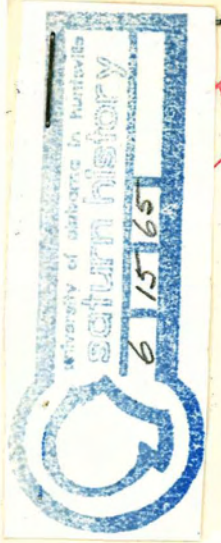

IV. 2

GENERAL O'CONNOR'S ADDRESS TO THE
HUNTSVILLE ROTARY CLUB
JUNE 15, 1965

Organizational Developments at MSFC

Good afternoon gentlemen,

It is always a pleasure to meet with a group of the local business leaders and citizens of the community in which we in Government serve. It is a special pleasure to talk to you in Huntsville.* In the short time I have been here, I have certainly found that the support of the city for our operations at Marshall Space Flight Center is an unusually active, complete, and dynamic one. I have been in no metropolitan area where the progressive attitude displayed by the business leaders in the community was as ~~active~~, cooperative, and responsive to the Government programs as is yours here in Huntsville.

Today I want to bring you up-to-date on organizational developments that have taken place in Marshall and to give you some idea of just where we are on our road map to the moon. I think you all realize, by now, and have heard explained by the leaders in NASA that while the moon is our immediate goal in the Apollo program, the ultimate objective is certainly more far-reaching than that. That is the establishment of pre-eminence in space for the United States. If we are to retain pre-eminence here on earth, we certainly must continue our leadership role in the space realm.

Now, I mentioned organizational changes at Marshall. I believe that you probably have not had explained to you some of the major developments that have taken place in the last year and a half. There has been little change, of course, in the role of the Director, Dr. von Braun, and his

* "Story — Joke"

Two Deputies, Dr. Rees or Mr. Heimburg [illegible] and little change in

key staff elements. These remain essentially the same. But in the operational aspects, Marshall has had to adjust to its ever changing mission. While we still maintain our technical competence in the space team, built up in the laboratories over the years, we have had to take into account the fact that this space business has just become too big to be handled in-house by any one organization anywhere. As a result, all the major stages and engines for the Saturn rockets are let out to industry through a series of prime contracts. There is a major contractor responsible for the development and manufacture of each of the stages and engines. In addition there has been added a number of prime supporting contractors, for example, in the areas of ground support equipment for these vehicles and technical support of our in-house operations.

This presents a new problem in the management of the vehicle programs. It has required that organizational changes be made to centralize our management while retaining our incomparable technical capability. As a result, we now have two major operational divisions at Marshall. There are still eight laboratories that comprise the technical team at Marshall. These have been grouped together under one head, Mr. Herman Weidner, in an operational division called the Research and Development Operations. Added, has been a second major operational division called Industrial Operations. This is the element which I head. Since the laboratories' functions are basically unchanged, I will concentrate on our new element. Industrial Operations' basic job is management of development, manufacture, test, and delivery of all Saturn launch vehicles.

In Industrial Operations we organized our management team into Program Offices, with a program manager for each of our vehicles and one for engines. Saturn I and IB are under one manager, Lee James. The stages and the Instrument Units for each have the same contractors. It simplifies matters just to have Douglas reporting to the same man for both the second stages, and Chrysler for the two first stages. We have Saturn V under Dr. Arthur Rudolph. And we have our engine programs under a separate manager, Lee Belew, because these engines are used across-the-board on all our vehicles.

We have recently added a fourth program office. You may have read in the newspapers that we now have at Marshall the job of development of the Saturn IB/Centaur. We are going to put a Centaur third stage on our Saturn IB, to take advantage of added weight-lifting capability for missions beyond the manned space effort for which this vehicle was originally designed in the two-stage mode. The Saturn IB/Centaur will be used for unmanned scientific satellites and deep space probes. The first assigned payload for this vehicle is a Voyager spacecraft which will be used to fly to the vicinity of Mars for further exploration of that planet. Actually this is one of our more romantic and dramatic opportunities. We have this Saturn IB/Centaur program office under Stanley Reinartz who trained under Lee James' in the I/IB office.

I would like to digress a moment to point out that when I came here there were quite a few rumors about possible changes, moves, and a decreased role for Marshall. You can rest assured that this Saturn

IB/Centaur is an example of what Dr. von Braun has been talking about when he said that there is more work in store for Marshall than we can possibly take care of. We are pushed right now to be able to actually undertake the management of this Saturn I/IB Centaur program. There will be more such demands for the kind of technical capability that Marshall has always had, and the kind of management capability which has been developed in our Industrial Operations. The Industrial Operations management capability is a team effort in every way equal in its field to the unexcelled scientific team that Marshall has built up over the years.

In our Industrial Operations we also direct the Michoud Operations in New Orleans, the government-owned facility for the manufacture of the first stages of the Saturn IB and the Saturn V, and the Mississippi Test Operations which is the test facility we are building down in southern Mississippi for testing the first two stages of the Saturn V. The Michoud and Mississippi Operations represent the government's effort to assure satisfactory facilities for testing of both current and future big-launch-vehicle stages in the most economical fashion. If the government did not provide this type of facility for the growing space programs we would be faced with the necessity of a new facility every time a new big-stage contract is awarded. We would either have to pay the contractors to construct such facilities or build additional ones for the government. So there has been a good deal of foresight on the part of the government in setting up the Michoud and Mississippi facilities. We feel clearly the burden of responsibility to prove the efficiency of such operations.

In Industrial Operations we also have a group of staff offices in addition to our program offices and Michoud and MTO. We have a Contracts Office which handles all our Saturn contracts. Right at the moment we have 119 of these. These are major contracts, comprising a total of nearly four billion dollars. We have a Facilities Office which is responsible for all our Saturn-oriented facilities -- for example, the test stands in Mississippi, and the test stands at Edwards Air Force Base and Santa Susana out on the West Coast. The Contracts and Facilities Offices represent a departure from previous Marshall arrangements in which one Procurement Office handled all contractual activity and one Facilities Office was responsible for all facilities. There is still a Procurement Office to handle Marshall procurement other than the Saturn contracts. There is also a Facilities and Design Office for other than program-oriented facilities in addition to our own facilities element. This has been a rather essential move to completely vest in Industrial Operations not only the program management of the programs but also the support that the Saturn managers need to assure that they are the "boss" in these programs and that they have responsive to them what they need to do their job.

Another of our staff offices is Project Logistics Office which handles transportation, propellants and pressurants, spare parts and maintenance associated with all the Saturn programs. Logistics is a support organization to assure that every program need is met in this area. This office has responsibility for such things as the barge stage-hauling traffic and

modification of the Navy barges that we are getting for the Saturn V vehicle; aircraft traffic like the Pregnant Guppy which hauls stages from the West Coast; and supervision of LOX and liquid hydrogen plants which supply our needs in these areas. Our fourth staff office is a Resources Management Office for allocation of our budget and manpower resources, our management information, and other such activities.

Also on my staff, to give us a technical judgement capability, I have one of the most capable men available in the country as Assistant Director for Engineering, Dr. Willy Mrazek, who was formerly head of our Propulsion and Vehicle Engineering Laboratory. Also have an Assistant Director for MTO, Karl Heimburg, who is also the head of Marshall's Test Laboratory. He is here to assist me in making certain that the Mississippi Test Facility is ready and capable of meeting the requirements for testing the Saturn V stages on time.

Briefly now I will mention our general method of operation. Our basic program management is carried on by project directors, who are established under each of the Program Managers. We have a project director for each of the stages and engines and one for the Instrument Unit and the ground support equipment. In other words there is a key man for the Boeing S-IC stage of the Saturn V, one for the Chrysler S-IB first stage of the Saturn IB, and so on. Prime duties of each of these people is to see that their contractor's stage, or engine, or system is reliable, on time, and within our budget and performance requirements.

We have complete support of and access to our technical laboratory people in Marshall in doing this job of contractor management. It is through these technical people that we apply to the contractor the supervision and monitoring necessary, at the discretion of the project directors and Program Managers.

We carry out our operations with the contractors primarily through a single point of contact for each of the prime contractors. This contact is the Government resident manager. He is the voice of the program management and the project director in the contractor's plant. He has a small permanent staff of his own, and in addition he has attached to him people from our Contracts Office and technical people from the laboratories. They reside with him at the plant to give him whatever support he needs to carry out his job. Having a man on the spot who can make decisions, and speed up the decision process benefits the Government in terms of time, schedules, and cost.

Now just a few words about our relationship to Washington: In Headquarters our prime point of contact for Saturn business is the Apollo Program Office which is one of the elements of Dr. Mueller's Office of Manned Space Flight. The Apollo Office is headed by General Phillips, who like myself, is an Air Force Officer assigned to NASA. Our Program Managers conduct their day to day business with General Phillips' organization. I might add that one of the aspects of our business today is that we are much closer knit across the board with Manned Spacecraft

Center in Houston and Kennedy Space Flight Center through this new Apollo program office and our daily close contact with it.

I won't go into further detail on our method of operation because I want to spend a little time now bringing you up to date as to just where we stand in each of the Saturn programs.

First let's talk about the Saturn I. This has been a phenomenally successful program. Of the ten vehicles planned in this program, nine have been fired and have been totally successful. Saturn I has given us a great deal of knowledge of big booster technology. The United States' first "heavy-weight" gave us the weight-lifting championship of the world with some of the payloads that it has put into orbit -- over 20,000 pounds each. Perhaps the most valuable contibution this vehicle has made is the great confidence it has given us in our ability to obtain the necessary reliability in large boosters that we must have for our future space missions, including the manned missions. With this vehicle, we successfully proved the clustered-engine principle, the feasibility of the very efficient liquid-hydrogen as a fuel for upper stages of space vehicles, and the principle of the guidance systems that we will be using in the Saturn IB and Saturn V. We also successfully tested boilerplate versions of the Apollo spacecraft in preparation for the lunar activity later on, and we have successfully placed into orbit two very important scientific satellites, the Pegasus payloads, which are supplying us with information on the size and distribution, frequency, direction and velocity of meteoroids in near-earth space. I am happy to report that to date the information that we have received from

Pegasus has indicated no meteoroid hazards in the vicinity of the earth for which we do not already have the properly designed spacecraft. We have one more of these Saturn I vehicles to go. It, too, will place another of the Pegasus payloads into orbit. I can say that up to now this has been a completely successful program. There are no further anticipated missions for the Saturn I since the Saturn IB is coming along to provide us nearly twice the orbital payload weight capability of Saturn I.

The Saturn IB uses the same basic first stage as the Saturn I, a Chrysler-produced booster, but we have uprated the engine considerably, beefed-up the structure, and made a few other slight modifications to this stage which improve its efficiency. We have a new second stage, the S-IVB, built by Douglas Aircraft. This new second stage uses the same liquid hydrogen technology as the Saturn I second stage. It only uses one engine, but it provides more than twice the power of all six of the Saturn I second stage engines. A bonus in this area is that this second stage, the S-IVB, will also serve as the third stage of the Saturn V later on. With the Saturn IB we are able to get in-flight experience as much as a year ahead of the time when we fly the first one on the Saturn V.

By the end of this year, we will have delivered to Cape Kennedy all the stages for the first Saturn IB, for firing early next year. We have successfully static tested the first stage of this flight vehicle and are getting ready for the static test of the first flight second stage in the next few weeks. We are running dynamic tests in our dynamic tower on the total vehicle with the spacecraft mounted. We now have the next five flight

articles of the first stage in the process of fabrication and assembly at Michoud and the next three flight models of the second stage in the process of fabrication and assembly at Huntington Beach, California.

This vehicle is capable of pacing over 35,000 pounds in low earth orbit. The missions for the Saturn IB are to place the Apollo spacecraft into earth orbit which will provide development experience for both the spacecraft and the crew. Rendezvous and orbital exercises will be conducted with the spacecraft launched by IB prior to the time that we are going to put them on the Saturn V and send them to the moon. Of course, the vehicle is capable of orbiting other payloads which might be assigned to it in the future.

Now to the case of our Saturn V. The major mission for Saturn V is, of course, to launch the Apollo manned spacecraft to the moon. We are well down the road with this vehicle. We have hardware loaded in the pipeline and are well into the testing phase with all the stages.

The test article of the first stage, S-IC, is already completed and installed in the Marshall test tower. Several full five-engine firings have already been accomplished. These tests were accomplished more than two months ahead of schedule. Early static tests of these stages will be at Marshall. Later, beginning in 1967 when our S-IC stand is ready at MTF, the acceptance static tests will be done there. In addition to the test stage which was built here at Marshall, we are also building a structural test stage and the first two flight stages. Boeing will be turning out subsequent flight stages at Michoud Operations.

The second stage of the Saturn V, the S-II, is built by North American Aviation. As in the case of the first stage, we have already tested this second stage with live firing of all engines. The S-II stage is tested at the Santa Susana test area in California. Our acceptance tests for the S-II will also be at the Mississippi Test Facility. We plan to have the first S-II stand ready there by this fall. The first actual acceptance test will be conducted there the first of next year. This stage has to come by ship through the Panama Canal and up the Pearl River to the test site and of course, from there by boat to Cape Kennedy. The structural test stage has been completed and is undergoing tests in the test tower at North American's manufacturing plant at Seal Beach, California. Manufacture of the first two flight stages has begun also in California.

The situation on our Saturn V third stage, S-IVB, built by Douglas Aircraft, is that in the second stage configuration for Saturn IB, it has successfully completed its static test program and the test stage is now being converted to the Saturn V configuration to begin Saturn V system tests.

As to the Instrument Units for both the Saturn IB and Saturn V we have completed manufacture of some test stages and are conducting tests at Wyle Laboratories here in Huntsville. IBM has the integration contract for these instrument units, with major components being supplied by Bendix Corporation and others. The first flight instrument unit for the Saturn IB is in fabrication and subsequent flight units will be built

by IBM in Huntsville. The instrument unit for the Saturn IB and Saturn V lunar mission, the vehicle instrument unit will control the flight through the parking orbit and out into injection -- the point at which the vehicle third stage actually places the spacecraft on its trajectory to the moon, at which time the spacecraft guidance will take over.

The Spacecraft is not a Marshall responsibility, but to bring you up to date I'll summarize this briefly: There are already 13 flight-type Spacecraft in fabrication. Several test models have been completed and have undergone various kinds of tests. To date the structural integrity of the spacecraft has been demonstrated in ground tests. Boilerplate craft have been flight-tested on Saturn I. The rocket escape system has been tested several times using a Little Joe rocket to launch it at White Sands. The parachute recovery system for landing the craft back on earth has been proven quite successful. As for the lunar excursion module, or LEM, the so-called "bug", which Grumman Aircraft up at Bethpage, New York, is manufacturing: several are in fabrication, including the first flight versions to be used on the Saturn IB. We already have a structural LEM unit mockup here at Marshall being used in our Saturn IB dynamic test program.

Meanwhile at Cape Kennedy, work is practically completed on the pad base and foundation for the first launch pad to be used for the Saturn V vehicle. Work has also begun on the second pad foundation. They have completed three gigantic umbilical towers. They have completed

three gigantic umbilical towers. They have completed the first of two giant crawlers. These are baseball-diamond-sized platforms mounted on four independent diesel motor units at each of the four corners, used to crawl this Saturn V, standing straight up, out of the Vertical Assembly Building, and haul it out to the pad at the beach area. They are already carrying out mobile tests with the first crawler, and work has begun on the second one. The Vertical Assembly Building is nearing completion. Incidentally, it is going to be the highest building in Florida and the largest building, in terms of volume, in the entire world. This building will be ready late this year. Installation of consoles and panels in the launch control blockhouse is also underway.

In summary: The progress of our Saturn IB has been excellent. We are on schedule to begin flight tests the first of next year, to be followed by manned flights of this vehicle in 1967. Nothing seems to be in the way of meeting this schedule.

In the Saturn V/Apollo program, we are also on schedule -- to begin flight tests in 1967 and manned flights in 1968. In this program we have met several technical problems. We have solved many of these: for example, we had a problem with the big F-1 engine -- during firing, it had a tendency to go unstable -- that is it didn't want to fire with steady, even thrust. But a great deal of extra effort and research gave us a solution mainly through changing the injector plate through which the fuel and oxygen are fed to the combustion chamber.

Another kind of problem we solved was in welding the bulkhead section of our S-II stage. We also have some fresh unsolved problems, namely, delay in getting our S-II stand ready down at MTF, running behind in our qualification tests of stage components, and some structural weaknesses that have cropped up in our S-II stage. We are working on all these and we don't believe they will delay the overall program, but they do represent a sample of the kind of major problems we meet in these big vehicle programs.

Across the board there are numerous technological problems yet to be faced but at this particular moment we see no major delays in the Saturn V/Apollo program. All of our engines have successfully passed their preliminary flight rating tests. They will be ready. Launch facilities and spacecraft apparently will be ready. We don't see any major problem in meeting our 1967 first launch of the Saturn V and in successfully undertaking our first manned lunar landing effort before the end of 1970.

Incidentally, we have been asked many times about which one of the Saturn V's is going to carry the first men to the moon. In answer, I can say that progress to date has given us confidence that the actual landing attempt can be accomplished by the end of 1969. Of course, this will be based primarily on the success that we achieve in the preliminary R&D flights.