

History of Rocketry and Astronautics

**Proceedings of the Fifty-Third History Symposium of
the International Academy of Astronautics**

Washington DC, USA, 2019

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AAS History Series, Volume 52

A Supplement to Advances in the Astronautical Sciences

IAA History Symposia, Volume 39

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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 2022

ISSN 0730-3564

ISBN 978-0-87703-681-4 (Hard Cover Plus CD ROM)
ISBN 978-0-87703-682-1 (Digital Version)

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 12

The Mars Project 1948 to 1956*

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Abstract

In 1948, Wernher von Braun conceived that he would inspire American interest in spaceflight by writing a novel about a mission to Mars. The underpinning of this story would be a very careful and detailed work up of the technical aspects. As the novel was being written, while at Fort Bliss, Texas, a technical appendix was assembled with help of six colleagues from Peenemünde. Examined here are some technical aspects of this Mars mission, in particular the evolution of the vehicles and their technical realization. What started as the design of a mission to Mars evolved into the large-scale concept of manned spaceflight, the design of earth to orbit ferry ships, a space station to support orbital assembly of fleet to Mars. The architecture for a Mars mission provided the method for exploration of the Moon. There was a steady evolution of vehicle design and mission configuration until a final expression was presented in 1956.

I. Introduction

In 1948, Wernher von Braun conceived the idea that a “hard science” science fiction novel would fire the public imagination to bring forth an era of

* Presented at the Fifty-Third Symposium of the International Academy of Astronautics, October 21–25, 2019, Washington, DC, United States. Paper IAC-19-E4.2.03.

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manned spaceflight [1]. That novel could not be sold in 1949, it was not published until 2006, but the technical background of the novel generated a sensational magazine series and popular three TV programs that had a strong influence on the careers of young people in science and engineering.

II. Project Mars

II.1. The Technical Appendix

From 1945 to 1947, Wernher von Braun and a group of Peenemünders had help with using V-2s for high altitude research and a few other projects. In 1947, von Braun hit upon the idea that he might stir up enthusiasm for manned spaceflight by writing a science fiction novel. It seems the basic idea was a bit of an analog to Columbus, put three manned ships on Mars, total crew approximately seventy men (Columbus had more than this, but the rough number is similar), further this big expedition provides redundancy.

Discussions of interplanetary flight had been common at Peenemünde, seemingly, for the novel von Braun decided to assemble the technical aspects first. It is not clear if he assembled a group of experts are consulted separately but this group of engineers and scientists came together:

1. Krafft Ehrlicke, also a spaceflight visionary with an expertise in astrodynamics
2. Dr. Hans Friedrich, guidance, navigation, and control expert
3. Dr. Josef Jenissen, Aeronautics
4. Dr. Joachim Mühlner, Electrical Engineer
5. Dr. Adolf Thiel, Aeronautical Engineering and Mathematics-Physics
6. Dr. Carl Wagner, Physical Chemistry



There must have been an outline of the technical subjects; it seems early on von Braun decided the Mars Fleet should be assembled in orbit. First order of business was a “ferry” ship to establish a stepping-off point, which would be a space station in Earth orbit. The ferry evolved from the A9/A10 manned Aggregat family, which was never built. The full orbital vehicle would have used fifty

200 metric ton engines and have been capable of boosting over 10 metric tons of payload into orbit. The liquid oxygen/alcohol propellants of the V-2, was moved to nitric acid/hydrazine propellants. These were corrosive and toxic, but self-igniting and could be stored and loaded at ambient temperatures—no handling of cryogenics was required. The initial ferry was a somewhat squat design of three stages the third stage being a swept wing reusable vehicle. Stages one and three would be recoverable.

The transportation node is a space station evolved from concepts published in the late 1920s. The station for the novel is from a study by von Braun in 1946, that used twenty cylindrical sections, each about 3 m in diameter and 8 m long, to make up a toroid. The Scientific Appendix is a close packed study of details about spacecraft and space station structures, propulsion, re-entry thermodynamics, astrodynamics, and electromagnetic communication. Even the space taxis called “busy bees” are outlined in the novel’s appendix.

II.2. The Novel

The title page to the manuscript of the novel: *Mars Project, Ein technischer Zukunftsroman*, Wernher von Braun [2]. It is not clear why it is in mixed English and German (see Appendix, Figure 12–9). One translation would be *Project Mars, A Technical Science Fiction Novel*, which is a little awkward, when published in 2006 it was *Project Mars, A Technical Tale* [2].

As a science fiction novel, it is a bit flat footed, much of exposition is pedantic, could be characterized a *Popular Mechanics* science fiction. It is not an awful read; there was pulp science fiction at the time that was worse. On the other hand, it is known that von Braun got copies of John Campbell’s science fiction magazine. Astounding during World War II. It is odd that von Braun complains, on page nine of the novel:

With the utmost care I have avoided delving into the realms of fantasy in describing physical conditions or phenomena encountered on the trip to Mars, nor have any assumptions based solely upon vague theories been used. No “miracle chest” from which the presiding genius produces at will “death rays” or “cosmic energy” will be found aboard my spaceships. This is in contrast to so many science fiction stories which rely for their plausibility upon mysterious knowledge springing from the brains of some intellectual superman. My ships are propelled by compounds well known to the chemical fraternity. They are constructed of familiar materials. Even their equipment is built up around presently familiar methods and procedures. In other words, they are but a projection, an extrapolation, a natural development of a still youthful but solidly established technology.

Astounding had changed the face of science fiction prose; authors like Isaac Asimov and Robert Heinlein (others) were publishing hard science fiction

that was well told. Attention was paid to solidly established technology, at least when considering exploration of the solar system. The novel was rejected by eighteen US publishers in 1950 [3].

There is no indication that von Braun read Robert Heinlein's 1950 novel-ette *Destination Moon*. As a story it is quite like *Project Mars*, except Heinlein show spaceflight working and does not lecture much about how it works. One wonders what von Braun thought of *Destination Moon*, the movie, when it came out [4].

A rewritten version of the novel was published in 1952 in German with an introduction by von Braun even though he did not approve of the new novel [1, 5].

III. The Mars Project

The novel was sent to an engineering student in Berman, Heinz Kölle in 1950 who was a member of a new spaceflight society, GfW (Gesellschaft für Weltraumforschung). Kölle passed the novel to publisher Otto Bechtle. Bechtle said he would publish the novel if he had it rewritten; von Braun agreed to this but was so unhappy with the result that he only wrote a foreword the book. However, both Bechtle and Kölle were interested in publishing the scientific index. The GfW published, as a supplement, the appendix, reorganized, as *Das Marsprojekt* in 1952. A year later, the University of Illinois published a translation, *The Mars Project 1953* [6,7].



Figure 12–1: Monographs *Das Marsprojekt* (art by Heinz Hähnel) 1952 and *The Mars Project* (1953), artist unknown.

It is interesting that the Mars landing “boats” and supply ships on the covers are essentially the final designs and drawings much have been supplied by von Braun. The University of Illinois edition has more detail, in fact on the back cover on the out bound cruise configuration of a landing boat with the stored wings, a detail not in the German edition.

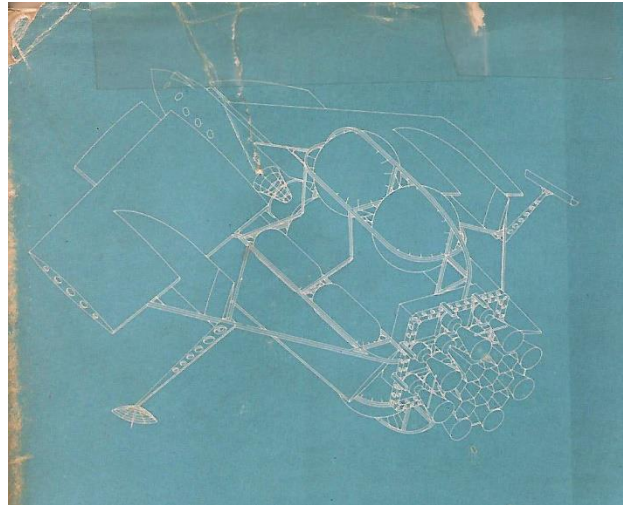


Figure 12–2: Back cover of *The Mars Project* (1953) with Landing Boat illustration.

The little *The Mars Project* was unlike any nonfiction spaceflight book before it. The scale of the mission is breathtaking. The attention to detail is astonishing. The six chapters describe the three-stage ferry vessels for building the ten-ship fleet. It is curious that in the 1953 edition no mention is made of the space station as a node, in the novel this is quite clear. Chapters b and c describe the Mars fleet and that is assembled in orbit (the space station orbit). Many tables and diagrams layout the details of the three landing boats and the seven supply and return ships. There is a schematic diagram of the supply ships but not for the ferries and landing boats. Unlike the appendix to the novel the space station and the taxis, called busy bees, are not described. One table is quite startling.

Table 31 has a lot of interesting numbers, but the required number of ferry flights all done in eight months implies there approximately four Saturn V launches a day for that period! In the novel, two ferries are launched at a time. Approximately 36,000 metric tons of nitric acid/hydrazine is delivered to orbit. The assembly of ten ships in orbit is described in the novel, which seems to take place from a standing start to fleet launch in a period of five years. One does wonder how many space suited workers it takes to put together 1,645 metric tons

of spacecraft. No matter how prefabricated or how many EVA hours are spent. It is impressive that in the mission weight tables even the mass of food wrappings is estimated.

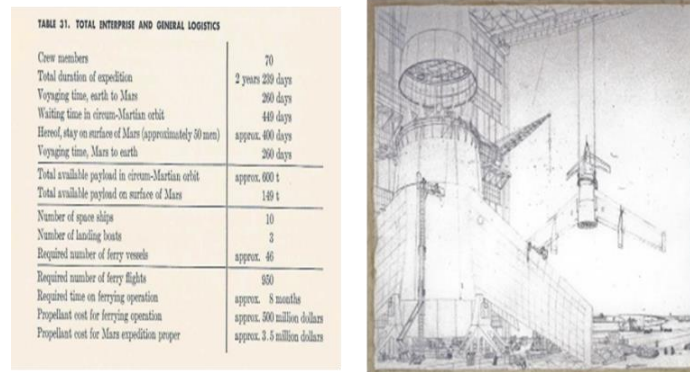


Figure 12–3: Logistics and illustration by Rolf Klep.

The monograph has a lengthy discourse on the astrodynamics of escape from Earth orbit, cruise to destination and the capture maneuver at Mars into orbit. He had an expert to discuss this with Krafft Ehrlicke (though Friedrich may have been knowledgeable too). It interesting to compare the following figures from the novel appendix and Ehrlicke’s 1962 book *Space Flight: II—Dynamics* [8].

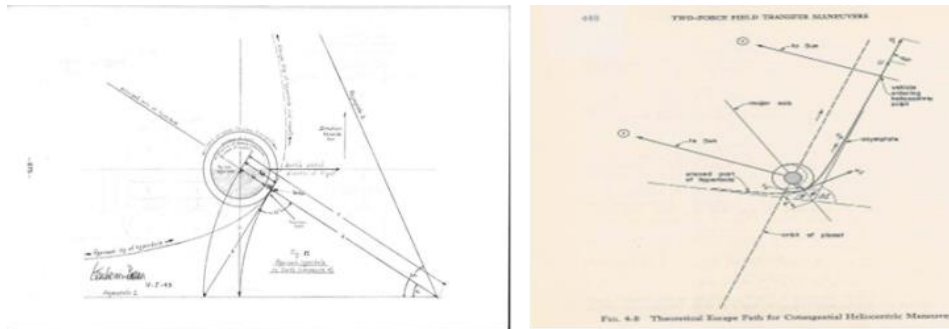


Figure 12–4: Take off orbit: *The Mars Project* compared to a diagram in Ehrlicke’s book on astrodynamics.

Lastly for this section, I would like to note that I interviewed Dr. Joachim Mühlner in 2002, electrical engineer, who did the calculation for interplanetary communications. See chapter f in the Appendix, Figure 12–10. It is a clear expo-

sition, based on the technology in 1948, how the expedition stays in contact with the Earth and each other.

IV. The *Collier's* Series

In the early 1950s, *Collier's* magazine was interested in publishing an article about spaceflight. Assistant editor Cornelius Ryan was assigned to cover a couple of spaceflight meetings, he was skeptical but was convinced by von Braun, astronomer Fred Whipple, and upper atmospheric scientist Joseph Kaplan of the feasibility. This led to Ryan assembling a group that added Willy Ley and artists Chesley Bonestell, Rolf Kelp, and Fred Freeman.

The main hardware in the series evolves from Technical Appendix and the monographs. The details of the ferry ship are now elaborated. Space suits, training, and emergency escape issues are addressed, and even some detailing of the interiors of the spacecraft is illustrated. In the seventh issue of the series the topic in the air, at the time, of an artificial satellite is addressed [9].

The ferry ships are used first to build a space station and then assembly of a Lunar mission. The Lunar exploration mission is not a part of either the novel or the monographs. The Lunar mission derives its ships from the passenger ships in *The Mars Project*. The space station is developed in much more detailed fashion. Ley and Whipple give some technical input to the von Braun's ship design. The equipment for exploration and habitation for lunar exploration is developed and presented. There is no lunar project monograph to accompany the extensive design presented.



Figure 12-5: *Collier's* series team. Left to right, Willy Ley; Fred L. Whipple; von Braun; artists Chesley Bonestell, Rolf Klep, Fred Freeman; and Cornelius Ryan (not shown Heinz Haber and Oscar Schachter).

Issues 5 and 6 are rather unusual; their presentation of training of men for spaceflight, both the ordinary tasks and escape in emergency conditions was not the usual part of expositions on spaceflight. The word *astronaut* is not common usage yet and noticeable no women are included in the crews.



Figure 12–6: Covers of *Collier's* for Series.

March 22, 1952	Man Will Conquer Space Soon!
October 18, 1952	Man on the Moon
October 25, 1952	More about Man on the Moon
February 28, 1953	World's First Space Suit
March 7, 1953	More about Man's Survival in Space
June 27, 1953	The Baby Space Station: First Step in the Conquest of Space
April 30, 1954	Is There Life on Mars?

Table 12–1: Topics for Spaceflight series.

The April 30, 1954, issue of *Collier's* is the only full visual presentation of *The Mars Project*, one might say the novel plus the technical index. The assembly of the ten-ship fleet in Earth orbit and operations in Mars orbit are depicted in what are probably the two-best, large-scale paintings Chesley Bonestell ever did for spaceflight. Some equipment described in the novel is also realized in Fred Freeman illustrations. Unfortunately, the original article written by von Braun was compacted by Cornelius Ryan to the point of making the narrative a bit sketchy [9].

V. The Viking Press Books

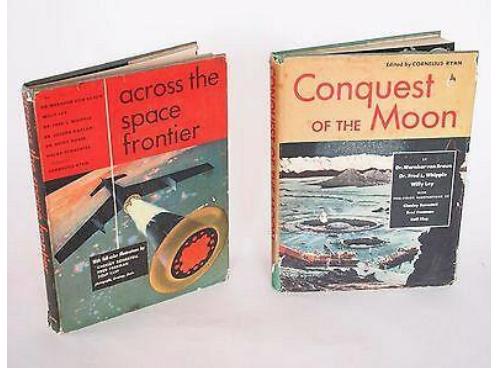


Figure 12–7.

Approximately the first four issues of the *Collier's* series appear in two books: *Across the Space Frontier* and *Conquest of the Moon*. The chapters of *Across the Space Frontier* are delineated by author, Wernher von Braun, Willey Ley, Fred Whipple, Joseph Kaplan, Heinz Haber, Oscar Schachter, and Cornelius Ryan listed as editor. The *Conquest of the Moon* has a collective authorship of Wernher von Braun, Fred L. Whipple, and Willy Ley, also edited by Cornelius Ryan. All have illustrations by Chesley Bonestell, Fred Freeman, and Rolf Klep. The text in both books is an augmented version of the articles that appeared in *Collier's* and the artwork is same as the magazine. Chesley Bonestell was not happy that the Viking books were printed on plain paper and complained to Cornelius Ryan about it [10, 11].

The April 30, 1954, issue of *Collier's* had an article titled “Can We Get to Mars?” It should have been the next book, but this did not happen due to several complications. Some seem to stem from von Braun and Bonestell being unhappy with Ryan’s book standards and also because von Braun wanted to respond to the criticisms of the magnitude of the original *The Mars Project* [1].

VI. The Disney Series

In June 1954, Disney, by way of Willy Ley, convinced von Braun to come work on an episode of the new Disney television show; this turned into three episodes in the long run [12]. The shows were a visual narrative of the *Collier's* series, or at least part of it pitched at a wider audience of all ages. The ferry ship and the building of the space station are presented by von Braun in the first episode. The Moon episode features a live action sequence of a circumlunar mis-

sion. It is interesting to see the wingless ogive of the classic von Braun ferry as the basic structural element.

The third episode is a mission to Mars, “Mars and Beyond,” von Braun had rethought *The Mars Project* and was quite busy in 1957. So, von Braun handed off to Ernst Stuhlinger for a completely reformulated mission, it was a manned mission with six electric ships to Mars, a very different technical implementation.

VII. The Exploration of Mars

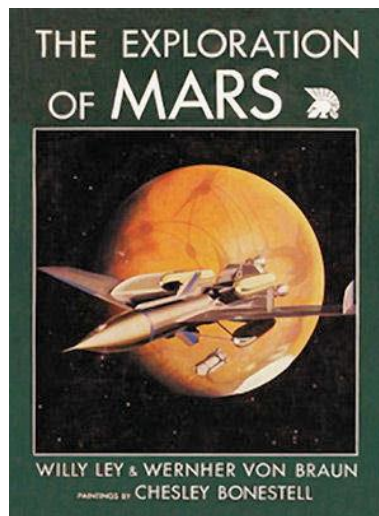


Figure 12–8. The book *Exploration of Mars*.

The second episode of the Disney series was broadcast in December 1955. Willy Ley and Chesley Bonestell convinced von Braun to issue a book on a manned Mars expedition. For this book, von Braun reworked the giant ten ships to two ships. The mission goes from seventy down to twelve, the landing boat takes down an expedition of nine, while three stay with the return passenger ship. The two-ship fleet is built using the smaller ferry ships, which first appear in the Disney series.*

* One notes that the first painting in the book by Bonestell is the two-ship assembly in the space station orbit, but with the old swept-wing ferry of *The Mars Project*, while the book narrative describes it being done by the new-style ferry.

Also, the time scale of the mission is the same but with probably a smaller exploration footprint. *The Exploration of Mars* [13] contains a few pages of a scientific appendix, a more condensed version of *The Mars Project*. * References [14,15,16] contain good descriptions of the differences contained in *The Exploration of Mars* against *The Mars Project* [7].

There is correspondence throughout 1953 that von Braun and Krafft Ehrlicke were reworking the Mars mission with various ideas about propellant selection and mission planning [17].

VIII. Conclusion

A novel written by Wernher von Braun not published for fifty-seven years had an important life as a generator of visions of manned spaceflight in the 1950s. This, in turn, influenced the realization of manned spaceflight in the United States in the 1960s. [Note: The entire *Collier's* series was published in digital form.]

Appendix

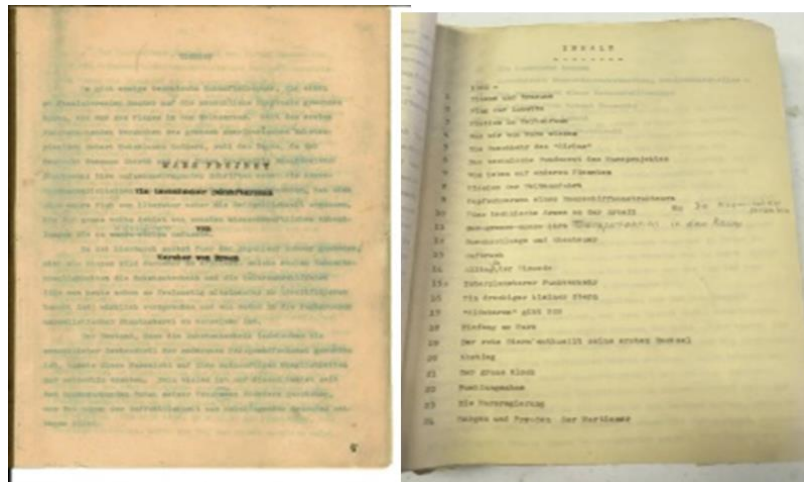


Figure 12-9. Title page and table of contents for *The Mars Project*. Courtesy US Space and Rocket Center.

* Note: In 1960, von Braun did get a portion of *The Project Mars* published in *This Week*. It was called “Life on Mars” and was about first contact with Martians.

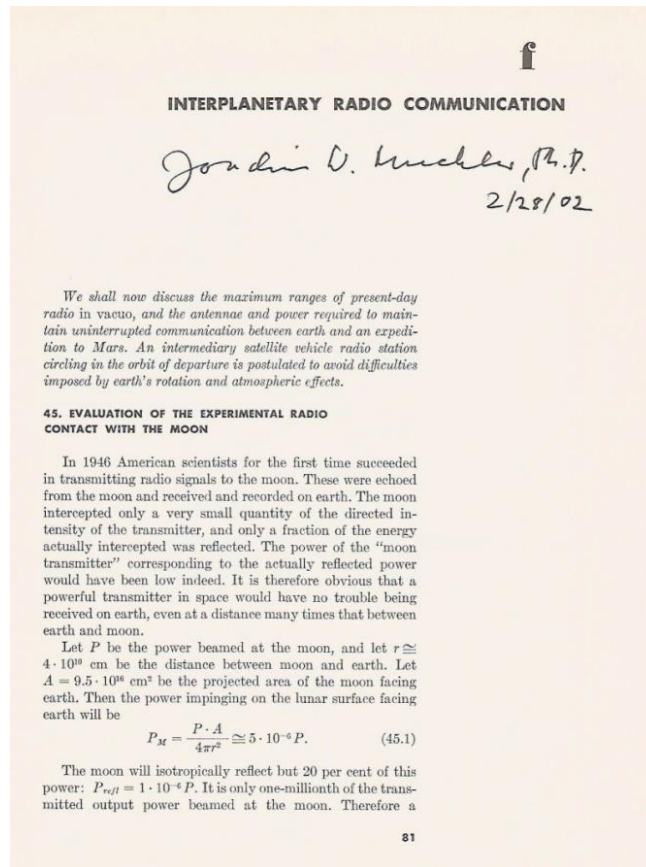


Figure 12–10. Chapter f of *The Mars Project*, University of Illinois Press, 1953, autographed by Dr. Joachim Mühlner (author’s personal copy).

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- [1] Michael J. Neufeld, *Von Braun: Dreamer of Space, Engineer of War*, New York: Alfred A. Knopf, 2007.
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- [9] The *Collier's* Spaceflight Series
- March 22, 1952: "Man Will Conquer Space Soon," eight articles
 - October 18, 1952: "Man on the Moon," three articles
 - October 25, 1952: "More about Man on the Moon," two articles
 - February 28, 1953: "World's First Space Suit," two articles
 - March 7, 1953: "More about Man's Survival in Space," one article
 - March 14, 1953: "How Man Will Meet Emergency in Space Travel," one article
 - June 27, 1953: "The Baby Space Station: First Step in the Conquest of Space," one article
 - April 30, 1954: "Is There Life on Mars?" two articles
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