

NASA HEADQUARTERS ORAL HISTORY PROJECT

ORAL HISTORY TRANSCRIPT

EDWARD C. "PETE" ALDRIDGE, JR.
INTERVIEWED BY REBECCA WRIGHT
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WRIGHT: Today is May 29, 2009. This oral history interview is being conducted with Edward C. "Pete" Aldridge, Jr. in Arlington, Virginia, for the NASA Oral History Project. Interviewer is Rebecca Wright, with Sandra Johnson. Mr. Aldridge has spent more than 40 years in positions relating to fields of aerospace, both in the public sector and private industry. We thank you so much for sitting down with us today and being a part of this project. We'd like for you to please start by sharing with us how you first became interested in the field of aerospace, and how this led to your work related to the Department of Defense.

ALDRIDGE: My earliest recollection of my interest in aviation and mechanical things seemed to be about maybe around six years old. I loved to build model airplanes. From that point, I was always interested in airplanes. I could pick out every airplane that was ever built, so from that early age, I just had this interest. It so happened my father had a pilot's license. Right after the war, the Second World War, he actually bought a used trainer from the government surplus and modified it and restored it. It was an AT-6 trainer. They called it the AT-6 Texan at the time.

I was about ten years old. My father took me up in the airplane. The airplane had a tandem seat, a pilot in the front, then the passenger in the back. I was so small at that time, I couldn't see over the edge of the cockpit, so he put me on a telephone book and sat me in the back seat, strapped me in, and I could see over the top of the canopy. That right there, my interest in flying just was accelerated, from age ten.

At age 15, I decided I wanted to be an aeronautical engineer, and as so happened, I wanted to go to Texas A&M [University, College Station, Texas] because they had one of the better aeronautical engineering schools in the area. I think it's rare for high school students to know exactly what they want to do and where they want to go to school at age 15, but I set on that path, and I did it. I went through it, and I got my bachelor's degree in aeronautical engineering from Texas A&M, and I got selected to go to graduate school at Georgia Tech [Georgia Institute of Technology, Atlanta, Georgia], and I got my master's in aeronautical engineering at Georgia Tech.

Then right after that, I entered into the aerospace industry at Douglas Aircraft Company in California. That started my career in the aerospace business. Through a series of promotions, I got transferred to Washington in 1965. In 1967, Douglas Aircraft Company got into deep financial trouble and was directed to merge with another aerospace company, and they merged with McDonnell. So McDonnell Douglas was formed in 1967, and I was in Washington, and they asked me if I would be interested in going back to California.

I liked Washington. I'd been here a couple years. I got offered a job to go to the Pentagon. That's where my government career started. I got very much involved in missiles and space and aircraft, space tracking, air defense, all the things that resulted in my continuing in that career.

WRIGHT: I guess it was just ever-changing at that point with all different types of ideas and technologies proposed, being at that time in the Cold War.

ALDRIDGE: Very much so. 1967, the Cold War was at its peak. I went in the Pentagon, and I got involved with missile defense. Well, about 1968, the Soviet Union and the United States decided they were going to get together in arms control discussions. That didn't happen in 1968 because Russia invaded Czechoslovakia, so the arms control discussions were postponed for a year. But because of my expertise in missile defense—and that was the key part of the arms control, they call it the ABM, Anti-Ballistic Missile Treaty, the ABM Treaty—my expertise fit that mold.

So in 1970, I was asked to join the arms control discussions as an adviser to Paul [H.] Nitze, who was then the representative of the Secretary of Defense. From 1970 through about '72, when the ABM Treaty was signed, I was in and out of the arms control negotiations. Sometimes I attended the negotiations themselves, either in Helsinki [Finland] or Vienna [Austria]. Or I was part of the backstopping group in Washington supporting the forward-based advisers. For those two years, I was very much involved with that.

In '72, after the ABM Treaty was signed, I had decided that I'd spent five years in the government, and I didn't see myself as a career civil servant at that point. I was offered a job at LTV [LTV Aerospace Corporation] in Dallas [Texas]. Here's a side story which gets involved with personalities. When I first went to Douglas in 1961, I was sitting right next to a young engineer. He'd been there about a year or so ahead of me, but we were working together on all kinds of advanced missiles. This young engineer's name was Norm [Norman R.] Augustine.

Norm went to the Pentagon. I moved to Washington November 1, 1965. Norm moved from California to Washington November 1, 1965. He went to work in the Pentagon. I went to work for Douglas. Then, when in '67 I went into the Pentagon, Norm and I were working together again. In fact, we wrote the first paper, the development concept paper, for a missile

warning satellite. That missile warning satellite is called the Defense Support Program, which is operational today.

Norm left in '71 and went to LTV in Dallas. Well, in '72, he asked me to come work for him at LTV in Dallas, so I moved to LTV. But then OMB [Office of Management and Budget] called and said—we want you to come to Washington. We're starting a new program called Management by Objectives.

They wanted me to work in the National Security Group, which I did. I worked there for a year, mostly on international problems—the Export-Import Bank [of the United States]. Then in 1973, [James R.] Jim Schlesinger, who was Secretary of Defense, asked me to come back to the Pentagon and be the Deputy Assistant Secretary for Strategic Programs, so I moved over to the Pentagon in 1973 and stayed there for a couple years.

Well, [President Richard M.] Nixon had resigned by then. Jerry [Gerald] Ford was now the new President. He and Schlesinger didn't get along too well, so President Ford elected to name his chief of staff as the new Secretary of Defense. That was Don [Donald] Rumsfeld. I think it's probably 1975 when this happened. Don Rumsfeld had a deputy chief of staff, a young guy by the name of [Richard] Dick Cheney who moved up to be Ford's chief of staff.

Well, that was my first introduction to Don Rumsfeld; I worked directly for Don. I ran the Program Analysis and Evaluation organization, which basically put together the entire defense budget. We worked there until [James E.] Jimmy Carter won the Presidency. Of course, Don left. I stayed on for about three months, but then I decided I wanted to go somewhere else. I stayed in Washington and worked for a company called the System Planning Corporation [Arlington, Virginia]. I was one of their vice presidents for strategic programs.

In 1980 when Ronald Reagan won the Presidency, Reagan had asked Don Rumsfeld to put together a list of people who could come back into the Pentagon. Don called me and said, "Would you be interested?" I said, "Sure, for the right job." Well, they offered me a job as Under Secretary of the Air Force.

The job of the Under Secretary of the Air Force is somewhat unique. At that time, you couldn't say anything what it was, but it basically ran the National Reconnaissance Office [Chantilly, Virginia.] Also, the Under Secretary of the Air Force coordinated all the Air Force space programs as well, so that position handled most of what we called the black and the white space world.

I think that's probably the introduction of my relationship with NASA, which was the strongest at that particular point in time. Even though I knew about NASA, had followed the space program for a while, I didn't have any direct relationship until I became Under Secretary of the Air Force. Since I was the guy responsible for launching spy satellites, I was interested in what the proper launch vehicle would be. In 1978, President Carter had made a decision that the Space Shuttle was going to be the exclusive launch vehicle for the country for getting into space, launching civil, commercial, and military national security satellites.

Obviously, I was very interested in the performance of the Shuttle. It's interesting that right before that, I was involved with the discussion centering around what was the partnership that was going to exist between the Air Force, (which had the responsibility of launching military satellites) and NASA. What were the conditions of that so-called partnership? Well, the conditions were that the Air Force would build another launch facility at Vandenberg [Air Force Base, Santa Barbara, California] for launching military satellites off the Shuttle. They would also develop an upper stage that could be put in the Shuttle for launching satellites to

geosynchronous orbit, which NASA at that time didn't have any requirement for. So that was agreed that the DoD [Department of Defense] would be investing in those two programs, as well as purchasing rides on the Shuttle, which had a certain price; then of course, obviously supporting the basic technologies and stuff that would go along with it.

At the point when this was sold, the flight rate for the Space Shuttle with five orbiters, which was the plan, was to fly 55 flights a year. That seemed exorbitant to us at the time, but that was what it was sold on. That 55 were all the commercial, civil, and DoD satellites that could possibly be imagined. The Shuttle would fly them all, so that required them to fly 55 flights a year. That meant the turnaround time was every seven days; they'd have to turn a Shuttle around for the five orbiters, about every seven days. The cost was going to be one third of the cost of what it would cost the Department of Defense to fly on expendable launch vehicles. In theory the idea of having a fast turnaround, a cheap ride to space—oh, and all the orbiters would meet all the DoD requirements for size and weight and things of that nature.

WRIGHT: All of these requirements and agreements had been set in place before you moved into that position.

ALDRIDGE: Before I moved in. This was in 1978. I believe Jimmy Carter wrote a presidential directive that the Space Shuttle is going to be at—and what we were told is that he didn't write the actual 55 flights a year, but it would meet all the demands of all the users. That was 1978. Well, in 1981—in fact, in April of 1981 we had the first Shuttle flight. At that point, it was clear that some of these statements of capabilities were going to be way lacking, that the turnaround time was not seven days, it was much, much more than that. Of the five orbiters, only four had

been bought, two of which were so heavy they couldn't meet the DoD demands. We only had two orbiters that could meet the DoD weight and size demands. The cost was not one third of the cost of an expendable; it was more likely equal at best, and possibly much higher than that.

In April when we first started to see this, we began to worry that well, maybe we were not going to meet the demands of the Department of Defense. We had a requirement for 12 flights a year from the Shuttle. Our estimates of what we were seeing as turnaround time said you might be able to fly 24 flights per year, but 12 to 18 was more likely the number. If it was going to be at the lower end, or even at 18 per year, we were going to take 12. We had a hard requirement to fly 12 flights. This meant the civil and commercial space business was not going to be as robust as we thought it was going to be. We with national security priority could preempt the launch of a commercial satellite in order to get a national security satellite up. It was highly uncertain whether or not any of the commercial or civil programs were going to have much viability if the orbiter flight rate was in the 12 to 18 per year.

So we started getting worried. Well, in 1983 I decided—it was my decision—looking at the flight rate, what our demand was, what the performance of the Shuttle was at that point in time—by then we had flown four flights, and much more robust data that was showing it wasn't going to be anywhere close to 55 flights per year. NASA was still touting it was going to fly 24. It could fly 24 with the four orbiters. That was [NASA Administrator] [James] Jim Beggs who made that announcement.

Well, I decided we ought to not terminate expendable launch vehicles. In 1978, we were to start phasing down the expendable launch vehicles, because we were no longer going to use them. All the production of the expendable launchers showed an end date that was going to be probably in the 1986 period. We were flying three different [expendable launch system]

vehicles, a Delta, an Atlas, and a Titan. The production lines were showing a tail-off of those. All the satellites that we had that were flying on the expendable launch vehicles, because the Shuttle bay was different and the loads on the Shuttle and the acoustics were so much different that we had to redesign all the national security payloads to fit in the Shuttle bay and to take the Shuttle environment. Since we were paying by the linear foot rather than the diameter, all the national security payloads got short and fat, because that's how they charged us.

Side note. If you now look at the Titan IV, you'll notice it has a great big bulbous nose. That was because as we went from the Shuttle back to the expendables, we had to put the new satellite on the old booster. So it was short and fat, and that's why you have a big bulbous nose on the Titan IV.

In '83, I went to the Secretary of Defense and said, "I believe we should not terminate the production of expendable launch vehicles until the Shuttle can prove itself, that it can fly at least 24 flights per year, and it can meet the performance demands of the Department of Defense, therefore we should keep a number of expendable launch vehicles continuing." He agreed, went to the President [Reagan], and the President agreed, and so we put together a budget to send to Congress that would continue the Titan production line for five more years, and we would buy two vehicles per year for the critical payloads that the Titan launched. We also converted an old Titan II ICBM [Intercontinental Ballistic Missile] to a space launch vehicle that could launch the very small satellites that we didn't want to have to try to integrate a little satellite into the Shuttle bay. It should not launch small satellites all by itself, it was far too expensive. But we needed weather satellites launched, so the Titan II launched from Vandenberg. We converted 14 of those to launch weather satellites. Our plan was laid out, and NASA fought it.

WRIGHT: Very bold statement, when so many of the people who were in the development stage of the Shuttle said that so much of what they wanted for the Shuttle, for the orbiter, was dictated by the Air Force, not what they [NASA] wanted.

ALDRIDGE: Well, see, it's very interesting. It is correct. The Shuttle bay was designed to fit the Manned Orbiting Laboratory [MOL], which is a program by the Air Force that was going to put men in space in a reconnaissance satellite. The other issue was that they wanted to have the ability to abort from orbit, so if you got into orbit, had engine failure, and you couldn't reach full orbit but had to come back and land, you wanted to have enough maneuverability in the Shuttle to maneuver about 1,000 miles off from where you were to where the launch site was by the time you made one orbit. So those wings had to be built on it.

The Shuttle bay size and the launch weights were dictated by the Department of Defense. But if they could not fly the Department of Defense payloads, then the economic rationale that was dictated why we wanted the Shuttle and why we wanted it to be the exclusive launch vehicle went away. Without the Department of Defense, they had no Shuttle. They had to accommodate DoD requirements. That's sure enough what happened.

But in the idea of continuing the expendable launch vehicle program, NASA got very upset about it. Jim Beggs in particular, because he saw that as a move by the Air Force—and the Air Force basically represented the Department of Defense, the Air Force was responsible for launching all Department of Defense satellites, which included Navy and Air Force and NRO. He got very upset and tried to, through his contacts with the Congress, to get Congress to deny us the funding for the continuation of the expendable launch vehicles. He testified he saw it as a ploy of the Air Force to remove itself ultimately from the Shuttle and go back to all expendable

launch vehicles. Therefore, the result of the Air Force and DoD going off of the Shuttle, in his mind, is it made it less viable for commercial launches of satellites, which were then planned to fly on the Shuttle.

So he, through his congressional contacts, continued to stress that this was not the right thing to do. We had quite a battle between ourselves and NASA. Finally, the national security adviser, I think it was Bud McFarlane contacted the Secretary of Defense, and NASA, and me—I represented the Department of Defense at this time as Under Secretary of the Air Force—to get together and come to a compromise. So we did.

We met in the Old Executive Office Building. Jim Beggs and I. Jim kept saying, "You guys can't get off the Shuttle," and I said, "We will sign up that we will buy at least one third of all the missions the Shuttle can fly in any given year, we'll guarantee at least one third." In fact, we were showing probably half, because Jim was saying still 24 flights a year. At that time, we were saying 12. But that's another story. So we said, "We'll buy one third of them, guaranteed." He said, "Okay, but I also want you to help us work on the next generation of launch vehicles." I said, "We'll do that." The Shuttle follow-on. We would determine what the fair pricing policy was at this particular time.

The reason for that, again I got to diverge a little bit. What was happening between the Air Force and NASA at the time was the Air Force had signed up with a certain set of interface requirements of their satellite in the Shuttle. If there were some things unique, like the clampdown mechanisms that were unique for that satellite against the Shuttle, the Air Force would pay for it. All other non-unique things in the Shuttle bay, that would be a NASA obligation, and therefore our pricing policy was based on the linear foot, any unique things associated with the satellite. Then other non-unique things, that was NASA.

Well, about every week NASA kept throwing these non-unique requirements over to the Department of Defense. It was angering a lot of people. We put in our budget a certain price to fly on the Shuttle, and all of a sudden NASA says, "No, the cost just went up 10%." This antagonism of the pricing policy and the antagonism of the expendable launch vehicle versus Shuttle had a very high tension rate between the Department of Defense, the Air Force, and NASA.

WRIGHT: Do you believe NASA was doing that because of the lack of funding support? Or do you know the rationale of why they kept sliding things over to the Department of Defense side?

ALDRIDGE: Yes. Because the price to fly the Shuttle was beginning to get known, and it was much higher than they anticipated. The price was going up, the launch rate was coming down, which made the price per flight go up even more. It was just a spiral they were in. They were trying to do everything to minimize the impact.

But in the final analysis, we agreed to redo the pricing, start some technology for next generation space launch vehicle that could meet DoD and NASA needs. NASA would stop arguing against the expendable launch vehicle production. In 1985, that agreement was signed by the President [Reagan]; it went all the way up to the President to sign. That was the new launch policy and relationship between the Air Force and NASA.

Well, then January 1986 rolls around, and *Challenger* blew up. This issue of a complementary launch vehicle to Shuttle went away. The whole issue went away. It's also interesting, in 1985 we lost a Titan. Titan blew up in August of 1985. Then *Challenger*.

Then in April of 1986, another Titan blew up. So the issue of our backup was Titan, we now have two launch failures with Titan and one launch failure with the Shuttle. It was some pretty grim days for the space business, or the capability to put heavy payloads into space was nonexistent.

Interesting, we found out that the two Titan launches can be almost directly tied to the fact the production line was going down and the good people were leaving, and the quality control got shaky. They left one of the boosters out in the rain one day without cover—they would never have done that. People were just starting to phase out. You could almost say that the two Titan failures were directly associated with quality control, that you always get when you get at the end of a production line.

WRIGHT: Well, this is about the same time though that you somewhat became involved on a personal basis.

ALDRIDGE: Well, yes, I have a lot of parallel things going on here. Right after Jim Beggs and I agreed to this compromise, Jim then decided it would be appropriate to try to reestablish this partnership between the Air Force and NASA. At that time, of course, they had teachers training to fly in space, and Bill Nelson who was a congressman then; we had [Edwin J.] Jake Garn, a Senator. So Jim decided that it would be appropriate to have an Air Force official fly. Well, they asked the Air Force official according to the pecking order. The first person on that list is the Secretary of the Air Force. So Jim asked Verne Orr [Vernon Orr], the Secretary of the Air Force, would he be interested in doing that. Verne Orr at the time says no, he would not,

because one, he was older, I think he was in his 70s at that time, and the more appropriate person to do this would be me anyway.

So Beggs offered for me to fly. Since the Air Force responsibility was to build Vandenberg Air Force Base, the SLC-6 [Space Launch Complex-6] there, it would be very appropriate for the first [Air Force] official to fly out of Vandenberg. So we set up for the mission. It was actually STS-62A, because [if the number was] 1, it was Kennedy and the 2 [indicated a launch at] Vandenberg, that's how they were numbered.

In December 1985 I go to Houston to start astronaut training for a flight that at that time was scheduled for July of 1986. I was in Houston going through training. [Robert L.] Bob Crippen was going to be our commander, who was the pilot on the first Shuttle mission. Guy [S.] Gardner was going to be the pilot. Crippen the commander, Guy the pilot. [Richard M.] Mike Mullane, Jerry [L.] Ross, Dale [A.] Gardner were going to be mission specialists. [John] Brett Watterson and I were going to be payload specialists.

We had two payloads. One was the SIRIS [Sputter-Initiated Resonance Ionization Spectroscopy], which was stationary. It stayed on the Shuttle. We were launching another one called Teal Ruby [P80-1, AIP, 888-Early Warning Satellite], which was a military satellite for detections of aircraft from space, and we were going to launch that. We were going to fly out at near polar orbit. We were going to fly at a 72-degree inclination, which man has never flown before. Of course, that's why you fly from Vandenberg; you can fly north and south. For military missions, you want to cover the entire Earth. Well, you don't do that by flying east and west, so you fly north and south. We were actually going to fly over the poles on every orbit, which was unique. It was exciting to have a completely new mission.

The other thing we had to do was to "soup" up the orbiter. We had to have a higher velocity in the orbiter, because if you go east and west you get 1,000 miles an hour velocity by the rotation of the Earth. If you go north and south you don't get 1,000 miles an hour, you get zero. So what you have to do, you have to get another 1,000 miles an hour out of the orbiter to get it into the right orbit, which meant you had to build new solid rocket motors, and you had to soup up the Shuttle main engine. It had to go I think to 109% of its rated thrust, and the new solids were what we call filament-wound cases, they're not steel, they're fiberglass. We were developing those, because those were required for the DoD orbits from Vandenberg.

WRIGHT: When you say we, you're talking about NASA and the Air Force together developing those?

ALDRIDGE: It was NASA developing that. But obviously, we—being the Air Force—were monitoring that, because we had to make sure the launch pad fit the new design and new power. We had to make it safe as we possibly could.

So I was in astronaut training. Started in December, went through December, January. Then of course January 28, the Challenger blew up. We, our crew, were actually at Albuquerque, New Mexico, going through training with one of the payloads that was going to fly, actually one of the sensors that was going to fly on the orbiter. We were all there because Sandia [Sandia National Laboratories, New Mexico] built the payload, and we were at Sandia going through the design and how to make it work in orbit, things of that nature. We stopped and went in a room to watch the Shuttle fly, all seven of us.

I guess like all things, you never forget exactly where you were and what you saw at the time. We saw it take off. Crippen was sitting in front. I was in the back of the room and I saw this explosion, and thought, Jesus. Then I was waiting for the orbiter, as we all were, to come out of the smoke. But as soon as that explosion occurred, Crippen obviously knew what it was. His head dropped. I remember this so distinctly. He knew exactly what happened. Or anticipated it much more so, I think, than the rest of us did. Anyway, we obviously stopped the training and headed back to Houston.

So happened that I had gotten to Albuquerque by a commercial flight, but the other astronauts, I guess four of them had flown up in the T-38s [Northrop T-38 Talon]. Well, when Challenger blew up I called the Air Force and I said, "I need a flight. Get an Air Force airplane." We got a little T-39 [North American Saberliner Buisness Jet] to get us from Albuquerque back to Houston.

At that time, I didn't want the other guys flying. So I said, "We need seats for seven people," because I didn't want Crippen in an airplane, because he was devastated. He had flown with Scobee [Francis R. "Dick" Scobee] before, and Judy [A.] Resnik as well, I think. They'd been on flights together. So anyway, he said, "No, I'm going to fly, I need to think a little bit," so he wanted to fly, so they did. They flew back. But I got an Air Force airplane to take the other three of us back to Houston. Of course, then we sat around there for a while. What do we do now? We thought well, maybe the orbiter will be grounded for a year, and then we'll get back on training, but in the meantime obviously our flight is at least postponed for a long period of time.

I made plans to go back to Washington and we'd reconvene when our flight would be reestablished. What we didn't realize at the time is now we had three orbiters, and you start

looking at the manifest, and now we had three orbiters and we had the production line going for the Titan IV. So we had an expendable production line intact. We really didn't need to buy another orbiter to make the DoD missions because we could fly those on Titans. We began to think, why do we have Vandenberg anymore, the SLC-6, we have the Titan pads there. We have ongoing production line. We have only three orbiters. Clearly they can't meet all the demands of DoD at this point in time.

The decision began to be obvious that we weren't going to fly Vandenberg, and we weren't going to put those heavy payloads on the orbiter. Then you start looking at the other DoD payloads. Of course then they said, "Well, with only three orbiters, the commercial viability of the orbiter starts going down." Obviously the cost goes up even more so.

When I got back to Washington, it was my decision to put Vandenberg in mothball status. The programs to soup up the Shuttle to meet the Vandenberg requirement no longer was needed, so those were canceled. We increased the production of the Titan IV from the ten, two per year. We bought 41 of them, because we saw continuation. The longer the Shuttle was down, we said, "Well, wait a minute. What about the GPS [Global Positioning System] satellites?" They weren't going to go on the Shuttle. We were going to launch three or four of them at a time. Well, with the Shuttle down, we started having GPS satellites sitting on the ground. We want to get those up, so we did a competition that said, "What is the best expendable launch vehicle to fly GPS?" The Delta II won that.

Then as time continued to go with the orbiter down, which ended up being down three years, the next critical payload was the Defense Satellite Communications System that provided the global communication for all the military. That was the next payload. We did a competition to find the best launch vehicle for that one, and it came out the Atlas was the winner. At the end

of all this, we had 41 Titans in full production. We had now Atlas starting production. We had the Delta II continuing production. All of a sudden, we had a viable expendable space launch industry.

We still had a few payloads that had been designed to specifically fly on the orbiter, and we flew those. The last one flew in December 1988. That ended any discussion between the role of expendables and Shuttle. We had, in fact, what we'd call now a mixed fleet strategy. The Shuttle is used for the thing it's uniquely designed to do, and that's where man is required. Where man is not required, such as the DoD satellites, you don't expose men in that mission when it can be flown better off an expendable launch vehicle.

WRIGHT: Looking back on that decision and those circumstances, how do you feel that decision impacted the Shuttle's future, knowing that the DoD pretty much took itself out of that relationship?

ALDRIDGE: Well, I think we realized—in fact, we put military people on the Shuttle, and I started a military man in space program to see what could humans, do in space that might be unique to the military mission. We hadn't found one. In fact the MOL program, the Manned Orbiting Laboratory program, was canceled, because we couldn't find where having men in that satellite was beneficial. In fact, it was harmful. You had to put a life support system in it. The cameras—that now we can talk about—that were on the satellite, people moving around in the satellite created "noise." You didn't want anybody around. So you look at the cost and the complexity, so the program was terminated.

We hadn't found what other role men could do. In fact, I was going to fly and take a pair of night vision goggles with me just to see what it would look like from space looking through night vision goggles, see if there was anything unique about that. But we had a program, and people could come in with proposals of technology, demonstrate the military applications of using men in space. We never found one.

WRIGHT: I know your training period was very brief. Did it give you any insight to—

ALDRIDGE: Oh, it was the most exciting time of my life. It was terrific. Not only dealing with the crew, who were all terrific people. All were seasoned, in the sense that the only two people who were rookies were the two payload specialists, Brett Watterson and I. Of course, Crip had gone up four times. No, I guess Guy Gardner was, he was also a rookie, but he ended up going up four times later. But no, it was exciting. The idea of dealing with the people, getting into the bowels of the orbiter. Of course we couldn't, the payload specialists couldn't touch anything.

In fact, I kidded around. I think [Gerald D.] Gerry Griffin was the center director at that time. I was kidding him that as far as NASA is concerned a payload specialist was the lowest form of human life. But it was also unique in the sense that I was paying for the flight, and yet I was a payload specialist at the same time. They didn't know how to deal with me.

But going through the simulators, they had a simulator out in California. We flew out for that, went through a training program, essentially two full days simulating a two-day flight. We were actually going to be gone three days, but we did a 24-hour simulation. Day and night. We took breaks just like we would go sleep, and then we'd come back. We had a seven-man crew.

There were going to be three people per 12-hour shift, and then Crip was going to go back and forth between shifts.

It was exciting. I look upon that period as one of the highlights. Learning how to eat, learning how to go to the bathroom. I got fitted out in all the astronaut suits and stuff like that. It was exciting. To this day, I contact people that I met during that period of time. I was disappointed I didn't get a chance to go.

But well, what happened after that, I came home, back to Washington, went back into the Pentagon. I had decided that it was time for me to leave. I'd been there for five years as Under Secretary. In the meantime, they had replaced Verne Orr with another secretary, a guy named [Russell] Russ Rourke. He'd been there since three or four months, I guess four months. I came back and I started looking around for another job, but then in March, one night about 5:00, phone rings and my secretary answers, comes in and says, "[Caspar] Cap Weinberger is on the phone," who's then the Secretary of Defense. That was March of 1986. I knew Weinberger was in Korea. It's unusual that he'd be calling me, I know he's in Korea, which is at least 12 hours difference, it's 5:00 in the morning or something.

So I said, "Yeah, Cap, this is Pete. Where are you?" He said, "Well, I'm in Korea." I said, "I thought I knew that." He said, "Well, what's happened is the Secretary of the Air Force Russ Rourke has indicated he is going to depart." I said, "Really? He's only been here four months." He actually came in December. This was March. He'd been here four months. He said, "Yeah, he says his wife is ill and that he's going to quit and he has other priorities now." I said, "Okay, well, all right." He says, "I've talked to the President, we'd like for you to replace him." I said, "Oh." He said, "Yeah, would you think about that and let me know what you

think?" I said, "Cap, I've thought about it. For about three microseconds." So he asked me to become Secretary, I accepted, and I was sworn in in June.

At the same time, I was running the National Reconnaissance Office [NRO]. How could I do that and be Secretary of the Air Force? Well, I had a very good Deputy Director of NRO. The Under Secretary that was coming in was a guy named [James] Jim McGovern. He was coming over from the Senate Armed Services Committee. He was general counsel. He had no technical background at all, so I didn't see him taking over the NRO. I talked to Cap Weinberger and I talked to [William] Bill Casey, who was then the CIA [Central Intelligence Agency] Director, who appoints the NRO Director, that I thought I ought to keep the job as the Director of the NRO since I had a really good Deputy in Jimmie [D.] Hill, who was there. They agreed. So I continued to run the NRO, and continued to have interface with NASA making sure that the payloads that they did fly, very few at this point in time, were okay.

I stayed as Secretary of the Air Force until the end of the Reagan administration. In December of 1988, I had served my eight years and decided it was time to move on. I did, and I got offered a job as the president of a new company, a new company for McDonnell Douglas. What they decided to do is they had the McDonnell Douglas aerospace division, and they decided to break it up into space, missiles, and electronics. They formed three different companies—smaller companies, but more focused on those three things. So I went to work as the president of the McDonnell Douglas Electronic Systems Company in 1988 and stayed there till 1992.

In 1992, the Aerospace Corporation offered me a job to become president and CEO of the Aerospace Corporation, which was really more involved with the things I was interested in, which was space. They're the space systems engineering arm of the Air Force, although now

they have become very much part of NASA. In fact, I notice today that the new Augustine Commission, the president of Aerospace, Wanda Austin, is one of the members of that, which I think is an outstanding selection.

WRIGHT: During that time period, before we get too far, when you became part of Aerospace, you spent some time on a couple of panels. One was the first Augustine Panel. Then one you chaired [Commission on the Implementation of U.S. Exploration Policy]. Then of course one with [Thomas] Tom Stafford [President's Moon-to-Mars Commission]. Can we spend some time talking about how you were—

ALDRIDGE: Yes, let's go in reverse order. I remember I was involved with Stafford's effort, but more of an adviser. I didn't participate in the panel in a very active way, but I do remember a couple of the things that he did, one of which I thought was, even today, I think it's a fundamental necessity.

One of the things they came up with was that if you could go nuclear propulsion, it would save you enormous amount of money, billions of dollars, and probably enables an Earth-to-Mars mission. I think I remember the numbers right. I thought this was the most profound statement they came up with, is that going with chemical propulsion from the Earth to Mars takes 247 days, something of that time scale nature. Then when you're on Mars, you can't stay very long, because you've got to get back, and it takes you 247 days to come back. Or you wait till the next closest approach orbit, which is another 500 days. If you had nuclear propulsion, you'd make the trip in 60 days. Then you can stay as long as you want, because you have enough power to come back in 60 days.

That to me says if it's a 60-day mission, you've enabled the mission to occur. If it's 247, it's marginal and you can't take as much stuff. That's the one thing I remember about that panel, but I was not in a day-to-day activity, I was more of an adviser, and I read some of the draft reports.

That's the one thing I remember. I keep harping on that today. Maybe this Moon-to-Mars thing is still viable and nuclear propulsion is still the enabler. It saves billions of dollars because of the weight and all the other things. Like if it's 247 days, think of all the life support you have to carry with you. If it's 60 [days], it's a different game.

Now the Augustine [panel] was much more intense. We had reviews. In fact, I have his report at home; I started to go back and look at it to remind myself what we did. Basically, we tried to put a foundation around a space program that we thought was real and feasible. But I don't remember all the specific recommendations that we made during—

WRIGHT: Well, one that I thought was interesting is that you put the highest priority as the science program.

ALDRIDGE: Yes. That was a lot of discussion as to where the emphasis should be. We all agreed. It gets back to the other panel that I did. The space mission has to be sustainable over—like Moon-to-Mars—a 40-year program. If it's sustainable, it's got to have some beneficial statement about something that it's providing the people as a result of the program. It's interesting. If you're going to do robotic exploration, there's some benefit. But over the long term, focusing on the science and the technologies that result therefrom was something we felt that would sustain a program over a longer period of time than a deemphasis on science.

In fact, this report that I talk about it, the one that I was the chairman of, 40 years, that's ten presidential administrations, that's 40 congressional sessions, and it's two generations of Americans. How do you sustain a space program that's different than the military? With the military programs you have an imperative—national security; I need intelligence; I've got to communicate; I want missile warning; navigation system. I want all those things that support our military. There's not that imperative in the space program, in the civil space program. It takes personal leadership. Well, unless you can say there's some long term beneficial impact that helps Americans, I think that beneficial impact has to be science and technology. The motivation of kids to enter science and technology because of the exciting things you're doing.

Also, it's got to be sustained because there's some tangible benefit you see resulting from the space program. We know there's all the spin-offs. Creation of good jobs. That's what you have to focus on. There's some really good jobs if you're pushing the space program. All the people say, "Well, wait. I can fix the welfare problem with the money being used for space." This is fascinating. Over the weekend I was with some friends of mine, and they were asking me this question. I said, "Well, how much do you think we spend on space? Not military, but just the civilian?" I said seven tenths of one percent of the federal budget. Everybody said, "Whoa." I said \$16 billion. I guess it's up now closer to \$18 billion hopefully. I said, "You could cancel the space program and not make a dent in the welfare problems or health care or any of those other things." I think the theory that they were trying to follow was well, if I could just cancel the space program, I can go work on education, I can go work on health care, I can go work on welfare, dadadadada. The space program, interestingly, is the one area that does all of those at \$16 billion or \$18 billion a year. It stimulates that kind of activity. Doesn't detract from it.

To answer your question, the science—because of the long term benefit that science provides. That is why the priority was set the way it was.

WRIGHT: The other one was that, especially during that time period and what we're facing today, the focus on environmental measures from the Mission to Planet Earth resolution. Information that came out of there. Why you felt or your group felt so—

ALDRIDGE: Well, I think incidentally it's changed. It's moved in a slightly different direction. Because of the recent President in 2004 [President George W. Bush], the mission is different. The mission is not this way, it's that way. But I think, as I recall, our feeling was that that's one of the other tangible benefits that you see. Understanding our environment to the point where we can take advantage of it way ahead of time in trying to make sure we can fix it. So that was, as I recall, our notion. That was the recommendation.

WRIGHT: I found too where you chaired a Space Policy Advisory Board to review the space launch strategy from 1991. The report that you issued a year later was the proposal of Spacelifter. Can you share with us some of that, and how that would have affected the civilian space agency as well?

ALDRIDGE: Well, the proposal was that the cost of space, the launch, was extremely high, because basically we're launching a few Titans, we're launching a few Atlases, we're launching a few Deltas. If we could figure out a way to build a production line where all of those launch vehicles were based off the same core, we could have a production line rather than say ten, ten,

and ten, 30, rather than ten per year on each production line, 30 per year. The cost goes down dramatically. The concept I had is that let's think about building something that looks like a core. Then we have a dial-a-capability. We can do solid rocket strap-ons if we want to. The basic core could be a Delta. If you do a couple of strap-ons, you've got an Atlas. If you do two cores together, then you got a Titan. So the concept of Spacelifter was to get the production rate up pretty high, and get the cost way down, and then have this dial-a-capability.

It so happens the expendable launch vehicle program we have today is very much the same thing. It evolved, but you look back, it is basically new technology. It's a new launch vehicle. The Atlas V and Delta IV are based on cores.

WRIGHT: When you were developing this idea, did you see it as a possible follow-on generation for the Shuttle as well, to be able to have the civilian space agency use it?

ALDRIDGE: They could use it, yes. In fact, they do use Deltas today. Not only the space agency, but the commercial field. Because at 1991, we were predicting a very high commercial launch rate. In fact, that's why we got into the difficulty we are in right now. The launch rate was predicted to be so high that after Spacelifter, we had another study that was done by [USAF Retired General] Tom Moorman, who came up with the Evolved Expendable Launch Vehicle [EELV]. The reason for keeping two contractors going was the launch rate was predicted to be so high; you could justify two contractors building roughly similar vehicles. But now that went away. That launch manifest rate went away to the point where we really couldn't justify keeping two companies alive. You know what they've done now. They've merged. They're now the United Launch Alliance, which Boeing and Lockheed merged together. Now they're using

essentially one overhead structure rather than two. It's saving the Department of Defense \$150 million a year. So that's where we've come from. But yes. Those vehicles should be used by commercial as well as civil. That was the concept.

Now, we didn't man-rate so they could launch the capsules, but they almost are man-rated. The number of piece parts that exist in the EELV programs, it's significantly below what the number of piece parts were in the old expendable launch vehicles, so the result is the reliability is much higher. In fact, they've never had a launch failure with the EELV, which I think is astounding. Usually the first launch you have of a new launch vehicle, you get a failure or get close to one anyway. Early in the game, they have spectacular reliability. I know Norm [Augustine], when he does his study, that's one of the issues. Is there a way that we can use the EELV program at least to deliver cargo? Whether or not we can deliver humans is another story. But I know he's going to look at that.

WRIGHT: Well, I'm going to take you back. Where we left off your career is when you moved over to the Aerospace Corporation. Because at that time, it was federally funded as a research and development center—

ALDRIDGE: It still is.

WRIGHT: This was a change for you, in the fact that now you were taking your ideas to this type of place of this type. Tell us what that was like.

ALDRIDGE: It was an adventure. Having run a for-profit center in McDonnell Douglas, then moving to a point where profit wasn't the motivation, quality was the motivation. We were paid by the Air Force. Maybe it might be interesting to back up.

Why was the FFRDC [Federally Funded Research Development Center] created? Especially the Aerospace Corporation? Well, the FFRDCs were created a long time ago. The RAND Corporation is an FFRDC. They had the Logistics Management Institute. In fact, ANSER used to be one. MITRE Corporation is one.

The problem was when the military space program was created, the people who were doing most of the engineering work in support of the Air Force was TRW [Thompson Ramo Wooldridge, Inc.]. Well, TRW was also in the mode of building the satellites. The Air Force felt this was a conflict of interest. You can't have the engineering group over here advising the Air Force as to what to buy, and then having the company they work for building the thing they told them to buy. So they said, "This is not correct."

What they did is, they created an independent group. They spun off the part of TRW that was doing the systems engineering for the Air Force. That became the Aerospace Corporation, whose purpose was to independently advise the Air Force. They cannot compete for contracts by law. Yet they can pay salaries equivalent to what industry can pay; they're not under civil service kind of rules and regulations or salary structure. They pay competitive salaries, but their objectives are aligned with the government's objectives. Buy the very best product independent of who is building it.

It put Aerospace in a unique role in advising the Air Force. Since they can't compete, companies can share information with Aerospace—the old TRW, now Northrop Grumman, can share information, Boeing can share information, Lockheed—knowing that that information is

not going to go among the contractors. They're not going to leak, because they're acting much like the government does. The contractors can in fact provide that information to the government. Aerospace is just sitting there with the government.

Because they can pay competitive salaries, they can get higher quality people, than the government could. We're now finding that most of the program management staff within the Air Force space program is made up by lieutenants and captains. Well, Aerospace people are in the colonel level in terms of equivalent such as experience and things of that nature. Most of them have advanced degrees. Two thirds of the Aerospace Corporation have masters degrees or above.

So you see the role of the FFRDC, in that case, is helping the government considerably. Yet, they know what's going on in each of the industries; they know who has the mature technology, who's doing the best quality work. When they make a cost estimate for what a satellite is going to cost, they have data from all the contractors, not just the one that's bidding.

It's a very unique role. It was fun because my objective was to provide the government with the highest quality service I could. Our goal was mission success. [It] wasn't profit. It was, put the satellite in the right orbit at the right time. That was the fundamental goal and objective of the Aerospace Corporation, to make sure that happens.

It didn't happen all the time. We had some failures. We had another Titan failure about that time. I sat on committee that looked at what went wrong, it was another quality control problem. People weren't paying attention. We lost a Titan.

So I stayed there. 1998, I looked at my schedule and I noticed that I was spending just about every week in Washington. When I thought about it a while, most of my customers were in Washington. I was having to come back to Washington to pay attention to what they were

doing. In order to come back to Washington, if I made an appointment with one of my customers, I would have to take a day and a half to get here. Then, given the government, sometimes the meeting would be canceled at the last minute. So I said, "Something's wrong here." I went to the board of trustees of Aerospace and said, "I believe my office ought to be in Washington. I can always come back to El Segundo and get a meeting, because I'm the boss. It's very difficult for me to arrange meetings in Washington, and take a day and a half, and have the risk of getting them canceled. Or if I really need to see somebody right now, I'm there. If I can get a meeting, I can do it. I'm also dealing with Congress. I can deal with Congress much better."

Congress at that time was attacking the FFRDCs as being overly expensive. This, of course, was being administered by the Professional Services Council, an organization in Washington that consisted of all the, what we call the SETA contractors, systems engineering and technical assistance—the SAIC [Science Applications International Corporation], the TASC [The Analytical Support Company], Booz Allen [Booz Allan Hamilton Consulting Firm] —all these companies who saw Aerospace as a competitor.

They wanted to eliminate Aerospace. They said, that "we can move in to do that," because we don't build hardware. SAIC does not build hardware, so we can play that role. They were saying, "It's unfair. We ought to be able to compete with Aerospace for that work." They were lobbying Congress with PAC [Political Action Committee] money, political action money that we didn't have. I was defending the role of Aerospace in Washington.

So I moved back here and from 1998 until I left Aerospace in 2001, I lived in Washington. But I was then traveling back to California; I had a hotel room right near the plant.

Then quick to 2001; that's another story. I was on a cruise. This is when George [W.] Bush won [the presidency]. My wife and I were on a Christmas cruise around South America. I guess in December we heard the news that Don Rumsfeld had been selected to be the new Secretary of Defense. My wife said some kind of expletive and said, "Oh, no," and sure enough, I got home, and there was a phone message, "Come and talk to me."

I went down and talked to him. He asked me to be the Under Secretary of Defense for Acquisition, Technology, and Logistics, which is basically—they call this the procurement czar. But it's more than just the procurement czar. It dealt with the Missile Defense Agency; it dealt with the Defense Advanced Research Projects Agency; it dealt with the Defense Threat Reduction Agency; and several others. There are five different agencies that we monitored, but we also worried about logistics, managing the Defense Logistics Agency.

I stayed there for two years. It's interesting that Don Rumsfeld, prior to his selection as the new Secretary of Defense, ran a space commission for the nation to try to decide what the DoD's national security space organization ought to look like. In the past the guy who integrated all the national security space activities was the Under Secretary of the Air Force. After I had left, a new Secretary came in and saw that he wanted the role of the Under Secretary to be more ceremonial, to take some of the load off of the Secretary. So they downgraded the past role of the Under Secretary of the Air Force to an Assistant Secretary of the Air Force for Space.

Marty Faga [Martin C. Faga] was the very first one of those. I thought that was a mistake, and it proved to be the case. An assistant secretary, even though a presidential appointee, does not have the same clout as the under secretary did. The decision process was more confrontational and debatable within the organization as a result of lowering it. His place at the seat of the table in the intelligence community wasn't quite the same as the under

secretary. So I think [it was] about that time, the uniqueness of the national security space program began to be eroded.

There was a lot of pressure to declassify the NRO. It was done. As a result of declassification, the oversight and attention given by Congress and by staff and by auditors increased dramatically. So the uniqueness of NRO, where you could make decisions quickly without all the fanfare, a very closely knit internal capability, started to deteriorate. It continued to deteriorate.

Well, when Rumsfeld's commission was held, they made a lot of recommendations, but one which was the critical one was to reestablish the Under Secretary of the Air Force as the integrator of the national security space activities. That recommendation, along with a bunch of others, came from Rumsfeld. Then he had to recuse himself from that particular activity, when he came to the DoD.

I came in, and he turned to me for the implementation of the commission's recommendations. I supported it strongly because it took the program back to its original integrated self. Didn't work out that well, I would say now, looking in hindsight. The reason is because all the other things I talked about, is a lot more oversight, a lot more people involved in the implementation of the national security space program as opposed to just the Under Secretary of the Air Force.

The other thing Rumsfeld asked me to do, he said, "I want you to think about how we're organizing the Missile Defense Agency." So I did that for him. I made it look like the old National Reconnaissance Office with unique decision-making authority, an organization that had very clear levels of responsibility and accountability to it.

In 2003, I decided that I had enough of the Pentagon and decided it was time to move on, so I retired in May of 2003. Then, of course, in January 2004 the President wanted me to run the Commission [on the Implementation of US Space Exploration Policy].

I was in Florida and I got a call. We bought a house in Florida just about the time I retired. We thought that I would be spending more and more time in Florida and less and less time in Washington. It hasn't worked out that way, didn't work out that way at all. Anyway, I was in Florida and I got a call from the White House from the Office of Science and Technology Policy, the OSTP. They said, "Well, the President is going to make an announcement about the future of the civil space program. He's going to form a commission, and wants to know would you be interested in serving on the commission." I thought about how the commission was going to be working for 120 days, and said, "Well, yes. Something that important I can probably contribute—yeah, I'd be interested if you want to consider me."

Two days later, I got a call that says, "We appreciate you agreeing to serve on the committee, and the President has agreed, but he wants you to be the chairman." I said, "Wait a minute. This is a different ballgame." Being a chairman and being just on the committee is something else. So anyway, I thought about it again and said, "Well, for something this important I can spend 120 days. I can give 120 days of my time to set the space program for the future. I can do that."

Then the guy called the next day, and he says, "Oh, by the way, the President is going to make this announcement day after tomorrow, and he wants you to be there." I'm in Florida, and I'm told, "We'll fly a plane down for you." That's what they did. They actually took one of the NASA planes, came down and picked me up and flew me back to Washington to participate in the ceremony. Then of course we then proceeded.

That commission was very interesting. A little different from the Augustine Commission that existed in I guess the '91 period. We had open hearings, five different public hearings. We went to Atlanta, New York, San Francisco, Dayton, and Washington. We invited people to come in and give us their views about what we should be doing in space.

The charter of the commission was not to challenge the President's direction. That had already been debated. Options had been looked at all the way from do-everything-robotic to do-the-manned-Moon-to-Mars, or focus-on-Earth. All kinds of different options. It had gone through the interagency process. The President decided, this is the mission I want to accomplish.

Our job was not to challenge the mission, but determine what was the best way to implement it. Again we didn't try to say, "Hey, forget about Moon, go back to Mars," that was all decided for us. We weren't going to challenge that.

We started the process with, how is NASA organized to carry out this new mission? Another question was, how do you sustain a mission like this. It's a 40-year mission, how do you sustain it? You got to have Joe Six-Pack say, "This is good for me," so we addressed that. Carly Fiorina, who was then at Hewlett-Packard [as chief executive officer], was the one who pushed this concept probably harder than anybody else.

Our first thing was sustainability, so we looked at how do we sustain it. Well, you sustain it by trying to show the benefits. You sustain it by showing periodic accomplishment. You can't wait 40 years to do just that. You got to do it a step at a time. You got to stimulate people's interest. You got to run a program that people have confidence that you're able to do it, not a lot of mistakes. You have to put together a program plan that has a lot of attributes that sustain itself over a long period of time.

Then we brought people in to tell us how to do these kinds of things. Of course, the guy who made the X-Prize, we thought that was terrific, and we ought to have more of those. People look at those and say, "Hey, that's pretty neat stuff." It doesn't cost a lot of money, but it's pretty neat stuff.

The other thing is that you have to have a sustainable space industry, jobs. We pushed NASA into "this is important, these are high skill jobs." If you get an industry started that can start hiring people and showing progress, that's a great benefit to the program.

Of course then the organization, structure of NASA, how does it look? One of the things we looked at was what NASA's organization looks like today, and we said, "Oh, my God, there's no way to do a program like this with that organization." You've got to be more focused on what the mission was as opposed to functional areas. We recommended that they make an organizational change.

Well, before we even finished the report [NASA Administrator] Sean O'Keefe changed NASA's organization. Progress was being made even as the report was ongoing. The other thing we said, which is the most controversial, was that the NASA centers, all of them looking together, it's too large to support this mission. Somehow or another we got to address the overhead structure of all the centers. You're not going to close a center, but you got to think about how does one restructure each center to focus on the mission and yet not carry all the overhead that's necessary. That's really hard.

We said NASA ought to think about the centers becoming FFRDCs, because they clearly are government. As an FFRDC if the center is too large, the amount of overhead, you can use the technical ability of the center to do other things than just support NASA. You can support other kinds of technology, industry, energy. You can even think about some of the centers

helping the Air Force. Each center will find its own level of competency, not just being carried by NASA.

Well, that hasn't happened. But still, in my view, I believe NASA is paying too much for the center operations that are over what they actually need to do the mission.

WRIGHT: What were some of the challenges that you encountered as being a chair? You only had 120 days. How were you able to take the talented people that you had, plus all the input you were getting from these visitors and people coming through and provide results?

ALDRIDGE: We had, I think, seven very bright people. My challenge was to try to focus. If we were going to make a series of recommendations, I didn't want to have 100 of them. I wanted to have five, six, seven fundamental recommendations. We could have subrecommendations, but fundamental key recommendations was what I was looking for.

As we heard people talk, I kept notes to myself. I kept writing down what I thought was a recommendation. What was the critical thing? In order to implement this vision what do you have to do? Sustainability. I kept writing. How do you get a sustainable thing? You have to convince people that's what you have to do. Sustainability also goes along with a space industry that can create jobs. You got to organize NASA to the mission, not the way it is now.

So I just kept writing these down. Then after about a month or so of these, I shared them with the entire group. We started whittling them. As we listened, we modified them. We expanded some of them. In fact, I brought the report today [*Report of the President's Commission on Implementation of United States Space Exploration Policy: A Journey to Inspire, Innovate, and Discover*; June 2004].

I'll just take one of them, robust space industry. Commission finds that sustaining long term exploration—you need an industry. Well, then we had a series of recommendations that supported that. Here's another: finding [number] six, technology base. Here's exploration science agenda. Okay, and then there's a series of recommendations, then education. We had a finding on that and also implementations of that finding.

Anyway, that was what I did. As we heard people, we essentially changed those. Then I wrote a draft. Finally, I sat down at my computer and I drafted something. It roughly looked like this. Then the other commissioners came in, and they would modify it. Then as we got pretty close, I would pick somebody who—there's always somebody who was the champion of the recommendation. Like sustainability, that was Carly Fiorina. I said, "Carly, take this draft and make it look right, like one person wrote it rather than a bunch of people."

Same thing was true for education. There were a couple people who really focused on education. Another one—science and exploration. So we did that, and we then compiled everything together. We had a couple of technical writers that were provided to us by NASA, then they took the whole report and put it into a really cleaned up version and injected pictures and that sort of thing.

But it was interesting. We had some very good people who came to talk to us. I think we have a listing of those in the background. There was a whole bunch of them.

WRIGHT: Are there any that just stand out, that were unique?

ALDRIDGE: Yes. Yes. A couple. One that I always recall, it gets back to this issue of sustainability. It was Ray Bradbury, science fiction writer. I said, "Mr. Bradbury, one of the

questions that is troubling us is, how does one sustain a program over 40 years that we need to keep the interest, the budget, the momentum, the direction, because somebody can come in, the next President, come in and change the direction, and all of a sudden you've been going this way and now you're going this way, and how do you sustain this kind of a thing?"

He told us a very simple answer, "Just ask the children." I thought about that. Well, he's right. They're the ones that are going to have to do it. If you take any kid anywhere and ask him what he thinks about the space program, he's excited about it. Every one of them. So I thought that was just absolutely profound. Just ask the kids.

Another one, in fact we have a quote in here of this guy, this is Roger Gilbertson. It's from the comments from the audience. This [effort] was all open, so you could go anywhere and listen. Gilbertson says, "I'm of the Apollo generation, that lucky group of kids old enough to have experienced the Moon landings but young enough not to have been distracted by the issues of the adult world." Said, "I was nine years old when Neil [Armstrong] and Buzz [Aldrin] first walked on the Moon, and I could not get enough. 150 years ago, if President Lincoln had formed this board, it might have been called the Commission on Iowa, Colorado, and beyond, and you would have faced the very same questions. Can we afford to explore the West? Isn't it dangerous out there? Shouldn't we solve the problems of the east coast first? Maybe even, is there life in California?" So anyway, his comments just went down, sounded like exactly what would have happened 150 years ago.

WRIGHT: A battle that is still fought today.

ALDRIDGE: Absolutely, absolutely.

WRIGHT: We have just a few minutes left and I wanted to ask you about a statement you've made, once in 1981 and again about ten years after that. You mentioned that the use of space supports our current and future national security interest. The one in 1992 was that you believed that the nation was not keeping up with our international competition. Do you feel, as you did in '81, that space is still important to national security?

ALDRIDGE: Absolutely. In fact, I've used other terms like space is the ultimate high ground in military operations. It's so fundamental to our abilities these days. Airplanes don't fly without GPS. They don't communicate without satellite communications. The accuracy of our weapon system such that we can drop one bomb on one target as opposed to the World War II kind of mass bombing raids. A B-2 [Stealth Bomber] can hit 16 simultaneous targets with one mission. You don't want to put 16 different airplanes in harm's way.

Intelligence—absolutely essential. In fact, we would not have an arms control agreement with the Soviet Union without what then they called national technical means, meaning intelligence satellites that would give us the information to verify the arms control. Therefore, we would have spent a hell of a lot more money with the degree of uncertainty. Both sides would have done so.

Of course, then you are in an arms race kind of a concept. The detail. The soldier today. He's in constant communications via satellite. Gets GPS signals. He can talk. We used to have a concept called combat search and rescue. When a pilot went down somewhere, we had to go search for him and then try to pick him up. It's now called combat rescue. There's no search. We know exactly where he is all the time.

We depend so heavily on communications for force multiplier effects that a smaller number of people, when they have intelligence communications, they know where they are and they know where the other guy is, they have a thing now called red blue location. They know exactly where every soldier is along a frontline. With that information, they can do the job with a lot fewer people than they would have otherwise. So everywhere you turn—I don't know how I could operate without the use of space.

Now it's almost like how do we as civilians operate without the use of space. Somebody told me the other day, says, "Well, we don't need space, I have the Weather Channel." Okay. I don't need space. I've got my GPS navigation system in my car. All the timing. The clocks are set by GPS. The atomic clocks on GPS. When you go to fill up your car with gasoline, the credit card information is via satellite to give you approval. Everything we do is based on that. So I feel probably stronger today than I ever have.

On the international thing, I would say in 1981 we dominated space. The Russians were right behind us in the sense of their capabilities, but our technology was far superior to theirs. All of that has slowly deteriorated. I'm not sure we could have done anything differently. But the Russians haven't caught up, but the one that bothers me, the Chinese. They are really moving fast. They're doing things that jeopardize the viability, survivability of our space systems. They're working on antisatellite technologies. They have their own manned space program, which has now started. That obviously adds more technological capabilities to what they're doing. They're moving very fast. That one bothers me to the point where I'm not sure I would race them, but I would do certain things to improve the viability of our own systems.

WRIGHT: With all those thoughts of looking to what should be done for national security, is there still room for space exploration and the vision for the civilian space agency to be included?

ALDRIDGE: Absolutely. I think this is a three-pronged approach. Obviously the military has the imperative. Because of the military, you can't say a lot about what it does, how it does it, information that's obtained from that. So the excitement of space really has to come from the civilian space program.

I think that's where the accomplishments like fixing Hubble [Space Telescope], and now we're going to see some pictures from Hubble that's going to blow your mind, and then when the [James Webb Space] Telescope goes up, that's going to be another type of thing. I think the miracles that happen with the Mars rovers, Opportunity and Spirit. What they're doing by remote control is just unbelievable.

The excitement. You can share information and show what you can accomplish. That has to be done with the space program. The civilian. Now commercial. I'm also excited about the commercial space program. It's slowed down, but now we're beginning to see it turn back up again. But that's profit and loss, and they're not going to take high risk. They want to put something up that's going to work. It tends to be a lower technology, but more reliable. Commercial firms can't take risk, but it can create the space industry, contribute to that space industry which keeps people in jobs and brings the fact that we are in fact using space in our everyday life is important. So I think all three of those are necessary.

WRIGHT: Do you think there should be one overseeing agency to make sure that these efforts don't eventually coincide in space?

ALDRIDGE: Yes. Yes. In fact, we recommended the recreation of the Space Council, because I think it is important to have all the agencies that deal in space understand the interfaces that exist. The Space Council, which existed during Augustine's thing, was very effective. In fact, that's who we reported to basically in the Augustine Report, was to the National Space Council. I think it ought to be recreated. It ought to be run by a high level government official. We said the Vice President.

The people in the White House think that it can be run by the National Security Adviser or the director of the Office of Science and Technology Policy. I don't think so, because I think it needs to be somebody who has—in fact we said so, a federal focus. If this is so important, this mission to Moon and Mars, it's a national objective. If it's a national objective, it ought to have national leadership. It shouldn't be just part of the Department of Defense or NASA or whomever, NOAA [National Oceanic and Atmospheric Administration], but people who can see the direction and somebody who can make a national decision and direct those offices to do what is necessary.

I think everybody who has a role ought to be playing in it, but it should be run by a senior leader. I thought that when Vice President [J. Danforth] Quayle was there—a lot of people didn't like him, but I did, I thought he was a nice guy. He had the right focus. He brought the Secretary of Defense in. He brought the National Security Adviser in. They would all be participating in the direction we wanted to go. I think that's very important.

We in fact recreated it in this report, and I'll bet you that Norm will say something about it in his report as well. DoD has something to bring to bear on this mission. It's the technology. They spend billions of dollars on advanced technology. Obviously NASA. Not sure what role

NOAA would play. But those people should be involved. There should be some participation by industry in this kind of thing, because they have good ideas as well.

WRIGHT: What were the challenges of working with ever-changing administrations and congressional members?

ALDRIDGE: I worked through them all. My first presidential appointee position was [by] Ronald Reagan. I'll tell you, that was an extraordinary period. I remember before the election, when the American hockey team beat the Russians [1980 Olympics]. I remember how the attitude of the American people just changed, almost like we'd had enough. The hostages were in Iran. Carter was, I think, a weak President. We were getting beat up everywhere in the world.

When the hockey team won, the whole attitude changed. Then Reagan got elected and comes in with these—he had terrific goals and objectives, and he had a terrific way to manage those by telling all of his cabinet officers this is where we're going. They all nod, and then he'd get the hell out of their way and let them have it.

I remember Cap Weinberger. He knew exactly what Ronald Reagan wanted done, and he was like a bull heading in that direction. Same thing in the intelligence community with Bill Casey. Anyway, it was a period of time that was a great enthusiasm in America, and a great respect for the President and what he was trying to do.

I remember every Secretary of Defense had a different attitude. I had to work with a lot of them. I was even there when Robert [S.] McNamara was there, in a very strange environment, very arrogant type of person. Then we went through a couple. Clark [M.] Clifford, but he was

there a short time. Then Mel Laird [Melvin R. Laird] came in; very nice, smart, political knowledgeable kind of a guy.

Then after Mel Laird, I can't remember who followed, but then Don Rumsfeld was a different kind. When he first came in, he was very young. He was 43 years old when he was Secretary of Defense the first time. Somewhat arrogant, but not as hard as he became the second time around. He was a very tough man to work for, unless you really knew your stuff and could tell him no every once in a while. He would roll over you.

I was there during Jim Schlesinger. Very articulate more professor type person. All of them were different. Harold Brown, the same way. I was only there for a short time.

Congress, a changing environment in Congress. Years ago, and I would say in the '80s, you had very strong chairmen of the various committees. The chairman could pretty much dictate like [Senator] John [G.] Tower was chair of the Senate Armed Services Committee or [Senator] Barry Goldwater. They could pretty much dictate the direction that the committee was going. They would keep the younger people in line. That's very different now. Everybody's more of an individual. Usually, if you got the chairman to agree with the direction you wanted to go, if you could convince him this was the right answer, the committee would go along with it. Not so anymore. It takes every committee member, so you have to deal with each one of them.

I remember when [Leslie] Les Aspin was the chairman of the House Armed Services Committee. The House Armed Services, the defense bill from the House went to the floor. There were 135 amendments from the floor to the committee's chairman's bill. Never happened before. If the House Armed Services chairman said this was what we wanted to do, and it went to the floor, very rarely did you get that type of number of amendments to fix things that they didn't like. That's true today. There are 535 different people, and they all have something to

say, which makes it difficult. Whether it's right or wrong is another story. They do represent their constituents, and they have a right to believe in them. But I think pork barrel, the pork is ridiculous. I know they're trying to take action to do that. That didn't exist 20 years ago. A few of them, but not to that extent, not billions of dollars the way it's going right now.

Anyway, every President, every Secretary, every cabinet officer is a different personality. I've had to deal with those. You just have to play it by ear how is the best way to handle it. First time I met Rumsfeld (when he was Secretary the first time), he and I got along great, because I briefed him one day on a weapons system, and he had his own ideas of what he thought was truth. I told him he was wrong, that wasn't the fact, and told him why, and we became friends ever since, twenty-five years ago, something like that. But of course that's why he asked me to come back again. It's been an interesting career.

OMB, [Office of Management and Budget] that was a very short time. I worked on the Export-Import Bank, international issues. But almost by the time I got there, I was getting—I don't know, discussions started about me coming back to the Pentagon. I always think probably even when I was there at OMB (for a year), the last three months I knew I was leaving to go back to the Pentagon. A different environment, but interesting because I was there right during the Nixon problems. That's an interesting story. I remember going to staff meetings. The Deputy Director for OMB was a guy named [Frederic V.] Fred Malek. We'd have a staff meeting every Friday. I'd go in the staff meeting, and Malek would come in. He said, "Well, we finally turned the corner on Watergate. Everything is now okay." Saturday there'd be some other disaster.

For that period of time, it's like week after week everything was dominated by Watergate. Nothing could get done. Fortunately, I left and moved to the Pentagon before Nixon

resigned, so I was out of it. But I'll never forget that. Well, we finally turned the corner on Watergate.

WRIGHT: It's interesting that you were there at that historic time, and then also you were working for the Pentagon on 9/11/2001. Were you in the building?

ALDRIDGE: I wasn't in the building. I had a speech engagement at Fort Belvoir in Virginia at the Defense Logistics Agency. My speech was at 10:00 am, so we had a breakfast meeting with Rumsfeld and several senators that I was involved with. The breakfast was at 8:00. We were meeting in the Pentagon. Rumsfeld said something about any time there could be a major event, and we have to be prepared for this. I guess he was getting ready for his budget or something was going on with the budget, something he wanted. But anyway, we were sitting around, and he talked about this major event and we must be prepared for it.

We had left breakfast, and I went back to my office, which was just across the street from Don Rumsfeld's. The phone rang as soon as I got there, and it was my wife on the phone. She said, "Turn on your television." I guess this was around 9:00 or so. I turned on the television in my office. A plane had crashed in the building [New York City]. As I turned it on, they were showing this thing. Just about that time, they showed the second one coming in. I said, "This is not an accident." But it was at 9:30 and I said, "I've got to leave."

I go out the door, and my military assistant is going with me. Going down the escalator going to get our car to go to Fort Belvoir, which is like 15 miles south of here. I thought to myself, "This is probably a good time to be leaving the Pentagon." I went down to Fort Belvoir,

started the speech, and of course we hadn't heard anything. Started the speech. We knew about the event in New York. Did my speech. The speech was over at like 10:30.

As I was walking out, the general who was the head of the DLA, Defense Logistics Agency, said, "The Pentagon is on fire." I said, "Oh, Jesus." He said, "Let's go down to our operations center and let's see what's going on. We've been told the Pentagon is on fire."

So we go down, and then we did determine that the Pentagon had been hit. Then they said, "The Pentagon is shut down." They're telling everybody to go home. So here I am at Fort Belvoir. I had my driver. I said, "Okay, well, take me home, and I'll try to call in." You couldn't get in. All the phones were busy or nobody was answering.

I could call in to the ops center [Operations Center], but I had to do it from home. So we start the drive home. Get there. My wife was panicked because she's heard the Pentagon is on fire and wanted to know—then found out it had been hit by an airplane, didn't know which side of the Pentagon it got hit on. She didn't know that I had left the building to go give the speech and was panicked. I kept calling her on the phone in the car, and finally I got through to her to say that everything's okay, and to tell her I'm on my way home.

Well, at 7:30 that night I get a call from the operations center in the Pentagon. Might have been 8:30 at night. They said, "The Secretary wants you to relocate to a secure facility." I said, "Okay." They said the Deputy Secretary had been at this secure facility all day. The Secretary of Defense was still in the Pentagon. The Deputy Secretary had left. He was in the facility. He's coming back. He wants you to replace him. This is at a bunker outside of Washington; it's 8:30 at night.

This is a funny story. As I was coming home [after the speech], I got home, my military assistant is with me. My driver, of course, has his own car; his car is parked in the Pentagon, so

he has no way to get home. So I said to him, "Okay, you take my car, take it home, and then come by in the morning and pick me up, and we'll go back to the Pentagon and get your car."

Okay, so now my car is gone. 8:30 at night the guy calls and said, "He wants you to relocate to this secure facility." I said, "Okay, when does he want me there?" Right now. Oh. Okay. He gives me directions and I tell him that I don't have any transportation. There's no helicopter or anything like that, there's no transportation. He said, "You have to get there any way you can."

So I take my wife's car. Now I'm leaving, going to someplace where she has no idea, leaving her by herself without any transportation. Anyway, she's told me, "If that ever happens again I'm not staying. I'm going with you." Well, I went up there and spent the night. Then I came back the next morning and went back to the Pentagon. It was still burning. The smoke was all inside the building. But everybody went back to work. Amazing. But that was enough.

Fortunately I wasn't there. The airplane did hit on the exact opposite side. If it had hit on our side, the Secretary of Defense, the Deputy Secretary of Defense, the chairman of the Joint Chiefs, the Secretary of the Air Force, the Under Secretary, me, Secretary of the Air Force would have been gone. It would have been a disaster. Just all those leadership positions.

WRIGHT: Well, we're glad to know that you are safe and somewhat enjoying retirement. Or is it enjoying retirement and still doing other things?

ALDRIDGE: Well, I'm on three boards. On the board of Lockheed Martin, that's why we can use this facility today. I'm on the board of a company called Global Crossing [Florham Park, NJ], which is a telecommunications company. Another employee-owned company out in McLean,

Virginia, called Alion Science and Technology—a bunch of entrepreneurial young men who have built themselves a really neat little company. They own it. To watch their enthusiasm is pretty spectacular. So I do those three, and that keeps my fingers in what's going on, but it's still enough time that I can play golf whenever I want to, go to Florida and stay for a while or whatever. But that's about the right balance. I wouldn't change anything right now. Just all I need to do.

WRIGHT: Well, we thank you so much for taking time out for this project.

[End of interview]