare seats are available on Shuttle flights than on the Russian Soyuz missions. The Share Space Foundation would like to award these Space Shuttle seats to journalists and to winners of lotteries, auctions, and televised competitions.

As a nonprofit organization, Share Space would use part of the proceeds for research into the medical and training issues involved in passenger travel. This knowledge will speed the design of next-generation vehicles to serve the passenger market.

The rest of the proceeds might go into a fund to underwrite the cost of developing reusable launch vehicles. Reusable space transportation is the key that makes space affordable, enabling everything from expeditions to Mars to providing pollution-free electrical power to Earth. In addition, if the United States leads in the development of such vehicles, it will be the nation with effective control over the most militarily important high ground of the twenty-first century.

A little over a year ago, I worked with some people from the University of Texas, Massachusetts Institute of Technology, and the Jet Propulsion Laboratory to put together a paper for the American Astronomical Society entitled "Earth/Mars Transportation Opportunities, Promising Options for Interplanetary Space Transportation." We looked at cycling orbits and how we might build a spacecraft incorporating this concept. This was a three-cycler system, and we are in the process of doing an update on that paper for the American Institute of Aeronautics and Astronauts.

Now the space transportation elements that we're working on consist of two pillars. One of them is two-staged orbit, and it comes in three sizes—small, medium, and large. The other pillar of space transportation is Shuttle-derived cargo and habitable volume. That's based upon the external tank and tanks above that that would put up habitable volume.

For small boosters and orbiters, we could use the solid rockets on the Evolved Expendable Launch Vehicle (EELV) programs. We could also use a Russian engine, RD-120, which is the upper stage of the Zenit rocket. In orbiter small, there is an Air Force research lab, reusable upper stage, that they have in mind, and there's also an Air Force space maneuver vehicle that could be available and boosted with varieties of this booster small which, of course, can apply to the EELV program as it goes out this way.

The booster medium is what we would nominate as the star booster 200, and it has the unique property of having a rocket inside of it, the Atlas 3 rocket, with the RD-180 engine. Now the booster and orbiter medium could conceivably come on line relatively quickly and could provide crew-only transport for ten to twelve people to low-Earth orbit. Three starts could be made in this four-year period, this first administration.

The orbiter medium has a pod that can be ejected from the pad or from anywhere in flight. The essence of that ejectable pod and its capacity and its systems could also be used as a lifeboat, similar to the X-38. The orbiter medium, when boosted by one booster, goes into low-Earth orbit. With two boosters and a tank, it can then rendezvous with things at the L-1 port. The L-1 port really comes from the habitable volumes that are put up. We would envision looking at a prototype during this period and actually launching one before the end of the year 2008 into the space station orbit of the International Space Station, where it could supplement what we think is a desirable thing . . . an orbiter on station. Owen Garriott, who flew on Skylab, has been pioneering the activity of long-duration orbiters that could be left at the Station and relieved on Station by another orbiter, thereby relieving the burden of having to rely on the lifeboat Soyuz and a half module, both of which have been sort of postponed now by NASA because of cost overruns. The booster large now is a fly-back booster for the Shuttle, and two of those go with the Shuttle system as it proceeds toward phase out. One large booster launches an orbiter large into low-Earth orbit for Space Shuttle transportation two into the future.

With two boosters and a tank, it can then go to high orbits, which means it can intercept cycling space ships. Cycling space ships are a derivative of what we first put at the 51.6-degree inclination and then work close to the International Space Station, perhaps take the nose section of the tank and put it actually on the ISS as a larger half module than we plan to do right now.

The next series of habitable modules would go to 28.5 degrees and would eventually serve as Shuttle-derived quarters for astronauts. Shuttle-derived quarters for tourists eventually can become a lunar cycler, as we have two of these now in Earth orbit. We can be taking adventure travelers in the orbiter large now to these facilities. They've been going through a check-out phase here. The driving force for all of this architecture is high-volume traffic, which is required to make transportation of adventure travelers economical. You can't make a profit out of ten or twenty people once a month or once a week. You have to have sixty or eighty people every other day or more frequently.

Regarding the booster medium, there are existing elements such as the tank. There are also new elements such as an airplane that houses the Atlas 3 rocket. We have this sort of capability where we can replace the Delta class and the Titan 4 with upper stages boosted by the propulsion modules. It replaces the solid rockets on the Shuttle, and the fly-back boosters eventually replace the solid rockets on the heavy lift rocket that puts up both habitable volumes or two empty oxygen tanks or cargo that's going to the Moon or Mars.

We are also using Star Booster 200s with Atlas 3s in them, and we're using Castor 120s and a center stage. This will put 6 tons to geo-transfer, which accommodates most of the payloads going to geosynchronous orbits. If we want to match the Titan, then we use a larger booster here. It's launched vertically on the pad, and we obviously are not burning the solid rockets at liftoff. The boosters burn to fuel depletion at about Mach 5.5 or 6, so that the thermal protection system on the booster can be an aluminum heat sink. A few seconds after separation, the upper stage ignites and goes on and performs its mission.

The booster rocket is unpiloted, so naturally it will re-enter the atmosphere straight ahead. When it gets into enough atmosphere, it begins automatically turning back to the launch site. We showed this system to Bert Rutan, and it took him the longest time to realize that this was not taking off horizontally, but it was a vertically launched, unmanned vehicle. As I mentioned, this one booster can be mated with one orbiter of the same shape or of a shape of a derivative from the present Space Shuttle. We favor internal oxygen and external hydrogen for safety reasons and for the size of the orbiter vehicle . . . . The cruise back is about 200–300 miles, and we land robotically at 150 knots, and, when we're back on the runway, we then can remove the propulsion module and improve the reliability of the best rocket engines that are available.

When we have better rocket engines than the Russian RD-120s or RD-180s here, then we would institute these. We would expect that the fly-back booster might be built by Lockheed and might also have RD-180 engines on it, because I imagine that the orbiters from the space maneuver vehicle to the orbiter medium and the orbiter large that I envision would most likely be built by the world's biggest airplane company that acquired another airplane company, and then it acquired the company that built the present Shuttle.

It's been a pleasure for me to come back here on this day that honors one Shepard, and we're going to hear from another Shepherd a little bit later.