

We will always have to pay a price for carrying man along. He has to be kept alive and provided all the equipment with which to live and function. This costs money, so we must identify those areas where man can contribute more than he costs. We are deep in the process of doing that.

I mentioned the question of long stay-time. This, of course, ties in with man's ability to be effective in space. We must answer important questions here, too. Do we need artificial gravity as we extend our stay-time in space, or will people be perfectly happy with the zero gravity they had so far? To what extent can man use his manipulative skills if he is encased in a space suit? Then there's the question of just simple, plain creature comforts. I think it was astronaut Frank Borman who was asked, "What is it really like to spend 2 weeks in a Gemini spacecraft?" He replied, "Have you ever spent 2 weeks in a stall in the men's room?" I think this a pretty vivid description. We have to get out of this very primitive state of affairs and provide them with a little more comfort so that they can sleep better, eat better, and have a little more privacy so they can do some thinking, some paper work, and maybe have a little entertainment.

Our Apollo Applications program aims at providing a 1-year stay-time capability as a first objective. This program will also provide the means for men to do a great deal in the development and evaluation of sensing devices. I mentioned these sensing devices earlier for Earth resources control, for prospecting, for weather, and also for traffic control. Now while some of these systems may ultimately run unmanned, it is still necessary to first evaluate which of the many possible sensors are really optimum. And we believe that men will play a very important role in a spacecraft during the development period to make these evaluations, even if he does ultimately withdraw and the operational system then works unmanned.

To take traffic control as an example. I don't think we would want to expose North Atlantic air traffic control to new-fangled, untested automatic satellites without first having monitored and evaluated the system by people on the spot to make sure the system will actually do what we want it to do.

So man may play a temporary role in some areas. This may be the case in some portions of our future space astronomy program. Finding out what measuring methods are most effective, say to study the Sun, may require man, but an eventual operational Sun-monitoring system designed to predict radio communications disturbances on Earth from X-ray bursts emanating from the Sun may well be automated.

It is my conviction, and most of us feel this way in NASA, that the demarcation between manned and unmanned space flight, a very natural split while we were learning how to fly man in space, will get more and more fuzzy in the future. After all, now that we know that man can fly in space, his reason for being there is essentially in the area of applications and in the area of science. To say it differently, if we want to conduct applications and science first class, we better use man in those areas where his contribution is necessary. We shall have to address ourselves to this problem more and more in the future. No longer can we compartmentize things as we have in the past.