NASA STS Recordation Oral History Project
Edited Oral History Transcript

Jody A. Singer
Interviewed by Jennifer Ross-Nazzal
Huntsville, Alabama – 21 July 2010

Ross-Nazzal: Today is July 21st, 2010. This interview is being conducted with Jody Singer in Huntsville, Alabama as part of the STS Recordation Oral History Project. The interviewer is Jennifer Ross-Nazzal. Thanks again for talking with me this morning, it's certainly appreciated.

Singer: You're very welcome.

Ross-Nazzal: I thought we could start by briefly describing your career at NASA.

Singer: I started with NASA in 1985 at the Marshall Space Flight Center in Huntsville, Alabama. I began my 25 year career with NASA in the Program Development [PD] group as a professional intern. In PD we were involved with planning future missions, which included estimating the design cost, identifying the complexity of a system, and forecasting the major development milestones and timelines. When I finished my Professional Intern Program [PIP] it coincided with the *Challenger* incident [STS 51-L]. At that time the Shuttle project offices were looking for people to help with return to flight [RTF] activities. I applied with the Shuttle office and was selected to work in the Space Shuttle main engine [SSME] project office with John [S.] Chapman, who was a respected leader within the Shuttle organization. He recently retired in 2010.

I worked with John in the business office performing program planning activities such as budget development, hardware inventory management, and working with the prime contractor, Rocketdyne, to ensure the availability and delivery of engine assets. We also tracked the life of the components to predict when certain hardware items would need replacement or refurbishment. It was important to balance the engine inventory [hardware builds and deliveries to the launch site, Kennedy Space Center (KSC)] with the flight manifest needs. It was critical that we were able to identify the most efficient method to support the manifest within the funding profile. I was in SSME until being selected by the external tank [ET] project manager, Gerry Ladner, to be the business manager for the ET project in 1990.

I spent approximately ten years in ET. In ET, I was able to serve in numerous roles. I was the business manager for approximately five years, followed by serving as the assistant manager from 1996 to 1998. In 1998, I was selected as the ET deputy project manager. In ET, I had the privilege of working with two outstanding project managers, Parker Counts and Jerry [W.] Smelser. In ET, I was also fortunate be a part of the Super Lightweight Tank [SLWT] development and delivery, which was critical to the launch of the International Space Station [ISS].

From 2000 until 2002, I served as the Space Shuttle Propulsion Office [SSPO] assistant manager. The Shuttle propulsion office is responsible for all the propulsion elements [external tank, the solid rocket motors, the solid rocket booster [SRB], and the Space Shuttle main engines], their integration, and readiness for flight which includes cost, schedule, technical performance, and safety/risk management. In 2002, the Center Director and the Shuttle propulsion manager [Alex A. McCool, Jr.] made the decision to add the deputy propulsion manager job as a Senior Executive Service [SES] position. Fortunately, I was selected as the deputy and received my SES. I served in that capacity until December of 2002.

From 2002 until 2005, I served as the reusable solid rocket motor [RSRM] project manager. During my time as the project manager, it was very rewarding yet sad time due to the *Columbia* incident [STS-107]. As a matter of fact, my first launch was STS-107. During STS-107's re-entry, on February 1st [2003], we lost the crew. That [the incident and return to flight activities] was one of those character-building and heart breaking experiences.

In 2006 my duties were expanded when I became the manager of the solid rocket motor and the solid rocket booster project offices. We knew we were approaching the fly-out of the Shuttle. It was important to maintain focus on Shuttle safety as we enabled the next generation vehicle and implemented the President's Vision for Space Exploration. The solid rocket boosters were selected to be used on the new vehicle. At Marshall, we needed to be able to share the expertise of the civil service skills, speak with one voice to the contractors, and be evolvable with the next project office. The result was the combination of the NASA project RSRM and SRB project offices. The combination was determined to be RSRB, reusable solid rocket booster project. That is the way the Shuttle booster office exists today; one NASA project office with two prime contractors, ATK [Alliant Techsystems, Inc.] and United Space Alliance [USA].

From 2007 to the present, I was asked support the Shuttle propulsion deputy, Steve [Stephen F.] Cash. In this capacity, I am responsible for all the elements [the solid rocket motor and booster, external tank, main engine, and the propulsion systems engineering and integration group]. In March of this year [2010], I was given an additional assignment to serve as the Ares project manager deputy, so I'm in a dual capacity to the Shuttle and Ares organizations.

ROSS-NAZZAL: Quite a varied career.

SINGER: A fun and a very rewarding career.

ROSS-NAZZAL: What's it been like to be the first female project manager in the Shuttle projects area?

SINGER: I'd say it's been fun and challenging. I have had a lot of great mentors and team members who supported me. The pressure to succeed was probably more self-inflicted. I didn't want to let the team, the community, the astronauts, or myself down. As for being the first female project manager in Shuttle, everyone has treated me very much as an equal and been very supportive. I have never felt so supported by a team in my life! It's was a great job. It was also a very proud moment to be able to do that.

ROSS-NAZZAL: Yes, I can imagine.

SINGER: It's like with any team, you don't do it alone. I had to rely on the great folks around me. They know more than I do and support me. I must rely on their expertise. RSRB is a great team. We had a lot of fun despite the seriousness of our job. Hopefully, I helped "open the doors" for other folks.

ROSS-NAZZAL: Every time we look at the Shuttle Program we're just amazed how it was able to get off the ground. There are so many components and so much that has to come together.

SINGER: So much complexity, there really is.

ROSS-NAZZAL: I thought we would turn our attention to retirement of the Shuttle, given your current position. I was curious if you could give us the status of the three elements right now in the program.

SINGER: Glad to. The Shuttle propulsion elements include the external tank, referred to as the ET; the Space Shuttle main engine, SSME; and the reusable solid rocket booster, the RSRB. Even though Marshall Space Flight Center is the Center where the propulsion project offices are located, our prime contractor counterparts are located across the United States: the external tank is manufactured in New Orleans [Louisiana], at the Michoud Assembly Facility referred to MAF; the solid rocket booster is assembled at Kennedy Space Center [Florida (KSC)]; the solid rocket motor is assembled in Utah; and the Space Shuttle main engines in California.

Each one of the contractors has a unique transition plan. The first project that finished producing all of its hardware and major testing was the Space Shuttle main engine. All of the engines have been delivered to KSC. We have engines in place to support the next two missions, STS 133 and STS 134, as well as the launch on need [LON] mission, if required.

The external tank will be the last to deliver all of its assets. Return to flight safety enhancements and Hurricane Katrina [2005] impacted our ability to build external tank asset. The last manifested external tank, ET-138, slated for the last mission, STS-134, was shipped it to KSC this July [2010]. The launch on need tank is being completed and is planned for shipment this September [2010].

All of the reusable solid rocket motor, or RSRM, hardware has been delivered. The last motor segment was delivered in May of 2010. The booster hardware, which is produced at the Cape [Canaveral, Florida] is being delivered and refurbished. The STS-134 hardware, which is assigned to the February launch, is to be delivered in late September of 2010. The launch on need hardware, if needed, would be delivered in earlier 2011.

ROSS-NAZZAL: It must be difficult knowing that that program is coming to a close.

SINGER: It's mixed feelings. I am very proud of what we've accomplished. We want to remain strong to the end making sure that the last flight is just as safe, or safer, than the previous flight. We are all committed to doing it right. However, there is a feeling of sadness. For many of us, it's been a major part of our life. [Being part of the Space Shuttle program team] has been so much fun, so rewarding—and tough to accept it is going away. [Shuttle] is a national asset. I have such an emotional pride, a national pride, in knowing I played a part and that I know the people who play or played a part. I really want to do my best!

It's been bittersweet. Recently, as an observer, I've gotten to participate in the last delivery of the solid rocket motor and the last external tank, and to experience the last main engine firing. It's amazing the pride that people have. You can see in their faces the attitude and pride of, "We're going to do this right all the way to the end and we're going to make this happen. And yes, if you ever ask us to do it again we'd love to!" I know that most of the Shuttle team members, if asked, would love work to together again.

ROSS-NAZZAL: What complications have there been with the recent Senate bill that was passed at the request of Senator Kay Bailey Hutchison? Has that brought any dilemmas for your office?

SINGER: I do not want to make a comment about the political aspects. We have planned for Shuttle to fly-out and transition. We have assets to support the next two missions and the launch on need mission. In order to produce more hardware or to support more efforts, we would have to procure and produce more hardware. As the Shuttle has been phasing down, we have completed different cycles of production and refurbishment. We have been and are reducing our workforce at our prime contractors with our major vendors phasing out or shutting down if we were their only business. It's a major ordeal to shut down and transfer those items. In order to get major vendors back, we have to know it now. It takes a long lead time in order to be able to recover. So just because someone says, "Let's go fly," we can't instantly return to flight. It would take some effort and funding to bring back the people and to deliver the hardware.

ROSS-NAZZAL: Has that been a discussion about how long it would take to ramp up to continue? I think it's 2012 in the recent bill that's being discussed.

SINGER: There's some discussion ongoing. I wouldn't want to go into any detail. As you are aware, there are different versions and criteria [extending the Shuttle or evolving to a next generation vehicle], so it depends on the question asked as to the answer that best fits.

ROSS-NAZZAL: What's going to happen with the spent hardware, like the SRBs or the engines themselves?

SINGER: The intent is that the SSP [Space Shuttle Program] hardware, if applicable to the next program, will be transitioned. We need to take advantage of assets and cost savings. If the assets are unusable, then they would be retired or destroyed. It depends on the component. Some will be going to historical places and put on display. Some may be stored or, for lack of a better term, destroyed or decommissioned.

ROSS-NAZZAL: I thought we would go back to when you became manager of the reusable solid rocket motor. Tell us about some of the new developments, if there were any going on at that point, for the reusable solid rocket motor. [Did] it pretty much, after *Challenger,* remain the same, or were there changes instituted along the way, during the course of the program?

SINGER: As the manager of reusable solid rocket motor from the 2002 to 2007 timeframe, we focused on the continued safe return to flight. As I previously mentioned, my first launch [January 16th, 2003] as the RSRM project manager was STS-107. The *Columbia* re-entry incident occurred on February 1st. From February of 2003 until the first return to flight mission, in July 2005, STS-114, we were focused on ensuring the integrity of our hardware and flight processes with less emphasis on hardware change. Our [Space Shuttle] second return to flight, STS-121, did not occur until a year later [July 4th, 2006] due to debris concerns from the STS-114 launch.

From 2002 until 2007, as project manager, we had seven flights, most of which occurred after December of 2006. During that time the focus was not on making changes, it was on making sure we understood what we were flying. We wouldn't have flown unless it was safe;

however, we continuously asked ourselves, "Did we make it safe enough?" Since we were close to flying out the Shuttle, we had to ask ourselves if we could even get a change incorporated before we flew out the assets. Most changes take at least two years to incorporate. The changes [obsolescence changes] that were being implemented when I became manager had been approved several years before, and due to the decreased build took longer to implement, test, and fly.

Being able to perform ground testing is a key part of certifying a change and developing flight rationale. The RSRM's flight rationale is based on process control and in knowing that we built it the same way each time within defined parameters, from its assembly, the mixing of propellant, to the insulation lay-up. Unlike some components, the RSRM does not get to test each motor before flight or have a "green-run". For each Shuttle launch, it requires two motors [referred to as a motor set] to perform flawlessly during ascent.

Our flight support motors [FSMs] are a critical part in validating what we are about to fly—our "test before you fly" philosophy. During the return to flight activity, we also tested an engineering test motor, called ETM-3. The booster we fly today on the Shuttle has four segments. The ETM-3 had five-segments. ETM-3 was a margin test for the SSP and has evolved into the booster for the Ares Project. The ETM-3 margin test has been very beneficial to us in the SSP in developing flight rationale. A full scale motor test, especially a margin test, helps us understand the physical performance limits of the hardware, as well as the physics of the hardware. The test information, in conjunction with analysis, is critical in developing strong flight rational.

Another area of concern we dealt with while I was project manager was motor age. At the time of the *Columbia* incident our motors were stacked at the Cape [KSC] ready for the next launch. As a result of the stand-down time, and age life limits, we had to de-stack the motors and return them to Utah. We also were required to review the age life limits of all the assets built in the plant in Utah. The motor assets were certified for five years. There was a concern if we did not fly for a long time that we would have motors which exceeded their certification life.

If they exceeded the age life limit, we had three options: (1) generically certifying the age life of the motors past five years [which would be very expensive and time consuming], (2) washing out the motors and building more [also expensive], or (3) developing flight rationale for each motor anchored to age-life testing.

Depending on the flight set, we did different things. We took the de-stacked assets [motor pair] returned from KSC and saw a unique opportunity to test the identical pair, one immediately and one after being stored. This would help bound the age of the motors we would fly in the future. Both motors were tested, performed flawlessly, and strengthened our flight rationale as we flew our older assets. It turned out that we did get close to the age certification limit as we flew out our inventory. RSRM-96, which flew on STS-117, was the oldest motor set we flew [four years and eleven months old]. The age limit was five. We are now flying younger motors.

Other obsolescence issues or changes we had to deal with included the loss of the vendor for the operational pressure transducer, referred to as the OPT. The OPT is a critical part of booster separation. The booster's burn for the first 2 minutes, 124 seconds to 126 seconds of flight. The OPT's monitors the pressure of the motor initiating the separation process.

Also we had obsolescence with the booster separation motors, referred to as the BSMs. The original vendor that produced the hardware went out of business. To support the manifest and fly the STS-122 mission in 2006, we had to completely redesign, certify and produce the separation booster motors. The separation booster motors physically push the SRBs from the vehicle. The OPT tells the system to separate, the BSM's [four in the front and four in the back] of each RSRB, kick the booster away from the external tank and orbiter, so they can continue into space. The booster sep [separation] motors are very critical, very powerful, only fire for a second and a half, and make sure we don't have recontact.

On the solid rocket booster, we had a return to flight concern, the SRB bolt catcher. I wasn't the SRB project manager during that time frame, David [M.] Martin was the project manager. He's now at the Kennedy Space Center. He would be the expert on it, but I can describe some of the details.

The solid rocket booster and the external tank have attachment points. The attach points are held together by large bolts. When we have SRB/ET separation, a cartridge fires which breaks the bolt. When the bolt separates it is ejected into the SRB bolt catcher. The bolt catcher prevents any debris, such as the bolt, from hitting the vehicle at separation. Debris hitting the vehicle is a concern.

During return to flight activity it was observed that the bolt catcher may not have the proper strength. There was a concern that if the bolt catcher didn't have proper strength that it might fail or become a debris source—with the heightened awareness of *Columbia* and the opportunity to relook, we said, "Let's go back and redesign the bolt catcher and make it safer." We redesigned the housing, the firing cartridge and changed to the separation bolt. There was also a change in the outside thermal protection system and in the absorption material inside the bolt catcher. Also the housing was changed from being a two-piece design to a one-piece formed design. This eliminated the concern about the two-piece housing weld, a potential weak spot. The redesign effort took a lot of work between Marshall and the SRB prime contractor, United Space Alliance.

Each design change to the hardware must go through a thorough review process. The acceptance of a change requires us to ensure that the hardware will perform as designed. We prefer, if possible, to test the component as well as the operating system. We certify that we're ready to go, with sound flight rationale based on an understanding of the physics—understanding the material properties, performance characteristics, and an understanding of the consequences if we are wrong.

Another key technology that was developed during RTF was vehicle imagery. On STS-122, which was in 2006, one of the things that NASA wanted to do was to look at the external tank to see any hazardous debris was coming off. We also increased the tracking of the debris during ascent to see if anything came off that would hurt the safety and success of the mission. During a mission, we need to know about any concerns as soon as possible so that we can make the decision to perform extra inspections, repairs, abort the mission, or execute the Crew Return Vehicle [Launch on Need mission].

A critical imagery item was observation cameras. There are cameras mounted in the solid rocket booster forward skirt and on the ET. The cameras can observe the ET and orbiter during ascent. The booster cameras record up to ET/SRB separation. Once we get the boosters recovered, we remove the film and get it processed. JSC [NASA Johnson Space Center, Houston, Texas], MSFC and KSC look at that imagery to see if they see anything of concern. You can see the boosters separate and tumble. They give the viewer a Disneyland ride. The ET camera displays the data in real time until ET separation. The ET camera is focused on the underside or "belly" of the orbiter. All the camera views have been very valuable, and they are also extremely neat to see.

ROSS-NAZZAL: You were pretty busy during that time.

SINGER: Yes. For not having a lot of changes there was a lot of the return to flight activity, including numerous reviews. We spent a lot of effort reviewing and validating our requirements, the hazards, looking at flight certification, reproving all of that. Even though it was a time which was sad because of *Columbia*, it was also in an odd way, revitalization to the program. The *Columbia* RTF effort gave the opportunity for all of us to question, not just accept a requirement or a way of doing business because that's the way you've always done it. There was an opportunity for a lot of us, particularly me who was new to that project, to understand why we did it to begin with and understand the logic and processes. It also helped us in the future when we made decisions. We also learned how seemingly insignificant changes can impact the entire system. Some changes, if not fully understood, can actually make it worse. What I mean by that is, if you look at one thing [change] it might make it better, but if you don't understand the rationale for the change and why it was there to begin with, you can do something worse to another component. You really have to understand the basis of a change, why you're doing it, and how it interacts with other elements or other systems. These types of questions seem to reinvigorate the team, even those who had been on the program for a long time. It really challenged us to ask, "Why?"

Not to say it was not okay before to dig into the "why," but it gave them even more authority or leeway to say, "I want to know this component, all the way back to the basics of it.

I'm not just going to accept that's the way it works because that's the way you've told me over the years. I'm going to personally understand what's there." I think it actually strengthened our flight rationale and our understanding.

ROSS-NAZZAL: As program manager, how deep did you get into all of these technical changes?

SINGER: As the project manager, I was the one that had to officially sign the change and provide technical direction to the contractor. I was the one that was going to be held accountable for a change. As far as my depth in the involvement of the technical evaluation of the change, there are team members that dig into the technical aspect of it, specifically the chief engineer. The chief engineer and the subsystem engineers were the ones that know the change, know everything about it inside and out. They have discipline support from the engineering and safety and mission assurance directorates, whether it is at Marshall or across the [NASA] Centers and the prime contractors. [The support] was another thing that was really great. We see a lot of teamwork among the Centers in working technical issues. I believe that [involvement] led to the success not only of the ET during return to flight but the continued success of the whole program.

Even today, if we don't have the expertise in house, we go to another Center or outside to academia or to industry. For implementation of our technical or programmatic changes, we have business and procurement teams that help us implement them. It's definitely teamwork. I do not personally evaluate the "nuts and bolts" of each change—I have to have awareness, but rely heavily on the experts on the team to advise me. As the project manager, my job was to make sure I managed and balanced the technical, cost, and risk.

ROSS-NAZZAL: Were there changes in attitude toward safety as a result of the *Columbia* accident, in your experience?

SINGER: My belief is that we always have had a focus on safety. After *Columbia*, we had more of a heightened focus. We did seem to have more requirements to prove it. Before there may have been more of an acceptance that an element had done their homework and it was safe to fly. After *Columbia*, there was more effort to say, "I believe you, but demonstrate it." I saw some differences—which we still do today—in how we present safety topics, how we present our risk, and the level of detail. I'd still say it's not like [*Columbia*] made us more or less safe, but I think the way we present our risk have made us better at articulating the risk and did give us more of a heightened awareness.

ROSS-NAZZAL: In 2004 the President [George W. Bush] announced his new vision for spaceflight. Did that change in any way the project that you were working on?

SINGER: The President's Vision, determined that the Shuttle would fly out by 2010, or when we completed the International Space Station. Before that point in time, in Shuttle we were assuming, based on previous direction, that we were going to fly through 2020. So when the President's direction came out and said, "No, you're not going to fly through 2020, you're going to end by 2010 or the completion of the Space Station," yes, that did give us a different view in what we needed to do with our assets. It also gave us a realization that the Shuttle Program is going to come to an end.

It did give us a different view of looking at our assets and our people. A big part was the impact on the people, which we still deal with today. It's making sure that we have the right workforce in place, that we're maintaining the right focus, that we're enabling them to do their job—as we try to help them understand that Shuttle is flying out, and hopefully help identify opportunities in the next generation vehicle. We're trying to help our people maintain their focus, yet have the ability to look to see how they can be a part of the future.

It's also maintaining the assets and keeping the right tools so that they can do their job. It was a definite paradigm shift from when you think you're going to fly through 2020. We must fly safely as we transition and retire our asset and as we lose our workforce. It's a major shift.

ROSS-NAZZAL: Was there any discussion that perhaps you not focus anymore on development or redesigns at that point?

SINGER: Obviously if there was something that we needed to fix because of safety or obsolescence, you fix it. For other changes, we had to consider if we could implement them during the life of the Shuttle. As I talked about before, even when you have a change certified, it may take two to three years before it can be implemented into the hardware production line, which means you couldn't even get the change incorporated until the end of the program. That's where we had to make some critical decisions on where are we safe today to continue flying with tender loving care [extra inspections, for example], versus where do we need to make a change.

We don't need to make a change just for performance's sake; it needs to be tied to correcting a safety issue. Most of the changes we see today have been in work for years or are driven by obsolescence issues. For obsolescence, in many cases, we don't have a choice; we're going to run out of materials, so we have to incorporate some of these changes now. We are working with the next generation vehicle to find opportunities to share the cost, workforce and materials. Some of the obsolescence and safety changes in Shuttle are applicable to the next generation vehicle.

If there are things that we need to do today to keep flying and it benefits the next programs, we save the taxpayer and the program money because we try to work together to say, "We both need this, so what would be a smart way to do that?" A lot of this synergy was accomplished on the solid rocket booster and motor projects such as insulation, O-ring material, operational pressure transducers, avionics, and etc. Other projects have found synergies too, but the ones I was more familiar with are the solid rocket booster [RSRB].

ROSS-NAZZAL: What type of mission support did you provide as the project manager?

SINGER: As the project manager, I was the primary mission management team; it's called the MMT, during launch. I was responsible for the hardware, process, and my team during the flight readiness process until mission complete. Sometimes people believe, "MMT is being on console for the launch." It is more than that. A majority of the time, the MMT or manager responsibilities back up at least two to three years prior to launch. There are review of hardware changes and the resolution of technical issues, government acceptance reviews, mate reviews, and element flight readiness reviews. From the element reviews, there is a Shuttle program review and Space Operations Mission Directorate [SOMD] review with Mr. [William H.] Gerstenmaier where we're saying, "Yes, Shuttle and Station, are ready to go."

Prior to launch, there's the mission management team, or L [launch] minus two day review and L minus one readiness reviews, followed by the tanking meeting, launch countdown, and then launch. After we launch the element, the MMT are responsible for post flight activities [data review, and recovery, if applicable]. While the mission is on-going, the MMT is reporting on hardware performance and reporting anything that would cause any issue with the safety of the crew or execution of the mission. As the Shuttle propulsion deputy program manager [Stephen F. Cash] or me, as his alternate, support the mission through on-orbit and landing. After the mission is complete [wheels stop], the flight readiness cycle begins again for each element. It's a very methodical, precise, and very important process.

ROSS-NAZZAL: Were you at launch control when you were a project manager, and then today as deputy?

SINGER: Yes. When I am the primary MMT, I sit in the Launch Control [Center], LCC, in Firing Room 4. During that timeframe I am responsible for the elements. Element MMTs poll all their systems during the countdown to make sure that their element is ready to go—with all your counterparts [prime contractor, the disciplines from Safety and Mission Assurance and Engineering, and the subsystem managers]. As the MMT, I give the final go for my area to the launch integration manager, which says my team is not working any issues and am ready to launch. From there, if all systems are go, it is turned over to the launch director.

ROSS-NAZZAL: Is that at the T minus nine hold? Is that when you make those decisions or is it well before that?

SINGER: It depends. There's the countdown process which begins two days before the launch [L-2]. There are many different launch processes and systems checkouts that are in work until we launch. Usually, about four hours prior to the launch the MMT reports "on station" in the LCC. We [the MMT] report on-station and status if we are working any issues. We are responsible for resolving issues through countdown. I will admit, it's a nerve-racking time. You know you and your teams have done everything possible to make the hardware perform as perfect as possible, but issues happen. Electronics cannot work, sensors can malfunction, the weather cannot agree. There are a lot of things happening simultaneously. I always have a nervous anticipation. I want to do it right. You know lives, seven lives are riding on us being right, so it's a lot of pressure. It's an extremely rewarding and fun job. It's very exhilarating we when launch and land safely and successfully.

ROSS-NAZZAL: Have you ever had to cancel a launch because of one of the elements, any of the missions you were involved in?

SINGER: In the missions I have been in as a project MMT, I've never had to scrub a launch. The weather has always been the one that scrubbed it. As the deputy project manager for propulsion, I was on console where we did scrub due to external tank sensor issues.

ROSS-NAZZAL: Well, it's been very interesting. I think we're at our time, so thank you very much for coming in.

SINGER: Thank you.

[End of interview]