



Inter-Office Communication

RECEIVED
MAR 15 1962
TEKTRONIX, INC.

To: Geoff Gass, Field Information

Date: March 14, 1962

From: Lou Broadbent

EAST L. A.

Subject: 321 Environmental Specs (Ref. Your IOC, 1/17/62)

Dear Geoff,

North American Aviation, Space & Information Systems Division, Downey, is seriously considering the installation of a 321 in the "Apollo" space vehicle which will be sent to the moon with 3 men aboard (one a Tek FE to operate the 321!). It would be used to troubleshoot the "In-flight Test System" of the vehicle enroute. They would like it to meet the following environmental specs (non-operating):

Vacuum: 10 - 9

Vibration:	5 -10	cps	.3"	D.A.
	10 -20	cps	1.6	G
	20 -63	cps	.075"	D.A.
	63-200	cps	15	G

Shock: 5 G for 11 MS

Acoustical Level: 170 db, 37- 9600 ~ , 2 sec.

Acceleration: 20G, 20 - 2000 ~

Some of these details are outlined in your IOC of 1/17, and I wonder what information is available on the rest? They would prefer we make the tests (we can charge them), or if we can't do it, they will test the 321 themselves.

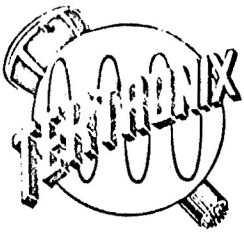
They are considering the purchase of one for each vehicle--approximately 30-35. This is still in the "talking" stage.

Best Regards,

Lou *Lou*

LB:pw

cc: Chuck Nolan
Ed Bauder
Harvey Worth



Inter-Office Communication

To: George Edens

Date: March 19, 1962

From: Geoff Gass

BEAVERTON

Subject: 321 -- Shooting For the Moon
Lou Broadbent's IOC Attached

Jack Cassidy suggested I put this hot potato in your hands to carry upstairs, since he'll be gone to IRE this week.

Having a Tek scope in the first (U.S.) manned moon-shot would be quite an impressive morale booster and image-enhancer.

On the other hand, with the attention of the world on that capsule, the responsibility for providing an absolutely reliable scope under the required environment is pretty big.

From previous tests, we can be sure that the 321 standard model will not hack the specified environment (we don't understand the "acceleration" specification requirement yet). We don't have the equipment to measure some of the required parameters.

Bob Poulin and Chuck Nolan agree that with the responsibility involved, a "bandaid" type of approach to ruggedizing the 321 would not be appropriate; it would take a lot of investigation, planning and work; probably some redesign.

It's possible that ETC's AN/USM-117 could meet the environment specs. Possible, not probable. However, this box requires 25 watts or more (USM-117 spec says "under 50") at 117 v AC. The 321 can operate on 12 v @ 700 ma (8.4 watts), though at 117, it may draw up to 25-30 w (fused for 250 ma). The high performance, small size, low power drain and low dissipation of the 321 would seem to favor it for this type of application, if we can meet the environment.

It would be an interesting project, but before negotiating with North American on the idea, a "policy" go-ahead would seem to be in order.

The scope that performs well on this moon-shot is automatically the most portable, reliable scope in the known universe. The question seems to be, do we want to be the outfit that makes it?

encl.

cc: Lou Broadbent
Jack Cassidy
Ed Bauder
Harvey Worth
Chuck Nolan
Bob Poulin
Oz Svehaug

Geoff Cass, Field Information, Beaverton

April 10, 1962

Lou Broadbent

321 for Project Apollo

Dear Geoff,

Further discussions with N. A. A. regarding use of the 321 for the Project Apollo Moon Vehicle indicate they definitely want a scope to be mounted in the vehicle. It would certainly seem to be to our advantage to supply the scope!

Bill King, N. A. A. engineer, indicated the scope may be shock mounted in the capsule and that the environmental conditions would be of short duration, not exceeding five minutes. He has no clarification of the acceleration specs., but the Acoustal levels of 170db could exist for five minutes or less - not 2sec as I indicated in my IOC of 3/14/62.

He would like to know which, if any, tests we can make, even though I explained that the 321 will not meet most of these requirements.

Then, I believe we can get them to do further testing themselves and probably ruggedize the 321 to meet these requirements.

Best regards

Lou

LB/ja

CC: George Edens
Jack Cassidy
Ed Bauder
Harvey Worth
Chuck Nolan
Bob Paulin
Oz Svehaug

Geoff Cass

May 9, 1962

Lou Broadbent

321, Moonshot, Your IOC 4-23-62

Dear Geoff,

Thanks for the IOC covering our environmental testing capabilities.

Please do not send down a design engineer at this time to more fully evaluate the proposed "Moonshot" requirements, as NASA is still quite nebulous on these at this date. Bill King, NAA project engineer fully realizes the limited environmental capabilities of the 321 and also realizes we can't build scopes to fit their needs, particularly when only small quantities will be needed.

However, it is felt that the lunar explorers may need to use the 321 outside the controlled atmosphere of the space ship for repairs to the service module after landing on the lunar surface. He will advise us further as soon as NASA nails down the specs! Ten penny nails, anyone?

Best wishes

"Feisty" Broadbent

LB/jac

CC: Ed Bauder
Harvey Worth
G. Edens
J. Cassidy
C. Nolan
Bob Foulis
Oz Svehaug



Inter-Office Communication

To: Lou Broadbent, E. Los Angeles

Date: May 22, 1962

From: Bob Poulin

BEAVERTON

Subject: 321 Moonshot

Dear Lou,

I have been following the 321 Apollo correspondence with a great deal of interest. The timing is about right to look very thoroughly at a 321 type instrument that can serve the environmental needs of the military with an eye towards outerspace. The ETC activity with the USM117, the Navy's looking at possible Polaris sub applications, coupled with the many applications that are field or semi-field conditions all point towards upgrading the 321 environmentally and functionally by utilizing recent solid state developments and packaging techniques.

As you can see Lou, this puts North American in a pretty good position of telling us what they need with a possibility of some of it getting designed into a new package. Normally they couldn't expect this from a manufacturer with their small requirements, but the timing is opportune. Often just a little more effort can fulfill a need if it comes early enough in the design stages.

Our group (Mil. Products Eng.) is carrying the ball on this project. We don't feel the company is committed to a new product yet. A good deal of effort will be extended before that occurs.

This letter is to clue you on the current thinking in engineering and marketing. We should get together with the people at North American just as soon as NASA has settled down on parameters. (The engines are warmed up ready for take off)

Our goal would be to serve them in the environmental and reliability areas to a maximum, consistent with the costs and the rest of the market. We would do as much testing as possible in our own laboratory. Exotic tests would be carried on at other locations but under our cognizance. In short, anything we finally sell will be thoroughly tested to the limits that we advertise.

Any "special" environmental capabilities required by the Apollo program that isn't practical to incorporate in a catalog item will have to be solved in the application i.e. special mounting, shielding or whatever. For these problems I believe it is our responsibility to assist wherever possible so that a Tek scope is the first to fly to the moon and play all the way there, and back.

Keep us posted - as I know you will.

Regards,

Bob

BP:jes

cc: Bill Polits
Jack Cassidy

George Edens
Pete Melhuish

Ed Bauder
Chuck Nolan

Harvey Worth
Oz Svehaug
Geoff Gass

Bob Poulin
Military Products Eng.
Beaverton

June 7, 1962

Lou Broadbent

321 Moonshot

Dear Bob,

Thanks for your IOC of 5/22. It pleases me to know you are interested to see that North American Aviation uses our scope in the space capsule going to the moon.

A discussion with Bill King of Project Apollo at North American Aviation on May 31 indicates that N.A.S.A. is in the process of setting up specs on instrumentation at this time and should be released soon. I'll let you know as soon as I get the information.

Bill further indicated that the scope may be required to operate in vacuum on a cold plate for perhaps an hour; removed from the plate for perhaps 15-30 minutes. He also assured me they would be willing to perform the more exotic environmental tests under our cognizance and supervision, probably at no cost to us.

I appreciate being cited in on your current thinking about a militarized portable scope. I believe this to be the right direction and I know the U.S. Navy would buy this type for the Polaris program (thru Autonetics) instead of the 321 Mod 217C, if it was available.

I shall keep you posted.

Best regards,

Lou

LB/jac

CC: Bill Polite
Jack Cassidy
George Edens
Pete Melhuish
Chuck Nolan
Ox Svehaug
Geoff Cass
Harvey Worth
Ed Bauder



Inter-Office Communication

To: Mearl Martin
F Orange

From: Field Information
Geoff Gass

Subject: Project Apollo

Date: September 18, 1962

BEAVERTON

Dear Mearl:

George suggested we send down a reference copy of D00A's reliability study on the 321 for you, in response to John Unruh's call report (8-9-62) indicating NAA's interest in 321 reliability data. The report is Tektronix Confidential, but the information could be shared on a confidential basis with Bill King, though he should probably not have a copy he might feel obliged to wave at ETC or Galaxy under NASA "second source" or "national interest" pressure.

If you'll leaf through Lou Broadbent's correspondence with me, Bob Poulin and Chuck Nolan over the past year, you'll get the drift of our present attitudes on the project. In summary,

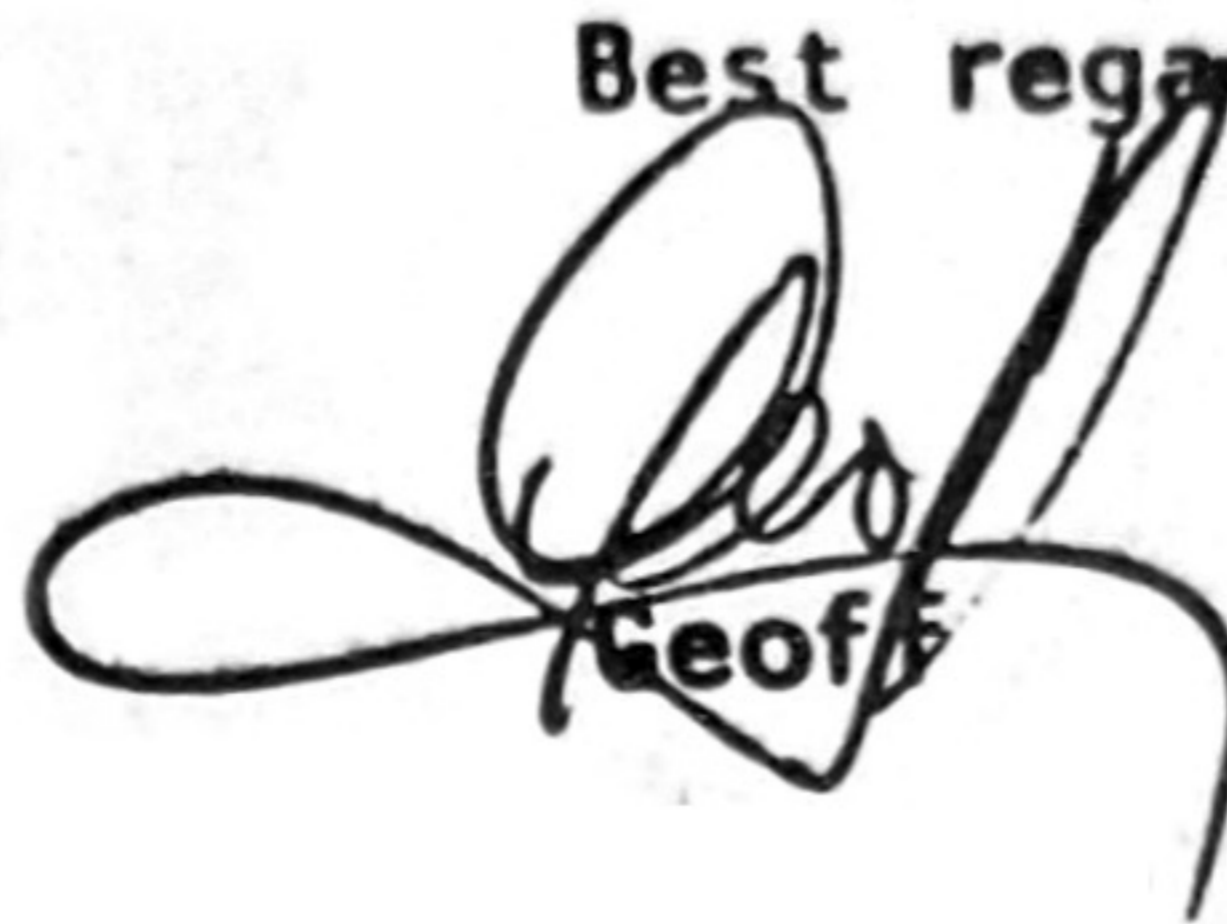
1. We are interested, yes.
2. We do not feel that any modification to the present 321 could possibly beef the instrument up to the probable end requirements. We are aware of a number of inherent limitations in the 321 design which limit its performance drastically under severe shock, vibration and thermal environments.
3. We would in no case encourage the use of any Tektronix instrument in the Apollo capsule itself unless we were absolutely certain of its ability to survive and provide accurate answers under the probable environments. We do not want to be the "goat" of any failure of this mission.
4. Bob Poulin is working on a design for a transistorized, rugged, dual trace instrument intended for a 321-size package which could be modified to provide reliable operation under the extreme environments foreseen for the Apollo shot.

The two-to-three-year schedule for the Apollo program gives us a chance to do a solid design in this area.
5. Our present position is, we need specs and conferences for clarification of specs as soon as possible. How much protection

of the instrument against the environment can be provided external to the instrument will have a lot to do with our ability to perform, if the specs are as rugged as advance information suggests.

All hands are eager for info -- a successful moonshot with a Tek scope surviving in good shape would be a real feather in our corporate cap.

Best regards,



Geoff

GG/ps

Encl.

CC: George
John Unruh
Ed Bauder
Bob Poulin
Chuck Nolan
Lou Broadbent
Oz Svehaug
Pete Melhuish

North American 321 Coordination Meeting

This instrument is to be used on the Apollo Project.

Lou Broadbent said that Mr. Bill King is Project Engineer for North American, and that he might be a good man to help clarify any problems that may come up. One point that was brought up was that the 321 vibrationwise, is not too good, i.e. there was failure at .01 inches peak to peak excursion with excitation applied in the horizontal plane.

We appear to have two possible directions to go. We would like to resolve these directions into a single one unless there are two actual requirements. We will try to resolve this with a conference call to Merle Martin this afternoon.

Once it has been determined whether their interest lies in a militarized version or a modified commercial version, we will be in a position to either pursue this from the angle of a special product or a militarized instrument. If the latter, Special Products would bow out.

Ed Bauder has requested that he be kept posted on the project as it progresses.

cc: Bob Poulin
Ed Bauder
Geoff Gass
Howard King
Lou Broadbent
Oz Svehaug
Si Corn
Bill Polits
Chuck Nolan



MEMO

DATE: 9-20-62

TO: Chuck Nolan DEPT: Special Products
FROM: Bob Poulin DEPT: MPE
SUBJECT: Present status and plan of action on Apollo scope

After our talk with Mearl Martin, the situation looks like the following from here: North American has two groups designing in CRT displays in the command module. One is for a TV type; the other is a straight test scope. There is an attempt at joining these two requirements in one package. Mearl hasn't yet been able to bring both groups together to obtain a mutual direction. The test scope group has published tentative "space" specs which Bill King indicates are pretty impractical. On the other hand, the requirements for the combined display (video amp and second sweep in batt. space) are not very demanding. They want Tek to make a proposal on what we can do in the way of a special 321. Also, they need environmental performance data on the 321 to judge what they need to do to put the scope into the command vehicle.

The time table they are currently talking about eliminates the possibility of the X922 solving the problems. However, there is a question from some of us that a resurrected 321 will do the job. The potential status and advertising is worth a lot of effort whichever direction they take. Tek will be sharing the responsibility of success whether it is implied or contractual.

It looks like the next move is for Mearl to set up a meeting with Bill King either at North American or at Tek so that we can talk over ideas and find out first hand what the real problems are; both technical and timing. This meeting would be aimed at the week of October 1. At that time, we probably should have basic environmental data put together on the catalog 321 with some ideas on what we can do in the way of a special. Towards this end our group will send you the 321 test data that we have obtained so far in our studies on the X922 project.

Also, it seems like a good idea if Bill King comes to Portland, that we might have a 321 on the shake table for him to look at.

Bob

BP:jes

cc: Ed Bauder
Lou Broadbent
Si Corn
Geoff Gass
Howard King
Bill Polits
Oz Svehaug
Mearl Martin



Bob Poulin
Beaverton
Mil. Products Engineering Office
Mearl Martin

January 29, 1963

Type 321 for Apollo Capsule

Dear Bob:

On January 16th, I talked to Bill King in the In-Flight Test System at North American Aviation. Bill informed me that the spec situation had been completely stopped. Apparently, there were a number of problems that could not be resolved with the existing staff. There has been a sweeping reorganization of this portion of North American Aviation so the In-Flight Test Scope Spec is being started from scratch. Bill estimated a minimum of six (6) months before reliable information will be available. He promised to contact me with under-the-table information as soon as anything is available. He also estimated eighteen (18) months after completion of specification writing before requirement of the initial instrument.

I chatted with him briefly about the X922 and also reiterated our feelings concerning development contracts. I told him I thought we intended to go ahead on our own on the 322/922 development. He commented that their time schedule may very well allow us to present a complete instrument by the time they are ready to let a development contract. If we can do this, he felt they would probably withdraw development contract bid requests as soon as they have had a chance to evaluate our instrument.

I will keep you posted on any new information as it becomes available.

Best regards,

Mearl

Mils

cc: H. Worth
E. Bauer
Chuck Nolan, Spec. Prod.
Ron Goard, C/S Staff

Thur. 11-12

Bob Paulsen. is working on it.

Lew Broadbent 11-12

50-75

321

North American Aviation

video amp for z axis gain of 50 DC \rightarrow 400KC

10-15 frames per second

28 volts DC primary power - No 110V AC operation

17 lbs seems to be acceptable for max weight.

sync pulses probably 4v amplitude.

where is the function switch going to be?

35.85 μ sec/cm for video only

27,000 ft alt operation in 100% oxygen atmosphere. dry switches etc to prevent

fire. potted high voltage

70-90°F for temp.

Radiation from scope is no problem.

Acceleration + shock specs from

Lew Broadbent

Order within next 2 months expecting delivery first quarter 63.