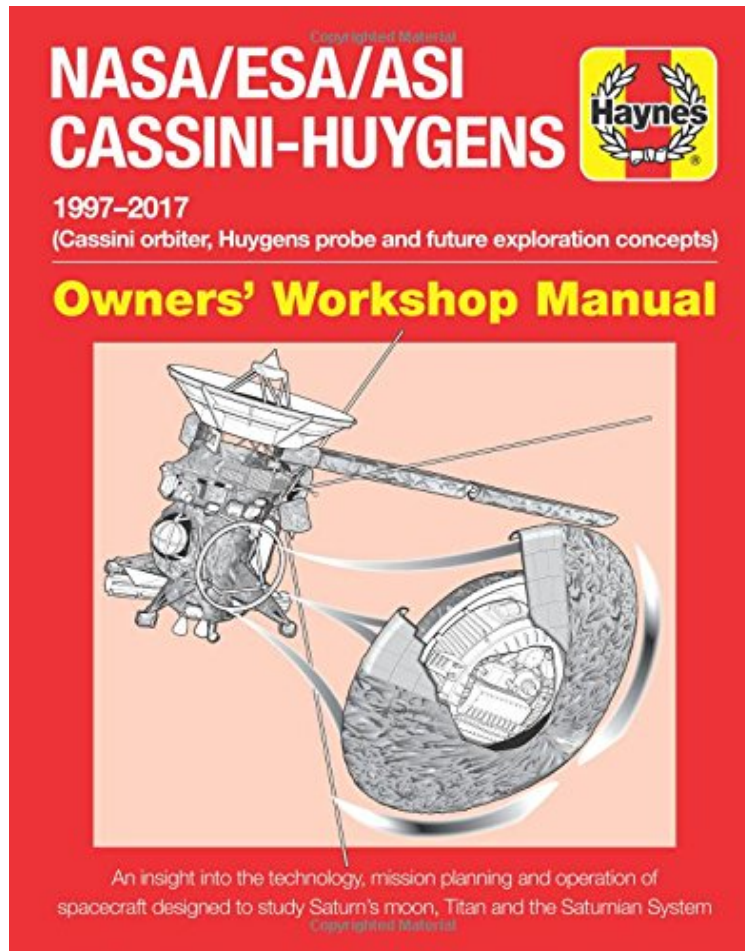


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## **NASA/ESA/ASI Cassini-Huygens: 1997 onwards (Cassini orbiter, Huygens probe and future exploration concepts) (Owners' Workshop Manual)**

*Ralph Lorenz*

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By Daryl Carpenter

Although Haynes still occasionally pumps out some really lackluster rehashes that are more photo-book than "technical manual," their space books have definitely improved over the last couple years. I've gotten a little burnt out on the series (to be fair, there's nothing wrong with weaning yourself from an addiction), but books like this give me hope that it won't die out anytime soon. The level of detail in this book is roughly comparable to their recent Mercury spacecraft manual - in short, novice readers stay away, serious space geeks take note. The book opens with a brief overview of the genesis and design of an unmanned Saturn/Titan probe in the mid-80s through early 90s. The next two chapters (roughly 70 pages) provide a wealth of detail on the Cassini orbiter and Huygens probe. Each of the major spacecraft systems and instruments is described in fairly rich technical detail, accompanied by a large number of "behind the scenes" photographs and technical diagrams. The rest of the book is essentially a chronological history from spacecraft assembly, through launch and cruise, Saturn arrival, Huygens landing, and ongoing exploration. The final chapter provides an interesting look at possible future missions to Saturn and Titan, including miniature submarines and dirigibles. This is probably the densest and most detailed space book Haynes has ever published. There's a flowchart showing how the AACS functioned, detailed explanations of what the DCSS, FPGA, MMRTG, and VIMS do, exploded views of the NAC of the ISS, and even a diagram showing the relationship of the BTA to the PMS. Lest anyone thinks I'm being sarcastic, the glossary provides explanations of roughly 250 acronyms. Quite honestly, this book can be a bit exhausting in places, and I found myself taking breaks from it rather often. The second half is definitely an easier read; the technical detail is still present but not quite as heavy, and everything described earlier on has a part to play in a narrative history of the spacecraft. The author is a planetary physicist and engineer who was heavily involved in the design of the Huygens probe, so it's not really surprising how detailed this book is, or that it focuses on the Titan/Huygens side of things. There's no human interest material, no "how we fixed it at the last second" drama, or much in the way in spectacular imagery. Although it can be awfully dense at times, this book is definitely worth checking out for anyone looking for a straight no-BS look at the engineering behind the Cassini spacecraft.

The descent of the Huygens probe to the frozen surface of Saturn's moon, Titan, in 2005, marks a pinnacle achievement in space exploration - the most distant planetary landing ever made or presently foreseen. The Huygens probe's seven-year voyage through space (past Venus, Earth and Jupiter) attached to the Cassini orbiter, its arrival at Saturn and three-week dormant coast to Saturn's moon, Titan, culminated in Huygens' hypersonic entry into Titan's atmosphere, 2.5-hour parachute descent, and continued operation for 72 minutes on the surface transmitting data back to Earth via the Cassini orbiter. Saturn has 62 confirmed orbiting moons, but Titan (which is larger than the planet Mercury) was chosen as it has two major components of Earth's atmosphere - nitrogen and oxygen - but the oxygen is thought to be frozen as water ice within the body of the moon. If Titan received more sunlight, its atmosphere might well resemble that of a primitive Earth. The hope is that study of the data gathered about Titan will help us to understand how the Earth evolved, and possibly what led to the evolution of life.

About the Author Dr. Ralph Lorenz is a planetary scientist on the Principal Professional Staff of the Johns Hopkins University Applied Physics Laboratory (APL) in Laurel, MD, USA. He is a member of the Cassini Radar team, and helped to develop the Huygens Surface Science Package. He is involved in formulating mission and instrument concepts at Titan, Europa, Venus and Mars, and served as the Project Scientist for the Titan Mare Explorer (TiME) Discovery Phase A study, a proposal to sail a capsule on Titan's seas. He has played a major role in the definition of a range of US and European Titan mission concepts, from airships and hot-air balloons, through airplanes, landers and even a submarine.