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Maj. Gen Bernard A. Schriever, Commander, Ballistic Missile Division, and Brig. Gen. Don Flickinger, Director, Directorate of Life Sciences, ARDC, made significant statements on Air Force space age plans at the Illinois Wing Missile Age Conference and Oklahoma City Frontiers of the Space Age meeting. As a service to readers, Air Force reprints condensations.

USAF Planning for the Space Age

Maj. Gen. Bernard A. Schriever

The past twelve months have been marked by unprecedented advances in science and technology, both at home and abroad. We have only to recall that during the past year the American public has been made keenly aware of Soviet ballistic missile flights, our own ballistic missile flights, Sputniks, Explorers, and the Vanguard.

Taken together, these have fostered a new climate of concern with outer space vehicles and travel, and the Air Force, through the research and development efforts of the Ballistic Missile Division, is helping to open up new frontiers in space technology. To put what we are doing in perspective, let me very briefly summarize the areas of our responsibility.

Our job involves management supervision of four major weapon systems programs. Our first mission has been the design and production of Thor, Atlas, and Titan. We are now also deeply involved in research and development for the Air Force satellite system, for lunar probes, and for the Minuteman ballistic missile.

In moving toward these objectives, we have had successes and setbacks. We have had our share of triumphs and our share of troubles. We have had our difficulties, and all our problems have not yet been finally solved. We anticipate further difficulties and problems as operational testing increases in intensity and scope. We also feel confident that we will continue to over come whatever obstacles may arise. In any event, then, here is that checklist:

- The flight-test aims of the Thor missile are being accomplished in a ay that closely follows or beats a schedule laid down thirty months ago. An Air Force Thor missile has flown [on October 24, 1957] 2,400 nautical miles, or 900 miles in excess of its designed range, and production of the complete Thor weapon system is going forward at an accelerated rate. As a result, plans call for the first Thor squadron, equipped with fifteen missiles, to be deployed to operational sites in the United Kingdom to be deployed to operational sites in the United Kingdom before the end of this year – or just thirty-six months after this project was begun.

- A strong start has been made toward further extending the missile art by means of a new refinement known as “Project Able.” Able illustrates the way in which existing hardware can be readily modified and adapted to several new spaceflight purposes. Moreover, Able is a prime

example of inter-service cooperation in exchanging ideas and coordinating talent and facilities. For in its first stage, Able uses an Air Force Thor missile as a booster, and in the second stage, it uses a Vanguard engine developed by the Aerojet Company for the Navy. This Air Force engine has been especially modified for the Ballistic Missile Division by the Ramo-Wooldridge Space Technology Laboratories. Able will provide us with vital high-speed reentry test data required in the design of more advanced nose cones for Thor, Atlas, Titan, and Minutemen, and will provide us with completely new information in the field of biomedicine. In the months ahead, as each Project Able missile is tested, it will carry a mouse in the nose cone. We expect the mouse's reactions will tell us a lot about the effect of spaceflight on living organisms. We will be gradually replacing such mice with more complex animals until, step by step, we have learned enough to make it safe to put man into space early in the 1960's.

Under direction of the Advanced Research Projects Agency, Able will be among the first US moon vehicles through which we can investigate and appraise many new phenomena in pace travel. To put such a vehicle in the vicinity of the moon, 240,000 miles away, we need powered flight for only about the first 500 miles. After this, the missile coasts toward the moon. It will coast for two days. At the end of these two days the missile will have slowed down to a mere 500 miles an hour in contrast to its early initial speed of nearly 15,00 miles an hour. These experiments can provide us with the information on cosmic rays, atmospheric pressure, gravitational, electronic, and magnetic fields previously unattainable. Once you do these things, you open the way to some rather astounding possibilities.

You could, for example, put telescopes into space where lenses would not be blurred in the attempt to see through the Earth's dense atmosphere. One authority in studies of the sun has said that it would be possible to get an entirely new type of space spectrograph which could enable us to acquire new knowledge about heavy element thermonuclear reactions in the sun – and that this knowledge could result in some remarkable forward strides in both the military and civilian uses of thermonuclear power.

- Our planned short-range Atlas flights, up to a distance of some 600 miles, have been conducted regularly at Cape Canaveral, Fla., where full-range flight up to 5,500 miles will be soon, all of them on a progressive timetable laid down more than forty months ago. From the very outset of our ballistic missile program, we have been meeting our flight-test objectives at a gratifying rate. We hope to have operational capability of the Atlas some months before the time thought possible by the distinguished Von Neumann Committee of scientists, which back in 1954 first established the feasibility of the ICBM.

- Our Titan ICBM will be ready for flight-testing at the Air Force Missile Test Center in the near future. The Titan was conceived as a backup missile for the Atlas to give us an alternative approach in achieving an ICBM capability. Initiated a year later than the Atlas, the Titan is the beneficiary of the concepts, techniques, and procedures, which have contributed so importantly to the success of the Thor and Atlas programs. When it becomes an operational part of our Strategic Air Command, the Titan will be launched from underground sites, which incorporate everything we have learned up to now in affording protection against nuclear attack.

- Our first launch facilities at Cooke AFB in California, including stands, blockhouses, photographic and tracking equipment, will be completed by early this summer. Crew training in the launching and logistic of both Thor and Atlas will be well under way at Cooke by late summer of this year. Construction has already begun on a new Pacific over the Pacific with the same accuracy we now enjoy in our Cape Canaveral flight-testing out over the Atlantic. Another

Air Force ballistic missile base near Cheyenne, Wyo., will soon be under construction. Two more such bases have been selected – one near Omaha, Neb., and another near Spokane, Wash.

- The Minuteman solid-propellant ICBM program is emerging from the embryo paper proposal phase into full-fledged research and development. Our hope is to push this program forward as rapidly as the technical state of the art will permit. We expect to have research and development contracts in the hands of selected contractors by the end of this summer.

The foregoing check list, highlighting major items in our record over the past year, shows some very substantial forward steps, always taking into account both our victories and defeats.

We must recognize that the only thing we can be sure of in the military picture is that technical changes will continue at an ever-accelerating rate. Thus the criterion of success for a military service has become the ability to conceive, to develop, and to operate weapons systems, which take the fullest advantage of scientific, and engineering advances.

This means that the weapon system we set out to design today has to be based on accurate forecasts of what operational requirements are going to be four to ten years from now. With these requirements in mind, we must then design the over-all weapon system in such a way as to gain the maximum benefit from anticipated improvements in the performance of the weapon system as a whole, as well as in its individual parts, during, say, the entire four-year period of development. The essence of this approach, in our case, is that there must be projection of the state of the art as it will exist four years in advance of freezing a weapon design, tighter with action to bring along simultaneously all the elements of our program so that they would be ready, at each successive stage, to be fitted into each other as required.

This has been done in our Air Force ballistic missile program. For example, when we started out four years ago, we did not have a reliable rocket engine. To be sure, we did have some test engines, but they were not very good. Based on development experience, we had every reason to believe that, by means of constant experiment and testing, we would be able to come out with a reliable engine. We therefore decided to go ahead and design the entire missile – including airframe and guidance – around what we believed that engine would be four years in the future.

Similarly, back in 1954, the warheads in existence would have required a gigantic missile to deliver them to the target – a vehicle weighing up to as much as a million pounds. However, using the same theory and principles upon which existing warheads had been produced, we were confident that a much smaller and lighter warhead, delivering a sizable megaton yield, could be ready for use on the ICBM at the same time the engine, airframe, and guidance systems would be ready.

The weight and size of this projected warhead became one of the principal design factors. The combination of such projections made possible the design of a missile one-fourth the size than otherwise would have been required had we designed it around the engines and warheads available in 1954.

We must continue to move ahead with the courage to take the necessary calculated risks. Otherwise we find ourselves equipped with obsolete weapon systems that invite national disaster.

A word about the future. In looking ahead to our future developments in missilery and other phases of space technology, we must temper imagination with realism and daring with objectivity. On this score, I think we should all keep in mind the criteria recently proposed by our Ballistic Missile Division chief scientist, Dr. Simon Ramo. He has pointed out that “we cannot be first and foremost in today’s world in every aspect of science. In particular, in space technology, there are so many experiments that are practical to perform, so many attractive systems for military or peacetime applications, that can be brought into being, utilizing outer space, tat any country with substantial resources choosing to work in this field must be expected to conceived and carry out some favored project ahead of other nations.

“Thus, if we send up many satellites, for worldwide TV relays, general navigation, communications, and mapping, and land instruments on the moon, and orbit around and take pictures of Mars, that still leaves to another nation during this same period the planet Venus, satellite systems to participate in weather predictions and control, and manned space stations… Scientific experts can help by indicating how much can be accomplished at a given time and at a given cost… But ultimately the people as a whole, through their selected representatives and their government officials, must make these choices.”

In making these choices there must be the widest possible public discussion and debate over alternatives clearly defined and understood. This ability to choose alternatives is the cornerstone of our democracy, the core of our faith in freedom. Moreover, we affirm that the values and standards of freedom must be chosen voluntarily in the market place of ideas and never imposed by force on anyone. —End