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Interview With  
JAMES A. CUNNINGHAM, Jr.  
4 October 1983

DEW: Concerning the U-2 engines, the history is rather unclear, there were two engines, the plane was designed for the J-57/P-31 engine, but you couldn't get it right off. You had to go with the J-57/P-37. It's unclear when you changed from P-37 to P-31.

JAC: As soon as we could get our hands on them, and that was some time in 1956, early on.

DEW: Did Detachment A have the proper engines?

JAC: They had the proper engines. That was May, June, July of 1956. Now, we didn't have very many of them. In fact, we had to rob ourselves in order to get enough to send them over to A.

DEW: Now, A had four aircraft to start with? And they all had the proper engines?

JAC: Yes.

DEW: What was the penalty in altitude between the two engines?

JAC: I can't give you an exact figure on that. It was something on the order of 1,500 feet. I have in my bag in the other room the thrust characteristics of it.

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DEW: Well, I have those. I have the difference in thrust that the P-37 was 129 kg heavier and it lacked 1,127 kg in thrust. In other words, the power-to-weight ratio was 3.4:1 for the P-31 and 2.7:1 for the P-37. So it's a significant difference. Now, the other thing that came up, and it's only mentioned when we get to the J-75 engine was that it was better because it had less problems with contrails. Now, did you have problems with contrails with the earlier engines?

JAC: We had problems with contrails practically all the way through the program. What you did was to make sure that you didn't penetrate the other guy's country until you were at your penetration altitude which was 69,500 feet, by which time you were out of the contrail area. In ascending, particularly in the tropics, it didn't matter whose engine you had you'd get contrails up to the point, depending on the day, it could be as high as 60,000 feet.

DEW: There was still that much moisture in the air that it caused condensation? Well, that answers that question. Now, the first aircraft to go out -- what I did, was go through here and get all the various types of systems, but it's unclear, who had what systems. Now, I found systems number with Roman numerals I through XXII. And I discovered that the earlier systems were all built by Ramo-Wooldridge. From an operations point of view, was there a great deal of pressure on you to do these things, use these ELINT systems? As opposed to pictures?

JAC: Well, of course, there was always a battle between people who wanted the pictures and the people who wanted the sounds. We even got to a point in Adana where we would run these "exciter" missions, you know, going around -- well, we did just before Powers, for example -- around the periphery of the Caspian Sea to try to excite some intercept information,

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telemetry wise. Particularly if anybody was going to fire a rocket at you. But, these were not terribly successful. I think I'd have to say in all honesty that ELINT was always second to photography. If you got something on your recorders, then everybody was happy. And, of course, once we started focusing on the missile aspect, which I would say, by recollection, was somewhere in 1958, then we did run more ELINT-only flights than we had at any point up to that stage. That was a world of experimentation, fuss and fidget with the damned systems, try to optimize, and a lot of time we got things that nobody knew what they were when we got them back. They'd say, Jeez, what the hell is that?

DEW: As I get into it from the other vantage point, it becomes very obvious that the really important data for missiles was not pictures but ELINT. But I could see that early on in the program there was a definite bent toward photographs because it could be seen. The other was sort of a black art.

JAC: And, of course, by 1958, the Air Force had its own stations along the northern coast of Turkey, at Sinop and

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DEW: Did they fly U-2s out of there, also?

JAC: No, they didn't. They were stationary ground sites. And, as a result, they couldn't get the initial stages of the telemetry as the missile would lift off the pad, because of the curvature of the earth. So they were always looking for that first 90 seconds, that's what they wanted. Usually they could not tune in until it had been 90 seconds into the flight, so there was a certain pressure to try and get that, but in those early airplanes you had just so much weight capacity. And, you know, the damned B camera weighed about 465 pounds, or some-

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thing, and you had a 500-pound capacity, you couldn't carry an awful lot in there.

DEW: Was the B camera that much heavier than the A camera?

JAC: Yes, quite a bit.

DEW: Now the A-1 was not used much at all.

JAC: No.

DEW: What was the difference between the A-1 and the A-2?

JAC: Without my charts I couldn't really tell you.

DEW: But there was a difference between them?

JAC: Very small. We even had a C camera, which never really got off the ground.

DEW: They said they used it once -- a 144-inch monster.

JAC: Yes, folded optics and all kinds of things. It was supposed to be able to count the hairs on Khrushchev's chin, that sort of thing. But, my God, you had no sweep at all, if you happened to miss the target by 20 feet you were out of luck; it was focused that narrowly.

DEW: Well, the OSA history said it was used once and abandoned. Obviously, it wasn't used operationally.

JAC: No, that program was collapsed. I was always kind of sorry that it didn't get a chance to run, because I thought they really would have had some high-resolution stuff out of

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it. And I can't recall at the moment what the resolution was, but it was infinitely better than the B camera. But you couldn't, you know, the B camera went from horizon to horizon, and the C camera was like driving down the white line on the highway. If your target was off the white line you were out of luck.

DEW: This was obviously another difficult aspect of the U-2, flying that high and trying to navigate that accurately.

JAC: Yes, exactly. It was something that was corrected in the OXCART program, of course, with the inertial navigation systems.

DEW: In other words, there was something that took control away from the pilot, that was guided by a computer -- that's not really clear in the history, either, that there was that sort of navigation available.

JAC: At that point, we had learned from the Powers' incident. We had originally developed a map which was the map the pilot followed. It was on two reels, a strip map. And his whole mission would be plotted on that. But as he flew the mission the part that disappeared off the screen in front of him would go into a tank of water, in the cockpit area, and dissolve. So that by the end of the mission all you would have is a gummy mess in the cockpit which was the route map, so that if he failed to make it you wouldn't know where he had been. You might know where he was going to go, but you wouldn't know where he had been. And it was quite an effort that was put out to develop this soluable paper. I guess we must have spent a year or more on that thing, and finally got it to a point where it worked.

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DEW: How far along in the program was that?

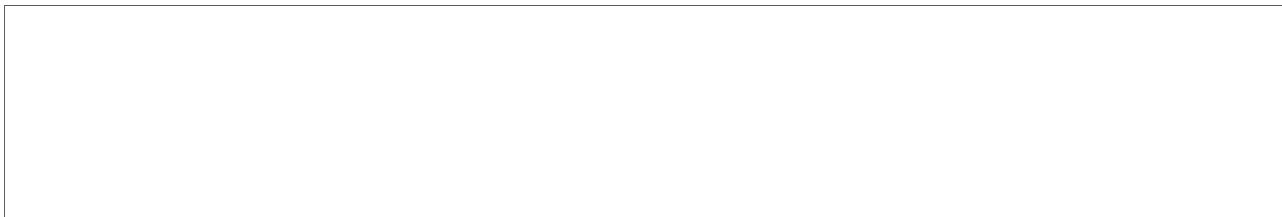
JAC: Oh, this was before we went operational.

DEW: Just to jump ahead a bit, I have no documentation on the U-2R, how different was it?

JAC: Let me get my charts. Here are the specs.

DEW: Used the same engine, maximum altitude  It went above that, didn't it?

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DEW: Where could they put almost 3,000 gallons of fuel? Of course this had external tanks, didn't it?

JAC: Well, of course, we had 900 and some odd gallons reserve. We had a total of 925 gallons in the mains, and 95 gallons in the sump. The auxillary tanks had 300 gallons, and if you carried the slipper tanks, you got an extra 100 gallons each. The B camera weighed 447 pounds, not 465.

DEW: When they did the Delta camera -- transferred it from the CORONA program -- it wasn't used all that much. Was it heavy?

JAC: I can't remember, because that's about the time I signed off on the program.

DEW: Where did you go then?

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JAC: I went into the Far East. You see, anything after 1966 is after me. I was away.

DEW: Who took over from you?

JAC: John Parangosky. I pulled a fadeout and went over to Southeast Asia and spent five and half years out there.

DEW: Were you aware of the other programs that were going on, such as GENETRIX.

JAC: Yes, in general terms, not down to the nitty-gritty -- 461-L.

DEW: What about BLACK KNIGHT, was it the Canberra they used?

JAC: That the was D-model Canberra. They had taken the Canberra and stretched the wings on it, made them bigger, and then they went into the F-model, finally, which was supposed to be the real challenger to the U-2. But the F-model never really made the grade either, because the Air Force was so desperate to get all the missions they could away from the Agency, they made a lot of fabulous claims for the engine on the F-model. They said they could sustain cruise indefinitely at 73,000 feet, and this kind of stuff, and I sat in on briefings when they were making these claims, and then I talked to the guys at Pratt & Whitney would were making the engine, and they said, no way, this thing hiccups and dies at 69,500, which we used as the penetration altitude.

DEW: Were they using the J-75 also?

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JAC: They had a different engine, a specially tailored engine for the Canberra.

DEW: Your aircraft had to go in at 69,500.

JAC: That was the optimum penetration altitude. Now we did fly a few missions much lower than that for range. When we were going from [redacted] you couldn't really get there if you were at maximum altitude. So you compromised and went at almost a "fairy" altitude at 67,500 all the way. And we had to plot the thing very carefully, based on the known air order-of-battle. And, of course, going north from [redacted] there wasn't any air-defense capability to speak of. They had a few MiG-15s and MiG-17s in that region, but, hell, the bases were 300 to 400 miles apart. [redacted]

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DEW: That was a long mission, I wondered how they ever got there. Later on, in 1965-66, they mention that one of the U-2s was fired on by a MiG-21. Now, how close did they come.



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JAC: On occasions, MiG-21s had been seen by the pilots arcing up and over, so they could reach mission altitude on a zoom climb, or what they call a dynamic-climb basis. They'd go to about 45,000 and then go as fast as they possibly could and do a snap-up. As they got up higher, they began to lose control of the airplane, it was like a missile. Then he was through, he'd arc on over, and that would be the end of it. That was kind of exciting for the pilots.

There was one occasion, that I can remember, where an air-to-air missile firing was made in China, but the missile couldn't do anything either, because it was probably a copy of the Sidewinder and didn't have enough dynamic stability to do anything but wobble and lose control. But there was no real threat from that. Although we did have System-IXB, as I remember, which was the tail-borne jammer, made by Granger Associates, which was designed to defeat heat-seekers. Of course, Kelly put this scoop on the back end of the exhaust cone, which he called a sugar scoop. This made the plume go up like so, and it couldn't be gotten at from below quite as easily. This was later abandoned, it is not now on the R-models. It was fairly dicey.

DEW: I take it that the R-model included all the improvements made to the C-model over the years.

JAC: What it really did was to -- you see there was a very narrow envelope of stability at high altitude. It was about 4 to 6 knots, as I remember. The critical Mach number was right here and then on either side of it was 3 knots. And if you exceeded that, if you went to the slow side, you then got a low-speed buffet, and if you exceeded it on the high side you got a high-speed buffet. In either event you were in danger of losing control of the airplane. If you went 10 knots on either

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side you were apt to be in big trouble, because it would start falling out of the sky. So when the R was built, one of the first things Kelly did was change the distribution of weight in the airplane, because it was much longer. They had two Q bays on the R -- two pressurized equipment bays, one for the ELINT equipment and one for the cameras. By keeping the same aspect ratios and everything else, but by extending the airplane you got a very comfortable margin of safety on either side of the critical Mach number. I can't remember right now what it is, but I would suspect it is 15 or 20 knots that you have to play with. The pilots think its great, it's like driving a car. And there is less danger of losing control, by a wide margin.

DEW: But at that, you didn't have so many crashes, did you?

JAC: Oh yes, we -- the Air Force and ourselves -- wiped out over 30 airplanes.

DEW: In the high-altitude aspect of flying them?

JAC: No, they were all kinds of dumb things. One guy down at Del Rio was showing off for his wife after he finished a flight, and he flew over the house, 500 feet off the deck or something like that, did a pull up and exceeded the limits of the airplane and the wings came off -- so much for him, you know. We had others where there must have been oxygen equipment failure and the airplane kept flying and suddenly went that way and crashed. The Air Force had a lot of crashes, because they had a little different selection process. But we had our share, too. One of our better pilots, who flew one of the two missions over the  Right after he got back, he was making an ordinary approach at Edwards AFB and turned on final [approach] and just went right into the ground. Never could figure that out.

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DEW:



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JAC:

DEW: He had flown more missions than anybody.

JAC: Whether he got too comfortable in the airplane, I don't know, but there wasn't any radio transmission or any indication of trouble. But it was an airplane you had to be very respectful of at all times, because if you weren't, you'd be up the creek. You saw the movie, haven't you.

DEW: Yes, I did. Now, the BLACK KNIGHT thing, when they got ready to put Detachment C out -- Detachment C had to leave, right, because the Air Force wanted to get in and train its pilots?

JAC: Yes.

DEW: Then you had to find a place to put them and you tried to get into Yokota. They wouldn't let you there because BLACK KNIGHT was there and you had to go to Atsugi. Later on, after Powers' crash, they also talked about making two flights, one with a U-2 and  over Sary Shagan. Were you in on that?

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JAC: We never did.

DEW: No, you didn't do it, they wouldn't let you. And then there was more talk about using the RB-57 around the Black Sea area.

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JAC: The whole subject of manned reconnaissance after May 1960 was very unpopular for quite awhile.

DEW: There's an interesting thing in McCone's history where he told McNamara that he had every intention of flying the OX-CART over the Soviet Union. Later, he had to admit that they couldn't do it.

JAC: There was a great amount of misinformation at high levels. I remember going to a meeting one day with McNamara and McCone and General Carter, and the whole joint staff in the room. And McNamara said, "John, what's this I hear that you've got two planes in Iran?" McCone did a double-take and turned to us guys and said: "What the hell's he talking about? We don't have any planes in Iran!" And McNamara said: "Oh yes you have, right here on this piece of paper." McNamara was nothing if not voluble. He passed the paper over, and it said "Two aircraft are I.R.A.N." That means "Inspection and Repair As Necessary." And McCone laughed and said "Aw, Bob!" Here was the Secretary of Defense and didn't even know what the acronym was for.

DEW: Were you often in McNamara's presence, did he get into this much?

JAC: I didn't spend that much time, except during the Cuban Missile Crisis, and I was not that impressed.

DEW: What about McCone?

JAC: I personally didn't like McCone, I thought he was given to Divine Intervention, thought some things were true because he thought they should be. He was very resistive to certain subjects. One of his pet ones was the supersonic trans-

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port. There wasn't anybody in the world who knew anything about the supersonic transport except John McCone. But, unfortunately, he became one the Presidential counsellors on the subject, you see. He didn't think the U.S. should build a supersonic transport and voted against it. I must agree that he was partially right, when he said that if the fuel price ever went up the supersonic transport would not be economic. But there wasn't anybody that thought there'd be a fuel crisis, so I guess you have to give him a plus for that statement. And that's exactly what happened. I don't know, he did the work; Walt Elder thought he was great, because he worked with him every day. The security officer who was with him for the whole time he was here wasn't <sup>too</sup> keen on him. Mr. McCone made one fatal mistake in terms of the Agency's role in reconnaissance, he willingly turned over the funding of all Agency reconnaissance programs to the NRO. Up to then -- you know, it's the old story, he who controls the purse strings controls the way the program goes. I can remember going up with Larry Houston and a couple of other people to McCone's office -- the one he had down in Central Building -- the day he made that decision and I practically wept outside. I walked around with Houston and said: "Jesus Christ, Larry, there goes the ballgame. He's turning the whole funding thing over to the NRO, and we're only going to get what they want to give us."

DEW: Do you remember what year that was?

JAC: Oh, goodness, I know it was in the springtime, like in March, but the year, I would say, was 1963, whenever it was that the Agency lost its right to fund its programs. From then on, we had to go down on bended knee to the Air Force controller for every nickel we got, just to maintain the programs we had, never mind starting anything new. There was this fairly tedious review procedure that got screwed together, where you

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had to go to whoever was occupying the undersecretary of the Air Force's chair and brief the hell out of him and try to convince him that what you were doing was right. It even came down to having to go to the secretary level in the Air Force to get approval for major engineering changes on a program that you'd been running. Like when we wanted to increase the number of engines that were put into the A-12 program. We had to get the Air Force to concur. Of course, they did so, grudgingly. Jack Ledford made a masterful presentation on that to Brockway McMillan, and they finally, grudgingly, let us do it.

As recently as two years ago, I heard people in the Air Force say that the SR-71 program is in tough shape today on engines because the CIA didn't order enough of them.

DEW: Is this a follow-on to the J-58 engine?

JAC: This is the J-58 engine. They took the engines out of the A-12s and put them into the pipeline for the SR-71, but they're saying, in effect, if it hadn't been for the stupid bastards in the Agency we'd have had enough engines to support the SR-71, because the engine went out of production.

DEW: Well, what was in the SR-71 to start with?

JAC: They had J-58s. But you see, they ordered for their fleet and we ordered for our fleet. We ordered this slightly larger engine -- bigger thrust -- than the Air Force did. The Air Force never followed our lead on anything. They had -- it was NIH [not invented here] all the way. We didn't invent it, so, what they ended up with was insufficient engines to support their own program, because they were doing it on the cheap. Instead of facing up to who made the decision, they said, well, it's CIA's fault for not having bought enough engines for their

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program. And yet, they accused us at the time of having bought too many.

DEW: What was the difference between the SR-71 and the A-12 in speed and altitude?

JAC: You couldn't get an honest figure out of anybody on that, even today, I don't think. Maybe Kelly would give it to you. Theirs was a heavier airplane, by about 10,000 pounds. So you don't drag 10,000 pounds around at altitude without paying a penalty. These figures are recollection figures only, but, as I remember, the Air Force felt very comfortable at 83,000 feet, whereas we were able to maneuver along at 89,000 to 93,000 feet. And the Air Force never really got above 83,000 feet; they don't today. The speed is roughly the same. We were Mach 3.15 and they were 3.12, as I recall, because they had the same engine. Once you get the thing moving it will step right out.

DEW: You have another body in there, but surely that doesn't account for 10,000 pounds?

JAC: No, it's not all body. You see, on the matter of tail fins, for example, the tail fins we used were of composite material. Theirs were good old titanium. They never did go over to ours, even though, from the standpoint of radar reflection, ours were much superior. There was a stainless spike on which this whole fin pivoted, but that was the only stainless that was involved in the after end. But the Air Force added up the score and they didn't think it was profitable to go to the composite tails. And they paid a weight penalty for that. And there was weight all over the place on that machine. At one point they even wanted to tanker fuel for themselves. They wanted to put in, at the base of the wings where they join the

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fuselage, two tanks, one on each side, that would have increased their fuel capacity by 10,000 pounds, but shucks, the penalty they would have paid for that made it totally infeasible, even they could see that. But Kelly's told me right out, as recently as last year, that the A-12 was a much superior airplane than the SR-71 in all departments -- defensive systems, the works.

DEW: You helped write the piece in the Studies in Intelligence, didn't you?

JAC: No.

DEW: Who did?

JAC: John Parangosky and a chap named Ed Duckett. You see, I was in Southeast Asia at the time.

DEW: Well, they don't mention the camera in that plane. Who designed the camera?

JAC: In the OXCART? Perkin-Elmer. And then a backup camera by Eastman Kodak.

DEW: Was that a derivative of any of the other cameras?

JAC: No, this was again taking advantage of what they knew and what they'd learned from the whole business of camera making. Eastman's was not a success, the Perkin-Elmer was, that was a good camera, I'm told. As, I say....

DEW: You weren't around for the deployment of the OXCART, were you?



JAC: No, I wasn't, I was over there and of course I knew about it. I had helped to put the base together at Okinawa in my last year, and established the communications, and everything. We had real-time communications right from this floor. You picked up -- down in the war room that we had at the other end of the hall -- you picked up the phone, you didn't have to ring, or anything, the minute you picked it up the light went on over in Okinawa and a guy picked up the phone and gave you his name. And that was a land line all the way, to keep it out of the radio-telephone business. Just the rent on that was \$40,000 per month. So, it was an expensive airplane.

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JAC: [Redacted] 25X1

DEW: [Redacted] 25X1

JAC: Not after the U-2 program.

DEW: It wasn't the same site, either, was it?

JAC: [Redacted] 25X1

DEW: [Redacted] 25X1

JAC: It was superimposed right on the old one. Well, when you look at it from the air, you can see the old base and the old runway, which was much shorter -- 5,200 feet, as I recall. And, of course, we had this monstrous runway that went all the way from hell to breakfast for the OXCART -- a total of 19,000 feet of usable surface. That was not all concrete, but we laid the thing without any expansion joints in it, which was kind of

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DEW: Which way was the testing area from you?

JAC: Southwest. And, of course, the evacuation was to the northeast.

DEW: Is there anything else you can remember.

JAC: The J-57 engine was also on the SAC B-52. The first engines we got were out of the hide of SAC's B-52 program, and LeMay was screaming madly about that. To my knowledge there was no World War II training field at , there was no airfield at all. Just the lake. There was, ~~and~~ consideration ~~was~~ given, to putting the project at Indian Springs, a satellite base of Nellis AFB and had been there throughout World War II. But that was rejected because it was too close to the highway.

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it was, and get the approval. Now, Wheelon was very sympathetic to these things for ELINT and countermeasures of all kinds. I can't really remember on that whether it came out of our own ELINT shop or whether it was a combination of those guys working with industry. I think it was probably both.

DEW: I mean, it wasn't NRO or Air Force, was it?

JAC: No.

DEW: But they took it over?

JAC: Yes.

DEW: There was a lot of spinoff from this particular aspect of the program in the early '60s that was directly applicable to Vietnam, right?

JAC: The little System-XII thing was all over the place in the Air Force, because at that point, let's see, about the time they adopted it was when we were blessed with Admiral Raborn. Fortunately, Raborn's big role in life was to make the Shrike work. He adopted that project, much to the horror of everybody who had anything to do with the Shrike -- a Wild Weasel airplane. He kept off in that corner, fiddling with Shrike, and nobody wanted Raborn in our back pocket, you know. We kept him out. That's a horrible thing to have to say about the Director, but he was something else.

DEW: I know. I was talking to  and had asked him who he thought the best director was that he had worked under. He made a similar remark to yours. He says: "It has to be McCone, but I didn't like him." That included up through Helms. As a manager, I suppose.

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JAC: Well, that's what he did well. Like I say, he didn't win any popularity contests. Of course, the one that everybody loved was AWD, but we couldn't have him forever.



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JAC: Now, as I go backward in time and come forward in reading your document, as well as the OSA history, I'm astounded that we ever got anything done. Because there were so many special group restraints, so many foot-dragging maneuvers, initiated by State or, in some cases, certain elements in the White House, and in other cases the NRO dragging its feet. It's a wonder we ever got anything flown.

You know, I can remember, for example, when Bobby Kennedy went over to Jakarta to meet with Sukarno. We were right in the middle of trying to cover Indochina and parts of the peninsula. We were told at that point that we had to standdown because nobody wanted anything to go wrong while Bobby Kennedy was in Indonesia. So the whole U-2 show ground to a halt.

DEW: This was in 1961?

JAC: Well, it was after Kennedy was elected. We were flying the Indochina area. What the hell, we weren't going to drop one in on the palace in Jakarta. But they said: No, no, the reason was that Kennedy was going to raise with Sukarno the question of this guy named Pope who had fallen into Indonesian hands on a crazy raid.

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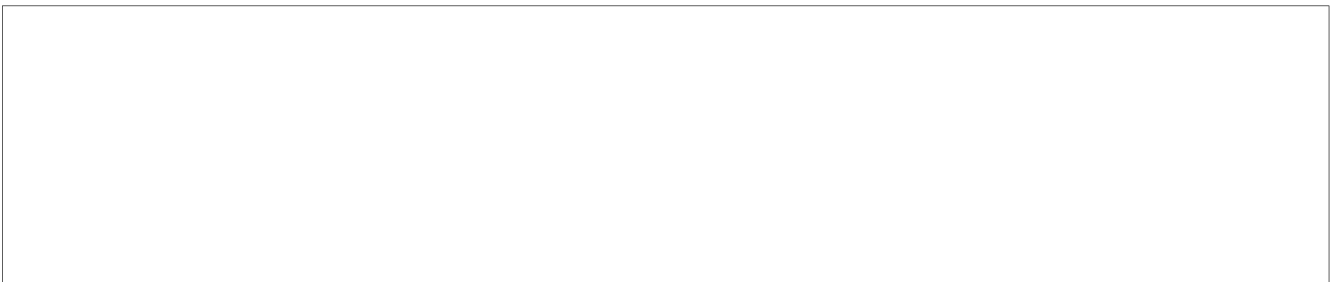
DEW: Well, I think he was probably connected with the up-  
rising back in '58.



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We got all of these guys, McGeoge Bundy was another one. He used to go down in the Situation Room and draw lines all over the map down there and say, "Well, we've got a critical period coming, elections coming up." We called that the "silly season." Because elections are coming, nobody will fly closer than 25 miles to the Chinese border. Then, the closer you'd get to the election or the primaries, or what have you, or convention, he'd say "Now it will be 50 miles." Nobody gets any closer than 50 miles. Well, it always happened that COMOR would come up and say the targets we have to cover are right there at the border. But we'd get turned down by McGeorge Bundy. There was a lot of teeth-sucking going on all the time in some of these -- "Hsss, Oh Jesus, what would happen if...?"

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DEW: Were we involved in the testing of it.

JAC: Yes, out West, from Edwards AFB. We tested a lot of strange things from Edwards, like the U.S. Mule. That was a gadget and a half. It filled the Q-bay with four packages, into which were placed four separate canisters, for want of a better name, with parachutes. Each of these would carry leaflets and, depending on the thinness of the paper, you could get several million leaflets in the Q-bay. Then, you took it upstairs and got to the point where you either wanted to drop

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them all -- one, two, three, four in train -- or you dropped them salvo, or you dropped one now and one later, and so forth. As they would descend they had a little explosive squib on them which would trigger the package to burst open. Coming down on the parachute, it would get to 16,000 feet, as I remember it, and would go poof and the whole thing would disperse.

[Tape Changed] This thing cost -- actually I just saw the cost figures on it not too long ago -- \$600,000 was what we paid Lockheed to come up with this thing -- ONE. We had to go test it, of course. We took it out in the desert from Edwards. Of course, the first couple of times the squibs didn't operate, the packages augered right into the ground. In fact, we damned near hit some guy in a car going up the road. They were heavy. You had close to 500 pounds of paper in it. But, we finally got it to work.

And this was like, 1960. As a matter of fact, it came into operational readiness about the same time that we were getting ourselves wrapped around the axle in Cuba. I remember going to a skull session down in L Building one day with all the people who were then concerned about Cuba: Tracy Barnes, Dick Bissell, and a Marine Corps colonel, I think his name was Hawkins. The idea was: What could be do to make life miserable for Castro, on a large scale? So I said to Dick: "Why don't we use the U.S. Mule?" Oh, he hadn't thought of that. And I said: "Why don't we go ahead and print up a bunch of bogus pesos, Cuban pesos and drop them over Havana?" Of course, Bissell was an economist, basically, and he sat there for a minute, and finally said: "Pesos, Oh God, no, can't do that. Don't want to debase their currency that way." He refused to even consider it. You know, it was sort of like Operation Cicero all over again. He refused to let it be used in that fashion.

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But, anyway it was a lot harder than you would think to do this, because you had to be able to project the winds aloft in order to be able to hit the target. And that meant generating what was called a ballistic wind forecast, where your Air Weather Service guys, SAC global weather, would have to be able to predict which directions the winds were going at all these altitudes up to 70,000 feet. And then average them out to see, if you dropped a package at A, would it land here or here. It would never go straight down because of conflicting winds. Not only going this way, but that way, too. It became a real nightmare for the weather guys to try to predict this, that was why we almost hit that car out west.

So, the thing was never deployed usefully. It sat around at [ ] in a warehouse. When the Air Force took over the program in 1974, they suddenly found the thing and decided they weren't going to have any use for it. So, in 1976, they destroyed it. 25X1

Here recently, John McMahon remembered that we had this thing and John was thinking about maybe using it in Nicaragua. So, he got one of his lieutenants to call down here. It's an emergency, you know. Cunningham, where in the hell did they hide the U.S. Mule? So I went tracing it through the Lockheed enterprise and found that the last known location was the [ ] [ ]. Then I was told it had been destroyed in 1976. At that point Lockheed said: "But we'll build you another one." How much? I asked. Well, slightly more than it was then, it would run into several million dollars. So, escalation took over and the idea was dropped. I thought it was kind of cute, myself, plastering the whole of Cuba with bogus pesos and send everybody into the overhead, because we could have gotten something on the order of 2 million peso notes in 25X1  
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the Q bay. The winds would have taken them all over the sky. Well, this is the vignette department.

DEW: You mention the escalating costs, how much did the U-2R cost as contrasted with the U-2C, a ballpark figure. You said the U-2C cost about \$660,000 each.

JAC: Yes, \$650,000. I'd be guessing now, but as I remember the nine airplanes were about, at the time the order was placed, 1967 dollars, around \$8 million each. Now, today, the one that NASA flies, the ER-2, they got at a rock-bottom figure of \$13 million for that. And for the TR-1, the Air Force is paying, on average, something like \$20 million or more per airplane. Now that's the U-2R with a slightly different configuration, horizontal surfaces and stuff. Same airplane, same tools. The tools <sup>AND TIES</sup> that we used to build the R were put in storage by Lockheed, they just dragged them out. They made a bigger wing, it's 103 feet, as I remember...

DEW: It's 103 feet on the R model.

JAC: Well, its the same wing. Same engine, J-75/P-13B. In fact, the engines come through -- in fact, the J-75 engine is no longer operational in the Air Force. The last airplane to carry it around was the F-105, and they've been taken out of the inventory over the years now. It was called the Thunder-sled. There are 650 engines existing in Air Force inventory, stripped out of these F-105s. That's all there are, there are no more. Now what they do to prepare one of these for the TR-1, is they take it back to Pratt & Whitney and rebuild it -- make all the changes in it to bring it to the P-13B mode. Those overhauls are running about \$850,000 each on the engines. The engine having been bought and paid for in the first place. So, that is not an inexpensive airplane, the TR-1.

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DEW: That must have been a good engine.

JAC: Yes, nothing wrong with it at all. I guess in some ways P&W wishes they had another airplane to use it in. But I must admit that the general public is not fully aware that this expensive piece of machinery known as the TR-1 is flying around with an engine in it that goes as far back as that one does.

DEW: Twenty years or more.

JAC: Twentyfive. Because people think: New airplane, new engine. They don't think these 747s are flying around with a 25-year-old engine. But I know this, because I went after a J-75 engine to put in the U-2 that's at the Smithsonian, only to find that I couldn't get one, and the Air Force had robbed the one out of the airplane that we got to go to the Smithsonian. They said: We have to have that, that'll be our 650th engine to support the TR-1 program. So I began to scratch my head, and I remembered that they had a brassboard engine up at Pratt & Whitney, which they used for bench testing, a prototype. It was not a flight-rated engine, but at the same time it was a J-75/P-13. I must admit there were a couple of problems with it once we got it down here. Pratt & Whitney donated it. And Lockheed and Pratt & Whitney paid to have it brought down to Washington. Wait a minute, they didn't have to pay, I got Jim McDonald <sup>OUR</sup> ~~LA~~ ADDA, who used to be our contracting officer for the U-2 and the SR-71, and he had an Agency truck go and get it. The Air Force had to pay to bring the airplane in from the West Coast. When we got it down here we found that, because it was a brassboard engine, the engineers had just put things where they thought they might be or should be: Oh well, let's stick the ignition pack over here, except that in the production engine it would be over there, wrong side of the en-

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gine, and so forth. So the people out at Smithsonian, who happened to be real damned good mechanics, had all the drawings on the way it should be, so they had to redo the engine before they could stick it in the airplane. They are sticklers for authenticity, and there were a couple of hooks on it -- you know, built right into the support flange -- that they had to remove because otherwise it wouldn't go in the tail cone. One guy installed the engine out there in Silver Hill, using these special carts they have. I told Kelly afterwards, I said: "Kelly, now I know you were screwing us, because there were never less than eight guys required from Lockheed to change an engine." Like a Polack changing a lightbulb, and this guy out there did it all by himself, one man!

DEW: That airplane out there, what missions had it made?

JAC: That flew the first mission over Russia, article No. 347. As a matter of fact, it was [redacted] Colonel [redacted] -- in fact, he was in the Hanoi Hilton for about six years. He's retired and living in Texas. I took out, and laid out with my shirt this morning, the list of all the airplane numbers to bring into you. But I didn't bring it with me.

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DEW: You would probably like to read some of these other chapters that take place early in the program.

JAC: Yes, I would. Well, of course, in many ways, one of the problems is that people say, gee whiz, you spent 12 years in the U-2 program. We never had a central headquarters during most of that time. Bissell was down in L Building, we were up on K street. We didn't get together as we should have. So it would be like some guy saying: You were at Pearl Harbor, now

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what were you doing? Well, I was down in the engine room and I didn't see a thing, I just heard the bombs go off.

DEW: I got that impression, too. In late 1960, when Bissell started getting involved in the Bay of Pigs, was there a slacking off of his interest in his three big programs?

JAC: No, there really wasn't. He was a very hard-driving man. He would still go to suppliers meetings -- of course, Tracy Barnes carried a lot of the load on the day-to-day stuff, and, of course, we were playing all of these keyboards: the CORONA over here, and the OX here, and U-2, here, IDEALIST. And we were also having to do all the planning and staffing for the Bay of Pigs. In other words, going out and commandeering at the B-26 planes, arranging all the logistics for that, having them shipped up to Hill AFB, modified, brought up to speed. Going down to Guatemala and Nicaragua, not only pick out where to put the airfields, but then our staff had to superintend the building of the airfields, in both places, the coffee plantation.

DEW: In other words, you're talking about DPD and so, in addition to all these other things, that is, in addition to three multimillion dollar programs -- in fact, one was a billion dollar program, or was it two billion, it might not have been all our money, still OXCART cost \$2 billion before it was over and done with -- you were doing all these other things, too? How big was the staff?

JAC: I don't know, a hundred, and that included the secretaries. Well, in fact, when we got out here to this building, we just had part of this floor on this side. The colonel's office used to be in the corner and mine was next to his -- or the general. That included the guys in operations who put the

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Zip-a-tone on the maps and the weather officers who came in to do the daily weather briefing and all.

But not only that, we had to come in, in those days, and share, among the three of us, the business of making on-orbit decisions for cameras for the CORONA missions. Once the damned thing would get off the pad and into orbit, you had to arrange your camera program for on and off. So then they'd have to plot the ephemera on the big boards, the size of that wall and show you that on pass 16 it would be coming down this way and would be covering the following target-areas of interest. You were film limited and you'd have to say: We'll take pass 16, and that will use up so many feet of film. But these on-orbit decision conferences, because of the time difference, took place at 1 or 2 or 3 o'clock in the morning.

So, you'd finish your day's work, go home and eat dinner, maybe watch an hour of TV, jump in your car and come back to work. The only thing you got was you didn't have to come in at 8 o'clock the next morning, you could wait until 10. This became sort of a lottery, you know. You'd sit there, drink coffee, or whatever, and wait, because you had to get a real-time weather forecast. When you started the mission you'd have one forecast and then the weather would go to pieces east of the Urals or something. So you'd say, Oh shit, that means we've got to use up more film west of the Urals. So, I remember the time when...

DEW: When you say "we," that was you and Reber?

JAC: An Air Force operations officer, either the colonel or the general, or the colonel in charge of operations or the major in charge, an ops officer. There'd be two of us, usually, a civilian and a military. Then, we'd have the COMOR menu in



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front of us. But this got kind of tiring, because these were not missions that ran one day. You had to keep doing this until it was time for the film to come home.

DEW: Yes, as they managed to extend those missions from four days, at the end they were 15 days.

JAC: I remember at the time the complex, the Russian ABM complex around Leningrad was first brought in. Nobody knew anything about it; there was no collateral intelligence on it whatever. We had a mission aloft at the time, and it came my turn at 2 o'clock in the morning to make the decision. The last pass was over Leningrad, and I remember the major's name was Art Dula~~k~~. Art was saying: Well, what do we do, do we take this or don't we. And I said: Aw, shit! He said: We could go home, we've got all the good stuff already, you know. I said: Well, let's make a wager on this thing. I'll wager that we ought to take Leningrad. He said: You're on, but what are we going to do it for? I said: A martini. Okay, you're on for a martini. If there is anything on that pass, I'll buy you a martini.

So we took that pass over Leningrad. And that was the one which had the first evidence of the ABM installation going in. Of course, the bells went off and the lights went on in the Community when that happened. And Dula~~k~~ paid me a mar-~~t~~ini. But this was the sort of monumental decision-making that was done at that stage. You know, we were all dog tired and we were betting martinis on whether or not there would be anything useful. I remember Art said: Well, hell, Leningrad, all the tourist buses go there. You know, you don't need to take pictures of that damned place. I said: But you can't tell, there might be something out in the suburbs. And there sure as hell was.

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DEW: That's where it was. That had ramifications for the CORONA program and later on it was a spur for [ ] There's not much available on [ ] except the fact that it started as a covert satellite. Were you aware of that?

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JAC: No, I wasn't.

DEW: It started because what they discovered around Lenin-grad, the ABM sites, and later on around Moscow, and then two big radars down in Sary Shagan, and they got to thinking "They are working on an antisatellite system. How can we protect our satellites?" Then they went around on a thing called [ ] to see how you get a secret or covert satellite? Well, they decided that you really can't. If you launch it they know when you put it up. Well, then they said, we'll put it way out, and we'll bring it back in to take closeup photographs. But the more they got talking about it the more they realized that what they needed was an instant indications satellite. And you didn't have time to fuel up a big liquid-propelled missile and fire the thing off if you're just about ready to have a war. It took too much time. So what you needed was something that was up there all the time, and you didn't have time to deploy a capsule back to earth and go out and catch it if you could. You had to have a picture. So they took that -- one thing led to the other, led to the other -- and said we're in the real-time or near-real-time area and that's when they started going into the photocells and the whole [ ] concept evolved.

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JAC: That was about the time I was leaving, but [ ] had started. In fact, a guy named [ ] was working on it then, full time. I think Alex is still alive and still around Washington, retired. A very bright guy, but, you know, sort of like Bathless Groggins. He looked like the seediest guy in

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town. John Parangosky used to tell him: For Christ's sake, Al, go out and get yourself a haircut. And, by the way, shave tomorrow morning. But he was double-domed, way out there. He really busted his ass on that particular program, I remember.

DEW: [ ] took it over later on. [ ] evidently was a very difficult man to get along with. 25X1

JAC: That's what I heard. I knew him slightly, but that's all.

DEW: When I started into [ ] I was amazed at how one started way out here -- it actually started with the Leningrad photographs but, together with the Sary radars, it evolved. Out of it comes something 21st century again. I've just finished the one on [ ] 25X1

[Interruption]

DEW: Did TAGBOARD get in the way of OXCART?

JAC: Damned near. We had it on our hands for seven months. I guess it was longer than that if you count how long it took Kelly to think it up. In terms of contracting we had it seven months. We didn't seem to be going anywhere, because it looked at first as though OXCART had solved all the problems that might be presented by TAGBOARD -- radar cross section reduction, general planform, all this good stuff. But there was so little experience in the real world about ram-jet engines. At the time when [ ] got involved in this there was something like six hours of running time on ram-jet engines. We were a little bit ahead of the curve, I think. 25X1

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DEW: The other things that I came across was KEDLOCK and WEDLOCK. I suspect they're Air Force programs.

JAC: I've forgotten those two. I should know. I know Bernie Edw<sup>AR</sup>stowski, our Registry fiend, will know in a minute because he's got it, somewhere in his head he's got all of these things. Whenever I have difficulty with them, I give Bernie a call.

DEW: Now, TAGBOARD was a drone. Originally it was going to be carried aloft by the OXCART was it?

JAC: Yes, in fact, <sup>IT</sup> was.

DEW: Destroyed one [OXCART]!

JAC: And cost us an airplane and one guy's life. We had a two-man airplane crew. For a brief moment there we had the No. 2 guy in this truncated seating arrangement in the back of the plane, in what would have been the equipment bay. The drone didn't separate properly out over the Pacific missile-test range. It fell back on the airplane, apparently. At that altitude it must have been an engine hiccup. But both the guys got out, punched out. The only thing is, one of them landed upside down in the water, became tangled with his chute, I guess, and drowned. The other guy survived nicely. But at that point we thought we had better separate the two, because TAGBOARD was going to hold us back in achieving operational readiness on the OX. So we gave it over to the Air Force willingly.

And they immediately took off in a separate direction, of course, with the B-52 thing. I gather, I don't know how many missions were flown -- wasn't very many -- but according to

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Dino Brugioni, he claims that one of them went astray over China. It didn't go through the program it was supposed to, it had a regular routine, you know, you launched it, it went and flew, and did its thing, and then it came back. When it got back it spit out the package. When it got below 60,000 feet, I think it was, the drone was programmed to self-destruct.

Well, all of this didn't happen. It just took off, and maybe it took pictures, but it kept going in a northwesterly direction and was never heard of again. Not very long ago, say within the last two years, a report surfaced in the Agency, came through this, what is it, Soviet weapons, and so forth, group here. They came over to see me, and said: Does this sound like anything we had anything to do with? Because there was a report out of Russia saying that this thing had ended up in Kazakhstan, or some bloody place, you know, way out a 100 million miles from nowhere, reasonably intact -- never mind the self-destruct, it did not. And the Soviets were terribly impressed with the metallurgy and the plastic laminates, and all these other things that were built into it, you know. And did I think there was any reasonable chance this was a TAGBOARD. And I said: It sounds like the only thing it could be. I said you better go talk to the Air Force, although they are probably not going to want to talk to you, because it's the sort of thing they don't go around advertising.

DEW: So they did use the TAGBOARD from a B-52?

JAC: They used it, yes. In fact, I have in the safe in there, the complete Presidential briefing for it, which shows in all these wonderful colors and schematics and pictures. They carried them two at a time under the B-52, one under each wing. I don't know whether one of them was a backup or whether you were supposed to be able to launch two.

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DEW: Well, they must have changed the actual launch procedure, because as I understand it, the original assumption was that you had to break the sound barrier; you had to get over Mach 1 before you could launch.

JAC: That was the assumption we started the program on. I would say the B-52 doesn't go transonic. They have a ram booster on it now. What they did was they put a separate tank underneath the flight article, which gave it that push to Mach 1 or better, and that was jettisoned.

DEW: Almost like a JATO bottle then?

JAC: Yes, in fact, it made it rather awkward looking with this big, conformal tank underneath the drone.

DEW: And it had a small radar cross section?

JAC: Yes, it tracked like a pigeon. Well, of course, it was smaller to begin with. It was only a scale model of the other one, and it had a single fin and rudder arrangement. It was programmed for about Mach 4, as I remember, something like that.

DEW: And altitude?

JAC: Up in the 90s.

DEW: How high did our OXCART ever go?

JAC: Ninetythree thousand feet, as I remember.

DEW: And it had a small radar cross section?

JAC: Yes, it did. Extremely small, by the time Kelly got through playing with it.

DEW: It's the original "stealth" aircraft?

JAC: Yes, in fact, he [Kelly Johnson] is getting a National Science Medal day after tomorrow (6 October 1984) here in town, from Mr. Reagan, and one of the things for which he is being honored is his pioneer work in "stealth" technology, going back to RAINBOW. *in 1958.*

DEW: Well, was he involved in RAINBOW? I thought it was Dr. Purcell of Harvard who was doing all that.

JAC: Yes, with all the trapezoids and everything like that, but Kelly was into the additive coatings.

DEW: Wallpaper? Now, the trapezoid worked?

JAC: Yes, but only in S- and X-band, as I remember.

DEW: What about the coatings, the Wallpaper, did it work?

JAC: Not as well as the trapezoid, but, of course, Kelly has been a major contributor to, or had a lot of input to this "stealth" fighter that's flying  Of course,

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DEW: The B-1 with another name?

JAC: I guess so, I've never seen any drawings of what it may look like, but, since it's Northrup, you have to assume

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that they've learned something since the "Flying Wing" days. It's probably something as weird as that.

DEW: You haven't read my history of the OXCART yet. There's a passage about revealing the OXCART. McCone said that Black of the World Bank had told him that he thought they had to make it public because thought that Lockheed and Pratt & Whitney had a \$700 million head start on the SST.

JAC: And then they didn't get it.

DEW: He [McCone] probably was right that we didn't need it.

JAC: They went through this whole exercise of bringing in all of the competition and briefing them. That was bitter pill for Kelly.

DEW: Oh, yes, another question: ISINGLASS. What's that.

JAC: That was a hypersonic, far out, boost-glide recce vehicle that looked like a scaled-down space shuttle. One man, liquid hydrogen propellant, with an RL-20 engine from Pratt & Whitney, one of the engines off the Saturn, I guess. No, it's the one that Pratt & Whitney has made so many of and has never failed. I guess it's used in the current program, too, where they cluster them, you know. It was throttleable, and the throttling was achieved through a shroud which moved back and forth on the throat of the engine. It was initially proposed by McDonnell-Douglas, who came sort of came in and said: Hey, what do you guys think of this? Do you think this would float?

Ledford, Parangosky, and I got together with Mr. Mac and his son, who is now running the company, and McDonnell-Douglas agreed to company-fund, because we were, at that point, under



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the NRO and didn't have any money. They said they'd put in \$10 million and they would go as far as that money would take them. We would trade inputs as far as some of the things we'd learned out of OXCART, which might be applicable, especially in the business of camera windows in high-speed environments.

This thing was supposed to be launched from a B-52. It would be launched, say, off the coast of Spain. It would promptly ascend to 125,000 feet under throttling, and you'd point it in the general direction of east, let's say, and pour the coal to it, and then shut it off. It would go tootling along at roughly Mach 22, just below escape velocity, which I think is Mach 24.5, or something like that. You'd take yourself all kinds of pictures all the way across Russia, and then you'd recover in

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Damn near circumnavigate the globe, you know. We carried it through, I guess we must have been on that for about 14 months. Some fascinating records in the Registry in here -- well, maybe they're out at  but they brought them in because Air Force was about to spend a bunch of money to do some of the same research, as usual, never having heard of it. And John Parangosky -- who's consulting with a company over here that has Air Force contracts in this space arena -- when he started hearing about the money the Air Force was putting into it, he got hold of the records again and, sort of on a disembodied basis, he said: By the way, you might like to know that this is what happens when you mate this particular metal with that particular metal. Where'd you get that? they'd ask. Well, that was research that was done about 1965.

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There were going to be eight of the airplanes built. They landed on skids, by the way, they didn't have wheels, landing gear, and all that, they just had skids. But they had the con-

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trol characteristics of an airplane when they got to the low speed. You either dead-sticked it in, or, if you had anything left, if you had a shorter mission, you could throttle it right down to the runway, almost. And it would land on a conventional, 10,000-foot runway. They built a third-scale cross-section of this thing, showing what they could do in a metallurgical sense, because it had all kinds of exotic metals in it, you know, heat-reflecting materials -- columbium and all these other weird things that you don't see on the grocery shelves.

We had complete, fully staffed out proposals from them. I remember one day doing a briefing, in a conference room right down the hall here, for Wheelon on where we stood. Well, Wheelon was in the audience, it was for the Budget people -- what did it used to be called? Congressional Budget Office, or something like that, the predecessor of OMB. And it was then in shape to talk seriously about going into production. Well, of course, the bill was, by anybody's standards, pretty staggering. It was like the eight vehicles were spaced out over three years and the total cost was like \$2.6 billion. And this was in 1965 dollars. So you can say three times that today, at least. It got a very polite reception, like everybody in the audience clapped with one hand. It got an airing in the Air Force, but, of course, the NIH feature took over. They didn't even want to hear it, basically.

We thought it was a pretty good idea, because McDonnell-Douglas did an excellent job. They did their homework like nobody's business. In fact, a guy named Harold Al<sup>T</sup>dis, who today is senior executive vice president of McDonnell, was the project manager for this thing. We had a security office out in St. Louis that cleared over 200 people from McDonnell-Douglas to work on this thing. We were all set to go, except we didn't have the money. Times were tough and the Air Force was-

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n't buying anything like that, but now they're back to thinking that because they've got something called a Space Division, they have to have something to fill it. It's like Parkinson's law of airplanes.

But ISINGLASS showed great promise. Virtually unstoppable. In other words, you couldn't shoot it down with an SA-anything. Now, you'd probably get all kinds of protests and there was always the concern that maybe they might think this was the big one. But, if you lug it up to their front door in a B-52 and they can watch it take off on radar, it's a little bit less likely than if something came over the pole. But it's probably, in a tense atmosphere like we seem to have today, the kind of thing that would be given very long thought before it was used over the [Russian] heartland. That doesn't mean you couldn't fly over China or someplace, but it's kind of an expensive way to get coverage, based on what you can get now from satellites. Of course, it was in some aspects overtaken by the sophistication of the KEYHOLE system. Christ sakes, now when you can take a picture and a PI can sit there and turn it and see the building rotate, a vehicle turn around, why hell, you'd have to go an awful long way and spend an awful lot of money to duplicate that on some manned type of vehicle.

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JAC: You are now at a stage where these machines that are used over in  apiece. It used to be, if you had a light-table and a magnifying glass you were in business.

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DEW: It's a great deal like OXCART. OXCART was 21st century and we hardly used it.

JAC: That broke my heart when I went out there and saw them all backed up against the fence.

DEW: They'll never build another one like it.