NASA HEADQUARTERS ORAL HISTORY PROJECT
ORAL HISTORY TRANSCRIPT

DANIEL S. GOLDIN
INTERVIEWED BY REBECCA WRIGHT
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The questions in this transcript were asked during an oral history session. Mr. Goldin has edited, shortened, and revised his answers. As a result, this transcript does not match the audio recording.

WRIGHT: Today is September 21st, 2013. This interview is being conducted with Daniel S. Goldin, in Calabasas, California, for the NASA Headquarters Oral History Project. Interviewer is Rebecca Wright, assisted by Sandra Johnson. Thanks again for letting us in your home and taking time from your busy schedule to talk with us. We would like for you, if you would, to start back to the time that you first learned that you were being considered for the Administrator job for NASA, and tell us how you worked through that thought process of this is where you would like to go with that part of your career.

GOLDIN: Well, let me start a little earlier so you might get some sense about my passion for human space exploration, space science, and NASA as an institution in general. Nine months before graduating college with a degree in engineering, on May 25, 1961, President John F. Kennedy announced before a joint session of congress the goal of sending Americans to the Moon and bringing them back safely before the end of the decade. Immediately after John F. Kennedy's audacious speech, there was only one place for me, NASA, where I could engage in next generation technologies to enable travel to Earth's nearest neighbors and open up our knowledge about the universe that we are living in.

Ever since I was a child, I have been fascinated by the thought of space exploration. This interest was initiated when at seven years old my father took me to the Museum of Natural History in New York City and lit a flame in me to the wonders of science in general and the solar system and larger universe we were living in more specifically. He was a biologist by training and wanted his son to become excited about science and the wonders of nature. The most fascinating part of the day was when he took me to the Hayden Planetarium, a facility inside the museum.

A multitude of decades later, I vividly remember being at the museum with my father observing meteorites, telescopes, images of planets, and stunning images of stars and galaxies projected as viewed from different locations on the surface of Earth projected onto a hemispherical screen above our heads. By the time we walked out of the museum, I was hooked on science, and thoughts of space travel also stimulated by science fiction movies. I became a prolific reader of books on science, science fiction, the solar system, the universe, and history of famous scientists and engineers. I built and operated model rockets and airplanes. All through elementary, middle school, high school and college the interest in space intensified. I recall thinking what an exciting future was ahead for me. When in New York City I occasionally visit the museum to rekindle those feelings of excitement about science I had as a young child.

A few months before graduation, there was a job fair on campus. I chose to only interview with the representatives from NASA Lewis [Research Center] in Cleveland, Ohio, now renamed NASA Glenn [Research Center], because they were developing the core technologies to enable human exploration to planetary bodies beyond Earth orbit with Mars as a primary target. I was in techie heaven interviewing with the NASA engineers. They were developing what appeared to be science fiction technologies such as a 10-megawatt space nuclear power system, ion and plasma engines could be matured to the point where astronauts might be walking on Mars in a couple of decades. Without hesitation I started my career at NASA Lewis just three days after graduation.

I worked at NASA Lewis for five exciting years at my dream job, but by 1967 it was clear that a mission beyond Earth Orbit was not going to commence after the Apollo Program [cancellation] due to the political pressures that had developed in the country. As much as I loved working on the cutting edge of technology to enable human space exploration it was time to move on in 1967 since I couldn't fulfill my dreams. I received an unsolicited offer to work at a company called TRW to continue my quest to work on the development of cutting-edge space technologies, with an emphasis on defense applications but still many opportunities to work on two of NASA's great observatories, Compton Gamma Ray and Chandra X-Ray [named after Nobel laureate Subrahmanyan Chandrasekhar] observatories along with a chance to help improve the quality of NASA's Earth Science Program.

Ultimately, I became General Manager of TRW's Space and Technology Group where the major focus of our work was in support of the US national security community efforts to protect the US and its allies from the threats posed by the Soviet Union. One of the proudest moments in my life came when Mikhail S. Gorbachev, President of Russia, ordered the destruction of the Berlin Wall on November 10, 1989. Subsequently on December 25, 1991, Mikhail Gorbachev resigned his post as President of the Soviet Union and Boris Yeltsin became President of the newly formed Russian Federation. My job at TRW was done and I was open to new opportunities, especially if I could get back to engaging in opening up the space frontier in what appeared at the time as a new peaceful era for Planet Earth. Amazingly six weeks later in early February 1992 I received a call from the White House that President George H.W. Bush and Vice President [Dan] Quayle were interested in talking to me about becoming NASA Administrator. One door closes and another door opens to get me back on my life's desire to open up the space frontier. I was sworn in six weeks later on April 1, 1992 as the ninth NASA Administrator, into a job for me that was a crowning achievement of a lifetime. I loved NASA, its mission and its future impact on America and the people who share planet Earth with us.

WRIGHT: Tell us about some of the ideas or some of the thoughts that you learned from the people when you visited these communities, especially those communities that did not have NASA in their backyard. What did they want for America for its space program?

GOLDIN: There was a general awareness of the space program; many felt the astronauts inspired them, but not all thought space exploration was important to America's future. A reasonable fraction of the people couldn't relate to how the expenditure of funds on America's space program impacted their lives. Others were ambivalent and some negative towards the program believing the funds might be better spent curing disease or improving education. Questions arose, like how would spending money on NASA impact my life for the better? It was clear that NASA had to do a better job communicating its vision, mission, and values to the American public. Some were concerned that robots could do the job at a much lower cost and the scientific returns might be even better.

On the other hand, there were many people who felt inspired by the thought of astronauts living and working in space while performing research to make life better on planet Earth. Others were inspired by the possibility that in the not too far future NASA astronauts might be engaged in sustained operations on nearby planetary bodies like the Moon, Mars, and asteroids. However just like those who had questions about the program, they wanted to see that there would be a payoff to the American public. There was a smaller group of individuals who wanted commercialization of space travel to result in an opportunity for themselves to live and work on other planetary bodies.

WRIGHT: If we can, talk about [Space] Station, what you inherited with Station.

GOLDIN: In 1984 President Reagan approved a plan for NASA to begin development of Space Station Freedom [SSF]. Eight billion dollars were appropriated by the congress to build out the station. SSF was conceived to be America's answer, along with our teammates in Europe, Canada and Japan, to the successful Soviet Mir space station. SSF was to be on orbit and ready by1992.

Unfortunately, when I took office on April 1, 1992, SSF was not only not on orbit, but there was no flight hardware ready for launch, and design of some critical equipment was not even complete. Unfortunately, SSF development was overcome by a number of unanticipated transformational events. The Cold War between America and our western partner countries against the Soviet bloc suddenly ended with the dismantling of the Berlin Wall in 1989. The entire aerospace industry was under stress as America and her partner nations were readjusting to the new political reality that was calling for a cutback in funding to space and defense entities, and the beginning of calls by the nations leadership for partnerships in space with the new Russian Federation, to take advantage of their extensive knowledge base and begin to build bridges to the west. At the same time, a new digital revolution was sweeping across government, academia, and industry that was making much more productive tools available to increase the efficiency of NASA's Space Station Program. After my first few months in office four issues became abundantly clear:

1. NASA and its contractors had many outstanding people assigned to the program.
2. NASA SSF leadership did not understand how far behind they were on schedule and how deep they were in the hole on funding required to complete the space station.
3. There was a need to dig out of the hole, but the SSF leadership hadn't yet seen the light.
4. NASA might explore teaming with the Russians, our former enemy to dig out of the hole.
5. NASA needed to avail itself of the new tools available from the new digital revolution.
6. My experience at a cutting-edge space and defense company would be helpful in allowing me to help NASA become more efficient.

WRIGHT: When you came in, you tried a program that had participation effort. The Red teams and Blue teams, trying to get people to recognize that there could be another way of doing business. Share with us your hopes with that.

GOLDIN: Instead of importing outside experts to educate the highly capable NASA team on how to do their job "Better, Faster, Cheaper," I decided to embark on the use of internal self-assessment. I maintained the belief that the NASA team would ferret out the technologies, processes and management techniques they required by themselves. Each program and project were asked to assign two teams of people to work together and understand how to improve their projects: a Blue team consisting of individuals who were previously working on the project as defense, and a Red team consisting of individuals familiar, but not part of the project as offense.

Please don't overreact to the terms offense and defense; I'm using them to emphasize the point that observing a project or system from two different directions brings out the best in people. In executing the Red/Blue team efforts, we conceived new rapid turnaround/low-cost programs such as the planetary Discovery Program, reinvented Mission to Planet Earth, and removed over eight billion dollars from the budget, began redesign of an affordable International Space Station [ISS] that engaged the Russians and their technology that helped control costs and schedule, and began rebuilding the NASA Aeronautics and Space Technology Program.

WRIGHT: There was a movement at that time, or maybe I should say directive mandate from the new administration—you were hired in by one presidential administration, but soon after, started to work for another one.

GOLDIN: Even though there were specific policy differences between Presidents George H.W. Bush, William Jefferson Clinton, and George W. Bush, there was continuity of mandate and commitment to build and operate the International Space Station from administration to administration with our partners, initially 15 western nations from Europe, Canada, and Japan under the leadership of Presidents Reagan and Bush 41, and then adding Russia under President Clinton, and continued with Russia and our initial western partners under President George W. Bush. The biggest administration to administration change came under President Clinton when he and Vice President Al Gore mandated a redesign of SSF to meet cost and schedule constraints and to invite Russia to participate. On the upside, Russia was able to provide key pieces of flight-tested systems, at the time unavailable in the U.S., such as the Soyuz crew transportation and rescue vehicle and Zvezda laboratory and Zarya habitation modules. Although NASA paid for the Russian equipment, it still saved the U.S. billions of dollars, schedule time, and significantly increased system reliability and crew safety. At the time, NASA did not have a crew rescue vehicle and to develop one from scratch would have cost billions and taken half a decade. Furthermore, bringing in the Russians provided alternate means of access to ISS for crew and logistical support if the Shuttle were grounded for a malfunction. Finally, we could operate the space station from either Mission Control Houston or Mission Control Moscow in case of a natural occurring disaster on Earth.

WRIGHT: Had worked with Gore because of all the dealings with Congress?

GOLDIN: I met Senator Al Gore when President George H.W. Bush announced he intended to nominate me to be the ninth NASA Administrator in March 1992. He graciously invited me to an in-depth meeting in his Senate office just prior to my confirmation hearing. Enough time was allocated so we could explore our points of view on both policy and technical issues. There were a number of issues of concern he expressed that I was able to address in both our private meeting and openly during my confirmation hearing in March 1992. I found Senator Gore to ask intelligent questions and to be open to new information during my interactions. I was confirmed by a unanimous vote of the Senate.

Vice President-Elect Al Gore called and asked if I would be willing to stay on in the new Clinton-Gore administration until they confirmed a successor to me. My response was immediate; I told him that he and President-Elect Bill Clinton won the election and must install the person they had most confidence in to lead NASA. In the interim I would be honored to stay and keep the Agency moving forward. As soon as the new administration was in power, I met with Vice President Gore, the director of OMB [Office of Management and Budget] Leon [E.] Panetta and President Clinton's science advisor Jack [John H.] Gibbons.

WRIGHT: You took the route to make the changes within the organization instead of waiting for someone outside, like Congress or the White House, to tell you; you attempted to do that internally?

GOLDIN: Yes, soon after being confirmed as NASA Administrator under George H.W. Bush, I met with the administration leadership to get clear policy-level directives and to understand if there were any particular concerns they might have for action on my part. With a basic understanding of the desired administration directionality, I felt empowered to work execution details with the NASA team. As a general rule, once I understand the policy directives and top-level expectations, it's possible for me to feel comfortable in establishing the top level strategic and tactical actions necessary without requiring detailed directions. Of course, I followed up with administration leadership to be sure I understood their needs for action. Top level directives fell into four categories:

1. **Focus on the Congress**: The President made policy and the Congress approved that policy along with the associated implementation budgets. Towards that end, it was essential to always be sure once administration policy was set there be no air gap between the administration and the NASA Administrator with regard to relations with congress. Furthermore, these were very stressful times of change and the congress was marginally in support of the NASA program. Therefore I prioritized communicating with congress as my highest priority and that of my immediate leadership staff.

2. **<u>Measuring progress</u>**: When I arrived at NASA, I was not comfortable with the existing system to measure progress or lack thereof. In fact, during my confirmation hearings I stated, "if you can't measure it you can't manage it." Soon after arriving I set out to develop a better system for measuring progress. Although we made considerable improvements to the measurement, it failed us on a number of occasions to my great personal distress.
3. **<u>Strategic Vision</u>**: I believed that NASA must look out at least a quarter of a century to select the technologies that must be matured to support bold future missions. As I entered the Agency, I was determined not to let the lapses that occurred between Apollo and Space Shuttle, and Space Shuttle and Space Station occur. Toward that end I asked each of the NASA Associate Administrators and Center Directors to prepare a coordinate strategic vision that went out 25 years. During my tenure it certainly assisted in the technology development planning but didn't have legs after my departure. Unfortunately, the U.S. budget planning is performed in one- and five-year spans of time, so neither the administration or congress view the strategic vision as part of their planning process.
4. **<u>Safety</u>**: NASA takes on very complex and difficult missions. As such I established that protecting the lives of our astronauts and those of our employees and contractors were the highest priority for all Agency employees. There were many specific rules drawn up by those with the required expertise, however I felt safety awareness and overseeing plans for implementation was my personal responsibility. I was passionate about this issue and put much energy into assuring that there was intense attention on safety by those I held

accountable for developing and keeping current the necessary procedures and plans for implementation of safety rules.

I also followed the approach outlined above during my tenure under Presidents Bill Clinton and George W. Bush.

WRIGHT: If you could, share with us some of your thoughts of putting that strategy in place. I know at the time that you started spreading this information throughout the Centers, you did it with a very detailed, strategic management plan, with phases and it was very detailed. It wasn't just, "This is what we're going to do," and everyone figured it out for themselves. You were very detailed, and you were very direct on how these new ways and these new efficiencies were to take place. Share with us some of the priorities of that management plan that you felt were just vital to get the Agency turned around.

GOLDIN: Just prior to the presidential election of 1992, I reorganized the leadership of the NASA Headquarters team and the leadership of a number of the 10 NASA Centers. The management team in place had a good understanding of the major tasks ahead. I left the details of implementation to the leadership team unless my guidance was required.

WRIGHT: It also was intentional. Every piece was communicated down to every person.

GOLDIN: I don't believe it was as hierarchical as you insinuate in your question. I tried to be very visible on the core issues and asked the staff to communicate more detailed yet important issues with their direct reports. I also visited each of the NASA Centers to talk directly to the employees and to take their questions in both large groups and in groups of employees without and supervision present.

WRIGHT: What steps did you take to make sure that that message became the number one message?

GOLDIN: I was passionate about the subject and used different venues and communication techniques. I visited each Center periodically and at my staff meetings made it a point to talk about safety and other banner issues for the Agency. Six weeks before Shuttle launch, I personally interviewed each and every astronaut on issues of crew safety and factors crucial to mission success. I tried not to tell people what to do but to just raise their consciousness on issues pertaining to safety and mission success.

A few hours before each launch at Kennedy Space Center, I asked many of those in attendance that were at the Kennedy Center to watch the launch to understand that there are seven people on the Space Shuttle who would be risking their lives to help America open the space frontier. I told them that the odds are one in seventy-two that they may not come back. Also I told them that since I was in charge, I assumed responsibility and accountability if anything goes wrong and there is personal injury. I did this so the people at the control consoles on the ground and the astronauts on the controls in the Shuttle shouldn't worry about being second guessed by investigators after the fact, while they must concentrate on making split second decisions to protect lives during the mission.

WRIGHT: You mentioned earlier when you were talking about safety, you said it wasn't just for human flight. You were also very interested in making sure the systems were safe.

GOLDIN: People could get hurt or die on the ground because we have high-temperature, high-pressure, we have complex systems. We could have explosions. We work with high voltage; people could get electrocuted. When one comes to the job, they ought to have the ability to go home, so clearly the complexity of the astronauts in real time is out there, but the people who work on the ground need to have confidence that safety systems are in place to protect their lives.

There's another aspect to it. I encouraged people to stop launches. Even if their concerns were later unfounded, there would be no retribution. I made it a point to give awards and congratulate people personally for stopping a launch if they were concerned about a safety issue. Schedule is not important, human lives are.

WRIGHT: Can you share an example of one of those occurrences that happened?

GOLDIN: Yes. On one of the Shuttle launches, an employee was observing the launch tower and saw a pin hanging down that might have hit the Shuttle as it was taking off. The person requested a launch delay so the crew could remove the pin. When at NASA Kennedy, I asked for the name of the person who stopped the launch and gave him a special award in public. Safety first, schedule last.

WRIGHT: Something so simple could have become so tragic.

GOLDIN: That Shuttle has 7,000,000 pounds of thrust lifting 4,000,000 pounds. By the time it hits the top of the tower, zero to 60 mph, that's pretty fast for 4,000,000 pounds. When you have all that energy, the slightest flaw in operations could cause a very big problem.

WRIGHT: Earlier, you also mentioned that one of your thoughts when you were considering the job was that you felt that exploration should have a purpose, a scientific measurement.

GOLDIN: Exploration should have a scientific underpinning as to why you're undertaking the mission. Missions this early in the space exploration program should be driven by answering fundamental questions. I don't believe exploration should occur just because we want to.

WRIGHT: Share with us how you were able to maybe shape that belief in that concept while you were there as Administrator. How did you start to move the Agency into having that underpinning?

GOLDIN: I go back to one of the early briefings I had on the Space Station and remember that one of the primary justifications for the Space Station was that it would serve as a vehicle to understand how people could live and work in space to undertake missions beyond Earth orbit. What happens to the human organism in zero gravity? What happens when humans are subjected to space radiation? What happens when humans are in isolation for long periods of time? What happens to the human body and mind on long duration spaceflight under no familiar conditions we have experienced on Earth during our development over millions of years.

Up until the time of the Space Station the protocol for the Space Shuttle was similar to that for an airplane. You take off, if there's a problem, you come right back to the ground. On the Space Station, the protocol is more like a submarine underneath the polar icecap. If something goes wrong, you just can't immediately come back, you've got to deal with it on the spot. If I'm on my way to Mars, or to an asteroid, or the Moon, one must learn how to deal with medical, mechanical, or electrical emergencies; there's no going back. One of the primary reasons—there are many, I'll just list a few—was to understand how the human body interacts with the psychological and physical aspects of spaceflight for long durations of time.

Example: when you're in 1-G and you go to sleep at night and you're lying flat, you're not putting impact load into your bones and you're not putting a steady state load into your bones, a static load. When I stand, I have a static load, when I walk, I have impact loads as my heel touches the floor. The beauty of the human body is it's a living organism and there are markers in the blood that when you are walking and standing, it triggers the body to take calcium out of the blood and deposit it in the bones. When you sleep at night and gravity is not acting, there's a marker in the blood and the body starts taking calcium out of the bones and dissolves it in the blood. Magical from millions of years of survival of the fittest.

If astronauts are going to be in space for years, they will lose bone mass on a continual basis, what kind of therapies can we execute such that their bones remain healthy? If they're in space forever, who cares, but if they're going to come back where there's gravity, they could be in trouble. Understanding the physiology and the chemistry, the biology of this process, is very important. There are many other considerations in protecting our astronauts from the potentially hostile environments they will experience on a space mission.

When John [H.] Glenn went back to space in 1998, he wanted to study the correlation between aging and going to and coming back from space using 12 different measurements. One of them was an aging issue in his mind because when you go to space your bones begin to dissolve under microgravity conditions as the calcium is dissolved in the blood stream. When you return, John postulated it would be equivalent to getting younger because the calcium will be returned to your bones by the static and impact loads you would experience back on Earth. Fortunately at 78 years old John Glenn returned from space and his bodily functions returned to normal in those measurements made.

WRIGHT: That's an interesting story, and a successful ending. Do you find that the science that came back from that mission contributed to the overall?

GOLDIN: Yes, I believe so.

WRIGHT: I'd like to talk about your desire to bridge, at the time, the current generations with the future generations through educational programs. You wanted to work closer with universities. One of the other programs you pulled back was the Educator in Space program. Having Barbara [R.] Morgan step back into a more aggressive role than what she had been with NASA, those educational areas that you felt were important, so that the new generation would be inspired, and that NASA could mentor another generation to take the Agency even farther, and the nation father.

GOLDIN: Let me say that Barbara Morgan is a good person and an excellent educator on the ground. I did not want to put her in a spacesuit and go to space without in depth training so she could contribute to the overall mission and not just talk to children from space. That was unacceptable to me and would set terrible future precedence.

WRIGHT: You had mentioned about the Earth System Science group, and about the instruments that were launched during your tenure, and it was more about attempting to start the whole global effort of exchanging information with the information system that they wanted to create, so that all scientists would be able to use that information.

GOLDIN: The EOSDIS [Earth Observing System Data and Information System]. In fact, part of my reach-out effort was to visit developing countries and engage them in the NASA Earth Science Program if it would improve the quality of life in their country. I remember going to Morocco’s ground station that was receiving signals from our Earth science satellites. As a result the information assisted Moroccans in growing more robust crops because they understood the interaction between the land, the atmosphere, and the water. Furthermore it helps build better relationships for America and the evolving portion of the world.

I remember a visit to Israeli scientists studying the lack of rainfall in the middle east. They were studying the effects of overuse of the waters of Lake Chad in Africa. They told me too much water was pumped out of Lake Chad to support cotton farming, which was the wrong crop—too much water. Ultimately the farmers ended up pumping the all the water in Lake Chad. As a result, a very fine residual powder was left in the lakebed consisting a variety of metals and other elements that were dissolved in the water. When the wind blew north towards

Egypt, Israel, Syria, and other countries in the area, small particulates were distributed in the particulates into the air.

Although it's counterintuitive, these particles were of the optimal size to suppress rainfall over the Middle East. What a devastating finding coming from NASA satellites in cooperation with Middle East scientists. This was funded by NASA in cooperation with other countries in the Middle East. Subsequently I had the opportunity to meet with Yasser Arafat, head of the PLO [Palestine Liberation Organization], at an event at the Moroccan embassy in Washington DC. I described the excellent science collaboration between Middle East nations and NASA and asked him if he wanted to participate. Unfortunately, Yasser Arafat said no. It led me to think about the possibility of getting people to stop worrying about boundaries and to work on important things like how do you stop the suppression of precipitation so people could have a better life?

There are a variety of spacecraft, operated by NASA and commercial space entities formed to assist farmers to get better crop yields

WRIGHT: You're connected to a point I wanted to talk to you about, the expansion of commercial work, because that is part of NASA, somewhat of its original charter. As you mentioned, Landsat was researched and developed; and commercial work can take over and create those jobs.

GOLDIN: Perhaps Landsat might be purchased from NASA as a commercial service, but that has not happened yet, but hopefully this will occur, or a commercial entity can find a more cost-efficient way of providing the service. The [National Aeronautics and] Space Act of 195[8] is one of the greatest documents. I read it just before my confirmation hearing—it says everything about what NASA should be. I think every NASA employee and contractor needs to read it so they understand that the space program is about the American people and not about them.

WRIGHT: Do you have examples of how you helped expand the commercial interest with the NASA relationship?

GOLDIN: I supported it and we accomplished much with commercializing , but I don't think I was as effective as I desired to be at the start of my tenure. We helped commercialize commercial services in support of farmers using GPS [Global Positioning System] to manage their fields. We built a facility in Mississippi to serve as a central point for those interested in getting support for building commercial space businesses. We were a bit early in the process and more time was required for the true commercial space sector to develop.

WRIGHT: Why do you feel it is so important to have an international coalition up in the Space Station?

GOLDIN: In the case of ISS, I believe that International Cooperation made the program better. Each country brought unique capabilities to the effort. The Canadians provided a robotic arm that certainly improved on orbit operations. The Europeans provided logistics and supply modules in addition to an outstanding research laboratory. Additionally the Europeans provided a logistics module for servicing the station. The Japanese provided another outstanding research laboratory with both pressurized and space exposure units. Additionally the Japanese provided logistics support. As discussed in more detail earlier in the interview, the Russians provided key modules, logistics support, and launch services that on multiple occasions kept the ISS on orbit during different problematic issues taking place on the ground and in space. Most importantly each nation provides highly talented astronauts and scientists that contribute in a major way to the success of the program.

I'm not prepared to generalize without a specific example whether international cooperation is beneficial across the board.

WRIGHT: You mentioned about building peace and involving the Russians. Share with us your experiences or your reflection on bringing the Russians in, in a more prominent partnership, as part of the International Space Station, and how that happened.

GOLDIN: President George H.W. Bush and Vice President Dan Quayle were concerned about the failing Russian economy and the inability of the government to adequately fund the Russian Space Program. The space program was an important point of pride for the Russian people. Loss of the program would be devastating to the Russian morale at a critical stress point in their history. President Bush encouraged me to work with the Russians and to see if we could rapidly initiate a Shuttle-Mir Mission to get things moving swiftly.

With the support of Vice President Quayle, I met with Russian President Boris Yeltsin on June 6th during his state visit to the U.S. We explored the possibility of the Shuttle-Mir mission thoroughly enough so that Presidents Bush and Yeltsin were able to sign an agreement for the mission on June 17, 1992. The start of the partnership had begun. About a year later under the leadership of President Bill Clinton and Vice President Al Gore, an agreement was signed by the

U.S. and Russia for joint activities on ISS. Soon thereafter our international partners signed on to the ISS with Russia. The rest is history, and today the International Space Station has operated flawlessly for two decades in space as a symbol that former enemies can work cooperatively in space for the betterment of humankind.

WRIGHT: Had you ever been to Russia?

GOLDIN: No! But I at one point in time was responsible for the system engineering of America's land-based ballistic missile program, which certainly was interested in Russia from a distance.

Shannon [W.] Lucid was on the Russian Mir Space Station. Due to a technical problem with the Shuttle, Shannon was stuck in space almost three additional months before she could return to Earth on the repaired Shuttle. Shannon was an outstanding NASA astronaut and conducted herself extremely well during the difficulties she experienced on Mir.

WRIGHT: Shuttle-Mir was such a precedent because we were sending American astronauts to live on a space station and on a spacecraft that had not been built by Americans. Did you feel that this was a most important step to moving closer into this relationship? What was your primary reason to move as you did into that program?

GOLDIN: The Russians forgot more about what it was to live in space than the Americans ever knew. We'd been to the Moon, but we weren't familiar with orbital stations and associated operations. America operated Skylab years before Mir but didn't have the depth of experience that Russia learned from the highly modular Mir, which was very close in concept to ISS. NASA astronauts and engineers learned many lessons valuable to the redesign of ISS and its operational plan once it was launched to orbit.

WRIGHT: You talked about the Soyuz providing a dual capability because a Shuttle could go to Station, Soyuz could go to Station. There was a time during your tenure that you were hoping to introduce a new launch vehicle, or another capability with the X-33. Could you talk about your effort to bring that technology online?

GOLDIN: Yes. I was concerned that as wonderful a machine as the Shuttle was, it was outdated in technology, it was expensive to operate, and we needed a new launch system that had significantly increased reliability and much lower operating cost.

An open competition was run, and I think Lockheed Martin won with their single stage to orbit design. It was based on a rocket engine technology developed decades ago but never went to space, the linear aerospike engine. It used the vacuum of space as one of the boundaries on the rocket nozzle so you could have virtual nozzle area control as you're going up to altitude to improve performance. There were other audacious technologies that offered up much promise.

Unfortunately I was not able to get enough money appropriated for the program, only the one billion dollars that I was able to reprogram within the NASA budget. As a result, when Lockheed ran into technical difficulties, NASA didn't have the financial resources to continue the effort to flight demonstration. Lockheed did an excellent job given the tight financial circumstances. To this day I regret not being able to reach out to the congress and White House to make the X-33 a reality. As NASA Administrator I must accept the responsibility for the failure of the X-33 program.

WRIGHT: Close to the end of your tenure, you pulled together a Decadal Planning Team.

GOLDIN: Yes.

WRIGHT: What was your intent for that, or the mission for that group?

GOLDIN: I wanted to leave those who followed me with thoughts to help them succeed in a very difficult job. The NASA team did a wonderful job in preparing the decadal plan. I'm very proud of them all.

WRIGHT: Were you hoping one of those items to consider included finding a way to get to Mars?

GOLDIN: That would be wonderful and establishing that we could mine rare earths and precious metals on a near-Earth asteroid, which would be even more inspirational.

WRIGHT: When we first started, you actually mentioned that that was one of the areas that you would have like to have pursued as well as going to Mars.

GOLDIN: I was very open about it during my tenure. Why did I pick an asteroid? If one travels to the Moon, which is one-sixth the mass of the Earth, you need the extra energy for a controlled fall to power out of the Moon's gravitational field on returning to Earth. If one travels to a near-Earth asteroid, it takes less energy because one has to only escape the Earth's gravitational field, since asteroids are so small, they have negligible gravitational fields. Unlike the Moon, asteroids have highly concentrated quantities of precious metals, rare earths and important metals for building things. There's one asteroid, whose name escapes me now, that has more water than planet Earth. There's commercial and space exploration opportunities on the near-Earth asteroids.

WRIGHT: One of the areas that we haven't had a chance to talk too much about is interest in going beyond low-Earth orbit into—to go back to your sign—the solar system. I know that you created the Origins Program so that we would have missions to possibly investigate the origins of the universe. Can you talk about the interests of that and some of the challenges of providing the path for that program?

GOLDIN: Let me come back to one of the five core purposes of NASA during my tenure. "We will search for life, single-cell or higher, carbon-based or other." What if we could find a single-cell bacterium, off planet Earth, either living or fossilized. If you look out into interstellar space, the building blocks are there. I recollect that there are over 100 different organic molecules in interstellar space. There's water all over the solar system and universe, all the elements of the period table are there, so there's a good chance it exists.

I like to make things simple, so with the Origins Program—that was one of the other things, we want to understand the origin, evolution, and destiny of life in the universe. There's a very simple statement, but it encompasses everything. With regards to the search for life and finding other planetary bodies, here was a challenge. Again, I tried to come up with a vision. My vision was if we were to find an Earth-sized planet around a star in the Goldilocks zone—not too cold, not too hot for water to remain liquid—you do that through gravimetric analysis. You look for the perturbations of the orbit of the star due to a body rotating around it.

I can't remember who developed it, but there's a variety of systems that are up there, then there's another system called Kepler [Space Telescope], which looks for the shadow or the blockage of the light from the star. The thought I had was eventually we were going to find an Earth-sized planet in the right orbit. If it existed within 100 light years of Earth, where there are tens of thousands or maybe even hundreds of thousands of F-type stars like our own, which have the reasonable life—of course, it takes life billions of years to evolve, so you want a star that's going to be there for a while, of substantial size—if a plant was found to exist, we'd need to do two things. We need to take an image of that planet with a resolution high enough such that if oceans, continents, and cloud formations exist, we will see it. And, we'll be able to take that image without having it washed out by the other star, and the light from the star, in the visible, is 10,000,000 times the reflected light from the planet, and the infrared, I think you pick up a factor of 10. It's less, and the infrared is a good way to take the picture.

I wanted them to build a telescope capable of that, and I knew it was decades away, so you need to remember the technology roadmap. Visualize the future and work back and find how you get there. I wanted to see that there was wide-open competition to how to go do this.

The next element was after we took a picture, it would be great to do a spectroscopic analysis of the gases on that planet. If I could find a planet that was at a chemical equilibrium, there's but one answer. Oxygen doesn't come from physics and geography; it comes from bacteria, biology, and it's at a chemical equilibrium because the energy from the Sun creates that disequilibrium in chemical balance. With a spectrometer, I could tell if there's life without seeing it.

Within our own solar system, as part of the Origins Program, I wanted to darken the skies around all the planets with robotic spacecraft to understand, does water exist, are the forcing functions for life there, what's the geology, what's the weather? I wanted us to go to all the planets, really understand it. Just a little gimmick, probably like flying a teacher in space, I wanted to fly a plane over the surface of Mars in 2003, which was the 100th anniversary of powered flight on Earth. It was too late in my tenure to get it through but think of the celebration for America. Yes, the Wright brothers were great, we're defining the next century by flying a plane on Mars. All the nay-sayers got me.

Another thing that I wanted, and I didn't get, I wanted them to drill a well on Mars. It is my sense that if you go down some 100, 200, 300 yards, we'll find artisan wells there. There's a whole bunch of physics behind it and geology, but I didn't get that either. Right now, they're going to drill down a foot or two. Boo-hoo! Again, don't get me wrong, it's a wonderful mission, but I wanted to drill. I want to drill like they drill for oil in Texas. There was a richness, and just think of the technology and the scientific knowledge that would come out of this. It would change children's perceptions about what's possible. They would see adults taking risk. When children see adults playing it safe and wasting money to protect jobs, it's not good. They need to see adults taking risk, pushing the boundaries, and then on cosmology, there's so much to learn. What are the forces?

We have a known universe—could there be parallel universes? Is our known universe like a yo-yo, it expands and then contracts? Or is it just constantly expanding? What about this dark energy and dark matter? We don't know what it is. What are the forces that drive us? Do we understand the fundamental physics of who we are and what the forces of nature are? To not fund these things is shameful. I tried to do my very best, and this is why I felt we were spending too much on human spaceflight, not that it's not important, but we need to answer fundamental scientific questions because the American population needs to know these things to build new materials and understand. As humans, we need to understand who we are, where we came from, and where we're going.

There's other science—what's the interaction between the Earth and its star? There are solar storms that affect life here. There are things that occur within our solar system. The other thing that I was hoping for in science is to bring together the Department of Energy, which does cosmology and they work with these very energetic machines on Earth, but why do I need to do that on Earth if I have these unbelievable energies in space? Before I left, I called a meeting at the Fermilab [Fermi National Accelerator Laboratory, Illinois]. Ernie [Ernest J.] Moniz, who's now the [U.S.] Secretary of Energy, he was the Associate Director of the Department of Energy for Science. Ernie and I ran a meeting at Fermilab where we brought together the physicists who were doing ground-based physics and the cosmologists from NASA, in saying, "Let's work together and if it needs to be done on the ground, let's do it, but perhaps you might conceive new spacecraft."

A wonderful, brilliant fellow at the University of Chicago whose name escapes me, the National Academy did a study of Beyond [Albert] Einstein, to see how America could bring its resources forward to really understand the basic physics of everything. I was concerned because a big transformation occurred as we had this biological revolution, and plenty of money was going into biology, but physics was being drained, and then, sadly, America decided not to build the Superconducting Supercollider, which was devastating to the physics community. I felt that physics is a crucial field that was being neglected and the Americans were living in Geneva at the Large Hadron [Collider] machine in Switzerland, and they're not here.

Again, I tried—it didn't make it. The space program needs to be about more than sending people into space; it needs to be about answering fundamental questions, and if you will, the astronauts are tools. I don't want to be misconstrued that I don't respect human life, but the astronauts help people understand how to answer some of these questions. They're doing it now with the AMS [Alpha Magnetic Spectrometer] on the Space Station. They could do it in exploring asteroids and other planets. It's an integration; it's not an either-or. It's not that Texas and Alabama and Mississippi and Louisiana and Florida have to be maintained with funding; it has to be a competition, wide-open competition, of ideas. What's the best way to implement our understanding of the laws of nature in this planet we live on, and how could they be used to improve the quality of life, create economic opportunity?

WRIGHT: To borrow your expression about using astronauts as tools, they were very instrumental in repairing the Hubble [Space Telescope].

GOLDIN: Brilliant!

WRIGHT: Would you like to talk about that episode of fixing that problem?

GOLDIN: I am so proud of the NASA team, their academic scientists and the contractors who undertook what appeared at the start to be a seemingly impossible task in front of a skeptical global audience. Its success proved to me once again the capacity of the NASA team to work with clarity of purpose under the pressure of time and public scrutiny to solve one of the most difficult scientific problems the Agency had faced in its history. How to determine an optical prescription, make a contact lens and install it on a telescope hundreds of miles above the Earth, and correct its blurry vision hundreds of miles above the surface of the Earth.

The mission required precise teamwork among the astronauts, scientists, and tool-builders over a three-year period. The final step, installing the corrective lens on the Hubble telescope with space shuttle docked to it required precise timing and teamwork to successfully complete the space ballet in 11 intense days. Intense rehearsals were required on the ground to assure the task completed in the 11 days available. Teamwork was the key to success, and I selected a non-scientist Marine pilot, Randy [H.] Brinkley to lead the team. Although Randy was not trained in optical design, he was bright and had a good sense about engineering, leadership and most of all leading and interacting with people.

Given the high stakes for carrying out such a challenging mission, there was a bit of tension among the many brilliant individuals involved. It was important to keep the environment calm and highly focused on mission success. Many issues arose and they were systematically, and precisely resolved in a time sensitive manner to meet the launch date. There were only 11 days available to complete the space ballet of attaching a contact lens onto the Hubble Space Telescope.

In the end, it was the determined individuals at NASA Houston [Texas, Johnson Space Center], NASA Goddard [Space Flight Center, Greenbelt, Maryland], JPL [Jet Propulsion Laboratory, Pasadena, California], Ball Aerospace, Lockheed Martin, many university professors, and the astronaut corps to complete the task. The mission established once again the value of teamwork.

WRIGHT: Do you believe it was a reflection to the American people of what NASA can do, and it helped restore credibility for the Agency?

GOLDIN: I don't think the Agency had anything to apologize for. If you're going to take on seemingly impossible tasks, then you're just going to occasionally have problems develop. It's how you react to those problems that establish the credibility of the Agency and its people. As a nation we should not take on challenging tasks if we are afraid of occasional failure. If you don't set ambitious goals, there will be no progress.

WRIGHT: At the end of your tenure, were you ready to go?

GOLDIN: Oh, yes! It was a long, challenging decade and I had believed I accomplished almost all of the tasks I had committed to in my confirmation hearing in March 1992. During my sixty-first Shuttle launch in August of 2001, my wife Judy looked at me and said, "Dan you look exhausted it's time to move on. Please go see Vice President [Richard B.] Dick Cheney and ask for his assistance with President George W. Bush to leave office with a smooth transition, but ask to be out before the end of the year."

I remained silent for a few moments and then said with a sigh of relief, "you're right, it's time. Let's get back to having a life beyond NASA." I went in to see Dick Cheney when we got back to Washington DC and said, "Mr. Vice President, I'm exhausted, I'm running out of money, I don't know my grandchildren, and need to reconnect with my family. Can you help me transition out before the end of the year?"

He looked at me, broke out into a smile and said, "I've been there twice before, we'll make it happen." I was ready to begin the next phase on my life having the satisfaction of accomplishing almost all of my objectives for while at NASA and my childhood visualizations.

On my last day in office, I went up to my office on the ninth floor of NASA Headquarters, opened the door, looked in and shouted to an empty office, "Great run, never coming back."

The greatest part about NASA, bar none, not the launch, not the space activities, not the science—it's the people who work at NASA, the civil servants, are very special. I found them to be exceptional. Absolutely exceptional. For most, NASA was their life, whether they were a scientist, an engineer, an astronaut, someone working in human relations, a technician, or an administrative assistant. No matter who they were, there generally was an unbelievable pride. One of the highest levels of grief that I had, because I held our employees in such high esteem, was the picture that gets painted about civil servants in the media—lazy, paid too much, negative connotations. It gets picked up and repeated, and for the most part, no workforce is perfect, but on average, I would stake the NASA workforce against any workforce in the world. They are wonderful. They work with a passion—in Houston, in Huntsville, in Sunnyvale, in Pasadena or Washington DC. They're really, really special people.

WRIGHT: Yes, they're a very committed group of people.

GOLDIN: Commitment is the word. NASA employees understand that their work is important to the American public and the results of their work are immediate and directly visible by the general public with regard to success or failure, more so than many of the other agencies of government. It takes personnel with a deep commitment to their responsibility's working on cutting edge projects day in and day out so closely monitored by Americans. As they perform their missions, lives must be protected, and high value scientific assets are expected to work the first time.

One of the areas we haven't covered yet is NASA's Aeronautics Program. It is the National **Aeronautics** and Space Administration. Over the history of the program, NASA has made significant technological advancements to make commercial flying by the general public safer and faster with less fuel burn and environmental impact. Although NASA doesn't develop new products for America's commercial air transportation industry, it performs precompetitive research to identify new technologies that the commercial plane builders can fully develop and deploy.

Perhaps my most impactful experience with the Aeronautics Program was engaging with NASA's General Aviation initiative, led by Dr. Bruce [J.] Holmes of NASA Langley [Research Center, Hampton, Virginia], to develop affordable digital fight controls and displays in the range of tens of thousands of dollars to enable production of planes that would be affordable, safe and easy to fly. While large commercial planes had been transformed earlier to be safer and more efficient to operate, their glass cockpit and digital flight control technologies were well beyond the affordability range for general aviation customers. In significantly less than a decade Bruce Holmes and his team, working in concert with the industry, produced the hardware and software that transformed general aviation and lead to a significant increase in orders and flight safety.

NASA didn't stop there; technologies were developed to assist the FAA [Federal Aviation Administration] in making flight safer for General Aviation. A digital highway in the sky was developed in cooperation with the FAA and flight tested in Atlanta, Georgia, during the Olympics of 1996 to show the system would work in restricted airspace without radar. Later on NASA utilized even more advanced digital technology to demonstrate the capability of safely landing piloted planes at a small Virginia airport without controllers in the tower or radars at the airport. Amazing capabilities that the FAA will be able to field in the future to support small general aviation airports to increase access and safety while reducing operating costs.

NASA also works to assist the FAA in its mission to make commercial flight safer through its Air Traffic Management System. It is a strong relationship that has lasted for decades. I was just on the plane sitting next to a NASA Dryden [now Armstrong Flight Research Center, Edwards, California] employee who for 20 years had participated in the NASA aeronautics program. She recognized me and started up a conversation that lasted all the way from Washington, DC, to Los Angeles [California]. What impressed me most about her was the pride she expressed about working for NASA. "Oh, yes," she said, "we may have budget problems, but God, do we do great things." She went on to say, "I love waking up in the morning and going to work at NASA." At its core, it's not the leadership, it's not the budget, it's not what employees do—it's in the hearts and minds of the people at NASA. That's what's most important.

WRIGHT: It truly is a brand anywhere you go.

GOLDIN: It's such a positive brand.

WRIGHT: We were talking, before we broke the last time, about safety. I was mentioning to you about most meetings still start with, "What's the safety message?" We start every meeting with the safety message.

GOLDIN: I'm really pleased. You want to know something? If that's my only legacy, it makes me feel good. It makes me feel good because if people start every meeting talking about safety, you know they're aware and conscious of it.

WRIGHT: One of the other subjects that we didn't have a chance to talk about was the success of Mars Pathfinder.

GOLDIN: Yes, the Mars Pathfinder mission was one of my favorites. I began to conceptualize the need for such a spacecraft and mission almost at the very beginning of my tenure as NASA Administrator. I was shocked to learn that the spacecraft required a full decade to develop and its cost was just under one billion dollars. It occurred to me that if feasible, what if we cut the price of missions to Mars by a factor of five, with one billion dollars we could launch a mission to Mars every two years when the launch window opened up every other year. NASA might send a mix of orbiters, landers, and robotic rovers to open up our understanding of Mars in an intense decadal program. I went on to speculate that if we launched five missions, one every two years at the optimal Earth to Mars launch window, over a decade we might be able to find water and signs of life starting on a planetary body other than Earth. Assuming the missions could be carried out at 200 million dollars each, it might be better spending the money than on the single Mars Observer mission.

Under the brilliant leadership of Tony [Anthony] Spear, the Jet Propulsion Laboratory successfully landed the Mars Pathfinder spacecraft on Mars and deployed the Sojourner robot. The system cost under 300 million dollars, not far from my first cost target. and only took three years from program start to readiness to launch to Mars. NASA had opened a new path to aggressive planetary exploration that was faster, better, cheaper!

What followed during my tenure was a dazzling set of robotic planetary missions including Clementine and Lunar Prospector to orbit Earth's Moon, Near-Shoemaker to land on Asteroid Eros, Deep Space-1 to bring back stardust from Comet Wild-2, Mars Pathfinder to deliver Sojourner Robot to Mars, Mars Global Surveyor Orbiter, Mars Odyssey Orbiter, Cassini orbiter of Saturn and the Huygens Probe into Saturn's Moon Titan. The Mars Climate Orbiter and Mars Polar Lander failed at Mars. There were also a number of stunning astrophysical telescopes including Spitzer Infrared Space Telescope, and the Chandra X-Ray Telescope.

WRIGHT: You've mentioned a few people along the way, and during your tenure, you had the opportunity to do some reorganization or appoint different people to different places. What were you looking for in a person to lead, say, for instance, a Center or a large organization?

GOLDIN: I want to know what is their value system, what is their capacity to take a different path and innovate not follow, are they capable of dealing with failure instead of avoiding it, can they build strong teams by influence and not from a position of power, are they inquisitive, do they continually seek new knowledge?

WRIGHT: One of the appointments that you made while you were there was appointing Carolyn [L.] Huntoon as the Center Director of the Johnson Space Center. Looking at her past, she had such a distinguished career in science, and JSC had always been seen as the engineering Center and human spaceflight. Looking forward to what you could do, what did you see in her that you put her in that position at that time that you felt that that was the leadership skills that you needed there?

GOLDIN: Let's come back to the Space Station. The main purpose of the Space Station is to have an orbital laboratory where NASA can understand how humans can live and work safely and operate with the highest levels of efficiency and cognizance. Towards that end I wanted a leader with a deep background in life science of Caroline's stature to lead JSC and bring attention to the main purpose of space station. I wanted to have a leader and life scientist watch out for the purpose of the Space Station.

WRIGHT: Were there other appointments that you made through the years that set out in your mind?

GOLDIN: Sure, absolutely. Charlie [Charles F.] Kennel, in Earth Science. Prior to Charlie, we had a great engineer in charge of NASA's Earth Science Program. Since I intended to have NASA restructure its Earth Science Program, I wanted a brilliant scientist with the leadership experience in charge to set a new science driven path for the new constellation of Earth Science Spacecraft we intended to deploy over the next decade and a half. I called up a gentleman named Dr. Ed [Edward A.] Frieman, the Director of Scripps [Institution] of Oceanography [University of California, San Diego, La Jolla, California] and a member of the National Academy of Sciences.

I said, "Ed, I need a visionary scientist to restructure Earth Science at NASA. He immediately responded "I have just the person to suggest—Charlie Kennel. He heads the Physics Department at UCLA [University of California, Los Angeles]. Space physics."

I responded, "What does that have to do with Earth science?"

He said, "Nothing. He's not an Earth scientist, but he's a brilliant scientist, he's a fast learner, and he's just going to inspire."

I called Charlie up and he immediately responded, "Dan, I don't know anything about Earth science."

I said, "You're brilliant, you're creative, you're a natural leader. I want you to lead this multi-billion-dollar a year Earth Science activity at NASA." Charlie Kennel assumed the Earth Science leadership role, he developed a clear vision and roadmap for the development and deployment of the space and ground segments of the system. NASA turned back almost nine billion dollars to the U.S. Treasury, and to this day the system is turning back a cornucopia of information about the functioning of our home planet. It transformed Earth science worldwide.

Charlie Kennel. The other fellow became Charlie's deputy—and we had a scientist lead with the vision and the engineer execute.

Another scientist is Ed [Edward J.] Weiler, the tough and brilliant man who really was behind the Hubble Space Telescope build and rescue. When an opening appeared for the position of Associate Administrator for Space Science, I interviewed a number of outstanding individuals from both within and outside of NASA. I wanted a smart scientist with a deep appreciation for hardware to run the Space Science Directorate. Ed Weiler stood out from among some of the most accomplished scientists in America. Once in the job, he stepped in, stepped up, and oversaw some of NASA's great achievements in planetary science and astrophysics.

NASA went for years without an independent Chief Scientist until my arrival. I believed we needed a strong scientist with excellent communications skills to work with our leadership team to develop a strategic vision for our future work and to have the capability to communicate it with American leadership and that for our international partners. I called Ed Frieman again, I said, "Ed, I need a Chief Scientist."

He said, "I have just the person to suggest, France [A.] Córdova."

"Who's she? Never heard of her."

He said, "No one has. She is a brilliant gamma ray astronomer at Penn [Pennsylvania] State University. She's just a professor there, but she has growth potential beyond belief. Why don't you talk to her?" I called up Fran and asked if she might be interested in the job. To which she responded yes. Then I asked her when she would be available for an interview.

She responded, "Dan, I could come out on Saturday."

I said, "Well, why don't you meet my wife and myself at the Cheesecake Factory in Bethesda?" France arrived with her two young children and her husband Chris. We sat for hours, talking, at the Cheesecake Factory. I was blinded by the light. Fran graduated from Stanford [University], with a degree in English, applied to and got accepted at Caltech [California Institute of Technology] and received a Ph.D. in physics at Caltech and went on to academia to practice her profession. She displayed a maturity, toughness, brilliance, and an ability to communicate. She had it all and I hired her on the spot.

Working with the NASA scientists and engineers, she helped us transform NASA to be science-driven and execute precise with engineering execution. She was with us at NASA until 1996, went on to become Vice President for Research at UC Santa Barbara, Chancellor of the University of California Riverside, President of Purdue [University], Chairman of the Smithsonian [Institution], and Director of the National Science Foundation.

I am proud that to have the privilege of working with the aforementioned people and many more not named. They taught me and enriched my life.

WRIGHT: I'd like to end this evening's conversation with—you had so many lessons that you had learned that you brought into NASA from working with industry, and then, as you've mentioned, you've started this current business that you have. Are there lessons that came from NASA that you're applying to your current business, or can help you see more into the future of what you would like to do with this business that you have now?

GOLDIN: I think what NASA helped me do, was to have a longer vision for setting goals. It also taught me to have a better appreciation for the dedicated individuals who work in government.

Most importantly it made me appreciate how to deal with overwhelming stressful situations without losing it. All valuable lessons for life and business.

WRIGHT: We wish you the best of luck with it, look forward to hearing it.

GOLDIN: You never know. You can't guarantee success, remember, failure could occur, but I could live with it.

WRIGHT: Good luck with all.

GOLDIN: Thank you.

WRIGHT: Thank you.

[End of Interview]