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ORAL HISTORY INTERVIEW

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Oral history interview with Arnold Rosenbloom  
[full name of interviewee]  
about TRW as <sup>MSC</sup> support Contractor  
[main focus of interview]

Title: TRW  
[interviewee's current and/or former title and affiliation]

Interview conducted by Robert B. Merrifield - Staff  
[interviewer's name/position]  
Historian at TRW  
[location of interview]

Transcript and tape(s). [for inventory only: # pages 9; # tapes 1]

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**CONTENTS:****Biographical** - [date/place of birth; family background] \_\_\_\_\_**Education** - \_\_\_\_\_**Career Path** - \_\_\_\_\_**Topics**

TRW systems engineering

TRW - Air Force ballistic missile program connection;  
 application of boosters for manned space flight;  
 TRW support of <sup>MSC & ~~TRW~~</sup> <sup>(MTEP)</sup> ~~Flight Operations Directorate~~ Mission  
 Trajectory Control Program of Apollo Spacecraft  
 Systems Analysis Project, <sup>(A SSAP)</sup> Ramo-Woolridge STL role;  
 Mueller at STL; Changing <sup>TRW</sup> role after Apollo  
 five, growth of ASSAP and TRW Houston;  
 analytic models of Apollo subsystems;  
 TRW recruitment; TRW <sup>parent-division</sup> operations;  
 employee morale; direct interface w/  
 MSC personnel; TRW relation w/  
 prime contractors (NR & GAEC);  
 question about future of MSC;

INTERVIEW WITH ARNOLD ROSENBLOOM

July 12, 1968

76-1 TRW's involvement in the manned space program has its roots in the Air Force ballistic missile program. Mercury and Gemini both used Air Force boosters as the spacecraft booster and STL-TRW had a comprehensive systems engineering role with respect to these boosters. Therefore, it was in the best position to advise the Air Force and NASA on the application of the boosters for manned space flight. There was significant corporate involvement in the early days of the Mercury program with respect to the application of Atlas and later with respect to the application of Titan II for the Gemini Program. The degree of this involvement as far as booster was concerned, diminished in early 1960 when these functions along with a number of key people who had been involved in these activities at STL were transferred from STL to the newly created Aerospace Corporation.

781 The utilization of the guidance system on the Atlas and the close interaction between the software in the Atlas guidance system and the orbital aspects of the Mercury flight brought our people into close contact with present key members of the Flight Operations Directorate. This relationship continued through some studies on the Gemini Program later, some direct support, and later this led to a much more direct involvement in TRW and the decision, subsequently implemented, to build up a capability in Houston in support of Flight Operations Directorate. Specifically this involved supporting the Mission Planning and Analysis Division, in activities relating to flight planning, mission planning, and realtime support. This activity is now entitled the Mission Trajectory Control

Program and is the largest single activity in TRW Houston Operations, and currently involves over 300 professional people.

81 The other major piece of activity in support of the manned spacecraft program at MSC is entitled Apollo Spacecraft Systems Analysis Project. This activity also had its roots in the Air Force ballistic missile program and the Ramo-Woolridge STL unique role in that program. The type of expertise and real value of systems analysis and systems engineering as applied to complex programs was convincingly demonstrated during the course of the ballistic missile program, particularly to Dr. Shea who then was active in the Air Force ballistic missile program through involvement in Bell Labs and in later assignments at AC Spark Plug and TRW. After he joined NASA, he became convinced that this type of capability was needed in direct support of MSC which led to the initiation of the activity entitled Apollo Spacecraft Systems Analysis.

108 Actually, TRW's involvement with the Apollo program started with its unsuccessful proposal for the prime contract on the CSM. I was involved for an entire summer in Philadelphia as part of the proposal team, and on this assignment, I met many of the key people who are still involved in the Apollo Program. Our total Apollo activity at that time was directed by Dr. Mueller who was then a Vice President of STL. This was several years before he became Associate Administrator for Manned Space Flight. Other key people in this proposal activity were Ladd Warzecka who is presently the local Houston manager for GE activities and at that time was the Assistant Proposal Director for GE. GAEC was represented by Joe Gavin and Tom Kelly both of whom are still active on the GAEC LM contract.

Our Houston activity has grown rapidly over the last year, and we an-

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ticipate a total of approximately 1000 personnel on site in Houston toward the end of 1968, most of whom are either directly or indirectly involved in our MITCP-ASSAP activities. Of this 1000, approximately 600 are professional engineers, computer programmers, analysts, mathematicians, and scientists. The evolution of the two projects has reflected itself in different patterns between MITCP and ASSAP. MITCP has shown steady growth from a small cadre of people. This growth has been planned and over the last two or three years has increased to close to 300 professionals. The MITCP activity involves support of MSC divisions. As such the activity could be planned and growth carried out in a rather consistent pattern. ASSAP's history has been somewhat different. Its activities have been in support of ASPO Systems Engineering Division, five divisions in the E&D Directorate and one division in Flight Crew Operations Directorate. As such, the distribution of talents has been broad and the collective management of the activity has been more difficult in planning and in overall direction. The prevalent attitude toward TRW support in the ASSAP area by MSC Management had been the specific expertise provided by TRW would be eventually supplanted by MSC personnel. TRW would provide this expertise in terms of specific analyses and software products but in the process would enable MSC to take over these activities. For the first several years, it was anticipated that ASSAP would be gradually phased out over the course of the Apollo Program. This situation changed during the last year or so due to several factors, the predominant one being the Apollo fire. After the fire a much more conservative and careful approach was taken to the many problem areas which previously had been thought to not require effort. Moreover the tight ceilings on MSC personnel and diffi-

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culty in creating sufficient skill levels resulted in a commitment by the Center to continue ASSAP rather than phase it out. This decision coupled with the increased pace and tempo of the program over the last year has led to a significant growth in ASSAP. The spectrum of skills represented by TRW now in support of MSC is quite broad. It involves most of the technical capabilities required for manned space flight. TRW Houston now has a very significant capability in quality and in depth in orbital mechanics, trajectory analysis, mission planning, and other related activities. The Guidance Control area is also important in terms of analysis and hardware-related support activities in terms of the special expertise of TRW in space flight guidance and problem solving and through the development by TRW of the abort guidance system under subcontract to GAEC. The software activities related to the abort guidance system although mostly performed in Redondo Beach result in additional guidance activities for TRW in Houston. Communications and related activities are also represented in Houston and in varying degrees of depth, the other technical disciplines such as electric power, aero-thermo-dynamics, structures, dynamics, propulsion, environmental control and life support. In addition, a strong nucleus of systems engineers from the immediate inception of TRW's activities have been largely responsible for the Flight Test Planning activity in support of ASPO including the definition of mission and test objectives and the further delineation of these objectives and their relationship to the flight program. The old problem of spacecraft data and its validity and consistent utilization by the many elements of the Apollo Program have required additional systems engineering activity.

Another area of significant TRW activity both at a system and sub-

system level has been the definition of analytic models for many of the Apollo subsystems and the utilization of these models in several areas. An important one has been in calculating consummables on Apollo both from the standpoint of preflight planning and to provide systems for realtime control and crew activities.

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We've been in a rather unique position with respect to the rest of the company in terms of building up our staff in Houston. We made a conscious decision to have our organization composed of all elements of TRW systems. We felt we would be better able to build up our staff through transfers by retaining a direct responsibility in the functional areas represented in Houston. The initial group of people was transferred from Redondo Beach but the growth of the company overall made it infeasible to staff to the numbers we required through continuing transfers, so an extensive recruiting program was instituted in Houston. The special nature of the environment around MSC, involving all the aerospace contractors and the Center itself made it clearly inadvisable to recruit from the local area and we imposed rather strict constraints upon ourselves in terms of offering employment to MSC personnel. Therefore the emphasis in our recruiting has been outside the general Houston area. We had success lately in attracting people from local universities and University of Texas, and Texas A&M. We have been most successful in attracting from the southern areas of the country--Florida, Huntsville, Alabama, New Orleans, Louisiana. We have been less successful in the Northeast. We have had some limited success in attracting people from the West Coast. A surprising number of people both inside the company and new hires have had ties in this general area and have wanted to locate here. Those

people who have come here have generally been satisfied with their living and working environment and as a result our turnover has been very low at least as far as the professional people are concerned. The turnover rate has been quite high in the secretarial staff, primarily because of marriages, pregnancies, etc.

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Finally, our dominant problem has been that we have a single contract with a single customer. We have felt vulnerable to the variations in our contract activity and now are seriously concerned about what the future holds for MSC and its support contractors. Consequently we have attempted in a limited way to diversify our activities locally, although as of now and for the foreseeable future, our activity will be almost exclusively concerned with our MSC contract. We have had some other problems somewhat unique in our company in terms of building up a large geographically separate set of organizations which retain direct ties to parent organizations in the company. There has been the necessity to have the capability for operating locally as an integrated team, and as the company is organized by division rather than by geography, unique administrative procedures, planning, and management methods have had to be instituted. These have required a special degree of patience and cooperation on the part of the local managers but is regarded within the company as a highly successful system, and is now being emulated by other offsite operations of the company.

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The general employee morale and spirit of motivation has been excellent. The major problems appear to relate to the question of future work and what that will mean to the people here. We have been very satisfied with the award fee concept which has been used for our contract. We've



been pleased in that it has permitted us to earn a better fee than if we were under more conventional contractual arrangements. At the same time and perhaps even more important, it has provided direct feedback in great detail as to MSC's assessment of our work and has permitted much more timely assessment and correction of problems.

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The nature of the work requires many of our people to be directly interfacing with MSC personnel and as is inevitable with such an involved and many faceted relationship, it has had its high and low points. Typical of the kind of problem we faced--initially and probably not unique to TRW was that many of the MSC people at the working level would prefer to be supplied with several skilled people to work with them at their direction rather than to assign a defined job to TRW. We now work under a task agreement arrangement and our total effort consists of something like 90 active tasks, but the degree of definition. The actual way the tasks are carried out has varied depending on the nature of the work, and also on preference of the particular NASA organization involved. There was unanimity of opinion at the MSC Management level that TRW should be employed on defined elements of work, which we would manage and conduct ourselves. This view was not all shared by some of the working level people we interfaced with which resulted in some conflicts and problems early in the program. Then of course there was the newness of the operation, although we had the advantage of having exceptionally good samples of the company's capability. However, most of the people had no familiarity with the Apollo program per se and a learning process was required, which in some cases was felt to be overly long. These growing pains are now behind us for the most part, and we enjoy an excellent relationship with most all the NASA

people we work with, if the grades we get on our tasks are an indication. Our relationships with the other support contractors has been cordial but not exceptional close and this has been by design so the efforts of the various support contractors can be kept reasonably separate.

Our relationships with the prime contractors are cordial, although we were viewed with much apprehension in the early days of the program by both NR and GAEC. NR came by this view through past relationships in the ballistic missile program where TRW provided technical direction to various elements of NR. This relationship was successful but it did produce resentments on the part of the associate contractor. Here this has not been a problem as it was made clear to NR we did not have a directive role in the Apollo Program. GAEC's concern related to the possible conflict between TRW's role in support of MSC and TRW's role as a subcontractor to GAEC in the abort guidance system and the LM descent engine. However, no actual conflict has resulted and relationships are cordial. I believe our contributions are recognized and appreciated by the other contractors.

The major overall problem we face is the question of the future role of MSC. MSC has given us a commitment that we will be involved in the follow-on programs and are not exclusively tied to Apollo, however, the nature of the follow-on programs and their level of activity is subject to much uncertainty. Another major problem we face is in terms of our day-to-day activities, because of the way our tasks are spread out organizationally. TRW serves three MSC directorates and ASPO, and there is no single organization or individual responsible for TRW's overall activity in the Center. As a consequence, decisions and planning related to TRW have been frequently slow and painfully arrived at. This is typified by

the fact that each contract we have performed under has been inadequately funded at negotiations and funds have been expended much earlier than originally contemplated. Hence this has required modification at the last minute and in some cases work without suitable contractual coverage. Although some of this could not have been anticipated, in many cases it could have.