

presumed in the design of the radar. Our landing radar is a more sophisticated cousin of that used on Surveyor, so we have acquired some confidence, because of the fact that the Surveyor has been successful. The testing that has resolved our more pressing problems on the radar has been the various ground tests run with portions of the vehicles, tests run with the radar being vibrated, and so forth.

Representative WAGGONER. Maybe Mr. Evans is the person who mentioned it earlier, but someone mentioned earlier that you had, above all others, a soft landing capability that nobody had; and it seems that I recall at one point in the soft landing program, in our early efforts to solve the soft landing package on the moon, there was some speculation on the part of some—and I don't know what they finally concluded—but there was some difficulty with the soft landing, because maybe the radar was giving erroneous information as to the penetration point into the surface before the reflection back, and that measurement signal was giving erroneous information.

Mr. RATHKE. I think that I have heard of such thoughts. It is my impression that these have been largely put aside in view of the success of Surveyor.

Mr. GAVIN. I think that one of the significant improvements shown here is in the case of the reaction control system. Now, this is sort of interesting, because the thruster involved is a common usage item between North American and ourselves. The basic thruster was developed for North American and we are using it in identical form.

The accomplishment here is largely one of getting past a series of development and qualification tests which have given us a better understanding of the operating limit of the engine under varying temperatures.

In the case of the electrical power system, we still have to complete the qualification of the batteries. We have had a considerable amount of difficulty with both relays and circuit breakers, and we are working our way out of these difficulties at present.

In the case of the communications category, the S-Band steerable antenna is the longest lead item and getting past the qualification on that will represent a significant improvement in our evaluation of this category.

I have mentioned already the situation with regard to the engines. I think that the significant point there is the improvement in our confidence with regard to the descent engine. A lot of testing and results have been obtained since the August evaluation.

Well, I could go on into this in much more detail, but I think I have hit the highlights. I would like to say before passing from this, however, that what doesn't show on this chart is the fact that our subcontractors in general have done very well in meeting their weight requirements and also their performance requirements. I think this is showing up in the performance of the vehicle and the confidence level attached to its operation.

Representative WAGGONER. What it does show that in the 5 months since August, in every area except the structure itself, you have made some real progress.

Mr. GAVIN. That's correct.