Ford

Philco-Ford Corporation

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December 4, 1968

Dr. Robert B. Merrifield
NASA - Manned Spacecraft Center
Houston, Texas 77058

Dear Dr. Merrifield:

I have made a few line-by-line corrections on the
enclosed, but have not bothered to do a complete
editing and rewriting. I assume that you can make
sense out of what I am returning and you are surely
free to use all of it rather than delete any specific
portions. I ask only that you exercise the normal
prudence in insuring that the context of the remarks
is maintained. In this case, I don't believe that
there will be any hurt feelings. You might, however,
clear whatever you write with Chris Kraft.

I am sorry for having been so long in responding.
To be honest, I forgot about it and it was only my
secretary's routine check of outstanding items which
picked it up.

If you have any further questions, please feel free
to ask.

Sincerely yours,

W. B. LaBerge

enclosure

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When Project Apollo started, I was at the Western Development

Laboratories of the Philco Corp. The WDC had developed the network

for the experimental flights at Vandenburg which the Air Force was then

just starting. This relevant experience provided us with the background

which enabled us to win a small study contract with John Hodge and his

organization, within Flight Operations. The study had to do with flight

control and information flow requirements for the Apollo missions. It

was a human engineering study primarily of the way by which a data

processing and display system could provide information so that the flight

controllers could direct the mission. The contract was run out of Palo

Alto with a large liaison staff in Houston. MSC was then located in the

Southeast part of town in a number of different buildings. The study

contract started in April 1962. It had an initial phase which, in a

typically human engineering fasion had the usual line diagrams--blocks,

circles, and diamonds which indicated who made what decisions, and what

information did they need to have to make the decision, and where was the

information going to come from. All this was carefully gone over with

the MSC people because they, in the end, had to decide how they were going

to organize themselves and all of the information flow essentially depends

on the prior judgment as to who is going to do what. Given this philosophical

question of how would NASA run itself, we pasted together a study which in

the end was indefinite because no one had decided the level of the computational

power which was going to be available. The necessary things for defining it

are the people assignments and roughly what kind of data processing system

there will be, - given that, then it is possible to figure out how to hook

it up with the hardware and software.

About half way through, the study was oriented toward the physical description of the way NASA wanted to do things. Before the study was over there was a rough general outline of what MSC wanted to do for Apollo, based fundamentally on a decision made by NASA that they would use the same organizational layout of responsibilities in Apollo that had been used in Mercury. There would be a central flight controller and he would have the various sets of people with the responsibilities delineated within the same way that they were in Mercury. This was important and was the major constraint on our design, in the sense that Philco could suggest fairly simple ways that the people could be reorganized and the machinery somewhat simplified. In doing this however, there would be a loss of continuity of experience that came out of Mercury both in the way the people worked together informally and the formal set of responsibilities that they had organizationally behind them. For example, if one is going to come in and design a command control system for the Army, one doesn't reorganize the Army; one has to assume that the same set of standards are going to apply, as opposed to reorganizing the whole place. This then meant that by fractions the various sets of people in the medical system areas defined what their requirements were, the flight dynamics people defined their, the vehicle systems people their, etc. What one essentially did was to do it the way it was done in Mercury. This is probably the principal difficulty that Philco and IBM had in the sense that they had to force fit the hardware into the prior Mercury circumstance. It was a major bother to me, but subsequently

I completely reversed my position and believed that it was the only way it could have been done properly, having built the system for Gemini rather than Apollo, and the Gemini program had been inserted between Mercury and Apollo, I find myself and my people arguing to do it the way we did in Gemini. I roll on the floor laughing because that is the position NASA ultimately took with us. In all arguments they wanted to do things the same way they did in Mercury and quit arguing about it. Ultimately I got my people to doing the same thing - saying that we are going to do it the way we did it in Gemini, and quit arguing about it.

Given that and the ability of the NASA to fund a major computational complex like the system which ultimately went out on bid, the only other major problem was to define the rules of the remote sites and the Center itself. Given the state of the computer technology, there was within the NASA a reluctance to put the whole system under automatic control. So we went to a hybrid arrangement to have both flight controllers at the remote sites and also flight controllers in the Center. We could, and in fact have, now that the technology has progressed, gone to a more automated operation than was done initially. This was essentially a safety measure. It was a safety device in the sense that there was a personnel interrupt capability along the chain and also a safety device in the sense we didn't have to bet our whole shirt on the fact that contractors and NASA would be able to work out all the details. Essentially it was a manual backup system at the remote site.

At that point the NASA went out on RFP for the computer complex for the IMCC and for the digital command system, each was on a separate RFP. The communication switching complex was also put out for bid. In sequence the computer piece was done first and won by IBM, primarily I believe, on their

experience developed on the Mercury program. And that itself constituted

a fair problem in the general procurement cycle, because IBM was thoroughly

locked up and yet a number of the contractors including ourselves put a

great deal of effort into arguing the technical merits of the individual

computer product lines they had. But in the end it was primarily, I believe

it was the programming ability and the confidence of NASA in the programming ability

that secured the contract for IBM. The RFP for the control center was

submitted in December 1962 by a number of contractors including RCA, ITT,

Lockheed, and ourselves. The scope of the work was fairly well defined in

terms of the hardware and less well defined in terms of the software inter-

face responsibilities. This constituted the major problem that had to

be solved--who could tell who what with respect to the interfaces that

existed. However, the RFP had pretty well defined the typical groundrules,

so that it was possible to respond to the proposal reasonably. It was page

limited. Almost everybody including ourselves guessed that the reviewing

team would be predominantely knit-picking in the detail. Therefore a

management gestalt was not required, but instead as much detail as possible,

which then made the page limitation fairly difficult. This in turn led us to

use almost no borders or margins on the pages and some of the other companies

either phot-reduced theirs or they used type so small that it could be

read only with a magnifying glass. Subsequently, NASA's page-limited RFP's

came out specifying the size of type and the size of the margins. Then

everybody went to extremely complicated diagrams and very, very small

print and the proposals are dreary in the extreme to read because everybody

was concentrating on getting bulk information into them.

What Philco proposed to do was to put together how the resources of its

major divisions, and these included the Aeroneutronic Division which for the Army had been doing the ARTOC system which was a presentation of Army field positions on detailed maps, and had a great deal similarity in technology because there was the requirement to superimpose dynamic data from the computer with standard reference data which NASA had available but which was too large in quantity to permit being stored reasonably in a computer. There needed to be some way of mixing systems of data together so the Aeroneutronic ARTC was reasonable. The Communication Division in Philadelphia had the experience of having put together military communications system and their background was brought to bear in that fairly major section which is now the communications handling area. The WDL division was the prime division because of its experience in the implementation of systems as large as this one. We had supported the Air Force in this general area. The Tech Rep Division, which had been supplying the flight controllers, was a field service group which was to be called upon to do the actual installation, test, and checkout. The company as a whole scrounged up its entire programming computer resource in order to be able to define the computer hardware interface. We wrote the proposal, priced it, and submitted it. Although the program guide had said MSC did not anticipate a contractor presentation, NASA did have a review and had all the contractors give a one-hour oral presentation. As we understood the scuttle-butt at the time, NASA was polorized into two groups--a pro-IBM group which wished to have the primary responsibility for the control in the IBM hardware and consequently less emphasis in the procurement than under evaluation. An anti-IBM or an anti computer group did not wish to have the prime contractor be the computer contractor. It was much like being in the Coliseum just before they turn the lions loose. Everybody sat in tiers of chairs ringing the speaker and they all looked as if they had their

thumbs parallel--ready to turn them down.

When we did win the proposal, we started to bring people to Houston in
about Feb. An essential portion of the proposal had been the time schedule
and the ability to rapidly implement. We had claimed in our proposal that
we could assemble 250 people within a month and have at the problem.
I had thought this was one of the more useful portions of our proposal. It
turned out that this scared ~~the~~ NASA, as they didn't wish to turn on a direct
response to the RFP, but rather to work out an arrangement with the
contractor as to what they really wanted and have a relatively slow turn on.
We spent about 4 or 5 months negotiating the details of what was meant by
each of the individual areas getting work statements for each piece of the
system seemingly in excrutiating details. As a financial contractual arrange-
ment, it caused my management great concern because we were operating without
a contract in an area that was very rapidly redefining the whole program
and evidently had no necessary correlation to the cost bid even though it was
a CPFF contract. The ability to perform to the original budget was obviously in
question as we began to redesign the whole works. As it turned out this
was the way it should have gone; however it was pretty agonizing while
getting it defined. The NASA people wanted a contractor to guarantee to do
the whole job, but they had not enough working experience to trust that
contractor to make intelligent impartial decisions as to the source of hardware
and things of this sort. Relations deteriorated significantly, and in fact
got to the point where for the first time in my life I was called a crook.
I didn't feel that I was, and we had several meetings that sounded much more
like labor/management meetings trying to negotiate a labor contract than
they did close technical rapport.

This strain was intensified by an internal organizational squabble within
NASA which subsequently was cleared up. The problem was that the MCC user
was Chris Kraft. Kraft was both able to, and anxious to, dominate what
was going to be provided him. He had worked with the majority of the
people in the study contract and knew them. Chris wanted to work directly
with these people. Yet, another MSC organization, a program management office,
had been set up under Barry Graves. Graves was the ~~tinker~~ EVERS in the ~~tinker-to-~~
Tinker-to- Evers-to Chance arrangement, ~~of direction through Chris~~. These was a real
problem that NASA had internally as to understanding who was in fact running
both IBM and ourselves. The situation was ultimately solved by Jim Elms,
who redefined the roles, essentially dis established Barry ~~and~~ who subsequently
~~he~~ went to Langley, and gave Chris the authority to go ahead and run it.

As seen from the contractor, the presumption was that the contractor
was wrong until proven right on the part of Barry and the presumption on
the part of Chris that he was right till he was proven wrong. It is a
fundamental difference, although it is possible to make both systems work.
Chris even with his more pleasant approach had the contractor much more
on the hook, because it was clear that the contractor had no way to run
if what he had decided to put together something that wouldn't work. Where each
individual piece is defined by somebody else, the contractor   always
has the emotional out that he is a slave in the system and why bother him
with whether or not it really works. Our difficulty It was primarily due to the fact that
Philco did not have the position of knowledge that the NASA people had.
The first number of things proposed had in fact some glaring errors in
them which were picked up by the people that had the experience, and this
thing intended to polorize the NASA people under Barry into believing that

we were pathologically unable to do anything right. I truly admit there
was plenty of support to the belief, but at any rate the thing that made
Chris look pretty good coming out of it was that by the time that management
had finally gotten around to making a change we had through ill feelings or
good (and they change from day to day and there were many good days and
also a number of bad days). We had worked out most of the problems. By
the time the management changed it didn't have to solve nearly as many
problems as there were on the docket originally. The job was in a position to
go at that time, pretty well. I still feel Paul Vavra is a good friend.
However, Paul and I had probably as many arguments as reasonable people
can have. Ed Odenwalder also, I guess at various times felt pretty
much emotionally involved.

There were in addition also areas of omission in the Philco system,
principally because we had not participated in Mercury. In addition to this
there were questions as to technical judgment. There were certain items, for
Where it was judgmental as to whether they could
example, able to be developed or not, in particular the selection of the
General Dynamics Charactron display system. This was probably one of
the biggest arguments we had. The question was fundamentally whether a
system which was technically less flexible and considerably more expensive,
but available, should be used in preference to a conceptual design which was
within the state-of-the-art but which hadn't been developed--namely a
digital TV system. Subsequently the digital TV was developed with
considerably more strain in time that the original schedule would have
permitted, which left Paul Vavra confident that his decision was right in
that the digital TV was harder than we had expected, and left me believing
he was probably right but surely had we had to do it, I believe we could

have forced the thing to have gotten it done. In the absence of not
having done it, you can't tell whether it could have been or not, but
that was ~~probably a~~ The kind of technical question that existed, and NASA usually chose
the conservative position.

Philco wrote the specifications for the technique for using the
communications processor which subsequently led to essentially the
definition of what the Univac machines were. Philco also worked with
NASA in specifying the requirements for the digital command processor
which subsequently was won by Radiation in an open procurement. In each
of the hardware areas there were specs developed well beyond what we would
normally do with the customer and interminable wrangles about the details of
the specs. It led, however, to the most unusual implementation I have ever
seen. Namely every thing came together like motion pictures of an
explosion run backward. It all went together and the specs had been so
thoroughly worked over that in fact they were in no appreciable difficulties
in making the whole system hang together. I have never had the experience
of one going together as easily as this one did that had as many pieces, ~~and~~ this
was undoubtedly due to the excrutiating details we went through, somewhat
involuntarily because of the NASA pressure. NASA has a thoroughly competent
set of people who in the early stages made it appear exceedingly difficult
for the contractor because his flexibility was essentially zero. Because
of the people he hired he got a run for his money in terms of arguments
and the net result was very good.

Finally all the specs got written and signed out by everybody in the
place and got put out and it was a crash program to meet the GT-4 schedule.
Our contractual date was somewhat delayed but also the GT series had
slipped, so we were able to bring the thing in to where it could support the flight.

There was a real question as to what the fundamental requirement of the contract was--whether it was to provide the hardware and interconnect it or whether it was to successfully pass a flight support. Fortunately this didn't get to be crucial contractual difficulties because the thing did go together and did support GT 4 pretty well. In the process, I think all of us recognized the major opportunities in simulation that derived from the hardware which was then being defined. Since the control of the flights was a shared responsibility with the astronaut, the reaction to emergencies and the techniques for control were all worked out in the simulations. The total number of major emergencies that have not been covered by simulations in the Gemini series was something like 2 or 3 out of 35. The whole simulation program was of profound importance. It was so good a simulation by the time everybody contributed to it that you could see the sweat on the brows of the people and their hands would get clammy just running the exercises. There are some stories how, for example, Grissom had decided to eject one day and Chris had told him don't and Grissom did and this defined who had what responsibilities during the ascent phase. As another simulation, Chris apparently aborted the mission without knowing it and the tapes had to be played back to make sure everybody else was right and Chris had in fact aborted the mission. The constant practice through the simulation made the missions themselves seem to be almost routine. Even the emergency had the appearance of just having happened two or three times before--a fabulous working out of the responsibilities of the ground controllers and the astronauts through simulation process.

During all of this time we had - as one would normally expect - a
fair amount of contest of will between ourselves and IBM people for the
large fertile ground that lay between their hardware and our hardware,
which was the software specifications area. Each had staffing problems,
and nobody was clean as far as whether they had all done their prime jobs
particularly well. I remember the meeting we had with Gilruth and Chris
and some of the people from Washington in a progress report where I had
described the Philco schedule position where we had an integrated schedule
with IBM. I turned to Jim Hamlin and asked if he was going to be on schedule
as we were. I thought I had said it in a conversationally pleasant way,
and his response was "we'll beat your ass off." In a meeting of this kind,
it caused a 30 second hiatus, and me to fumble over what came next.

In point of fact, the IBM people were extremely competent. They
had a massive job to do as well as we did, and we probably got along better
than one could expect. NASA sort of refereed the interfaces. Clearly
there were very many fundamental questions of how we tied together because
we had a completely computer directed command and control system. Although
there were separate pieces of machinery the organization of the system was
one basic system. The relationships with Univac and the Radiation people
were good and I think on the whole the relationships with the NASA people were
pretty good. We did have considerable question about the propriety of NASA
influencing as much detailed control. But MSC tehcnical competence was,
in the main, just excellent.

From Philco's standpoint, I think we did a pretty competent job.
We had the staffing problems that one might expect getting people to come
to Houston, although no different really from what the NASA people had themselves.

It was thought to be about the world's worst place to live. After we once

got our staff down they all enjoyed it, but getting them to come initially

was a pretty difficult task. The impression that Houston is the end of the

world had been generated primarily by people's experience with Ellington

during the war, and Houston as it was during the war at which time it was

a totally different town. We have far more identification with that area

by our people now than exists among the Palo Alto or Philadelphia groups.

There was a massive conversion later, but that didn't help much with the

problem getting people there initially. We did draw people from all of the

individual divisions and put them together in a way that the company had

never done before. The company had frequently supported its other divisions

but it never really put together a "purple suit" team like this from all

parts of the company and made it work. Undoubtedly the major reason that

it did work was the obvious national interest in the program, and the fact

that the company and all of its individuals were committed to make it work.

Our problem was not radically different from IBM or any of the other people.

This amorphous organization was put under one manager. Complete financial

control was retained in Houston. That again was probably the only way it

would work. Just bringing people in on temporary assignment could not have

been made to work, but by making them permanent and tied to the success to

the program people they did get the identification necessary to make it work.

Probably the fundamentally most useful thing Philco did during the

period of hardware concentration was to force a set of people together who

could work on the software end of the business in defining procedures, in

writing software requirements for the computational system, in defining what

the formats and displays would be, and the general process by which they

were used. This was a necessary piece of work, which by forcing at that time,

we probably got a great deal of the business that IBM could just have easily

have fallen heir to or NASA could have gotten another contractor to do.

This business is the main area of revenue to us currently. We have the

hardware in this area and there is some hardware support, but the provisioning

of the flight controllers which we do and the support tasks in defining

mission requirements in hook-up of the system is what most of our 500

people do outside of the Bldg 30. The other one-half of our kind of business

is the current support to the maintenance and operation. The tech rep

division did an outstanding job in getting people assigned from all over

the world to do the support in the installation and checkout and subsequently

in the operation and maintenance. The incentive scores show that they have done

a first class job. In the main, NASA is bound to be happy if the support goes

well and bound to be unhappy if it goes poorly. The critical requirement

then and now for maintaining our position is support to the flights. This

is the one which frequently gets the least attention because it is the least

interesting. NASA has the real flight control and what Philco does is maintain

the hardware, bring it up to date, modify it, and see that it's all hooked

up right. One can argue that this is a fairly pedestrian task. As it turns

out, we can get good people and keep them interested because of the kind of

programs that are being run. Really the key to our ability to maintain

the people is not our inventive management, it is the fact that we are doing

rendezvous and are getting ready to go to the moon and the people want to be

a part of it. I don't believe we could have maintained or can maintain the

level of competence that we have through whatever ingenuity we have except

for the fact that there is this kind of test program going on. In fact

it represents a major problem to NASA in its organization and also in ours

when there are long hiatuses between flights, or the long period between

Gemini and Apollo. The capacity stays together only if it is doing something that is interesting. Reoccurring hardware is not that interesting - supporting flights is what is interesting. Philco has a major blessing in that it could draw people from the past flight support of the Air Force programs and out of the Mercury program.

We had much more of a transient management than what NASA has had, primarily because the rule has changed very significantly from what was a hardware definition, procurement and integration task to a flight support task. We were forced to bring in the kinds of people who could integrate hardware systems and they turned out to be lousy with respect to long-term flight support, and for our own self protection, we moved a number of them out. They are the kind that would argue day in and day out as to what is the best technical design and go all out to conquer the world. In the long term, this is not the kind of people we needed to make it run. We needed and got people who were more operations-oriented and less hardware oriented.

Dr. O. G. Schuede was the Chief Engineer during the early portion of the program and he and Dr. Frank F. Cartwright were the primary people responsible for the hardware definition phase and the key technical people in the definition of the system. Bob Benware took over Philco's Houston operations at the time of GT-4. In the communications area, Don DeWitt was the primary communications man. John Poloneimi directed the simulation systems. Herb Hendrickson had the display system. Bob Cronhardt had the responsibility of making sure that this system was integrated, and probably and that about 4.5 million wires laying on the floor were put together right correctly. as well as insuring that the whole scheduling and testing program went correctly. In the software support area, Dr. Lepine initially started the work.

During the period just before I left, we had begun discussions with
MSC about the proper way to measure performance. We agreed with MSC that
an incentive program would be desirable for both of us. At least one half
of the scoring was to be subjective. In the end it was how the people felt about
us that would set in the back of their minds as they evaluated the numbers.
This worried us somewhat because it was unilaterial with respect to the
scoring. However, knowing Chris and John Hodge, and the contracts people,
and having worked together a couple of years we were willing to have a go
at it. It seemed to work so well that later we suggested to the Air Force
that they consider this technique for scoring an evaluation of our performance
in the worldwide network that we operate for them. Incentive programs are
very difficult when they are subjective unless you have had some operating
experience with the people. Our technical capacity that we brought to bear
was built up out of the work we did for the Air Force. In that sense NASA bought
that prior experience. As the Air Force in turn has gone toward larger
computer control of its network, it has had the benefit of being able
to visit NASA, review specifications, etc., and also by having the
advantage of NASA experience of Philco in updating the Air Force technology.
The technologies are very similar and it is possible to trace the technology
back and forth--

We had about 150 people by the end of the third month in Houston.
I purchased a house on the west side of town near the Houston Country Club
and shortly after we moved in, we had a party and invited all of our people
and a number of NASA people, including John Hodge and his wife, Audrey.

We had become good friends with the Hodges, and liked to kid her about the fact that she retained her British citizenship. During this party she got back at me by saying in what was actually a normal voice for her, but what seemed to carry through the whole house - something to the effect that nobody in NASA can understand why you bought such a nice house because you are not going to be here for very long -- at which point a complete quiet came over everyone, including the 150 people I had brought down there on the assumption that this was a long-term commitment. It was as if everyone stopped to listen to see what the answer was. I answered as best I could that I believed if we did a reasonable job, it would be impossible for NASA to wish to get rid of us, and I was confident enough that I had bought the house. I am not sure that this satisfied anybody and clearly set the initial tone of questioning a little bit as to whether or not it was sensible to go buy houses - move families, and settle down. Audrey blushes each time I remind her of this subject. What had been sort of a private conversation became a single question symposium.

We had had a history in the division before we moved to Houston of having parties and enjoying each other socially. We put one together at the end of the first 6 months in Houston. We had a series of songs and paradies which gently poked fun at ourselves and the NASA people. After the first joke at MSC's expense, everybody looked over at Chris to see whether he would laugh. Chris was rolling on the floor which encouraged others to accept it in a good spirit. Probably the most unusual thing that ever happened to me on this contract - we were holding intense discussions with IBM on the question of who was going to do what, which was made more difficult by the fact that we were all under a crash schedule, and IBM had just changed its local leadership--Jim Hamlin had been replaced by Larry ~~Saroban~~ SARAHAN. One day soon after his arrival, Larry called me and asked if my name was LaBerge? I replied in the affirmative and

he said he knew only one LaBirge and could I be the one?   It turned out

that Larry and I had grown up together within two blocks of each other

in Maywood, Ill., and had been part of the same gang who threw snowballs

with rocks in them at one of the other neighboring gangs. He was a couple of

years older, had gone to the same high school and was a very close

personal friend. Probably because of this singular factor, I was obliged

to be tolerant in my attitude toward IBM and toned down our emotions a little

bit. We got along much better as a result of that personal move that nobody

had figured out.

Bob Benware took my place just prior to GT-4. Bob came from the

Palo Alto division of WDL and had the responsibility for all the systems

managed by the division. Bob has fairly substantially altered the staff

from the one I had brought down and it is to his credit that it works as

well as it does. The problem is the transition bridge between

primarily hardware oriented activity which had been the one that I had

participated in and the flight support work which he has been running.

The transition has gone really quite smoothly and it has seen a number of

people advance because of their ability.

There are a couple I think particularly that should be mentioned--

Chuck Abbit has been the program manager for the last couple of years.

Abbit in a last assignment in his military career had been the DOD rep

down at the Cape. He had experience in the Mercury program and was known

to Chris and his people. He joined Philco when he retired from the service

and has been the program manager for the last several years. He has done

an excellent job of making sure that the two organizations mesh well in a

fruitful way. Ed Brown should be mentioned as he is the primary man

responsible for the software & Planning support. He also came out of the Cape Kennedy

complex, and for the last several years has had the major responsibility for all of the direct software support. George Straty who is primarily responsible for the programming for our simulation computers.

ORAL HISTORY INTERVIEW

DATE OF DOCUMENT [Date of Interview]   = _0_7 - _3_1 - _68_

OFFICE OF PRIME RESPONSIBILITY   = JSC

NUMBER ON DOCUMENT   = 00

TYPE OF DOCUMENT [Code for Interview]   = 1

PROGRAM [3-letter Program Archive code]   = _INS_

AUTHOR [Interviewee's Last Name]   = _LA BERGE_

LOCATION OF DOCUMENT [Numeric Shelf Address] = _091-3_

SUBJECT OF DOCUMENT: [use relevant bold-face introductory terms]

Oral history interview with _Walter B. LaBerge_
_____
[full name of interviewee]

about _Phileo Corp + Flight Control System_
[main focus of interview]

_____.

Title: _Phileo Corp._
[interviewee's current and/or former title and affiliation]

_____

Interview conducted by _Robert B. Merrifield - Staff_
[interviewer's name/position]

Historian   **at** _~~MSC~~ Phileo Corp_ .
[location of interview]

Transcript and tape(s). [for inventory only: # pages _18_ ; # tapes _____]

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

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Education - _____

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Career Path - *Philco Corp, Western Development Labs*

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Topics - 1962 Philco contract for flight control system study;
organizational responsibilities for Apollo; combining
flight controllers at center & remote sites; control
Center *page-limited* RFP Dec 1962; Philco's resources; NASA-Philco
~~Contract problems~~ *touchy* relations; NASA management confusion; *election*
& display system; NASA's detailed specs; Simulation
program; Philco-IBM relations; Philco problems
attracting personnel to Houston; Philco people
felt part of something important - flight support;
Philco prime movers - Schuede, Cartwright;
DeWitt, ~~Poloneimi~~ Poloneimi, Hendrickson;
Cronhardt, Lepine; performance measurements;
earlier Philco experience w/ Air Force; *Philco-NASA special*
events; ~~LaBerge~~ connection w/ *IBMS* Larry Sarahan;
Philco's Chuck Abbit & Ed Brown;