

NEUBERT (CONCLUDED)

"O.K. I think we are ready now. We were talking about the Van Broun Team. "

I don't know ~~if~~ ^{how} he would answer this because you know if you are directly involved it is very hard to adjust these things. YOU get use to certain habits and I think Von Braun ^{is} very much to do with it. One thing for ~~example~~ ~~example~~ example, he hated, more than anything else, ~~to~~ is to order somebody to be convinced. He ~~tryed~~ always to convince, you know the last guy in the room maybe there were 10 or 12 to 30 people and he made an effort ~~to~~, he could convince people that this was the right thing to do under such and such circumstances. It took along time and even if you were controversial for example, once ~~an~~ a while sorted time that you get on something and not that you were convinced that it should do ~~this~~ way, ~~but~~ you had a new idea was discussed where you couldn't even vote for your own suggestion. It makes no ~~sense~~ sense ~~if~~ everybody is against it, but conditions like this develope and all this is done with reasoning so if you understand the reasoning I think 90 percent of the time ? . He was very nice to them and why feel bad about it?

"O.K. So then Von Bruan was able to convince say the fimilar team members. Was there ever any occasion when a reverse had oc-cured by another person?"

I could, if you'll go back you know in the Army days. We had a very strong comander for the last 4 years . '56, '57, '58 Madeis was directing while Ponee was off. In the very beginning he was

strictly a ² Navy commander and he was willing also to listen to Von Bruan and backed up all arguements, but then he could once in a while say, now look fellow, I honor your honest technical ~~opien~~ opinion but based on this opinion I will not loss a battle. So I have to do better. He Is antire or in performance, how much can you strech an imagination? How much we can squeeze out of him. He went back in the session and we said input and we must also begin because the engneer basically works as a safety factor, you know. The safety factors or the promises you can make on this you know and latter we learned the famous words
 ??????
 with assesment in that ~~the~~ time we didn't use this double language of bulistic assesments you know. To fly the Saturn without any men you know you couldn't guarntee, you had to make an assesment what is first involved you see.

"In which assesment did you come out with a bigger that's dif-ferent than your design, .99 something for relaibility?"

Oh yes. So this assesment ...

"Was it calculated on ^{Probability} relaibility?"

Well, you need first this what you just said in perfect conditions you see. But above and beyondd this you have infueneces which you, when you lose an engineto certain decent time and the risk assesment is against, get lacour away from the disaster. So in an accident today still the escape power which is carried along for about 3 minuted of flight time or even a little longer, I don't know exactlywhen it comes off, but at least it is on until you have agnition of the 2nd stage and then we discard it. But until this time under all conditions this thing is ^{strong} on enough to pull the crew away form whatever happens on the rear end of the

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missile. But as long as you talk naturally of atlas systems, you don't need that. You are alright, Just so ever missile hits the target. I haven't seen a commander yet that wouldn't a tree around of the target was very important.

"I was wondering to about ~~gh~~ specific problems that developed during the course of the Saturn program. The S2 stage which created some problems and became a pacing item finally. Do you remember that time and what you did to cope with it?"

YES. I remember it only too well. I was ^{man}manger for the ES60 . Actually it is typical for the interface between the government and the contractor, what happens there to a certain extent at least and then you ... Let me start from the ~~begin~~ beginning . When the contract was signed the diameter was ~~460~~ 260 inches and the thing had 4 engines. A year later we found out within the first year we found out we needed more thrust and more horsepower with those , a thing called triger, made it 396 so this was the same diameter as the first stage. We added an engine. Now naturally to overcome the more weight whenever you make it bigger, you add to it, so we then started considering what can we do to make that thing lighter. This was the big drive of the CB or maybe we better start over again , we say the 2 stage was, after it had been changed, to the present version, we had to find means and ways to make it as light as possible, to get a better performance. In doing so we got in more problems than we had anticipated. Now the program ~~mix~~ arrangement change was no problem once we had it at about 2600 bounds payload. The assest between these two was by just changing

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the program mixer arrangement change by ⁷sugestics plan, nothing you can remember between 5 pound size and 4 pound size, which was the limit of the engine in mix aration ^{PRIME} program. We run it finally under 5.4 and 4.7, I think were the actual values that we finally went to but this could be ~~very~~ ^{in section} varified anytime today. Then other things were considered as you see here, we reduced the shell, I don't know if, don't see it right now here, but we made a decision to reduce tank pressure, and we redesigned the common bar-tap, anyway that time we made our decision in what in this number 4, this change went in number 1, so we made some changes. Actually the problem that we run into if we went down with our safety factors, you see with the alumnium sides so far that had finally a running problem and in reality ~~is~~ it wasn't the volume problem we had requirements that the valves were so perfect that you barely could make them. Another thing happened here, when we made the valves for presicion for example those Americans preferred to stay with them until they had choesen which ~~one~~ was 20-~~14~~ 14 T6 alumnium. We had suggested we should go 22-~~19~~ which ~~was~~ ^{we} used on the first with Boeing.

"Why did you suggest the using of this different strentgh? Characteristics?"

No, 20-14 had quite some amount of copper in it and this way critical to weild, to get good weilding out of it. It is almost an art. North American and previous missiles had experience with 20-14 and the others said that they would stay with it. Then the 2-19 was ~~used~~ at that time pretty new on the market. The exper-
ience was really not to broad you know.

"Even though it had, I would guess, less copper in it, would be easier to weld?"

Yes, it was the different combination in it. I only know the number, I don't recall the combinations. It was definitely preferred if you are welding.

"You used 20-14 T6 then in the Hounddog I think."

Yeah. I think Douglas had the same thing on the S4B. But see, Douglas didn't have a module requirement in their structure. Module requirements along with, to say maybe, they were not, they didn't push a design so fast that they were on the left corner you see. But the S2B really was, I think from the ratio of fuel to structure, it is the most advanced ever built, running better than 92%. I mean they present structure for the total rate of flight including all the engine, whatever you have. This is pretty, pushing the odds pretty far. We did another thing on the S2. You have the oxygen oration, that means in other words, we gain about 20% of your strength in your material if you undercoat it to hydrogen temperatures. Whenever we undercoat aluminum combinations to this type of temperature you gain up to 20% strength.

"Why didn't Douglas, was it in that by the time the S2 came around, there were other ~~advances~~ advances in project adhesives and material of this kind that made it easier to bond it to the outside? I recall that is one of the difficulties that Douglas had was bonding it to the outside of one, so they went to the

inside."

That's right and they finally liked the inside stuff, then h
the 4B came along over the 4 they didn't want to change systems.
We learned that the hard way. On the other hand, the logical thing
would be to have the hot center duration on the 3rd stage which is
the stage which goes through orbit, you get 100% of your rate
savings in the S2 you only get about 30%. But as it was in this
big field, so we finally comitt ourselves to this. We had two
things going, we finally talked about a operating the G2 engine,
which was ~~the~~ a possiblity but would have cost alot of money to
operate the engine. We never got that far, but the engine wound
up somewhere between anyway, you know the engine finally had number
one, a better and specific garuntee to _____, it was always in the
upper corner.

" You found out with the 200K design ⁵² that it ^{got} is close to a ²
38K rating anyway."

Yeah. there are specifics also on the higher margin of the pre-
dicted scale. I don't recall, I think it was the 424 and we were
on the 428 or something like that. But the engine/ people should
verify this, because before you knew."

"What's the date on that I968?"

"I don't even know why I have this here, maybe because it h
has a nice shiny envelope."ha ha ha

"Well do you have any more questions to ask?"

"Not right now."

"Hey if you have any fine."

"You're writhing now

NEW VOICE "Generally before we pass to far beyond, I wondered, you know this laboratory is unique here, does it date back, uh, who thought of this approach, was it Dr. Von Braun or do you remember??"

"Well "laboratory approach" I don't know what you call it I don't think I even have a chart from up there, here. "

"Well as far as structure is concerned, this supposed to make MSSE unique."

"This was on the Air Force production list testing, here you have the ~~are on the~~ S&M, your structure mechanics, electro-mechanics, and the ground report and then a naturally the _____ or whatever you want to call it."

"Actually that's a little different than we are here, basically."

"And you have down here project design, guidance control, chemistry tests or whatever you want to call it. . ."

" These are real important. Does R Fred have copies of these."

"I think I met you once in his house upstairs."

"Yeah, yeah."

"So this the entire group, see we grouped it in groups if you want to look at it this way, maybe this was a special outfit. But again _____ had all the gang from control stuff here " and ^{Lorch} ~~li~~ was _____, ya know Hamburg was his second man, and Roach, he finally wound up in taps you know, Roach had all the previews here. And number one was a special group see, at that time we played a lot of round-and-around-jack buseness. So again you find alot of people two times, because this was kind of a project office.

But this was a only ourr groups see . Now we were supported by
at least 3 times the number of the General Electric personnel,
but I Don't have that chart . So they were k a supporting
factor to us on those projects .

"1948 would date back to . . was this in Ft. Bliss?"

"Uh HUH."

"Well that's great that's very good."

END