

that direction, bringing industry into that particular effort more rapidly than we have in the past.

I am speaking broadly. I am not speaking just of the Army program, but from a national viewpoint.

I would like to make this observation also, that to date there isn't anything operating in space. We are talking about all these great and wonderful things, but it is still R. & D. essentially in almost all of our efforts, and it is still very expensive.

Now, when you get to operating—let's say in a communications satellite effort which is one that I am personally very much interested in, the cost of operation is essentially zero. The cost per ton mile of a satellite after it is up there is nothing, and I think this is important.

We are never going to have any operations in space that are worth a damn until we get reliability. It makes no sense to go on researching forever. We have got to get something which works, and when a communications satellite, for example—and the same applies to other satellite systems—becomes operational and is useful whether it be for military purposes or civilian or any other application we may think of in the future, its cost then is nothing per ton mile. It just sits there, and all of the costs associated with the operating aspects of the program are going to be on the ground and that is where the Army is, on the surface of the Earth.

As in the case of the Navy, in navigation, for example, in Transit, I think in many cases we should look a little further ahead than just to be temporarily glamorized by R. & D. at the moment. We have to look further down the road and perhaps realize when these things become operational—and we are doing things in space, whether it be to make money for stockholders or do it to defend the country or against a satellite, or to communicate world-wide—the problems are going to be quite different and it is necessary on a national level and we will think more along these lines of a nationally-planned effort.

We get excited about these things and the directive comes out but it is still research. However, it does affect the future and I think that is why each of the Services is very much interested.

I think those are the main points I wanted to make, if they are of any use.

General TRUDEAU. This is why the position was taken as stated by myself before this committee last year, and this year in the previous recommendations we have made because we could see that whatever you do now with respect to research and development is going to have a major impact on operations. All you have to do is to look at this wonderful model [of satellite orbits around a globe], Mr. Chairman, that you are putting out here, and look at all those bands going around in all these directions at different speeds and for different purposes and realize that somebody at some focal point has got to do a lot of work one of these days.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. The problem comes up on the new terminology. I spoke of that previously. There is basic research and development; there is applied research and development; there is then testing as a stage and then engineering as a stage.

We may have revisions and variations and so on in models and the changes for practical uses.