

Centaur Redesign Threatens Surveyor

Drop in lifting capacity may also snag weather and communication satellite programs

by Hal Taylor

NEW DESIGN recommendations are cutting down the payload capability of *Centaur* and forcing other extensive changes in the liquid hydrogen upper-stage vehicle.

The drop in lifting capacity is so great that the *Surveyor* lunar landing mission is in jeopardy. Also likely to be affected are the *Mariner*, weather and communication satellite programs.

The design changes, resulting from a re-evaluation of the program by NASA scientists, are causing sharp increases in vehicle weight and a resulting drop in booster efficiency.

Space agency officials refused to say just how much, but one official declared that "the reduction in payload is enough to scare us. There is a good possibility that we may not meet the *Surveyor* mission requirements."

One solution being considered calls for the use of a new first-stage booster for the liquid hydrogen upper stage. Under the proposal, the more powerful *Titan II* would replace the currently planned *Atlas*.

Another alternative would be to reduce the weight of the 2100-lb. *Surveyor*. This might cut the chances of success for the spacecraft designed to provide the first detailed information about the Moon before the U.S. manned lunar landing flights.

The recommended changes in design are the result of a technological review of the *Centaur* by scientists at NASA headquarters and the Marshall Space Flight Center.

The review was ordered by the House Space Committee after public hearings to determine why the upper stage program was 18 months late.

The committee ordered NASA to report back by Aug. 1 its findings on what was wrong with the program and how it could be accelerated. The report has been delayed because of the many recommended design changes. NASA officials, however, have informed the committee that it will be ready before the end of this month.

While NASA refused to discuss the report except to admit the loss of payload capability, informed sources report

it will:

- Call for a sharp increase in *Centaur* funding including a Fiscal '64 budget request of about \$100 million—far higher than earlier estimates. In Fiscal '63, an additional \$30 million above the \$67 million approved by Congress will be obtained by reprogramming funds from other space agency programs.

- Indicate that *Centaur* will not be operational until mid- or late 1965, two years late.

- Reveal that in order to increase

its payload for missions calling for 22,300-mile-high orbits, the *Surveyor* spacecraft's propulsion unit will be used as a *Centaur* second stage. It will provide an additional 1000 lbs. of payload.

The space agency has decided that *Centaur*, despite its many troubles, is still feasible. While other industry proposals for upper stages have been studied, NASA intends to push ahead.

There will be further delay in the second launch of the upper stage, currently scheduled for March, 1963. **

Mariner Is Set on Venus Course

SUCCESS of *Mariner II* was virtually assured following a mid-course guidance correction which will send the spacecraft within 9000 miles of Venus.

Only the successful transmission of data from two planetary experiments stands in the way of a major U.S. victory over Russia in the space race. This will be attempted on Dec. 14, 1962.

The vital mid-course maneuver was executed at 6:49 p.m. EDT Sept. 4, at a distance of 1,492,500 miles—the greatest range at which man has ever changed the trajectory of a spacecraft.

At that time, the spacecraft was traveling at 6780 mph on a course which would have taken it 233,000 miles from the planet.

Three coded commands were sent to the spacecraft and stored in its command and control system.

The first ordered the spacecraft to roll 9.33 degrees. The second command ordered a pitch maneuver of 139.85 degrees. The third ordered the spacecraft's mid-course correction motor to burn for 29 sec.

As soon as receipt of the commands by the spacecraft had been verified, an "execute" signal was sent by the Goldstone, Calif. tracking station which automatically triggered the whole command sequence at the

specified times.

It required 51 sec. for the roll maneuver, and 13 min., 15 sec. for the pitch maneuver. The pitch maneuver turned the spacecraft almost completely around so that the brief 29 sec. motor burn served as a retro-rocket to slow the spacecraft by 69.5 mph to make the course correction.

Mariner still faces some 14 weeks of space flight and the continuing dangers of temperature extremes, space radiation, cosmic dust storms and possible collisions with meteorites.

The spacecraft has been sending back data obtained from four of its experiments. These are measuring the planet's magnetic field, charged particles, cosmic dust and solar plasma in space.

Its two most important experiments—designed to provide information on the planet's temperature and atmosphere—will not be turned on until about 10 hours before planet encounter.

The first *Mariner* launch July 22 failed when an erroneous guidance signal sent its *Atlas* booster off course.

W. A. Collier, Asst. *Mariner* Project Manager at the Jet Propulsion Laboratory, said, "This has been a shot in the arm for everybody at the lab, and I believe a pretty good shot in the arm for the whole country." **