

Wind Tunnel Oral History

Number 1

HISTORY OF THE GROUP OF GERMAN SCIENTISTS

(As recounted by several German Scientists who came to NOL)

After the air raid during the night of 17-18 August 1943 on the housing area of the people working for the rocket plant in Peenemuende, General Leeb, the Chief of the "Heereswaffenamt" decided to separate the supersonic wind tunnel from the rocket plant and to move it to a safer place. Only parts of the plant were damaged - the wind tunnel equipment and almost all instruments of higher value were not touched.

Before the air raid, in the spring of 1943, we found a place in Kochel, Bavaria, where we intended to build a large supersonic wind tunnel up to Ma-number 10 (corresponding to a velocity of 7500 m.p.h). At this place the water power of 30,000 KW, which was needed, was available. It was now decided that the Peenemuende tunnels should also be moved to this place.

So the first efforts to save this precious tool for supersonic research began, partly against the opinion of the Peenemuende people who feared the interruption of their development. We began, however, as soon as possible to take the tunnel apart and to move the parts. It proved later on that this fast movement was justified. It is highly probable that the tunnel equipment would not now be in the United States had we hesitated in saving it at this time.

With about 300 railway cars we moved the two 40 x 40 cm tunnels, the small experimental tunnel intended for the development of higher Mach numbers, the wooden 40 x 40 cm tunnel for subsonic velocities up to Mach 0.4, the compressors, motors, the 41 ft. diameter sphere and other equipment, furniture, etc. to Kochel. The 18 x 18 cm continuous tunnel was moved to Braunschweig where in the meantime measurements were made with it.

The reconstruction of the tunnel in Kochel was partly finished on 15 November 1944 when one 40 x 40 test section and the drier could operate again. In the summer of 1944 all instruments were overhauled and brought back in good condition.

The experimental research was interrupted about half a year after the last measurement in one 40 x 40 cm test section was made in April 1944.

Considering all the difficulties of transportation, supplying materials for the construction, the lack of workers, etc. in that last year of the war, it was the shortest possible time in which this extensive wind tunnel equipment could be saved and reconstructed. Disregarding some slight damages to instruments and the loss of the small experimental tunnel for higher Mach numbers, which burned by indirect action of an air raid on Muenchen, all precious equipment could be used again for further development of the high speed missiles.

Unfortunately, after our new settlement at "Wasserbau-Versuchs-Anstalt" in Kochel we missed the originals of our reports containing all the results of our scientific work of the last eight years. These reports were part of the Peenemuende Library and were moved with it to the "Mittelwerk" in Thuringia (Middle Germany), the big underground plant for the A4 production. Efforts made to obtain them from Kochel in the last period of the war are described in the following report:

During the last days of March 1945 (senior German scientists) from the WVA were supposed to secure the secret archive reports series 66 which were contained in the files of the Peenemuende institution. These reports included the entire scientific research work of the supersonic wind tunnel since its foundation. The Peenemuende organization had just completed its move to the Harz area in middle Germany and was transferred to the jurisdiction of the SS General Kammler. During one night we drove from Kochel, Bavaria to the Harz because driving during day time was practically impossible at that time. At the ordnance office we learned that SS General Kammler had just issued orders that all secret reports and data have to remain stored in a special cave in the underground factory "Mittelwerk" where the V-weapons were manufactured. Nobody should have the right to remove anything from there in order that the SS could destroy all records simultaneously before the occupation. In the evening we consulted (a senior German scientist) who was in a local hospital. He signed a permit to enter the "Mittelwerk" and to remove some reports. We entered after endless formalities the plant which was heavily guarded by SS troops. We found the entire Peenemuende file in a small connection tunnel. After opening all boxes we found the WVA series 66 and removed the reports in a bag which we concealed under spare tires and tools in the car. Then we destroyed the permit by (senior scientist) for which he had no authorization. On the same day a general order issued by Keitel prohibited the use of any civilian car which uses gasoline. This order was enforced by special SS detachments which confiscated all cars they encountered. After finding out where these check posts were located we drove again during one night without lights back to Bavaria. At Kochel microfilms were made of all reports and secured in various places in sealed metal boxes. On the other hand, all documents in the cave at the Mittelwerk were loaded by SS into trucks and these trucks were dumped into the shaft of a salt mine now in the Russian occupation zone.

Since the beginning of 1945 there was no doubt that in a short time the German Army must surrender, the opinion came up that our wind tunnel should be destroyed and all results burned. The corresponding secret orders came later on to the "Abwehrbeauftragter" of the institute.

We were scientists and not fighting people. We could not understand the senseless destruction of scientific equipment with which we had made so many important investigations in the supersonic field during the last years. It was absolutely of no use to anyone in Germany if we should burn all the results of our scientific work. If we did so, we would fall back in our field several years. It was not clear at this time which one of the hostile armies would occupy Kochel. However, all efforts were made to save as much as possible of the work already done and to protect the wind tunnel to use it for further work. The development of high-speed flying bodies is one of the most urgent and most interesting technical problems of the near future. The destruction of his tool for this development and the destruction of his own brain work would actually mean the suicide of the scientist.

We decided to protect our work from the destruction of the hostile or our own side. There was the possibility that the first fighting troops might shoot into Kochel (which later occurred) whereby important reports and instruments might be destroyed.

With the knowledge of all responsible people of the WVA we began to make microfilms of all important reports and drawings. It was difficult to keep this action secret because people who did not understand too much of our scientific work could cause us serious trouble. The microfilms were put in small iron boxes, carefully sealed and hidden in a safe place in the hills of Kochel. The originals and important other papers were well packed in a large box which was buried in the ground.

The following descriptions illustrate the methods used in saving these documents

The work on the projected supersonic wind tunnel 1m x 1m with water power plant, which had been started in 1941, was suspended by order of the "Heereswaffenamt" in Sept. 1944. The details accomplished until this time were requested from the respective firms and preserved at the WVA. From January to March 1945 we made microfilms of all these drawings and reports, since we expected that all these papers would be destroyed. In April 1945 the microfilms were packed in boxes and the drawings and reports put in cement blocks and buried in the ground in the vicinity of the laboratory.

After the occupation of Kochel by the American troops the American scientists were informed of this. The microfilms and papers were dug out and given to the American scientists for disposal.

For all important investigations done in the supersonic wind tunnels in Peenemuende and Kochel, photographic records have been made and filed systematically. Therefore, the several thousand negatives represent the results of tests, which have not yet been

published or are no longer available, are particularly irreparable. Even in the case where copies of publications exist, it is often necessary to get more exact values and dimensions than those which can be picked up from the more or less adequate reproductions (for instance evaluation of Schlieren pictures or application of functions given in diagrams having a general or specific importance for new developments).

In the very last period of World War II, I received strict orders from the security official of the Wasserbau-Versuchs-Anstalt (WVA) to destroy all records of secret character. Since most of the investigations were connected with the development of secret weapons, practically all of the photographic records should have been destroyed. Because we felt that it was nonsense to destroy the scientific results of a decade, we decided to save our recorded results against the received order. This decision was made regardless of any possibilities for us to continue our work in the future. We did this special work in this manner, as well as doing our regular work, we packed the photographic records step by step very carefully during the day and buried them at a secret place in the woods during the night, so that we could save these important records.

All drawings and construction data on designs of supersonic wind tunnels, measurement equipment, and models collected between 1936 and 1945 were filed in the Wasserbau-Versuchs-Anstalt in Kochel, Germany. This institute also had three supersonic wind tunnels, nozzles, precision measuring equipment and the shop for fabricating this precision equipment.

Approximately four weeks before the arrival of the American troops we anticipated an order from the German High Command to destroy all of the equipment and documents. Therefore, in an attempt to save these years of painstaking research we acted individually to hide whatever information we deemed important. To hide this information was extremely dangerous because all of the reports and drawings were classified as secret or top secret.

In my own case, I had prints made of all of the important drawings, and hid these drawings in sheet metal tubes which I personally welded closed and then buried. My reason for trying to save the drawings was the hope that some day we could give them to posterity.

The anticipated command to destroy all secret equipment and documents came about one week before the arrival of the American troops. After we received this order, we discovered that the German High Command had no way of carrying it through. Therefore, we only burned the unimportant things and were able to save the tunnels, the original drawings and all secret documents. To protect the hidden documents and equipment from plunderers and souvenir hunters we kept them hidden until the arrival of the first American scientists.

The first American troops came through Kochel 1 May 1945. They fired several shells into the town. However, none of the tunnel plant was damaged. Unfortunately one of the computing girls was killed. It seemed that our caution in hiding the things was useless. In the next days, however, our assumption proved true.

Since we had no guard for the plant anyone could enter and take out or damage things as he wanted. Soldiers, foreign workers and other strangers came looking for things they could use. They took part of the tunnel, instruments and photographic equipment. We made a guard of our own employees, but since they had no weapons they could not get rid of these people.

Therefore, we tried as soon as possible to contact the first American Commanding Officer in Kochel, Lt. Roberts, and told him about the precious wind tunnel and instruments of high value, which were in the WVA and asked him for help. Fortunately this officer understood the situation, came out to the plant and signed the first order to protect the WVA. The officer could not give us soldiers for a guard because they left Kochel the next day. The order, however, kept off all unauthorized people. He promised to send help as soon as possible.

During this time the employees were working as they had done previously. The tunnel, however, was not running. About one week later the first American scientist (Biot ?) came to Kochel and with him came a permanent guard of American soldiers. Since this guard could not estimate the value of the object, and they obviously had no special orders, the next day all cabinets, desks, and boxes were broken up to find souvenirs. All the remaining documents, papers, books, photographs were dispersed in the rooms, cameras, lightmeters, photographic material, etc. disappeared. Fortunately, we did not bring back the hidden reports and microfilms at this time, otherwise they too would have been damaged.

That is especially true for the precious optical instruments which we had well packed and buried or brought to safe places. Optical flats of great value, large concave mirrors for Schlieren photographs, precious lenses, etc. would have been touched and damaged. Hence it is known that optical things especially attract people to play with, not knowing the value of them.

One week later a commission was sent to Kochel with the scientific leader Prof. Zwicky, Calif. Tech. under the military protection of Col. O'Mara. From now on we knew that all scientific work was protected and should be used for further developments. Therefore, we recovered systematically all hidden documents, films, photoplates, etc. and we finished reports not yet complete, made copies of all originals that visitors could obtain copies, so that the originals could remain together. In this way only it was possible that we saved practically all documents until they could be used for general purposes.

In May and June 180 employees of the WVA were still working in Kochel. In June Col. O'Mara requested that we make a list of 90 people contemplated to be transferred to the States

with the tunnel project. 90 people were released. Up to the end of September the packing of the tunnel, instruments, and taking apart the sphere was done by the 90 people. Between May and September about 150 scientists and engineers from the United States, England, and France visited Kochel. We discussed with them the supersonic problems in a scientific fashion.

The train with the wind tunnel equipment left Kochel in the first days of October, also the American commission in charge of the shipment, which was led by Lt. Comdr. Mott-Smith. There were finally 20 scientists and engineers who should obtain American contracts. Navy contracts were provided for about 12, however, no efforts were made in the next two months to hold the people. The Army Air Force took care of some people who were not provided for the Navy and who left Kochel very soon. In the last days of October the writer obtained a contract from the War Department but did not sign because of the expected Navy contract which was proposed to him in September.

Since some other people waiting in Kochel gradually came to the conclusion that no American contracts were forthcoming, they accepted contracts from the French, who took advantage of the situation by presenting good conditions concerning salaries, family transportation, etc. It was very difficult to hold the essential people together without any prospects of a contract with only the belief that the Navy would bring them. We lost in this time several good scientists and engineers who went to the French, where they found interesting work and good living conditions for their families, as they wrote in the letters to the people who were waiting. Therefore, new difficulties arose to convince the people that the Americans would come. In spite of the almost hopeless situation the nucleus of the supersonic research group stayed together and waited. We had the idea that we would make better use of our long experience in the supersonic wind tunnel research for further development and larger designs in the United States than anywhere else in Europe.

Finally in December 1945 the contracts were brought by the War Dept. (USFET) as the only American contractor for the German scientists. We left Germany 11 January 1946.

Number 2

MEMOIRS OF DR. RUDOLF HERMANN

Dr. Rudolf Hermann was in charge of the German wind tunnel developments at Peenemunde at the end of World War II. Exerpts from his memoirs are presented herein describing those last years of the war and the transfer of facilities and scientists to the US. The NSWC Tunnel 1 came from Kochel after the war along with a number of distinguished German scientists.

Memoirs of Dr. Rudolf Hermann are based on interviews with Sandy Sherman April 22 through July 2, 1988 in Huntsville, Alabama.

Questions posed to Dr. Rudolf Hermann

S At Peenemunde you lived on the peninsula and the little island nearby was for experiments only?

H Yes. The island is Greifswalder Oie, and we went there by steamboat. It was a two hours undertaking, and we went there only for professional purposes. From there the launchings of the A3s and many of the A5s were performed.

H Our house was located in the north-east corner of the settlement, and very close to the beach. Our house was a two family house, many other ones were five, six, or ten family homes. I was together with Mr. Riedel. He was chief designer for the V2. He had 3 or 4 children, and we had 3 children at this time.

S There was a prisoner of war camp near your housing area. Weren't you ever worried with it so close?

H The prisoners were mostly from Russia, strong and well built. They were good natured people. We talk with them, and had absolutely no fear that they would do anything against us. They felt fortunate to be away from the front, from the fighting. They received every day per person 10 pounds of potatoes. They ate them raw and so they had enough vitamins and minerals, but they got nothing else. The German workers got in the years 1939 through 1942 sufficient nourishment. But for everyone 1944 through

1948 were starving years especially after the war. (The book, From the Ruins of the Reich, describes exactly the conditions at this time.)

The Russians also were very helpful for instance at air raids. They realized that should we get killed, they would be also.

Dornberger's book describes exactly as I lived through this period. I was always so close to him. I saw him several times a week until he left Peenemunde for other assignments. As you know from the book he was very interested in my work.

For long time we had no idea that the Allies would know what we were doing. Suddenly the German Army started putting up anti-aircraft batteries which are always in big cities. When I realized this, I thought, "Oh, this means serious business." I knew this meant the Allies knew what we were doing, and I expected an air attack every day. Two weeks later the English Air Force attacked us, again and again.

On August 17, 1943, the sirens went on, and you could hear them of course all the way. The bombing aircraft came from England. Of course sirens came on often, always when aircraft came from England on their way to bomb Berlin, Hamburg, Stettin. But they had certainly a very different corridor that they flew all of the time. It was a very clear night. I remember you could see dark blue sky. I started smelling the smoke of the anti-aircraft battery. They produced artificial fog in order to make the contours vague so that from the 7,000 meter height they wouldn't know where we were. That confusion produced by the artificial fog proved very important for our survival. The first line of bombs fall all into the Baltic Sea. Just a 200 meters closer to the beach, and we would have all been dead.

After the first alarm went on, I then told my wife, "I think we have to go. It's for real." Because often the alarms went on before, but this was the first time you could smell the smoke. We went to our basement. Then we have some protection since it was made out of brick.

After awhile we heard the bombs falling all around us. And of course many airplanes came down, down, down. I heard something hit our house. So when it was quiet for a moment, I ran up to the attic in order to find out. There I found two incendiary bombs in between the roof and the attic. I took one and threw it out of the window. (It was a three foot long cylinder about as big as a fist.) That would have saved our house, but there was a second one. I did not have time to throw it out because immediately the big bombs started falling, and I think it's nonsense to be up there. So I went back to the basement and got my family out to the trench - every house had its trench. Those trenches they had been dug into the sand ten meters away from the house and fortified with railroad ties about four or five weeks prior to the attack. That was of course also, one of the indications that the attack was imminent.

We had two small children and a newborn baby, only 13 days old. This was Algund. We carried her protecting her with a big wooden board from all the falling, burning debris, bricks, and glass. We were lucky.

So we spent several hours in the trench. Some people came we did not know. They were not from our scientists group because we knew them all. They came from the North. They were workers working of course all over on construction not prisoner of war. Free German people whom you class as workers. Their house and area was hit by bombs, so they came for protection to us. This is, by the way, described in the Rocket Team.

We stayed in the trench for a long time because our house burned down slowly, slowly over hours. I tried to bring out of the house all the furniture and the important things - beds, kitchen things to cook, the range. I had to get this out because we knew when it burned down, we would never be able to replace these things.

The attack lasted for many hours, but there was only one attack. Almost half the private houses were totally destroyed, but only one leading scientist, Dr. Thiel and his entire family was killed. As we learned later, the goal of this attack was to bomb the houses and to kill the scientists and engineering specialists. But 735 were killed: civilians, workers, technicians, clerks, truck drivers, women, children, and the elderly.

The Army Rocket Experiment Station was not totally destroyed, but hit were the Pre-Production Works, the Oxygen plant and P.O.W. camps, and totally destroyed were many barracks where foreign workers lived. Test stands, special plants and my supersonic wind tunnel were spared, also the guidance and control laboratories were intact. 600 four-engine bombers with 1.5 million kilograms were assigned form the destruction.

The fist night we spent all outdoors. Of course there was no indoor anymore. After one or two nights, we finally found transportation away from Peenemunde into the country.

Ruthilt and the children and Mrs. Kurzweg, the wife of Dr. Kurzweg, my deputy, who owned a comfortable house in Bavaria, left for this place where they lived for awhile maybe five or six weeks, and later they went to Kochel. But we were happy the families were well out the way of danger.

I, myself, left the settlement by bicycle for a safer place near Trassenheide to one of my employees at the wind tunnel, a mechanic, and he was out of this area. He lived there fortunately on a small farm. For five weeks I lived in his house, and everyday I bicycled

back and forth to work. His wife was very kind. When I came home always late at night after work she always had food for me and refreshments and took care of me.

Of course there was a tremendous amount of work to do, because much of the equipment was destroyed. The wind tunnel parts were shipped to Kochel, including the personnel. It is described in detail in "First Annual Report of the Aerodynamic-Ballistic Research Establishment Kochelsee (WVA) for the period from 1 January to 31 December 1944" (Report No. 26, page 17).

Dornberger had every day emergency conference when he had to listen to the complaints of the people saying: "That happens," "I don't have this." "I run out of this." He immediately made decisions who would do this, who would furnish that. He had a tremendous work load organizing a kind of trouble schedule for all parts and people which were destroyed. Of course he was very good in organization as a major-general.

S From August to November you were already preparing to go to Kochel, did you decide right away that you had to move the wind tunnel out of Peenemunde?

H Oh, yes, sure because we had anyhow already started in Kochel in order to build the large Mach number 10 wind tunnel with the water power plant to produce 57 megawatts.

S So you had really planned to move to Kochel anyway to get the electricity needed. I was reading in Report 26. You talked about having trouble getting the equipment, running out of gas for everything, snow. Now during all this time were you going between places or did you stay in Kochel?

H Yes, mostly going between places, but I tried to stay as much as possible in Kochel. There was new construction going on. Dismantling is much easier job. You don't have to make big decisions.

S In this report when you were listing all the people at Kochel there is a children's nurse? Whose children was she taking care of? It seemed odd in the midst of all these bookkeepers and welders, carpenters, kitchen help, charity women.

H As you see there are not only technical people, they have also their wives and children at Kochel, and when they are there you must help them to take care of all.

S Did you stop all testing at this time or was there some work going on somewhere part of the time?

H That is also described in this same report. One group at Aachen, one at Gottingen, and one group at Braunschweig at wind tunnel there. On page 17, "The WVA is to be

organized as a commercial enterprise (corporation or registered firm.) Dr. Hermann drew up a draft, detailing organization, administrative and security regulations. HAP procures the necessary funds for the transition period..... It was decided to organize the company G. m. b. H.”

S When you were building at Kochel were you planning then the hypersonic wind tunnel?

H Yes, it was here call Project A. It was a code name. On page 17, “The new project (Part A) is to be considered a supplementary construction project of the Walchensee Works.” Because this plan had 150,000 kilowatt power plant producing anyhow, and we need part of this as I explained to you.

S Why set it up as a private corporation?

H It much easier to work within a private corporation. When we were part of the Army and there were hundreds and hundreds of people involved. But they all were of course working under separate rules, very definite rules.

For procurement, you did not have to go through the Army rules, “Take three bids, and then take the lowest one.” It is the same in this country with all government organizations. Hiring of people was also less complicated when you did not go through the channels of the Army. As a private corporation, we could hire on the spot, because we had a higher priority then other companies.

S And the money came from government contracts?

H Not individual contracts. We had funds appropriated every six months for all our entire work.

In one place you will find three names. The director was me, the two other ones, Dr. Hermann Kurzweg and Dr. Herbert Graf were my deputies. Dr. Kurzweg was the Technical Deputy for Science and Research and R. Graf was the Administrator. Dr. Graf was in charge of business, personnel, salaries, and security.

S So, did you get the hypersonic wind tunnel built?

H No, it was never finished. We had 90% of the technical designs ready. Because in the German language, we call “Uberschall-Windkanal” what we used all the time up to Mach 5.3. The new Mach number 10 tunnel was something completely different. We invented the work “Supersonic-Windkanal” which translated verbally would be “ultrasonic wind tunnel.” My first report in USA, Wright Field report IRE-67, 1 May, 1946, I used: “Ultras-Supersonic Windtunnel.” Much later in this country, some scientists decided everything above Mach number 6 was hypersonic.

About the activities in Kochel, see Report 26 - on page 21 about compressors and on page 22 about generators. Let me say here that we had three generators at 3000 kilowatt each, costing a total of 3.6 million Reichsmarks. Page 22 is about air drying plant. Based on my scientific results at Aachen (Report 14, picture number 29) it was necessary to build a huge air drying plant. Air has so much humidity - when it enters the wind tunnel, it starts condensing, forming very unpleasant shock waves, which disturbs the air flow. The costs of this plant was 1.3 million Marks. The requirement resulted in the need of two absorbers 785,000 kilogram per hour of air from 12 gram per kilogram moisture to 0.5 gram per kilogram.

Then comes the actual wind tunnel (on page 22) called Measuring section. "The design of the measuring section, including chamber, diffusor, and three component balance, and optical instrumentation was carried out in our own design department." Mr. Hans Gessner, chief engineer, and MR. Edmund Stollenwerk made the construction in the machine ship. Mr. Stollenwerk had also been with me in Aachen, and I took him to Peenemunde. The day I hired him in Aachen, in our private house on Sunday, I told to Mr. Gessner, "I believe this man will make very good success." I was right about this, but at that time it was just a conjecture. Mr. Stollenwerk came to this country first with the wind tunnels for the Navy. Later he went here to AEDC in Tullahoma, Tennessee for several years as chief designer for the wind tunnel there. His boss became chief scientist at Lockheed, in California. At the same time, Stollenwerk, who joined him, became designer of high speed, high temperature facilities. And he designed in California many pieces of equipment, difficult things which I could hardly understand anymore.

"By May 1, 1944, according to Report 26, these parts had gotten tot the blue print stage. At this time all work on these parts was deferred in favor of the special job to be done. The material for the construction of measuring chamber and diffusor totaling about 87 tons of iron (predominantly sheet metal) was turned over to the Dingler Company in Zweibrucken as of July 1, 1944."

Most important technical data concerning the plant were incorporated into the reports on:

(aa) Machines for project A, dated June 22, 1944.

(bb) Air-drying plant for project A, dated May 10, 1944.

(cc) Determination of the average diameters for the pumping prevention equipment, Pumpverhutungsanlage, May 10, 1944 was a study done by my associate Dr. Willi Heybey. We had to product hydraulic power from one lake "Walchensee" to another lake "Kochelsee" with 200 meters difference in altitude. When you open one valve on lower lake, water is rushing through the turbines, the whole water system starts

oscillating. Very difficult and dangerous. The theory was only partly known. We did it on half experience and half theory.

My long associate, Dr. Willi Heybey, who also came to USA and finally to Huntsville, was all the time working on complicated mathematical problems, engineering mechanics, gas dynamics, aerodynamics, or optics, in this case hydraulics. That's pumping prevention equipment.

"The order for the equipment of the new supersonic wind tunnel was cancelled by letter - dated Sept. 29, 1944. As a result work on this project was halted." This was September '44. In May 6, '45 the war stopped in Germany. So it was only seven months more.

S Were you able to bring much of your research with you when you came out of Germany?

H Oh, yes. One hundred fifty reports written by members of my staff. But many facts are not in reports, as highly industrial works made by companies. For instance the hydraulic portion was from Siemens; one of their first Directors came to the USA and was with me for four years in Wright Fields.

S According to the book The Rocket Team, page 260: ???issued an order that all research facilities and their important documentation were to be destroyed, as part of his 'scorched earth' policy for what remained of the Third Reich.

The order was honored more in the breach than in the observance -

Dr. Rudolf Hermann, director of Peenemunde's supersonic wind tunnel, then at Kochel, simply disregarded the order. He had the more trusted of his two hundred associates round up the most critical data and reports and bury them nearby. The precious wind tunnel and ancillary facilities were not destroyed. Thus, when the American captured the facility a month later, their first task, under the direction of Dr. Fritz Zwicky, a California Institute of Technology, consultant to the US Army Air Corps, was to finish the reports which they had been working when the war ended."

H Yes, yes. Dr. Fritz Zwicky stayed several weeks. We became good friends. Years later, when I was in this country in the Los Angeles area, I visited with him for hours. He was a world known astronomer and astrophysicist. I had the question how he could prove how many stars, galaxies, clusters are in the universe. He showed me tens of glass plates taken from the sky with the Palomar Observatory, counting galaxies per late, multiplying with the numbers of plates, covering the survey and allowing for the remainder of the sky, not possible to cover from Palomar. And in two hours he proved the billions.

We had also planned in USA to build the Mach 10 facilities which are now in Tullahoma. They were also to be constructed using a large water power plant. And the Air Force at Wright Field officers took trips to find places in the United States where you could have this. Eventually was built here in Tullahoma because they said, "Sure, it was necessary for you in Germany because you had not so much energy, not so much electricity. We have enough electricity here. We build it right here in Tullahoma without water power plants." And you know what happened? Five years later after it was built, they already must arrange the schedule, because the facility consists of various wind tunnels, with different amount of power required, so you need scheduling, day and night - which group comes first. When they can do this, who will do which tunnel running so it does with more than this amount. So my idea that you have to do with water power plants was right.

S Did you ever get to build your ultrasonic wind tunnel?

H Not myself. But my associate Mr. Stollenwerk at AEDC (Arnold Engineering Development Center) built it with all his experiences and the drawings that we had.

S When they stopped your work in September 1944, that meant all the construction work stopped. What did you do?

H It was only on the new ultrasonic tunnel which was stopped. The tunnel shipped and rebuilt from Peenemunde was running and working right to the end of the war.

Report 26, page 24 gives some details. I) Test activities at Peenemunde, and on a measuring section moved to Braunschweig prior to transfer to Kochel. We had about 20 persons there, who produced test results since Braunschweig was not a daily air raid target. II) Tests made in other tunnels: Luftschiffbau Zeppelin, Laupheim: LFM, Munich; LPA, Braunschweig; TH, Aachen."

Ref. (1) From January till May the following were carried out or completed: Wasserfall.

Wasserfall was an anti-aircraft missile. We put a tremendous amount of working because Wasserfall was anti-aircraft. As long as you can live you do that in order to shoot down the enemy. And you see here launchings were made in this time. (Report 26, page 26)

S Launchings were made in Peenemunde?

H Yes, "Test results described in the following reports." These are all my wind tunnel people listed here. H, U, Eckert, he came to me in USA (That is not the famous heat transfer Ernst Eckert.) Dr. F. Wegener came to this country. He was very good. S.

Erdmann did not come to this country, but stayed in the Netherlands. He learned the Netherland language and build wind tunnels for the Netherlands. He finished his first wind tunnel using the theory of the Diffuser Efficiency published by me in 1949.

“(2) Three Component Measurements on Projectiles” -- mortal shell, armor-piercing shell. “Evaluation and interpretation of these tests and measurements were immediately forwarded as preliminary reports to the various agencies that had requested the tests.”

“(3) Stability Measurements Essential to the Development of the Peenemunde Projectile Shells. (4) Nozzle development...” up to Mach 8.8 because our test in Peenemunde were up to 5.2 then that was the first results to be used for the supratunnel.

“At this point all research activities in Karlshagen” -- in Peenemunde -- “were terminated.” Because the Russians already came closer and closer. “The test results on hand provided three months of evaluation and interpretation work starting in mid-May.”

“(5) Research Activities of the Thermodynamics Group under the direction of Dr. W. Krause, involving an 18 X 18 cm squared measuring section which had been moved to Braunschweig.”

In December '44 we heard already people coming to Kochel from Berlin or from trips to the East telling they heard the Russian guns there.

A few days ago, somebody said that of course only through the war, it has been shown through the centuries, that you get a big, big step forward in science.

S If we hadn't been trying to beat the Russians, we wouldn't have gotten to the Moon that soon, if at all.

H But competition is of course an important thing in the world.

On page 29 there is a report on “Drop-trajectory Computations” by Zettler-Seidel who lived in small house just hundred meter from our house in Inspiration Lane. He came first to the Navy in Washington then to Huntsville, Marshal Space Flight Center.

S On page 29 is Dr. Willi Heybey's report on oscillations. He fixed the problem?

H Yes.

H “Clarification of the starting phenomena is the Laval Nozzle -- by T. Schubert; (not yet concluded). Report by Erdmann on tests at Mach 8.8 and filed August 1944.”

Here is a report on the rocket "Taifun" (page 31) which is an anti-aircraft missile. That was a development from the industry Rhein-Metal. After January 1945 many efforts continued. About May 5, or 6, the American troops moved in to Kochel. We had worked all together up to one day prior to the occupation.

I talked to the telephone operator, that she should inform everybody to finish the work, close offices, and go home. Tragic was that the same girl, on the way home was hit by a bomb and was killed. She was the only one killed of hundred and more people that I had.

WVA had 225 employees with wives and children, a total of more than 500 persons. It was Dr. Graf's responsibility to provide housing, food, and clothing. There was about one day in between after the German Army left and American soldiers came. It means, that we were not protected by anyone, a very dangerous situation. We were very much afraid that outside people (former prisoners) would come, destroy our equipment, instrumentation. Fortunately it did not happen because the moment the first armor cars rolled in, I went towards them, and made clear, that we had laboratories, asking them to protect us from vandalism. The American officers knew exactly whom I was, they also knew some of my associates.

When I went back to my office, some of the American officers wanted to meet me. They were actually most of them scientists and engineers in uniform. On my desk I had a small photograph of Wieselsberger. One of them said, "Oh, you have a picture of Wieselsberger." I thought, "Oh my God, they must really be experts."

From the beginning of May, they came all the time, in June, July, and August and half of September. Hundreds of scientists, and engineers from the Army, Navy, Air Force, and from companies like Bell, Aircraft Northrup, Convair, and NACA (National Advisory Committee for Aeronautics) which later became NASA.

I remember one of them, Dr. Tsien, von Karman's closer associates, because he had written the paper about the "Pressure Distribution on a Cone in Supersonic Flow." He was the only scientist who had ever written a complete theory. We knew about his theory, because it was published about two years prior to the end of the war. We had used his theory and tested it in our tunnel exactly. I found out that nobody so far had tested Dr. Tsien's theory in his country. We did it, because we had the equipment, we had the supersonic tunnel, the scientists and engineers. Dr. Tsien went back to Red China shortly after I came to the USA.

During those summer months we had the wind tunnel running in full operation, which attracted the Americans. They would rather see our testing than the destroyed buildings which were bombed out. Dozens of my associates and I, all had offers to come to the USA. The Americans were constantly observing us. Later came to a decision that all

our equipment must be packed and shipped to this country. This took about two months, many construction workers and American engineers watching, photographing the procedures in order to know who to put it together later.

I believe it is written in one of the reports at the end of September that the train left, 130 railroad cars all filled with the wind tunnel parts.

I was with Heisenberg together in Kochel at the end of the war. In 1943 - 1945, I started building the hypersonic wind tunnels, since there was large water power available. It never came to this point that we could use it, but was all prepared.

Dr. Werner Heisenberg was professor and Director of the Atomic Research Institute, and the best researches were working for him. It was originally in Berlin, but because of the bombing, it was moved to a smaller town. I believe it was Tübingen, and that was not too far away -- a few hundred kilometers from Kochel. He had a big family of six children. And he had bought a house for himself in a beautiful area in the Alps in Walchensee which was only two kilometers away from Kochel. His wife and children lived there all the time, and he came there to visit them. In Kochel. I was the head of the research station called, Wasserbau-Versuchs-Anstalt (WVA).

We had no contact since Leipzig until early 1945. Heisenberg and I were glad to meet again in last two months of the war. His family was in great need of the most important necessities of life like coal, potatoes. I had the possibility to help somewhat, since I could use truck and cars for transportation. In the last few days of the war, he came by bicycle since this was the only means of transportation. The highways were bombed. We saw each other also during the last two days of the war.

I recall that I asked him about the USA, since he had been there a couple of times lecturing. Also, I asked him what he thought would happen when the Americans occupied Germany. He gave me a very clear description. He also said, "The American will want to have scientist like you."

S Did you go to White Sands?

H No, actually the scientist went to many various places. Nobody of my engineers went to White Sands since it was the task of the Army Ordnance to continue the development of the A4 in this country. About 35 of my associates went to the Navy, with this Kochel wind tunnel, which was rebuilt piece by piece, equipment by equipment, compressor by compressor. Only component which was new was the large vacuum tank of steel, which was easier to build here in the USA than to ship it over. The compressor which ran first in Peenemünde, then in Kochel, was still running ten years later at the Naval Ordnance Laboratory (NOL) in Silver Springs, Maryland.

All of the rocket team went to France, Great Britain, or USA. The Russians fortunately got only a few. But none of my associates went to Russia. Gessner, who was at Peenemunde and also in Kochel, did not come to the USA because he was too careful in his planning. He wanted promises and assurances that was not possible to give. So he stayed all the years of his active life with the French. One group went to France under MR. Gessner's direction. For their families and important motive was that they could stay in Germany. In France they established great ballistic research institutes. Gessner was very active in the design of those supersonic wind tunnels.

My good friend Dr. Hermann Kurzweg, who was my deputy since 1937, all the years, he became the Director of NOL Wind Tunnel Laboratories. Later Dr. Kurzweg joined the NASA Headquarters as Director of Research. I went to the Air Force.

S How did all those people go to the Navy and you went to the Air Force?

H There was confusion at the end of the end of the war. The Navy wanted us. The Army Ballistic Proving Ground (near Aberdeen, MD) which had a new supersonic wind tunnel in operation, they wanted to have me. And the Air Force in Wright Patterson also asked for my services. Hence, the Chief of Staff, who was head of all Armed Forces, made the decision that I should be assigned to the Air Force. I was very proud.

S Did you ever see your parents again after you left Germany?

H Not my father because he died so soon. My mother was twice in the USA. She visited in Minnesota in 1953 and 1956, to the wedding of Hiltrun. I never returned to Leipzig after the war because of the secret nature of my work.

H I was from late November 1945, in Dayton, Ohio. I stayed nearly five years at Wright Patterson Air Force Base. I remember Christmas of '45, how we celebrated without our families, and in a foreign country, we the "strange scientists." The number of scientists started with 25, and grew steadily. Later on, after two to three years, we were about 150. They all came from industry -- aircraft industry, structural engineers, propulsion and design engineers, and aerodynamicists.

While we were at Wright Patterson, Ingolf was born, after we got the news, we celebrated for hours and hours. We bought wine. You could not buy Schnaps because of military regulations. But anyhow we were so very happy, happy that we celebrated hours and hours into the night. So Ingolf got a good start of his life.

Ruthilt and the children stayed at Landshut in Bavaria, in the so called Housing Project. The American Army and Navy, and Air Force took very, good care of our families comfortable houses, and food rations guaranteed, heating and cooking fuel. Some of my German associates did not want to move to the USA, because they did not trust the

American would keep their promise. In reality they not only kept their promises, but delivered more than promised.

S Did you have any real qualms about going?

H No, not a single day. I knew it has to be a new life, and you had to start. My decision was absolutely clear. We lost the war, and we tried to make the best out of this situation.