History of Rocketry and Astronautics

Proceedings of the Fiftieth History Symposium of the International Academy of Astronautics

Guadalajara, Mexico, 2016

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AAS History Series, Volume 48

A Supplement to Advances in the Astronautical Sciences

IAA History Symposia, Volume 36

AAS Publications Office
P.O. Box 28130
San Diego, California 92198

Affiliated with the American Association for the Advancement of Science
Member of the International Astronautical Federation

First Printing 2017

ISSN 0730-3564

ISBN 978-0-87703-641-8 (Hard Cover)
ISBN 978-0-87703-642-5 (Soft Cover)

Published for the American Astronautical Society
by Univelt, Incorporated, P.O. Box 28130, San Diego, California 92198
Web Site: http://www.univelt.com

Printed and Bound in the U.S.A.

Chapter 4

Karl Poggensee—A Widely Unknown German Rocket Pioneer: The Early Years, 1930–1934, A Chronology*

Karlheinz Rohrwild†

Abstract

The rediscovered estate of Karl Poggensee allows to reproduce chronologically his rocket tests of the period 1930–1934 almost completely for the first time. Thrilled by the movie *Frau im Mond* (*The Woman in the Moon*) for the idea of space travel, he started as a student of Hindenburg-Polytechnikum, Oldenburg, to build his first solid-fuel rocket, producing his own propellant charges. Being a coming electrical engineer, his main goal was not set up new record heights, but to provide his rockets with automatic measuring instruments, camera and parachute release systems. The optimization of this sequence was his main focus.

I. Introduction

Karl Poggensee is one of the lesser known rocket pioneers of the 1930s. He did not become more widely known, because he did not start his work until 1930 when the big rocketry buzz had begun to wane and the press became more criti-

* Presented at the Fiftieth History Symposium of the International Academy of Astronautics, 26–30 October 2016, Guadalajara, Mexico. Paper IAC-16-E4.1.5.

† Hermann-Oberth-Raumfahrt-Museum, Feucht, Germany.

cal in its reporting, restricting it to major events. Furthermore, he used solid-propellant for his rockets which—according to the expert opinion prevailing at the time—was unsuitable for future spaceflight and therefore his achievements were not considered to be really worth reporting about.

This lack of awareness and thus of appreciation of his achievements was also owed to the fact that until recently the relevant collections and archives on the history of spaceflight possessed no material about him. Nor were the philatelists specializing in rocket mail interested in him, because his rockets did not transport any postal stamps.

Thanks to the initiative of Mr. Marc Hillrichs from Wildeshausen / Germany, the Hermann Oberth Raumfahrt Museum succeeded in acquiring the surviving remainders of the estate of Karl Poggensee. A small folder of documents containing photographs, newspaper clippings and comments by Karl Poggensee cover the tests he performed between 1930 and 1934. The remaining documents, relating to the period from 1950 to 1970, provide a relatively full account of those years. There are several papers retrospectively reporting about Poggensee's initial work and his family history. The document folder and all other relevant papers were digitized and are referenced as sources with their file names.

II. Biographical Information

Karl Otto Engelbert Poggensee was born on December 3, 1903, in Bremen as the first child of Carl Otto Poggensee (born on June 25, 1883, in Angern, district of Wolmirstedt, protestant, occupation sales agent) and his wife Alwine Gesine, née Tölken, (born on March 10, 1879, in Westerwede, Amt Lilienth, deceased on November 13, 1951,[1] in Bremen, also Protestant, she sold grilled sausages for a living). Karl's brother, Engelbert Hermann Otto, was born on March 20, 1913, in Bremen. The family's residential address was Helgolanderstrasse 14 in Bremen.[2]

Karl Poggensee attended primary school in Bremen from age 6 to age 14. From age 12 to 14, he simultaneously attended the Drawing School for Boys of the Bremen Vocational Schools.[3] He was so captivated by the demonstration of a radio in physics class in 1921 that he became a passionate radio amateur and focused his entire future training on this discipline.[4] Then from age 14 to 17 he did a three-year internship at Lloyd-Dynamo-Werke AG in electromechanical engineering, at Hagen&Rinau in mechanical engineering, at the Electrical Testing Authority in measuring and calibration engineering and at the mechanical engineering factory which his father owned at the time, all in preparation of his university studies. At the same time, he attended Vocational School and evening

classes in electrophysics and electrochemistry, high frequency engineering, and mathematics as well as the electrical engineering department of the Bremen Industrial School.[5]

To prepare for the intermediate school leaving certificate (Mittlere Reife) he studied in the B prep course and took evening classes in high frequency engineering at the Bremen Technical College between the ages of 17 and 18. This was a prerequisite for taking up engineering studies at Hindenburg Polytechnic, Ingenieur-Akademie (Engineering Academy) Oldenburg, IAO, Oldenburg i. Oldenburger Land.

In the spring of 1928, aged 18, he passed the entrance examination and registered as a regular student at IAO with the department for electrical and high frequency engineering.[6]

Figure 4–1: Poggensee, Stud. cand. Ing., aged 18.*

During the time he spent studying in Oldenburg, he was registered at the following addresses in that city. From April 19, 1928, he lived at the address Rueselerstrasse 11 in Oldenburg and his landlord was Fritz Kohl. On April 18, 1929, he moved to Werbachstrasse I 5, land-lord Heintze. Then on May 15, 1930, Poggensee moved again from Werbachstrasse I 5 in Oldenburg to Pommerschwei, landlady Ms. Eisenschmiedt.

On April 25, 1931, Poggensee moved from Reiten (Oldenburg) to Oldenburg i. Oldenburger Land, D II g 7, landlord L. Müller. The next move was on December 1, 1931, from Nord-Strasse 48 to Oldenburg, Ruselerstrasse 10, landlord Stoppenburg. He deregistered from this address on March 1, 1932, to go to Sulzbacher Strasse in Bremen. Poggensee's last registered address in Oldenburg was at Hirgereschstr. 37, on August 1, 1933, he gave notice of departure from Oldenburg.[7]

When he was 20 years old, he became enthusiastic about rocket engineering after watching the film *Frau im Mond* (*Woman in the Moon*) in 1929. He realigned his studies to concentrate on rockets and specifically on courses in thermodynamics, chemistry, combustion engines, mechanical elements, strength of materials, and high frequency engineering. As a student of the Oldenburg Inge-

* Poggensee, Part 2 – 058.

nieur-Akademie he took classes in pyrotechnics at what was then the Reichswehr in Oldenburg. At age 23, he completed his studies after passing the examinations in mathematics, electrical engineering, chemistry, mechanical engineering, and strength of materials.

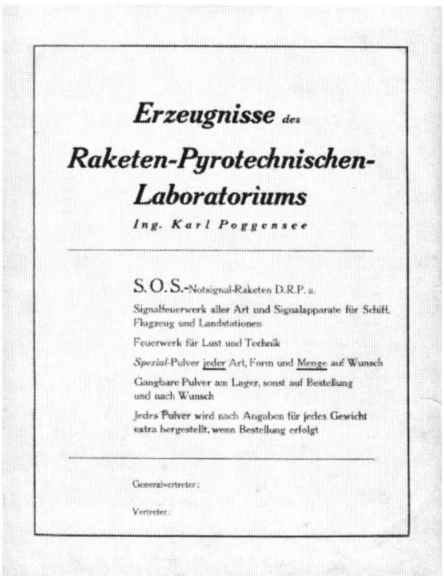
Figure 4–2: Karl Poggensee (front row, second from right), class of 1929 / 1930 winter semester of Ingenieur-Akademie-Oldenburg i. Olden-burger Land, without teachers.*

Figure 4–3 (left): Stud. ing. cand. Karl Poggensee 1931, Ingenieur-Akademie-Oldenburg.† **Figure 4–4 (right)**: Stud. ing. cand. Karl Poggensee 1932, IAO.‡

* Poggensee, Part 2 – 052.
† Poggensee, Part 2 – 059.
‡ Poggensee, Part 2 – 063-IAO 1932.

Figure 4–5 (left): Karl Poggensee (Cosinus) and his fencing partner Hofer, 1932.*
Figure 4–6 (right): Karl Poggensee and his fellow students at a mensur fencing event.†

In 1934, he took the major state examination for pyrotechnical engineers—Ing. pyrot.—administered by the Trade Supervisory Board together with the Reichswehr. He was granted a so-called "major concession" to set up and operate his own factory for powder and pyrotechnics and to manufacture his own rocket powders there. This was a factory in Hespenbusch in Oldenburg funded by his parents.[8,9]



Erzeugnisse des

Raketen-Pyrotechnischen-Laboratoriums

Ing. Karl Poggensee

S. O. S.-Notsignal-Raketen D.R.P. a.

Signalfeuerwerk aller Art und Signalapparate für Schiff, Flugzeug und Landstationen

Feuerwerk für Lust und Technik

Special-Pulver jeder Art, Form und Menge auf Wunsch

Gangbare Pulver am Lager, sonst auf Bestellung und nach Wunsch

Jedes Pulver wird nach Angaben für jedes Gewicht extra hergestellt, wenn Bestellung erfolgt

Generalvertreter:

Vertreter:

Figure 4–7.‡

S.O.S.-Signalrakete D.R.P.a.

Figure 4–8.§

* Poggensee, Part 2 – 049-IAO 1932.
† Poggensee, Part 2 – 047.
‡ Poggensee, Part 2 – 015.
§ Poggensee, Part 2 – 016.

After a short relationship, he married his first wife, Minna Emilie Poggensee, née David, from Bremen, in Bremen in September 1934. The marriage was annulled in 1935, because on December 30, 1934, the "son" Ortwin Poggensee was born to this very recent marriage.[10]

As he now had a "pyrotechnical factory," he was in the position to do serious research work into rocketry. He wanted to approach the issue from the side of airplanes and sought information about statics, strength, and materials as a materials testing technician at Focke-Wulf-Flugzeugbau AG (airplane manufacturers) in Bremen and then in 1938 at Bayerische Flugzeugwerke in Regensburg, working in group 9 for change management; this was the kind of experience he was lacking in his own rocketry research operation in Hespenbusch.

Figure 4–9: Karl Poggensee 1939—Bayrische Flug-zeugwerke in Regensburg.*

On December 2, 1939, Karl Poggensee married his second wife, the concert pianist Gertraud Alwine Poggensee, née Künstler, born in Frankfurt am Main on April 10, 1906. His wife had a daughter from her first marriage. This was Charlotte Kordes born in 1935.[11] The couple's child, Renate, was born on January 23, 1945.[12]

As he had developed fuels (some patented), devices for rocket engineering and radio controls and radio measurements for rockets (flying test stations), the Army High Command was prompted to award him a research contract. In March 1941, he was drafted for the Wehrmacht and commandeered to the Army Test Center in Peenemünde to work on the A4 (V2) project.[13]

On March 23, 1941, Karl Poggensee was transferred to unit 5./N.E.A. 20 (Intelligence Reserve Dep.) in Hamburg-Wandsbek, then after basic training assigned to field unit NK 710. On May 29, 1941, he returned from there to 5./N.E.A./20 because he was mentally and physically unfit to serve in the army. Then from June 13, 1941, to July 19, 1941, he stayed at the Reserve Military Hospital 11, Dept. 1b (Psychiatric Unit) in Hamburg, which released him as suited for homeland garrison duty. After three weeks of rehabilitation leave, he was transferred to 1/L.S.B. 653 (special infantry unit) in Nienburg a.d. Weser. It was found that he was incapable to do full service as a guard or foot soldier and he

* Poggensee, Part 2 – 066.

was therefore transferred again, this time to 3/L.S.B. 653 in Sandbostel/Bremervörde. This is where he did night guard duty for some nights with the strong support of the military doctor and frequently taking long rests. On September 13, 1941, he was again sent to reserve military hospital, this time in Rotenburg i. Han, he was released as suited for homeland garrison duty after two weeks. His mental and physical problems started 14 days after he had joined the Wehrmacht and his condition deteriorated consistently. The first major reprieve came with his transfer to 3/L.S.B. 653 and when he was finally assigned to 3rd company/V.K.N. (Test Command North) on October 23, 1941, he did not get worse anymore. It relieved him that he could contribute to the "Endsieg" as a soldier and engineer at Heeresanstalt (Army Research Center) Peenemünde Dept. TA/BSM in the central group of Dipl. Ing. Hölzer and as engineer in the group of Dipl. Ing. Röhner.[14,15]

From Peenemünde, he was transferred to the Heeresabnahme (military design approval department) for the arms industry to work as an engineer at company Blaupunkt, Seichenberg/Sud. facility and Dynamit Nobel AG, Schlebusch and Liebenau facilities.

Figure 4–10 (left): Soldier Karl Poggensee, 3rd Company/Test Command North, Karlshagen a. Usedom. Saturday, November 30, 1941, on Zinnowitz Beach.*

Figure 4–11 (right): Birthday party of Albin (December 2, 1941) and Karl (December 3, 1941) in Zinnowitz, shown from left: Otto Bäuerle, Max Bendorf, Willy Weiden, Karl Poggensee, Albin Hildebrandt.†

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* Poggensee, Part 2 – 043.

† Poggensee, Part 2 – 042.

Figure 4–12 (left): Karl Poggensee, Göttingen 1943/44 Heeresabnahme "Phywe."*
Figure 4–13 (right): Albert Püllenberg, Karl Poggensee, and Rudolf Nebel, April 1951, in Bremen, former Püllenberg premises.†

The Allied Control Council Act made it rather difficult and complicated for him to resume his own research into rocketry after WWII. Together with Rudolf Nebel and Albert Püllenberg from Peenemünde, another old hand at liquid propellant rockets, he succeeded in launching a press campaign in 1950 which started out cautiously and then "went all out."

The campaign brought him criticism and more importantly the benign toleration on the part of the allies. After he submitted a "cheeky application," Karl Poggensee was granted an official license to launch rocket models at Hespenbusch.

In August 1952, the first German rockets were launched and flying in Germany after the war in the presence of the allies and their broadcasting station. The "big stir" in the British Parliament with calls "to lock them all up" caused thereby remained without consequences. Rather the Deutsche Arbeitsgemeinschaft für Raketentechnik (German Working Group for Rocket Engineering—Afra), which later became the Hermann-Oberth-Gesellschaft was founded at Bremen airport in 1952 by eleven rocket enthusiasts.

He worked freelance for Dynamit-Nobel-Verwertchemie on developing and testing special powders for five years and five months and in his own re-

* Poggensee, Part 2 – 065.
† ACME press photo, 4 December 1951.

search facility for Verwertchemie Liebenau. The project was completed on September 30, 1962.

From the 1970s until his retirement, Poggensee also acted as technical consultant for ERNO in Bremen. Karl Poggensee died on August 1, 1980, aged 71, in his house in Wildeshausen, St. Peter-Str. 16.[16]

III. Karl Poggensee—Rocket and Aerospace Engineering

He started his research into rocketry for spaceflight at his own risk at the end of November 1929, inspired by the Fritz Lang movie *Woman in the Moon*; he joined the "Verein für Raumschiffahrt" e.V. Berlin (Association for spaceflight) and immediately connected with Hermann Oberth, Rudolf Nebel, Wernher von Braun, Max Valier, Johannes Winkler, and Franz v. Hoefft.

Since neither experience nor literature on high-performance large rockets were available at the time, he had to specialize in chemistry, thermodynamics, steam turbines and radio engineering in his university studies. Important input came from "Hütte I," from *Rakete zu den Planetenräumen* (*By Rocket into Planetary Space*) by Oberth, and *Die Rakete für Fahrt und Flug* (*Rockets for Travel and Flight*) by Scherschewsky.

Figure 4–14: Cover, Thea von Harbou, *Frau im Mond* (Berlin: Scherl-Verlag, 1929).*
Figure 4–15: Cover, Hermann Oberth, *Die Rakete zu den Planetenräumen* (München: R. Oldenbourg Verlag, 1923).†
Figure 4–16: Front page of Newsletter No. 1, *Verein für Raumschiffahrt*, April 1930.‡
Figure 4–17: Cover, A. B. Scherschevsky, *Die Rakete für Fahrt und Flug* (Berlin: Verlag C.I.E. Volckmann, 1928).§

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* Author's archive.
† Author's archive.
‡ Archive HORM.
§ Author's archive.

The practical part of the research started in the meadows around Oldenburg in the form of a large number of firecrackers from a sports goods shop and powders from a shop for hunting rifles. For his personal safety, he used the traditional armor of student fencing with mask and chain gloves. Together with the fellow chemistry students he mixed his own, explosion-proof rocket propellant powder which was to be tested in larger devices.

The IAO provided the funds and its mechanical workshop to build a first smaller "large rocket" of about 50 kg thrust, a photo camera, registration equipment, and a parachute. This—first—rocket was launched in June 1930 in Golzwarden near Brake/Unterweser, while he was still a very dedicated student.

These are the "explanations" provided by Karl Poggensee according to his memory and his two CVs dating from 1964.

The following description is based on photographs and newspaper reports included in his documentation—to the extent it survived the wartime chaos—as well as on Poggensee's reconstruction of his work prior to WWII.

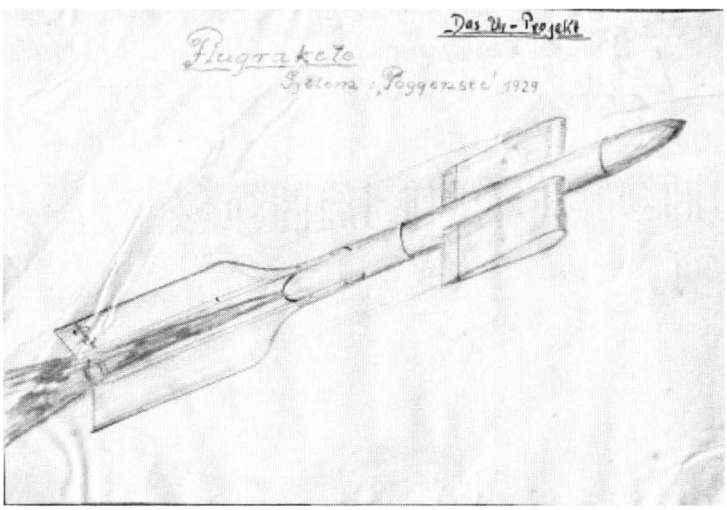

Figure 4–18: Karl Poggensee's original project.*

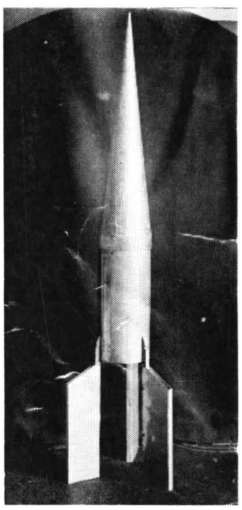

Figure 4–19.†

Karl Poggensee's original project differed from the rockets he then ultimately designed, in that it had additional stubby wings.[17] The first draft dates back to 1929. Already in December 1929 he built the first test rocket model with 10 kg thrust (see Figure 4–19).[18] It is not known, however, whether this model ever took flight.

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* Poggensee, Part 2 – 102.
† Poggensee, Part 2 – 097.

Neither the newsletter nor the accounting records of the *Verein für Raumschiffahrt* indicate that Karl Poggensee joined it as a member. However, on p. 4 the hectographed newsletter of March 1931, edited by Dipl.-Ing. Rudolf Nebel and Willy Ley, carried a report about the successful flight of Poggensee's rocket "Poggensee Rak II," which notes "by our friend, Ing. Karl Poggensee." Thus it seems that he was not a member, but that there was an amicable relationship.

Contemporary sources reported as follows:

Nachrichten für Stadt und Land, Oldenburg i. Old. (Oldenburg Local Newspaper)[19]

Rocket trial in Oldenburg
Launch of test rocket with registration equipment next Friday

In Oldenburg, June 3 (1930).
A young student of the local Hindenburg Polytechnic, Mr Karl Poggensee, has been quietly working on the construction of a rocket since Christmas. It carries registration equipment and a photographic camera and is scheduled to be launched next Friday in an open area at Butjadingen.

Our reporter had the opportunity to inspect the rocket and discuss its technical details with the originnator. At Christmas Mr Poggensee, hailing from Bremen, a student of electrical engineering in Oldenburg, was struck by the idea to build a test rocket equipped with registration apparatus that should be propelled into the air to the highest possible altitude. Mr. Poggensee started out with a number of minor tests to study the effect of recoil. He sent his draft for assessment to the "Chemisch-Technische-Reichsanstalt" (Reich Agency for Chemicals and Technology) in Berlin that suggested certain types of powder to be used and some technical details. The practical work was next. Hindenburg Polytechnic provided some funds, materials and the state-of-the-art workshop. Studienbaurat Dipl.-Ing. Wiecking supported and advised his student in the construction of the rocket. The rocket has meanwhile been completed, except for the installation of the apparatus; its launch has been scheduled for next Friday. The local administration of Golzwarden, where the launch shall take place on a large meadow, has already given its approval.

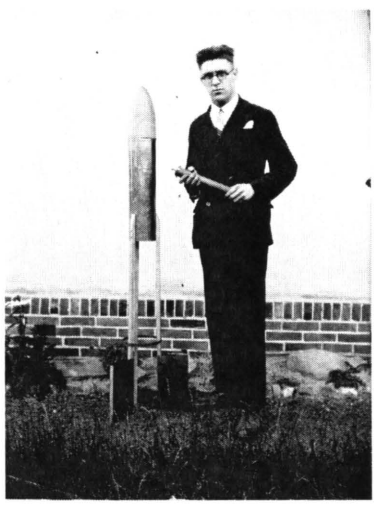


Figure 4–20: K. Poggensee and the completed Rak-1 on June 3, 1930, aged 20½. The design draft for 50 kg thrust is dated November 25, 1929.[20] *

* Poggensee, Part 2 – 077.

Nachrichten für Stadt und Land, Oldenburg i. Old.

Technical specifications of the rocket[21]

June 4 (1930).
The rocket that is to be launched as we reported yesterday, is about two meters high in total, the diameter is 14 cm. Without powder and propulsion rockets the rocket weighs six kilograms. It consists of a body that carries a heavy head and at the bottom a frame with the steering elements. This is an innovative design, invented by Poggensee. It consists of three steering panel surfaces of brass sheet, 28 cm high and arranged as a triangle. This doubles the steering effect. These steering elements are mounted on a sturdy beech wood frame that carries the rockets' body at the top end. The body is made of heavy brass sheet and 60 cm high. Its diameter measures 14 cm. This rocket body contains three propulsion rockets, made explosion-proof by strong iron sheet shielding which end flush with the body's bottom edge. Above the rockets is a compartment separated by a very thick wooden board: the so-called "registration compartment." It holds a heavy-duty barometric altimeter and a photographic camera equipped with a telescope. Once all rockets are burnt the photographic camera is automatically triggered and a picture is taken. The registration compartment also contains several batteries supplying strong permanent electricity for the automatic trigger. The registration compartment is sealed off at the top by another strong safety board and the space above contains the parachute. The parachute is also triggered automatically as soon as the rocket propulsion stops and the falling movement starts. According to Poggensee's calculations the rocket will return to the ground at a fall velocity of 2 to 3 meters per second. The parachute is released by a pressurized spring activated by a series of levers. The rocket head is above the parachute compartment and forms its center of gravity. The head weighs about 1.5 kg and is made of strong beech wood. Once the parachute has been triggered it will force the head out of the body. The head will then in turn pull out the parachute and unfold it.

The rocket is launched

from a sturdy catapult by electrical remote ignition. The catapult is made of three iron rods of 8 meters length each that will guide the rocket up to 8 meters high and thus direct it like the barrel of a cannon. The rocket is vertically launched and propelled by three separate rockets that will slowly burn off. The rockets are supplied by the fireworks factory Cordes Nachf. (olger) in Wesermünde which is owned by Ingenieur Sander who is known for his rocket tests. The launch of this rocket is nothing but a very first small trial, but should this experiment work, a bigger launch will follow soon.

Poggensee soberly commented the sentence in the last paragraph: "The rockets are supplied by the fireworks factory Cordes Nachf. (olger) in Wesermünde; which is owned by Ingenieur Sander who is known for his rocket tests": "I made the rockets myself!"

Nachrichten für Stadt und Land, Oldenburg i. Old., Juni 6 (1930)[22]

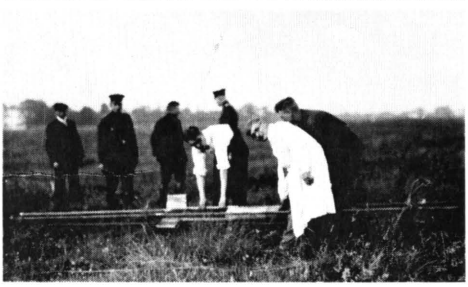
Mr. Poggensee's rocket launch had to be postponed, for the time being until after Whitsun. The postponement became necessary, because the approval from the ministry is still outstanding.

Delmenhorster Kreisblatt, June 11 (1930)[23]

Region and surroundings

About the scheduled launch of the Poggensee rocket.

See Oldenburg. June 10 (1930. A few days ago "Nachrichten für Stadt und Land" reported in detail about the plans of the student at the local engineering academy, Mr Poggensee, to start a rocket in Butjadingen. Diplomingenieur Wieking has commented now and said that research of the rocket issue will only be successful, once a new basis for the calculations will have been found. Diplomingenieur Wieking is convinced that the rocket can only be launched after the completion of a sufficient number of pre-trials with recoiling elements, resistance measurements, and pyrotechnical preparations.



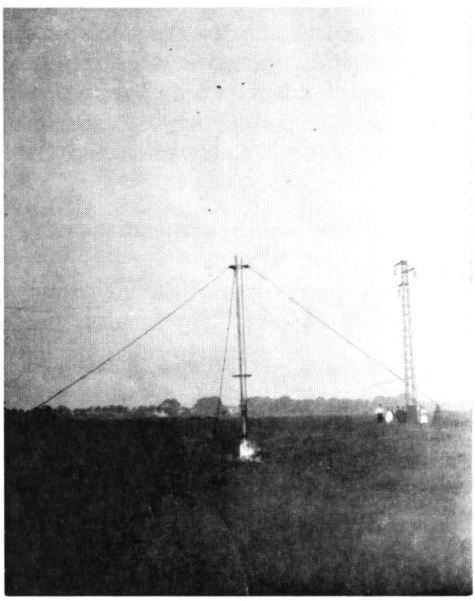


Figure 4–21 (top-left): Assistants come to the launch area on a meadow in Golzwarden (Butjadingen) on June 21, 1930.[24] *

Figure 4–22 (bottom-left): Poggensee rocket "Rak-1" ready for take-off, is pushed into the launching catapult.[25] †

Figure 4–23 (right): Failed launching attempt on June 21, 1930.‡

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* Poggensee Folder 01- 06a.

† Poggensee, Part 2 – 068.

‡ Poggensee Folder 01- 26.

Nachrichten für Stadt und Land, Oldenburg i. Old[26]

Rocket trial in Golzwarden.
The launch failed.

See Golzwarden, June, 21 (1930)
On Saturday the student of the Hindenburg Polytechnic in Oldenburg, Mr Karl Poggensee, performed the rocket trial announced some time ago, on a meadow in Golzwarden. The launch failed, however.

On Friday the ministry gave permission to the student Karl Poggensee to launch a test rocket equipped with registration apparatus. The launch was scheduled for 8 pm on Saturday. These are now the last hours before the launch: intense last-minute tune-up work on the rocket. The propulsion rockets are charged with nitrocellulose gunpowder mixed with a little black powder. (Poggensee's comment: Camouflage!). Thus the afternoon hours pass with last preparations that are performed in a state of great excitement.

By 6 pm a large perimeter of the surroundings of the launching area has been cordoned off. The Brake and Ovelgönne police have barred off the area in a very expert way. Although the hour of the planned launch has been kept secret a large crowd has gathered all around; many automobiles are parked on the far away road. First Police Lieutenant Jensen has arrived from Oldenburg to check the safety measures for the launch. There are several photographers that take pictures of the preparations and everything else. The pasture that is the site of the launch is on the road between administrations of Golzwarden and Ovelgönne and belongs to the farmer Mr Blohm.

It seems that the preparations were started too late. Instead of 7pm the hour advances to 8pm. Then the parachute does not fit into the rocket head; something like that should certainly be calculable or at least tested beforehand! The 8m high catapult is erected after the rocket has been set up within. This catapult is to determine the rocket's initial direction.

Everything is ready for take-off now. The fuse cables for the electrical remote ignition have been laid and we moved several hundred meters away from the rocket. We are taking cover in a ditch. There really is some excitement in the air: "Will this rocket take off?"

Poggensee is holding the cord that leads to the ignition lever. He pulls. Some seconds pass. Then some fire pops out of the rocket's bottom. Just goes 'phut.' That's it. The rocket does not rise. When seeing the fire you get the impression: "There is no power behind this. It's just burning. "It does not take more than a few seconds and then it is all over. The rocket is still standing firm.

We approach it again. The three propulsion rockets are burnt. The rocket itself still stands as before. The launch failed. The first trial flopped. People drive home along the road with the sensation of some disappointment.

Poggensee has not lost courage after this failure, though: he plans to repeat the trial shortly, this time with a mix of gasoline and oxygen.

When reading this account, one must bear in mind that Oberth's rocket launch for UfA that had been announced in the press as a sensation, did not take place and that Max Valier died in a combustion trial in Berlin-Britz on May 17, 1930.

So much for the comments and coverage by the contemporary press. Much later Poggensee wrote the following about this early phase:

> ...This first little 2 meter test rocket was secretly made in my lonely student quarters in November of 1929. But the teachers "heard it through the grapevine" and did some "serious talking" to the author. At first there were intense discussions "shaking the very foundations" like "we want to turn you into a useful engineer." This was understandable and the result was convincing: only systematic studies and penetrating down to the very last detail of the concept of a space rocket may lead to success with liquid propelled rockets or—even more efficiently—with solid fuel propelled rockets. — Work began as a practical lesson for engineering studies with fireworks rockets from the sports goods shop and in the mechanical workshop of the engineering academy that made available a small amount of money. The firecrackers were cut open in longitudinal and transverse directions, the "powder" was analyzed. In doing so several of them blew up in the author's face. Therefore additional, just as intensive studies in pyrotechnics and explosion engineering were required. ...[27]

and:

> The academy became involved "to feel out the situation" in order to prevent any of its "flock from erring."
>
> "We want to turn you into a useful engineer," was the starting point of a fundamental, often lively discussion about rocketry. The following material was available: Oberth, Rakete zu den Planetenräumen; Scherschewski, Raketenfahrt; Hütte and the intensive engineering studies, in particular the course on thermodynamics. This discussion boiled down to the following: "Solid propulsion rockets are more effective in the end and clearly superior, once we succeed to design them in such a way that they can be turned on, off and controlled as required," as seems to be implemented now.
>
> Thus I changed over to solid propulsion and started this development work with fireworks rockets purchased with coupons issued by the academy's procurement office at the sports goods shop. With different calibers I built one stage, two stage, three and four stage rockets of cardboard that went up to impressive altitudes. We sawed open many calibers, smaller ones were picked up, adequately protected by chain gloves, arm, body and head armor from fencing, and then burnt; many different calibers were weighed with spring scales. This resulted in the first solid-propellant rocket research project. The Reich Agency for Physics and Technology made a positive

assessment. The academy provided RM300 and its mechanical laboratory workshop. ...

... This project was launched in May 1930 in Golzwarden near Brake. It had the very new, proprietary solid propellant, but not in the form of a solid propellant regular engine. Although it failed, it finally opened the door to further research that was to remain focused on a solid propellant regular engine. Critical support came from fireworks specialists of the former Reichswehr and the powder factory of Wolf & Co., Walsrode, und J. F. Fisfeld, Silberhütte/Anhalt.[28]

More on the decision to go for solid propellant:

... At the time the academic and empirical research on spaceflight equaled zero! This indicated that a long and troublesome road lay ahead on which one could only endeavor at one's own risk. And on top of this by me, who did not have 'the faintest idea' of rockets. I immediately understood that radio technology plays an important part and I was well versed in this, because I had been a radio amateur since 1922. The parabolic or escape velocity of a missile leaving the earth or the reach of the earth's gravitational pull, such as a rocket flying to the moon, was known to be 11.8km/second. This defined how much energy was required. Thus I had to make a clear-cut decision at the outset: liquid propellant or solid propellant rocket engine. I went for the solid propellant rocket engine; while the liquid propellant rocket engine could be "turned on and off," controlled and was energy efficient, the fuel pumps, pump drives, on-board energy supply requirements (for turbines, batteries etc.) made it heavy-weight and complex as well as costly—which was relevant at the time. None of this applied to the solid propellant rocket. Furthermore a solid propellant rocket could be made much more energy efficient with specific solid fuels, as has today been confirmed in practice. However, the research effort required would in fact be the same, of this I was already well aware at the time.[29]

Karl Poggensee wrote about his trials with the "Rak-1" rocket, which he was able send up to a maximum altitude of 2500 meters after about 9 launches, although the first trial on June 21, 1930 had failed. He said that the thrust was 90 kg, i.e. 30 kg per rocket (three in total).[30]

There is another series of photographs in a Japanese book on the history of spaceflight that might show the first attempt: the successful launch of the Rak-1 rocket on June 19, 1930, at 8:10 pm in Golzwarden near Brake that was not a public event.[31] It is notable on these photographs that Poggensee is wearing a tie and not a bow tie as on June 21.

After this successful trial on June 19, it is not surprising that Poggensee believed that the foiled launch on June 21, 1930, was to be blamed on sabotage, because some parts had been stolen and the fuels had been tampered with. He also said that he saw some foreigners who could escape by chance.[32]

Figure 4–24: Erecting the launching catapult.*

Figure 4–25: Inserting rockets.†

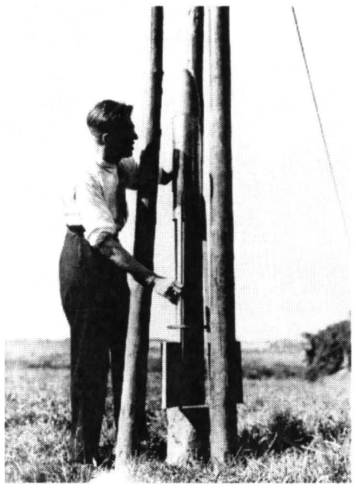

Figure 4–26: Positioning.‡

All of Poggensee's large rockets were propelled by a pack of several individual rockets that burnt simultaneously. He went on to develop his propulsion rockets by making smaller "test rockets" which he tested for their performance. An undated report from a daily describes the methodology (according to Poggensee these are trials nos. 12, 13, 14 and 15. He also said that a subsequent 16th trial had been successful):[33]

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* Figure 4–23 in H. Osawa, *The History of Japanese Rockets* (Tokyo: Mita Press, 1996), ISBN 4-89583-150-7 C0040, p. 33.

† http://spatial.forumdediscussions.com/t695-les-premieres-fusees-du-20eme-siecle and Poggensee, Part 2 – 039.

‡ Figure 4–22 in H. Osawa, *The History of Japanese Rockets* (Tokyo: Mita Press, 1996), ISBN 4-89583-150-7 C0040, p. 33 and Poggensee, Part 2 – 117.

Nachrichten der Stadt und Gemeinde Oldenburg

About the rocket trial[34]

As reported previously, the student Karl Poggensee is planning another launch of a larger rocket equipped with registration apparatus for the near future. It is known that the rocket launch in Golzwarden failed, because the powder that was to generate the thrust was not powerful enough. Before launching a second rocket Poggensee performed a series of experiments with another type of powder.

To test out the new powder Poggensee recently launched a number of small test rockets in the upland moor on the coastal canal near Wildenlohe. Our reporter had the opportunity to attend these trials. These four rockets were charged with a nitrocellulose powder mixed with black powder, just as the Golzward rocket, but with a different mixing ratio than for the first rocket. For instance, Poggensee launched a two-stage rocket whose second priming charge ignited only at a considerable altitude. The other rockets contained magnesium in addition to the powder which ignited at a certain altitude. These four light-weight rockets (one was launched from a makeshift catapult and had steering panels) or rather the powder worked well and they rose to a certain altitude. Mr Poggensee had selected a remote meadow in the upland moor for the tests where no damage could be caused.

This report indicates that Poggensee tried out multistage rockets, traditional rockets with a guiding rod and rockets with side fins fired from a catapult.

The article also announces Poggensee's second rocket. Poggensee's Rak II rocket flew for the first time on March 13, 1931 at 1:30 pm in Bremen, Blockland and was his trial no. 30.

Figure 4–27: Karl Poggensee with Rak II holding the fuse.*

* Poggensee Folder 00- 29.

Figure 4–28: Diagram of the self-made altimeter—800m.*

Figure 4–29: Poggensee.† **Figure 4–30**: A. Saakel.‡

Friday, March 13, 1931—Bremer Nachrichten (Bremen News)[35]

Rocket experiment—Successful trial by a man from Bremen

Stud.-Ing. Karl Poggensee has quietly worked on the construction of his new rocket "Rak 2" which he successfully launched near the city of Bremen a few days ago. The rocket was equipped with an altimeter and a parachute. It was made of aluminum, copper, hardwood, brass, and bronze. A brief description of the structure: The steering wings are fitted at the lower end of the steering bars and consist of thin, very hard brass sheet. The steering bars are screwed to the body with thick bolts. The aluminum sheet body is subdivided into four compartments that hold the apparatus. The tip is also made of aluminum. A parachute is packed inside which can be separated from the body by a powerful, highly tensioned spring and will then open up unhindered.

The propulsion rocket is located in a compartment in the body's lower part. The altimeter is installed in a second compartment above. Next are the accelerometer and the central release with the photographic camera. Then finally the parachute.

It was a beautiful day. We were a very small party that went out to the large wasteland where no damage could be caused. We had gone for a long time until Poggensee had found the right place. The rocket was prepared for take-off, the parachute was fitted, the tip rubbed with talcum inside and installed on top. The rocket was set up slightly contrary to the wind direction at an angle that Poggensee had calculated beforehand. The electrical remote ignition was made ready with utmost caution. "Rocket ready for firing." We retired about 200 meters while Poggensee carefully examined the entire setup once more.

Poggensee positioned himself at a short distance. The tension rose. Will it take off? Will it blow up? Then the command: "Attention, ready, steady—fire—go!!!"

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* Poggensee Folder 00- 29.
† Poggensee Folder 00- 29.
‡ Poggensee Folder 00- 29.

A powerful huffing and puffing and howling can be heard. The rocket speeds skywards like a bullet dragging a long thick trail of fire behind it. An overwhelming drama nobody ever laid eyes on!

I am looking through a telescope and have difficulty to take it all in. High up in the air, just about visible with the naked eye, I can see how the tip is separated from the body.

The parachute opens up and starts its descent. The trial was a success! All of the devices have served their purposes. The rocket was launched without any launching pad and guidance, just from the surface; because the point of gravity had been positioned in such a way that the rocket had to climb straight along the foreseen trajectory! Despite the gusty wind at the time the parachute had very little drift and landed only 10m from the point of launching. This most probably was the first trial that was accompanied by measuring equipment that recorded perfectly during the flight.

Ingenieur A. S.

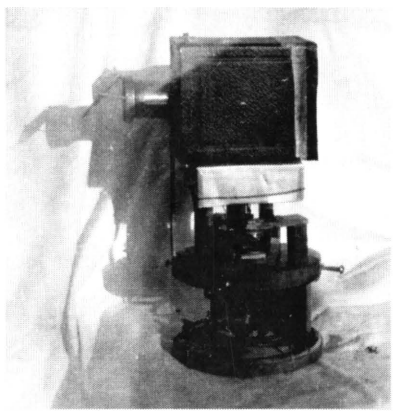


Figure 4–31 (left): Connecting the fuse (electrical ignition cable connected with the auto-support).*

Figure 4–32 (right): Photo camera with parachute release and release unit for photo camera and altimeter.[36] † Self-made camera with deflective mirror in front of the lens.

Another article about this launch offers a retrospective of Poggensee's relationship with his teacher after his "public failure" in June 1930:

* Poggensee Folder 00- 30.

† Poggensee Folder 00- 30.

Schweizer Wochen-Zeitung (Swiss Weekly)—Zürich, March 21, 1931

"Rocket ready for firing!"

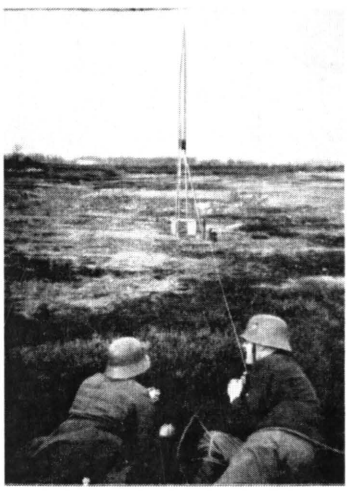
The trials of the student Poggensee meet with success.—How the launch happened.

Already last year the student Poggensee from Oldenburg had made the news with his rocket trials. The professors of the Oldenburg academy, many of the students and a large number of other people had assembled at a place near Oldenburg. There was widespread disappointment at the time, because the launch was total failure and retroactively the Oldenburg professors totally distanced themselves from Poggensee. ...

Poggensee added a handwritten comment:

Contradictory article by Stud. Baurat Hofmann, Oldenburg, in the Oldenburg daily "Nachrichten für Stadt und Land"—trying to ridicule me! (My teacher).

Another flight (trial no. 31) with the Rak II rocket (Poggensee comment—rocket no. 5) was performed at Gedstedter Heide near Bremen in 1931. Poggensee commented: "Stand alone" launch and "without" guiding rails—wireless remote steering and control—transmitter induction coil 5 cm striking distance.



Neue Raketenversuche des Bremers Poggensee.

Links die Rakete im Moment des Abschusses. — Rechts oben ist im Vordergrund die Rakete und das zum Abschuß verwendete Gestell zu sehen. Zur Landung der eingebauten Registrierapparate befindet sich in der Rakete ein Fallschirm.

Figure 4–33 (left): Even more trials with controllable rockets Student Poggensee and his collaborator Saakel at Bremer Heide (Sennecke). 1 sec. before *"firing."*[*]
Figure 4–34 (right): Poggensee Saakel.[†]

[*] Poggensee Folder 00- 31.
[†] Poggensee Folder 00- 31.

However, this trial had consequences in court:

> Because of this trial I landed a suit for payment of RM 101.50 in damages to a farmer named Gerhen from Garlstedt. Because my lawyer defended me rather clumsily I was sentenced to pay RM 101.50 and had to do that forthwith. The farmer claimed that my rocket made his horses shy that then ruined his mower.

It is said that this launch at Gedstedter Heide was recorded by Fox—Tönende Wochenschau (news broadcast with sound).[37]

Figure 4–35: "The camera is inserted into the rocket, powder added, and then set off to get sky photos."[38] *

On August 11, 1973, Poggensee reported the following about his camera to Frank H. Winter:

> Here, as well, I started from scratch and designed and built a camera, at first a dedicated one for one image each. This is the camera you see on the attachment mailed to me "Camera on Rocket gets high Altitude Photos". I thank you very much for this photo attachment; because—due to the war—I do not have any pictures anymore and I greatly deplore that I do not have any of the pictures that were made from the flying rocket towards the ground. Yes, it is true, this attachment shows an image of myself and my rocket with said camera! This camera took several flights and enclosed I sent you two enlargements of my photo rockets which also were those flying test stations mentioned above. The camera was installed in transverse direction, it has several lenses—designated "Objektiv" in the picture—they protrude at the side and the mirror directs the view downwards, so that the ground, the rocket exhaust and the surrounding landscape are captured. The mirror is designated as "Sp" in the picture. I am holding the release rope

* "Camera on rocket gets high altitude photos," *Popular Science,* October 1930, p. 63.

"R" in my hand which is connected to the ground. It works as follows: When the rocket is launched and rising the rope "R" (fastened to the ground) unravels from the rocket releasing a clockwork in the rocket which activates the camera and subsequently triggers the parachute that lets the rocket glide safely back to the ground. The trigger is activated at a precisely defined and preset time that depends on the firing period or the duration of the propulsion phase of the rocket engine, the parachute trigger is timed for a specific duration of propulsion as well.

The rocket mechanically records the data to be measured—thrust, acceleration, air pressure—and transmitted to the ground via radio with frequency detuning and a microphone. This system has proved itself. The camera became a victim of a rocket crash. It was built very lightly to save rocket fuel. We then postponed the continuation of these camera trials in favor of the development of considerably more powerful rocket engines. Unfortunately no film cameras were ever used, for one, because of financial problems and secondly, because of the Reich government's rigorous banning of all private rocket research and rocket trials by threatening serious punishment. The altitudes we had reached by then were around 1000 meters. The negative was from a film pack, photo-sensitivity 23° Scheiner, optical lens 1:2.5, aperture 1/2, weather: clear, sunshine, but also cloudy; launches in summertime at +25°C., but also in wintertime, sometimes –10°C., lens set to infinite, exposure 1/25 sec., powder weight at launch 5 kg, own built 2000 cal/kg, take-off weight not known anymore. All logs are lost!

The guiding wings "F" acted as radio antennas and the aluminum rocket body as so-called "counter-weight." We used the 600 meter radio wavelength. Two flashlight lead accumulators served as electrical power supplies, the anode voltage—200 V—as generated by a buzzer / chopper / vibrator. The extensive length of the stabilizer prevented the rocket "S" from "distorting" while airborne.[39]

The paper *Allgemeine Wegweiser* published a full-page photo report on April 22, 1931, which Poggensee identified as trial no. 32. Unfortunately, there is no exact date. Poggensee indicates that the location was Golzwarden near Brake. In this trial, he was assisted by his younger brother Engelbert.

Another test flight of three Poggensee rockets (third trial, no. 35, Rak-II) took place at Alexanderheide in Oldenburg on June 12, 1931, at 5:00 pm.

Source and Date Unknown[40]

More Rocket launches in Oldenburg.

Yesterday afternoon between 5 and 6 pm the student of the Oldenburg Hindenburg Polytechnic, Karl Poggensee, launched three rockets built by him. The first one rose only about ten meters high, but the others traveled about 300 m to 400 m from the ground. The third one bore a parachute in its head that was supposed to unfold by the actuation of a spring that triggers two small dry batteries when turning downward. However, this obviously somewhat crudely designed device failed and therefore the rocket plum-

meted down. While Poggensee had totally failed with his first attempt at a launch near Golzwarden, it now seems that he has made some progress with his attempts at rocket design.

Figure 4–36: Picture top left, first brother, Engelbert.*

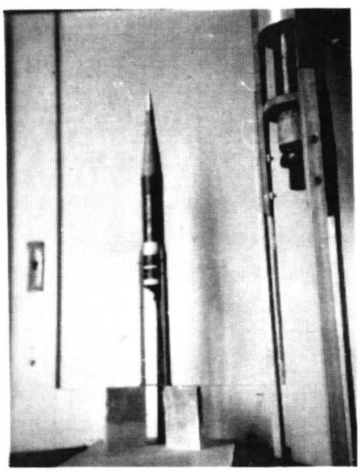


Figure 4–37† and 38‡: Trial no. 33—miniature rocket—3.5 kg thrust—350m altitude– "without" guidance.

* Poggensee Folder 00- 12.
† Poggensee Folder 00- 34.
‡ Poggensee Folder 01- 31.

Figure 4–39,[*] 40 and 41[†]: Trial no. 34—Test rocket with a new charge—new design—now a D.R.P. patent—20 kg thrust—700 m altitude.

Figure 4–42[‡] and 43[§]: Trial no. 32. 35–45 kg thrust—500 m altitude—weight = 8.5 kg – "without" guidance—(Rak II).

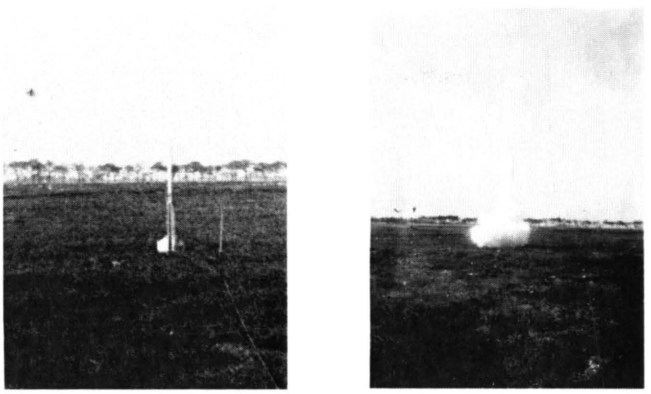


Figure 4–44[**] and 45[††]: Trial no. 32.

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[*] Poggensee Folder 01- 29.
[†] Poggensee Folder 00- 34.
[‡] Poggensee Folder 00- 34.
[§] Poggensee Folder 01- 30.
[**] Poggensee Folder 01- 32.
[††] Poggensee Folder 00- 34.

Figure 4–46: From left to right: Hufnagel, Poggensee, Landfort, Rönbech, and First Police Lieutenant Jensen.*

Another public demonstration was scheduled for July 4, 1931. It eventually took place on the afternoon of Sunday, July 12, 1931, at Alexanderheide near Oldenburg. Poggensee successfully launched a small model. The large rocket's parachute did not open, though, and therefore the rocket crashed (Trials no. 36 and 37). Poggensee's estate does not include any photographs of these two trials. All that is left is a poster announcing the launch.

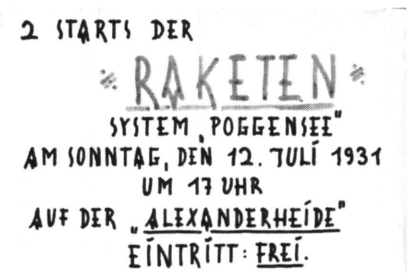


Figure 4–47: Poster announcing the rocket launch at Alexanderheide on Sunday, July 12, 1931.†

* Poggensee Folder 00- 16.
† Poggensee Folder 01- 04.

Wilhelmshavener Kurier Special Report[41]
July 14, 1931

Rocket launch in Oldenburg
Partially successful

People in Oldenburg have become rather skeptical regarding everything that has to do with rockets after the rocket trial in Golzwarden failed last summer and Tiling's recent demonstrations were rather disappointting. After failing in Golzwarden, Mr Karl Poggensee from Bremen continued his work and he may well consider the result of his tests on Sunday to be rather positive advancements. There were but a few interested spectators. Only the teachers and students of the Hindenburg Polytechnic and some representatives of the press had been invited. The Oldenburger Landes-Luftfahrtverein (regional air-travel association) was also present.

The launch of the large rocket was preceded by that of a smaller test rocket which was fired from a makeshift catapult to test a new type of powder. Experts estimate that it went up into the air about 400 meters.

The climax was the subsequent launch of the large rocket of more than three meters length which took off directly from the ground. This rocket bore wooden steering panels at the bottom, the body itself containing the propellant rocket (45 kg thrust) and the parachute, was made from tinplate. The rocket design called for an automatic release of the parachute during the drop down to earth.

The launch worked smoothly. The rocket took off from the ground at high speed and soared vertically up into the air. But already at a low altitude parts of the steering panels and the tip fell off from the rocket body which returned to the ground after reaching an altitude of approximately 200 meters. It crashed at touch down, because the parachute had failed to open. The result of this trial is not unfavorable, although many things went wrong, because the large rocket could be launched directly from the ground. Possibly this achievement would have been even greater, if the rocket had been built more robustly.

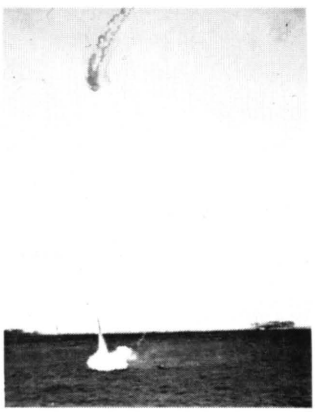
Hans Redelfs.

Unknown Source—July 14, 1931[42]

Mr Poggensee's view of his rocket tests.

The student Mr Poggensee submitted the following comments to us regarding yesterday's article about his rocket trials. These show his own assessment of his tests last Sunday: My main purpose was to achieve a perfect rise, without catapult and any guiding device or support, just from the ground and this has been fully achieved. Because this launching method is simple and fast it will probably be of utmost significance for the practical evaluation; launching with a catapult would greatly reduce the value of the rocket launch, because the locations do not always lend themselves to a catapult-bound launch and it is rather time consuming. Just consider a

launch from rocky ground in the mountains to improve effectiveness, that needs to happen very fast. The parachute-guided drop failed, because the electrical batteries used to release the parachute were dissolved by the rocket's strong heat and therefore did not work anymore. The remaining voltage was then too weak to release the parachute. This trial thus showed that the air rushing past does not provide the anticipated cooling effect. Very soon the test will be repeated and I will give special attention to this point to prevent any failure. I should like to note that my trial used an innovative electro-mechanical release mechanism for the parachute that is much more reliable than the one used in the tests in Bremen, Garlstedt and Golzwarden. While the rocket soared upward on Sunday the head wind separated the head from the body for some incomprehensible reason. As a consequence the rocket's flight became bumpy which caused one of the steering wings to break off. Despite all of this the rocket reached an altitude of about 500m according to expert views. The powder charge of the high-performance rocket that was fired in addition to the first small one, which only served to determine the direction of the wind, consisted of a completely new composition of powders that was tested for the first time for its performance and explosion safety. The result was exceptionally positive, because a thrust of 20 kg and—according to experts—an altitude of about 700 meters was reached.



As both of these newspaper articles say, the large rocket Rak II was completely destroyed in the crash landing. Therefore, Poggensee had to build a new "large rocket" Rak III.

Poggensee started his trial no. 38 at Bremen Brockland with model rocket type "M" on April 29, 1932. No further details are known about this trial, but there are three photographs that show the successful launch of model rocket "M" and the set-up for the trigonometric calculation of the altitude reached.[43]

Figure 4–48: Launch—model-rocket type "M" with parachute "without" guiding rail.*

After this successful trial, Poggensee went public again on May 21, 1932. Originally, he had planned four tests for that date. He then abandoned the second and the last ones for which he wanted to use his new Rak III model. He ultimately only performed the first two trials nos. 39 and 40 from 2:10 pm—3:00 pm. These two launches were covered live by the Bremen radio station Norag, with Mr. Bellbrück as commentator.

* Poggensee Folder 00- 25.

Figure 4–49 (left): The altimeter. Poggensee and Lampe—my master of ignition.*
Figure 4–50 (right): Lampe sen., Lampe, Gral, Ernst Arndt, Engelbert & Karl Pog.†

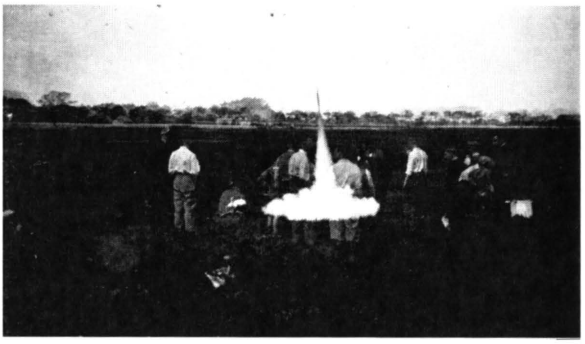


Figure 4–51‡ and 52§: On the "Norag" microphone—Launch of no. 1—altitude reached 680m—On trial at "Bremen Brockland"—a double exposure.

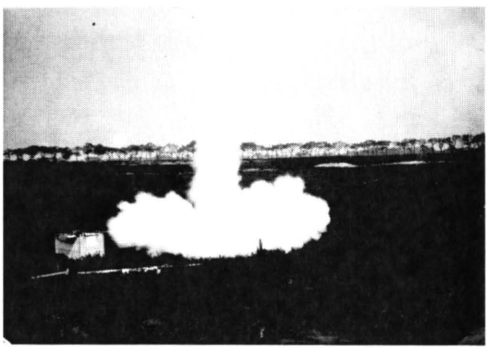


Figure 4–53: Launch no. 2—Beginning of the SOS rocket, second trial at Bremen Brockland.**

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* Poggensee Folder 00- 25.
† Poggensee Folder 00- 25.
‡ Poggensee Folder 00- 14.
§ Poggensee Folder 00- 17.
** Poggensee Folder 00- 17.

Figure 4–54[*] and 55[†]: Rak III original form—Rak III parachute—The launch of Rak III could not take place on that day.

The draft of the script prepared for the radio broadcast, which was usually live in these days, has been preserved. Poggensee's handwritten notes show that the second launch was canceled, because he decided to do this without the public. Nor was his new large rocket Rak III launched, but the text explains this as well.

Transmitted from Alexanderheide in Oldenburg[44]

May 21, 1932

2.10 pm: Announcement. Norag field coverage.
then:

Eicke: Description of location, cordon, weather (also with respect to the trials). How was the trial prepared (primitive). Description of the shelter, the altimeter. Indicate that one is going for altitude, not horizontal distance.

Question: Mr Poggensee, have you already previously performed rocket trials at this site?

Poggensee: Yes, I launched rockets from here for the first time on July 12 last year.

Eicke: (Question) Did you use the same type then as we see here now or have you made any major innovations since then?

Poggensee: The first rocket I will launch is more or less the same as the previous ones.

Eicke: (Question) Thus one could say that this first rocket is something like a prelude to a following rocket symphony, couldn't one?

Poggensee: Yes, that is how you could put it. Let us now get closer to the rocket? More detailed description: No launching pad in the ground, only a board as base, therefore the rocket will not be guided.

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[*] Poggensee Folder 00- 21.
[†] Poggensee Folder 00- 14.

Eicke: Asking Poggensee about details (steering panels, nozzle, powder chamber, attached tip with parachute).

How far away will the rocket land?

Eicke: How much thrust does this first rocket have and how strong is the powder charge?

Poggensee: 5 kg thrust and 200 g of powder. My system (also inside)

Eicke: Please be so kind as to describe the type of ignition used, Mr Poggensee ? I do not see any fuse cable or the like?

Poggensee: Yes, because we don't need that. I installed a battery right next to the launching site.

Eicke: Well, then we could get started, couldn't we. Well Mr Poggensee, you intend to stay right here, but I think you will not take offense, if we remove ourselves somewhat to the rear; there is a similarity to a battlefield situation with grenades and mines. One never knew exactly when they were going to explode.

Further description of the last preparations, the launch and landing of the first rocket.

Discussion with Poggensee about the altitude reached, the operation of the parachute etc, possibly description of the rocket returned to the launching site.

Eicke: Ok, then we can get number 2 ready. Cancelled!

Description of the required preparations.

(Question): Well, Mr Poggensee, didn't you forget something with this second rocket? I cannot see any steering panels.

Poggensee: That is because this rocket does not have any. They are replaced by this rod. I dispensed with the steering panels here, because I don't want to risk their breaking, if we have a crash landing. This second rocket is built totally differently inside and also its powder charge is different. Therefore it is more difficult to forecast the course of this experiment than in the first case.

Eicke: Well, that is sure kind of you to let us know that beforehand. Please tell us about the thrust of the second rocket and its powder charge?

Poggensee: The thrust is 35 kg in this case and the powder charge and 350 g, just for testing.

Eicke: Under economic considerations this would be great progress indeed, if you get seven times more thrust with not even double the powder charge.
Discussion of the preparations for the second launch and the entire sequence of events as observed from the shelter.

While rocket no. 3 is prepared ↯ approx. 35 mm

Eicke: Mr Poggensee, in its announcements the press sometimes talked about a heavy rocket. A layman will then imagine something of the size of a medium-sized coal box. However, your rockets 2-4 do not differ much from the first one externally and I think you said that it weighed 2.5 kg in total.

Poggensee: Also in these cases the total weight amounts only to 2.1 kg. Actually, one should not talk about heavy rockets, but rather of high-performance rockets.

Short explanation of the term.

Eicke: What about the thrust and powder charge for no. 3?

Poggensee: 45 kg thrust and 500 g of powder.

Eicke: Thus the ratio is not as favorable as for the first two rockets.

Well then, we are ready, aren't we Mr Poggensee? Further description as for nos. 1 and 2.

Thereafter third launch.

Eicke: Before you let your last child go we would appreciate it, if you indicated which objective you want to achieve with your test results.

Poggensee: We want to reach the maximum altitude with the smallest possible powder charge, however, at maximum acceleration. In this way one could make all kinds of meteorological measurements in a very economical way.

Eicke: Compared to the schemes of other rocket researchers this is a relatively modest objective; but I think that the public would nowadays prefer trials that aim at a specific and feasible target, rather than having such that always forecast success and achievements that are never delivered. One would probably trust this whole rocket business more, if the promises had not been all that grand.

Note on the value of such meteorological measurements, especially, because the parachute almost always worked in Poggensee's trials.

Description of the preparations for the fourth launch.

Eicke: You fitted this rocket with an accelerometer, right?

Poggensee: Yes, in all these trials it is especially important for me to increase acceleration, because this is what exclusively determines the cost. In this case I expect an acceleration of .....

Eicke: Description of the events and possible information on the acceleration reached.

Concluding remarks.

The print press reported as follows on May 23, 1932 (source unknown):

Rocket trials of a man from Bremen[45]

Already in spring 1931 we reported on the trials of Mr Karl Poggensee from Bremen who had been successful with several launches that went quite well. Poggensee continued to work intensively on his trials and made more progress in practice as well. That his work is also appreciated by the experts can be inferred from the fact that Poggensee recently made several trials at the premises of a large central German powder factory. These also went as planned and ensured him of the continued support of this factory. Unfortunately the launches scheduled for Saturday afternoon at Alexanderheide in Oldenburg seemed to be rather ill-fated.

Firstly, the launch of the larger of the rockets could not take place due to a misunderstanding and the required safety measures could not be completed on time. It would have been interesting to see the performance of especially this rocket that had much more weight and thrust than its predecessors. However, it seemed that the connecting rods between the steering panels and the rocket's body should be strengthened further (report on Rak III—Bremen airport).

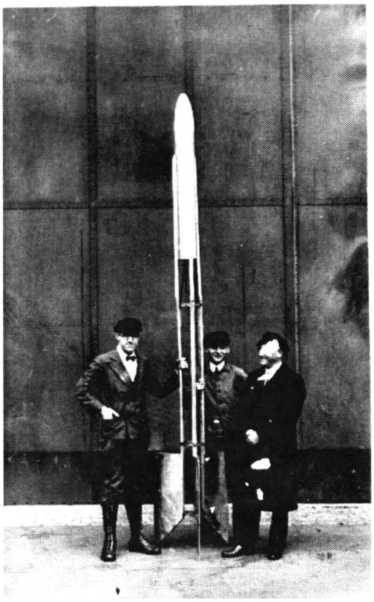
In the trials with the two smaller models the parachute did not open up fully once, although it had been triggered correctly. At least the parachute's braking effect was strong enough to take the spent rocket including its steering panels safely back to the ground (trial no. 1).

Poggensee used an altimeter that looked rather primitive, but for the expected altitudes it seemed to be quite satisfactory. It had measured an altitude of 680 meters.

Neither did the second trial fully succeed. In the air the rocket took on "a life of its own," it was probably ignited too early. Nevertheless an altitude of 1600 meters was measured and had everything worked according to plan it would certainly have been exceeded (trial no. 2).

Poggensee wants to use his rocket, that generally is going for height and not for horizontal distance, primarily for meteorological measurements for the time being. His intention is to achieve maximum acceleration with minimum charge to make the rocket as economical as possible. Since he relatively successfully proved the precise activation and operation of the parachute and since the general handling and launch of the rocket is very simple—for instance, the rocket has no guiding system, it is positioned on a board with the outer edges of the steering panels—the envisaged target seems achievable within a short time frame. At any rate, within a shorter time frame than the public is inclined to assume in the light of previously performed rocket trials.

Trial no. 41—Launch of Poggensee's rocket Rak III at Bremen airport on November 1, 1932 at 4:25pm. The rocket weighed 35 kg, its thrust was 400 kg, power was 529 HP and therefore it rose to an altitude of 1,135 meters. The rocket was 3.80 meters tall.[46]



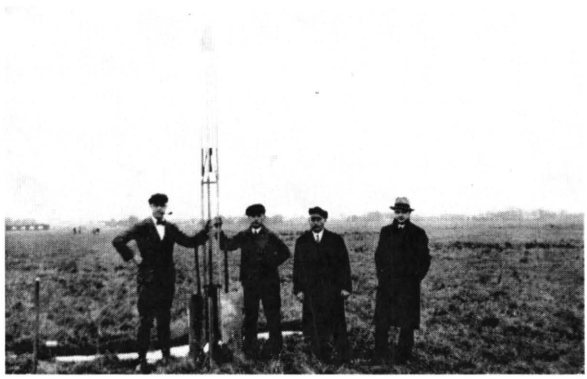


Figure 4–56 (left): Poggensee—Schwiegerhensen—Willrodt. Parachute is ejected by compressed air.*

Figure 4–57 (upper-right): Police Officer "Ferigen" was kind enough to lend us a helping hand during the installation. He showed us the site.†

Figure 4–58 (lower-right): Everything ready, from left to right: Poggensee, Schwiegerhensen, Willrodt, and Reinesche (Telegraphen Union).‡

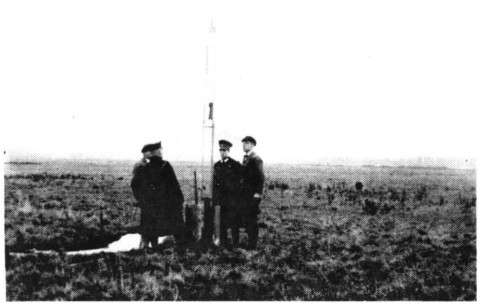
B.N.Z. (Bremer Neue Zeitung) Bremen, November 2, 1932—Article F. U[47]

Rocket launch in Bremen
1000m altitude reached

On Tuesday afternoon the local airport witnessed a rocket launch which is a rather rare occurrence in Bremen. The student Poggensee who became known by prior trials in Oldenburg launched his 41st rocket in the presence of a small number of invited guests. The rocket stands an impressive 3.80 meters tall and its special feature is that it is launched independently from the ground without a guiding rail or catapult. After the rocket had been erected with due consideration of the required safety measures, the measuring equipment was prepared. Although the ignition failed in the first trial (image 1), the second trial succeeded (image 2). By an unfortunate accident the large parachute collided with one of the rocket's guiding panels at the

* Poggensee Folder 00- 21.
† Poggensee Folder 00- 23.
‡ Poggensee Folder 00- 23.

apex of the trajectory, it separated from the rocket and therefore the latter crashed to the ground and broke apart, contrary to the builder's intentions (image 3). The altimeters located in the rocket head were damaged and were therefore rendered useless for the scientific analysis of this trial launch. Poggensee estimates that an altitude of 1000 meters was reached.



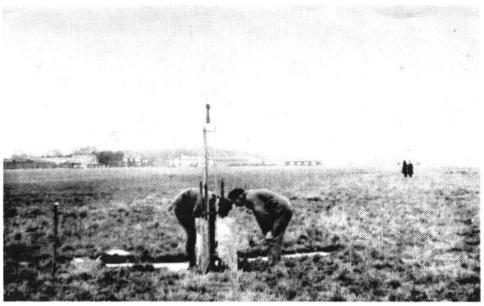


Figure 4–59 (left): Acceptance—Police Lieutenant Voigt and the police officer attended the acceptance. The fuse can still be seen in the grass (post to the left next to the water).*

Figure 4–60 (right): Positioning the fuse. Poggensee and Schwiegerhensen.†

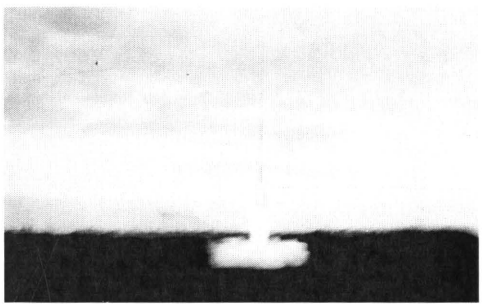


Figure 4–61 (left): Attention!—Fire! The launch.‡

Figure 4–62 (right): Parachute got caught in the lower pointed tips of the steering panels and came down with the rocket that broke in the crash. Bad luck! Big ... Schwiegerhensen.§

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* Poggensee Folder 00- 23.
† Poggensee Folder 00- 22.
‡ Poggensee Folder 00- 22.
§ Poggensee Folder 00- 22.

Figure 4–63: If a "detail" of the parachute trigger fails! You end up with "wreckage!"*

On August 1, 1971, Poggensee wrote an account of the rocket[48] launch at Bremen airport from memory. It is understandable that such an account will include a number of inaccuracies due to the long period of five decades that had passed since then. Nevertheless, this account can provide some further interesting insights into this trial.

> Rocket trial no. ... ... performed with company Focke-Wulf, Flugzeugbau, Bremen, airport.
>
> Approved by the Bremen head of police; Heads of security Police Lieutenant Voigt, Airport Director Admiral Gygas. Fee for launching permit 1.00 RM.
>
> The rocket as shown in the enclosed photo was built at the mechanical workshop of the old engineering academy in Oldenburg (IAO), Oldenburg i. Old. Assembly and launch with company Focke-Wulf, Flugzeugbau. Launching team Poggensee and two people of Focke-Wulf. Flight observation by about 100 Focke-Wulf employees. Altitude measured with theodolite and altimeter in the rocket.
>
> Purpose: Handling and safe operation of powder quantities exceeding 1 kg, stability in flight as launched independently—no catapult!—testing of measuring equipment in flight, in particular during acceleration, testing a new 5 sqm parachute made of damask-callico.
>
> Rocket thrust performance: 400 kg (thrust determined by special fuel measurements made at short intervals, e.g. black powder end burner, compressed on 500 kg/cm² pressing surface, nozzle clamping 1:40 at combustion ⅓ kg thrust performance per 1 cm²).
>
> Propellant powder: Own design, 5 kg (fine nitrocellulose granulate, company Wolf & Co. Walsrode, compressed with fine-grain black powder, company Eisfeld, Silberhütte/Anhalt und Wolf & Co., Walsrode).

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* Poggensee Folder 00- 35.

Construction materials: Aluminum, white beech wood, chromium-nickel steel combustion chamber, cast nozzle.

First ignition: Powder charge does not ignite "my heart is racing!"

Second ignition: Because of the stand-alone launch the police is concerned by the strong thrust and the rocket's size Focke-Wolf procures three additional guiding rods—at record speed—which are driven into the ground near the rocket's steering gear. Then three times hotter ignition and rocket ignites perfectly.

Rocket takes off perfectly with high speed, no "zig-zagging", straight smooth steep rise at 90°, as a "line drawn by a ruler," loud applause by the Focke-Wulff people near the last bombed-out hall. Very hard ejection noise. "Great flight!"

Altitude 1135m measured by theodolite.

Parachute perfectly ejected and unfolded in the apex, however, rocket swings too much when suspended from the parachute and then gets caught in it; Crash with a flapping and rattling parachute.

Result: perfect ignition and combustion of—my own—propellant powder during the acceleration phase and the flight, in particular with larger amounts such as 5000g (5 kg) instead of 50 or 100 or 1000g.

Rocket's thrust performance confirmed, i.e. the thrust has been calculated correctly;

Steering gear perfect for stand-alone launch without catapult and clean flight;

Triggering and unfolding of parachute perfect, however, suspension rope too short, needs to be four times longer.

This account was given from memory, because all documentation has been lost during the war.

Poggensee, August 1, 1971

This is where one needs to report of the fate of the parachute of Poggensee's Rak III.

Karl Poggensee supported his Hanover colleague Albert Püllenberg, by giving him and his group the expensive parachute that had survived the crash and total destruction of his Rak III at Bremen airport and which he said he had "saved every penny for" for their tests with the Diesel F.T.-Rak 3.

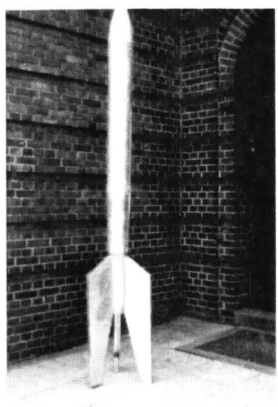

Figure 4–64: Albert Püllenberg's Diesel F.T.-Rak 3.*

* Poggensee Folder 00- 20.

Karl Poggensee's documents also include a photo of Albert Püllenberg's Diesel F.T.-Rak 3. According to Poggensee, the photo was taken in front of the school in Helgolanderstrasse in Bremen where the Poggensee family was living.

The total length of the Diesel F.T.-Rak 3 was 3.5 meters, its diameter 0.2 meters, empty weight 20 kg, parachute with 5 meters diameter, fuels were oxygen and diesel oil. It was made of aluminum and its engine of copper.

The rocket exploded because of a pipe burst caused by icing during the second launching attempt on March 31, 1934, at 6:00 pm. The daily *Niedersächsische Tageszeitung* reported as follows in its paper of March 31 /April 1, 1934 (no. 77):[49]

> ... "Better a real Brandenburg guy than nothing at all," said one and both contemplated at the remnants. "The motor is still fully intact," somewhere the rocket's tip is lying around and right next to it the parachute is just bursting into flames.

This then was the end of the large, expensive 5-m-parachute of Karl Poggensee.

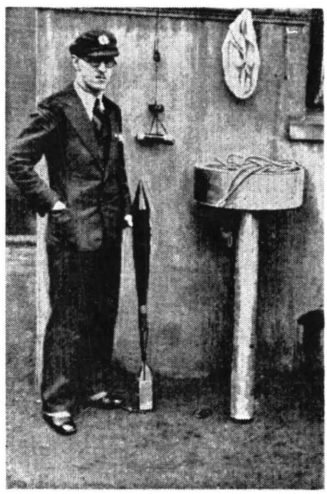

Figure 4–65: Poggensee and his flare, the float is shown on the right.*

The SOS Distress Flare

An article in the paper *Wildeshauser Zeitung*—Year 92—no. 109—of Saturday, July 14, 1951, explains Poggensee's motivation, experience, and the lessons he learned from his rocket trials in the early 1930:[50]

> In 1929 when studying at Oldenburg Ingenieur-Akademie Poggensee watched Fritz Lang's movie "Woman in the moon" which shows a rocket flying to the moon. At the outset I did not have the faintest idea of rockets, but this problem that actually scared me, became such an obsession that I watched every show each day. Finally I started very secretly and very cautiously to dabble with the construction of my first rocket." After producing a huge amount of drafts, drawings and calculations Poggensee set out to build his first small, powder rocket equipped with brass instruments and a parachute in the head, for which he had saved up every penny. The first public launch on a meadow in Golzwarden in 1930 failed, although there was a big bang, the rocket did not budge. It was difficult to get more funds. By literally starving himself, selling eggs and making music Poggensee,

* Poggensee Folder 00- 38.

totally obsessed by this idea, saved up every penny, cast around for new propellants and being a dedicated radio amateur he developed a wireless remote control system. After another 30 trials he ventured the next launch with remote control and wireless transmission of the flight data. Although this launch was successful it did not quite satisfy the inventor. More tests in Bremen and Golzwarden followed until the first large-scale trial finally took place at Bremen airport in cooperation with the Bremen Broadcasting Station. The powder-propelled large rocket has a thrust of 400 kg and climbs to an altitude of 1000 meters. Further development work falls victim to his financial difficulties until he can practically implement one new idea in 1934: The sea distress signal flare (SOS rocket)! This is a light flare that is visible for several minutes and its main demonstration takes place in Bremerhaven for the Marine Trade Association while the Fox Weekly Newsreel recorded it for the latest newscast. Altitude reached: 2000 meters! Although Poggensee received a patent from the patent office for this alarm flare for sea rescue services, it did not attract the hoped for and necessary funding.

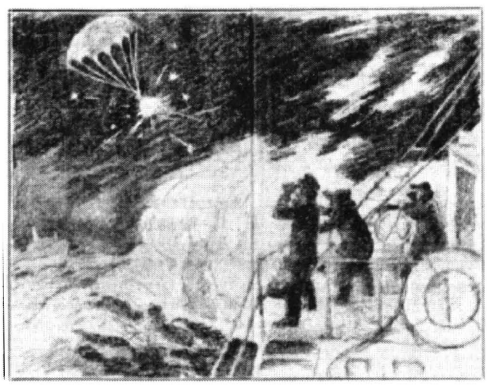

Figure 4–66: Drawing of SOS rocket signal in action.*

Poggensee himself says that the second rocket launch (number 40) at Bremen Brockland on May 21, 1932, was the beginning of the distress flare. He informed the radio announcer Mr. Bellbrück about the rocket's data as follows: total weight 2.1 kg and thrust 45 kg with a powder charge of 500 g.

Karl Poggensee filed the patent for his signal flare with the German Patent Office as filing number P68230-VIIIa—74d (P for Poggensee) on September 23, 1933. The grant of the patent was published on March 21, 1935, and it was issued as patent no. 611 843—class 74d—group 7 on April 6, 1935.[51]

* Poggensee Folder 00- 38.

Deutsche Allgemeine Zeitung, Berlin—January 10, 1934[52]

Successful trial with new rescue signal flare

Ingenieur Poggensee aboard the Lloyd tugboat "Vulkan"

By our special correspondent.
ss. Bremen, Jan. 10

Ingenieur Poggensee from Bremen tested his rescue signal rocket with a totally innovative design in front of invited experts aboard the tugboat "Vulkan" of Norddeutsche Lloyd. This trial can be called a complete success. After the inventor had pulled the time fuse the float with the rocket was thrown into the sea and drifted off. As planned, the rocket ignited after exactly 92 seconds and soared skywards at breathtaking speed up to an altitude of about 2000 meters. Unfortunately clouds covered the sky at an altitude of only 200 meters and thus the light flare could not be observed, because it burns only for two minutes. At any rate one can say that the objective was fully reached, because the most important aspect of this trial was launching the rocket with a float in the open sea.

Ingenieur Poggensee from Bremen has been testing signal and light flares (and other rockets—author's note) for many years. After lengthy, intensive trials he went public for the first time with a rocket built by him in Oldenburg in June 1930. That trial failed: ten further, smaller trials, also in Oldenburg, and a large-scale trial in Bremen, where a photo camera, a barometer, an altimeter, and an acceleration device were used served their purpose. The apparatus worked properly, the altimeter registered 800 meters. The parachute opened properly. The last launch succeeded on March 13, 1931. After these tests the inventor then ventured another large-scale trial together with Nordische Rundfunk A.G. in Bremen in May 1932. At the time a completely new rocket flew to everyone's satisfaction up to an altitude of 680 and 1,600 meters. Next followed a major launch in all quietness in which the rocket reached an altitude of 4220 meters. The experience gained during this previous work led to the current SOS rocket for sea vessels in distress. As reported, a trial was performed with this rocket on January 4.

The purpose of the invention is to give people in distress at sea, in a rescue vessel or a sinking ship a last chance to make themselves known at a long distance. A strong rocket carrying rotating, very bright illuminants in its head is thrown into the water where it automatically ignites and soars up vertically. At the end of its trajectory the rocket ejects illuminants that are visible at a distance of about 30 km; these are suspended from a parachute and glide downwards very slowly. The big advantage of Poggensee's SOS flare is that it will be glowing in the air for 100 to 120 seconds due to the parachute, while the traditional flares (shining stars) light up for hardly a second.

In the rescue boats these flares are located next to the helmsman; a second man throws the flare overboard into the water after pulling the fuse; the rocket will then automatically position itself upright and speed vertically

skywards after about 80 seconds. Neither the wind nor heavy sea affect the flare once it floats on the water. As a very last resort this SOS flare shall help to rescue people.

Figure 4–67: On board of the Lloyd tugboat "Vulkan."*

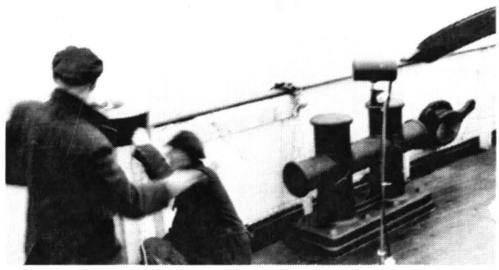

Figure 4–68: Float with rocket are cast overboard.†

The photographs and the image of the tugboat on the model sheet of Hamburger Modellbaubogen Verlag illustrate clearly that the position on the tugboat must have been on the stern platform.

The following information about the tugboat *Vulkan* can be found in the book *Schlepper des Norddeutschen Lloyd 1857-1970 Hapag-Lloyd, Transport & Service 1970-1994* by Reinhard H. Schnake, published in 1995 by Koehlers Verlagsgesellschaft mbH, Hamburg.[54]

***Vulkan (3)** 1929 to 1941*
395 GRT. 42.30 x 8.50 x 4.11 m.
Triple expansion engine 1200 PSi, J. L. Meyer, 12.0 kn.
Crew of 13.

Built in December 1912 at J. L. Meyer, Papenburg, construction no. 284, launched on March 28, 1913. Delivered to HAPAG, Hamburg, under the name of *Wendemuth.* 1922 managed by Bugsier-Reederei u. Bergungs A.G., Hamburg, transferred to Lütgens & Reimers, Hamburg, in 1926, purchased by Norddeutsche Lloyd, Bremen, on November 22, 1929 and renamed *Vulkan.* 1940 serving for the navy, deployed for operation "Seelöwe." Le Havre, sank in Le Havre on September 20, 1941 after hitting a mine. Total loss, two casualties.

* Poggensee Folder 01- 84.
† Poggensee Folder 00- 36.

Model Sheet—Hamburger Modellbaubogen Verlag[53]

Figure 4–69.*

* Model sheet marine tugboat Merkur/Vulkan—Hamburger Modellbaubogen Verlag, 2001.

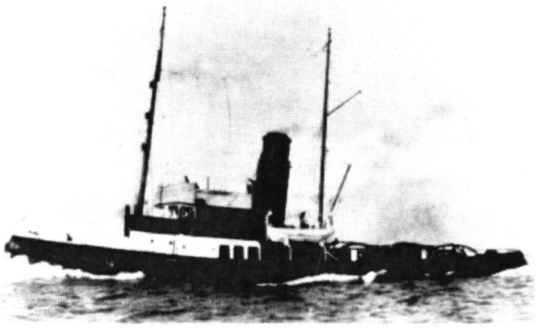

Figure 4–70: *Vulkan* (3). Photo: Lloyd-Archiv.*

As related above, Poggensee took the major state examination for pyrotechnical engineers—Ing. pyrot.—administered by the Trade Supervisory Board together with the Reichswehr in 1934. He was granted the so-called 'major concession' to set up and operate his own factory for powder and pyrotechnics and to manufacture his own rocket powders there. This was a factory in Hespenbusch in Oldenburg funded by his parents.

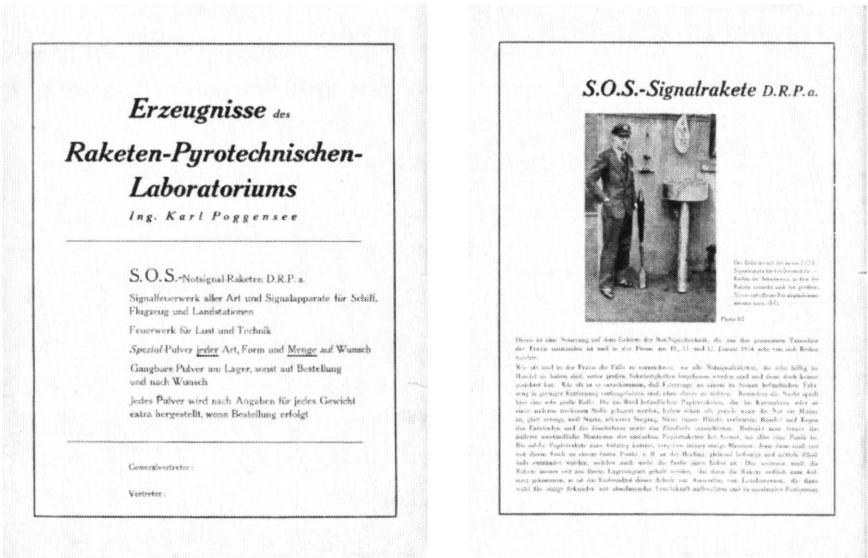

Figure 4–71 and 72: This multi-page brochure[55] contains a general description of the signal flare, a detailed listing of 16 special advantages, a price list (RM 44), the testimonials of some active sailors for the signal flare and also lists other pyrotechnical products and services offered.†

* Reinhard H. Schnake *Schlepper des Norddeutschen Lloyd 1970-1994*, Koehlers Verlagsgesellschaft mbH, Hamburg, 1994, p. 68.

† Poggensee, Part 2 – 015 and 016.

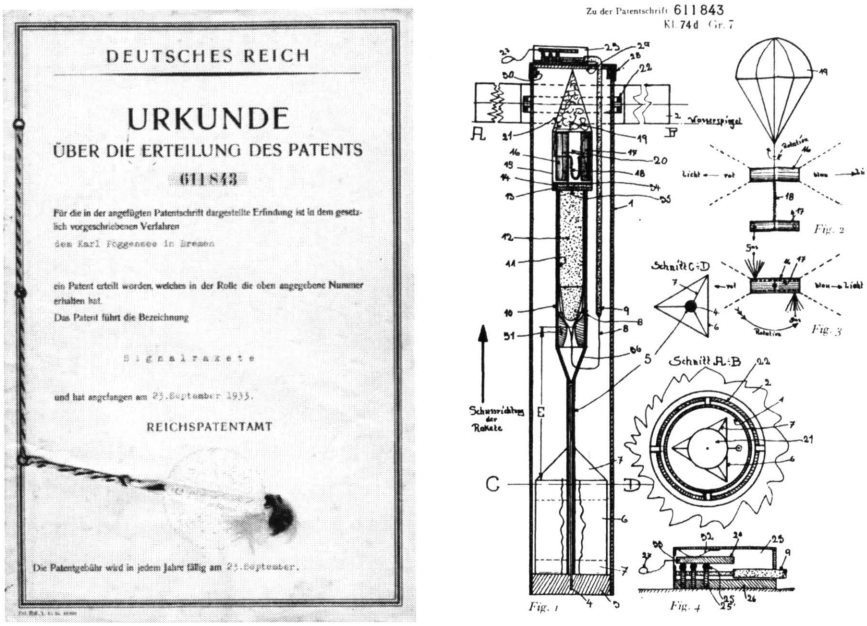

Figure 4–73 and 74: Poggensee Patent No. 611 843.*

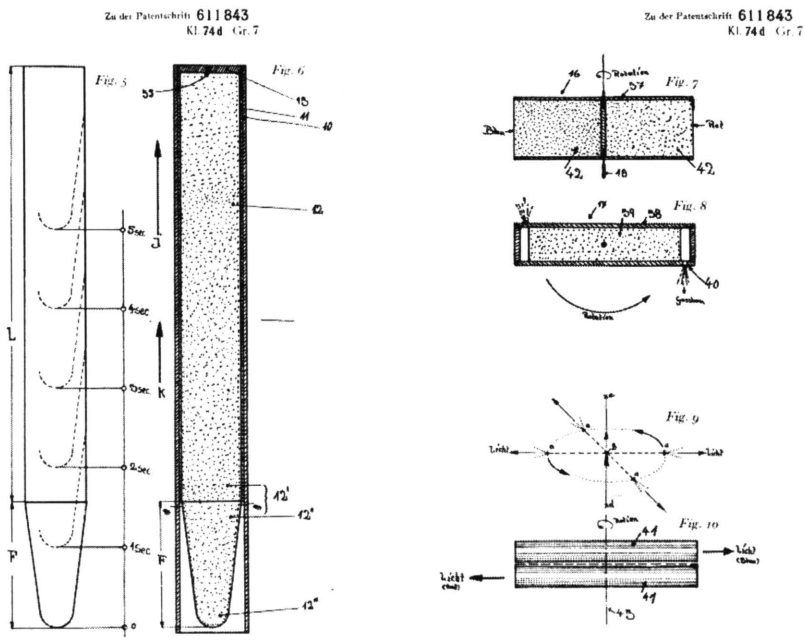

Figure 4–75 and 76: Solid fuel and signal charge.†

* Poggensee, Part 2 – 022 and 023.
† Poggensee, Part 2 – 024 and 025.

Patent certificate and drawings for the signal flare. The shape of the propellant is especially noteworthy, because its burning properties differ from that of the end burner or hole burner common at the time. An end burner offers only a relatively small circular area as combustion surface. Assuming a burn rate of 1 cm per second this results in a relatively long combustion period.

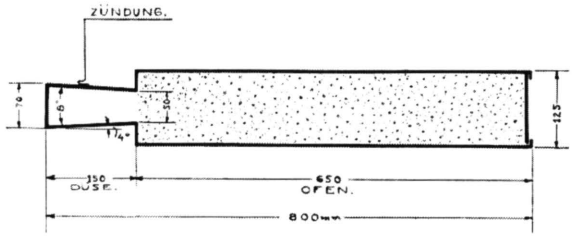

Figure 4–77.*

However, only a relatively small volume of the propellant is transformed into the corresponding volume of gas per second, therefore the resulting thrust remains consistently low throughout the combustion period.

The combustion area becomes considerably larger in a hole burner, either slightly conical or cylindrical, compared to the end burner, and this area consistently increases throughout the combustion process and thrust increases in line with it. As a result the propellant volume is spent much faster.

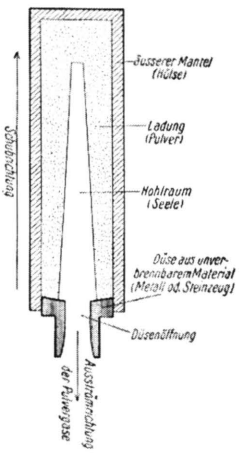

Figure 4–78.†

Karl Poggensee was looking for an intermediate solution—a large combustion area and a uniform burning rate at the same time. He transferred the interior cone to the outside and shaped its tip as a hemisphere. This resulted in a shape that for one allowed a small increase in propellant volume and secondly, provided a large combustion area burning at a uniform rate.

Thus, his rocket accelerated uniformly throughout the entire combustion period.

We should like to point to two further projects Karl Poggensee pursued in the fall of 1937. The drawings were recreated from memory in 1951, because the originals were lost during the war. Such documents generated by the inventor are

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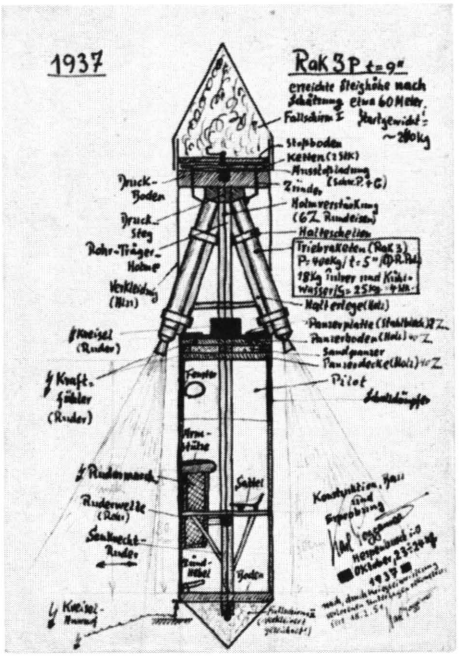
* *Der Luftweg*, June 10, 1928, Issue 11, p. 120.

† *Die Umschau*, 1928, p. 883.

difficult to evaluate without any further proof or references. But for the sake of completeness they are still necessary in the present case.



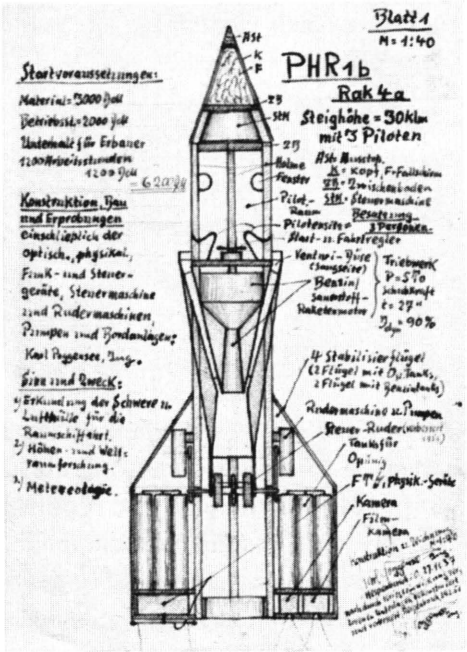


Figure 4–79 (left).[*]

Figure 4–80 (right): About this drawing Karl Poggensee said that he reconstructed the draft made on November 27, 1937 in 1951 with some improvements.[†]

IV. Conclusion

On 25 November 1929, Karl Poggensee summarized his career by saying: "From fireworks rockets via meteorological rockets and rocket mail to space rockets!"[56]

Starting from these premises Karl Poggensee described his life's achievements in 1969 by saying:[57]

> ... The first thrust trials were made with fireworks rockets and the powder of such firecrackers in an empty cartridge case on a postal scale; the first live thrust measuring trial was then executed while wearing chain gloves, it resulted in the distinction between "end burner" and "core burner." Applying the Oberth effect, three different fireworks rockets then led to the first perfect flight of a three staged rocket in January 1930. The fireworks rocket progressed to become the black powder rocket with 5 tons of thrust, next

[*] Poggensee, Part 2 – 003.

[†] Poggensee, Part 2 – 004.

was the nitro-cellulose powder rocket with up to 6 tons of thrust, between these two there was the gas-powered rocket with conical combustion chamber and spark plug with oxygen from a cylinder + acetylene, gasoline, benzene, methylated spirit as well as liquid-solid propellant with solid oxygen carrier and gasoline, benzene, gas-oil, turpentine or methylated spirit as liquid fuel and a hypergolic propellant of nitric acid and turpentine. The double section solid propellant for which a patent of the Deutsche Reich was granted in 1934 as a signal flare, did not mark a financial breakthrough. Several electrical engines using petroleum as fuel could not generate the thrust performance required for launching a rocket from the ground. --- All of these, sometimes quite cumbersome, trials served to provide the author with more information about his concept of a spacecraft following the intense discussions with his teachers at Ingenieur-Akademie Oldenburg. The comprehensive evaluation of all investigations led to a rocket fuel that was granted a patent by the Federal Republic of Germany and permitted the construction of the above-mentioned regular engine for a solid-propellant rocket with constant, immediate re-ignition. This engine can be maneuvered in the same way as all liquid propellant rockets. One version of the special impulse is equal to that of the liquid oxygen-hydrogen engines and in another version it is superior to them. The trial of this engine on a test station is still outstanding, because of a financial collapse.

Contrary to the prevailing opinion at the time, Karl Poggensee opted for a solid-propellant rocket as propulsion for spaceflight. Although he lacked adequate financial support Poggensee succeeded in making his own solid-propellant rocket engines and achieved quite impressive results for that time and age. At the outset, he was not so intent on reaching maximum altitudes, but rather on perfecting the technology behind his payload of apparatus. Some of these devices were radio-controlled and communicated by radio. Other than many of his contemporary colleagues he succeeded in making the rocket fly upwards vertically straight from the ground, without any launching pad. Also, his altimeters and release devices for the parachute worked most of the time, which was not the case in his colleagues' experiments. Within his financial possibilities Poggensee also experimented with gaseous and liquid propellants and his achievements were significant, considering the circumstances.

He finally succeeded in implementing all known advantages of liquid propellants also in solid-propellant rocket engines. Rockets like Scout and Vega show us today that space rockets can also be made with solid propellants.

This chapter intended to describe Karl Poggensee's work up to the mid-1930s. Another paper will be dedicated to relating his cooperation with the German Army Weapons Agency at the end of the 1930s, to provide further information beyond what is contained herein on his work in Peenemünde, on his contribution to the resumption of rocket trials in Germany in the early 1950s as well as his plans to send his own German satellite into space together with A. F. Staats.

Although only very few documents are available to illustrate Karl Poggensee's achievements, they suffice to portray them sometimes in more, sometimes in lesser detail. Poggensee never won the recognition he would have deserved in view of his achievements, for one, due to his modesty and secondly, because space can only be conquered with liquid-propellant rockets.

In the end Poggensee proved to be right with the motto for his life: *From fireworks rockets via meteorological rockets and rocket mail to space rockets!*

Figure 4–81: Karl Poggensee in the mid-1950s.*

Acknowledgments

My special thanks go to the following persons without whose cooperation or support this chapter would not have come about:

Marc Hillrichs, Procurement of Karl Poggensee's estate
Martin Frauenheim, Newspaper clippings, correspondence with Ms. Poggensee
Maximilian Heibutzki, Staatsarchiv Bremen
Frank H. Winter, Correspondence with the German Army Weapons Agency
Ulrich Bremer, Family documents, clippings from Weser-Kurier
Ursula Mock, Proofreading
Elke Limberger, Translation

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