

W. F. Parker

Well, there's none here, we don't monkey with it here.

Wherever it was bonded we
machine in

We had this prefabricated insulation prefabricated honeycomb that we input these
and then had channels, manifolds and channels that were distributed
that would cause a uniform purge that kept the insulation from as I would say
cryopumping air and freezing air inside the insulation and interestingly enough when you
get off the ground and start it didn't outgas fast enough, you see
it still has that helium in there, the pressure is diminishing faster than atmospheric
pressure is diminishing

insulation

just at liftoff the first action is to tear out the these channels
means of outgassing unwanted pressure. These are some of the things you know,
it don't sound like much but if you don't do it right, bug the daylight out of you as you
start to go into operation. I guess probably another significant thing about the S-II was
the amount of testing we did, both in the, at the component level, the system level, I
should say, the subsystem level, and then the complete system level, and to augment this
program, we had the battleship which really was an engine test stage, for a minute I said
clusters And this was followed by what we referred to as the all systems
vehicle, the flight but never to be launched, The all systems
bird, we had an odd way of getting our stages off the stand, we would demolish them.
And we proceeded to demolish the all systems bird. It kind of happened – Was this a
destructive test purposely? No, we didn't really want to blow it up. We found out a
great deal about it though, we found out that the old problem that was to rear its head
very large in the whole space business world was fracture mechanics. We found that
through some of the metallurgical work, I just think that some of our metallurgical experts,
they should be given a special medal, because they were able to take the pieces and do the
detective work that said not only here where the failure occurred, here's the direction that
the failure propagated, and they were able to put the whole thing back together and tell us
then that we needed to ~~KXX~~ increase our vigilance for inspecting welds, and find any

testing

failure

fracture mechanics

minute fracture that might become an incipient failure. But we learned a great deal by the fact that, ok, we lost the all systems bird but we learned that you better really look for these cracks. Now as a matter of fact at the same time we instigated a pneumatic pressure test that was done over on the Navy side _____ pressurized these things to a peak pressure. We did one other thing, we did a cryogenic _____ pressure, because there were these experts in the country that said the susceptibility to failure is increased as you decrease the temperature. Ok, the aluminum, _____ make it stronger, but if it has an inherent weak spot in a weld, maybe that's not as strong as the depressed temperatures. So we did a cryogenic proof test at _____ So, with all of this, of course, then there was the facility checkout stage that was used at the Cape, you know and the dynamic test vehicle that we used at Mississippi, in the total stack, you know, along with the first stack, the stack in the third stage in Apollo. What was the first test vehicle _____ down at the Cape.

actions

Are these covered in the contract? That's right. You build 15 flyable but, — Yes, we built a static test article which we broke up, I ~~XXX~~ said we had a very interesting way of doing _____ We built the all systems bird, we built the battleship, which was well-named, because it was stainless steel an inch thick. We built the dynamic test article, and then we built several _____ cryogenic test article, tested it, the reduced temperatures, failed it, and then because of really wanting to get added confidence in our structure, built the so called mini-stages, and they were shorter segments of the tankage and bulkheads. The mini A, B, and C which was a real critical portions _____ That was the one

mini stages test

that was demolished at Mississippi, Yes, and the structures stest, we were fraction of percentage points _____ that's where you gotta be if you're going to design a zero margin, you keep the weight down. Don't you have a design margin on the vehicle, about a .5 Well you have 25 percent, let's say we operate for a factor operating is one, test it, it can fail at 125. Yes, something like that.

I remember when we got it one the stand, somebody sent me a picture of it. _____ missiles and rockets, they sent me the cover of it

Was this that big stand down here at Seal Beach? Right. Is taht the one that was hydrostatic test, you had water in it -- Yes, we had water in it for the purpose that, you know, it isn't like a bomb then. When we did the pneumatic test, when we would move over on the Navy site, would be just a virtual bomb, but they figured the hazardous area, then they clear that area

Test Hydro pneumatic

But we really had, I think, a complete test program that gave all concerned the confidence when we stood up and said we're ready to fly, we had statically fired the thing, we had tested ~~in cryogenic~~ at cryogenic temperatures, we had gone through a whole lot of backup tests of the structure, and in the true sense, there could be no unexplained failures. In other words, if a filuare occured, you really had to say, here's what happened, here's our fix, and it is fixed because. And it had to satisfy the astronauts, it had to satisfy Dr. von Braun, Dr. Rees, Dr. Miller, and the whole top NASA organization. So we had really to severe critics but that's the reason I think we've been so successful.

critic standards

How in the did you work for von Braun, Rees how often did they suggest things to you. did they try to help you in some of your design

cooperation

Yes they did. Many times they'd have a parallel design going down there, and frequently we would come up with a combined solution to a problem. In other words, it would be thier metallurgists plus ours, or some of their people that were good on adhesives, or some of their people doing either ~~a~~ cooperative or independent work, provided this confidence that the system is ready to go, or solve problems, help us solve the problems that occured, that naturally occur when you are developing, and this was really developing.

confidence + reliability 35

We had to go in there with a high confidence, we couldn't go like the old missile programs, where the government bought 35 missiles ~~and~~ and they expected you to clobber all of them, or very few successes.

Your're still interested in continuing the relationship between you and MSFC, now would they help on out some of your difficulties with scheduling and production or are you supplying them with most of the information. Well, so far as the technique is concerned, they, it got to a point where they had a format which they finally wanted and if that jelled then we reported

part

The contract called for perts initially and pert was a little cumbersome because to really

get the pert program so it would in a timely fashion report the problems, pert is only a tool and it means a lot of other things in my view. But we reported pretty much in the way the government wanted the information. It wasn't until well into the program that it smoothed out to what I call a real good system. There's a lot of learning going on in what the government should and what the contactor should supply in terms of information so that you would know ~~XXX~~ in a timely way how the program's really going. As I ~~say~~ say, we all tended to underestimate the complexity of the S-II, and it tended to make all concerned a bit more optimistic about how long it would take to do a job, and how much it would cost to do a job. And this became resolved as we went on where problems would occur, we'd have to mutually decide, well we'll have to solve that problem.

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complexity - optimism

so we'd better take this method plus and backup method and go with two until we can see a little ray of hope here and then chop the other one off and go with the solution that looks best, the most promising. That method was only used where the problems looked pretty tough. I mentioned one some of the valves we had. Sometimes we would abandon a supplier right in midstream, the insulation, we abandoned our we abandoned, we abandoned the original source and went to a new source. Did it cost you anything to get out of that contract - -

Oh, no we were bailing them out a little bit until such time as they saw they just didn't have a solution and couldn't meet the terms of the contract, so the government having paid for that information, all that was available to the guy who was going to pick it up from there, so they had the full advantage of mistakes to that point, I think it cost a little time, but it's better judgment not to put good money after bad if we see that someone isn't really going to be able to solve the problem. With a vent valve you've got problems of leakage, you've got to react rapidly, to vent tanks at a very rapid rate to prevent explosion. Then they've got to close again, and not leak and some of these response times and leakage rates and performance just couldn't be met the original source of valves. They did, I think, a very remarkable job of making back some of the time, and I think that another one

prevalves Now here's a case where our Los ~~XXXX~~ Angeles division and decided to go to Parker. So now rather than North American bailing them out, we look to Pa~~rker~~ to take over from Crenshaw plant. We've had a lot of, stille built a lot of valves for us but not that particular one, they just weren't having all that much success solving the particular problem. And here there were tolerance prblms. Once depressed to those temperatures butterfly valves, you know 8 inches like that wouldn't seep. Of course our tests were terrible. We cycled and cycled and cycled and then they'd have to seep and seal. And we couldn't quite get that thing to ~~XXX~~ operate properly. The power it took to cyble it was too high, just a whole lot of problems Yes, right, the shaft would distort a little bit and the power to overcome this, and it had to fail in a certain way. You see, certain valve would fail closed, adn these added extra complexities to the valve design that Parker solved, there again, they did a really, I think a wonderful job in making up some of the time lost. We had to pull certain of the cryogenic lines out of some of the suppliers and put them over with Solar. Solar tended to be our best source of cryogenic, these are vacuum jacketed lines, and then they're hought, have to sit there forever and a day and never leak. The vacuum can't degenerate and they're very very lightweight. We've got an awful flap about weld offset. Here these very very thin metal, putting them together, here, you know visualize that having to be perfectly lined up all the way around, a little offset was like this see, so our tolerance on offset was just out of this world, but with the proper tools, we finally go it you know. Well, wasn't this the case with diameter tanks? Oh yes, sure, right, and we fianlly got the proper solution with our backup bars, our heat sinks and proper clamping. And of course, too part of the problem was contamination. Gosh, when we first started to weld, they were still building the building down there, so you take one part weld metal, 2 parts paint and 1 part dust and that doesn't make the greatest weld in the world, because the Navy was a little behind in getting the darn buildings built. So we finally The Na~~y~~y built the building? Sure, see that's our Navy property, the Navy dedeed that land from NASA ~~XXXXX~~ but also the Bureau of Yards and Docks, you know like in the Army CORps of Engineers, well the Bureau of Yards and Docks are a lot like the Army Corps of Engineers.

valves

*back up
bars -
comparing
heat sinks*

They really built that, so the Navy guys are in charge and they aren't the contractors. It was merely to our requirements which the NASA approved. So our facilities guys, [they would draw up the requirements for those buildings, so the engineers, my guys would say well we gotta do this, this, and this and the tooling guys would get in there and we would hand this group of specs over to the Bureau of Yards and Docks and they would execute the contract. And there was a hell of a lot there, you know, here we are, we got new designs, new facilities, new problems, tight schedules, gonna go to the moon in this decade that was of course the great pressure to keep everything on schedule as close as possible. Was everybody pleased with this decision to go to the moon? within the decade? I don't know really how to answer that because it was such a big decision, the president made it you know, so everybody was dedicated, nobody even really questioned it. The thing that really was difficult for people to realize that there are variables. If you're going to hold schedules then you've got to up the overtime and pour in more money. Or if you hold both of these back, and assume reasonable efficiency, or if they guy's a dog, you've got to get him out of there, but if you assume reasonable efficiency, hold back on the money, hold back on the overtime for some reason, then the schedules are variable. You can't have everything, and it took us all quite a while to get that in the proper context. Because if you look at the first flight but still got us there in this decade, so the president's commitment was achieved, We just didn't fly as many before 1970 as the original plans called for.

*money
holdable
overtime*

Yes, then of course Miller came along, when Bernard Holmes was in it, there were a certain number that was set aside for tests, but when Miller came along go for broke

I guess the thing that bugged me the most the country has always looked for either a major war or presidential proclamation or the war for jets, the war for rockets, the war for nuclear energy, the presidential proclamation that we are going to the moon but all we ever seem to do is get a minister or a secretary of technology. You start to lay out a 2, a 5, a 10 year program that says this is the way this country's going, we not going to drop suddenly, we

*secretary
of technology*

way this country's going. We're not going to drop or fall technically nor are we going to require a yo yoining of the funds that doesn't permit sensible planning of the space program. Tell the country it does that and hell, 3½ billion dollars and they stopped it, if the guys that are shouting humanities, they wouldn't see that much difference. I'll get off my stump, but I believe that, and I believe until the country recognizes it, we're going to get yo yoed around, budget-wise and if I ever have nothing to do, I think I may go beat the tub for a secretary of technology. Some of the countries in the world are smart enough to do it, including the Russians.

works Sure yeah They've been nipping around the edges of it, yeah, advisors, sure — but Nixon's got to go the other route, he's going to cut down the That's the way it looks. The same darn thing right now, you've got an EPA and these various things on ecology and pollution until there's a goddamn window you can walk up to saying here's my proposal Mr. Government and there's a guy that says yeah, we've got these requiremnets and we're going to go from here to here in this length of time. Forget it, except Mother Hubbard down here that's going to raise hell because somebody's dumping pollution in the bay.

Can't get any money. There's some ideas, this company, North Aermican had some, still has some marvelous ideas, but to really exploit them at the right level. I've got a young stalwart son that's in oceanography right now and he's got a discrete level opening sample taker. Right now the oceanographer goes out there and grabs samples if he gets temperature, salinity, and all these good things that tell us about what's affecting things and what's growing down there, what they do, they run a sampler down there and it gets everything from any level. Now he's got a discrete opening and closing thing — can't get any money. He's with USC down here, actually he's paid by the National Science Foundarion but doggone it just burns me up that we don't get technology administators that really does something, so my parting shot is not really — I think NASA handled it great compared to what I see a lot of other people doing. True, they might have borrowed a hell of a lot more from the Air Force and gotten with it a little faster but I'm not here to criticize them for that. They got with it and industry did and without the two, the way it works nothing would have happened gotta learn the lesson all over again

Well, I mentioned some of them, we kinda staggered several times on getting what was an acceptable solution to many of those technical problems. I think probably one of our biggest problems was to realistically assess the magnitude of the problem. There are people who have statistically said that if this is your complex devices, weapon system or space system that you are going to develop, I can tell you quite accurately and plot it over the years what it's going to take on a basis to do that. But there are gillions of people who won't believe it, now we have people like that in our corporate office who are able to do that. And when we do a realistic pricing job all the hands go up in the world you know. There's probably a dividing line that says if I'm going to put the dollar sign as high as it'll probably actually come out, Congress, the competition, the senators, they'll all gang up and say no go. So you kind of give them an introductory offer that's wrong by some order of magnitude. But it's out and out almost criminal to come out at a figure you know damn well you do - - - now I don't ~~XXX~~ think any of us did - - - we bid S-II on technology and on methods that North American had used on all the stuff before that. So you say you went into the program with some experience.

magnitude of problem

pricing

did

McDonnell Douglas other

people have had experience with missile training and up to that time you didn't have any experience. No, we had different kinds of experience, so we had to project, extrapolate that experience into what it would cost to do it and everybody knows those two overran. But, it has not overrun to the point to where we have not been able to come through with the thing that has been profitable at North American and I think highly acceptable to the government because we've been given award fees and so on. But the thing I'm really getting at, had we said, now this guy Joe has that says if you're going to do this kind of thing, this is logarithmic. I think semi-log or log-log, but these are straight lines and there's an advancement that goes along there and you can take certain families and you can show that the S-II he forecast it to be out of here somewhere here and nobody but nobody would believe that data when it was surfaced, and he can surface data today that will say what the Shuttle program is really really really going to cost and whether anybody will believe it or not I don't know, he's on the Shuttle pricing team.

profitable & going ahead

costs

because we set up with NASA a very strong change control process. You see, after, I think it was S-II three we had what was called _____ and after that no change could be made. Normally you are permitted what is called a class 2 change that you can just make independently if it don't affect somebody else _____ but after _____ everything else was a class 1 change so it had to be approved by our change board and I chaired the thing the whole life of the gosh darn program until I got off the program even thourhg the _____ and I when you make a strict control of changes as they affect interface, I don't think there's really any problem and you can with sensible people get good communication to GE with their ground support equipment and the various interfaces Douglas and Boeing and that sort of thing and I don't think that causes a prblem. I'm just going to talk aroundthat subject in the minutes remaining and that is on how the business runs in pricing these things. I know that it was and probably still is customary to give kind of a low bid. von Braun did the same thing to

used car lot. You want a car, how much do you have. Yes, in open bidding. They got the thing together, and of course people wanted it so they just kept bidding it up. It's scuttlebut, but I've heard a great deal of money is spent on engineering change orders, that these are expected in the business and its even referred to by some peoples the contractors come in so low that if they just did it with no change orders, they wouldn't make any profit, they wouldn't even break even and so they have to go through thse various rituals in order to get the government up to a reasonable price _____ on the surface may seem somewhat skulldugerous but its really the way things have been done in order to see that the companies did get

one million dollar contract cost plus fixed fee that _____ fixed and we have another million dollars worth of changes _____ same rate you make twice as much money, the rate is the same. Now actually you don't really do it, you can't really, you can't come out with it, I know what you said because your

stockholders don't like it for one thing. is the answer

doing like you said contractor doesn't like

to ever admit to that, so me as the contractor I won't agree with you. But if you start with

this much business, here's your million dollars, now ~~XXX~~ went to 2 million, but this is

not percent fee, this is a fixed fee, CPFF. Fixed it is, so that's all the fee you're evergoing

to get. So then you do twice as much business, if this was 5 percent, all you got was 2½

percent and the chairman of the board doesn't like it, the stockholders don't

like it if they don't get a hard dividend, and so on. Now, if you did that on only 1 percent

of your business when the thing was just being , you still have 99 percent

out here when you can have an award fee, I don't like award fees but if you had an incentive,

you can incentivize it, when you know what you're talking about, then the gosh darn

contractor isn't over the barrel to make his fair return. Now on the business of changes

and things that fall within the changes clause, if the scope, if you write a loose contract, [

you're at the disadvantage of saying that anything is out of scope but if you try and define

it you're virtually assured of having to change it. So unless you take yea-long to do it, this

spec isn't worth the paper that its written on if you want to become very

In other words, if you had to do it in this length of time, it's like engineering releasing

something to the factory, the factory is the first ones to gripe if its wrong, and they should.

But if they want it tonight, they're going to get what's right off the top of my head. If they

want to give me what is normal leave time to do the engineering before I release it to the

shop, I have a far better probability of having that stuff right when it goes out there. Same

thing on the dollars, if we can get a sensible phasing of it we can define the job. If we can't

define it we can't price it. Now, getting well on changes, what Ralph was saying, not really

all that good because unless you can define out of scope work you don't get any money on

that, all you get is your cost so the guy that, I guess it was Bill who had a

sign in his office that said count that day lost when you see the slow descending sun, sees

estimates and cost and business done for fun. And we arent in business for our health.

So I just think that we can be sensible about it and phase the work and once we have it

tied down

*Whitney's
contract*

and evolve it will

You bet it's good

I think it's the only healthy way the country can go into this srot of thing

Yes, and we didn't, the country didn't suffer, the country developed systems, rocket systems, new materials,

and this was incrementally bid, it was incrementally funded, but this business of saying we get well on changes, I guess you just don't broke, I would think more of that and a guy can look awful sick when he says I've got to face up to an overrun, because we bid this thing to completion, we just can't do it for that. I guess the only thing worse is what Lockheed had to do. They bid at fixed price and then they had to take the extra cost. That'll wipe you out. Only two hundred million dollars. Oh brother, how about that. Well, I've run over here. Well thank you very much. Well I always enjoy talking about Saturn, it was one of the greatest experiences I've ever had.

great experience