Convert the Shuttle

Dr. Robert Zubrin
SpaceNews, Sept 8, 2003, Op-Ed Article

It is now apparent that the Shuttle Orbiter cannot be used much longer as a system for transporting crews to Earth orbit. The Columbia disaster has made it clear that the antiquated Orbiters are becoming increasingly unsafe. Moreover, even if the Orbiter could be flown safely, it is clear that using a launch vehicle with a takeoff thrust matching that of a Saturn V to transport half a dozen people to the Space Station makes about as much sense as using an aircraft carrier to tow water skiers. The Shuttle was designed as a self-launching space station. Absent a permanent space station on-orbit, such a vehicle had some justification. But with the establishment of the ISS, the rationale for using a flying Winnebago as a space taxi is no longer sustainable.

NASA has already begun to respond to this reality by starting the Orbital Space Plane (OSP) program, which will move the human taxi-to-orbit function from the Shuttle to a small capsule or mini-orbiter that can be launched on top of an Atlas or Delta. If constrained to the objective of producing a simple reliable capsule instead of a complex mini shuttle, such a program makes a great deal of sense. A simple capsule will be much safer than a more complex system, will have a much lower development cost, and can be made available for flight much sooner, thereby cutting short the risks and costs associated with prolonged Shuttle operations. Launched aloft a medium lift expendable launch vehicle, it could assume the Shuttle's crew transfer function at less than $1/5^{th}$ the cost.

As rational as such an approach might be, however, it poses a direct threat to the jobs of hundreds of thousands of people associated with the existing Shuttle program, and to the bottom line of several major and many minor aerospace companies. For this reason, some people have been lobbying for making the OSP a complex mini shuttle program that would take many years to complete, and cost, at most recent estimate, some $17 billion.

This is the wrong approach. The raid upon the treasury it involves would sap funding for any other space initiatives, and the delay it would entail in Shuttle replacement would expose our astronauts to serious unnecessary risk.

The right way to extend the Shuttle's industry's career is not by delaying the Orbiter's replacement. Rather it is to employ the simple capsule approach accelerate the transfer of taxi-mission responsibility, and use the funds saved to convert the Shuttle launch stack into something really worth having.

The reason why the Shuttle is such an inefficient launch system is precisely because it is dragging around the huge inert mass of the Orbiter. If we relieve the Shuttle launch system of that burden, however, and replace the Orbiter with a simple cargo compartment, we obtain the configuration known as Shuttle C, capable of lifting 70

tonnes to low Earth orbit. This compares quite handsomely with the current STS 20 tonne payload capability. However, we can do still better if we insert a hydrogen/oxygen upper stage into the payload fairing. In that case, we obtain the Shuttle Z, analyzed by NASA and the Martin Marietta company in the late 1980's, capable of launching 120 tonnes to Earth orbit or sending payloads in the 40 to 50 tonne class on direct trajectories to the Moon or Mars.

Such a Shuttle-derived Saturn-V class booster would provide NASA with the primary tool it needs to launch human missions of exploration throughout the inner solar system. However its development can only be justified if NASA actually initiates such a program. The space agency is thus presented with a choice; either embrace human exploration now, or be forced to throw away a $10 billion asset that will be needed if human exploration is ever to be done later.

If NASA makes the negative decision, and opts to discard the Shuttle infrastructure instead of converting it, the agency will be making a statement that it really never intends to do human exploration at any time. Under such conditions, the public will inevitably question, with considerable force of reason, what the remaining justification is for the Space Station, the OSP, and human spaceflight in general. The result will be an implosion of the entire manned space program. NASA is in a box, and the only way out is forward.

The Shuttle catastrophe needs to be answered not with retreat, but with advance. Human space flight will always be risky, but we need to be doing missions that are worthy of those risks. We don't need humans in space to study ant farms in zero gravity. We need humans in space to explore the planets. Converting the Shuttle will make that possible.

Dr. Robert Zubrin is president of the Mars Society (www.marssociety.org) and author of *The Case for Mars: The Plan to Settle the Red Planet and Why We Must*, published by Simon and Schuster.