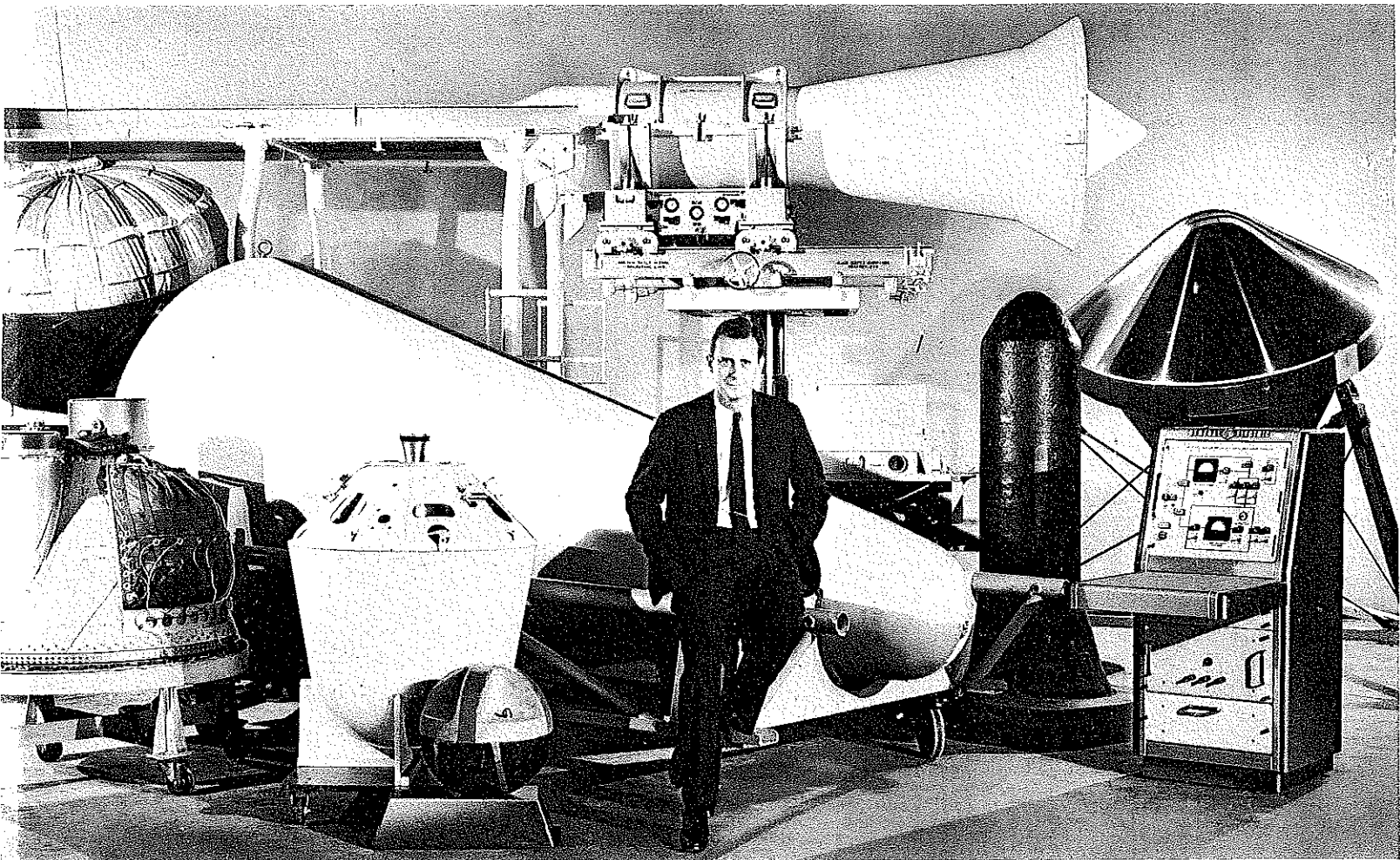


**MISSILE AND SPACE
VEHICLE
DEPARTMENT**

*...center for missile and space technology research
and development at General Electric*



*How Subcontractors
play important role in G.E., USAF
re-entry vehicle progress*

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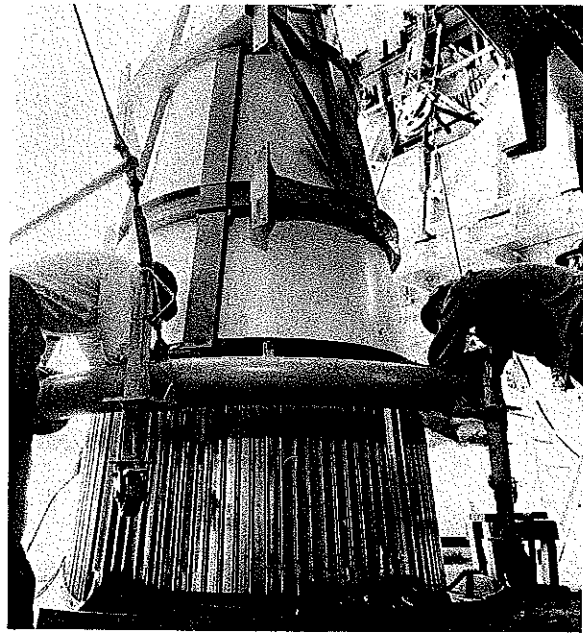
**A TYPICAL EXAMPLE OF USAF, G.E.,
SUBCONTRACTOR TEAMWORK**

All of the 4000 different subcontractors involved in these 1959 MSVD re-entry vehicle purchasing activities could be listed here, but perhaps of more interest and of greater significance is a summary of one representative subcontractor's contribution.

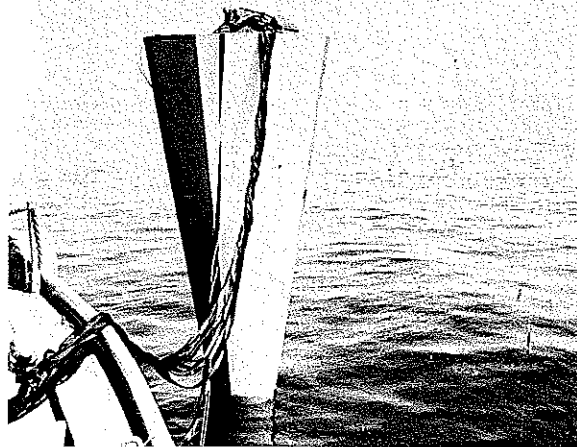
Chalmers and Kubeck specializes in machining and fabricating radar, missile and field service devices. Located in Chester, Pennsylvania, C&K has grown from a six-man operation in 1953 to its present status as a major local community business firm doing over one half million dollars worth of business. C&K serves many different companies in addition to General Electric's Missile and Space Vehicle Department. Although they are a small business, they now subcontract work to other neighboring business firms. The successful completion of a contract awarded to C&K in 1958 by MSVD dramatizes in part that C&K's performance is responsible for their growth.

In 1958, the Missile and Space Vehicle Department of G.E. was awarded a USAF contract to continue already intensified studies associated with the development of ablation re-entry vehicles. The contract involved the design and fabrication of an experimental, recoverable ablating-type nose cone or re-entry vehicle, including the development and fabrication of the necessary recovery and instrumentation subsystems. To be called RVX-2, this re-entry vehicle would be flown on the Atlas missile to check out the design parameters of ablating re-entry vehicles with extremely high impact speeds.

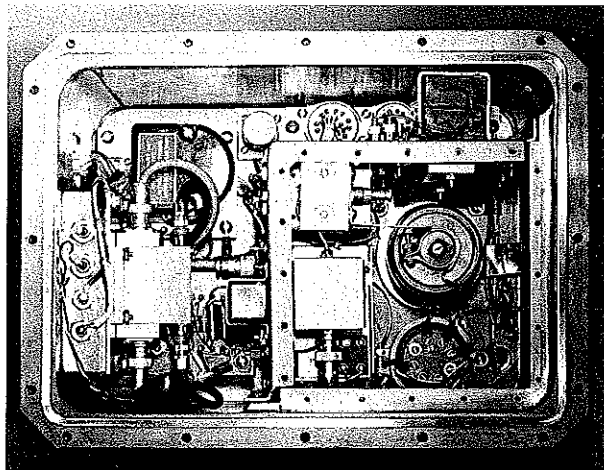
The vehicle instrumentation MSVD engineers were called on to develop included an automatic radar antenna tuner assembly. This device was required as an aid to ground personnel in maintaining telemetering contact with the RVX-2 vehicle dur-



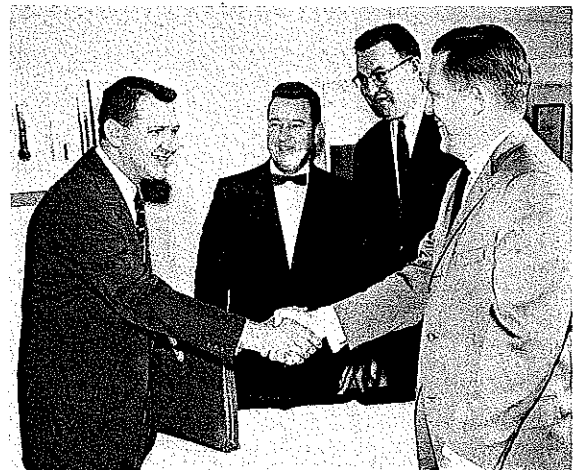
RVX-2 RE-ENTRY VEHICLE (above) is mated with USAF Atlas missile. Special radar tuner device fabricated by Chalmers and Kubeck for MSVD is contained in vehicle. Shortly after successful flight, (below) RVX-2 missile is recovered from ocean thousands of miles from firing point. Tuner helped USAF and MSVD personnel to maintain telemetering communication with the re-entry vehicle.



D developed and built by abled C & K to use existing radar housings so that all fit properly.



ACTUAL FINISHED AUTOMATIC RADAR ANTENNA TUNER as it appeared after fabrication by Chalmers and Kubeck and final installation of all components by General Electric's Missile and Space Vehicle Department.



MSVD SUBCONTRACTING PERSONNEL congratulate C&K representative after RVX-2 radar antenna tuner delivery. This was another job done for MSVD by one of its more than 4000 subcontractors.

ing the re-entry phase when shock-induced ionized gases would seriously weaken or totally destroy radar signals in the frequency range of 30 to 30,000 megacycles. This tuner had to be packaged so that it would be able to withstand the vibrations of missile take-off, the extreme heats of re-entry, and the internal pressures of up to 15 psig encountered at high altitudes. In addition, the package or housing had to be very light-weight. MSVD turned to Chalmers and Kubeck and presented them with the housing requirements.

CHALMERS AND KUBECK SOLVES THE PROBLEM

Because of the extreme heat, vibration problem, weight requirements and internal pressures to be encountered, the production of the antenna housing was difficult. Magnesium, the lightest available metal, was used. To produce the desired box-shape of the strength required, C&K proposed to form the box from a flat piece of magnesium which would require the welding of just one seam. This forming process posed another problem since magnesium has a tendency to crack while bending. This was circumvented by heating and forming the metal in a jig while hot. After the bending and welding phase, a special inside milling operation was neces-

sary. This required the development and fabrication of a special milling head so that the close tolerance machining operations could be properly performed. After each housing was produced, it was subjected to extensive testing and inspection.

Chalmers and Kubeck built all the required antenna tuner assembly housings for MSVD and delivered these on time, overcoming many fabricating problems. In addition to performing a service for G.E., Chalmers and Kubeck benefited in that they gained new skills for use in future projects. General Electric MSVD, for its part, successfully developed the RVX-2 re-entry vehicle. This experimental vehicle flown on a USAF Atlas ICBM is the largest re-entry vehicle to be recovered after traveling the full intercontinental range. The recovery of this vehicle provided the Air Force with vital information about ablation phenomena and vehicle design for application to the USAF's newest generation of ablation re-entry vehicles for Atlas.

This brief description of how C&K helped the Missile and Space Vehicle Department simply illustrates one of a thousand such stories. It serves only to support more fully MSVD's belief that subcontracting is a good business practice.

Who benefits from Missile and Space Vehicle Department subcontracting activities?

THE FINAL CUSTOMER BENEFITS

In the case of MSVD subcontracting activities on USAF re-entry vehicle contracts, the Air Force benefits because the creative talents of many different people, with the widest possible diversity in skills and backgrounds, are applied to a given project. At the same time, complete project management responsibility remains centered for optimum coordination. Also, from the customer's point-of-view, subcontracting often helps to gain added economies and speeds, especially when complex projects are involved. Finally, by receiving Government sub-contracts, many small businesses build up skills, know-how and equipment inventories that might otherwise have been impossible to attain. In time of national emergency, these already existing capabilities become immeasurably important to our military services.

THE PRIME CONTRACTOR BENEFITS

Through its broad subcontracting activities, the Missile and Space Vehicle Department is better able to undertake those portions of military and civilian missile and space vehicle projects with which it can make the greatest contribution. MSVD

does not have to become a huge, unwieldy, complex of men and materials. Rather, it remains well integrated and makes the best use of the many subcontractors that have proven their capabilities.

THE SUBCONTRACTOR BENEFITS

Many small and large business firms have quite specialized skills, not normally suited to be applied to complete systems contracts, but ideal for certain aspects of such projects. Subcontracting can help to keep such business firms' operations at a healthy level and in many cases can help small firms to grow in size and in value to their community.

THE COMMUNITY BENEFITS

The very economic well being of many communities is closely associated with local small business prosperity. Subcontracting helps to assure this well being by building more jobs . . . by encouraging our free enterprise system. Skilled craftsmen and engineers can find good opportunities in local communities without moving to more populated centers. In short, everyone in a community benefits when larger business firms like General Electric MSVD take full advantage of small business capabilities.

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