

COLONEL HANS-ULRICH RUDEL
QUESTION AND ANSWER SESSION

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Moderator: Let us start out with the subject of how they, Rudel's forces, were controlled and oriented prior to the mission, the kind of steps that we are going through, what kind of control they had, what kind of intelligence they had, prior-to-take-off thoughts as a first area of questioning. Then we will go after the take-off to learn how you find the tanks and so on, and we will work our way through a mission with Colonel Rudel.

Pierre Sprey brought up a couple of things about Colonel Rudel. He had more missions than any man in World War II, with 2500 combat sorties. He personally killed 500 plus tanks. The way that was verified was that after he killed a tank, it had to not only burn, it had to burn and explode and it had to be seen by another person in order to have a verification of a kill. Now, Don Tribble is here from Nellis, and we have done a lot of shooting at tanks and one of the things that we found out is that tanks do not necessarily burn and blow up right then. A lot of times that happens five and ten and even thirty minutes later, after you are long gone. So the probability is that there were more kills than that, but that was how it was done at the time.

Colonel Rudel did sink a battleship, at that time the largest ship sunk by air. It reminded me a lot of the movie "Star Wars" because he had to get it down the chimney. In the book he pulled out and it was a heavy high g pull out to the point where he blacked out and he was just above the water at 50 feet when vision came back so he had really gotten close. Let me introduce Colonel Hans Rudel and pass on to him our thanks for being here and then explain the procedure that we are going to have.

We will start out with questions to Colonel Rudel on pre-mission briefings and any pre-mission control arrangements as Colonel Rudel knew them on the Russian Front.

From the floor: Mr. Christie asked Captain Ratley to give a brief run down of the Luftwaffe's anti-tank operations on the Eastern Front.

Captain Ratley: I might just mention how very important it is to understand that there were only two squadrons of cannon-equipped Stukas on the

Eastern Front. There were a total of something like 300 of these JU-87G's built and they were fed through these two squadrons which, of course, had a very sizable attrition rate. Colonel Rudel himself had thirty airplanes shot out from under him, which is a little over one percent loss rate from his 2500 missions.

Question: How did they decide what they were going to do the next day?

Interjection: Just give the rough size of the units.

Answer: There were a lot of Stuka wings and squadrons and so forth, but there were only two units that had the cannon-equipped aircraft; that is with the 37-millimeter cannon under each wing. Each aircraft had two 37-millimeter cannon hung under the wings, one on each side, and they had a clip of six shells in them for each side, a total of twelve. They were supposedly synchronized to fire two shells out at the same time to keep it symmetrical when they were firing.

The two wing-size units' (Geschwader) nominal strength was 150 aircraft. Geschwader 2 and 77 had the cannon-equipped aircraft and each of those units had one enlarged squadron that had the cannon-equipped aircraft. Each on-line string in the field ran about 15 aircraft each, so there were only, at any given time, about thirty Stukas that were cannon-equipped at a time. There was also another unit that was equipped with HS129's. It was a group-size unit and it had at its inception sixty-eight HS129's, which was a twin-engine aircraft with a belly-mounted 30-millimeter cannon. It was a Mark 101 and later a 103 Mauser, similar to the Derlikon KCA which some of you may be familiar with. It carried 30 rounds of 30-millimeter ammunition. All of these used a tungsten carbide penetrator. Any questions on that?

Question: Ask Colonel Rudel if he can remember the date that he first attacked a tank with his aircraft with the cannon on it. Does he remember that time? And was he successful?

Answer: The first time that they had a chance to use the cannon-equipped aircraft was in May of 1943 on a bridgehead down in the Southern Army Group. It

was noteworthy by their unsuccess because the front in that particular area had been stabilized for over a year and a half--very, very firm lines on both sides and the defenses in the area were too formidable for them at that time to use their aircraft successfully. They had an encounter with tanks, but they did not report any kills to their knowledge. However, there were some ships that they did attack.

Interjection: Let me translate directly a very telling phrase that Colonel Rudel just used. He said, "That day we discovered the limits of the cannon-equipped Stuka and we realized that when you attack static defenses, static positions, you cannot have any success." This relates obviously to what we were just talking about.

Question: Here let me insert Tom Christy's question. What time of the day did they start, how did he get his mission for the day, how did he perform his pre-take-off preparations, how many people went?

Answer: Just talking about force size, Colonel Rudel says that going out with a group of more than five to six airplanes was simply nonsense. They just got in each other's way and they started attacking the same tanks and there was no point to it. So he favors tactical formations of no more than five to six. He is talking here about the cannon-equipped aircraft, which you should realize was an extraordinarily unmaneuverable airplane. It was really a marginal war plane. It was a very heavily overloaded JU-87. It was right at the maximum limit. It was considerably more limited in top speed than a normal JU-87 which was not known for its blinding speed, and secondly it was quite unmaneuverable. In general, I think, they were limited to maneuvers of less than three g's with this airplane. So you can see what kind of hindrances they were working with, but the effectiveness of the gun was so critical because it was the only thing they had that really worked against tanks. They were willing to take all these disadvantages and a really poor handling aircraft just to have the gun.

Moderator: With regard to the intelligence that they had in their preparation prior to their attack, they got most of their information from army

units that would report that there were tanks attacking or in preparation for attack in a certain sector. Sometimes they would go there and sometimes tanks would be there and sometimes they would not. They also got intelligence from their own reconnaissance units and again, when the information was relatively new, it would work out and they could go there and find the enemy. Other times, it just did not work out because they had already dispersed.

Interjection: They were being briefed by division-level staff, ground division level staff intelligence was what they were getting.

Colonel Rudel is returning to the subject of the stable front. He said in May of 1943 they really discovered the limits of their weapon. There was a stable front in the south, it was Kunsia (sp. ?), and they just found there was simply no point in attacking that front. It was better simply not to fly, not attack, because all you could hope for was high losses and very few Panzers to show for it.

Question: Let me return to the original question. What time did he start the day out, how was he told, was it radio communications, who was he attached to, where were they located relative to the front, what did they do in the way of preparation for the mission? Can you answer those questions?

Answer: They would attack the enemy tanks as soon as they made contact with friendly units. Sometimes this would be as early as five in the morning or as late as ten in the evening. There was not that much preparation in the way of a briefing or anything of that sort. Everyone was expected to know his job before he got there and as soon as they were contacted and given information about the enemy, they would take off and try and get there as soon as possible.

Interjection: Let me add one thing to that. The normal preparation for a day's operations, and this is from Colonel Rudel's book, was a morning meteorological flight, usually conducted by Colonel Rudel alone, and that was the first flight of the day, take-off was well before dawn and that flight both served the purpose of getting the visibility conditions in the area in which they were supposed to operate and, of course, was a reconnaissance flight and,

in fact, I was referring to the very valuable reconnaissance he was doing, a lot of that was gained on these first morning flights. He would be in touch by whatever means he could either through a radio tank equipped with an equivalent of a forward air controller or, on occasion, as he has described in his book, he actually wrote out a note on a knee pad and enclosed it in a metal capsule and then dropped it on a battalion commander's tent in order to communicate with him that there were tanks in the next village. This was invaluable information. A lot of this was derived from these first flights of the morning, which he called meteorological flights.

Question: Was his mission tasking out of the army or did it come from air force? At what level did it come to him and by what means? Was he told that he was going to be at such and such a point at a particular time with a given bomb load or whatever, a mission load? Was he given those kind of details or was he told, like John Boyd was talking about, "Here's the main activity of the day. Do your mission?"

Answer: The usual request was from Army level to "liege divizion" which was the air division level, although sometimes there was much higher air level, the next two levels up. The critical thing is that the army had no control whatsoever of the air assets. The army could only request. It had no control over the actual air assets. Decisions were made at air division level or these higher levels as to whether Colonel Rudel's squadron was going to be here today and attacking tanks in this area or somewhere else in the front. Of course, the army could state their preferences, that was essentially it. Furthermore, of course, as all higher level staff processes are, that was kind of slow. By the time the word got to Colonel Rudel, the tanks were somewhere else. However, he had a lot of freedom for choosing his own area of operations. It was up to him and the army expected it of him to find where those tanks were by this time. You know, the request might be a day old or more. He based his mission simply on the request and then it was within his authority to find the tanks that he thought had been referred to in the original request. So he had a lot of tactical flexibility about the area he operated in. I might add one other thing and that is that the reason the Stuka units were so responsive, or one of the reasons, is a very

significant thing that you will see in Rudel's book. He never refers to himself as a pilot, he always refers to himself as a soldier and that seems to me a very critical difference in the responsiveness that was actually achieved, even though the ground units he was supporting had no authority whatsoever over allocating his efforts.

Question: I think the question was asked how close to the front they based themselves and what were the facilities they had at the base, what did they require in the way of support coming in to them, and how did they do that?

Answer: Normally, they were based fifty to sixty kilometers from the front but, because of the fluid situation, sometimes around a hundred kilometers.

In some instances, of course, they were much closer, as close as a kilometer or maybe even on the other side. Their normal supplies and fuel were brought up through rail to the nearest rail head and then from there they would be brought directly into the airfield with trucks. In normal instances, they had quite an adequate supply of both supplies and fuel and only very seldom did they use air to bring in any kind of supplies, when there was a critical shortage or perhaps in one of these instances where they were real close to the front.

Question: Did the trucks belong to the Luftwaffe or the Wehrmacht?

Answer: They belonged to the Luftwaffe ground organization.

Interjection: His deliveries incidentally were every one or two days, deliveries of supplies, but every once in a while they would get interrupted because of the situation, then they would eat less.

Question: What was the vehicle for getting these requests. Was it by radio, telephone, or how?

Answer: By radio.

Question: In his book, Colonel Rudel made a reference to frequent moving of the base from position to position in response to the changing ground situation and Pierre also brought it up in his briefing. As this is very important for the blitz fighter, I would be interested in some illumination on what it took to move a base and how long it would take to move it and how they moved it.

Answer: They had no bare base moves. It just was not part of their system. Corps level, air corps level knew in advance that they would need certain bases and did all the provisioning of the bases in advance and this included when they were in the retreat, they would be preparing bases to the rear, knowing that the front would be moving back or lateral moves or whatever. So those would already have munitions and fuel and some ground personnel. Their moves were very fast because they did not have to bring that heavy stuff. They brought essentially crew chiefs and airplanes and started off with borrowed technical people, borrowed maintenance people and then could bring in more of their own if they needed them. So, as far as I can see, the moves were essentially not much longer than the flight time.

Question: That is assuming that they were retreating all the time. When they were going forward they did not have that opportunity. What did they do then?

Answer: Let us amplify that a little bit. They had more flexibility I think than our units do. They would tailor a force for whatever particular operation they happened to be involved in--roughly an equivalent of a wing commander would have reconnaissance units, Stuka units, cannon aircraft, and maybe just straight ground support ME-190's or something like that. Their forces were much more flexible and much more tailored to individual operations than we are.

And they could do the same thing going forward or back. I just used the example of the retreat. But then again when they needed new fields it was not up to them to arrange it. The corps level had to have foreseen that and already had ground personnel on hand.

I have a follow-on on that. One of the reasons why they had to move, of course, probably had to do with the limited range of the aircraft but an

interesting question would be whether even if he had more range would Colonel Rudel have wanted to move like he did just to keep the intimacy with the evolving situation, to be closer to the target. This is the answer to a slightly different question. He was asked whether he preferred to stay with certain ground units and whether that helped coordination and cooperation. He said they did not have that luxury because of course there were so few cannon-equipped aircraft. They had to cover the whole Eastern front with the few cannon-equipped aircraft they had, so they did not get any choice whatsoever about where they would rather fly. He said, however, it did make a lot of difference to them which units they flew with. They knew which were the elite divisions, which were the divisions that had tradition and a really aggressive spirit and had a good fighting record. Of course, this made a difference in how they felt about their flying, and to some extent perhaps the effort, because if they knew that they were just one of the ordinary run-of-the-mill or cannon fodder divisions they knew they had only been assigned there in order to kind of soothe the ground commanders. But when they were with an elite unit they knew their attack and their losses would have some effect, because they would be followed up on the ground, you know, with some results.

This is quite interesting. If he had had more fuel on board and more range he would not have used it to move his fields further back 50 or 60 kilometers but he would have used it in the target area for more search time because that was invaluable to him. He would have liked to have stayed the same distance, the 50 or 60 kilometers, because of the matter of time--time to respond. In case they got an emergency request, or when there was an attack on the front, he wanted to be able to respond in what he thought was a reasonable time and to go much further back than 50 or 60 kilometers would just take too much time to get there. You can calculate for yourself what he is talking about because the Stuka had a cruise speed of something like 140 knots or so.

Question: Would you ask him please what the optimal killing zone was. How far did he range from the FEBA and did he ever engage enemy tanks when German and Soviet tanks were actually fighting and were actually mixed up together?

Answer: We might even start out, could he see the FEBA? He could not because it did not exist. How could he be told where the FEBA was if none existed.

He goes back to Kunsia (sp. ?) which taught him the lesson that as soon as the tanks were within their defenses, you did not want to touch them because you were not going to have any success until they started to move; that is, move out from their assembly positions. In their assembly positions they were covered by heavy flak and you just could not go in there and make six or seven passes on them without expecting really heavy losses yourself. It was not worth it. The time to get them was when they started to move out. As soon as they went into their road march or into their attack formation they would move out 1 or 2 kilometers from their defenses. They were a little careless, they were mostly concerned about the battle itself and the flak was not that mobile. That was the time to get them. Anytime they were back of there, back of the actual deployment for attack, you were going to be in trouble if you tried to attack them. You were just going to take very high losses.

Question: Ask him if enemy air ever interfered with their operations at their bases. Was enemy air a problem?

Answer: He said they had very few attacks by Russian fighters on their own bases to the extent that they rarely used camouflage, the camouflage nets were not a standard procedure because when the Russian fighter pilots attacked their aim was so poor that they almost never destroyed any airplanes. They did not worry about it a lot. There were some elite units--the Stalin Falcons were quite good, but that was just a few squadrons in a huge air force, and so on the ground at their own bases they did not worry very much because even if they were attacked they were unlikely to get hit. Now we are going to ask him the next step of what he felt.

They did camouflage their aircraft by painting them different colors for different times of the year. In the winter, it would be white, and then it would be spring and it would be greenish-brown, and then a lighter brown in the summer time.

Question: I would be curious if he could project or if he could imagine what if the Russian aviators had been as good as he was in air-to-ground and decided to attack his bases, what effect would that have had?

Answer: He says that is a very theoretical question. He says that the real reason that he got to be good was experience. Experience with sortie after sortie after sortie. The Russians generally were shot down after 20 or 30 missions and never had a chance to get the experience. He says very modestly, and I think he is probably falsely and incorrectly modest, he says that he was not any better than the other pilots, it is just that he flew so much longer. That is excessive modesty.

Question: A more basic question is security of the forward basing. Forward basing was very practical, but if the enemy had any kind of a decent air force at all I do not understand how he could operate.

Answer: On that subject of relative quality of pilots and the importance of experience, he says it was clear being there that by the middle or end of 1942 the German Luftwaffe had declined very significantly in effectiveness, in the results they were getting, the quality had declined greatly because a lot of the experienced people, highly trained and experienced people, had been shot down by that time and the effect was very visible. From the end of 1942 on you just did not see the kind of results that you had seen up to that point. That question of who were the experienced and good people was absolutely dominant in the effectiveness of the whole air force. He says he was just lucky, he was one of the guys who was left at the end of 1942. He already had the experience.

Question: (inaudible) This will be the last question before lunch. Make it rather short if you can.

Answer: Sir, to answer your question about the Russian pilots and if they were better what would things have been like he really does not want to address that because it is very theoretical in nature but I asked him. I mentioned that he was obviously not a very good example to take, so how would he find the difference between an average Russian pilot during the war and an average German pilot. As he mentioned, the power the Luftwaffe had declined very seriously after the middle of 1942 because they lost so much of their experience.

However, he said a lot of the difference in the character and the quality of the German pilots versus the Russian pilots was just because of the national mentality of the Russians and their attitudes as opposed to those of the Germans. Where the Russians tended to be more dogmatic and more authoritarian, the Germans tended to be more flexible in their operating methods. Just as a national characteristic.

Moderator: Now that we have finished lunch, I think we can get started again. We have a couple of questions remaining from just before lunch, and we heard some very interesting commentary during lunch and it will probably come up as we ask more questions. General Casey, I believe, had a question just before lunch. He wanted to know whether many Luftwaffe personnel became casualties as bases got real close to the front or even got to the wrong side of the front.

Answer: Colonel Rudel can give you a pretty precise answer on that question. He had a Geschwade of 1500 men and he thinks in four years of war they lost about 30 men--30 casualties due to ground attacks. On various occasions their air field was either within artillery range, and I think on one occasion it was actually overrun by tanks. In toto, out of 1500 men they had 30 casualties in four years of war due to ground action.

Question: How about airplanes?

Answer: He says that at most they lost perhaps 40 airplanes in the entire course of four years of the war due to direct ground action--either artillery on the airport or direct tank fire. He says they lost substantially more airplanes than that due to having to move fast and not having the last washer or tiny part in place so they could not fly them out. They lost far more because of their constantly having to move and leaving the airplanes behind that were not quite ready. And then, of course, as you know their hostile action air losses overshadowed all that. These are very small numbers compared to how many airplanes their wing lost in four years of war because their attrition rates were high and they took them continuously. What I am saying is that the total of all forms of loss on air bases including air attack was no more than 40.

Question: Did they ever get an airplane shot down by a tank?

Moderator: Let us hold off a little until we get into our tactics, but please ask the question then. I am sure they did.

Answer: To answer the other important question from before lunch, Mr. Myers asked if the Russians had been better would it have been possible to operate from bases as close as 50 kilometers behind the front? I just asked Colonel Rudel and he says if the Russians had been better attack pilots and had been better shots in strafing, he says with the addition of very careful extensive daily camouflage such as camouflage nets and so on, plus heavy flak at every base, he said they would not have changed their tactics. He thinks that it would have been quite feasible to continue to operate, and the disadvantages of moving further back than 50 kilometers would have been too strong.

Question: You say he would have added more camouflage and flak protection.

Answer: Yes, he says they would have added in their TO&E more camouflage equipment, and I presume the men to do it, and they would have added more flak batteries.

Question: Do you think he could have operated in the west?

Answer: He says he would have to answer that question with a flat no. They could not have operated in the west because the air superiority of the Allies was simply too overwhelming. Keep in mind that it was not just a quantitative thing, it was also due to the fact that the really first-class pilots of the Luftwaffe by 1943 were pretty much wiped out. Earlier than 1943, of course, as you know over northern France, and so on, the Luftwaffe more than held its own and there was no such air superiority. But after 1943 and by the time of Normandy they had both the quantitative losses and much more importantly the good pilots were gone. Therefore, they did not have the situation of necessary air superiority and therefore the Stukas could not have operated.

Ignoring the factor of the Allied air, he says, in every other way it would have been lovely to operate on the western front because he said the Sherman tank burned much more beautifully than the T-34. The T-34 was one of the finest armored tanks of its time.

Question: What is the secret they used to keep from being shot down by German troops and how much of a problem was that?

Answer: He cannot remember a single loss among the Stukkas to friendly flak. He attributes that to several factors. One was that they were pretty austere equipped with flak in the first place. There was not much German flak. They were concentrating much more on the main ground weapons.

What flak they had was very heavily engaged in anti-tank combat because the 88 was such an important anti-tank weapon. Since they did not worry much about the quality of the Russian pilots, and so on, that was a far more important application. One, there was not much flak. Two, the JU-87 had a very distinctive shape. So distinctive that even the dumbest flak gunner could see that it was German. Third, they had Very pistols that they would fire off and if they thought they had friendly flak firing at them they would actually fire a Very pistol out of the airplane. Lastly the flak gunners were very, very carefully and constantly instructed on aircraft recognition, although in the case of the Stuka it was not so difficult, but other German airplanes were a little more like the Russian airplanes. He was also mentioning during lunch, I might just add, that the pilots were under constant instruction on tank recognition, and always being brought up to date on the very latest Russian models and the very latest German models. He himself in his career thinks that he fired on friendly tanks once or twice; fortunately, without lethal results. Once he remembers he fired at a tank and he happened to be shooting a little high and hit it in the turret which he did not penetrate completely, and immediately a helmet popped out. He was still watching to look for the results and he saw by the shape that it was a German helmet, and the guy was waving to him like that. He felt very badly. He said luckily they had the tungsten carbide round and not the uranium because the uranium round would very likely have set the tank on fire and that would have been bad. But his shot was nonlethal.

Question: Can we get a sense of what the battlefield looked like? I am interested in how many tanks he would normally engage. Was this a division size attack or was it a smaller group of tanks that he would pick up and attack with a flight of five or six airplanes? Is it five or six airplanes against 500 tanks in an attack or five or six airplanes against five or six tanks?

Answer: If you do not make the question theoretical, I think you will get a better answer. If you ask him how many tanks he would see at one time he will tell you. I do not think he could possibly tell how many there were in the attack if he did not see them.

Question: Okay, how many tanks would he see, were they mainly dispersed across country, or were they maybe on roads?

Answer: Difficult question because of the variability, but he will try to answer it.

In those which were huge battles, much larger than any tank battle since, one saw five to six hundred in assembly areas ready for the trip. But they were so defended by flak in static situations that there was simply no hope of attacking them. When the tanks went into the attack out of these assembly areas they would typically be in groupings of 20 to 30, and their spacings would be 50 to 60 meters apart. And incidentally, just as a side comment, that of course is what destroys the effectiveness of cluster weapons. That is too far apart to get much overlap from cluster patters.

Question: About the tanks on the roads.

Answer: He says you have to remember the special quality of the Russian terrain. It is very flat and almost all of it is trafficable with some exceptions and so there was not much need for road. Furthermore, there were not many roads. There are not now and there were not then in Russia and so there was nothing to restrain the tanks to the road. So they would go into attack positions. Even if they were on the road when they saw a Stuka attack coming they would leave the road and start weaving maneuvers as much as possible in order to defeat aiming.

Question: I would like to get back to an earlier statement you made, Sir. Do you actually look for specific areas where the tank is vulnerable. Do you actually aim for those points, shoot at them, and have you found that to be an important factor?

Answer: That was discussed at lunch. Let me repeat the question first of all. For specific tanks did they aim for specific points that were vulnerable. To make it quick I will just give you the gist of the discussion at lunch. Colonel Rudel said this was one of the great differences between the gun he worked with and the new uranium round. The gun he worked with was not particularly incendiary, that is the round was not particularly incendiary and so you had to hit specific areas, preferably always the area that had the ammunition. In fact, they would aim to hit within 10 centimeters of an aim point to really get assured destruction. They were talking about tiny vulnerable spots because of the difficulty of getting a visible kill. Remember, they only got credit for kills that could be seen burning or exploding. He says that is one thing that has changed totally. Now you have the uranium round, and now he says all over the tank there are vulnerable places and you can set it on fire from a very wide area and these accuracy requirements, to hit within 10 centimeters of where you aim, no longer exist. He says that is a tremendous new freedom.

Question: At what range did he shoot?

Answer: 200 meters for him and less experienced pilots would shoot at 400.

Question: I would like to get back to the question of firing on his own tanks--how did he handle recognition and what effect did weather, smoke, and what not have on this?

Answer: Okay, the question of recognition was discussed at lunch. He says the principal thing was of course the constant training of the pilots on recognition of friendly and enemy tanks and the latest models. If it was not clear from some other clues as to which tanks you were dealing with, then as

a last resort they would go to extremes and actually overfly the tank at 5 to 10 meters to make positive recognition because they all understood the very serious impact of firing on friendlies. The incident where he fired on the friendlies was caused by the fact that he had two German tanks right next to a Russian flak gun. It was in very close combat; when he saw the Russian flak gun he figured there would not be two German tanks next to one of those and that is when he attacked, you see, it was a mistake.

Question: Colonel Rudel, in your book you made considerable reference to the futility of cutting bridges. The basic thought was that you cut them well enough but they had portable bridges and they rebuilt them so fast that it just was not worth it--it was not worth the losses and it was not worth the effort. We are putting considerable effort into that today so I was just wondering if he had any thought there.

Answer: He says they attacked bridges as you mentioned and it always took lots and lots of effort to get a bridge, you know, you would have side winds. You would have all kinds of problems in placing the bomb just where you wanted it and it always took lots of bombs and lots of sorties and then finally you would drop the bridge with effort and losses and, lo and behold, the next morning it would be fixed or there would be a pontoon bridge right next to it and all the effort was down the tubes. He says it rarely took them more than half a day to fix a bridge. So, he says, of course there are tactical situations when a few hours may be very important and then you need to attack it despite the losses, but he says as a matter of constant targeting he thinks it is a very bad idea to attack bridges as a regular matter. He said they would figure out exactly how many bombs it would take but that points back again to the fact that they were very resource limited. They had lots and lots of things to do with Stukas and never had enough to go around and bridges just turned out not to be very useful.

Question: Could we explore the impacts of obscuration of the battlefield due to smoke and the impact of artillery shells a little bit more?

Answer: He said smoke was much less of a problem than you might think. Obviously, if a tank is smoked in and he needs to hit it within 10 centimeters of a certain spot he is not going to do it. But he said the typical situation when smoke was used as a tactical measure there would always be three or four tanks that somehow were not covered at the edge of the smoke barrage. They would go after those first. Fifteen minutes later the smoke would be gone and they would go after the rest of them.

Question: Friendly artillery and enemy artillery in the impact area?

Answer: Well, he is talking specifically of enemy artillery putting down a smoke barrage to protect their own tanks. That was the situation he has been discussing.

Question: How about camouflage. Did they try to use camouflage while they were advancing or anything? I am just trying to think of the difficulty of acquiring targets in that arena.

Answer: Right. He said there is a world of difference between moving and standing. Standing, of course, the Russians were masters at camouflage. They would put bushes and what not on the tanks, but he said once they were moving it did not help much to do all that. If you are interested, I will ask him about detection ranges.

He says typical recognition distances for knowing that they were tanks--not identifying but just knowing that there were tanks out there--moving tanks as carefully camouflaged as they could be on a field, not on a road, 400 or 500 meters he said. Pretty close. Even closer than I had expected.

If you used the speed of the A-10 at 900 kilometers an hour, he says, it would be totally useless. You might as well forget about it. You would never see tanks at 900 kilometers an hour. You have to use the low-speed capability of the airplane. That brings up an interesting point that came out at lunch that I think is of major significance here. Colonel Rudel thinks that we have made a terrible mistake in the A-10, and that we would be likely to repeat that mistake in any new airplane, by not having a second seat facing to the rear. He says

there is no question in his mind that if you are going to do anti-tank work you cannot do without that second seat. He gives the following reasons. You must give undivided attention to scanning the terrain in order to find the tanks because they are terribly difficult to find. To do that you cannot be distracted by any requirement to look to the rear or to cover your own six. As soon as you have to interrupt your scanning to look back, you are out of the tank finding business. You will not find them. It will be impossible. Secondly, there is also the issue that if these airplanes have a high-speed capability and the pilot is in some fear that he is going to be bounced he is simply not going to use the low-speed capability and he will be using the upper end of the speed spectrum, the 900 kilometers an hour that he is talking about on the A-10 or on any new airplane. So you must have the second seater to cover six simply to give the pilot security so he will be willing to use the low speed, because if he does not use the low speed he is not going to find the tanks and that is all there is to it. He is absolutely definite on that, just unshakeably firm in that opinion. I think it is something we have to take very seriously. He is talking about this more. He talks about it much more in terms of just seeing than in terms of defense. As you know, the Stuka had a gunner back there and he has not really brought up the question of the effect of having the gun itself. It is just the effect of having a pair of eyeballs looking to the rear.

Question: At what altitude did you make the reconnaissance flights that you mentioned earlier and at what altitude would you normally fly?

Answer: The question was what altitude, what typical altitudes were used for these early morning reconnaissance meteorological flights and what were the typical altitudes used when searching for tanks?

In fairly thin defenses on the morning reconnaissance flight he would fly about 800 meters. If there were stronger defenses he would fly at 1500 meters. Normal search for tanks when he went out on normal attack flights was 400 meters altitude. Then he says if they knew there were tanks down there but could not see them he would look for evidence of tanks. If he saw tracks or something he knew there had to be tanks down there and if necessary they would continue circling and go down to 200 meters knowing there were tanks down there and simply not

being able to find them. They would just keep on circling and circling. After 10 minutes they might find them. Remember they were doing this at perhaps 270 kilometers an hour. There was just no way to do this at any higher speeds.

He said he remembers a typical situation. They would be circling and circling, knowing that there had to be tanks. They could not find them. They would be looking and looking a little more closely at the houses and suddenly they would notice that one of the houses would have this long rod sticking out a window and suddenly they would realize that a tank had driven into the house through the wall on one side and only the gun was sticking out because the tank was too long. He says, with the A-10 at 900 kilometers an hour, how are you going to see a rod sticking out of a window?

Question: Would you get him to discuss the tactics they used to find tanks at night, if they did?

Answer: There were in the Luftwaffe specialists for night attack and there were specialized night-attack airplanes that were used to go out to try to find targets. Colonel Rudel does not think much of their effectiveness. He says basically their main effect was to spoil people's sleep but they would not have any effect. He said the job was so tough in the day, the job of just finding the tanks, that the night business was completely hopeless--was and is. Another reason they did not go on night operations was because they got very little sleep, particularly in the summer when the days were long. They were up much more than an hour before dawn and they were flying until last light, and it was not humanly possible to fly more than that. Furthermore, he said the Russians did not normally operate at night so there was not much need.

Question: In view of the fact that he flew 2500 combat missions in a little over four years he obviously flew in pretty bad weather. What were the limitations on ceiling for your missions and the visibility distance?

Answer: He says if the ground forces were really screaming for help in a very serious emergency then they would be willing to fly at 50 meters ceiling and 600 meters visibility and make attacks under those conditions. He says,

however, that you knew in advance you were going to get heavy losses, naturally. But they were willing and able, and did fly, and did make successful attacks on tanks at 600 meters visibility and 50 meters ceiling.

He says you have to remember though that the climate in Russia is continental climate. It is not the same as central European climate, say. The incidence of bad weather was relatively less than you would expect in Europe. They had generally better weather, but those were the limits in Russia, those were the limits he flew against.

Question: That brings up the question of navigation. In bad weather did he have severe navigational problems? How did they get to the target--did they have a leader?

Answer: Well, you know you cannot find anything without an inertial. We might pursue that a little bit about the flight leader. How they did it with bigger formations. Colonel Rudel says that he flew 2500 combat missions and on every single occasion, 2500 times, he was always afraid he would not find the field. He said, however, he did find it on 2500 occasions. But that is not necessarily true of everybody. Other pilots did have to make emergency landings because that was not particularly serious, you know, because you could land almost anywhere in Russia. You could always find a place to land. But he says Russia was particularly difficult from a navigational point of view because the country was so uniform and the chart material was terrible. He says they had terrible maps. Very inaccurate. And in winter it was really bad because you could not even find the railroad tracks in the winter. Either you would have just unbroken woods or unbroken open fields. It just made navigation very tough and so he said he flew rigidly by compass and clock. Absolute, as precisely as he could, and 2500 times he was afraid he was lost and 2500 times he would get back to the right field. He attributes a lot of that to experience. Experience made up for the navigational difficulties that he might have expected. But we will pursue what the role of the flight leader was in finding a target.

He always made sure to have an experienced pilot to lead every formation and that mostly solved the navigation problem for them.

You see there was always the problem of bringing in inexperienced people because of the high attrition rate. They always had a substantial number of inexperienced people to do the formation leading.

He says he has no experience with inertial so he cannot comment.

Question: I guess my question was that if he had had that capability, does he feel it would have resulted in a significant improvement?

Answer: I asked him if he had an instrument of say 6 to 10 kilometers accuracy, roughly, at our current level of inertial accuracy, would it be useful? He said, sure, if somebody gave it to you it would be great. He says, of course, you have to remember that it also strengthens the laziness of your air crews.

Question: (Pertaining to his supposedly getting an expensive inertial navigation unit.)

Answer: He said of course in Germany people normally say America is so rich they can buy anything, and he says if that is really true, sure, he says, buy inertials at \$200,000 each and pay a price, whatever it is, 10 percent in sorties or something. But if it was up to him and if the real truth was that you do have to consider cost, then he says no he would not be interested. He would much rather spend the money on training.

Question: On this experience question, after him what was the experience of the air crew in terms how many sorties they had been on?

Answer: I will break the answer up into two parts. One is the question of combat experience. The next most experienced pilot on the Russian front had 1400 attack missions. The next one after that had 1300 and then there were 10 or 12 who had over a 1000. So you can see there was quite a leap even from the largest of those to Rudel's 2500 missions. A lot of those were not equipped with the cannon-equipped Stuka, they were flying bombing Stukas. The highest scoring tank-killer after Rudel had 900 sorties, combat sorties, and shot up a hundred tanks. The next best after that shot up 70 tanks, and then there was a group of

40 to 50. Of course, you are talking about a relatively small group of pilots, all those pilots who went through two squadrons which had the cannon-equipped Stukka.

Question: Could we get into the question of tactics--the attack formation. Did they attack in trails of several aircraft or did they come from different directions. Did they try to attack the rear of the tanks?

Answer: I will ask him that question. Let me first give you a wrapup of what he said during lunch. I think Tribble asked him what the best formation would be--what the best size of formation would be for attacking tanks. He said if you have the quantity of ammunition you are talking about in the A-10, he would not want to take more than two people per attack mission because you have so much ammo you do not need the others along. At most, he would take three. But certainly beyond that you would just be getting in each other's way. Then the question was asked since the A-10 is a single seater with nobody covering your rear, does that modify your views of how many people you ought to have along. Then he says, if you have the luxury of pilots in your attack squadron who have air-to-air experience, who are well trained in air-to-air, then he says he would probably feel that the best unit to go out would be four A-10's to fly air cover and still no more than two at a time to be doing the attacking, four watching and two attacking. You see why they feel so strongly about having the guy in the back seat. He thinks he needs four just to make up for the lack of the guy in the back seat. I will continue with your question now though about the specific maneuvers and attack formations.

Question: In your question would you ask him how much communication there was between aircraft during those maneuvers, and so forth, in the target area.

Answer: We will ask him also about the communications just prior to the attack and while the attack was going on.

He says if we were flying in two's he would assign one tank or group of tanks to his number two man a few hundred meters away from his own. They

would attack them independently. But he says, however, that has a tremendous drawback if you do that in the A-10 because you have nobody covering your six. In the Stuka it was perfectly feasible and was not any problem because you always had somebody watching your rear. But you would have to balance that in the A-10. In general, the unattractiveness of having two airplanes fire at the same target is very great. It is silly and it is a waste of ammunition. You know he feels very strongly about ammunition because he only had six bursts of two each on his airplane, so he is very economical about that. His preference is to fly separately. His preferred dive angle, if everything else allows, would be 20 degrees.

Question: Would you ask Colonel Rudel what the FEBA looked like as far as depth and also the silhouettes that the tanks presented. Was there any uniformity at all or was it a mix?

Answer: Well we went round and round on that subject at lunch time because there were some people who were very keen to know about typical distances. The question at lunch was how far ahead of friendly troops his typical attacks were. He was very reluctant to answer that question. He did not like the question. We kept on insisting and finally he said first of all a lot of time he would attack behind friendly troops because a lot of their missions were against tanks that had broken through. There was no question of being in front of them. You were behind them. And then things were very, very confused. Those were the toughest recognition situations, because friendly and enemy tanks were just totally intermixed and there was no telling which was which by position or anything else. From a defense point of view that was a good situation--from a flak point of view--because these tanks had outstripped their defenses. That is when he could overfly them. For those situations where there was not a breakthrough where he really was somewhere ahead of his friendly troops, he said the average distance, again he was reluctant because it varied so much, but the average distance at which he would attack tanks was maybe 3 kilometers in front of friendly troops. Again, his preference was always to get tanks that were moving out of the assembly area. The assembly areas were tougher. Of course, if he would see the tanks there and if the defenses were not too bad, of course he would shoot them in the assembly areas too.

Question: What I was really interested in was the appearance of the Russians' FEBA. In other words, how much distance might there be between the forward or leading tanks and the lagging tanks, all of which theoretically should be in a nice straight line?

Answer: He says it is very difficult to answer, but in terms of what he saw he would say perhaps there would be 500 meters between the furthest forward tanks and the last tanks in an organized assault.

Question: And what would be the silhouette appearance of the various tanks? Would they all be uniformly presenting the same aspect or would they be heading in different directions?

Answer: He says first of all that if they were inexperienced, if they had never been attacked by Stukas, they would try to hold a parallel formation. Now remember this is in Russian terrain on the flat fields. They would try to hold parallel formations. If they had Stuka experiences, if they had been attacked before, then they would just break wildly in all directions. And if you looked across a wider front, a division front, again in this terrain, he feels they were mostly trying to adhere to a rigid parallel attack direction. But of course that is completely conditioned by terrain.

Question: In situations where there were some defenses present, did he still have the latitude to determine his attack azimuth on the tank or was he constrained to attack from certain aspects?

Answer: He says the main effect of increasing defenses was that they required very hard maneuvering approaches. He said there were only two possibilities: either you jinked constantly and very hard coming in and used just the tiniest amount of tracking time to fire and get out; or, if you did not have the experience you could not fire and hit from such a jinking approach and tried to come in pretty smooth and level, he says then you would get shot down. That is all there was to it. If you did not jink you would get shot down, this was just guaranteed. It was on or off--that simple. If you jinked hard and you

were good at it you could survive. Now, not everybody could hit from such a jinking approach with such a tiny amount of tracking time, but with experience you could do both. You could come in, jink, survive, track for a very small amount of time and get good hits. Hit within that 10 centimeters that you had to. Secondly, he said they normally did not change their attack direction because of the presence of flak. They preferred to attack from the rear. For them there was a bigger vulnerable area from the rear into the engine or into the back of the turret. If because of where they were and they wanted to attack directly, the other preferred attack was from the side. That was harder because the vulnerable area into the munitions from the side was quite a bit smaller, but they would attack on occasion from the side and try to aim for just that spot where they knew they could get into the munition containers.

Question: What would the effect have been on his operations if it had been necessary for him to fly no higher than 100 or 150 meters?

Answer: He says if you had an upper ceiling of 150 meters due to guided missiles and the same defenses they had in Russia, it would have been totally impossible because the guns would have gotten you for sure. You had to have the flexibility to come up higher in the areas where you were uncertain as to whether the guns existed or did not exist. I think that is an important comment because of our recent obsession with low-level tactics. I think low-level tactics are a very important part of the repertoire, but there are places where they are obviously impossible, and where you want to fly at 800 meters instead of 150 meters or 20 or 30 meters as he did many times too.

I think there was an earlier question as to what kind of flexibility the squadron or wing commander had in picking targets, and so on, and Colonel Rudel has answered that question at a previous session. I will give his previous answer, then I will ask if he has anything to add. The German command in that respect was very flexible and they took into account the experience of each commander. For instance, Rudel himself was given very wide latitude. He was never told the coordinates of targets. He was just given the most general kind of guidance about what unit he was supposed to help and what problem they had and then the rest of it was up to him. Of course, he had a lot of experience. He

knew exactly what kind of attacks the Russians were likely to mount and where the critical points would be, and so on. However, with squadron commanders or wing commanders of decreasing experience, the tactical initiative allowed them by the air division would decrease, and the greenest squadron commanders would be given quite specific target coordinates.

He adds to that commentary that very often they would attack a different target than they were assigned and they would tell the army, "We just attacked tanks over here by this village instead of over there because these tanks were further ahead than the others". They said the army was always very happy because they had very short range vision. They only see a limited part of the world and if he was in a position to know that they were more closely threatened by another group of tanks he would attack it and they were always very happy with his results.

If you had a completely green squadron commander, if he was told to attack tanks at such and such a point, such and such coordinates or village and he flew out there, if he found the tanks he would attack them. If he did not find them he would go home. They did not have any authority really to go out and then search and sweep.

Question: That brings up the concept of FAC's. Did they have such a thing as the FAC?

Answer: Yes, I will give you the answer from our previous session last year and then I will ask him to add to it. I will answer both those from last year. First of all, they did have a forward air controller, non-flying but Luftwaffe, who rode in a radio tank. They had to take the gun out of the tank and install radios instead. They were pretty scarce. Normally something like one per division and he had the right radios to talk to the Stukas and would relay the needs of the division that they were supporting and, perhaps, even more important, receive the reports of the Stukas on what they had seen. This was the visual recce that I referred to earlier. Colonel Rudel recounts one incident where an armored division commander was down to this last half-dozen tanks and announced in public that if he was down to his last tank, his last tank would be a radio tank. He would take the gun out. He would put the radios in because the value of the information he was getting from Colonel Rudel and

his observations on where the enemy was and where the greatest threat to him was were more valuable to him by far than his last tank.

Question: That sounds like a liaison officer instead of a FAC.

Answer: I will ask the question but you have to remember of course, that Colonel Rudel had an unusual amount of authority. That fact may have had a different position relative to a greener air commander.

The general's name was General Unhein, who is still alive, who made this public comment about the value of Rudel's reconnaissance information. The title is "Fliegerverbendungs offizier" (FlieVO) which means flier's liaison officer. He was really a liaison officer as best I can tell. He was really subordinate to the ground. He had to pass what the ground wanted on to Rudel or to any commander. The division commander wanted to tell his air support, "My problem is such and such", or, "I absolutely want you to attack over here", or whatever. The liaison had to pass that on and likewise he passed on whatever information Rudel had. He apparently had very little authority and he was nonflying.

Question: I would like to explore the nature of the threat at low altitudes as we referred to earlier and the reasons they did not spend more time operating at very low altitudes. Was that largely from dedicated AAA or was that from just machine guns on tanks and other vehicles?

Answer: Let me say first of all Rudel is talking strictly about being very adaptive on the question of what altitude you fly at. He says any time that they started to get the sense that there was not much flak around they would simply descend in altitude, go down to the best altitude for search. They would start off at 800 meters because they were uncertain. If they did not catch a little fire for a little while they would go to 400 meters. If they did not catch any fire there they might even go a little lower. But it was constantly a question of probing the defenses and then of course, the very important point of being absolutely current on the dispositions of the defenses and again I will bring up a point from last time. Rudel said that critical to survival was to be there all the time and to be in total constant touch with the current front situation. He

said the most dangerous thing you could do was go home for a week's leave. He said when you came back after a week's leave the front situation had changed so much and you were out of touch with it, that was the time you were likely to blunder into a very strong flak position. It was critical to be right on top of the very latest information on dispositions and to have personal knowledge of it. Just to be briefed on it was not good enough. I will ask him the other question now.

He started off with a German saying which literally translated is "With enough hounds the hare is dead". He said if you ran into some place where everybody was shooting everything, you were going to take a lot of hits. Each hit might not be that dangerous; he came home often with 50 hits in the airplane. It was not uncommon at all, but if one of those was in the radiator he had seven minutes to get down. But he says you never know what the exact causes were and which was the most dangerous, whether it was the specialized flak or the ordinary machine guns. But certainly ordinary machine guns could bring down Stukas, particularly with these hits in the radiator. That is what they were most afraid of. Furthermore, he says it was very dangerous for them, and very uncomfortable when the flak would fire without tracer. When they fired with tracer, it was great. You could always evade and go up in altitude, but if they were firing without tracer you were flying along fat, dumb, and happy, thinking nobody was shooting. It was very dangerous. There is an interesting point for tactics of anti-aircraft. Since everybody shoots with tracer, tracer is the right way to do it.

Question: Did he ever run into any communications jamming or any of that kind of disrupting communications or false information being passed to them from the ground?

Answer: He heard some noise on his communications channels. He heard no deception conversations in his experience. And in fact, he said it is very important to remember in this connection that they were very rigid about communications discipline in the Stukas because they believed that all you had to do was talk a little and the fighters would be on top of you. Okay, so they just did not talk. There was no chatter. Absolutely no chatter and if they

could assign targets or whatever without conversation, all the better. There was absolute minimizing of conversation because they knew it led to losses. On the other hand, he said the Russians had no discipline at all as far he could tell. There was just constant chatter on their channels and he had a man in his squadron who was born in Vilna who could understand fluent Russian and who said they were always yelling on the radio, "Attack the first one, attack the first one. Because it's Rudel who's shooting up all our tanks".

Question: Did he have any problems of discipline with his noncommissioned pilots or between them and the commissioned pilots?

Answer: He says his experience is limited to his own units and he says in his unit there was no discipline problem, so they did not have any problem between NCO's and officers. The discipline in his unit was as good the first day of the war as it was the last day. He says, however, it was different in fighter units. A lot of the air-to-air fighter units had poor discipline, particularly towards the end of the war. Discipline really started to break down in those units and he does not know whether under those circumstances certain frictions or problems developed between NCO pilots and officer pilots. He cannot comment on that. For his own unit he can comment. There were not any problems.

He says he will venture a general opinion beyond just his unit. In general he does not see that having good quality NCO's is any problem, in fact, he is for it. And you have to remember that the ones that he dealt with had mostly at least 8 to 10 years of service. Some had 12 years. And they were good soldiers. He emphasizes the word soldiers. Then he says even more so in the coming war with the Russians. If you want to conquer the Russians, he says the first quality that air crews have to have is they have to be soldiers; the second quality they have to have is to be soldiers; and the third quality they have to have is to be soldiers. And then, at some much higher or much lower level of priority, they also ought to be pilots.

Question: How does he rate NATO and how does he think the German and U. S. air forces would stand up against the Russians today?

Answer: He says first of all that he thinks in general the German Air Force has become commercialized or materialized and that lots of the personnel are more interested in a little more leave, or a little more privilege, or material things like that. And he says against the Russians that will not do. That just will not do. The question of spirit is absolutely the first and most critical thing and he feels that has declined--declined substantially. Of course, there are exceptions, naturally. And he just hopes that the Americans have not had that kind of decline and that they have the requisite spirit with which his unit served in the war--this idealism and dedication is essential.

Question: Ask him if he is familiar with Sturmovik and if so, how would he rate that in some kind of reasonable sense that you could understand relative to Stuka.

Answer: And then we will take one more question and that will be it.

He says the Sturmovik had one great advantage and that was that 20-millimeter flak just bounced off it. It was very heavily armored and it flew and it survived beautifully against 20-millimeter flak. Inside it was extremely primitive, I mean really surprisingly primitive. Just all those things that the Americans do 150 percent better and maybe too well, he says the Russians did not do at all. It was really primitive. The Americans, of course, do it much more expensively, but the airplane was a perfectly respectable flying machine and very survivable. The main problem was the crew of the Sturmovik. The crew was not very good. At most, 10 percent were in any way competent; 90 percent would just fly blindly right into the flak and just get shot down. Just shot down in droves. Just no idea of what they were doing and just get shot down. Then the other thing is of course it had no anti-tank weapon. It was strictly a dive bombing airplane for whatever targets were addressed by dive-bombing then.

Okay. One more question.

Question: Pertaining to the availability of aircraft and experienced pilots during the war.

Answer: He says, of course, each one of these was a problem at one time or another. Essentially, he never ran out of gas. Essentially, gas was

no constraint on their operations but it had a lot to do with the quality of people they got, because there were so few flying hours given these people, so little gas given to train them, the people that he was getting late in the war, we are talking about late 1944 and on, he said it was astonishing that they knew how to fly at all. If he had to enter the war on the amount of gas they had to fly, he certainly would not have known how to fly when he got to Russia. And he said it was astonishing and a tribute to them that they could fly at all when they got there. He was always surprised that they did as much as they did with so few hours. But that of course, really hurt because with people that inexperienced, they would get shot down right away and they never had a chance to build up the experience to become really effective and good. On aircraft, he never ran out of aircraft. For perhaps a week he would have a shortage of an airplane or something that had not arrived yet. But he says that may not have been the general experience on the Eastern Front because he got high priority. By that time in the war he was certainly the most famous German pilot of all and the whole system would bend itself to the maximum to supply him with airplanes. I am adding that as commentary. He did not say that. He just said you have to remember he had special priority and other people might have had shortages. He does not know.

Moderator: I think that wraps it up. Colonel Rudel has been very patient with all our questions and our lack of experience in Panzer warfare. Every time that I have talked to Colonel Rudel I have discovered completely new insights, and I am sure we have not even gotten close to the bottom of what he knows about attacking tanks with airplanes. On behalf of all of you I would like to thank him for having been so absolutely forthcoming with his views and, in my opinion, very rigorously objective. Thank you very much, Colonel Rudel.