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Chapter 2

Rocketry Mentors, Rocketry Practitioners and Unique Space Pioneers*

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Abstract

The Apollo missions to the Moon will be one of the few events of the 20th century that will be acknowledged in history for many centuries in the future. Historians and the Apollo participants themselves agree that an essential factor in the success of the lunar missions was the "team" circumstances that prevailed. Hence, it is historically valuable to identify those team members who began their space careers in Germany and, after World War II, came to the United States and ultimately provided the experienced core of the Apollo rocket transportation team. It is informative to compile three lists of these core team members. The first list has those individuals who worked and gained experience in Peenemünde and who subsequently came to Huntsville, Alabama, to work for the U.S. Army. The majority of them held advanced degrees from prestigious European universities. In the process of leading the development of the Redstone, Mercury-Redstone, Jupiter, and Juno rockets, they mentored a large number of native U.S. citizens and some selected immigrants. This first list is arbitrarily titled "Rocketry Mentors." The second list has those Rocketry Mentors who subsequently were at the NASA Marshall Space Flight Center, or at the Kennedy Space Center

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after its formation, during the 1960s, when the Saturn-Apollo rockets were developed and used to carry men to the Moon. During this decade, this core of rocketry professionals was by then very experienced in execution of new rocket developments and uses. Thus, this second list is titled "Rocketry Practitioners." The third list has those few Rocketry Practitioners who, prior to their participation in developments in Peenemünde, were involved in the early rocket investigations at either Raketenflugplatz or Kummersdorf. In their lifetime, and with their active participation, these individuals had the unique opportunity of seeing youthful dreams realized when mankind first traveled successfully and repeatedly to another body in our Solar System. This list is therefore titled the "Unique Space Pioneers."

I. The Data Base

The University of Alabama Huntsville campus has origins starting in 1950, when the United States Army decided to center its rocketry programs at Redstone Arsenal, adjacent to Huntsville, Alabama. The Huntsville campus grew as the rocketry activities at Redstone Arsenal evolved [1]. A highlight of the rocket programs was the successful development and management of the Saturn vehicles that took mankind to the Moon. The first time that mankind left Earth to operate on another body in the solar system is an event of the 20th century that will be long remembered in future centuries.

Given these historical circumstances, the Archives Division at the Library of the University recognizes that it has an obligation to preserve the history of rocketry at Huntsville. With this objective, the Archives has assembled many space history collections [2]. In 2013, the Archives undertook to establish a new collection by forming an individual information file for each of the people who, after World War II, came from Europe, mostly from Germany, and became the core of the rocket team in Huntsville. These transplanted engineers, scientists, and managers have been designated here as the Transplanted Rocket Pioneers.

Many of the people represented by an individual file came to the United States under the leadership of Wernher von Braun and the "Paperclip" program. However, other important individuals came in different ways. The Transplanted Rocket Pioneers Collection concentrates on transplanted European individuals who either came to Huntsville to work on rocketry for the U.S. Army and NASA, or had some tie to these Huntsville operations.

The existence of the Transplanted Rocket Pioneers files facilitated a next step at the Archives, namely preparation of a one-page standardized summary for

each person represented by a file. Figure 2–1 is the format for the one-page summaries [3].

Transplanted Rocket Pioneers: Summary Sheet Format

Family name	Date of birth Place of birth
Given names	Date of death Place of death (If living, Current address)
Archives holding	Primary collection (one or more banker boxes) OR
	Secondary collection (archives box) OR File folder
Oral history	Video or Audio (If in collection)
Education	Highest level, School, degrees, dates
Raketenflugplaz-	Did individual participate in the activities at these sites?:
-Kummersdorf	Yes or No and dates
Peenemuende	Did individual participate in programs? Yes or No, dates
Fort Bliss	Was individual there?, (1945-1950) Yes or No, dates
GMDD/ABMA	Was individual there?, (1950-1960) Yes or No, dates
MSFC	Was individual there?, (1960-1970) Yes of No, dates
U of Al Huntsville	Nature of involvement, if any
Incidental Remarks	A variety of incidental information, including whether the National Archives and Records Office has a file for the individual

Figure 2–1: Transplanted Rocket Pioneers: Summary Sheet Format.

The collection of more than two hundred files and corresponding summaries constitutes the data base for the following analyses and discussions, which emphasize people not events. After all, it is people who create most historic events. Indeed, the people in the following lists were responsible for very historic happenings.

The Transplanted Rocket Pioneers collection is not static. As new information reaches the Archives, it is added to the individual files and to the summaries, as appropriate.

II. The Rocketry Mentors

The data base of individual summaries allows easy identification of informative sets of Transplanted Rocket Pioneers who satisfy various criteria. A first significant set has those people who were associated with the rocket activities at Peenemünde and who later worked for the U.S. Army in Huntsville sometime in the period 1950–1960. During these Huntsville years, these individuals led the development of the Redstone, Jupiter, and other rockets, using the knowledge and experience they acquired at Peenemünde.

However, it is probably more significant that this set mentored a very much larger group of new Army employees—mostly native U.S. citizens, but including some immigrants. The Redstone and Jupiter programs were excellent opportunities for these newcomers to gain experience with the many rocketry disciplines needed for the successful development of a new rocket system. It is important that they gained this experience under the mentoring of the already-experienced rocketry team from Peenemünde. It is therefore appropriate to designate the set of individuals who came from Peenemünde to the Army organizations as the "Rocketry Mentors," listed in Figure 2–2.

Angele, Wilhelm	Heck, Arno	Lindenmayr, Hans	Schilling, Martin
Axster, Herbert	Heimberg, Karl	Lindner, Kurt	Schlidt, Rudolf
Ball, Erich	Hellebrand, Emil	Ludewig, Hermann	Schlitt, Helmut
Bauschinger, Oscar	Heller, Gerhard	Luehrsen, Hannes	Schnelle, Heinz
Beduerftig, Hermann	Helm, Bruno	Lusser, Robert	Schuler, Albert
Beichel, Rudi	Henning, Alfred	Mandel, Carl	Schulze, Heinrich
Beier, Anton	Hermann, Adolf	Maus, Hans	Schulze, Wilhelm
Bergeler, Herbert	Heusinger, Bruno	Merk, Helmut	Schwartz, Friedrich
Boehm, Josef	Heybey, Willi	Milde, Hans	Schwidetzky, Walter
Brandner, Friedrich	Hilten, Heinz	Millinger, Heinz	Seiler, Ernst
Buchhold, Theodor	Hintze, Guenther	Minning, Rudolf	Sendler, Karl
Burose, Walter	Hirschler, Otto	Mrazek, William	Sieber, Werner
Cerny, Otto	Hoberg, Otto	Mueller, Fritz	Speer, Friedjof
Dahm, Werner	Hoelker, Rudolf	Neubert, Erich	Stein, Arnold
Dannenberg, Konrad	Hoelzer, Helmut	Neuhoefer, Kurt	Steurer, Wolfgang
deBeek, Gerd	Holderer, Oscar	Nowak, Max	Stuhlinger, Ernst
Debus, Kurt	Horn. Helmut	Oberth, Hermann	Tessmann, Bernhard
Deppe, Hans	Hosenthien, Hans	Osthoff, Leopold	Thiel, Adolf
Dhom, Friedrich	Hueter, Hans	Paetz, Robert	Tiller, Werner
Dobrick, Herbert	Jacobi, Walter	Palaoro, Hans	Tschinkel, Johann
Drawe, Gerhard	Jenke, Richard	Panzer, Walter	Tuebbecke, Julius
Duerr, Friedrich	Kaschig, Erich	Patt, Kurt	Urbanski, Arthur
Ehricke, Kraft	Klauss, Ernst	Paul, Hans	Vandersee, Fritz
Eisenhardt, Otto	Klein, Johann	Pauli, Fritz	Von Braun, Magnus
Euliz, Werner	Knothe, Adolf	Pfaff, Helmuth	von Braun, Wernher
Fichtner, Hans	Kraus, Gerhard	Poppel, Theodor	von Saurma, Friedrich
Finzel, Alfred	Kroeger, Arthur	Prasthofer, Willibald	von Tiessenhausen, Georg
Fleischer, Carl	Kroeger, Hermann	Raithel, Wilhelm	Voss, Werner
Friedrich, Hans	Kroh, Hubert	Rees, Eberhard	Vowe, Theodor
Fuhrmann, Herbert	Kroll, Gustav	Reilmann, Karl	Wagner, Hermann
Geissler, Ernst	Kuberg, Willi	Reisig, Gerhard	Weber, Fritz
Grau, Dieter	Kuers, Werner	Rosinski, Werner	Weidner, Hermann
Gruene, Hans	Kuerschner, Helmut	Roth, Ludwig	Wiesman, Walter
Guendel, Herbert	Lahser, Heinz	Rothe, Heinrich	Wittmann, Albin
Haeussermann, Walter	Lange, Ernst	Rothe, Kurt Wilhelm	Zeller, Albert
Hager, Karl	Lange, Hermann	Rudolf, Arthur	Zettler-Seidel, Philipp
Haukohl, Guenther	Lange, Oswald	Scharnowski, Heinz	Zoike, Helmut

Figure 2–2: Rocketry Mentors, 148 Individuals.

It is worth noting that this is a different list than the often cited list of people brought to Fort Bliss, Texas, by the U.S. Army. Several people who were at

Fort Bliss moved to sites other than Huntsville. Also a significant number of Peenemünde participants delayed their move to the United States for personal reasons, often until they could bring their families to the stable and professionally promising environment provided by Redstone Arsenal and Huntsville.

The systematic mentoring by the Peenemünde alumni has been recounted by various authors who were the recipients of the mentoring. Perhaps the most informative account of mentoring is by Charles L. Bradshaw in his book, *Rockets, Reactors and Computers Define the 20th Century* [4]. In 1951, he was an early new-hire by the Army Guided Missile Development Division. He describes rather intense mentoring, during his first few weeks of employment, by Dr. Hans Friedrich, who had been a university professor in Germany. Later, Bradshaw was tutored by Dr. Adolf Thiel.

Dr. Sherman Seltzer gives another example of mentoring in a communication to the daughter of Fritz Weber, quoted in a communication from her to the Archives [5]. He writes (condensed),

> I came to the Army Ballistic Missile Agency upon finishing my graduate work at the U of Michigan. I was still in the Army then. When I arrived at ABMA I was assigned to the ABMA Project Office as the "Senior Pershing Project Officer." Because my academic training had been in guidance and control, I made a bee-line to Dr. Haeussermann's G[uidance] & C[ontrol] Lab. He introduced me to Fritz Weber, who was the Pershing Project Leader for the Lab. Fritz took me under his wing and introduced me to the Pershing G & C system. ... As time went on, Fritz introduced me to all the wonderful members of the G & C Lab. This helped shape my whole engineering career.

Other Army employees from the 1950–1960 Army period, in their oral history video interviews, have acknowledged being mentored by their former German colleagues. Returning to Bradshaw's text, he summarizes the mentoring with the statement: "Dr. von Braun had established the procedure of assigning some newcomers to an experienced rocket scientist with teaching experience to establish a cadre of trained scientists and engineers." The result of the mentoring seems clear. The Army did indeed produce a large cadre of well-trained scientists and engineers. A very large team of experienced space rocketeers was essential, subsequently, to accomplish the development of the massive Saturn vehicles and the very ambitious missions to the Moon.

III. Rocketry Practitioners

Even before the Marshall Space Flight Center (MSFC) was established in Huntsville on 1 July 1960, preliminary design of the Saturn vehicles had begun.

The people involved in the preliminary design were among those transferred from Army civil service employment to the National Aeronautics and Space Administration. Dr. Wernher von Braun was appointed the director of MSFC.

When President Kennedy sought a space undertaking by which the U.S. could surpass Russia, von Braun, supported by a large, experienced rocket team, was able to convincingly assert that a manned round trip to the Moon was indeed possible within the current decade. President Kennedy was convinced, and he committed the U.S. to that objective. The Marshall Center then embraced the responsibility to develop, manage, and use the Saturn V rocket to send astronauts to the Moon.

All of the individuals at MSFC in the 1960s, who had been involved with Peenemünde and then helped develop the Redstone and Jupiter rockets, were very ready to undertake a still larger rocket, the Saturn V. They had experienced rocket technology evolving from a little known concept to a mature profession. They were now professional rocket engineers, scientists, and managers. The list of the people who moved from Peenemünde to the Army rocket programs and were subsequently at MSFC can be called the Rocketry Practitioners, Figure 2–3.

Angele, Wilhelm
Ball, Erich
Beduerftig, Hermann
Bergeler, Herbert
Boehm, Josef
Brandner, Friedrich
Cerny, Otto
Dahm, Werner
Dannenberg, Konrad
deBeek, Gerd
Debus, Kurt
Dhom, Friedrich
Drawe, Gerhard
Duerr, Friedrich
Eisenhardt, Otto
Euliz, Werner
Fichtner, Hans
Finzel, Alfred
Fuhrmann, Herbert
Geissler, Ernst
Grau, Dieter
Gruene, Hans
Haeussermann, Walter
Haukohl, Guenther
Heck, Arno
Heimberg, Karl
Hellebrand, Emil
Heller, Gerhard
Helm, Bruno
Henning, Alfred
Hermann, Adolf
Heusinger, Bruno
Heybey, Willi
Hilten, Heinz
Hoberg, Otto
Hoelker, Rudolf
Hoelzer, Helmut
Holderer, Oscar
Horn. Helmut
Hosenthien, Hans
Hueter, Hans
Jacobi, Walter
Jenke, Richard
Kaschig, Erich
Klauss, Ernst
Knothe, Adolf
Kraus, Gerhard
Kroeger, Arthur
Kroeger, Hermann
Kroh, Hubert
Kroll, Gustav
Kuberg, Willi
Kuers, Werner
Lahser, Heinz
Lange, Ernst
Lange, Oswald
Ludewig, Hermann
Luehrsen, Hannes
Mandel, Carl
Maus, Hans
Milde, Hans
Mrazek, William
Neubert, Erich
Nowak, Max
Paetz, Robert
Palaoro, Hans
Panzer, Walter
Patt, Kurt
Paul, Hans
Pauli, Fritz
Pfaff, Helmuth
Poppel, Theodor
Prasthofer, Willibald
Rees, Eberhard
Reilmann, Karl
Reisig, Gerhard
Rosinski, Werner
Rothe, Kurt Wilhelm
Rudolf, Arthur
Schlidt, Rudolf
Schnelle, Heinz
Schuler, Albert
Schulze, Heinrich
Schulze, Wilhelm
Seiler, Ernst
Sendler, Karl
Sieber, Werner
Speer, Friedjof
Stein, Arnold
Stuhlinger, Ernst
Tessmann, Bernhard
Tiller, Werner
Urbanski, Arthur
Vandersee, Fritz
von Braun, Wernher
von Saurma, Friedrich
von Tiessenhausen, Georg
Voss, Werner
Vowe, Theodor
Wagner, Hermann
Weber, Fritz
Weidner, Hermann
Wiesman, Walter
Wittmann, Albin
Zeiler, Albert

Figure 2–3: Rocketry Practitioners, 105 Individuals.

Understandably, in establishing the management structure of MSFC, von Braun utilized his most experienced colleagues in leadership roles. The Marshall Directory dated February 1969 (just five months before the first lunar landing) contains an organizational listing of the then-current directors and managers. These are, of course, the leaders of the seasoned team that provided the rocket vehicles to first take men to the lunar surface. Forty of these directors and managers are on the list of Rocketry Practitioners. The 40 are listed with their positions in Figure 2–4.

Angele, Wilhelm
Astro Lab; Ch Prototype Dev Br
Boehm, Josef
Astro Lab; Ch Electro-Mech Eng Br
Dahm, Werner
Aero Lab; Ch Aerophysics Div
Dannenberg, Konrad
Adv Sys Off, Ch Mission Eng Off
Duerr, Friedrich
Sat V Pro Off, Mgr Inst Unit
Eisenhardt, Otto
Mfg Eng Lab, Ch Mfg Dev Div
Fichtner, Hans
Astro Lab; Ch Elec Sys Int Div
Geissler, Ernst
Aero Lab; Director
Grau, Dieter
Qual&Rel Lab Director
Haeussermann, Walter
Astro Lab; Director
Heimberg, Karl
Test Lab; Director
Hellebrand, Emil
Pro&Veh Eng Lab; Dep Director
Heller, Gerhard
Sp Sci Lab; Ch Space Thermo Div
Hoberg, Otto
Astro Lab; Ast Director
Hoelzer, Helmut
Comp Lab; Director
Horn, Helmut
Aero Lab; Ast Director
Hosenthien, Hans
Astro Lab; Ch Flight Dy Br
Hueter, Hans
Ind Ops; Dep Director
Klauss, Ernst
Qual&Rel Lab, Ch Proj Off
Kroeger, Hermann
Astro Lab; Dep Director
Kroll, Gustav
Pro&Veh Eng Lab, Ch Struc Div
Luehrsen, Hannes
Faci Ast I & Design Off, Spec Ast
Mandel, Carl
Astro Lab; Ch Inert Sen&Stab Div
Maus, Hans
Executive Staff, Director
Mrazek, William
Ind Ops; Ast Dir for Eng
Neubert, Erich
Center Assoc Dep Dir Tech
Nowak, Max
Mfg Eng Lab, Tech Ast to Dir
Palaoro, Hans
Pro&Veh Eng Lab, Ast Director
Paul, Hans
Pro&Veh Eng Lab; Ch Propul Div
Rees, Eberhard
Center Dep Director Tech
Schulze, Heinrich
Facil & Design Off; Ast Ch Tech
Sieber, Werner
Test Lab, Ch Test Inst & Con Div
Speer, Friedjof
Mission Ops Off, Manager
Stuhlinger, Ernst
Sp Sci Lab; Director
Tessmann, Bernhard
Test Lab, Dep Director
Tilier, Werner
Qual & Rel Lab ; Ast to Director
von Braun, Wernher
Center, Director
Weber, Frrtz
Astro Lab; Ch Projects Off
Weidner, Hermann
Research and Dev Ops; Director
Wiesman, Walter
Manpower Util & Ad Off; Internal Com

Figure 2–4: Rocketry Practitioners in February 1969.
MSFC Management List (40 individuals)

IV. Unique Space Pioneers

The data base described in Section I allows identification of yet another remarkable set of individuals. Before any thought of the eventual programs at Peenemünde existed, a small group of dreamers in Germany formed the Verein für Raumschiffahrt (Society for Space Travel). Then young, Wernher von Braun was an early member. Hermann Oberth, who later spent time with the Army in Huntsville, was its first president. This volunteer organization began liquid pro-

pellant rocket experiments and had a successful static firing in 1930. Later in 1930, they established a primitive test range that they called Raketenflugplatz, at which they made many flight tests. After 1932, experimental flights became more organized under von Braun's technical direction at an Army test range, Kummersdorf. Finally, in 1937, a greatly enlarged rocket activity moved from Kummersdorf to Peenemünde.

Ten of the people in the Rocketry Practitioners list were also participants in activities in Raketenflugplatz and Kummersdorf. They can be called Unique Space Pioneers, Figure 2–5.

Unique Space Pioneers
Kummersdorf-Peenemuende-ABMA-MSFC
10 Individuals

Ball, Erich
Haukohl, Guenther
Hueter, Hans
Kaschig, Erich
Rosinski, Werner
Rudolf, Arthur
Schulze, Wilhelm
Tessman, Bernhard
Urbanski, Arthur
von Braun, Wernher

Figure 2–5: Unique Space Pioneers.

They had remarkable careers that began with futuristic dreams of space travel and concluded with personal participation in making the dreams a reality, in less than half a century.

These ten Unique Space Pioneers deserve further recognition. The first, alphabetically, **Erich K. A. Ball,** was born on 12 September 1901, in Berlin, Germany. By training he was a skilled tool and die maker and was knowledgeable about machine construction. As a master mechanic, he worked at Kummersdorf as foreman for operation of the rocket propulsion test stand [6]. When he moved to Peenemünde in 1937, he was foreman for the assembly of experimental rockets. He reached Fort Bliss, Texas, on 17 November 1945, and stayed there until the team moved to the Redstone Arsenal in 1950. After transferring to MSFC, he was, in 1961, a Section Chief in the Components Test Branch of the Test Division. The Division was one of the largest elements of MSFC because the prevailing philosophy was to test on the ground everything that could be tested before

flight. He retired from Marshall in 1968, but was living in Huntsville at the time of the lunar missions. He died in Huntsville on 2 November 1990.

Guenther H. F. Haukohl was born in Hamburg, Germany, on 27 March 1913. He studied machine construction first in Berlin and then in Rostock. As a master mechanic, he was a foreman for jet propulsion tests at Kummersdorf from 1936 to 1937 [6]. After moving to Peenemünde in 1937, he was involved in the development of jet engines and was a factory superintendent. He arrived at Fort Bliss on 16 November 1945, where he stayed until the rocketry group moved to Huntsville in 1950. He was with the Army Guided Missile Development Division and later with ABMA until mid-1960. In 1961, a few months after MSFC was formed, he was one of the Section Chiefs in the Components Test Branch of the Test Division. By February 1969, the MSFC organization had evolved, and he was then in the Computer and Subsystems Test Division of the Test Laboratory. Hence at MSFC he was involved in the intensive ground testing programs that insured successful operation of the Saturn vehicles and the Apollo missions. He was retired by April 1971. He died in Huntsville on 9 December 2002.

Hans H. Hueter was born on 21 March 1906, in Bern, Switzerland. He got a B.S. degree in mechanical engineering from Technikum Mittweida in 1927. From 1932 to 1934 he was project engineer for the development of liquid propellant rockets in the Verein für Raumschiffahrt. Between 1935 and 1937, he was employed by Siemans, working on guidance and control equipment. Subsequently, in 1937, he joined the activities at Peenemünde. He arrived at Fort Bliss on 16 November 1945. From 1945 to 1947, he was a leader of the group firing V-2 rockets at the White Sands Proving Ground. With the Army in Huntsville, from 1951 to 1960, he was Director of Launching and Handling. After transferring to MSFC, he was at first Director of the Agena and Centaur Systems Office. By February 1969, he was Deputy Director of Industrial Operations. He was Director of Safety at MSFC at the time of his death on 6 September 1970.

Erich Kaschig was born in Breslau, Germany, on 11 February 1906. He attended Breslau Technical College and received a B.S. in mechanical engineering in 1928. He started working in Kummersdorf in 1937 and from 1938 to 1939 was subforeman for combustion chamber production and testing [6]. When test facilities were ready, he moved to Peenemünde, where he was foreman for testing and firing. He reached Fort Bliss on 16 November 1945, and remained there until the move to Redstone Arsenal in 1950. After working for the Army for a decade, he transferred to MSFC. In 1961 at MSFC, Erich Kaschig was Chief of the Tower Test Section of the Systems Test branch of the Test Division. He retired from NASA in 1966. He continued to reside in Huntsville until his death on 7 September 1988.

Werner K. Rosinski was born 23 September 1914, in Baruth, Germany. He studied engineering at the Colssen Technical School at Baruth, near Kummersdorf. In 1936 he was one of the earliest participants in static rocket firings at Kummersdorf, and was an electrical systems subforeman [6]. He moved to Peenemünde with the von Braun team and was involved in the rocket testing there. He arrived at Fort Bliss on 6 December 1945. In the years immediately following his arrival, he spent most of his time at the White Sands Proving Grounds, launching V-2 rockets. After moving to Huntsville in 1950, at Redstone Arsenal, with both the Army and later with MSFC, he worked at the large test stands erected there. In 1961, he was the Chief of the Electrical Equipment Section of the Systems Test Branch of the Test Division. By 1969, he was in the Electrical Systems Integration Division of the Test Laboratory. He retired in 1970. He died in Huntsville on 14 May 2000.

Arthur L. H. Rudolf was born 9 November 1906, in Stepfershausen, Germany. He attended the Berlin Institute of Technology and got a B.S. in mechanical engineering in 1930. While working in Berlin, he met rocketry pioneers Max Valier and Walter Riedel and in his spare time, collaborated with them on rocket experiments. Also he became aware of the Verein für Raumschiffahrt, where he met Wernher von Braun. With Alfons Pietsch, he developed, and in 1931 demonstrated, a liquid propellant rocket motor, under the sponsorship of the German Army and Walter Dornberger. This led to Rudolf being hired at Kummersdorf, where he led rocket motor development until he moved to Peenemünde in 1937. Eventually, at Peenemünde and later at Mittelwerk, he was in charge of designing production plants for the A-4 rocket, later renamed the V-2. After World War II, he was transported to Fort Bliss, arriving on 6 December 1945. From there he moved to Huntsville in 1950. During his Army employment, he was technical director of Redstone Missile development and later was the project manager for the Pershing Missile. Rudolf transferred to MSFC in 1961, and in 1963 became the Project Director of the Saturn V rocket program. He retired on 1 January 1969. After unproven allegations that he had been a war criminal, he returned to Germany in 1984. There the German government investigated his record, found no crimes, and restored his citizenship. He died in Hamburg on 1 January 1996.

William A. Schulze was born at Newlaubush, Germany, on 23 November 1905. He received a mechanical engineering degree from the Max Byth Ingenierschule in Berlin in 1935. His biography states: "In February 1937 he joined Dr. Wernher von Braun in Kummersdorf and then later moved to the rocket development facility at Peenemünde." He arrived at Fort Bliss on 18 September 1945, and remained until the group moved to Redstone Arsenal. After transferring from the Army to NASA in 1961, he was the Deputy Chief of the Propulsion and Me-

chanics Branch of the Structures and Mechanics Division. He was in the Vehicle Systems Division of the Propulsion and Vehicle Engineering Laboratory in 1969. He retired in 1969 after the first two successful lunar missions. He died in Huntsville on 4 November 2001.

Bernhard R. Tessmann was born on 15 August 1912, in Zingst, Germany. He was educated at Gewerbessal College in Berlin and received a B.S. in mechanical engineering in 1935. He was working for a Berlin company that had contracts with the Army Weapons Department when von Braun recruited him in 1935 to work at Kummersdorf. At Peenemünde, he worked on test stands and launch facilities. He arrived at Fort Bliss on 16 November 1945. Testing continued to be his specialty during his Army and NASA employment. In the February 1969 MSFC Directory, he is shown as Deputy Director of the Test Laboratory. He retired in 1972 and died in Huntsville on 19 December 1998.

Arthur Urbanski was born in Berlin, Germany, on 24 January 1900. He studied at a Machine Construction School in Berlin and became a master machinist. From 1936 to 1937 he worked at Kummersdorf on rocket mechanisms, such as valves [6]. With his colleagues from Kummersdorf, he moved to Peenemünde in 1937 where he became a workshop foreman. He reached Fort Bliss on 16 November 1945, and moved to Huntsville in 1950. At MSFC, in 1961 he was Chief of the Mechanical Systems Analysis Branch in the Quality Division. He retired two years later. He lived in Huntsville and died in January 1977.

There is little need here to outline the life of **Wernher von Braun**. But for completeness, he was born on 23 March 1912, in Wirsitz, Germany, and died on 16 June 1977, in Alexandria, Virginia. He is acknowledged as one of the leaders of the activities of the Verein für Raumschiffahrt at Raketenflugplatz. The activities at Kummersdorf intensified when the German Army engaged him in October 1932 as technical director of rocket development efforts there. Subsequently, starting in 1937, he was technical director of the rocket programs at Peenemünde. Thereafter, at Fort Bliss, at Redstone Arsenal, and at the Marshall Center, he was the director. He was manifestly a Unique Rocket Pioneer. He not only directed the technical work, but was also instrumental in "selling" the rocket programs to governments and the public.

Some other individuals who were participants in the activities at Raketenflugplatz and Kummersdorf deserve mention, even though they do not satisfy the adopted definition of a Unique Space Pioneer. Four Rocketry Mentors who did not join MSFC, but were at Raketenflugplatz or Kummersdorf, are **Fritz Mueller, Hermann Oberth, Kurt Patt,** and **Helmut Zoike.** Another special individual is **Herbert Schaefer**, whose autobiography states "My first employment was as Laboratory Engineer at the Raketenflugplatz in Berlin-Tempelhof, where I

participated in the development of rocket motors and three launches." Schaefer came to the United States in 1936, where he worked for various companies until 1 December 1959, when he joined ABMA and in 1960, transferred to MSFC. Another special person is **Willy Ley.** He was very active in the Verein für Raumschiffahrt and at Raketenflugplatz, but came to the United States in 1935. After World War II, he collaborated with Wernher von Braun, authoring a series of space articles in *Collier's Magazine* that did much to inform the American public about the possibilities of space travel.

As a final remark, it is important to emphasize that many U.S. natives had very important roles in the Apollo program and they also richly deserve recognition, but that is beyond the scope here.

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