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Oral history interview with James M. Bayne
[full name of interviewee]

about early planning for Manned Spacecraft Center; designer & contractor relations.
[main focus of interview]

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Topics - NASA Space Task Group negotiations with Corps of Engineers; first site visit; request for additional 600 acres; 1962 budget authorization $60 million; criteria: functional buildings, campus-like environment, 50-100% expansion; dissatisfaction with choice of Corps; selection of A+E firm; Brown & Root not top choice; preliminary design work; importance of time schedule & budget; early design problems; 2 major decisions: steel frame & precast concrete; cost-cutting modifications; role of MSC management in design effort; road access; planning for future expansion; addition of Mission Control Center; FY 1963 budget request; Bechtel Corp to design environmental Chamber; redesign required by new architect (Mace); friction with Brown & Root & Corps; integrated office lab concept; utilities service design problems; modular partitions too expensive

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INTERVIEW WITH JAMES M. BAYNE
December 9, 1968

I came to the Langley Space Task Group Labor Day 1960. After Stu Clarke swore me in he took me over to meet my new boss who was Ed Campagna, only Ed was out on travel somewhere so I met the secretary, Helen Gregory. Our office was located in the old boiler plant at Langley Field. My reaction was I had gone from frying pan to the fire. Helen introduced me to the staff, Bennie Land, Ray Helsum, and John Welch.

Ray Helsum had all the information on what was wanted in the new Center. We began going over that sort of material, and when Ed got back from travel we started working in earnest.

Ed decided that it was going to take a pretty good capability to hack the problem in the time frame we were talking about. We thought we could get some good information if we went down to Fort Worth to talk to the Corps of Engineers. Everyone at that time was hopeful that we would have the opportunity to do the job on our own, and we didn't know that a decision would be made to have it done by the Corps. Shortly after I was hired, Ernie Gillam transferred in from the Air Force Academy. Ernie was the procurement officer who handled construction matters.

About the time the location of the Center was announced it was also announced that the Corps of Engineers would be the design and construction agency. At that point we went to Fort Worth and started discussions with them on their methods of operation. Then we flew down to Houston and came out to the area that had been selected for the Center. We drove over it in a couple of jeeps. The Site was kinda way to hell and gone. NASA Road 1 was then a little two-lane farm to market road, and since this visit was

shortly after Carla had gone thru there was a lot of debris all along this road. Where the road went over the water between Clear Lake and a mud lake, there was a large boat that had been lifted completely across the road by Carla to the mud lake side. All the marinas were badly battered and smaller boats were scattered everywhere. At the site it was obvious that the high water mark did not get up into the area where we intended to build. The debris line was down by the pecan tree grove on the site. We therefore didn't have too much concern about the location of the site insofar as the high water was concerned. Carla was a bad hurricane, and yet it hadn't flooded the site.

There wasn't a thing on the site, not a thing, except weeds. We were told there also were rattle snakes and alligators but we didn't see any. We were able to drive all around the site in the jeeps. We drove up to the grove on the north side and came back down to the highway.

From there we went to the airport and to Fort Worth. We were asked if we thought 1,000 acres was sufficient for the Center and its long range requirements. As I remember this question was asked on Friday, and we spent Saturday in the Fort Worth offices working on it and finally decided we needed additional land. We blocked in what we thought we required along FM road 528. This amounted to about 600 acres, and gave us a chance for the buffer zones around the chemical area and additional access into the Site. Under the original configuration we would have had only one entrance into the site and this wouldn't be sufficient.

We went back up to Langley and we discussed our recommendation with Mr. Hjornevik and he approved our recommendation. We then went to see Dr. Gilruth, explained it to him and he approved. Hjornevik called NASA Head-

quarters and arranged for a meeting, as I recall the following Tuesday, for us to present our estimates of the land requirements for the site. The next day we went to Washington. The first man we saw was Ralph Ulmer, who supervised facilities construction for the agency. After we explained the problem to Ralph, he took us to see the Assistant Administrator for Manned Space Flight, I've forgotten whether it was Holmes or Silverstein. He agreed to our proposal and took us to see Deputy Administrator for the Agency, Hugh Dryden. We explained the problem. He also agreed, gathered up all our material and left the table and saying "I'll be back in a moment." A few minutes later he and Webb came back around the corner and the Administrator says "let's do it." It was unbelievable. Here in the course of part of a day we got a major decision approved, and I knew then that this operation was a little different from run-of-the-mill government agencies.

Having decided on the size and configuration of the site we could then get together with the Corps and give them our criteria. We told them what the program content would be, we explained that the 1962 budget authorization--of 60 million dollars--was what we had to work with. We explained the number of different buildings we felt would be required, and that we wanted them arranged on a functional basis, a campus-like academic environment. We instructed them to provide for expansion of at least 50%, preferably 100%. The schedule required the work to be done fairly rapidly. We wanted good architecture. We were more interested though in buildings which functioned well than appearance.

The Corps then started the initial screening process of the A&E. The project was nationally known and they and Space Task Group had received

letters of inquiry from almost everyone with a staff capable of handling the project and many others who couldn't. It was decided it should probably require a consortium of an architectural firm or firms and an industrial firm with real design capability. The designers had to have a good engineering organization, be able to turn out designs in a hurry, and a large number of people. We estimated it would require an organization of 300 or more to do the required work within the established time frame.

The Corps had their own methods of selecting A&E's, and an architech board was constituted from the Fort Worth district. Ed Campagna and I were invited to sit in on the deliberations in an advisory role. As I recall, we were non-voting members of the selection panel.

A number of us were a little unhappy at the selection of the Corps of Engineers to be our design and construction agent. However, we understood the reason. They could weather any of the political storms that might arise in the design and construction of the Center, whereas we as a fledgling Center might not be able to. We were a little unhappy as we had hoped to be able to handle this ourselves, but it was a fact of life that we did not have the staff that could have handled it. We did not have the numbers and obviously there was no chance of our getting them because the billets were going to support the Mercury Program. So realistically as far as I am concerned, regardless of the basic reason for selecting the Corps as our agent, they were necessary for us to do the job. I have been a long time complainer about that decision, but I really felt that it was the best decision in the long run.

Ed and I felt the A&E selection was done in a professional fashion. The best qualified firms were ranked in what seemed to be the proper order.

Now one of the things that I understood at the time we came to Houston was that Brown and Root was an important organization in Houston and in Texas, and had some important friends in Washington. It did not appear to me that they were given very high ranking on their ability as architect/engineers which was understandable as for this work, they had greater strength as constructors, and we felt that it was going to take architects and engineers to handle this problem. Well after the initial screening had been completed, there were several firms that were up on top of the list (and Brown and Root was not among them), and we thought a decision to select one of them--it didn't make much difference which one--would be satisfactory. They all should have been able to do the job. We went back to Langley and the next thing we knew Brown and Root was the selected architect/engineers, together with Charles Luckmann as the "designer" and any number of Texas architectural firms. Obviously the contract was with Brown and Root and the others were consultants and subcontractors to them. Well this was quite disturbing. I felt we had been done-in, and I was real unhappy about it.

I felt we had been done-in on a number of counts. In the first place if the reason for having the Corps do our work was that they could withstand political pressure, they had failed right off the bat, because I viewed the Brown and Root as being a pressure situation. Also one of the things we had been working on at this time was a proposed form of agreement with the architect/engineer. We gave this suggestion to the Fort Worth District and asked them to consider it in their preparation of the contract for this job. This was not done. They used their standard form, and omitted some things which we felt were critical; such as stopping points

in the design, assessing where we were and whether things were going properly or not, and if they were not, having an opportunity to get out of the contract easily. We felt that the program could not be properly undertaken until a lot of preliminary design work had been gotten out of the way; for example, we should make sure we don't go off into the costly aspects of an architect/engineering contract, such as the preparation of the contract documents plans before the real functional design of the buildings had been thought through. There were some other things missing as well. The architect/engineer group was called together by the Fort Worth people, and the program was explained to them, the time frame established (the master planning architectural concept had to be done by early in December and decisions made by NASA, followed by the final plans and specifications). They started working on this and in fact started working in advance of the official signing of the contract. I guess the terms had been worked out but the contract had just not been signed. They completed their initial effort by the first part of January, by working over the Christmas holidays. They actually got started the first part of December and finished the 18th of January or there abouts.

During the design of this phase Brown and Root had set up space in their offices and brought together Luckmann and all the architect/engineers involved, under the one roof of the Brown and Root offices. The Space Task people flew back and forth between Langley and Houston reviewing what was being done and furnishing additional detailed requirements from the staff which was still at Langley.

At the same time we were growing modestly. Mr. Zbanek was hired in early October as I recall; Tom Conger was interviewed in Washington National

Airport and hired shortly thereafter. Garth Summers was interviewed by Mr. Zbanek, Ed Campagna and me in a motel in Fort Worth or Dallas and was hired. Larry Jacobson and Jim Weir came from Washington to work with us and Jack Kinzler's people on technical shops requirements.

One of the things that we were terribly concerned over as Luckmann, Brown and Root, etc. were working on this project, was that realistic cost estimates be established for all proposed construction. We reiterated time and again to any and all who would listen that there were three things that were important. 1) Buildings must be functional, 2) they must be completed on time and 3) their costs would have to stay within the budgetary figure. We couldn't say which was the most important of those three things. But unless the three were all met, we would have problems.

They came through with a proposal in early January which appeared to be satisfactory as far as the architecture was concerned and as far as the functions were concerned, we were uneasy over the probable price tag. If we could stay within the budget we were sure that the remainder of the design and the construction could meet our schedule. With those sorts of assurances we felt it was worth presenting to Space Task Group management, and if they felt it was satisfactory to take it to Washington and have approval of it there. A meeting was set up then back at Langley to afford Brown and Root-Luckmann an opportunity to present the plan to Dr. Gilruth, Walt Williams, W. Hjornevik and the rest of the MSC management. This was done and was received favorably, subject to the understanding that our conditions were being met.

At this point the Master Plan and architectural concept were really just ideal. No hard line configuration and no internal planning had been

done. As an idea or a concept, it looked fine, and it was this that we were seeking approval for. At this point we needed approval to go ahead with preliminary design. At the presentation to the Office Of Manned Space Flight in Washington, Luckmann spoke in ~~glorious~~ glowing terms--what was being done for us and how much we were going to get and how little it was going to cost. In the process I felt he overstated the case. Again everyone seemed to share the understanding that our requirements on schedule and budget would not be exceeded. Thus we felt we could proceed with the program. All during this time the work force of the architect/engineer was engaged in further development of what was at that time being presented to MSC and OMSF with the assumption that it would be received favorably and the work that they were doing wouldn't be wasted. They continued with this and sent in what we refer to as a single line drawing. These more or less fixed the exterior dimension and started to indicate the interior arrangements and configurations. When we started receiving these we were terribly disappointed. The project management building for instance, was quite narrow--essentially only one office deep. The elevators and toilet facilities, were banked against what was the north wall of the building, and the building itself was no longer situated on an east-west axis. It just did not look like a very efficient building plan and was 14-16 stories high in order to accommodate the space requirements that we had imposed. I remember Kimbell Johnson working on this problem trying to figure out how the project offices and the administrative elements could be sandwiched in and he felt it was hopeless as did the rest of us. A quick review of most of what was being developed indicated that the architect was not paying much attention to obtaining efficient structures. We advised that

perhaps he should try a different configuration. After much discussion it was agreed. As a result the project management building got a little bit fatter and developed into what we call a court concept facility, with the elevators and toilets and stairs in the center of the building. When it got fatter, of course, it became lower, as we could get more on each floor. The mall concepts started to show up in some detail and appeared quite attractive. Several of the structures were to have interior courts in them, which were very attractive architecturally. The designers attempted to satisfy this campus environment appearance that we were after, and we were advised that the cost were within established limits. As more detailed architectural design drawings appeared they began to look more and more costly. For example, there was quite a bit of relief on the precast panels. We began to get more and more uneasy over the probable cost. All we had to go on were verbal assurances that the budget would not be exceeded. We asked that this be substantiated. In reply we received verbal assurances that it was not going to be more than so many dollars a square foot, so don't worry about it fellows.

In addition, we felt that the way to get the buildings up in a hurry was to use steel frames and something on the outside that could be prepared away from the site and put in in large sections, thus, enclosing the building in a hurry. It had been generally agreed that precast concrete would probably satisfy that requirement if its cost were not excessive. Then we ran into the pressure from the brick people. They came to Fort Worth and insisted that brick would be faster and cheaper. They had contacted all kinds of people and the pressure started to show. To combat that we agreed to an evaluation of the relative cost--and the expense of this investigation

had to come out of our available funds. Use of brick was priced out and it was clearly evident that the precast concrete work was going to be much cheaper and faster than brick work. So the brick people went away and left us alone. We were also studying the advantages of steel versus concrete and had T. Y. Lin called in. (T. Y. is a specialist in precast-prestressed long span units.) We wanted to see if there might be a chance to do the work faster and cheaper in a concrete motif. That investigation again indicated that steel was superior. At this point we made two major decisions. 1) Use steel frame and 2) use precast concrete work.

As we examined the details we were concerned because a lot of relief work was involved. The panels were not smooth, and the forms necessary to get relief looked like they would be expensive. Also the quality control measures looked like they would be expensive. We became more and more concerned about what the costs were going to be and finally we had to call a halt to everything until we could get some definitive cost information. This made everyone mad, because production was cut down on the drawings and everyone had to do cost estimation work. This took a week or 10 days, and when we got through with the cost estimates, our worst fears were confirmed--we were way over the budget. There followed a big conflab as to what do we do to get back within the budget limits. Everyone had his own opinion as what might be the best thing to do. One of the things we decided to do was eliminate interior courts. Although they were pleasing and we would like to have had them, they had to go. We also had to simplify the exterior appearance of the precast architectural work. As a further means of economy, we regrouped the buildings somewhat closer together to shorten utility runs and lessen the site development work that was necessary.

We trimmed space and actually eliminated some buildings through a combination of functions, which formerly we had hoped to keep separate but which were not really critical. After going through this sort of exercise, it appeared that we were going to be down to the budget figure that we had to honor.

We were also starting to feel pressure of our schedule. We were now being forced to make rapid decisions so that we could quickly award contracts on certain aspects of the facilities, particularly roads and the tunnel systems. We felt that we could finish the contract documents in a hurry and give a contractor who was going to do the building work a better base on which to work. Then it was felt that we should also try to award construction contracts for some of the permanent facilities that were going to be occupied by people so we considered what would be the best facility to put out for award first, and finally concluded they should be the center heating and cooling plant (obviously something that had to get done early), the computer facility and a warehouse. Then there was the water and sewage treatment facilities. During the third phase the contract for the remainder of the permanent facilities was let.

One of the things that should be noted was the great interest that MSC management had in this design effort. Walt Williams was insistent that work be done right, in the final analysis make a good appearance for the agency. Wes Hjornevik gave us continued counsel. The senior people were especially interested in the so-called front door to the Center. They wanted something that would let everyone know as they came this way that they were at MSC. Besides design considerations to cope with the solar load of the buildings, the orientation was established by the location of

the project management building. We would have that as our front door with the access off FM road 528 up to the project management building.

At this time we were also working with the highway people in trying to assure ourselves that adequate highway access would be afforded the site. We received information that FM road 528 would be made into a four-lane highway, that the LaPorte road down to Texas City would be improved, and that a multi-laned highway would go in from LaPorte towards Houston. We would be provided with access around the west side of the site looping back into the freeway down to Galveston. So with those sorts of considerations we felt that access-egress conditions would be good. In studying the requirements for our being able to get on and off the site with the number of people involved we had determined that we were going to need at least five points of penetration into the site, and that of course is what we ended up with. One of the main ones was what is commonly known as Avenue B now running east-west. A lot of people thought it was strange that we had what was in essence a four-lane road running out to our west property line and ending there. The plan had always been based on the assurances from the state highway people that the west end of our Avenue B was going to tie onto a road of the width that they were going to put in for us.

Early in the planning for the site, we were advised that the FY 1962 $60 million authorization was just a beginning for the Center in Houston. A part of the criteria was that the facilities planned within the 60 million should accommodate about 3,000 government employees. As we could furnish additional justification the center would be allowed to expand to about 5,000 government people. This was over a 10-15 year period. What-

ever we did with the initial funding, we had to make sure that we were leaving room for this expansion. We had to leave the room in the right areas, and for the planners, this was a difficult assignment because in the fall of 61 we were dealing with the Mercury Program, and the people were just becoming heavily engaged in Apollo. We were more than a little uncertain as to what the future programmatic requirements might be, but the assumptions were that they would be similar to what we were working on then except probably in larger scale. Before the planners or architects had gotten involved, it was decided we would have only a few buildings--perhaps three to five--an office type building, a laboratory type building, an operations type building and the like. Now, Bob I've got a sketch that was prepared--I think I probably have the only one (see attachment). I saved it because I thought it was a marvelous little gem. Since the Center didn't have long range requirements established we considered what functions were to be performed at the Center, and thereby avoid building a white elephant. This was the real motivation behind scattering the buildings out as we did. We left blank spots here and there so that we could add functions that were compatible to those that already existed at that particular location. For example, the Mission Control Center was not contemplated for MSC at the time we were doing the initial planning effort. We had a Flight Operations building conceived where people concerned with flight operations would hold forth. It had some small labs, computers, etc., but nothing on the scale of real flight control as we ended up with in the Mission Control Center. When Mission Control was introduced into the program we were able to accept it and place it at the Center and at an advantageous location, without having to bother anything else that had

already been planned. The reason was we had left a spot, to accept a major facility of that type and Mission Control happened to come along at the right tmme. Mission Control was in the '63 budget as I recall.

When we developed the two-mall idea, one of the things that we felt was required in the way of an additional facility was on what we referred to as the engineering mall. There the Structures and Mechanics Division, the Instrumentation and Electronics Division, Advanced Spacecraft Technology Division and others would be located. With the growth of those elements, another facility was going to be required and we left a spot for it when we were planning the total complex. We visualized that in time an integrated office/lab-type facility would be needed. We could accept almost any sort of functional requirement and in that location it would not disrupt the campus appearance of the architecture. It still has not been built, and if and when it gets built it will look like it was always intended to be there.

One of the other things that we had to do during this early design phase was to get budget in for the FY63 program. In the fall of 61 Rod Diaz joined Manned Space Flight as the director of facilities. Rod's people started calling us on what we were going to submit for the 63 program. After meeting with Wes Hjornevik, Walt Williams, Dr. Gilruth, Max Faget, Chris Kraft, and Aleck Bond the general guidelines as to what was felt to be the next critical elements to be built at MSC were identified. The Facilities Division worked up a rough program plan for FY63 during the 1962 Christmas season. We planned the flight acceleration facility, the thermochemical test facility and several others at this point.

At this time we were also trying to nail down the requirements for the

environmental chambers facility, which had been a big part of the FY62 appropriations. We kept that money off to one side. There was a great debate at that time as to whether we needed a chamber that could be expanded into multiple uses, etc. There were many schools of thought on the subject. Finally an evaluation was conducted, and the Bechtel Corporation was awarded the contract to study the problem. Design parameters were established and a contract was entered into with Bechtel to design an environmental chambers facility in accordance with the criteria developed by them in the consultation with people at the Center.

In the spring of 1962 during the design effort by Brown and Root, a period of disenchantment set in. They were dissatisfied with us and we with them. The Corps was unhappy with us and we with the Corps. For a while it was quite difficult to communicate. The program obviously had gotten into some difficulty, as regards to the budget. The Corps said they had never been advised that there would be the constraint that would be imposed by a limited budget, and of course we had verbally and by written word told them many times about the budget limits that had to be honored. The Corps position was that if more money was needed and one had a program that had excited the imagination of the country all one had to do was go back up to Congress and ask for more. The way they looked at it there was no bottom to the well. I recall a meeting in the Farnsworth Chambers Building on this matter. In the course of the conference Wes Hjornevik in no uncertain terms advised the District Engineer and his staff that we had a limited budget to work with, but it just didn't seem to soak in. And of course when it came down to the point where the work was done, it had to be done over again because we were way over the budget. Then all

of a sudden the NASA people were supposedly vacillating. We were accused of all sorts of things. But the redesign had to be done, and it was done. Unfortunately it was done at additional cost to the Agency. Because the architecture was being changed substantially, and all the grand things Luckmann had recommended--the courts, articulated exterior, the relief on the architecture work--all were going by the board, and Luckmann suddenly had very little interest in the design of the Center. This is when Mace-Tungate plus a couple of other architects took over (Mace was the principal in Words-Tungate-Calhoun-Jackson). Mace was a fine architect. He took hold of things, simplified the architecture and did an admirable job.

The program manager for Brown and Root was a fellow by the name of William D. Rice. He had a good reputation, although personally I felt he was short on ability. We needed a presentation package prepared and we worked with Mace-Tungate and Dave Graeber of Brooks and Barr. We told them what we wanted in a way of presentation material, the time frame, and dollar cost. Mace told me what he thought it was going to cost and it sounded reasonable. They did the work, which was something we were to pay for in addition to the contract that they had. They submitted a bill that was more than we expected so we went to talk to them about it. It was easy to see some of the friction developing here because Rice adopted the attitude that Mace could sink or swim on the matter, and would lend no support in seeking payment. In fact he said pointedly that Tungate was responsible for it and it was up to him to get paid whatever he could get from Uncle Sam. Mace was really sweating by this time, as he was not getting support from the people he should have been able to rely on. We went over the books and Mace agreed to live by the original agreement even though

his manhours indicated that he had probably spent more than this amount. He agreed that he had in fact, called for a fixed price contract and he would live up to his word. He did and that is what we paid for. I had great respect for him. We could also see the friction developing within Brown and Root because the work was not going well. Harry Hutchins came in and took over some of the work particularly in the thermochemical area.

One of the early design studies that we did was to separate office space and lab space. We thought perhaps that this might be cheaper and better, but after talking with the people who were to use the facilities we found that most of them desired to have their offices across the corridor from the lab spaces. This led to the integrated office lab idea. Then most people wanted a window that they could look out of, and since most labs do not require windows this led us to the idea of ringing the outside of the building with offices and putting the lab space on the inside. This proposition works only if the ratio of lab to office space is just right. Sometimes we would get offices for the inside and sometimes we would get the lab outside. But basically we wanted to have lab inside and offices outside.

We also wanted a heating/ventilating/air conditioning/lighting system and a basic utility services system that would give us maximum flexibility, but one that we could afford. We studied the lab areas to provide service chases every 14'. A service chase is where all the utilities are accessible--the pressurized air, the gases, the electric power, etc.--all in one spot. We were going to provide all the utilities that any lab would require every 14'. But after we did a study of that, we found that we were not going to be able to afford it. Then we decided we would custom-design the

utilities and the lab areas in the present configuration.

In the office areas we decided we would provide for maximum flexibility. Partitions would be arranged on a modular basis. Lights and air conditioning were placed in every modular system. Under this arrangement the high initial cost was to be off-set by the lower reinstallation cost, but we ran our of money, and were obliged to limit installation of the metal movable partitions only in a few buildings and in the others we used the cheaper dry wall construction.