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ORAL HISTORY INTERVIEW

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Oral history interview with Paul Vavra
[full name of interviewee]
about Information Systems Division +
Mission Control Center
[main focus of interview]

Title: 1963 - Ground Systems Project Office
[interviewee's current and/or former title and affiliation]

1968 - Chief, Information Systems Division

Interview conducted by Robert B. Merrifield - Staff
[interviewer's name/position]

Historian at MSC
[location of interview]

Transcript and tape(s). [for inventory only: # pages 21; # tapes 2]
master 1

Education - _____

Topics - Initial STG work; Comparison of effectiveness of small STG groups & early small organizations
~~* later Mercury Project~~; Goddard Space Flight Center planned as ^(GSFC) operating center; STG part of GSFC 'on paper' only;
 Tracking & Ground Instrumentation Unit (TAGIU) & disagreement w/ GSFC ^{organizational} approach; 1962 transfer to MSC for ^{planning} word on Mission Control Center (MCC); new ^{creation} Ground Systems Project Office (GSPO); building GSPO personnel; Philco contract definition phases MCC; GSPO abolished; creation of Information Systems Div; 1965 ACE / Spacecraft moved under ^{ISD} ~~ISD~~ ^{ISD} ~~Syst Div~~ ^{Syst Div};
 Apollo Communicator System Compatibility Testing Facility; Motorola Contract; Lockheed Electronics Support ISD ~~branches~~; GE Contract; Apollo Range Instrumentation Aircraft (ARIA).

I recall first getting into the manned spaceflight program, I was working at Langley Research Laboratory. I started working there in 1947, and then I was member ^{as a} of the Electrical Engineer in the Instrument Research Division. In 1958, ^{about} that is when the space program was really first formed, out. It started hearing a lot of activity in the Instrument Research Division and how we might be asked to help the ~~forming of the Space Task Group in their~~ ^{with its} tracking instrumentation problems. In early 1959, the Chief of the Division, Mr. Buckley, and the Assistant Director, Hartley Soule, were in ^{Langley} ~~in~~ ^{asked by} conference with the Space Task Group people ^{for support} in ideas and forming out the supported group. At Langley they directly supported the Space Task Group. As result of this, Mr. Buckley called ^{together} ~~some time~~ in spring 1959, a group of engineers ^{the} ~~together in~~ Instrument Research Division set up a conference room and asked them to put NASA in there for a while in order to have ~~to form~~ a little team to answer questions and to support the project Mercury activities that were forming up under Mr. Gilruth, ^{in the} Space Task Group. ^{This was to be} Strictly ~~as a~~ part-time, ^{in addition to} give it a little effort when you have a chance off ~~your~~ regular job. A few weeks later we were in the space program night and day ^{and} never thought about our other jobs again. ^{team} This ~~group~~ I am speaking of was formed up as a Program Office at Langley ^{and} ~~called the~~ "Tracking Ground Instrumentation Unit". ^{Mr.} Barry Graves was appointed ^{as head and I as} assistant head of it. ^{time} And for the first in our life we had a major multi-million dollar project to plan and implement, ^{but} ~~and get done in~~ almost ^{share period} an impossible amount of time. The ~~group was small and never got very large, and~~ ^{team} it was composed of ^{months} the people ^{who had been} that were in the rocket and aerodynamic research and instrumentation ^{research} ~~business~~ at Langley for a number of years. And you might say it was

of

basically a conservative engineering type ^{group}. I skipped past the activities that resulted in the successful completion of this job which was done very rapidly and successfully. ^{In} And looking back at that particular ^{job} thing and thinking about the institutional aspects that we were trying to get at, the one thing that seems to be outstanding in thinking back to that particular history, as compared to ^{in comparison to the} organizations that we now ^{have} formed up at the MSC, and the size and complexity of the management interfaces that ^{now have to be considered,} are formed up. It seems - that a real searching ^a question that always comes up ^{was} - is to how a relatively small group ^{with} was relatively limited expense and program management, ^{able to} For that matter management ^{NASA and AF} of complex interfaces with other groups within ^{the} NASA and Air Force that was deeply involved in the Mercury Range activities at that time and other groups such as supporting groups such as Lincoln Laboratory, MIT, ^{and the} large group of contractors that we ^{had to} worked with. Looking back it appears that ^{although} we had many troubles at ^{times} that time, it appeared that we were much more successful in getting at the answers and getting action on work, than we ^{have been} are in recent experiences ^{to} particularly ⁱⁿ Apollo where the organization has gotten ^{so} large and cumbersome.

Going ^{on} from that - why do you think this is the case (?) - that's hard to pin down

but own personal opinion, may get into that later, as we get into another job later ^{at MSC.}

on work on Mission Control Center later on ^{No. 1 One} The one idea I have on that is that these people, I guess first of all, at that time in history of 1959, ^{were} I was very enthusiastic effort - ^{Mercury was} new and ^{exciting} enthusiastic effort - because it was being formed up. ^{and} The people involved, ^{almost} all of the people involved at the time, almost all of the people involved at the time, had known each other in the past at Langley, Research work, both on the Space Task Group side of the house and the Langley group that was supporting very closely. I

^{there} think ~~that part of this~~ was a mutual respect ^{on the part} of all of the people involved.
~~And a~~ ^{direct} ~~dranked~~ acquaintance with most of the people involved. I
 think that partially the group accomplished ^a more per man than can be done
 today. Perhaps ^{it} ~~that~~ was fortunate that there ^{were} a limited number of people
 involved, ^{considered themselves} ~~Although everybody was very~~ over worked. ~~And, I think there is~~
~~another aspect in the general management feeling as comparing these days~~
~~with those days that there was~~ ^{des} a basic ingrown feeling and ^{attitude}
~~atmosphere, well, or, ingrown education that people had at that time; I think~~
~~in the experience working particularly in the old Langley Research days; That you~~
~~tried very carefully, at least in our experience in instrumentation Mercury~~
~~tracking range business. You tried~~ ^{it was important} ~~very carefully~~ to lay out a program and
 understand it before committing full effort to implement it. Although ~~the~~ ^{one}
~~time scale for doing this is~~ ^{schedule was tight,} ~~very short,~~ ^{basic discipline of,} this feeling you had to concentrate
 on getting the program defined ^{laid} and ~~laid~~ out and negotiated with people involved
~~before starting.~~ ^{was adhered to too} ~~A~~ many unknown directions. The feeling, again comparing
~~it to what has happened, has got what I would say~~ ^{that the failure to continue with this approach has gotten} MSC in major trouble in
~~Apollo start.~~ ^{where} That feeling ^{did} ~~does~~ not prevail. ^{well this}
~~I think that many people realize that they~~ ^{was} ~~particular~~ job that I am
 speaking of ^{then} ~~is~~ pretty wrapped up with Langely within ^a two year ^{time} span, and
~~there was a management decision that had to be made prior to that~~ ^{then} ~~between~~
~~Headquarters and Space Task Group and the Langley people involved. For the~~
~~transfer of that brand new world-wide ground network activity to the newly~~ ^{was transferred}
~~formed Goddard Spaceflight Center which Headquarters had since decided previously~~
~~would be the operating center for all NASA ground tracking and communications~~
~~network. So this,~~ about the summer of 1961, when most of the program

decided

initial

management problem *then*

instrumentation was completed, the ~~problem~~ *that could pick the continued operation* was to set up an organization at Goddard ~~to continue the interfaces properly with the Space Task Group which~~ *STG was on paper a part* although ~~had been part of the Goddard organization, But~~ *was never really* closely connected with Goddard. The ~~group that was formed up at Langley~~ *TAGIU* and was asked to transfer to Goddard ~~take their experience and partially~~ *they were to* completed job with them. Finish it out and get it operating ~~as~~ *for* a ~~operational Mercury support network.~~

Q ~~Interesting management dispute originated at that time because the~~ *TAGIU* responsibility was ~~put in the newly formed directorate at Goddard for~~ *that to be* attaching ~~data acquisition under John Mengel. I had the feeling,~~ *tracking and* John Mengel ~~personally had the feeling that the management group that would~~ *planned to direct the* support the manned spaceflight with the tracking network at Goddard would ~~be done out of a small staff office, and that the technical groups and operating~~ *auth.* management groups for this network would ~~be integrated in with the or should~~ *other* be integrated in the established organization that Goddard had at that time, ~~which was an outgrowth of the mini track and Goddard tracking network.~~ *and operational the personnel Vanguard*

~~The group at the time of the tracking ground instrumentation at Langley~~ *at* at the time fell in my hands to negotiate with Goddard because about that time Mr. Graves, who was ~~head of this group, departed to accept the Sloan~~ *the one on a* Fellowship Scholarship. So I became head of ~~this group and at the time we had to~~ *the right* negotiate the arrangements ~~with Goddard. I disagreed with the Goddard approach,~~ *for our transfer to* and the personnel involved at Langley ~~those who were interested in the~~ *as did all our Langley* continued work at Goddard had ~~agreed with my fellows that we all refused~~ *we among ourselves would*

started, to transfer ~~take part in the Goddard part of the activity, except to help them get~~ *not* If we could ~~arrange for at least a division level of activity, that would form our~~ *far our part of the* Mercury job at Goddard. This became a ~~very heavy difficult issue, and~~ *contentious* eventually Goddard management ~~did concur in transferring those people into a~~ *agreed to our request* close ~~organization to keep them together for the continued operation, or building~~ *as a unit*

Insert item from next page

~~up of a continued operation of a group for the Mercury network.~~

~~For a summary of that particular management issue in dispute, the group of~~ ^{people} ~~at Langley who had worked so long and hard on this project~~ ^{were} ~~determined that they~~
~~would want to stay together as an operating group, and not be split up~~
~~at Goddard. And essentially, I was under the responsibility~~ ^{representing them} ~~in the group~~
~~and to tell Goddard management~~ ^{the} ~~that none of the group would come unless this~~
~~management arrangement was approved at Goddard.~~ ^{agreed to by} ~~And, as a result, eventually~~
~~this arrangement was approved.~~ ^{management} ~~Now even so while this dispute was going on,~~
~~a number of the members of the group broke off and either went back to Langley~~
~~or joined the Space Task Group, because of this dispute, that was going on at the~~
~~time.~~

In 1962, while I was the associate chief of the Manned Spaceflight ^{Support} ~~Network~~ ^{Division}
~~at Goddard, I was asked by B. Graves, who had then graduated from college work~~ ^{finished his Sloan Fellowship} ~~and was~~
~~that he had done, back at Langley to consider transferring with him to the~~
~~MSC group that was then forming up in Houston.~~ ^{in the process of moving to} ~~In order to operate a program~~ ^{we would}
~~construction of the mission~~
~~for the Houston Mission Control Center.~~ ^{Walt} ~~At the time, Williams at Houston was~~
~~trying very hard to get Mr. Graves to take this job.~~ ^{transfer and}
~~In late 1962, Goddard~~
~~management agreed to allow me to be on travel to the newly formed Houston group~~ ^{to go to}
~~at MSC, in order to assist them in the forming up work on definition and~~
~~specifications for the MCC and also to participate~~ ⁱⁿ ~~some of the contractual~~
~~evaluations that were started early~~ ^{underway} ~~to get a real-time computing~~
~~complex contractor, started for the work on MCC.~~ ^{the} ~~In approximately September or~~ ^{around}
~~October 1962, on continuous travel~~ ^{I was} ~~the Goddard operation to the Houston,~~ ^{(almost continuous travel) down from between}
~~operation, and approximately in November, officially transferred to Houston.~~ ^{to report to Mr. Graves}

~~who had been appointed by the Center to form a new directorate, up,~~
~~and Mr. Graves then appointed as Director of Information and Control Systems.~~ ^{had been} ^{assistant for}
~~Under this Directorate, Graves formed up with myself heading up the group~~ ^{created}
~~called the Guidance and Project Office to be the organization~~ ^{to} ~~handle the technical~~ ^{around systems}

6

and
control design and construction of the new Mission Control Center, in Houston, *asked me to take charge of this organization*

if
There were a number of management problems in setting this operation up in that
~~they~~ at the time Mr. Kraft was the head of the Division, called the Flight
Operations Division *and his* these were the people who were setting up the basic
requirements *the* and plans for a MCC in Houston. They also *furnished* had the desire
attempted to control the construction of it. But *they* were at the same time too small *a* group both
to

finish up the Mercury operations ~~job at the time~~ and do this new job. So they
reluctantly

turned over the responsibility to the Graves organization, ~~for the project~~
management of this new job. In order to get a very fast start on this
off the ground (construction was to begin) beginning
project which had to be underway fully contractually in 1963, the immediate
management problem that Graves and I had was to get a group (a reasonably large
of people
enough group to accomplish several *things* jobs). As a result we had to negotiate
nucleus
for a *who* of people taking a small number of people out of the which had
some background *and* interest in the systems engineering and equipment aspects.

Although the existing FOD organization *furnished* and some people out of the existing or
who later the organization which later became *a part of* the Instrumentation and Electronics
Systems Research Division at MSC, which I was

~~organizational~~
~~we~~
title (I will fill this in later - forgot what it is) and thirdly, had to very

he had to very quickly *additional* hire so many people, this had to be done at the same time as

move moving to the Houston site, and at the same as trying to evaluate the contractual
phase bids that were coming in on the construction of this project, and at the same time
other administrative setting up budgets and new management arrangements, places set up offices, etc.

if I left out other source of new people *for BSPO* out of the group which is now called the
was the Computation and Analysis Division, for assistance *they were used* (in the computing center construction
and specifications.

Immediately when the prime contractor was chosen for the

was chosen as MCC contractor
after MCC which turned out to be the Philco Corporation, this was just at the end of 1962,

a management conflict or dispute in the area of the basic policy for operating the contractor ~~some~~ ^{developed} some portions of the center management ^{including} ~~could be~~ ^{Kraft} ^(FOD) FOD management, which had most of the background up to that point, ^{and had worked} in working with Philco previously on ^{the} a study definition contract. Thought the contractor knew enough about the job to be turned loose immediately on letter contract to start the activity which they had proposed which was essentially to in parallel design and ^{and definition?} construct define the MCC job.

In order to meet the near impossible schedule that ^{had been established for} ~~was set up for them~~, and they ^{completion of the MCC,} ~~had to propose~~ on the meeting. Graves and my experience, along with several other people, ^{felt} that we were able to get into this group that had experience on the Mercury range construction have strong opinion that we would be better off in the ^{(before turning the contractor loose, this would entail a series} long run to insist on a contract definition phase of meetings with the contractors to definitize in detail specifications and contract definition, costing, technical ^{parameters, and} definition so on down the line, ^{which would require} and spend at least a month or ^{doing that} two prior to turning the contractor loose on construction job. That opinion ^{ed} prevails and we did go immediately into ^a contract definition phase ^{we immediately had to} and also work through a series of ^{put up with} immediate reactions ^{from} negative reactions ^{the} the contractor who had been led to expect that he would be not held up and ^{(would be allowed to begin} ~~off~~ impossible schedules. ^{although} ^{decisions made} at the ^{we} I feel that now ^a the provisions being taking time for the very difficult ones to get people to agree to, ^{Graves and I} that above the contractor after the year was over, ^{had been used} and we both felt that ~~that was~~ the correct management approach that by spending a couple of months at the beginning of the contract to definitize things, ^{It we} ^a saved many months and ^{or} great deal expense. ^{had} we not done that. After ^{on} a year of intensive activity, over a year of intensive activity of the MCC work, the major technical decisions, design approvals, and subcontracts had been definitized and approved, and the program was ~~pre~~ completely frozen for what was to be done and how it was to be done. ~~Other~~

7 other
 concerns and disputes ~~that entered into this period~~ *the picture during* was that although Mission

the main purpose and requirements for the new major Control Center was ~~for~~ *to*

~~the essential support for the project Apollo~~. Practically nobody on that

job, including the Flight Operations people who ~~are~~ *were* defining the prime and Mission

basic requirements of the Control Center had very much knowledge of Apollo.

As a matter fact, ~~as we mentioned previously~~, *at FOD* the people who ~~the Flight~~

Operations people who defined the requirements - most of the key people

were very heavily engaged *(still uncompleted)* on the complete project Mercury *operational phase* and were just the

beginning to get heavily involved in definition of what they had to do *for Project* with

and network support *in the way of* for

regard to Mission Control Center *project Gemini*. We are having a hard

enough time determining that, let alone thinking ahead to how this would fit in with

project Apollo *by this time* which ~~although~~ was going full blast in another part of the center under

and the Apollo Program Office. There was relatively little contact with that group. *between ASPs and FOD.*

Near the end of 1963, the center management *organizational structure* was being reassessed at that time

by Mr. Elms, who was Deputy Director, *then* and as part of *an* overall reorganization,

that Mr. Elms came up with that ~~the~~ for Dr. Gilruth near the end of 1963,

it was decided *make the* to, or Mr. Elms decided to reorganize the Center, in terms of making

~~a flight operations group larger, turning the Flight Operations Division into a~~

Directorate *and to give* giving them more responsibility for *many* all the aspects of the Center

operation. This was done to a large extent - *to* at some extent - extent of some *at the expense*

Graves of the Directorates that had been previously set up by a ~~wait within~~

major which Graves was in charge of. As part of this overall, and also one

other aspect that influenced what we were doing at the time, Elms

also decided that the Center *ch* would be reorganized in terms of a very different

support arrangement for project Apollo *in particular* and that meant the assignment

of the subsystem manager responsibilities throughout the Center line organizations.

The direct affect on the work that I was doing at the time was that *I* it was decided

that the Program Office *ground systems* operation had completed *the* initial purpose of setting

the

contracts up for the Mission Control Center and technically approving the designs, and through the stage of getting all of the subcontracts set up.

the announcement came out *Ground Systems*
So Gray suddenly and with little warning, that the Guidance and Project Office
which I was head of *its functions and personnel* into *other organizational elements*.
was abolished and was integrated *the new or the personnel was to be*
integrated into the new organizational setup. Generally, Elms had reorganized.

a period
This was the time of a great turmoil, and everything was being reorganized
at once. New program office setup, and right about that same time, *the* head of the
Apollo Program left, and Dr. Shea was transferred in from Headquarters to take *his place*
up the responsibilities of the Apollo Program Office. Looking back

just for a minute for what was going on in the Program Office activity

under the MCC, *as a*, and this relates to some of the things that happen
later on, as *at that time, as* a part of the responsibilities of the Program Office *the Ground Systems Program* Office

we had a responsibility besides building the MCC to define the interfaces
of the MCC with the supporting tracking *ground* network, which *then became* was the responsibility
of Goddard to implement. both for project Gemini which was the first use

of the MCC and for the follow-on project Apollo. *As we previously mentioned,* very little was known

Requirements
at the time, for project Apollo. Although we were able to spend very little
effort, *in this area* we did set up a small group, *element of NSPO* people called *the* systems analysis group that

tried to make proper contacts with the Apollo Program Office and the Goddard
and other activities that were going on
planning at the time to try to figure out what the future interfaces would have

to be on MCC overall ground network. As the result of this, some basic plans were
very sketches plans but a start was made on the planning for an eventual

compatibility testing program, which was intended to get started to *measure compatibility*
determine what the new technical interfaces of the Apollo spacecraft
with the

communication system would be ground network. The reason for mentioning this *is*
at the time as compared to the spacecraft communication interfaces *with the* ground network

In comparison Mercury *communications called for* a
on Project and Gemini the plans for Apollo were forming up in terms of relatively
new *but* or revolutionary different type of system, *where* Were the direct experience

spacecraft

10.

from the Gemini and Apollo ground communications ~~could not be directly used.~~ *were not comparable.*
This ~~eventually resolved in the~~ *function. become the responsibility* compatibility testing facility which we have *now*
today. *but at* The time was *only* just a few ideas on paper. This *is built, is now* located in Bldg. 440.
communications

Well the idea of the need ~~of a compatibility test facility, as I mentioned,~~
turned it back *on* for reasons why this was thought of.
of *of*

What the concept ~~it would be or was because the Apollo communications~~
network, as I mentioned being a completely new type of thing as compared to experiences
in Mercury and Gemini, *for the Center again to understand this*
it was conceived that it would be necessary *new system or*

~~new interfaces by planning and setting up a laboratory which would hopefully~~
~~spacecraft or design work~~
~~pull in an early stage of the contract~~ *prototype models*

the Apollo ~~of the new spacecraft communications system which~~ *had to function effectively and*
~~complex modes all the way through earth orbit and~~ *reliably both in* *up to* the moon and back. Along with

~~the early prototype designs that Goddard would be responsible for implementing~~
to operate with this system, and it was vital that everything undergo
~~in the ground network, pulls these together at one central location which~~

~~we proposed to be MSC for a joint systems compatibility testing in order to~~
~~refine designs and in order to get feedback to the spacecraft contractors,~~

~~the requirements in terms of possible~~ *areas of* ~~incompatibility in the designs, ideas~~
~~that the ground supporting network~~
~~they had because there would be assurance~~

equipment ~~the spacecraft would work together. At the same time, the idea was to set up~~
so ~~management arrangements that the Goddard Spaceflight Center would also participate~~
~~in the sense that delivering to MSC as early as possible prototype models of the~~ *device*

to MSC ~~new ground receiving and transmitting equipment, which are~~ *completely*
~~different which was provided previously for Gemini. In order for them also to get~~
Mercury and

~~the knowledge and experience in early date, as early possible date, as how to~~
to be *the* ~~refine their designs compatible with the progress with spacecraft contractors~~
~~are making.~~

this Basic idea was supported very heavily during this period by Graves, who

had been our director *four* activities. And a start - ground work was laid during this period of 1963 for the groundwork and plans for the basic type of buildings and facilities and for the basic type of management arrangements that would have to be made to make this possible. ~~Again, this~~ because was a difficult one to set up, ~~it was a relatively new concept of~~ relationships between the spacecraft contractors, the Apollo Program Office, *other* Goddard and all the people involved this type of arrangement has been done before. ~~So fortunately, or what~~ we feel at least fortunately at this time, proper groundwork was laid to ~~get these ideas underway at that time. Although not very much progress~~ was made at the time. towards implementing this ~~Mainly because the group involved because 99 %~~ was concerned with the very urgent job of completing the MCC in time to support the Gemini to support early as possible Gemini flights and ~~mandatory~~ *a* deadline in supporting the Gemini rendezvous flight.

~~Then, picking up again~~ *4* ~~near the end of 1963, as I mentioned~~ *with* ~~things~~ *(at least* from our standpoint) ~~in anyway were in great turmoil, although much of the turmoil~~ *direct* outside of the activity (Ground Systems Project Office) was only something we were observing because not real directly involved in, because the group ~~was~~ *we* that we were in *we* head over heels and concentrated on one thing in doing that one thing very effectively and that was getting the Mission Control Center built. So, as opposed to the main things we knew that were going on around *and* of the Center reorganization plans, setting up new activities, planning for new future organizations, etc., we did not get real actively involved, ~~in~~. We had to do one job and that was to get the Mission Control Center ~~job~~ done, mainly.

~~So when - so except for this planning I mentioned, which we had seen~~ and gotten the need for and gotten support of grades for the future setup of the *Communication* Apollo compatibility facility - you see that had to come in the future - we have

beyond
 no future plans building the Mission Control Center in this Ground Systems Project Office
 Group, I mentioned. Picking up at just after the end of 1963, prior to end of 1963, the Center reorganization was established by Mr. Elms, and at that time our supervisor, Graves, was setup as - his activities were combined with Mr. Faget's activities, and Mr. Graves became the Deputy Assistant Director for E&D under Faget.

And because at that time, as part of the Elms' reorganization of the Center, apparently Mr. Elms and that agreed with Kraft and other Center management that the end was in sight for the Ground Systems Project Office and the integration of the operational of the MCC had to be planned within FOD. During the period of month or two prior to end of 63 and the final date in February, and the final resolution of the Ground Systems Project Office which came in February of 64, during that period the Ground Systems Project Office organization, as such, was simply left off the Center Management Charts. This still doesn't exist on the charts but we were still operating as the Ground Systems Project Office during those several months trying to finish up as best we could the task we had in the construction of the Mission Control Center. Well, that was just a period of indecision that Elms and other people had because when the Center reorganization came out this activity we had was simply left off of any organization chart, and we couldn't figure out what to do yet, and this made a difficult period for us. I think there was a span of about 3 or 4 months in there.

Then, finally in February, 1964, Mr. Elms wrote a memorandum to Mr. Faget and Mr. Kraft for Gilruth indicating that he wanted Mr. Faget and Kraft to jointly resolve the reorganization of the Ground Systems Project Office and decide on the future operating organization that would continue on with construction of the of the the finishing of the MCC and the organization follow-on operation of the MCC

~~construction was completed,~~
~~within FOD, Flight Operations Directorate. So in a few~~ days,
~~later, in February 1964,~~
~~I was suddenly called out of my job in which Mr. Kraft presented a list of~~
~~people to Mr. Faget and said these are the people that will be transferred~~
~~out of the Ground Systems Project Office, for operation to go within~~
~~FOD, and the rest of the people will stay in the E&D Directorate to form up another~~
~~electronics activity, undefined. Again, this was a very quick~~
~~standpoint unplanned detailed session - simply walked into the door and these~~
~~are the names that go one way and these are the names that go the other way.~~
~~So as of that day the Ground Systems Project Office, as such, was officially~~
~~dissolved. A group of some approximately 1/3 of that group was transferred~~
~~to Flight Operations Directorate. The Flight Operations Directorate set up an~~
~~interim project office - MCC Project Office - under Major Clements, and the~~
~~people remaining, most of whom were given choices whether they would like to go FOD~~
~~or not, were set up in a holding organization called Information Systems Office,~~
~~which was still responsible for some follow-on support to the MCC Program~~
~~Office during the transition period.~~

During the next month or two, various meetings and planning sessions
 were held to determine within Faget and Grays Directorate as whether
 to combine the remaining people of the Ground Systems Project Office
 with the Instrumentation Electronic Research group that was formed up and
 running at the time, or to form up a new Division, organization, which was
 eventually done, but it wasn't clear as to what the responsibilities
 of this division organization ought to be, and took some period of weeks
 to outline how this new organization would fit in within the Center.

The new organization which resulted in the Information Systems
 Division, was formed up by a shuffle of people between several organizations.
 Some of the people that were from the old Ground Systems Project Office
 real-time computing complex of the Mission Control Center. Most of these people

and
 were transferred to the Computation and Analysis Division, and a trade was made with
~~In return the~~
~~the~~ Computation and Analysis Division a group of people who were operating with-
~~in the~~ Computation and Analysis Division as an engineering group to set up the ^{for setting}
~~reduction~~
~~data complex.~~ These engineers were transferred out of the Computation and Analysis
^{They were}
 Division into the new Information Systems Division, to set up a continued operation
^{They brought with them the}
 in electronic ground data systems, with the continued responsibility though
^{and as well were to set up an electronic ground data system.}
 for completing the data reduction complex for the Computation and Analysis
 Division. Some of the people of the old Ground Systems Project Office were
~~back~~ ^{who had originally come from}
 transferred into the Instrumentation Electronic Systems Division,
^{back to it,}
 some of which came from there initially, and some people were transferred out of
^{and another group from}
 the Instrumentation Electronic Systems Division ^{who had a} comparative experience
^{and}
 in the ground electronic systems, combined with the group under J. Overton's branch
 who had been doing the data reduction complex.

One of the difficulties at the time was at the ~~When the new division~~
~~was formed up -~~ it had no building set aside for it. ^{There had been a}
~~which had been previously planned in the~~ Ground Systems Project Office
~~was in the construction facility plan for setting up a building for this~~
~~systems~~
~~electronic and compatibility work, that was in the planning stage but not to~~
~~be completed for some two~~ ^{years,} yet. The new Information Systems Division was housed
~~at that time, moved temporarily to Office City and then temporarily to a~~
^{for the time being in}
^{after the move to the site, was}
~~located~~
 location in Building 30, Mission Control Center building, when it was ready
 for occupancy. Later on when the Bldg. 30 got very crowded
^{it was again}
 it was moved off to Bldg. 6A. Later on, moved to a temporary ^{quarters in} building,
^{and then to}
 of course, 16, was constructed, eventually, 440, which is the Information Systems Division
^{Division's}
 building.

Another major point in the formation and growth of Information Systems Division
 activity came about in January 1965. Office of Manned Spaceflight

OMSF functions at the Cape were being reorganized and the 15
~~of~~
was concerning the organization, Center responsibilities, and it was decided
that
about that time the MSC Fla. operations under Mr. Preston ^{were being} absorbed by the
new KSC organization. ^{as part of the reorganization, the ACE/Spacecraft} At that time A group under Mr. Preston which had been
the technical initiators of the what is now known as the Apollo
ACE/Spacecraft. It was decided that this group that initiated the ^{ACE/}spacecraft
work, ^{under} Preston's organization and was actively supporting the
Apollo Program the sites.
Office work in this area for all Apollo It was
decided that this was the one responsibility that would not be transferred
to KSC but would be transferred as a continuing engineering and development
activity ^{was} at MSC. In January, 1965, Mr. Low ^{as} Deputy Director ^{and} at the time, wrote
a memo to Mr. Faget directing Mr. Faget to arrange for the transfer
of the functions ^{and} in personnel of the organization under Preston ^{at the time} called the
^{It was then called the} Electronic Ground Support Equipment Division ^{Florida} for operations. They arranged
the transfer of these functions and responsibilities for the engineering
and construction of ACE stations ^{were given to} to MSC under the new Information Systems Division.
to

Mr. Faget was requested complete that move of responsibility of personnel
by April 1, a very rapid thing to accomplish.

In early January, myself and Faget, and representatives of the Apollo Program
^{and I met at} Office met KSC with Dr. Debus, and ^{others,} Preston and other management people,
to try to arrange ^{the} that transfer. We met ^{encountered a} with the situation very similar ^{to}
to the one I experienced ^{had} earlier when asked to transfer ^{my} functions and people out
of Langley to Goddard. ^{similarly,} And that the key personnel located at KSC were not
particularly anxious to move to Houston. For a number ^a reasons: One, of course,
was that KSC was very rapidly growing organization at the time ^{and} many opportunities
^{were} available for ^{promotion in the} new organization set-up. The relationship between this group
and the Apollo Program Office which had their point of contact ^{as in the Apollo Office, for a practical} which was Dr. Lanzkron
relationships with Dr. Lanzkron ^{were} was not particularly good at the time, and as a ^{people}
^{happy one, and as a} result they were in a position to hold off for a hard bargain in the same sense ^{used to} fashion

~~that we had on~~ ^{that} ~~of previously in the Langley and Goddard transfer.~~ However, this did result
in a satisfactory agreement where ^{they} ~~nucleus of people from KSC~~ were willing to
transfer to MSC, Houston, provided that they be given a very full and complete
responsibility for the ACE program ^{and would not be under the} ~~which would include the phasing out of~~
control ^{of} ~~Dr. Lanzkron, essentially transfer of program responsibility from~~
Dr. Lanzkron to this new group coming up to MSC. Fortunately this worked out
because at the time Dr. ^{Shea} ~~he~~ felt that the ACE program was ^{well enough} ~~flown up under~~
control and ~~would rather use Dr. Lanzkron for other activities anyway.~~
So that arrangement came about satisfactorily. The only ^{great} ~~difficulty in that~~ ^{encountered}
was the final transfer that the negotiations with the ^{chief of the} ~~division, chief of the~~
^{Electronic} ~~activity that was~~ KSC, which was named Ground Supporting Equipment
Division - MSC was not willing to set up a new division for this activity
so the division chief was not interested in coming with this group. The
assistant division chief ^{also declined to come when he was offered a} ~~of the activity was also negotiations broke down~~
^{better} ~~with him cause he had a bigger opportunity at KSC, so he had doubts in determining~~
~~who could grab the leadership for the people out here.~~ After some turmoil
a group did form up around Mr. Cliff Bradford, who ^{It was} ~~then was~~ organized into a
Checkout Systems Branch ^{with Clifford as its} ~~head, under the~~ Information Systems Division, and
he was able to successfully pull around him a group of about 25 people ^{got} ~~in this transfer,~~
^{which in fact, was accomplished before the} ~~That did in fact successfully meet this deadline, pretty well of April 1~~ ^{date} ~~deadline.~~
~~for transfer of personnel and responsibilities up to MSC.~~

I think maybe we should stop about there, if you are ready.

^{One of} ~~On the subject of functions and support contractors, I mentioned previously~~
~~the major activities that our responsibilities of the new Information Systems~~
~~Division was to set up~~ ^{an} ~~Apollo Communication System Compatibility Testing Facility,~~
~~and related to this was~~ ^{we} ~~in 1963 as~~ ^{got} ~~underway, we made a proposal~~

^{In 1963 the division} ~~and briefing to Dr. Shea to present a plan for what this compatibility~~
~~testing would be so that we could get the proper authorization and support~~
~~of the Apollo Program Office for the furnishing of the spacecraft contractor~~
~~equipment to it and also for the furnishing of the spacecraft~~
~~equipment to another aspect that which~~
~~of the testing program we proposed was to~~
~~provide Goddard with the appropriate early model spacecraft equipment for~~
~~installation in aircraft for early checkout of Goddard Apollo ground stations.~~
~~The first contractual setup for supporting this test work was the contract~~
^{drawn up} ~~with the Motorola Corporation, which had good experience (previous experience)~~
~~with JPL on similar activities and had direct experience on the new Apollo~~
~~unified S-Band techniques, and that they had the subcontracts to NAA for~~
~~the construction of the basic transponder equipment. So, our first support~~
~~contractor was Motorola for the initiation of the Block I series~~
~~of spacecraft ground compatibility testing. I don't remember the exact date,~~
~~somewhere near the end of 1963, the Center management that~~
~~had made a decision many and various support contractors having to do~~
~~with the electronic systems support needed to be, the number of contractors~~
~~needed to be pinned down in a more manageable number and the idea was proposed~~
~~that a general electronic support contractor be chosen on competitive basis~~
~~such to replace smaller contracts such as the Motorola, one as part of our division~~
~~support of and many other small contracts for the various divisions in E&D, and for that~~
~~directorates. matter, in other~~
~~A phase-over was planned from the Motorola~~
~~support work to Lockheed, and this was a very difficult period and still is in a way~~
~~that and our concern was that as the new general support contractor came onboard he had~~
~~had to become familiar with a very difficult technical background, to understand and learn and to be able to~~
~~support properly. Our negotiations with the support contractor~~
~~were difficult in a sense for him to understand and to get him to understand~~
~~that he had to have a technology base in this area to come anywhere near~~

~~that~~
~~doing the kind of job we had previously with Motorola satisfactorily he had to~~
~~have a very good technology base which he had a very difficult time producing.~~

The contractor has achieved the competence required
 As of this date, ~~gradually come up to do this job pretty well, but~~ *properly*
 we had *long period* ~~a very bad grade of inefficient operation during the transition.~~ *period.* (F)
 : ~~A~~ *that* ~~other things I should touch on, which I'm not too well prepared to now, because~~ *like to and do so*
 I must get some more notes, is that during this ~~period~~ *in* 1964, while *we were getting*
~~setting up the operation of the Electronic Systems Test Laboratory~~ *in operation at*
~~in~~ a temporary location, before getting to the Bldg. 440, we also had a
 great many management interfaces to work out with the ~~HQS representatives~~ *of*
 OMSF, with the Office of Tracking Data Acquisition, at HQS which controls
 the ~~Goddard participation, and with Goddard.~~ On negotiating the support
 required from the ground network people and the equipment required *for* ~~setting~~
~~up the program, a big difficulty in the scheduling adequate priority early~~ *we ran into a problem on equipment delivery with*
~~models of equipment for timely initiation in this project - difficulty being~~ *the network people needed*
~~that Goddard had very difficult delivery schedules to me and the same problems~~ *it*
~~the spacecraft contractors had very difficult schedules to meet.~~ *for equipment.*
~~Because this~~ *far and since no provision*
~~program of equipment delivery to the compatibility testing had not been~~
~~well-established early in the program, it was very difficult at that time to get~~ *now*
~~the priorities for support established for both the ground network people~~ *agreement on changing priorities between*
~~and the Spacecraft Program Office, and the subsystem~~ *management* managers in IESD.
~~who participated in this.~~ There were, *management* in order to accomplish these agreements,
 we had to make several presentations and participated in several HQS ~~meetings~~
 and in 1964, and the major *management* documents ~~did~~ *resulting* from this *effort did*
~~establishing~~ firmly the HQS, MSC, and Goddard support arrangements.

The ~~at that time~~ in establishing all of this, the basic concern of OTDA and Goddard was that MSC was ~~trying to do things which overlapped~~ ^{ing} into the Goddard responsibility in construction of the ground network and responsibility for the ^{and} engineering ^{of the} ground network, and a considerable ^{degree of friction} difficulty in establishing the proper support ~~at all times~~ was experienced because of the basic ~~concern~~ ^{suspicion} of OTD and Goddard, ~~that~~ and MSC was continually trying to overlap ~~into~~ their responsibility.

In a sense, they would have preferred that MSC and HQS give Goddard the full responsibility for this type of activity and MSC only participate by supplying spacecraft equipment to Goddard for this performance and compatibility testing. The support contractor, which turned out to be Lockheed Electronics Company, of course, also was established to support the other activities of the division including primarily other larger areas of activity ^{with the systems} ground/data systems which included furnishing the of ISD in support to all of the E&D Directorate divisions, and outside of the Directorate for that matter, the various types of data acquisition and additional equipment throughout the Center. The other major support contractor, of course, which was completely separate from the Lockheed activity, ^{is} ~~as~~ the GE contractor which fully supports the ACE, but has the program contract under the Apollo Program Office technically directed by our Checkout Systems Branch; GE supports a Checkout Systems Branch activities and development and all of the operational stations for the ACE Apollo Program. I don't know how much coverage you want to get into.

Okay, the present division strength is 94 ~~people onboard~~ civil service people, ~~onboard~~ and although the recent personnel cut indicates that ^{and that number will be} we have to decrease ~~that~~ by the end of the summer by two or three people. The general comments on the civil service organization is because as I mentioned there

We got started late compared to ~~some of the other~~ ^{organizations in} portions of the Center, ^{and} by the time we were able to start ^{building up} civil service in 1964, the cuts ~~on~~ ^{had begun}

^{Meanwhile} personnel allotments and the formation of other directorates in the Center ^{down} and etc., kept holding ^{prevented us from} our ability to do any expanding like we wanted to. ^{As a result we have} This resulted in a larger contractual support organization than we would prefer.

desire to have, because being blocked on civil service all thru the development had jobs that were demanded to be done and were pressed towards building up heavy contractor support. General numbers on contractor support - the largest contractor general support we have for general division activity is Lockheed, ^{whose} Their present strength is about 170 people. ^{Lockheed} ^{of} in support of all our branches except the Checkout Systems Branch, which as I mentioned operates the General Electric contract to the Apollo Program Office for the ACE work, and ^{is} that Branch responsible ^{technical} ^{direction of the} for the monitoring the GE effort which amounts to a total of over 400 people, ^{of whom} with about 200 ^{are} ^{being} ⁱⁿ hundred of those people located at Houston. The rest being ^{Through} ^{the Division} at different site locations. Arrangements with the Apollo Program Office, E&D ^{supervises} has TRW support contracting work and our systems analysis work make use ^{of them} ^{are} presently around 15 TRW support contracts mainly in communication and systems analysis. In some support work ^{that} ^{to} ^{for support} we have continued doing the MCC through the ^{an} operation of a mission control laboratory and other support work, we have ^{on this work who report} a total of about 34 Philco people to the Flight Operations Directorate ^{under the} Philco contract. That's about roughly how it comes out.

^{At} In terms of total support contract effort, there are about ^{here} 413, including ^{of} ^{personnel} ^{supporting the Division at the Site and about 406 at other locations,} We have about 406 off-site and what this 413 total was a total contractors including the GE contractors that are directly here in Houston.

In reviewing ^{have done} Some of the recent testing that we are doing in compatibility equipment ^{has required the use of} performance checking on the ground network, that has been built, for example, ^{an} at the present time we have Apollo range instrumentation aircraft. There are ^{a total of} eight of these aircraft ^{being used in connection with} ^{these} implements for the Goddard network, and are operated by the Air Force. Arrangements with HQS, Goddard, and the Air Force we have a

^{these} Apollo range instrumentation aircraft ^{are} commonly known as ARIA.

We have ^{not} one of these units ^{is} out at ~~the~~ EAFB right now ^{being instrumented as a} and have set up a field site compatibility test facility, ~~out there because we are not able~~

~~to conveniently move the equipment from the aircraft, we had to move the test~~
laboratory out to the aircraft ^{what}. ~~this amounts to.~~ There we are making ^{detailed tests} performance in compatibility test with a set of Block II

unified S-Band spacecraft equipment to check each ⁱⁿ of the areas of channel performance ^{for} telemetry, ~~test mission and~~ ^{reception}, voice transmission, and reception and sensitivity tests and etc. The basic purpose of this type of testing is to determine whether the previous agreements on performance ^{Goddard previously} (interface performance) specification that we established with ^{coverage} are actually being met, ^{and to ensure} so that our analysis of communications and performance ~~can be~~ is confirmed, ^{we want to make certain that} as being correct, in other words, ^{according to specifications} is the equipment

^{is} actually built ^{again according to the specs.} like it was specified and will it actually work ^{with} in the Apollo spacecraft, ~~like both ends are specified, that is the object of~~

~~these type of tasks.~~ Each aircraft is a modified of Boeing 707 jet transport, ^{with} Each aircraft having about 5 million dollars worth of electronic installed ⁱⁿ for support of the Apollo program. The equipment in the aircraft is somewhat different because of ^{weight restrictions.} the nature of the lightweight requirements, etc., ~~and some~~

~~are so much different than the equipments procured by Goddard for installation at~~
the

~~and ground stations and the ships.~~ Installation on the ground stations and the

~~ships is basic RF receiving and transmitting equipment~~ ^{that is} common ^{on the aircraft, we test it} and ground stations, ^{use it}

to the ships ^{but} is somewhat different ~~in testing the aircraft~~ as a separate item.