OF A GREAT WEAPON SYSTEM

A "Flight" Analysis

programme is assigned to a large private firm. In the case of WS-315A the firm is Douglas Aircraft.

For various reasons, Douglas's task with 315A was reduced to the basic business of organizing an army of subcontractors, developing the hardware within parameters already understood, and then, by persistent slogging, turning each piece of the system into a product capable of giving utterly reliable performance with a user squadron. In making such an assertion the writer has no wish to belittle the outstanding achievements of all who have worked on the system; he merely intends to point out that 315A accomplished few technological advances, nor was it intended to. The ground-work was largely already done, during the development of WS-104A (Navaho) and WS-107A-1 (Atlas).

In fact, to a very large extent, 315A was deliberately based upon the Atlas system, since it was deemed logical to cull for the IRBM programme the maximum possible amount of assistance from lessons already learnt, and thus permit the new missile to be developed to an extraordinarily compressed schedule. The decision has been proved a correct one; for, although the Thor and Atlas systems are of necessity ending up quite unlike each other, they have proved mutually complementary to a high degree. At the outset the IRBM appropriated major critical components of the ICBM as going concerns, and now Thor is actually assisting in the development of the larger weapon.

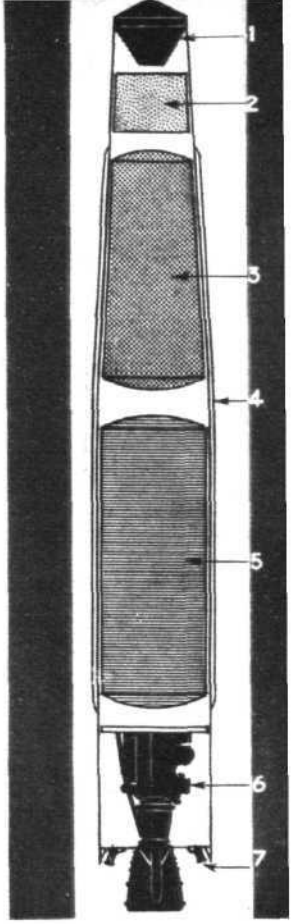
It is not difficult to see why the development of an ICBM was started first. The intercontinental delivery system, operating from bases inside America, has long been regarded as the primary U.S.A.F. weapon. In contrast, the IRBM pre-supposes overseas deployment. Moreover, other things being equal, the ICBM should pose much the more difficult scientific and engineering problem; it is always a harder task to make a longer-ranged vehicle, and the ICBM also has a critically high speed of re-entry into the atmosphere.

It was not until November 1955 that the U.S. Department of Defense gave the U.S.A.F. permission to develop an IRBM, and the contract for WS-315A was not let until a mere 36 months ago. (Development of the competing Jupiter IRBM was begun by the U.S. Army at about the same time, although Jupiter naturally had to make its own scientific and engineering discoveries as it went along. Jupiter and Thor have always been rivals, and it seems unfair that the Army weapon should have been wrenched from its sponsoring service and turned over to the service which already had Thor. As these words are written, the decision to cancel either Thor or Jupiter is awaited. The fact that this journal has chosen to devote so much of this issue to one of these weapons does not necessarily reflect our assessment of their relative merits. Thor just happens to be used by the R.A.F.)

Be that as it may, the U.S. Air Force's IRBM system was initiated in December 1955 as WS-315A, and the vehicle was called SM-75 (strategic missile) and given the name of Thor. Development was put in hand following the usual administrative set-up, which is described by the Air Force in the following terms:—

"The Air Force Ballistic Missile Division (formerly the Western Development Division), Major General Bernard A. Schriever, Commanding, has the entire management responsibility for the Air Force ballistic missile program. The Air Force Ballistic Missile Division is the management member of a three-part team. The second member is the Ballistic Missile Office of the Air Materiel Command, which exercises all contracting and procurement responsibilities for the program. The Guided Missile Research Division of The Ramo-Wooldridge Corporation, the third member of the organization, provides technical direction and scientific supervision for the program, which now includes three inter-related weapon systems, Atlas, Titan and Thor."

Western Development Division and Douglas signed the contract for WS-315A on December 27, 1955. Douglas's rôle was defined as that of "prime contractor, responsible for airframe fabrication, systems integration and ground-support equipment." Before the end of January, the Thor project team under J. L. Bromberg had determined the size and principal characteristics of the SM-75, and the engineering design was completed on the last day of July, 1956. By that date fabrication of XSM-75s was already in hand, using production tooling.



This schematic diagram clarifies the location of each of the principal portions of the SM-75 Thor: **1**, nose-cone and warhead; **2**, airborne guidance; **3**, RP-1 fuel tank; **4**, external service duct; **5**, liquid-oxygen tank; **6**, main propulsion engine and turbo-pumps; **7**, vernier motors

From the outset 315A was a "crash" programme and it was conducted at such a tempo as to form a deliberately calculated risk. More than in any previous project, the entire weapon system progressed in parallel—so that, for example, Douglas were calculating stresses in the airframe at the same time as another company was designing the struts which prop open the sides of the hydraulic supply vehicle. In theory such a policy saves time; and it is certainly an amazing achievement to have fired the first round within thirteen months, and to have equipped the first squadron overseas within 36 months, of the start of the project.

It was decided that the 1,500-n.m. mission could most efficiently be flown by a single-staged missile. At that time the longest-