

*Capt. Young
reception
9/10/74*

WE ARE AT THE JOHNSON SPACE CENTER, HOUSTON, TEXAS, FOR AN INTERVIEW WITH CAPTAIN JOHN YOUNG, NOW CHIEF OF THE ASTRONAUT OFFICE. THIS IS ROBERT SHERROD SPEAKING ON 28 JUNE 1974.

A. I like Mike [Collins]. A really intelligent fellow.

Q. It's a good book [Carrying the Fire]. I must say it's the best thing of its kind I've --

A. Has he got a good one?

Q. I think he has. I think this is one of those rare space books that will sell some copies. Very few of them have. A lot of people have "taken a bath" on space books. There was Time and Life which sold -- the Apollo 11 book, you know, the one that was signed by the three Apollo 11 astronauts. They put out \$400,000 in advances, and sold 23,000 copies.

A. Is that right?

Q. Yes. They got that money back by syndicating the stuff to European publications, stuff that appeared in Life as the program was going on. But they were sure disappointed in the sales...Well, how do you like this seat? How long have you been in it?

A. Officially since April the 21st, I think; but before then when Al [Shepard] was on temporary duty I was filling in a little for him. It's very interesting -- we've got a new & different problem every day. It's a little more coordination and a great deal more of talking to people on the phone than what you usually do in a technical job -- trying to keep everybody happy and trying to keep all the boys pointing in the right direction. Of course these fellows, you just sort of turn them

(19)

loose and they go and do the job, without any problem. They're still a bunch of tigers.

Q. How many astronauts are there on the rolls now?

A. Well, at the Johnson Space Center we've got 35 right now, I guess maybe 34 if you count Jack Schmitt as leaving -- he's sort of in transit.

Q. Yes, I see him up at headquarters.

A. He's working back and forth. He comes in here on weekends and does his homework and keeps up with what we're doing. Somewhat from a par- *standing*
ent *stand* standpoint that's how many fellows we worry about; and then in the Flight Operations Division we've got -- counting Al, who's still here --

21. And then the medical doctors have three; and not counting Jack, the Science and Applications Directorate has seven; four working in the program offices -- Gene Cernan on ASTP, Charlie Duke is working for Bob Thompson on the Space Shuttle Program integration, Freddo Haise is working for Aaron Cohen on the orbiter, and Owen Garriott is the deputy director of Science and Applications. They're all working.

Q. All this adds up to your 35 or 6 --

A. Yes. ^{Q.} When I was reviewing this upcoming Collins book I asked the Manned Spaceflight people in Washington, and they couldn't get it quite straight just how many were left.

A. It's hard to keep up, it really is, because fellows are always coming and going, and they spend a lot of time working on the Space Shuttle and ASTP. You've got eight guys right now in the Soviet Union working with the Russians, and we've got, well, at the first part of this week we had three or four guys out on the West Coast working en-

(40)

gineering simulations. And we had fellows up at Johnsville on the Space Shuttle centrifuge program. So they're always in transit -- at any given time it's hard to put your finger on how many guys are --

Q. Al Shepard's leaving, isn't he? He is retiring, I read somewhere.

A. I don't know whether he is or not. He was, but he's working as a senior adviser right now.

Q. Who's he a senior adviser to?

A. To me. He's run into every problem that comes across the desk. If I have any doubts about it I just go and ask Al; he's got the answers because he's seen them all before. It's a good way to get started in a new job.

Q. Pete Conrad's having his farewell party tomorrow, I hear.

A. Tomorrow night.

Q. I look forward to seeing him -- I haven't seen him since right after Apollo 12.

A. He hasn't changed any.

Q. Mike makes a point in this book of his that if anybody got screwed in the changing around at the time of the C' Decision it was Pete, because Pete would have been pointed toward the first lunar landing if the switches hadn't been made in there.

A. Well, shoot, that's all water under the dam, I guess. Suppose Apollo 11 hadn't been successful, and Pete would've got -- and if he hadn't have done it I suppose they would have sent Tom and Gene and I back to try. If Apollo 13 had happened on Apollo 11 they could have done just that.

(64)

Q. Yes, there are a lot of if's and and's about it.

A. Yessir.

Q. Let me ask you a little about yourself, Captain Young. You aren't a rear admiral yet, are you?

A. No sir, a long way from it.

Q. I guess Al's the only admiral to come out of the space program. McDivitt and Stafford, I guess, made brigadier general. You were born in San Francisco, but apparently your parents were there only a short time. Is that right?

A. About two and a half years.

Q. What was your father doing out there at the time you were born?

A. He was working for an outfit called *Raymond* Concrete *Co.* Company. He was a civil engineer and participated in laying the foundations for the blimp hangars out at Moffet Field.

Q. And he had gone there from Georgia, was it?

A. No, before that he had worked in China.

Q. Oh really?

A. He worked in China in '27 and shortly thereafter was working in St. Louis. It was a very interesting outfit. He met my mother in St. Louis, and then they moved out to San Francisco to work on the hangars out there. And that's where I turned up.

Q. Where was your father from originally?

A. A little town in Georgia called Cartersville.

Q. When you were two and a half or less your family moved back to Georgia? I've read in some of these clippings here that you moved back to Cartersville, and I guess you started school there.

(88)

A. No, in I guess '35 the family moved down to Orlando and I started school in Orlando, and then went back.

Q. Then you went from Orlando up to Cartersville, then back to Orlando? Is that the way --

A. That's the way it turned out.

Q. What do you remember about the Depression when you were very small?

A. Pretty grim period of life for everybody. People in Georgia were working on the WPA, and it was really tough times, for a lot of people.

Q. Yes, I was down there. I'm from Georgia. But you can't remember very much about when you were five or six, about how tough times were -- you just remember what you were told later, I guess. Or do you?

A. Oh, you can remember that stuff pretty well. But fortunately it all went away.

Q. Do you remember any specific instances when you were five, six, seven, eight?

A. No, I really can't put my hands on any specific times, except everybody was worried about how tough the times were. So long ago I just can't remember.

Q. I can remember it probably better than you can. You probably remember this -- it came out in the Orlando papers soon after you were reported
an astronaut. This was November of '62.

A. Is that right?

Q. It's the most complete story I've run across. I'll be damned if I know where I got it, but it was in your folder in my office.

A. Well, you know the Orlando people look out for me very well.

(118)

Q. Didn't they name something or other for you down there?

A. Yes.

Q. Was it a school, or --

A. No, it's a museum. I think it's a little premature, but they did it anyway.

Q. Yes, this says that your father in '62 was a 60-year-old plant superintendent of Plymouth Citrus Products Co-op, in nearby Plymouth.

Is your father still living?

A. Yes, he's retired now.

Q. He would be quite well along by this time -- he'd be 72, I guess.

It says here that you and your brother moved back and forth between Cartersville and Orlando until 1939; when they moved permanently to 815 West Princeton, where astronaut Young spent his childhood.

A. That's right, by golly.

Q. Then you stayed on through school, and finished school there?

A. That's right.

Q. Then you went to Georgia Tech. How did you happen to go to Georgia Tech?

A. I had an NROTC scholarship.

Q. That would have been right after the war, wouldn't it?

A. '48.

Q. '48. Well, you must have had some mathematical or engineering ability.

A. Oh, yeah. I loved airplanes, still do, and wanted to be an aeronautical engineer.

(135)

Q. So you took some sort of test to get the scholarship, or how do you get the scholarship, do you remember?

A. We took some kind of of competitive examination, as I recall. It's so long ago I can't remember what they consisted of. There were aptitude tests and mathematics tests and language tests; if you placed high enough in those the Navy gave you a physical and gave you a choice of any one of 52 colleges and universities that you could go to. And I was looking for a good engineering school not too far away from home, and Pop said that Georgia Tech was the best. But I was just lucky to get there.

Q. Now this says that you majored in aeronautical engineering at Georgia Tech and graduated second in your field. Is that accurate?

A. Yes.

Q. Who was first, do you remember?

A. Bill Schliss (sp?).

Q. Who's he?

A. He has a lot to do with guidance and control on the Space Shuttle out at Downey, California.

Q. He works for North American Rockwell, does he?

A. Yes.

Q. How do you spell Schleich?

A. I hate to -- S-C-H-L-E-I-C-H, but I wouldn't be too sure. I'd have to check that.

Q. Sure, I --

A. You could call out there and they could tell you right away.

(157) Q. Well, you must have seen quite a bit of him during the time since you came here.

A. He was working on the Saturn II -- he's quite a fellow. He was working on the Saturn II during the Apollo Program, as I recall. That's something else you might check.

Q. Well it finally came out all right, but it had a tough road for a long time, didn't it?

A. Yes, it did.

Q. All right, did you finish second in your class at Georgia Tech, or second in --

A. No, just in the aeronautical engineering class.

Q. And while you were an undergraduate you were contributing articles to the Tech engineering magazine?

A. Yeah, it was a convenient way to get published and make money at the same time. Not much money.

Q. Oh, you did get paid?

A. Oh yeah.

Q. Then you went aboard a destroyer for a year and then to Pensacola.

A. That's right.

Q. My god, they've got a pretty good reporter here. And you didn't even know about this?

A. No. ^{Q.} His name is Dave Howell. He got it from your family and teachers, apparently. There are pictures of a couple of your teachers.

A. Yeah, that's Miss Reeves and Miss Thomas, certainly is.

Q. They're quoted in a lot of this. Also, it says your brother Hugh is a Baptist minister.

(175)

A. He's a missionary.

Q. But this time he was studying in Germany. Where's he a missionary now?

A. He's in Japan, teaching the Japanese to speak French. He's kind of a remarkable fellow.

Q. Is he older or younger than you?

A. He's about a year and a half younger.

Q. Where did he go to school before he went to a seminary?

A. He went to Stetson, and Duke I think. I'm not sure about Duke, but I know he went to Stetson for awhile.

Q. In Japan? Still for the Baptist Church?

A. Yes, I'm not really sure what his job is, or how those folks are organized. But he's teaching school over there in the university, and teaching the Japanese to speak French -- which means, of course, you have to know both Japanese and French and be able to work back and forth. Pretty tough way to make a living.

Q. Quite a linguist...You went to Pensacola and, what do you stay, 18 months there? That used to be the -- then where were you assigned first?

A. In Jacksonville, in ^{Flight} ~~Fire~~ Squadron 103. That's at Cecil ~~Beale~~ ^{? Field}.

Q. You were a little bit late for the Korean War, weren't you?

A. Yes. When I was on the destroyer we were in Korea. It's just as well.

Q. Well, you were married in December 1955 at St. Mark's Episcopal Church in Jacksonville.

A. That's right.

Q. How many children did you have?

- (200) A. Two.
- Q. How old are they now, they must be grown up by now.
- A. Sandy's 17, Johnny's 15.
- Q. You and your wife were divorced, what, two or three years ago?
- A. Yes.
- Q. And you're remarried. What's your second wife's name? I don't have that.
- A. Susy.
- Q. What's her maiden name?
- A. Feldman.
- Q. Where's she from?
- A. St. Louis.
- Q. Did you meet here here or there?
- A. Out here, yeah.
- Q. All right, you went to a squadron in Jacksonville.
- A. Yes, that's correct. All that's right in that thing, pretty much. I shortened it as much as I could . It used to be a whole bunch of pages more, but I figured the folks wouldn't want to bother reading all that stuff.
- Q. Then you went to the Test Pilot School in '59.
- A. Right.
- Q. At Patuxent.
- A. At Patuxent River.
- Q. And then you were assigned as a test pilot in '62.
- A. Until '62. We worked about three and a half years -- it was a really good tour for me.

(219)

Q. You were selected in a class of nine astronauts. Had you known any of them before?

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A. Well, at Weapons Test I worked for Jim Lovell. Pete Conrad taught me in the Test Pilot School. Dick Gordon I knew -- he was in the next bunch -- from operations out at Miramar. And of course I met him at Patuxent when he was there. And I made a cruise in '48 with Tom Stafford, when he had a lot more hair, in a midshipman cruise.

Q. That's before he went into aviation too.

A. Yes, he went to the Naval Academy.

Q. I know.

A. But I didn't remember that until we got in the program. We didn't recall those -- he looked a lot different then.

Q. Well, you knew, you'd met almost all the other eight.

A. No, I didn't know --

Q. Armstrong.

A. I didn't know Neil, I had heard of him. I didn't know White or Jim McDivitt or Frank Borman or Elliot [See]. I hadn't met any of those fellows.

Q. You didn't apply for the first astronaut program, did you?

A. No sir, I was aboard ship on the Flying Crusaders off the "Forrestal" when they were picking astronauts the first time, and I didn't, I had no idea they were even doing it. We were all wound up in what we were doing, and being out in the Mediterranean we were away from everything, and that news was generally speaking one page long.

Q. Mike Collins tells how he didn't make it in the second group. Dr.

(243)

Gilruth said he hadn't had enough experience or something. So he went out and got a lot of experience.

A. I don't know how they decided. The last 32 guys in that bunch were all very fine gentlemen, and they could've picked any of them and they wouldn't have gone far wrong.

Q. Well, apparently they did pick up quite a number of them.

A. Yes they did.

Q. It's amazing to me look up the record and see how many people didn't make it on the first go-around, but did later. Lovell was one, for instance. Lovell missed out on the first selection of astronauts. And I think Conrad did too, I believe Conrad missed. It shows if you keep on trying --

A. Persistence pays off, it does indeed.

Q. When you were undergoing all the tests, were you pretty certain you were going to be selected? Were you surprised when you were selected?

A. As I say, I don't think they would have gone far wrong if they'd picked any of those fellows. My impression of all those fellows is that there were really qualified to do the job. And I was mighty pleased, yessir, I really was. It was something I wanted to do personally in the worst way. I think that the space business is something that's really going to do something for this country and the human race in the long run. I said that when we had a press conference back then, and I still believe it. Nothing I've seen has changed my reasoning one little bit.

Q. In spite of the fact that the center of attention isn't on the space program as it was you still feel the same way?

(265) A. I'm more sure of it than ever. There's just no doubt about it. Space is such a unique environment: there are so darn many things people can do up there that we haven't thought about doing before, that it's going to pay for itself. Communications satellites are just the tip of the iceberg as far as making space a really remarkable place. Some of the things that can be done with metals up there that have never been done before, as the Skylab guys showed. Shoot, it will be remarkable the kind of advanced technology that will come out of that, that sort of thing. And just about the time the country and the world get around to needing them, too.

Q. Along those lines: on the plane I was reading this piece in the Wall Street Journal. Pretty interesting -- it's a review of a book.

A. "The Next Ten Thousand Years"? I saw something about that the other day.

Q. I hadn't seen it before.

A. It's mighty hard to go beyond about five years in predictions. Ten thousand years is really something. Yes, I saw the review where he has taken Jupiter apart. I don't know if Kepler would go along with that.

Q. You were the first one in the second group to make a flight.

A. Yes.

Q. Tell me something about Gus Grissom, as you saw him.

A. I think old Gus was a really hard-working fellow, hard-playing too.

He did everything in while everybody else was in the military. A really good man to work with. In terms of getting a job done, he knew what it took. We spent -- I forget what it was -- 40

Grissom
1968

(296)

hours in spacecraft tests in the report, but it was more like, it must ^{been} have [^] three or four hundred. There was plenty of times up at McDonnell when we stayed in that spacecraft all day and all night. The way they checked out the first one, they'd put in a system, check it out, take it out again, put in another system, check it out, take it out again. Then they'd put the bunch of them in there together, play them together, take them out again. And that kind of attention to detail -- we rode in the vibration test, ^{they load} ~~we load~~ the thing up and shook it with us sitting back there in the middle of it. First altitude ^{altitude} ~~attainment~~ test up there. We got to participate in a complete run-through of that whole spacecraft. Got down to the Cape, fired the engines on the pad, we were sitting there firing the engines. And back in those days that was really the key way to find out just how the spacecraft operated. We didn't have these -- we had simulators, we had the Gemini mission simulator. But it was coming along -- like you'd expect in those days -- kind of slow. So we had to go in there and do all this nuts and bolts stuff -- nothing glamorous about it, just plain "get in there and do it."

Q. The spacecraft was, then, in effect, your simulator.

A. Well, it was a real machine. You learned how to operate it, what its idiosyncrasies were by being right there when it was doing it. On occasion we've done it again -- first spacecraft on Apollo was in some respects the same kind of thing. And I suspect the Space Shuttle will be about the same kind of a learning thing. The things you find out are that what everybody designed to be a normal operation the spacecraft wouldn't quite operate that way. It'd be normal, but its

(320)

perimeter?

normal operation would be a little different than what we predicted in our preliminary *judgments*. And those kind of things you sort of need to know so you have -- well, they call^d these tests systems "assurance tests": you assured yourself that it operated correctly.

CASSETTE IS TURNED OVER.

Q. Now, on your Gemini flight you got a great deal of publicity out of your corned beef sandwich. I understand that Wally Schirra put it into your flight coveralls.

A. That's the rumor. I don't remember how it happened, exactly, to tell you the truth, just what the mechanism was back at the time. That was such a minor part of the Gemini flight that it received a lot more than it deserved. You know, three orbits -- Gu^s did a complete test of that spacecraft. There was 12 systems in it and he checked every one of them and every control mode and every operation of it. It was really a good engineering test flight of the vehicle. We checked all the systems. That sandwich was just a two-minute interval in the whole five hours and 54 minutes. I'd hate for it to get warped out of what it was.

Q. Actually I'm not paying any attention to it. It was remarkable to me how much attention it did get at the time. Dr. Gilruth got called up before a congressional committee -- or rather, he was testifying at the time and --

Agency?

A. The Congress is pretty smart. They saw that as a symbol of guys doing something that the AEC didn't know they were doing, and they wondered what else was going on. *on Gemini 3* We had pencils on there that cost a quarter,

(351)

maybe, and then had ^{later} qualified pencils; to run them through the kind of qualification you need to qualify a pencil it runs the cost up something fierce. The Congress saw that, and they were incensed about that too. I don't much blame them.

Q. They were latching onto something that people could understand.

A. You think, if a guy's paying that much money for a pencil, how much is he going to pay for a fuel cell? I don't blame them, I'd have the same nervousness about the situation.

Q. Well, then, your next flight was Gemini 10.

A. With Mike.

Q. Mike Collins. And this one worked out as a pretty good mission. The EVA wasn't completely satisfactory, but --

A. No, I thought it was -- you always overschedule those things on purpose, and I said before and after I didn't think we'd be able to accomplish all the things we set up to do, but we did just about everything, as I recall (it's been so long ago).

Q. Mike lost his camera, which he said he was embarrassed about.

A. Oh, that was a tragedy. We had four cameras to take pictures of Mike while he was -- three in the vehicle and Mike's; and one of them in the vehicle had failed already, and the formation flying took so much work in that pressure suit that I couldn't let go of the controls long enough to get the camera to take pictures of Mike. And I know that if I had got some decent pictures it would have truly immortalized him, it would put him up on Mount Rushmore somewhere. But I just couldn't let go of the ship to do it. That was a remarkable thing, rendezvousing with an Agena that had been up there for three months. We didn't know what kind of condition it would be in. People had predicted

(379) it would be rotating at rates of -- tremendous rotation rates, we wouldn't be able to get within, very close to it at all. We got up there and it was just ^{vertical hold} sort of slowly, very slowly rotating, probably in a gravity gradient mode. I didn't know that such a mode existed. People had predicted it would be either not rotating or rotating some or real fast, in which case -- and that was really a tough thing Mike did, flying on the end of that umbilical and grabbing hold of the Agena where there was no hand-holds, and yet he just went right over there and did it, on about the second try, I think it was, it's been a long time, and pulled that meteorite package off there. That was a really impressive feat. If I had gotten just two or three pictures, it would have really been something. But I couldn't turn loose -- kept thinking about that I ought to do it. But we were operating within two or three -- sometimes closer than six inches from -- two or three feet average and sometimes closer than six inches from that Agena. And I just didn't feel like I should let go long enough to take a picture.

Q. No, I can see why you wouldn't. But altogether it was a very satisfactory --

A. Yes, it turned out very well.

Q. Then of course you were selected for Apollo 10. I think the crew was announced about six months before, wasn't it?

A. I don't have any idea.

Q. I can look it up.

A. You know, we were on the backup crew of Apollo 7 and were working on Spacecraft 101 out at Downey for three or four months. And then

(423) they had the Apollo fire, that sort of put a stop on everything we were doing. But Tom and Gene and I were working as a crew for a long time. And I don't know whether they had announced it officially or not back in those days. I doubt it.

Q. But you were together as a crew even before the fire.

A. Oh yes.

Q. I didn't realize it was that far behind. How did you feel about being put on as command pilot rather than as LM pilot? Had you preferred always to be on the outside seat?

A. No, I think command pilot was a good seat. There's no bad seats in space flight, contrary to everybody's theory.

Q. These selections go back so far. Mike said in his book that some lady asked him why he didn't walk on the moon. He said "well, it goes back to Spacecraft 14, lady." She didn't know what the hell he was talking about, of course. But something that happened on Spacecraft 14, which was the 014 which was the Block I companion to 012 that caught fire on the pad. It finally never flew at all -- 14 never flew. They went straight to 101.

A. That's right.

Q. But something or other that happened to Spacecraft 14 caused him to get switched from the outside seat to the center seat, and he said that's the reason he didn't walk on the moon. He said "lady, I can't explain it to you, you'll just have to take my word for it."

A. I don't have any feel for that interchange of how people were getting switched around back in those days. It seemed like there was more work than any one guy could handle as it was, whether he was on a crew or not. And everybody was doing it, I thought.

(455)

Q. Did you ever have any hope that 10 might have been the first moon-landing crew? There was a possibility, wasn't there?

A. Well, they had a different, they didn't load the ascent stage but half full, and the radar in there was modified to run certain tests, so you couldn't have -- to take data -- I don't think there was any opportunity to land 10 on the moon. It wasn't part of the overall mission plan. Our job was to go and do the circumlunar mission. And I think that was the correct thing to do.

Q. You mean lunar orbit?

A. Yes. And I think if you had to do it again that'd be a prudent thing to do again with the same gear.

Q. Of course there were some people -- I believe including George Mueller -- who felt 10 could have been skipped. But it certainly yielded enough information to justify it.

A. Shoot, I'm not qualified to say whether we could have skipped it. I just feel better about having done it, having gotten that experience. We went right over the same site that Apollo 11 was going to, and we got pictures of the site, and also discovered by our tracking that we were being translated by those mascons -- it seems like it was four or six miles south of the footprint. So if they had landed on 10, without any real way to process that data back to see where that landing site was, the rendezvous might have been very interesting. I won't say you couldn't have done it, but it could have been a very interesting rendezvous, and maybe a very fuel-consuming one, I don't know.

Q. Actually, mascons had been discovered only a few months before.

(482)

A. Yessir, and they were continually updating the lunar orbit model -- the gravitational model of the moon -- in the mission control center. In terms of the total program, I think everything was going about as fast as it could. It's really difficult to give a fair judgment of that, because I really wasn't qualified to say about the mission control center or anything, but in terms of crew training we were taking big steps every step of the way. We were checking out the lunar orbit checkout of the lunar module in just the same manner as the Apollo 11 guys did so they could then worry about the process and going down and landing and getting back up again. I don't know, unless we slipped a launch some, that we could've learned all that in that short period of time. There's really been a mouthful for everybody. You sort of stair-stepped it by doing it in mission phases. We felt like we were really pressing it; and I thought then for the Apollo 11 guys to pick up and learn and worry about the lunar landing and lunar surface operation -- which in itself was a big step forward: suiting up the backpack in that vehicle and getting out on the surface and doing the things they did was a big training step. Training on the lunar landing training vehicle -- I just don't see how we could have done that much additional training and made it in the time-frame. It would have been really something, if we had done it. I think we were just right on the ragged edge of our resources all the way along that business. I don't see how we could've done it any sooner, unless we had -- it would have been tough. It was pretty tough as it was, in retrospect. From a training standpoint we just would have had difficulty crowding all the other information in. Now

(515)

after Apollo 16, of course, you'd say it would have been a piece of cake to do it on there, but if you look back on it, man we were really pushing. Working late nights. There wasn't anybody, everybody was, you know, working about twelve hours a day. And the thing about a launch is that there's so much counting on it you get closer and closer in and people, if you let them do it, can give you a twelve-hour day every day of the week. Because they want their money's worth, and I believe they ought to get it. That's the fascinating business about it -- you want to take as big a steps as you can take, and yet not over-extend yourself. Of course that's operational judgment, and I think NASA made the right decision to do that.

Q. Well, the Apollo 9 crew, of course, apparently had worked too hard. Remember they all came down with colds and they had to postpone the launch three days or something like that.

A. Yeah, that was a tough mission too. No question about it.

Q. Well, the first people who flew in that damn contraption were as brave as the first man who ate an oyster.

A. [Laughs]. LM 3 was quite a vehicle. Lot of test and checkout problems, that they solved.

Q. Apollo 10 worked out pretty smoothly, just about as planned, didn't it?

A. Yes, I think it worked just like we planned it.

Q. The number of anomalies was much smaller than it had been before, as I recall.

A. I don't remember what the anomaly report looked like.

Q. I haven't seen it for some time. After Apollo 10 what did you do?

(542)

You weren't assigned to a new crew for quite ^While. There's a lot of gap between 10 and 16.

A. I backed up Apollo 13.

Q. Yes, that's right. Did you ever think there that you were glad you weren't the prime crew?

A. No, I always wanted to be on the prime crew. I didn't really think that. In retrospect it was certainly a harrowing experience. That's what they pay the guys for.

Q. How long -- you were right in mission control when the trouble was going on.

A. Yes I was.

Q. How long did you think there was a real danger of losing the crew on 13?

A. About the first half day. I don't remember, to tell the truth, how long I did. I was really concerned when I was watching those oxygen bottles -- one of them had zero and the other one leaking down. I was really concerned that we had done a bad thing there, lost some good men. And then as things kept going on we kept building momentum, it was good. Kept doing things, checking procedures and verifying everything.

Q. Of course the LM had been designated as a lifeboat some time before.

A. Yes, the procedures had all been worked out on Apollo 10 -- they worked the math models|simulations that demonstrated that it had reserves to do that kind of a mission. A math model type sim in the mission control center. Well I didn't know anything about that. They had run simulations and consumables analysis that showed you could use the vehicle that way. They'd done that kind of preparation already. I'm sure

(572)

glad they had. The kind of things they did on Apollo 13 -- the burn with the descent propulsion system, and the mid-course corrections using the cusp of the earth to point the vehicle through the ^{optical} ~~site?~~ sight had been subjects of mission techniques briefings as far back as Apollo 8, when we were worried that we might lose the guidance system and they devised this procedure if they did lose it to be able to make mid-course corrections with the command module without any guidance system -- which would certainly have enabled them to save that mission if they'd had a propulsion system and no computer or inertial system.

Q. I don't understand quite how they could do it. How narrow is the band that you've got to hit in order to make your landing? Sixty miles wide out of --

A. Yes, it's only 60 miles wide. You mean in terms of altitude? It's more like 20 miles for a safe capture.

Q. Is it? I didn't realize that.

A. But it's remarkable with orbital trajectories: as long as you put any bit of the velocity in the right direction with the ground tracking they can tell you how much you need to correct. The Pacific Ocean is a mighty big ocean, and you may not land in terms of latitude and longitude where you want to land, but you're going to hit that 20-mile corridor, by doing repeated mid-course corrections you can target yourself right for the middle of that corridor. And that's what they did on Apollo 13.

Q. Well, people have always spoken with horror on, suppose you skip back into space and get into orbit around the sun.

(604) A. That's right, that's an interesting problem although, you see, you design your trajectory so that the first thing you do is worry about capture. We did centrifuge runs over here that showed you could get captured just by maintaining your ^{lift} ~~list~~ vector -- maintain your ^{lift} ~~list~~ vector up until you get peak G's, and as you're coming off peak G's you just roll the vehicle over on its back and pass through, by time it was around two minutes and 12 seconds -- by that time you would be sub-circular, there wouldn't be any chance to skip ^{out} ~~back~~. So you're going to come in then; you just hold a moderate G-force. As a matter of fact the seat-of-the-pants method will land you within 50 miles of the ship, because boy, there isn't much of the kind of lift that you've got on a -- on an Apollo spacecraft there's not too many places you're going to go if you hold the right G-force. So those kind of problems everybody worried about, but as you went further and further along you found more and more ways to handle it. We ran it on centrifuges, we ran it in simulators. And some of these fellows got really good at it -- they could take this relatively crude entry monitor system and land within the accuracy of the system, which was 12 miles from the ship, just doing bank reverse banks -- which is very crude in the sophisticated things we're talking about on the Space Shuttle these days. But if you could put the Shuttle back within twelve miles of where you want it to be you could land it anywhere, because it's got that much footprint capability.

Q. Footprint capability? I don't think I've heard that term before.

A. The ability to operate in an atmosphere. If your footprint is 12 miles, within 12 miles of an airfield you can certainly land a vehicle

like the Shuttle there.

(635)

Q. I remember during Apollo 13 -- I flew down from Washington, didn't get here until the morning after it happened (Tom Paine went off and left me, he was going to give me a lift but didn't have my home number, so I didn't know about the accident until five o'clock in the morning) -- I recall in mission control (I stayed in mission control until it was over, the landing took place) there was some talk at one time that it might be necessary to land in the Indian Ocean. Do you remember that?

A. No sir, I sure don't. There were two or three trajectories that they talked about doing, as I remember, and it's really hazy. One of them that really speeded everything up I think put you in the Atlantic somewhere; and another one probably put you in the Indian Ocean and the other one put you in the mid-Pacific landing area. And as it went along they just got more and more confident that the place to go was where they'd intended to go in the first place, in the Pacific.

Q. You may remember that the Russians had a ship in the Indian Ocean. They volunteered to lend a ship for whatever assistance it might have. I can look that up.

A. I'll tell you who would know -- Gerry Griffin. He's up in Washington, D.C.

Q. I know. I saw Gerry the other day. In fact I have two long interviews that have just recently been transcribed with him. But somehow we didn't get into that. I talked to him about Apollo 13 but not about the Indian Ocean possibility.

A. Glynn Lunney or Gene Kranz would know.

(666)

Q. Yes, I'll get it straightened out with one of them... Well then, all the time from 10 to 16 you really were assigned to a crew, then. You were never rattling around loose.

A. No, I haven't been able to rattle.

TAPE IS TURNED OFF, RESUMES IN MIDDLE OF ANOTHER DISCUSSION.

Q. That's the galley.

A. The galley proofs?

Q. I've to write a review on it [Carrying the Fire].

A. Gee I'd like to see that one of these days.

Q. Well he has nice things to say about you, which he doesn't have for everybody.

A. I don't see why not.

Q. Here he's got a line or two about people. He says "John Young: mysterious, the epitomy of the non-hero, with a country boy's 'aw shucks, 'aint nothing' demeanor which masks a delightful wit and a keen engineering mind." But he has a lot of references here, and he has quite a long account of your Gemini flight together.

A. It's remarkable the details that these fellows can remember in their books, I'll say that. They really are good. I learn a lot by reading the books, they bring back things to mind that -- the technical details that have long since escaped me. Some of the technical detail in those books, it's like it's instant recall.

Q. Which ones are you thinking of now?

A. Well, Jim Irwin's book, and Buzz's book -- just remarkable attention to detail, and correct, very accurate.

Q. Well, maybe you ought to write a book; you've flown almost more mis-

sions than anybody else.

(697)

A. No, I don't think I should. You write the book, Bob.

Q. I hope to get one finished one of these days. They're doing a picture history of Apollo -- I think I mentioned it to you. The GPO's going to publish it.

A. I'd like to get a copy of that. I bet the pictures --

Q. It's going to have quite a lot of text, too. Fourteen chapters of 3,000 or 4,000 words each.

A. The only fault with pictures from space is they don't do it justice. That's why I think a vehicle that'll allow people to get up there -- just the average person who wants to get into space will be able to do it. Once you get people up there looking around, the uniqueness of the view is just remarkable. We haven't developed a camera that can do it justice. The satellite pictures that they take -- the weather satellite has a very good camera. But it's not in color and it doesn't show the contrast like it really is, doesn't really reveal all these three-dimensional things that the eye picks up. It's just unfortunate that they can't come up with -- it would take a monstrous development to come up with something like the human eye. We are a long way from doing that still, I think, although I've seen cameras that come very close. They're so big and heavy it would take something like the Space Shuttle to get them up there. But we're going to do that, and it'll be remarkable.

Q. From the first Gemini flight you were really on a crew, weren't you?

A. Pretty much.

(726) Q. But you had more time to train for 16 than for any other mission, didn't you? The center was so much greater.

A. Yes we did, they'd spread out the launch center. After Apollo 13 Charlie and Ken and I were sort of working on Apollo 16, unofficially. I guess they announced us about a year before the flight, but we'd been working on it for a good deal longer than that, doing the background training that you need to do for that kind of a mission. Geological training and experiments training and the lunar scientific experiments package training.

Q. You had Swigert for awhile, didn't you?

A. He was on Apollo 13 backup crew, yes.

Q. Whose place did Mattingly take?

A. Ken was on our crew, on 16.

Q. I know he was, but he was originally on 13.

A. He was on 13, and he helped with all the rescue --

TAPE BLANK, SIX SECONDS.

Q. We didn't miss much there.

A. They put Jack and Jim and Fred in the simulator, and for two days threw everything in the book at them in terms of malfunctions and in terms of nominal and off-nominal and two- and three-order failure cases. And the training program was such that you couldn't tell the difference in the way Jack operated and the way Ken operated. Just couldn't tell the difference, it was absolutely amazing, I wouldn't have thought it. But it just shows that the standardized training format that everybody was getting into really worked. That really made it possible for us to make that swap. It was a real tribute to

(762)

the standardization of training techniques, the standardization of checklists, the standardization of all the operating procedures.

Q. What's Ken doing now?

A. Ken is the head of the Space Shuttle group here in the astronaut office.

Q. Swigert's up in Washington now.

A. Jack is up there in congressional liaison, working for Tiger Teague.

Q. After 13, how much change took place in your training for 16? Of course you had a great deal of reworking of the service module, putting in the extra tank. But insofar as your training for the mission.

A. Of course for 15, 16, and 17 that was a change that was already being programmed into the vehicle, pretty much. Now they made some changes, redid the plumbing a little so you couldn't get in this kind of -- put more check valves here so if you had a line failure you couldn't leak all your oxygen out, which I was all for. And they made several other changes. But the vehicles -- 15, 16, 17, what we call the long-duration lunar module and the service module with the instrumentation package, scientific instrumentation module, those were already on the boards and had been built, and of course we were running spacecraft tests on them. So we were all learning a new phase -- just the delta that we'd concentrated on during Apollo 13 (landing on the moon and taking off and going into orbit) -- we learned this new delta, operating this scientific instrumentation module in the command-service module and doing the extended lunar surface operations with the rover, the long-duration explorations, extended backpack, and several sort of unique

(801)

experiments -- the telescope, the cosmic ray experiment and the active seismic experiment that we carried on the mission. We just concentrated on learning those deltas; it's just like everything else, of course we had to know all our other procedures for the whole business, so we continually practiced those all along, but we just learned the delta.

Q. Well 16, of course, was the crowning event of your Apollo career, wasn't it?

A. It was a good mission. There are no bad space missions.

Q. Except for the time you kicked the wire out.

A. Well, that was an accident, it certainly was.

Q. That was too bad.

A. You know, in a pressure suit you can't see your feet. On Apollo 17, whether they could see their feet or not they couldn't kick the wires out. They really did some good engineering work.

Q. They did something to make the wire more secure.

A. Yes, it was in there. You'd have had to pull the lunar science package across the ground before you'd have gotten rid of those wires. I wish we'd had that for Apollo 16, because that would never have happened to us. That was a good experiment, it was really a tragedy to lose it.

Q. It was a heat flow experiment as I remember.

A. Heat flow.

Q. It was one ^{of} those things that you can't predict. So many things in engineering, it seems to me, cannot be fixed until they've been tried. No matter how ^(much) theory you have. Nobody ever thought of making that wire so secure it couldn't be pulled out, did they? Did you ever hear it discussed?

(834)

A. Yes. It was a calculated risk we took. In all the training exercises -- I know that accidentally when we were training, at one time or another we pulled out every wire in the training gear. And everybody said "well, that won't happen to you in the real thing." And it had been recommended long before then to fix the wiring, but it was just a calculated risk. If you really were slow and careful you could avoid doing it. I was in too much of a hurry.

Q. I thought that you and Charlie Duke had some pretty good lines, some pretty good vaudeville comedy on 16. Did you practice any of your comic lines beforehand?

A. I don't remember any of that.

Q. Well, to sit in mission control and listen to it, I think it was the most entertaining of all the --

A. Well, we were, we really enjoyed being out there and doing that surface exploration. That was a really interesting and fascinating trip.

Q. I remember Charlie Duke was saying, "god, almighty (he sounded like Gomer Pyle), John, you wouldn't believe what's over here!"

A. He's a really good man.

Q. Very amusing man. What's he doing now?

A. As I told you, he's working over in Shuttle Integration Branch, in the program office, for Owen Morris. That's under Bob Thompson.

Q. Yes, I remember you did mention that... In making out these mission reports, do you read the whole thing before it goes to press, or just the parts that apply to the spacecraft or your part of the mission?

(878)

A. I generally read the whole mission report, but I'm not sure before it goes to press if -- I can't remember if we read Apollo 16 or not. The press of time -- after Apollo 16 we got assigned Apollo 17, so --

Q. That's right, you were backup to 17.

A. Yes, and we probably just didn't read it as we usually would, I don't think. The pilot's report, we write that and edit it and help with that part of it pretty good. But there's a whole bunch at NASA whose job is in integrating those reports; in fact they're about to come out with a post-Apollo mission report, which must be that thick, summarizing all 11 Apollo missions. And it's written so that people who operate future spacecraft programs can learn something from what we learned on those kind of programs. It's going to be a very valuable piece of writing.

Q. I'm going to have to get a copy. Who's in charge of --

A. Don Arabian, Test Operations, would be the fellow who would know when that's coming out.

Q. I'll ask about it.

A. He's got some good writers over there integrating that thing. And it's tough, because 11 missions -- it's very difficult to compile 11 missions so that they follow through, but they're working at it.

Q. And of course you'd have to relate one to the other to make sense, I suppose.

A. I don't know how they're doing it; they told me the other day that they wouldn't try to relate them in any order, they were just giving information. It's going to be very interesting to see how it comes out.

(920)

Q. Let me ask you this, John: in the matter of the exploding oxygen tank on Apollo 13, as an engineer what's your view of why it wasn't discovered that the switch was overloaded, that a change had been made which overloaded the switch?

A. I have no idea; I never thought about it, never looked into it. I read the post-flight findings, and I read the accident report.

Q. As I recall the switch was able to carry 25 [sic] volts, and it was changed and had to carry 65.

A. But nobody changed the documentation or something.

Q. There was a lapse there somewhere. But this isn't something that you paid any particular attention to.

A. No sir. It's that kind of minute attention to detail that allows us to do Apollo in the first place. And I'd say that it's absolutely magnificent that with as many moving pieces of machinery and as many different kinds of things that we did, and knowing just how many parts there are that have to work right on one of these contraptions -- shoot, an occasional one? I have no way to explain it other than to say that, shoot, it's darn good that they caught as many as they did. They catch thousands of them before the mission.

Q. Of course you have to work from a stack of papers a foot high.

A. There wasn't anybody that wasn't conscientious about their job, I believe that. It was an accident, just the kind of thing where they probably had the procedures all set up and somehow it just got away from them. It's that meticulous attention to detail that does a program like Apollo. I don't think anybody's going to do it again for a long time. It's really challenging.

(973)

Q. Where were you when the spacecraft was being rebuilt after the fire? What did you do during that long period? It's about 22 months without a flight.

A. We were working on the design of the hatch and participating in the evaluations of the backpack, the pressure suit --

Q. This is because you were on the backup crew for Apollo 7.

A. And working on Spacecraft 101 and establishing the design requirements for this removable probe that we had to take in and out, and the drogue, and making that compatible with the operation in a pressure suit, and making it, doing all the crew interface development that we had to do. And of course we were participating in materials meetings and things of that nature. The sort of day-to-day engineering work recovering.

Q. You spent a lot of time at Downey during this?

A. Spent a lot of time there. Frank Borman was running that operation out there -- krackerjack job. A natural-born manager, really good.

Q. I remember. He sure has got a tough job now, though, trying to bring --

A. Yes. [Laughs]. He's doing it, though.

Q. How you can bring an airline back into profit columns.

A. It's tough.

Q. It's rough nowadays. Well, he's a remarkable fellow... Before we leave Apollo 16 -- I've stayed a long time, I certainly appreciate it -- what are your thoughts in retrospect about 16?

A. Well, I'd like to do it again.

Q. Do you still expect to fly again someday?

A. Well, hopefully, if the Space Shuttle comes along I'll still be able to fly. Pass the physical and keep doing my homework.

(17)
(1017)

Q. Let's see, the first Space Shuttle flight can't be before '78, can it?

A. Right now we're saying we're going to do ALT approach and landing tests in '77 and the first vertical flights in '79 or '78, right in that time-frame.

Q. Well, are you going to have to select some new astronauts to feed into the pipeline before then?

A. In the past the best way would be to wait until you're about ready to go operational -- say two years before you go operational with the Space Shuttle -- and then pick numbers of qualified pilots and co-pilots and payload specialists and mission specialists so that you can get fellows who will be around NASA for a long time. These days they're talking about six flights per year per crew, so you want to select qualified individuals who will be around for some period of time so that NASA gets a return for their investment in their training -- which is going to be similar to what we had to do for Apollo. It's going to be involved in simulators and extra-vehicular activity and payload operations in much the same way as -- an all-up Shuttle mission will probably make a report that day if NASA chooses to write it.

Q. For this one you really will need test pilots, won't you? Even more than --

A. It sort of looks that way now, Bob. What the government ought to do is wait and see how the vehicle comes along. If it's very reliable, a very straightforward and honest flying machine you can use professional pilots very easily. What I'm saying is: in the best interest of the

(64)
(1064)

government they ought to wait until they see how it comes along and see how reliable it is and how unique the pilot involvement is in it, and if it requires test pilots then we ought to get them; if it doesn't, then we can get professional. In any event they're going to have to be professional fellows, I'm sure of that. They're going to have to work the same as the Apollo crewmen worked: they're going to have to work hard and they're going to have to learn new systems, because -- we have triple redundancy in the shuttle, but they're all very involved, very complicated systems. Nothing that anybody who's dedicated can't learn to operate, but it's going to take the kind of guy who'll do the job right whenever he's under some pressure. In the best interest of the government I think they ought to pick the best guys. You know, we're talking about \$10½ million a flight on this vehicle -- but you've gotta get them back every time to make your cost per flight reasonable.

Q. Well, that's very interesting...Let me ask you one more question: some of your language that came out during Apollo 16 wasn't intended for public consumption, as I recall.

A. Stuck mike switch.

Q. Oh is that right? Well, you didn't think this was for the onboard stuff that was recorded and dumped later, the DSEA?

A. No, it was a stuck microphone, it really was.

Q. It was off altogether?

A. It wasn't even inadvertent -- you know, we have a setup where you can inadvertently transmit, but that wasn't it; it was just a plain old stuck mike switch.

Q. Did you get much reaction?

A. Quite a bit.

(101)

(1101)

Q. Most of it unfavorable, or some of it tolerant?

A. About 50-50.

Q. Was it?

A. Yessir.

Q. When Gene Cernan said "son of a bitch" on Apollo 10, he told me once that his most comforting reaction was from a man from Arkansas, who called up and said "Mr. Cernan, wasn't Snoopy a male dog?" He felt better after that one.

A. Yes, his was a problem of inadvertent -- the system they were operating on, the fellows didn't realize it was going out on the radio. Mine was just a stuck mike button.

Q. Well, I certainly am grateful to you for this time and your valuable --

SO AT 1600 HOURS ON THIS DATE, THE 28th OF JUNE, 1974, THE INTERVIEW WITH CAPTAIN JOHN YOUNG, USN, NOW CHIEF ASTRONAUT, ENDS. IT'S ALL ON TAPE EXCEPT FOR ABOUT FIVE MINUTES WHEN THE THIRD SIDE, THIRD OF THREE [CASSETTE] SIDES, FAILED TO START TURNING. BUT THAT BIT WAS NOT OF MUCH CONSEQUENCE. THIS IS ROBERT SHERROD SPEAKING.