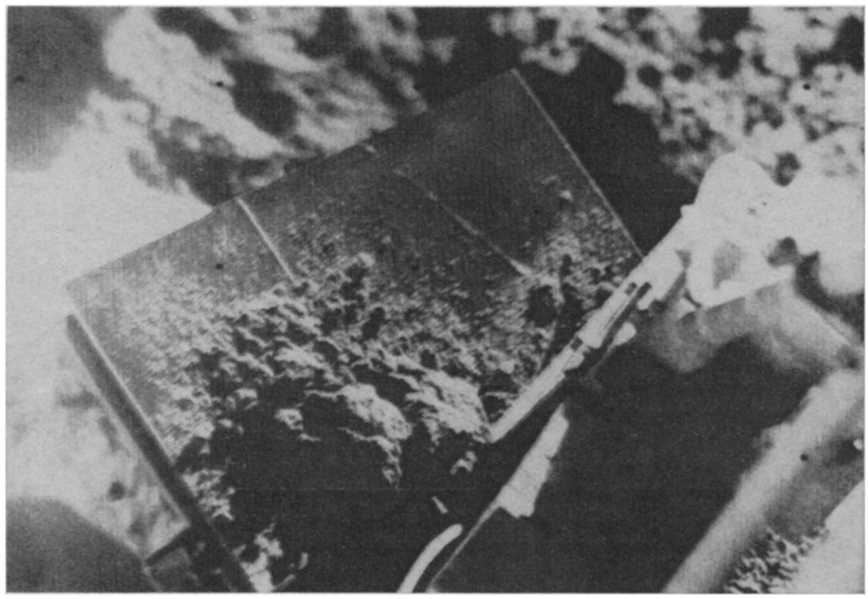


NASA

Automatons like Surveyor could go to the planets as well as the moon.

NAS

MacDonald: no unique role for man.

AN AUSTERE DECADE

Robots for the planets

The prestigious Space Science Board votes thumbs down on manned solar system exploration in the next decade

The Space Science Board of the National Academy of Sciences has issued recommendations from time to time on various aspects of the U.S. space program.

Its 1965 endorsement of the manned lunar exploration effort, for instance, granted to that program the imprimatur of scientific acceptability. And board pressure is largely responsible for the presence of scientists on the astronaut squads.

The board does not set national space policy. But its members are influential in the scientific establishment, and the National Aeronautics and Space Administration, which solicits its views, must take them seriously.

The board was meeting last week at its summer study center at Woods Hole, Mass., to consider the future of the nation's efforts in geophysics and near-earth space exploration. At the same time it has issued its summary of a June review of the national program of planetary exploration.

The agonizing reappraisals now accompanying austere budget projections brought the prestigious board down solidly against extension of the manned space explorations beyond the moon.

The planetary recommendation is both austere and research oriented. The study group's chairman, Dr. Gordon J. F. MacDonald, executive vice president of the Institute for Defense Analyses, describes it as "a modest program that comes to $160 million to $180 million a year," compared to the $107.2 million already being spent on planetary work, and $2.5 billion on Apollo. The board's 1965 recommendation on planetary exploration was keyed to a NASA budget of $5.5 billion or $6 billion, a figure that Dr. MacDonald says "is no longer relevant." The space agency's fiscal 1969 budget is not yet final, but will probably come to rest at little more than $4 billion.

In this new situation, the scientists opted for what they want most: the greatest amount of scientific information for the dollar. That they issued an obiter dictum against manned exploration of the planets should surprise nobody who knows the general opinion of the scientific community on man's usefulness in space. The board's 1965 report telegraphed what might be regarded as a body blow to the near future of manned space flight when it anticipated that, "In the period 1965-1985 . . . unmanned experiments will probably provide the most significant contributions. . . ."

"There is no unique role for man in the foreseeable future—the next 10 to 25 years," says Dr. MacDonald.

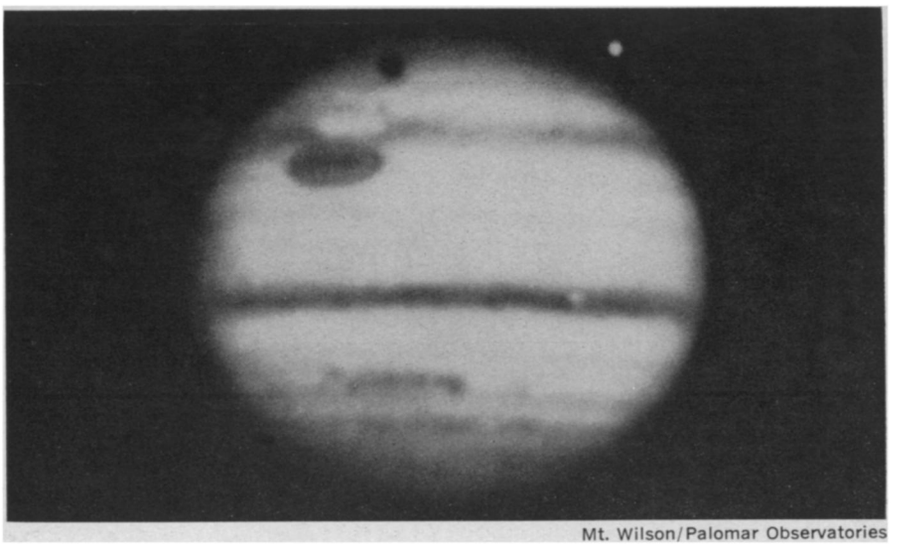
Another member of the study group, Dr. Von R. Eshleman of Stanford University, says that while he enjoys the vicarious experience of man in space, in advising about scientific missions he has strongly stressed that man "can extend his hands, eyes and feet to the planets by means of teleoperators"—systems like Surveyor, which dug a hole and examined the pieces it brought up.

Far more sophisticated operations than this can be done by automatons, says Dr. Eshleman. Man can even transport part of his brain to the planets in the form of self-adapting computers—computers that learn from experience gained in doing an action the wrong way.

The recommendation against manned planetary flights might be like flogging a dead horse, says Dr. Edward C.

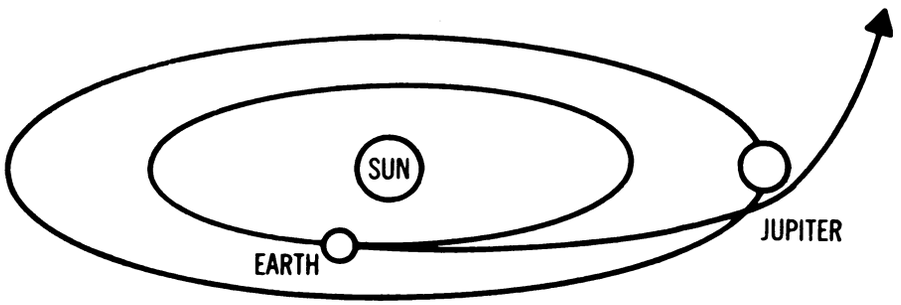
USAF

Welsh: no men planned for planets.



Mt. Wilson/Palomar Observatories

Jupiter: hydrogen-helium composition and odd radio signals beg for study.



NASA

Jupiter's gravity could assist a flyby probe on a tour of the major planets.

Welsh, executive secretary of the National Aeronautics and Space Council. "Neither NASA nor the Department of Defense has a manned planetary project. It's not Government policy to have one," he says.

But Dr. MacDonald believes the board aimed true, and hit home. He says the board's shot was aimed at "various programs suggested or begun. Over the past two years there has been substantial discussion of manned exploration." And he points to studies now going on of astronauts' qualifications for long flights.

"There are studies all the time," counters Dr. Welsh. "They don't necessarily take money from something else."

Money seems really to be the crux of the problem. To get the most from the money available, the study group wants a planetary exploration program divorced from considerations of manned space flight and national prestige.

The group recommends that NASA spend more money on planetary exploration than it has been spending.

And here, too, it finds a critic in Dr. Welsh: "The source of more funds is left vague," he comments. "They may have wanted to take from the Apollo or Apollo applications program. . . ."

The study group members recommend the use of the least expensive vehicles possible for missions. The money spent to stabilize payloads, for example, might be unnecessary.

They point out that spinning payloads can satisfactorily obtain many kinds of information and save the expense of using nonspinning ones.

They also advise against setting up back-up missions to be flown in case a given mission fizzles. This practice adds, they say, about 20 or 30 percent to the cost of a mission and in planetary flights this can be a lot. They prefer taking a chance on a single shot.

Although one Administration source says this recommendation caused groans to resound in the NASA organization, Dr. Welsh denies it is a problem.

Rather than attacking the space ef-

NASA

Planetary lander models are test dropped in California's Mojave Desert.→

fort, as Dr. Welsh seems to interpret the report, the board may simply be reefing its sails to ride out the budget blow.

The members view what they've done as an effort to keep some missions flying over the next decade. In the next few years, the configurations of the planets will provide opportunities for gathering information that will not return for many years.

In 1973 and 1975 it will be possible to use the gravitational field of Venus to assist a joint Venus-Mercury flyby. This opportunity will not repeat until 1980, and to study Mercury otherwise would need a much larger booster.

In 1977-1978 the same kind of gravitational assist can be gained for a grand tour of the major planets: Jupiter, Saturn, Uranus and Neptune—again without the need for extraordinarily powerful boosters. This opportunity will not repeat for 100 years.

The report also recommends learning as much as possible about planets from the ground. Radar astronomy has done particularly well lately with its studies of the nearer planets, especially Venus (SN: 8/24, p. 179).

The study group believes that the radar people, who have put up "a continuing battle" for recognition, in the words of one observer, should be encouraged by NASA support for a radar astronomy installation 1,000 times more sensitive than existing ones, at an estimated $30 million capital cost.

An optical telescope for planetary studies at some location in the Southern Hemisphere and one in orbit around the earth are also recommended.

Finally the board members seem to feel that so little national prestige is really involved in the space race that they recommend renewed efforts at cooperative planning with the Soviet Union so that the two countries do not duplicate each other's efforts. The U.S. Government has had feelers out to this end for years with very little success.

Now, as Dr. Eshleman puts it, the scientists ask for a change of emphasis that they feel could lead to success: "Let's make overtures at the scientific level, not through diplomatic channels," he says.

Support for U.S.-Soviet cooperative planning was expressed by several Congressmen during last winter's hearings on the NASA budget, but some Administration officials are not sure the space race is that far over. Dr. Russell C. Drew of the White House's Office of Science and Technology points out that the Russians haven't flown a manned flight in two years and public reaction has become dull. What would happen if things started up again is difficult to assess.

HIJACKING

Airlines seek a breakthrough

Have gun, will travel . . . to Cuba.

On the average of once a month, a U.S. airliner lands at Havana, Cuba, and discharges a pistol-packing hijacker. During the last year, 13 such unscheduled flights were made at the behest of hijackers.

The frequency with which airliners are being hijacked has stirred up wide concern in the aviation industry and Congress. But the prevention of hijacking is a problem so fraught with technical, legal, economic and public relations problems as to almost defy solution.

One quick remedy, which no one favors, at least not yet, would be to

search every passenger before he boards the plane.

Another strong-arm measure, actually proposed as national legislation last month by Senator Warren G. Magnuson (D-Wash.), would empower the Federal Aviation Administration to place armed guards on all passenger aircraft. But the airlines are completely opposed, fearing this will lead to gun fights. A bullet puncturing the pressure skin of a jet airliner flying at cruising altitudes can result in an explosive release of pressure—and disaster.

The airlines point out that so far no passenger has been harmed, and not one hijacked airliner lost or even damaged. This explains the prevailing attitude among airline executives: "If you don't get the hijacker at the gate, take him wherever he wants to go," says one. Pilots on several airlines have been instructed to do just that if faced with a hijacker.

Still another approach to the problem would be to lead passengers past some sort of gun detection devices before boarding. Presumably, the device would be located at the boarding gate through which passengers must pass single file.

The difficulty here is that there is no known device that can distinguish reliably between a gun and a harmless piece of metal, such as a penknife. Various types of electronic devices have been tried, but none of them can tell one metal object from another. To use detection devices presently available would result in a plethora of false alarms.

There is one device that may offer some promise: a magnetometer just developed by Lockheed Aircraft Corp., Burbank, Calif., and under consideration by the Air Transport Association.

The Lockheed device senses disturbances within its immediate segment of the earth's magnetic field. When magnetic lines of force are interrupted by a metal object containing iron, the device causes an alarm to go off. It detects only ferrous metal objects above a certain preset length. This rules out false alarms from key chains, penknives and other objects below the size of a small pistol, plus all nonferrous objects. One slight problem: a portable radio's loudspeaker magnet would set it off.

Next step for Lockheed is to test the device at an actual boarding gate to see what sets it off and how reliable it is at detecting pistols. Says Lockheed R&D manager Don Galbrath, "Neither we nor the airlines know at this time what kinds of objects the flying public carries in its pockets or pocketbooks. About all we know is that ladies carry aerosol cans in their purses and these would set off the magnetometer. We've got to find out what other objects in the same size range as pistols are being carried and if these will set off the device. We'll also run a few planted pistols past the device to make sure it picks them up."

Galbrath predicts, with some caution, that based on these studies Lockheed may be able to develop the device to the point where it will distinguish guns from other objects of a similar length with a sufficient reliability to be of value to the airlines. The low cost of Lockheed's present magnetometer—approximately $100 per gate position—makes it highly feasible from a cost standpoint.

But even if the Lockheed device proves to be reliable enough for the airlines, the use of it would raise all sorts of legal problems. Says FAA lawyer Barclay Webber, "We don't know if it's constitutional for the airlines to