

Interview with Georgine Glatz
December 7, 2001

Cameron: This is an oral history interview with Dr. Georgine Glatz, held at the OSD Historical Office on December 7, 2001. Interviewers are Drs. Alfred Goldberg, Diane Putney, and Rebecca Cameron.

Goldberg: We know what your general responsibilities are with reference to the Pentagon renovation program. In this interview we are primarily concerned with your connection with what happened on September 11 at the Pentagon. First, what had been considered during the renovation? What thought had been given to providing safeguards against attacks?

Glatz: I am sure there have been many safeguards as far as security of the interior of the building is concerned. As far as the exterior, we asked the Corps of Engineers to analyze the building, perhaps as far back as three or four years ago, and come up with the appropriate threat. The threat was an exterior blast, like a truck, TNT, exploding about 200 feet away from any one of the Pentagon wall surfaces. We began to look into the integrity of the exterior walls and windows. We were almost finished with the window system design for wedge one. It is a window system because the E-ring involves two items. Not only the reinforcement of the exterior wall, consisting of steel tubing and ties, the steel tubing being connected to the upper and lower slug which function like a diaphragm, but also windows that would be comparably strong to withstand the lateral force generated by exterior blasts of the given magnitude. We didn't have in mind interior blasts, because I firmly believe that we thought we were

capable of detecting a person carrying a bomb into the Pentagon, and whatever a person could carry would not be much.

Goldberg: You do know that some bombs were exploded in the Pentagon.

Glatz: I know something about it, but not much. There has not been much talk about it, so I don't know the details, but it certainly wouldn't cause the same amount of damage as the Boeing 747.

Goldberg: They were minor.

Glatz: Let me go back to the windows. Before those windows were purchased, there was a force protection exhibition at the Quantico base about three years ago. I ran across a product named Arpal Defender Windows, a phenomenal product. The windows are designed to deflect, of course, impact, the window glazing. They will not shatter, but a blast of that magnitude will actually make an opening in the window, an intentional breakthrough, intended as a release of the outer pressure of an interior blast. This product has been developed by the Israelis. I was fascinated with what it did because they proved, based on a test performed, that our walls would not have to be reinforced. The elasticity of the wall and the window and the progressive failing mechanism in that window would release the pressure without injuring the people on the inside and the wall would not be damaged in that type of a threat. Mind you, in wedge two we had broken windows, but the blast, which was of the same magnitude, did not break the walls. The walls remained intact because the blast pressure was released. There was one testimony in which the person said that he virtually saw the wall bounce a foot and a half inward within a millisecond and then bounce back, which is normal. The tapes that I have watched from the Arpal Defender Window, when they

are slowed down, actually show that. It is inconceivable that someone that is not a structural engineer can visualize that a brick wall can deflect within a millisecond a foot and a half and return to its position, leaving the wall completely intact. Structural engineers and those qualified in structural dynamics have two ways to design for blast, the elastic way and the rigid way. The program chose to go the rigid way. The windows were purchased for the entire Pentagon. The rigid way, meaning the rigid framing of those tubes we now have, the reinforcement of the tubes and the bracings which are part of the window system in the wedge one E-ring. The Arpal Defender Window came so late in the process, and they did the tests the most practical way by building a wall, building a window, and taking the TNT and blowing it up. That was not enough for the program. The design A&E was very proud of the design they produced, and rightfully so, it's a good design for the rigid portion. But they are expensive. People couldn't visualize that we could have a system with a strong wall and strong window without reinforcement. That was not logical. The Israelis did not have the computational part of the analysis, which our professors at universities and our engineering staff understand. Because we were rushing to stay on schedule, and the Israelis were not able to convince us in time that the window was better, we went for the rigid windows and the reinforcement of the E-ring wall, consisting of steel tubing of a certain size, lateral bracing, anchored to the concrete slab on the floor below and above, making it an integral part of the floor support system. I watched the construction of this wall support system. It is very complex, very time consuming, and very costly. It was proven effective on 9-11 for the exterior blast, but the question is, have we explored enough all the opportunities? I think not.

Goldberg: So the windows that were used are not the Israeli windows.

Glatz: No, I fought for the Israeli windows because I really believed in the elastic solution. The Israelis have been subjected to terrorism for so many years they do know what they are talking about. Their system, as shown, required delay of the program of the manufacture of the windows for a month or two and the Israelis would have actually modeled the entire wall between two columns, with the window, simulating the situation.

Cameron: After 9-11, was there serious reconsideration of the rigid structure versus the Israeli system?

Glatz: The Army Corps of Engineers came up with the proposal that they would like to take a look at the blast protection of the Pentagon to see where we may have made mistakes. Their studies and our task force studies were somewhat parallel and we helped them with quite a bit of information. We have cooperated, but nevertheless the Army Corps of Engineers had the computer simulation methods. They could simulate the blast, the way it was propagated through the rings and corridors, up over the roof of the building, through the windows, and so on. They have the necessary tools, and they came up with some improvements, of which some are still in evaluation. Mind you, we already purchased 7,000 windows at enormous cost. We want to work with them in some kind of patch that would work for those windows and satisfy the Corps recommendations.

Goldberg: These windows are only for the outside, weren't they?

Glatz: The blast resistant windows are for the E-ring, the outside. We have shatterproof windows on the D and C rings and we have semi-blast resistant of lesser magnitude on the A-ring.

Goldberg: What difference would it have made if you had had the Israeli windows on the E-ring in the renovated area?

Glatz: I am certain that the effect would have been the same. I am convinced about this. I have had discussions and clarified things with the Israelis after the 9-11 incident and my first question was, "Now that you know what happened to us, would your window have decreased the pressure of the interior blast, which was of paramount importance?" They said it would. The effects of the interior blast, the pressure on people's lungs, barriers, and concussions, would have been released. At least it would have performed the same. It is a phenomenal product, and it is good for the Israelis. Confronted with terrorism every day, interior and exterior blasts, they knew what they were doing.

Goldberg: Were they cheaper, also?

Glatz: I'm convinced, looking at it from the window system, they would have been cheaper.

Cameron: You have already bought the 7,000 windows of the original kind to put back on the exterior. Did you consider using the Arpal windows for internal windows?

Glatz: We purchased windows for the entire Pentagon. They are purchased and stored. So we now have to work with what we have and see if we have a patch for the increased threat or completely dismiss that threat and not go any further with it, keep the windows and hope for the best in the future.

Goldberg: What were you thinking of as the most likely threat?

Glatz: When Lee Levy came on board, we had meetings about the windows and types of threat. I was not privileged to attend all of those meetings because I didn't have the

right clearance, and still don't. I wondered why they were considering a TNT truck in the 21st century. Wars will be fought differently. I thought about the Iraqi war, where everything was done from the air. Why would anyone even bother with a truck full of TNT, since everything was guided. Little did I know that the remote control would be the person flying the plane. I personally was concerned about the A-ring and the E-ring, but not as concerned about the C-ring. I thought that the threat would be to try to penetrate the building. And if the building had been penetrated between wedge two to five as it was in wedge one, it would have been catastrophic. We saved lives because we vacated the building much sooner than anticipated. The renovation saved lives from that point, many lives.

Cameron: Diane learned that there may have been problems with the fire doors.

Putney: I don't understand the new feature in the renovated wedge that had doors that activated. We need a better explanation of those.

Glatz: The fire suppression doors, which are accorian-type, are designed to deploy as soon as the smoke detectors detect a sufficient amount of smoke. They are also designed to open if you press on the handle. In the 9-11 environment we had rooms filled with a very heavy hydrocarbon smoke. The speed at which the smoke traveled was enormous and it was so thick that you couldn't see your hand in front of you even if you had it up close. You couldn't even keep your eyes open because it would burn your eyes. It was traveling a bit slower than the fire. The smoke detectors detected the smoke very quickly and closed. People had no idea that the doors existed, they are hidden in a pocket and driven by an electric motor which is activated by the sprinkler system. It all functions together. The door closed, the smoke caught up with them and

the people who were trapped behind those doors couldn't tell where they were going. There was a door, a wall. They ran against the wall, crawled, and hit another wall. It was disorienting. Some people would like to believe that it was their own fault that they did not know about the doors. I would say that in that environment the doors contributed to a lot of chaos and diverted people back into the area of imminent danger. You couldn't see the handle and you couldn't tell what you were running up against. There were facilities people on several floors who tried to keep the doors open for a short period of time. The motor is strong enough to move those very heavy doors. But even people who weighed 270 pounds, and found the handles from the side where there was no smoke, couldn't keep them open and had to give up after a few minutes. We interviewed one of those people. We had one caller testify that they knew people were trapped behind those doors, and they were forced to go back into the area of danger because there was no other way out. When I look at the pathology map, I will solve the puzzle within about two weeks of how many of the people on the Army floor, number two, actually went back to where they had been sitting, looking for escape. All the staircases were compromised. By that I mean that there was fire up to the fifth floor.

Goldberg: What is the function of the fire doors, then?

Glatz: The fire doors were designed so that a person could not shoot through them, and to isolate areas where there is fire and smoke of a normal magnitude, where people could use a staircase and go down. The fire doors were supposed to isolate the main corridors to keep people from other areas safe to leave the building.

Cameron: Did the original planning consider that the doors might isolate people who happened to be within that space?

Glatz: If the stairways had not been compromised, the fire suppression doors would have been more effective.

Goldberg: Does this suggest that we need to do a lot of educational work so that people understand the whole security apparatus of the building? That not enough of this was done before? People didn't understand.

Glatz: Yes, and my report addresses that in detail. We know that the tenants have to do it, and that the Pentagon renovation has to educate the tenants before they go into their spaces. We have to have inside drills, and have completely different plans for the disabled and be ready to deal with foreign debris and people in wheelchairs who would not be able to get over it. We have to deal with people who have to be taken out of the expensive wheel chairs which cannot be carried down a compromised staircase, and the disability may not allow us to pick up the person because we may cause injury to them. We are not yet ready to deal with people that are disabled and face the kind of emergency we had. We were lucky to only have one person, who was blind, and was carried out by somebody. Had we had the same problem in wedge three, four, or five, it would have been a serious problem because the fire would have penetrated much more quickly.

Goldberg: We have not been as prepared as we should be.

Glatz: We have not been.

Goldberg: That raises a problem for the future. Now, to get around to your role on this day. Where were you and when did you learn about the plane hitting the building?

Glatz: I could have been dead, because I was planning to go to wedge one to see how the façade was being repaired. I was going to compare wedge two with wedge one. They were charging so much money and I didn't see much difference. I was going to go that morning but my ID card had expired and I decided to get a new one first. I was at the pass office and the lady said that one of the Twin Towers had been struck.

Goldberg: You were in the office on the concourse?

Glatz: No, I was in the pass office at the Pentagon renovation complex. She wouldn't issue me a pass because her computer was down. If my card had not expired, I would have been in wedge one when the plane hit. That's how fate sometimes works. I immediately ran to the office, having been one of the first to learn that the Tower had been struck. Two or three people in my office already knew of it, and we gathered by the radio and, soon, by a television set. There was not a doubt in my mind that it was terrorism. My education is in structural engineering, general civil engineering, and transportation engineering. I did some airport planning and design and I know that planes do not crash into tall buildings on Manhattan. The route is different, the heights are prescribed, the limitations are well known, and the pilots are well trained.

Goldberg: It happened before, but a long time ago.

Glatz: That was something different. This was very intentional. What struck me about this was when I saw what part of the building they actually hit. There was no doubt in my mind that the tower would fall down and be demolished. It could not stand for long because of the exact things that happened in the Pentagon. The steel heated up and the domino effect caused the floors to cave in downward. I was terrified. It was just a short period of time before the second tower was hit and everybody knew it was a

terrorist attack. My boss, Mike Sullivan, wanted to have business as normal and sit down and talk about it and go back to work. We were not going to leave the building. As I was sitting at the computer, there came an incredible explosion and I could feel the building at North parking actually rattle. The blast wave was so incredible it propagated through a very large area and we could feel the building shaking. I ran out and saw enormous smoke, and people were saying that a bomb hit a temporary generator outside the building at wedge one. I said, "No, not that much smoke, this would not cause that much vibration." The structural engineers and electrical engineers were talking about it. I have seen too many movies—technical films—on earthquakes, explosions, and so on when I did my dissertation. So we were standing and looking at it and still people didn't know that a plane had hit. It took quite some time before they were sure it was a plane. Then some people started to go home, crying, panicked, and some ladies in our renovation complex were quite despairing. An officer came to our office and told us to leave the complex immediately. He wouldn't explain to us why. Someone cut a hole in the fence.

Goldberg: Was this a Defense Protective Service man, or military?

Glatz: I don't even know. Then I saw a Navy person guiding us to the Rosslyn area where we should hide. I asked him what was happening and he said there was another incoming plane. I asked if the plane was already here, because then standing under the bridge would be the safest place. He said, "No." So it came to my mind that they were planning to shoot the plane down. That's why they wanted us to go as quickly as possible, so they could shoot it before it hit the Pentagon. I ran as far as I could. I felt very alone. Who knew what that plane was carrying. It could have been an atomic

bomb. I had not been injured, but I was scared. I ran with everybody as fast as I could, and the plane never came. Then we were standing and sitting there getting information on what was happening.

Goldberg: Where were you by this time?

Glatz: I was in Rosslyn, standing with all the people who ran up there. We were not allowed to go anywhere else. I wanted to go to the crash site but the people directing us didn't allow us to go in that direction.

Goldberg: How long did it take you to get to Rosslyn?

Glatz: It took us about 20 minutes to walk, not completely to Rosslyn, but close to Arlington Cemetery, where we all gathered. We were waiting and trying to call families and receive calls. A police car came to our area asking for [Irno (?)] or Stacy. Irno was close to the car and jumped in. He wanted to help identify spaces because even the fire department had difficulty orienting themselves in wedge one. Stacy was faster and went up with the policeman. I understand that she was very helpful in identifying the spaces. I sat there for 1½ hours until someone told us how to get in the back way, around the policemen and the guards, and into the complex. We finally got into the complex.

Cameron: Into the Pentagon?

Glatz: Yes. I was told that no one was allowed to come close to the Pentagon, that we should go home. I was not ready to go home. I wanted to help, but I didn't know how, from that office. We formed a command center in the office and started to plan what activities might be required. We had a person, Rich Fitzharris, who somehow had managed to get to the site and was communicating with us as to what was needed.

Jack Kelly got involved and called Allyn Kilsheimer, someone he knew from the past, to come and assist us with the recovery activity.

Cameron: We interviewed Mr. Kilsheimer. But I'm not sure what his official capacity was at the outset.

Glatz: We had FEMA on the site, and the Arlington fire department, very qualified people, doing shoring activities. Allyn Kilsheimer was called by Jack Kelly to assist or direct the shoring activities. One of the great things we had done is that the renovation was able to support its recovery activities to a large degree by ordering all the materials and having construction companies right on the site. We took the initiative and ordered all the shoring wood that was needed. Perhaps this is where Kilsheimer was very helpful. I didn't know he was hired. I was waiting for someone to tell me I was permitted to go to the site and assess the situation and make recommendations. I was not called to the site and I suffered tremendously because I wanted to help. I knew that it fell right into my discipline and wanted to help so badly. Later at night, when it was already dark, I succeeded in getting to the site, and when I saw it, I told Mike Sullivan it looked like the left corner of the building was due to collapse any minute. It wouldn't be there in the morning if we didn't do something about it right then. He said, "yes." I didn't know that Kilsheimer was already on the site.

Goldberg: Where did he come from?

Glatz: He has a company in Maryland and Virginia. He was involved in some of the work in Oklahoma City. I would have chosen someone else for it, because I knew that much better experts were in the area. I had worked with them before and knew their credibility was enormous, but I didn't get a voice in choosing the structural engineering

company that would assist us. I was told that within five minutes Kilsheimer got a \$15 million contract to assist us with the rebuilding and recovery actions. It was a letter contract, which I believe we were authorized to do to begin with.

Goldberg: What did Sullivan do about your suggestion? Did he shore it up?

Glatz: No, he didn't.

Goldberg: Did it collapse?

Glatz: No, they did shore it that night. They had to do additional shoring. Nobody was allowed to go inside, because the FBI declared it a crime scene, but Allyn Kilsheimer told me that he had already been inside. I could have gone in, too, we could have done the job jointly and very effectively. I was discussing it with him, and I also told Lee Evy the same thing. I didn't get any answer at all, he just walked away. But he already had a structural engineer, so he probably didn't want to hurt my feelings.

Goldberg: Evy arrived at about 6:00?

Glatz: Yes, and immediately had the security people bring him to the site. I wanted to help and no one wanted my help. I just stood there and couldn't do a thing other than hoping that tomorrow was going to be a better day and the chaos would ease. I felt that my boss was so unhappy and distressed that he wanted to talk with as many people as possible and he knew what he was doing. I didn't want to do anything that he wouldn't want me to do, so I just looked at the situation. One of the fire department people came to me and told me that it was definitely my area of expertise, and I could be helping them a lot.

Goldberg: Which fire department was he from?

Glatz: It was Stanton Engineering who volunteered for the Arlington fire department. He is close with them and such an expert in fire protection. He said he would be glad to work with me and to call him whenever I needed to. We could go inside the building if necessary. Ten minutes later Allyn Kilsheimer tapped on my shoulder. He was very cordial, and I asked him if I could work with him. He said that would be fine. I asked him to take me into the building since he had the authority to do so. He said he would do it the next day, and I waited a long time, but he never took me there. It took me a long time before I got an access card to get inside, because the FBI continued to work on the recovery action. I was not even on the list of people that had access to the site. That troubled me but I thought maybe it was an oversight. I was fortunate to work at the command center with the FBI, at Fort Myer. I was giving them valuable information on the location of certain columns as the calls were coming in about the possible recovery of certain areas. There was nothing they could do unless they could lift the debris in the area. Suddenly there was a person telling me that Kilsheimer was directing their work and telling them what to do. On the third or fourth day they took me to the site to check the work and made sure that I had an access card. They were the ones that insured that I had an access card to the site. I told them where I saw nothing wrong and where I would do things slightly differently. I would support a bit more because when they started moving the debris they must have one side supported better because the side that was cut would take a load away from the pile and there needed to be something supporting the rest of the building. There had to be more shoring.

Goldberg: So you feel that you were handicapped because you are a woman, working with men?

Glatz: I think so.

Goldberg: That was part of the problem that you faced?

Glatz: I think so. I had rejected Allyn Kilsheimer for one of the jobs we had with the RDF structure because I heard from many consultants that worked for us and knew him that he is very rough around the edges, not the best person to deal with, and certainly not the most qualified. I hired a person very highly qualified who did the Hyatt Regency Inn, and also the Oklahoma City analysis. He is a nationally known expert and a member of the American Concrete Institute. He is Gary Klein, with [Janey Associates?]. From that time on, Kilsheimer and Jack Kelly were very unfriendly with me because I rejected Allyn for the job. Somehow Kelly knew that I would never opt for Kilsheimer to work on the job for a number of reasons. The problem involved dynamic forces and rebuilding the Pentagon a better way. I knew that Allyn was not qualified for that. A lot of people were calling him an ambulance chaser. I didn't know about that, but I was not happy with the fact that he got the job without anybody consulting me. I thought there were much better qualified people out there who would be very honest with the program and capable of advising Lee Evey much better than Allyn has.

Cameron: When were you given the assignment of chairing the task force to look at the situation?

Glatz: I was very unhappy, and I think Lee Evey thought that it would calm me down and take me out of Allyn's way. He felt that it would preoccupy me long enough and that I would do a good job. He didn't know to what extent I would look at the lessons learned. I began to look at it from a different standpoint. When a structural engineer sees the collapse of a building he takes it very personally, because what he is

supposed to do is build buildings that will not collapse. This is what tortures and torments structural experts when they see it happen, because it is not supposed to happen ever. I knew that the structural collapse and the force were enormous. I do not have the magnitude modeled yet, but I knew we could have done something with the rest of the building. I knew the relevance of the blast-protective windows and the magnitude and the raging of the interior blast. Interior blast loves rigidity. If you can visualize how a combustion engine works, the system is about the same. The blast wave hits at enormous speed. I would call it [dislargation?], there is a big difference in the speed of the wave. The speed is enormous and when it hits a rigid object it ricochets and propagates until it finds a way to escape. At certain places where the waves meet they gain in magnitude and in certain places they consume. It all happens within milliseconds. If you look at the C-ring windows you will see that the blast went out right through them. It also rushed via the suspended ceilings because this was its least path of resistance. That's why it appeared that the smoke was actually even coming from the air ducts. Of course it did, because they had been ruptured in many places and the force was adequate to carry the smoke through those broken air ducts. Then it also went to the stairwells. Interior blasts love shafts. It demolished our elevator shafts in wedge one. They were unusable. It damaged the stairwells by carrying smoke and fire up to the fifth floor, compromising the access entirely.

Cameron: Could you tell us some more about the report?

Glatz: Knowing the technical implications and that we could have saved people elsewhere, or made their exiting easier, I recognized that we have to deal in the future with interior and exterior blasts jointly and do it extremely effectively, because there is

no such thing as a perfect defense for interior and exterior blasts. We can minimize it. We cannot make a bunker out of the Pentagon. I knew that Lee Evey wanted me to look at whether we should have photoluminescent exit signs near the floor, but that would not be the extent of my research. I knew that I was going to analyze every building system there is and see how they performed. I knew the building as it was, and how it functioned, and I saw it destroyed. But the missing link for me was to see what the people experienced as it happened, to get a clue as to what we could have done better. Many people on my task force didn't have a clue of how to go about this, but I knew that if the people were honest and open with us we would get the answers. We did, and that is how I started the interviews. There were so many interviews in which people talked constantly about the interior layout, about the combined rings, about the fire traveling too fast through the areas without anything to stop it.

Cameron: Will this be made public?

Glatz: I hope that the final report will be made public.

Cameron: It will not be classified because of the national security issues or anything of that sort?

Glatz: There is nothing of national security in that report.

Cameron: You mentioned prior to our interview that there was discussion of possible threats that might not be made public.

Glatz: The report doesn't talk about a specific threat. It talks about the performance of the Pentagon as a building and its systems in the 9-11 attack, what hindered people's escape and what killed them. It was not necessarily the impact.

Goldberg: The area being worked on now is four to five, correct?

Glatz: Between four and five, yes.

Goldberg: Half of which is a renovated area, and half of which is an unrenovated area.

Glatz: Yes.

Goldberg: How much difference was there in the effect on the building and on people between those two areas, do you have any idea on that?

Glatz: We don't have a fair comparison on wedge two, because many of the people were vacated. We didn't have a proper barrier wall between wedge two and wedge one, which allowed the fire to flash over into wedge two. Plus, when you look at the thrust of the plane, it really tossed about 40 people into wedge two.

Goldberg: From the plane?

Glatz: No, from wedge one. The people who were in the rear end of the plane were tossed into wedge two, one of the corners of a big hall that was hit by the blast wave. Wedge two is disadvantaged because it is not really sprinkled, and also has a lot of steam pipes that connect to the fire department hoses, and many were not operational. We had to run 800-foot hoses, a very difficult job, into some areas. Suppressing fire in wedge two was a big job. Suppressing fire in wedge one, where the sprinklers came on, and they didn't come on everywhere because the pipelines were damaged by the impact, was tremendously improved. But we can do better. The focus is really on the interior layout and the fire protection. We have to focus on much higher protection for wedges two through five in terms of being able to suppress fire in case it happens. In my report we recommend that ahead of time we renovate the fire suppression system, which requires replacing the steam pipes inside the stairwells ahead of time so that we can fight fires. Based on how much advertisement we have provided about how well

wedge one functioned, God forbid that terrorists took that seriously, because now they know where to hit.

Goldberg: With reference to the Twin Towers, when the planes hit, do you know whether the explosive effect, the smoke, and the fire, were as fierce as the Pentagon?

Glatz: Our fire was of the same magnitude. It was the same type of fuel and the same damage to the concrete slabs.

Goldberg: And the Twin Towers went down like the Pentagon, a domino effect.