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ORAL HISTORY INTERVIEW

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Oral history interview with Howard C. Bedford, Jr.
[full name of interviewee]

about Mission Control Center, MSC and IBM
[main focus of interview]

joint efforts.

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

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CONTENTS:

Biographical - [date/place of birth; family background] _____

Education - _____

Career Path - 1959 IBM + Manual Space Program

North American - (F108, B70, X15 + SAGE)

Topics - 1962 IBM Contract for RTCC (Real-Time Computer Complex)

recruiting programmers to Houston; attractions & drawbacks of Houston; IBM pay scale; personnel in technical areas: programming, engineering, mission analysis, Maintenance & Operations; 1962-63 establishment of Ground Systems Projects Office; resolution of IBM - NASA technical disputes; leadership of Chris Kraft; MSC esprit d'corps; IBM relations with MSC Contractors decision to conduct GT-4 primary control from Houston; contractor performance measurement & evaluation of RTCC; 1960 IBM working conditions at Goddard Space Flight Center; IBM facilities and working conditions in Houston;

76-1 I joined IBM and the Manned Space Program in December 1959. Prior to coming with IBM, I had had experience with North American on the F108, the B70, the X15 and SAGE projects. When I came to IBM in Washington, D. C., I was assigned to be the manager of the Mercury launch area. I think my background in real-time systems was something which not many people had and consequently some of the problems we ran into in '60 and '61 were somewhat reduced by the fact that we had some previous experience.

273 I think one of the key reasons why NASA chose IBM for the RTCC contract was because of the experience we had with projects like Mercury, Tiros, and Echo, which were all NASA Contracts. When we were chosen in October 1962, the IBM Mercury staff consisted of about 35 programmers, about 10 engineers, and about 20 operations personnel. Of that total, we had some difficulty in getting the Goddard Space Flight Center to transfer some of these key individuals from Washington to the RTCC in Houston. We weren't able to transfer more than 10-12 people in the first 6 months of 1963. Consequently, we had great difficulty in hiring the 125 programmers which was the target set for August 1963, in fact, we overran this date by some 3 months.

278 The principle areas we were able to recruit from were aircraft industry in and around Los Angeles, Cape Kennedy, and professional contacts in the ACM and SHARE (Society to Help Avoid Redundant Effort -- an IBM user organization that meets twice a year and is composed of almost a thousand companies). Of the first 125 people we were able to hire, the experience averaged was approximately 5 years, which was outstanding.

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It is very difficult to get people with an average of 5 years of experience when you have 125 people to hire. Of that first 125, there were no trainees. We drew people who had experience in every real-time project at that point in time, including 4 or 5 top secret areas. Of the 125 people, we were able to bring to the RTCC by December 1963, approximately 21 came from Project Mercury, 19 from sub-contractors (of which three were from Texas A&M, 12 from Informatics, Inc., Los Angeles, California, and four were from Computer Applications, Inc., CAI, New York City), 25 from other parts of IBM, 33 were personal contacts; 27 were from agencies. Of the 125, 117 had BA or BS degrees, 21 had MS degrees, and there were no PhD's. Real-time experience represented by this group included work on Vanguard, Tiro, Echo, Ballistic Missile Early Warning System, SAGE, FAA, Weapons System 239-A, the Cape Kennedy Impact Predictor, Saber, JPL, and the North American Apollo Simulation Group. Everyone hired was interviewed by at least three professionals and everyone had to be either recommended by someone or personally known by someone. I think this enabled us to get started with an extremely good crew.

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One of the major difficulties we had was in trying to interest people in the Houston area. We tried to stress to them the fact that the RTCC was probably the most advanced real-time system they could possibly work on within the next five years, an unparalleled opportunity for on-the-job training.

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(Not on tape, but reconstructed from notes)

Only 50% of those contacted came for interviews, and of that number offers were made to 80% and 50% of that number actually accepted. Fortunately, most of the recruiting was completed by the time the summer heat was at its worst. We adopted a positive approach on the local area emphasizing that Houston was one of the four or five lowest cost of living areas in the U.S. People were generally well pleased with the price of homes, and the quality of local schools. In fact, we had no real problems over the environment once people were located here. We gave the families as much personal attention as we could - tours of the area, etc.

Initially, people were dissatisfied with the quality of higher education available. Only Houston University offered evening work in graduate studies, and initially, this was weak, but has since improved substantially.

Of the 125 we hired initially, about 40 came from California, 15 from the Cape, 30 from the DC area, 10 from the Northeast, 5 to 10 from the Alabama-Louisiana area, and the other 20 or so from various other places.

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Generally speaking, the people from the East had the most prejudice against coming South. They expected the South to be a sleepy area where there was not much modern industry, only cotton mills and stuff like that they had read about in books written about 1900. Of the 40-45 people that came from the West, many of them were Texas people - Texas A&M, TCU, Texas University, SMU graduates. At that time, there wasn't much industry in Texas other than Convair-Fort Worth, and Texas Instruments. Mainly, those people worked in the far West for the aircraft industry. We had no trouble hiring those people. People from the East, especially the wives, didn't want to move South because of fear of red-neck Southerners and other prejudices. However, once they came, they found that Houston was as modern a town as they could expect. In fact, each time I go back, I find the people from the East more and more concerned about leaving, once the RTCC contract ends. My experiences were much like the others. (I was born down in West Texas and raised in the East. I had been to Texas in 1955 and I knew there was a difference between Texas and Alabama and Mississippi. I would never care to live in Alabama or Mississippi. Texas and Oklahoma are fine)

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We tried to interest people in those aspects of Texas that they didn't have in the East - outdoor living all year, the ability to go out in the Gulf all year round, and the Astrodome. Houston also had an excellent cultural environment with the Houston Symphony, Alley Theater, etc. Also there were quite a few of our people who had never been on a horse and surprisingly it was a pretty big item, especially with children.

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Between November 1962 and July 1965, we had five people who resigned from IBM - left the RTCC. Of those five, one of them accepted a job with Union Carbide in New York, but returned to the RTCC in January 1964.

Another went to Western Union, Washington, DC, to head a group of around 25 people. A third joined Univac and stayed in Houston. Another fellow left for personal reasons - a death in his immediate family required his presence at home in Paris, Tennessee, to run the family farm. Another stayed with IBM but transferred back to Los Angeles, purely for personal reasons.

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All in all the job was sufficiently interesting that we were able to keep the people. We had some difficulties over the fact that the husbands worked such late hours. We did establish social clubs for IBM families. Picnics were arranged to enable the wives to meet each other. These people were generally young, from 24 to 29 and generally making between \$8 to 12,000. This was back in 1963. I'm sure it would be much more difficult to hire people today at those pay ranges. The average college graduate is being hired for about \$700 per month in June 1968, whereas the average college graduate in June 1963 was making about \$600.

There were 3 other technical areas in addition to the programming area I discussed earlier. There was an engineering area, a mission analysis area, and a Maintenance and Operations area. In the Mission Analysis area there were about 10 people under Jerome Shipmen. Those 10 people had an average of 7 or 8 years experience and about 5 or 6 had PhDs.

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In the Engineering area we had about 15 people, all of whom had either BS or EE degrees and an average of about 10 years' experience. In the Maintenance and Operations area there were 50-60 people. Of this group about 5 or 6 had BS degrees. The remainder had little or no college work and were mostly keypunch operators, maintenance technicians, computer operators, etc. Our rate of staff increase was as follows:

As of end of

	<u>12/62</u>	<u>12/63</u>	<u>12/64</u>	<u>7/65</u>
Eng	3	15	15	17
Prog	15	125	175	195
M&O	5	30	40	50
Analysis	3	10	10	7
Clerical & Admin	6	15	30	40
TOTAL	<u>32</u>	<u>195</u>	<u>270</u>	<u>309</u>

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In late 1962 and early 1963, the Ground Systems Projects Office, was established under the leadership of Barry Graves, Paul Vavra, and Ralph Everett. The purpose of the group was to work with IBM and enable the GSP0 to translate the requirements of the Mission group under John Mayer into terms the RTCC could understand. However, our experiences indicated there was a lot of misunderstanding between IBM, the Ground Systems Project Office and the Real-Time Mission Requirements Group under Lyn Dunseith, who reported to John Mayer. Somehow or other the organization just didn't seem to work out and I believe it was around late summer or early fall of 1963 ^{THAT} Chris Kraft and Barry Graves reorganized the responsibilities of various groups and we were then to report technically to Dunseith. That was the only difficulty we had working with anyone in NASA. Now that isn't to say we didn't have many technical arguments; but I think the feeling that everyone had was that these differences were predominantly technical and never involved personalities and certainly, never involved a polarization of NASA vs IBM over who could or could not do certain work. Because of the leadership from Chris Kraft, John Mayer and John Hodge, we

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worked extremely well together and whenever there was an argument, everyone seemed to respect each other's opinion. To resolve technical differences, frequently a joint effort was mounted to determine the best technical approach. Univac and Philco were also represented on many of these teams. And once the team agreed on an approach, that is the way everyone went. No where else have I seen the esprit d'corps and high morale that the entire MSC team had. It was predominantly a team effort and I think its success was largely due to the responsible leadership of Chris Kraft. Again and again, he made it plain that the best way to help him was to tell him what the problems were. If we wanted him to help - tell him, and if we don't want him to help - tell him that too. Everyone was left to solve their own problems as long as everyone understood what the problem was--what the targets were for getting resolution, and if it wasn't possible to meet it, what would be done to meet it. I have been in many high pressure programs, worked for North American Aviation, worked for Sperry Rand, worked for the Civil Service, and for IBM, and I have never run into the esprit d'corps like we had down in the MSC.

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Now a few words about IBM's relations with other MSC contractors. We worked with people from Philco, Univac, and a few from NAA. Initially there was some friction between IBM and Univac, but after the first two or three months, we got along fine, i. e., once we had determined who was responsible for what. In part, perhaps, that early trouble with Univac arose because MSC had not clearly defined what responsibilities Flight Operations and GSPO would have in the IMCC. Consequently, I think there was a lot of misunderstanding as to who had responsibility for what and who didn't. Once the responsibilities were clearly spelled out, there was no further argument except for bonifide technical arguments, which we constantly had down there. Between the Univac and IBM Maintenance & Operations was an extremely close rapport. Monte

Dellinger frequently loaned IBM testing equipment to Univac in order to detect or isolate some particular problem between Univac and IBM equipment connections. Many times Univac worked with us to determine whether the problem was ours or whether it belonged to them. We had a few difficulties with Philco, usually over technical issues but overall, our relations with them were good.

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In January or February 1962, following GT-3, Chris Kraft asked Philco and IBM to recommend whether we should or should not support GT-4 in a prime mode from the RTCC/IMCC Houston, rather than from Goddard Space Flight Center. The original contract responsibility IBM had was to provide rendezvous support out of the RTCC. However, rendezvous had slipped about nine or 10 months and consequently, we had a computing system ready earlier than expected. Around March 1965, Larry Sarahan of IBM recommended before a joint board with members from MSC, NASA Hqs, Philco, Univac, IBM, and McDonnell that the RTCC be the prime control center for GT-4. At that point, I believe Philco recommended that MSC continue in a back-up role only. Within the next two weeks Chris Kraft and NASA Hqs decided to provide GT-4 primary control from Houston. Goddard Space Flight Center, from that point on, was considered a backup to Houston. The RTCC had monitored GT-2, backed up GT-3 and went prime on GT-4 about six months earlier than IBM had contract responsibility for. Something very similar to this had occurred in the Mercury Program. The contract responsibility that IBM had was to provide mission support for Mercury-Atlas. When the Mercury-Atlas program fell behind, NASA substituted Mercury-Redstone flights. There were seven of them, and IBM adapted the Mercury Control Program for Redstone flights MR-1, MR-1A, MR-2, MR-2DB, MR-3, MR-4, and MR-5. I

think this extra support went a long way toward cementing the relationship between NASA and IBM. They had confidence in us and we had confidence in them.

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Around the early part of 1965, NASA Hq was insistent that the NASA field centers develop a method for measuring performance of contractors. Now that was a problem with respect to how to measure the performance of the RTCC. Some of the arguments were what if we tried to specify functions performed, and if we perform 9 out of 10, we perform successfully 90% of them. Others said well let's measure system availability; how well the hardware stood up under it, that's all part of it too. What about people, because people were part of the total system also; The computer operators, the mission control operators, and the RTCC operators and others like that. However, since that was a joint integrated team effort, many times it was very difficult to determine how to quantify it. Also, NASA wanted some of the experiences learned during GT-4 to get immediately into the GT-5 system. From a programming standpoint, a system as large as the RTCC had probably from 500 to 600,000 lines of code in it. To modify or to add 10,000 lines meant that it was necessary to go back and completely system test everything again. Sometimes there just physically wasn't enough time for NASA to specify what the requirement was, for IBM to design it, code it, and check it out. We also had to support the T-21 day countdown during which time NASA wanted to "freeze" the system, i. e., no changes could be made after that. It was very difficult to get the data and analyze it, which probably took anywhere from 2 to 3 weeks, and then define new requirements. This meant IBM had between 3 and 5 weeks to design the requirement, code it, and check it out. Consequently, at that point in time generally it was agreed that major modifica-

tions from GT-4 would be in GT-6 and those from GT-5 would be in GT-7 or even GT-8. Speaking from a contractor standpoint, I think it is very, very difficult, knowing the requirement, for anyone to actually measure system performance.

Moving on to the administrative problems involved in undertaking large projects such as Mercury, Gemini and Apollo, I would like to discuss some of IBM's early experiences in this area beginning with Project Mercury at GSFC. Speaking from a contractor's viewpoint, when we initially moved to the Goddard

Space Flight Center in September 1960 everyone had the same dismal working

conditions out there. The Goddard Space Flight Center facility was 6 to 9

months late. However, the NASA/IBM team had to support one of the very

early Mercury Redstone shots, probably MR-2, launched in December 1960.

In December 1960, the situation at the Goddard Space Flight Center was nothing

but mud, unfinished roads, no place to park, inadequate facilities, no bath-

rooms, etc. All the people put up with it since we jointly shared it; however,

toward the end of '61 and early '62 when I was still at the Goddard Space

Flight Center, I really believe the contractors at that point were treated as

second class citizens. NASA had a very difficult time because of crowding.

No matter how one seems to plan ahead, by the time the building is ready, it's

no longer large enough. However, at GSFC IBMers were asked to move into

the halls where there was inadequate heating, inadequate ventilation, and

safety problems. I think at that point NASA should have allowed IBM the op-

tion to move off-site or given us adequate space to work in. *In the case of some Mercury*

to Houston the Clear Lake Site wasn't ready until probably the fall of 1963. So,

in October 1962, IBM immediately contracted for around 20,000 sq ft of floor

space. Since construction in the South is a lot easier and a lot simpler than in

the East we were able to put up the building in about 8 weeks, including 5,000 feet for a 7094 computer which required a "false" floor, special air conditioning and power supply. This facility was expanded in 1963 from 20 to 40 thousand sq feet. That held us from January '63 until July '64, when we moved about half of our people into NASA Bldg 30 at Clear Lake. Then in the fall of '64, it became obvious that all the IBMers would not fit into the NASA facilities. IBM agreed to put up a building very close to NASA and we moved the rest of our people there about early 1965. However, because the arrangements for housing our people had not been settled, we had people working in a blue temporary steel office area along Old Galveston Road near the entrance to Clear Lake City. It was unbearably hot there for most of 1965, when we had 70 or 80 people there. One group moved into the building the day after we had a heavy rainstorm. When they arrived there were two inches of water on the first floor. They couldn't even get into the building. We hired some pumps, pumped water out and built a dike around the building until a drainage ditch was constructed. This kind of problem is typical where the technical requirements outpace the administration's ability to keep up. The technical people constantly refer to the "green eye shade" types, and there are times I have to agree with them. Yet, there are other times when technical people don't understand the administrative problems involved, and for a short temporary period, they have to be willing to put up with some inconvenience. Their attitude is often colored by the fact that they are working 12-14 hours a day and consequently, they feel they should not be obliged to suffer these inconveniences and discomforts. To summarize, I think the administrative problems we encountered, while frustrating and harmful to a project's success, were typical of other large projects.