'One Up' On Buck Rogers

The atomic power system which Plum Brook scientists will test if Congress approves a $12 million expansion program is America's best answer to the problem of power for months-long voyages between the planets.

But SNAP-8, the model for which a special $5 million testing building is designed, won't provide that power.

SNAP-8, NASA has decided, will be used exclusively for auxiliary power aboard interplanetary rockets; it's too heavy for the amount of power it develops to be used as a source of propulsion.

NOT THAT "WEIGHT" is any problem in space — there isn't any. But "space ships" start at Cape Canaveral, and getting off the ground is hard enough.

In order to be useful as a power source for propulsion, NASA has decided that a space power system could not weigh more than 10 or 20 pounds for each kilowatt of electric power

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it produces. The SNAP-8 system was originally shooting for 50 pounds per kilowatt, but the suggested redesign requires 100 pounds per kilowatt or more.

The decision to re-design SNAP-8 for auxiliary power was apparently made at a meeting just this week. Plum Brook officials hadn't been informed of the change when details of the station's expansion plans were published Thursday.

ALTHOUGH LONG CONSIDERED, the switch is an indication of the rapid realignment of plans which takes place almost daily, as scientists all over the country strive for solutions to problems Buck Rogers could only dream about.

SNAP-8 (the eighth model in a series labeled Space Nuclear Auxiliary Power) didn't make it; perhaps it will be SNAP 15 which will land Americans on Mars — or SNAP 50.

As one Plum Brook official explained it: "Atomic energy offers the best source of power for long flights through the planetary system, where distance is vast, but resistance negligible." Each step in the development of a light-weight atomic engine is a step on the road to outer space.

THE DEVELOPMENT OF THE REACTOR for SNAP-8 is contracted to Atomics International by the Atomic Energy Commission.

The original design of the power plant uses a liquid metal — NaK, a mixture of sodium and potassium — as the fluid circulating through the reactor to absorb the tremendous heat produced there. This NaK reactor fluid emerges from the reactor at 1200 degrees Fahrenheit. It then passes to a heat exchanger where it boils mercury.

The boiling mercury produces mercury vapor which then turns a turbine-alternator that generates electric power. From the turbine, the mercury passes on to a condenser-radiation where it becomes liquid and starts through the power cycle again.

In the redesigned system, the mercury vapor will not go to a radiator to be re-condensed. Instead it will go to a second heat-exchanger where it will give up its heat to the cooler fluid in a second NaK loop. The second NaK fluid will then go to the radiator.

The reason for this change is that the process of condensing a vapor into a liquid is sensitive to gravity — and likewise sensitive to lack of gravity. With the radiator and condenser separated from each other, the mercury condenser can be shorter and more compact; thus, gravitational effects on condensation become less important because there is better control of where the condensing fluid is.

THE REDESIGN NECESSARILY calls for a heavier system. In addition to the weight of an extra NaK loop, the main radiator has to be larger than in original design plans.

This is due to several complications, one of which is that NaK in the radiator will be at a lower temperature than mercury would have been. Since a larger radiator is required it means also that a larger area must be shielded from possible micrometeoroid penetrations. Consequently, the weight gain is increased by both radiator size and heavy shielding.

Harry B. Finger, director of the Space Nuclear Propulsion Office is quoted by Nucleonics Week (May 16, 1963) as follows: "No one understands how to get a reliable system that can operate for 10,000 hours. So our approach is to do a lot more on component testing. We have to learn to break a system package into subsystems and components and parts that can be developed separately, proved out and the reliability of each demonstrated separately. This was one of the main considerations in the SNAP-8 redesign: it was redesigned for better component and subsystem testing."

LEWIS RESEARCH CENTER in Cleveland and Plum Brook both will eventually play a role in this component testing. Present SNAP-8 work includes studies of the operation of the condenser fluids in weightless conditions, simulated testing of SNAP components and determination of radiation effects on electrical parts. Zero-G studies have been done in ballistic aircraft flights and sounding rocket tests will continue these weightless studies in the next year or two.

The facility proposed in the 1964 Plum Brook Budget will be used to integrate the SNAP-8 reactor and the SNAP-8 conversion system into a total powerplant for space vehicles.