K = Jeffrey Kluger

Interview with Glynn Lunney: 5/29/92

K: What time did your shift start and what were your plans for afterwards?

L: I don't even remember what time of day this was - the shifts we were on were 3 shifts 8 hrs apiece, traditionally a book ended by arrival a little bit early, feeling for the place, read the log, debrief w/ the last guy on the console then you pick up with you team which comes on duty and you kindof reset everybody's clock and make sure we're all on the same music, and then at the end of an 8-hr shift there's a similar thing only this time you're the briefer, making sure the set of players know what the situation is when they come on the console, and many times during Apollo, not necessarily every shift, there would be a press conference, I was coming on to work basically it was the sleep shift, [K: 10-6 or something?] so I doubt there would have been a press conference cause it would've been the middle of the a.m. sometime. What I normally would do at that point is go home and go to bed

K: There wouldn't be breakfast or coffee...

L: Well, we just did that at the console, but it wasn't like we all went out for breakfast or anything after that

K: Did you know there'd been a problem before you got to JOhnson?

L: No, I was here and one of the things I did when coming on duty was walk through the backrooms, the backrooms are the support rooms, if you think of it this way if the front room has one console, then each of those consoles is backed up by 4, 5 or 6 in the back room, kind of like a tiered thing, so I would normally tour through our back rooms and through the place where the engineering support team was housed where we had almost like a little contol center that connected our cells with the engineering ... just to see what was on everybody's mind and how they were doing it was very benign, I was in one of the back rooms when we got the problem occured

K: So you were there, the problem wasn't already unfolding?

L: No, and I had gone in and sat down and talked to GEne before I went on my tour and I was just walking through the rooms and seeing all these guys and someone says Glynn somethings going on or something like that, you oughta go back into the front room, at which time I did, so I was there w/ Gene immediately as the events went on and frankly I've never really tried very hard, I can't remember how long it was before it was handed over to me, probably 30 minutes cause gene was about at the end of his shift and we wanted to bring on a fresh team

K: WEre there NASA emergency procedures that would have allowed for the extension of the previous shift?

background for Lost Moon

L: Nothing so formal as that, we would have done whatever seemed appropriate at teh time, and as we got into this case it was clear that it was gonna be a long term stabilization, 8-10 hrs, or 10-12 to get the thing settled down, and that would be something you wouldn't wanna extend the previous group, but we didn't have formalized procedures for this we just did what seemed reasonable and logical between the 2 of us at the time. So I came out and sat w/ GEne - again the records'll tell you how long it was before I went on duty but I was there the whole time, and a curious thing, see one of the things we have been trained is not to jump to conclusions and not to immediately assume the worst, and you don't jump any faster than you really have to, and it was interesting because it took a little while to sort out whether it was something that had caused a major instrumentation problem, cause so much instrumentation was looking funny, in retrospect it was clear why, but at the time it was a dawning process, it wasn't like the lightbulb went on in an instant, and it might have been a little bit more apparent to the crews who experienced the bump but I think even in their voices for a while it wasn't obvious, the depth of the hole we were really sliding down into, it was a gradual process, and somewhere in that process the handover occured between Gene and me, and of course I was experiencing it as I was sitting there anyway, and I don't exactly know where we were in concluding how bad this thing was... but GEne's team fairly promptly handed over and the truth is there was a period where we didn't know how bad it was but it became apparant quickly and I think I handed over from GEne after 30 min or 1 hr at the most , probably w/i 30 min, at which point it was beginning to become apparant that we really were in some kind of trouble and then large scale I was on duty for probably about 10-12 hrs and that was intentional at the end because we were in one of these stabilized modes and we had a few more things to finish up and I think Gerry GRiffin or Milt Windler?#78 I'm not sure which team was coming on behind probably Gerry's team

K: There were 4 teams?

L: No, there were 4 flight directors, I can't remember why, I don't remember if there were 4 teams or not, we might have been experimenting w/ teams at that point I remember for the plan for the entry portion GEne took a team of people off line so we had 3 teams to continue to fly the flight, after we got stabilized, and GEne's team went off to work on the entry part so we may have been experimenting w/ 4 teams, a spare team, I can't remember...

K: AT what point in your shift...it said according to other accounts when you took over you were looking for ways to salvage the integrity of the command module and service module - was there any event or individual that prevailed on you to abandon that

L: When we got to point it was clear we were losing the cryogenic O and when we were at the point of shutting down the fuel cells, we went through a routine, I think Sy was the guy who ...something about shutting down the fuel cells and I went back to him a couple times cause that was a permanent thing, it was shutting of the fuel cells or shutting of the cryo to the fuel cells -- it was the reactant valve, the

reactant to the fuel cells, once you did that it would shut down it couldn't be restrated -- it's 22 years....but somewhere in that process I could tell if I went back and listened to the tapes it was a slightly gradual process of becoming aware of how serious the problem was and that it wasn't instrumentation and we lost the cryo's and we were powering down the fuel cells which left us with no place to go but the lunar module and truth is we had given a fair bit of thought to that in our earlier planning sessions and discussions, I worked early on I suppose I was the flight director but I also had a branch that worked on all the trajectory stuff, and we had long used the impulse from either rocket system, we wanted to be able to use any propulsion system at any point in the trajectory out to or back from the moon even if that wasn't the nominal plan and we thought in terms of well someday we might lifeboat, and the systems guys, the lem systems guys had done in work in terms of thinking about lifeboats, we didn't have a checklist that says do this, but we did have a lot of other checklists on board that when we finally into moving into the lunar module, Jack Lousman was capcom and was a help to us and got us to start dealing with the right checklists and when we got the crew into the lunar module we were thinking of powering up and we were doing it a lilttle ad hoc, we went to the checklist that was the closest in terms af its appllicability, and then we used that as a mainstream set of activities and switched to the crew and modded ?130 it appropriately but it gave us a reference to work from ,like haveing a graph to work from ,and ad lib as we went along when things didn't

...So in through this period of gradual awareness that we were really in deep stuff and at some point in that I can't recall in terms of minutes it was pretty clear so we were engaged in shutting down on the CM side powering up on the other side and beginning to imagine what the hell we were gonna do next because up until that time we had always been on what we call fdr'ee returns checklist to the moon - theoretically - you couldn't do anything but swing around the moon and come back to the earth and probably reenter but this was teh first flight for performance reasons and trying to get to certain landing sites that we had diverted from that plan so we were on a trajectory that did not have a free return

K: That would have been a capture trajectory

L: No, it probably would have just gone out somewhere - wouldn't come back to earth and wouldn't have stayed around the moon it would've just been gone somewhere and we called it non-free return, prosaic or clever we are w/ words. There was all that situation going on with moving the crew over with preparing the lem module in such a way that we didn't prejudice using it later and then starting to power the lunar module but also doing thta in such a way that we didn't use up too much of the consumables because the lunar module wasn't designed to get us from there all the way back cause it was a good 80 or 90 hrs or so back to the earth plus we were in this funny trajectory condition and it was sort of clear that we needed to stabilize a number of things - and there were a lot of other long-term things that I'll talk about that we were just sure people were gonna, we needed to get the lunar module cockpit powered up, and the crew over there and comfort-

able with that, we needed to secure the command module as best we could and not to anything that would preclude from using it again, we had to manage the lunar module powered up as to how powered up we wanted to be so we didn't get teh stuff using up too much of the coolant water, the limiting parameter. Teh other thing we wanted to do was get this barbeque thing going, we did some of those going to the moon w/ the stack and the CSM and we all designed for it and all that and they were always kind of tender, delicate things you'd set them up and it was very slow spin, if the sun is here and the moon is here they kind of spun this way, keep everything even temperature, but they're very delicate it didn't seem to take much to throw them off, these big stacks of stuff - spacecraft - with all that fuel in all those tanks and it kind of wobbles around, sloshes around as you spin 'em, here we had to get all this stuff spinning with the lunar module we never tried to do that,

K: YOu were never barbecuing with the lunar mod...

L: WEll, we lost it, by the time had to get this thing going w/ the lunar module we had to get this thing initiated and stablized

K: Oh I see. WEre the RCS thrusters not working on the sevice module

L: no, they were working but with the explosion and everything we lost the nice, slow, controlled barbeque that we like to have. We also kenw that because we were on the non-free return we had to do something about that at some point in the mission and my feeling was teh soomer we got ourselves settled down with that the better it would be, cause I was afraid we would have to do a drastic powerdown, and there's alot of equipment that needs to be powered up when you're gonna do a big propulsion (mumble)#184, so while we had the reference system in the command module that is we had a platform that was aligned and we kenw wehre it was we wanted to transfer that into the lunar module but you didn't know where it was yet and I don't remember the mechanics of that but we wanted to get the alignment we had, the inertial alignment in the command module transferred over and we did that

K: Can that always be done manually?

L: No, there were internal lem ways to do it, but this was a faster way to do it, and a lot of the lem ways...I can't remember why we didn't do that ... but tranfering that was important because we cneeded to have that in order to do a propulsion burn. The situation was how to close out the command module as safely as we could, getting everybody over there, and then getting started on a checklist and not making any mistakes, and we knew we would be consumable limited so we were trying not to get on the high side of having everything turned on. And then we were worried about also getting transferred this attitude reference so we could platform the lem, the inertial system of the lem knew where it was, so we could later do a propulsion burn cause we knew we needed to do one of those sooner or later we hadn't really figured out optimal times to do it and my feeling with the sense of things was teh sooner we could do that and get stabilized at

least on a return to the earth the better off we could be cause if we got to that we could take the whole thing way the hell down to calm??#206 and some lights and then figure out what to do

K: Now did the various flight directors have complete authority to make those decisions or...

L: Now somewhere in the course of that a lot of the backup teams and people started coming in - and I lost track - but a lot of people from the ???213 office, a lot of ?? management people and so on, but no we ran the thing, basically the the fl. dir's just did what we had to do, no Craft was our boss

K: What was his position

L: When he was in there he would sit at the back console, he was the director of flight operations

K: The position Kranz has now

L: Well, the organizational position, then there's a console in the control center that the back row, it's not an active console, kind of like a management role, and we got rolling in this thingf, and every once in a while we'd turn and you know - 5 words - and he would nod and off we'd go, we'd worked w/ each other by that time 10 yrs, a lot of us had, and a lot of the team that I had worked together not together not together specifically but the whole group had worked together, Gene and I, Gerry, the guys and the people who worked for us at all the consoles, Sy Liebergotz, and we'd worked for Chris, so it didn't take a whole hell of a lot of calm to communicate and we got tko a point I'll tell you about it we had a chance to tell the management people a little more about what their choices were on the return leg but in that 10 or so hrs - whew!

...it was by the door and the biggest constraint, the biggest fear that I had was that we wouldn't make a serious mistake during that period of time because it seemed like anything we could do wrong might end up either losing the reference system, significantly delaying ....??234 manouver, require us to be powered up a lot longer, etc. and then anything else we could do by way of making a mistake could have put us in other holes we didn't even know what they all were yet but we spent the next period of stabilizing the command module stabilizing the crew in the lunar module, getting the thing ready to do a propulsion burn and then we did one at the end of my shift - I forgot, got the barbeque going, then we did a propulsion burn at the end and got the thing back on free return which was a form of arriving at a, its like a forward hospital, get the patient stabililzed to that point where we have a little more time to then consider the exact configuration we wanted to be in so as to minimize the power cooling and the number of options we had to fire engines when we'd get back tok the earth, an ocean to land in and all that stuff. So my time on there was during this window when somewhere in the process we figured out we're really in bad trouble and the stabilization of the entire thing that I think we got ot when we got to the burn, and soon after that we

were able to do some more powering down, we were also able to start giving the crew some rest cause that - you know I was coming on fresth but they were going into their sleep period, they were up like a full night, so their morning was about the time we got the thing settled down enough so we could get into a little bit more of a routine, routines probably a bad word...that's an outline

K: Do you recall any non-tech, off the loop conversations you had...any other big picture conversations about say how savable the astronauts were

#264

L: We didn't really talk about that, it was bad attitude, you know at that age we were not inclined to be philosophical, or if we were it didn't come out very easily under the circumstances, at that time in general, I don't remember a lot of off line things, a couple of events stick in my mind though, cause Tom Stafford was in the control center that night, and he was a fellow that'd flown a couple of Apollos, he and I went back a long way together and I had a lot of respect for Tom, and Tom was very concerned thatd we maintain the active reference and be able to do a propulsion burn, Tom was one of proponants to be sure we did that as well as we could, Tom was very helpful cause that was his major contribution to the thought process we were involved in and he wasn't capcom on duty Lousman was, Tom was of that mind and I was to, we thought alike in terms of getting this thing stabilized

K: In what capacity was he working there?

L: I don't know what his job was in the astronaut office at that time

K: I mean during that time

L: He just showed up, he wasn't on duty as a capcom, I mean he was a big commander by that time so he wasn't a capcom, but I mean he showed up and a lot of the people showed up, as a matter of fact it was amazing how many people showed up and how quickly the control center filled up with people, I mean we still ran it in a disciplined way but people were around and it's a very interesting thing to sit in a contarol center and not be on duty because when you're on duty you have to respond and it's interesting when you can just sit there and not have to respond it gives you a little more time to think a little bit ahead than the guy on the console, and all those men, it was all men at the time, had been together for so long that it was easy for them to come in and help each other out in that regard so although to an outsider it might look like a lot of people most of the people had operated for so long togehter that they knew exactly what was on each other's mind and it was easy for them to be helpful or to just stay out of the way and we'd all done that enough to know that you need to do that and at times people could suggest something I don't really recall anything except Tom was very strong on keeping the thing aligned and get the burn done...

and it's interesting Jeff if you think about that I said that my overriding concern was not to screw anything up that would put us further

in the hole than we already were and in the whole night - 10 hrs - the only thing I only personally allowed ot go wrong was while we were getting this whole thing all set up we got the command module thrusters turned off before we got the lunar module ones on so it didn't have any attitude control and that was my fault cause I had been coordinating the command module guys, but it was only terribly...probably seconds, but we went back over the stuff pretty carefully and in retrospect that was the only mistake we made out of the control center, that was really my..that was the only thing we did wrong in the whole 10 hrs of doing something that we had really not trained specifically for but we had certainly ...someone says, you had the skills but you didn't have the procedure, we were at the point in our careers you know we'd all been a lot of people doing that together for 10 yrs, I mean we had the skills, we didn't have the particular procedures for this event. And with the flight crews, the flight crew guys, and the guys at the control center, that was always a very close thing, I found after a while after doing that you could tell how they were doing from their tone of voice - the astronauts - you could tell when they didn't quite understand something, you could tell when they didn't quite agree with something, and its subtle but after you work with someone and listen to them talk, especially we'd run a lot of sims with them in the simulator, you know a lot of the guys personally, and you kind of know what they think and how they think etc. so the wire - our radio signal to the crew back and forth, was always packed with more inforamtion than would be apparant to people, and then we always had capcoms doing the job that had been pilots or were flyers, so they were very much aware of what was happening inside the cockpit, as the team of people in the control center were, and I was always proud of the way the flight crews and the people on the ground worked together, always very harmonious except for one event in the past, and when you wathc it it's almost like people are reading each other's minds, cause they'd talked about a lot of this stuff ahead of time, in general principals enought that you know where people are coming from, and it's almost like reading minds

K: What event was it?

L: We had one flight where the crew was not cooperative w/ the people on the ground - Apollo 7, I worked on that as a matter of fact I was ??354 flight director and that caused, I mean it really irritated us but that passed and subsequent crews...

K:: What happened

L: Well I think the problem was we had a fellow flying who was past the point in lifestyle who should be flying, in other words flying, the business that it is, I think Wally?363 was past the point where he should have been commanding the spacecraft, emotionally, what I mean by that is, well he was just past the point.....I mean emotionally, his life was beginning to fill up with other things, I don't know exactly what they were but clearly his priorities were other ....The best was I can say this is he's past the point in his emotional view and how he is that he should be flying. Some guys never pass that point they can fly forever but he was, shouldn't have been flying.

And I think it carried over his behavior, he didn't give us any trouble on the ground - he did once and we kind of balled him out - but when we flew he really turned into a horses ass, and it was pretty embarassing, also very very infuriating

K: What constitutes being a horses ass, an open disagreement

L:: YEah it was open, I can't remember any specifics but he was disagreeing with things we were doing and he'd ask questions like what flight director ever approved this and stuff like that, totally out of line, Jim would tell you about it if you talked to him, but I thought that the best response to the problem was by the subsequent flights, cause we returned to where we always had been, so Wally's flight was kind of an anomoly - I think WAlly was a anamoly, I mean he had served very well, but he shouldn't have been flying

K: The other 2 never flew after that either

L: You noticed that, and they never would have, no matter how long they stayed in

K: WAs there a formal policy that dictated that ..

L: See you guys think in modern terms, see we were out there doing all this stuff and our attitude was ok guys you do that, pppppt!, the of the boss was, if you do that...we didn't have any formal policies but it was goddam clear, and in a sense they got tarred with a brush they weren't totally responsible for, but that's life, they're big boys...

K: Also the stakes were so high..

L: That was the event and subsequent crews returned to the way crews had always been, but the point I was trying to make is the relationship between people - and it exists today if you listen to the loop, is a great deal of understanding and mind reading that's going on as people communicate back and forth but it's because they have this background together of thinking their way through different things and evaluating options and having discussions, lot of mission rule discussions, flight techniques....so as you go through those things you develop a lot of understanding, it's almost like you're telling jokes by numbers

K: WEre you or the crew you were working with present for other crisis moments like Gemini 8?

L: I wasn't on duty on the fire, I was home, in fact we were having dinner over at Bill Ander's, and his wife, they'd just gotten the word, a phone call

K: Who called you

L: Somebody called Bill, I'm not sure who it was. Let's see, Gemini 8 when the thrusters went up, I don't know that I was in the control

center but I was in there fairly quickly, which was typical because we always came in when there was an event. What other events...

K: Were there any other crises...

L: Well GEmini was a series of crises cause the thrusters always clogged up, the fuel cells always flooded, EVA was always - it was a learning, we'd just learned how to do EVA's then, so the Gemini flights were really...Jim flew a couple of those... 6 and 12, you know we learning a lot doing that stuff, rendezvous' (mumble #434). Those flights were punctuated by a lot of interesting things as we went along. Apollo 8 we had a - that was the one that went to the moon - the only burn of the engine we gonna use going around the moon - we had a kind of tweaky? burn on the way out - we got funny indications. It ended up being a loading problem that we were able to figure out, fuel loading, it got air in it or something that made it look funny

K: Did that make you question whether or not you wanted to go into orbit

L: Yeah,

K: How was the decision made to maintain the orbit

L: I was just there listening to it all and said ok, we'll go with it...Apollo 11 we had the funny thing with the alarms - Gene can tell you a long story about that

K: Actually he did

L: 12 got hit with lightening, scared the shit out of us, stuff was screwed up and the command module...but we kindof tooled along said well we've got it on orbit, fixed it all up again - looks ok, might as well go to the moon

K: Who was on shift?

L: Gerry Griffin. 14 was Al Shepard's flight, I don't remember any big events, 15 was ok, we had a little trouble getting away from the stage, sort of a funny separation, 16, 17 seemed ok

K: Going back to 8, what did that decision involve, that seemed to be a critical moment in the Apollo program to have even a small question about the SPS

L: First was understanding the problem. As I've mentioned we had this engineering team on the side, we were able to acess the engineer who had been at the cape, for the loading, that was when he began to put together what he saw at the Cape, something was a little different, and he translated that into gas or heating bubbles in the fuel system, gas through the engine, the combustion system caused the readings to look funny - and the truth was you couldn't go around burning those engines the whole time cause you only had so much fuel, and every time you burned them you changed the trajectory. So the process

was get the people who know the subject, and we all understood the risk, talk our way through it, pros and cons and decide what to do. It was problem options decision, was the process

K: And you determined that it was a transitory problem

L: And that was our decision...a decision not to do nothing

K: The description I've heard a lot about that crew was that Frank Borman was a somewhat wary commander, he was very cautious..was that an impression you got and was that reflected

L: I'd say careful. In fact on that problem we kind of broke one of our long-term understandings with the crew because we did not tell them about it. Cause we figured there was no way we could explain it to their satisfaction, and they might do something wrong, inappropriate, we debated that quite a bit. We told them after the flight of course, and they were pissed. We felt like we couldn't convey all the stuff we'd been through, the loading and the gas bubbles and all that stuff...we felt like we couldn't convey it

K: And presumably there was nothing you could do once the problem was resolved except

L: You'd be setting uncertainties and concerns in their minds, which might cause them to take action, as a matter of fact on some of the early flights like the Gemini flight we almost set the crew up for - we got them worrying about the control system on the agena, for some reason I can't remember, we got them focused on worrying about the attitude control system on the Agena that they were docked to, and then subsequently when they had a problem with the Gemini thrusters there was an assumption, you know they conditioned them. We had this understanding that would tell them about anything that we knew, Chris talked to, told us we were not going to do that in this case, his feeling was it was not going to help them at all, it might just condition them to do something wrong

K: Was there that kind of information management going on on 13?
L: Oh no, no, as a matter of fact that is the only event I can recall where we did that, other than that there's no real selective communication, it's packed in there, it's all in there
K: When your ship came on, my understanding is that at that early stage there was only a sort of maintainance - the term is Telmu? -
L: Oh yeah, the lem guys really weren't hardly there
K: WAs it on your shift they were rounded up?
L: I think so - they overlap so much, they showed up alful fast, I can't remember who, as a matter of fact we even at some point didn't have any lem support, ...(mumble 547) lem...powered up so the guys can stay home - well, that wouldn't ever happen again, they all fired up fast, people were called and the team was there, we had a bullet team who could deal with the lem when it got there, took us a little while to get there ...you might look at the timeline and see how long did it take them from the explosion to transfer into the lem
K: It had to be w/i 2 hr...

L: Right, But it was measured in an hr and a half, 2, 2 1/2, something like that so it wasn't like it was minutes
K: At what point was the lem lifeboat decision made and what kind of input did you have in that?
L: I don't think we said to ourselves we have to make a lem lifeboat decision, I think we said to ourselves holy shit this thing is falling apart over here, we gotta go move over, it was more like a lifeboat decision on a boat would be made, you know if the big boat is sinking I better get in the little boat. It was a natural consequence of the events that were unfolding including, you know, we were shutting off the fuel cells, reactor valves....it was a natural flow, and we had talked about it before, matter of fact I think the lem crew I had had done some specific work on lifeboat procedures, I think

Somebody else's voice unclear (S:) mission planning and analysis that doesn't support the background, but ....??583 analysis support Sy Liebergotz, we had done an IN which is probably available in the archives, internal note on the lem lifeboat study. It was done probably 6-8 months prior to flight
L: We had talked about it for years
S: It was considered a low probability, but it was something that was put in for contingency studies, it was documented, in fact a gentleman that works for Rockwell right now was probably the ??592 for that Walter Scott, and he probably has a copy - in fact I know how you can get it from the archive. There's a lady named Mary Shipbert, that works and Rockwell on the plan now, and she knows...
L: There would be a lot of things that you could look at that way - post flight reports, we had a flight director report where we really sat down and paid attention to what we wrote rather than ...and all kinds of reports and literature on it
S: It was really one where you had to look at the consumables of both, even a fissible??608 study from the standpoint of having to use lem O and nitrogen and so forth, all of it was worked out, I don't think we did it exactly...
L: And we didn't do it at this particular time or anything, it was kind of like an awareness and understand of what you have to do when you're flying under these conditions...the thing blew up at about 50 something hrs and we got back 80 hrs later but there are a variety of ways to get back, we could've made it shorter, made it longer, we kind of picked a middle-of-the-road burn, that's about what we were beginning to do at the end of the first shift I was on, as we were moving towards the ??620 stabilizer we were then looking at what other options do we have, returning to what ocean, how fast, with what risk or lack of risk
K: Given the fact that there was a sketchy lifeboat study done, How was the lithium hydroxide problem overlooked?
L: It's funny cause we had the little cannisters of CO2 out, one that was square and one that was round, the command module which was square, the lem module was round, the cannisters would take the CO2 out...so we had to jerryrig something...But you say this lifeboat study,people had done various things, but it was usually from the point of view of the discipline that was involved, C Sissio's??634 group did work on consumables so they thought about consumables, they originally thought of it from the point of view of we need to have

these little engines so we can control the trajectory all the way out and back, we never really focused full up on the lifeboat itself, under a whole variety of circumstances, so we touched 80-90% of the problem, we had trouble imaging that we were gonna blow up the command module on the way up there, I think a lot of people will talk to you about it but we didn't have a 100% lifeboat plan
K: Was there a thrust threshold below which the engines wouldn't affect the trajectory in a significant was - if for some reason the descent stage was exhausted could you have used the ascent stage for major course corrections
L: It was limited to the fuel that you had and so on, but there's a whole bunch of other considerations cause a lot of the batteries of power were down in the descent stage so it wasn't just here's the engine go get it, it was just there
K: Was that option ever considered
L: We did all the options on it, we had - I can't - we did all the options on what propulsion was available in each one of the stages and what you had to do to get it, the pros and cons, we dumped the descent stage for example
K: Now, Lovell, he said I think one of the concerns NASA had was if nothing else, get it back on a free return because even if we exhaust our consumables, even if we miss the corridor and come into the wrong angle, even if something else goes wrong and we don't make it, I think that NASA wanted to get 13 back into the atmosphere and incinerated rather than having this ghastly monument floating around
L: Somebody may think that, there may be people who thought that, but I was there at the time and I did what I did and it didn't enter my mind
K: DId you ever get brought up short by the possibility of losing the crew
L: I had one sinking spell during my shift, it was one of those holy shit what have we gotten into here, it just lasted 30 seconds
K: WAs there any particular thing that triggered that
L: Well it somewhere on the - if I can describe it as as our awareness of the problem increased, you know I felt we were on one of those sliding down hill things, somewhere in the period of the shifts when we were down here near the bottom when I went through one of these holy shit things, but that only lasted momentarily because it wasn't in our nature to sit around and worry about these things, we were there to act, cautiously but to act, and that was our predisposition and we were all 30 yrs old, predisposed to action rather than to sit around an philosphize
K: Kranz was saying this morning that he was asked at a press conference...did you get the crew back, and he said it's not if we get the crew back it's when and how much of the ship is gonna be left, do you think there was in all of you true belief in that or was it bravado
L: No, it was true belief, we didn't know how we'd do it all the time, and as I said I had a couple of seconds sinking spell but that was about all, but our view was -- we can do it
K: WEre there any confidential and candid exchanges like between you and any other crew members

S: My impression is that people were so busy trying to find every alternative and every way around and every contingency that nobody even though about it

L: It's a little bit like playing ball they're not mentally thinking about any of the things
K: It's like people who survive any great crisis...
L: Just reacting according to yuour training hopefully and that's what we did, no only were we trained but we were goddam cocky, we were confident we could do anything, we were we could do anything, we were indestructible, we would live forever, and we could do anything in the space business so .. and we had a bunch of people who had kinda grew up and been around each other for almost 10 years so
K: What's your background
L: I started working for NASA when I was 18, I was a coop student which means go to the school 3 mths and work 3 mnths, going to school in aeronautical engineering - my first 2 yrs were in Scranton, then I went to University of Detroit, and I was 18 when I was there so I'd had 2 yrs of college by the time I was 18, that was when I get on this 3 month 3 month thing, and my 3 months w/ NACA at the time was at Louis Field - '55 - '58, then in June of '58 when I got out of college I started to work w/ a small group of people who were doing entry body search things - aerodynamic stuff, and in June of '58 I saw my first drawing of the Mercury capsule, from guys at Langley who were doing an equivilant kind of research, then in '58 we started to support the guys at Langley who were beginning to conceive of this Mercury capsule thing, although they didn't have that name on it at the time, the branch chief there by the way was George Lowe, he bacame probably one of the leading lights in NASA, the last 30 yrs, so we started communting down to Langley fraom Cleveland to help the guys down there then we would come back and take some stuff and run it in our computers - I probably didn't know what the hell I was doing, but anyway I moved back to Langley that summer, summer of '59, I was doing a lot of trajectory stuff and I moved over into the flight control room, which I did for Mercury - flight control - I was flight dynamics officer, byt the time of Gemini I was flight director, so I was flight director for a number of the Gemini flights, a number of the unmanned Apollo flights, and a number of the Apollo flights. I left the agency in '85, after Apollo 15 - probably 1971, I retired as flight directors - I went over to the program officer and I became program officer for - you know the command ship that we used, Apollo ship to go back to the Skylab, well I was program manager for that, I was the US program director for the thing we did with the Russians, that was in '75, then I did a lot of stuff, and in '80 I was program manager for the space shuttle - 4,5 years then I retired. I went to the west coast and sat there a while and now I'm here. So I've done a little bit of everything at NASA.
K: Is your work w/ Rockwell NASA related
L:: Oh yes
K:::What kind of stuff are you doing
L: Our company supports - in fact this is back to my roots, supports the operations team - as a matter of fact GEne Kranz is our customer, he's the guy who holds the contract for what we do. A lot of people who do the flight planning, flight design emissions, maintain and operate old facilities in a simulator in the control center, sail, the laboratory where we redo the flight software?#841 We have a lot of young people work on site who are like additional manpower for Gene Kranz' organization, they sit in consoles in the control center they

train the astronauts, they do the flight plans, so all this stuff that NASA does in many cases we do most of the work, we run the facilities, in the case of systems work in the control center, the different consoles, our people work as extra hands to the NASA guys, so we're an integral part of the team
K: BAck to 13, when your shift was over that night, what did you do, did you call your wife at some point...
L: I must have done that cause the whole community was aware of what was going on, but I went home that's what I always did I went home. I didn't go home immediately, I had to do a press conference, and frankly it was a very positive thing in a sense that a lot of the press people had followed the missions for years and I knew them all on a first name basis and it was eminantly clear that they were totally in support of this thing in terms of to come out successfully, so I spent a lot of time explaining what was going on and what we'd done and why, it was all, it was the kind of thing where people were really caught up in it, people were watching t.v. all around the world so there was an outpouring of concern, not concern but a kind of connectedness that people felt over this event, and hurt...so that stuff poured out and it was reflected in the attitude of the people, sometimes the media can be a pain in the ass here, press conferences, but there was none of that
K: Even in Challenger there seemed to be a subtle but direct confrontational attitude
L: Yes and our whjole country's changed in that regard, since Watergate when people view that as the goal,, and that has maybe done some good it's also done some harm, but it is what it is. Then I went home at some point - probably slept for a week - I was back on duty that night so I couldn't sleep, Gene got his team off...The other thing I would comment on that is generally not commented on is the management of NASA was extraordinarily helpful and supportive
...side 2...
briefed all management on what our options were and what we thought we should do and why, this was after we'd stabilized, so we went in this room there was a lot of people, Dr. Paine was the administrator of NASA, George Lowe was his deputy - after my shift ended I'm no sure maybe I went into press conference and came back - but anyway we went through the options w/ people and you know, was there anything we can do to help the O, there was no nitpicking or interference or second guessing or anything like that, tremendously supportive in terms of the way they responded to us. I felt real good about this- another story - there was a time when...(cough)...#946 and we would ?? on what we did as flight directors from Washington
K: Do it remotely?
L: No, walk in late and do it (Mumble) The program went through a period of that and it went away, because it became clear that it was not workable, we had a very good working relationship then. But you could not have walked into that work and done it without being involved, today GEne and I, guys who have been through it all, we don't interfere, sometimes there are issues that can be decided over a period of a day or 2, have a chance to discuss it, but anyone who's been in it would never think of interfering with the real time process, you have to be too current.

....gap....

L: the problem was faced with during that flight was, that was about as close as you could come to losing crew in a mission and being able to manage your way through it. In other words, if you wanted to construct a problem and got much closer to the edge, could not have constructed one and gotten much closer to the edge, without going over.
K: You must have felt later in the mission when there was that battery...venting this is it, now we're going off the edge
L: No no by that time we were immune, I don't remember exactly...batteries banging....but that was quite a time and when it was over I think all the people who participated in it, and the associated network, we all felt pretty damn proud that we'd done a good job on it, we went back over pretty carefully and we didn't really make any mistakes to speak of.
K: Pure speculation, if the crew had been lost, would it have been the end of the Apollo program
L: I don't know, I'd have to go back and put myself into the political environment of the time. We might have stopped going, we might well have stopped going, it might have been delayed, it might have taken several years to get back in line and probably then be on to Skylab or something
K: As it was there were already people questioning the Apollo...
L: ...Yeah ...(mumble) restless, yeah I can imagine there would have been a fair bit of sentiment that would have been in that quadrant, who knows it might have prevailed
K: Brian was saying the biggest risks w/ 10 and 11 was had there been a catastrophic accident and the vehicle (mumble993) recoverable people might have backed off cause there would have been no black box, you couldn't have done any autopsy, even with the challenger there was enough to recover
L: And I'm sure we were exposed to that a number of times in a number of ways, couldn't stop to calculate
K: you couldn't, were you paralyzed
L: Brian was here the other day, as a comment on our times today, there's an awful lot in America that has become risk averse, I mean we ditigate, we insure, at the drop of a hat on risk, and the media deals with any failure as a witchhunt almost, almost a natural tendency ato deal with it that way, and it's curious what NASA tries to do is just a little bit out of synch with the risk aversion that seems to be somewhat prevelant
K: I think they're trying to wed two incompatable things with is a 0 defects or 0 risk philosophy and a high risk or high defect program enterprise like space travel, that's like saying I wanna play freshman football but I can't tolerate the pain, the question of injury, well don't play
L: the problem is that the outside world feels that NASA (mumble#613) probably hurts guys feelings
K: Well that takes it down to the human level
S: There's just one thing I remember that takes it down to the human feeling, when we went for the powerdown, adn went very low to save consumables, and the guys were in the dark and freezing, trying to put on anything they could possibly put on ...terror...
L: See the other thing that we did when we were trying to set up this funny barbecue on of the things that could upset that was when they

would dump something out of the spacecraft like fluids of some kind well, you know, turns out they were taking leaks and dumping them over and we said hey, you're rattling our nice thing, so stop dumping that stuff overboard, well Fred Hayes, he really suffered for that, I don't know what he did except he tried no to go for as long as he could, he actually got an infection out of it, and there was a period afterwards when that was not so critical for us but Fred was belabouring under this admonation not to be leaking and dumping...he got an infection out of it...there was a period later on in the flight where we could have relieved that constraint...poor Fred

S: mumble.....