Renaissance Man: A Conversation with Joachim P. Kuettner, Director of Project Mercury

When reflecting on the years that marked the beginning of the manned space program, we often zoom in on but a few individuals: the astronauts, or perhaps the mastermind himself, Wernher von Braun. We overlook the multitude of talented people it actually took to open up a new frontier as vast and unforgiving as space. Now they recede still further into anonymity, their names and faces receding into the fog of the past. Yet as we begin to look ahead to our future in space - to the moon, Mars and beyond - it is fitting that we consider more of the people who got us this far. We should ask ourselves what it was about those who came before that made them so successful.

In this age of specialization, we must recognize and appreciate some one whose mind could not be bound to a single discipline of study but who exercised an insatiable appetite for discovery and for tackling unanswered questions wherever he found them. He is one who can be described as a true renaissance man having earned Ph.D.s in fields as diverse as law and meteorology, flew as a test pilot for powered aircraft and set world records in gliders. It is his ability to take in the larger picture - one not bound by a particular discipline or field of study - that sets him and many of his contemporaries apart from their successors.

Joachim P. Kuettner is truly a remarkable man. Just a few of the posts he's held are Project Manager for the Mercury-Redstone program and member of the Mercury-Redstone Flight Safety Review Board; Chief of the Saturn-Apollo Systems Integration Office and Co-Chair of the Apollo Crew Safety Panel; Chief Space Scientist for the National Environmental Satellite Center; Scientific Director of the Mount Washington Observatory; and Chairman of the AIAA UFO Subcommittee.

In 1955, he won the FAI (World Air Sports Federation) Lilienthal Gliding Medal. In 1981, he was entered into the National Soaring Hall of Fame. A prize for the first glider flight in a straight line for 2000 km was named after him. He also holds two world altitude records for flights in gliders, one of which was in an open cockpit to 23,000 feet!

It was an honor and pleasure to speak with him and get a few insights about where we came from and where we might be headed in the space program. A soft-spoken, unassuming gentleman, he isn't quite what one might expect from a man of such a massive intellect. He exudes gentle nobility that left this interviewer with the keen sense of having been in the presence of greatness. He's lead a life of discovery and adventure of which most of us can only dream.

We caught up with him at his current post where he serves as the Distinguished Chair for Atmospheric Science and International Research with the University Corporation for Atmospheric Research (UCAR). Here's what he had to say:

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Communicator: You have had a diverse career in both science and engineering, earning doctorate degrees in both law and Physics. How did you come to make the transition from law to science?

Kuettner: I already had the intention to go into science when I was 10 or 12 years old. Somehow, under the influence of my parents, especially my mother, I went into studying law and economics. She thought it offered more possibilities. My interest in science from an early age was primarily in meteorology.

Communicator: And what sparked that interest?

Kuettner: Certain observations. For example, I remember watching, during the night, a thunderstorm with a lot of lightning but without thunder. I've never encountered that again, but a few years ago it was discovered that some thunderstorms make a discharge upwards into the ionosphere that doesn't create any thunder. They are called "sprites." This is an example of the kind of thing that interested me, but somehow, I got sidetracked.

There was another factor in my choosing science. I stopped the law career when Hitler abolished the separation of the judiciary and the executive powers. There was no way to do legal work without being immediately involved in politics. This was a contributing factor in my giving up that career. Finally I embarked on flying sailplanes. This had become a highly popular sport in Germany after WWI, when flying powered aircraft was prohibited by the Treaty of Versailles. In the early 1930s it developed into a research tool for exploring atmospheric circulations and I began to participate in its scientific adventures.

Communicator: You were a test pilot in Germany in the early 1940s. Can you tell us about that?

Kuettner: Most of the time I spent in flight testing during WWII was connected with a six- engine transporter plane -- the biggest one that existed, at that time, in the world. It was called the "Gigant", designed by Messerschmitt. I became head of a flight test department that was attached to the Zeppelin works and was primarily concerned with the development of these planes, called the "Me 323."

Communicator: Can you tell us about your experiences setting world altitude glider records to 23,000 feet in 1937 and 43,000 feet in 1955? The first flight was in an open-cockpit "Rhoen Buzzard". How did you manage that one without oxygen?

Kuettner: When I switched from law to meteorology, I had to have a way to make some money. I accepted an invitation to start gliding schools in some Scandinavian countries; Finland and Norway, in particular. I studied meteorology in Finland at the same time, since some of the leading meteorologists of the day were there. For my doctoral thesis I selected the study of the mountain wave phenomenon. It had just been discovered by glider

pilots near the Riesengebirge mountain range, close to where I grew up. (In German the name means "mountain of the giant", referring to the giant named Rübezahl who, according to legend, frightened people in Silesia.) Although it was not a very high mountain range, I was able to make my dissertation with the first description of the mountain wave. One unanswered question had been "do they reach all the way to the stratosphere?" My theory concluded that they did. I decided to see for myself how high they reached. The difficulty was that my altimeter only went to 10,000 feet. Luckily, the device that recorded temperature and altitude, called a "meteograph", worked properly and we were able to analyze the data and to determine the height I had reached. During the flight I really didn't know how high I was; I just went as high as I could. I ran into an oxygen problem - I got all the symptoms we now know to be "hypoxia." At that time, however, the symptoms were not well known, since no one had ever flown this high in a glider.

Communicator: The temperature was also extremely cold - around minus 35 degrees Celcius. Had you anticipated the extreme cold and dressed for it?

Kuettner: Not really. The wave appeared earlier in the year than I expected and I was not well dressed for the flight. This sailplane had an open cockpit, but I didn't expect that I would go that high. At that time, no one considered taking oxygen into a glider. It was an interesting experience.

Communicator: So you started to recognize that you were having certain symptoms and terminated the flight for that reason?

Kuettner: Yes. I had double vision. I saw two suns and almost lost control. I couldn't feel my feet. The sailplane was hardly climbing, so it was definitely time to go back down. At the peak altitude of 23,000 ft (as recorded by the meteograph) this glider had a sinking speed of over 2 m/s, so the vertical air currents sustaining the glider must have been higher than 2 m/s or 400 feet a minute. As I was only 2 km from the tropopause at my highest altitude, it was clear that the waves must have reached the tropopause.

It turned out that this was a world record, exceeding the previous glider record for absolute altitude by almost 5,000 feet; but it wasn't submitted because of political difficulties I had at the time. Of course, the submission needed to be done by government agencies, and they didn't submit it.

The flight I made in 1955 should have been another world record for a single-seat glider. However, according to the standards set by the FAI, it was only 4.5% higher than the existing record, and to be a new, official record it needed to be 5% higher. The flight was made in the mountain waves of the Sierra Nevada during a three-year research program. It was called the Sierra Wave/Jetstream Project and studied both the mountain wave and rotors - rotating air masses that form under the wave and are extremely turbulent. This was a continuation of the research we had started in Germany. One of the reasons I was wanted in the US was to help with this project. This flight did penetrate the tropopause into the stratosphere. The temperature was -70¼ Celsius, but we were well equipped this time. The glider was a Schweitzer 2-25,

a newly developed, high-performance ship.

Communicator: What was your most frightening moment while flying?

Kuettner: I think it would be the break-up of the six-engine Me-323 Gigant at 25,000 feet. That was about it's ceiling, and at that point it started to "flutter", and finally broke apart. I made it out when it was in a reverse spin. My parachute would not open because the rip cord was caught in cables and oxygen hoses. I fell a very long way - down to 600 feet before I finally was able to open my chute. It was a fairly tense moment, because as I fell, I knew I had either 50 seconds or 50 years left in my life. Many on board died.

Communicator: What brought you to the United States, and where did you locate?

Kuettner: A few years after WWII, I got an offer to go to the Air Force Research Center in Cambridge, Mass. From the end of the war until that time, I had been the Head of the Observatory on the Zugspitze mountain, the highest mountain in the German Alps. After three years at the observatory I decided to accept the offer and I moved to Boston.

Communicator: From 1958 to 1965, you joined the Marshall Spaceflight Center in Huntsville, Alabama as Director of the Center's efforts in the Mercury Project and later as Chief of the Apollo-Saturn System's Integration Office. What are the major accomplishments and difficulties you experienced in each of those posts? Weren't you part of Dr. Von Braun's team?

Kuettner: At that time, Dr. von Braun was the head of the Army Ballistic Missile Agency's (ABMA) Research and Development program, before he became Director of NASA's Marshall Space Flight Center in Huntsville, Alabama. I knew him from Germany, but was not part of the Peenemünde team. We were both glider pilots. Von Braun called me up in Cambridge and surprised me with the question, "Would you be interested in heading up our effort for the first manned space flight?" I replied, "Of course I would be interested, but I don't think I have enough experience." He answered, "Neither has anybody else." So, I decided to join him. We came up with the design of a sub-orbital flight using the Jupiter C missile, which was an enlarged Redstone. This project, which was proposed to - and later rejected by - Congress was practically identical to the Mercury sub-orbital project that came later.

Communicator: You're referring to Project Adam. What was its difference with Mercury?

Kuettner: There was very little difference, except that the spacecraft development for Mercury was done by a NASA spaceflight group, whereas Project Adam was proposed to have been funded by the DOD's Advanced Research Project Agency and carried out by the Army Ballistic Missile Agency (before NASA was formed).

Communicator: What were the challenges that you faced?

Kuettner: The main effort on the launch-vehicle side for Mercury was the so-called "Man- Rating" of the rockets and missiles. In order to carry a human payload, a surprisingly large number of modifications were required. The Redstone rocket had to go through 800 changes. At the Systems Office we integrated the Saturn rocket with the Apollo capsule. It involved the interface between our center, NASA's Houston Space Center and the astronauts. For example, Frank Borman and I were co-chairmen of the "Apollo Crew Safety Panel." That involved the "emergency abort system" and other safety aspects of Apollo.

I didn't stay until the landing on the moon. I was interested in the development of the design plans, and deeply involved in that, but when this became a huge management job with thousands of contractors, it was not what I wanted to do, and I decided to go back to the atmospheric sciences.

Communicator: Do you believe we are applying the lessons learned from the Mercury, Gemini and Apollo programs in today's space program? If not, what do we need to change?

Kuettner: That is a very difficult question. I think one could answer it this way: Enthusiasm and the adventurous spirit are, in my opinion, missing now. That is part of what has to be behind such an ambitious space program. I think that also the application of manned space flight is in some jeopardy. Unmanned planetary exploration seems to be in excellent shape, but we also have to remember that these programs were created many years ago. For example, to travel to Saturn takes six years, so that project began a decade ago. However, some decisions, like abandoning the Hubble, are very questionable. In general, my impression is that the public is not encouraged to have a positive attitude toward space.

Communicator: How can we turn that around?

Kuettner: Mainly by changing the president.

Communicator: What are your thoughts on the President's new vision for the exploration of the moon and Mars?

Kuettner: The question is "how serious this is?" since the time frame is so far in the future. There will be different decision makers in Congress and a different president, etc, that will have to carry the workload and budgets. Also, I wonder if the moon landing isn't a repetition of something that has already been done.

Communicator: Some feel that there are natural resources on the moon that we could use for the Earth. But you feel that we should bypass the moon and go straight to Mars?

Kuettner: That's right. You may need a base with zero gravity, but this is the task of an enlarged space station. Whether a stop on the moon in between is necessary or not, has to be studied very carefully. I am not convinced.

Communicator: After leaving the Saturn Program, we understand you returned to your atmospheric science interests, one of which was as Director of Advanced Research Projects at NOAA in Boulder, Colorado. What are your most memorable milestones and difficulties from that period?

Kuettner: When I left NASA, I then became Chief Scientist of the National Weather Satellite Center, at the time of the first geostationary weather satellites. The prediction of weather was limited to a few days at the time, but it was thought that numerical forecasts could possibly be extended to two weeks or so. That triggered a world-wide attempt to find out how to overcome any obstacles that prevented this. That is when the World Meteorological Organization (WMO) and its member countries came together and created the Global Atmospheric Research Program (GARP).

Among the leaders of this effort was Bob White, the founder and head of NOAA and also the President of the National Academy of Engineering. He asked me to consider going to the WMO in Geneva, because, as he said, "You now have the experience from Mercury and Apollo that you can apply to run these complex field projects." He said that was the kind of experience needed, since the upcoming projects were of such magnitude that they could not be afforded by any single country. They were "global projects to address global problems." We needed so many ships, aircraft, etc, that it had to be international, and that had not been done before. That's when I got involved with GARP. Its first project included over 70 nations, and we needed countries like the Soviet Union, with their many ships. We finally had 40 ships taking measurements, primarily of the ocean-atmosphere interface. We also had a fleet of aircraft contributed by different countries, and some special satellites. This project was called the GARP Atlantic Tropical Experiment (GATE) and was conducted over the Atlantic, in Africa and in South America. It was followed by other programs that addressed other questions. The next one was the Monsoon Experiment (MONEX), which I also headed as international scientific director. It was conducted over the South China Sea and Indian Ocean during 1979.

Communicator: What were some of the more notable discoveries that came out of these projects?

Kuettner: The mechanism of "air-sea interaction" that plays a decisive role in long-range weather prediction was clarified. Today's "coupled ocean/atmosphere models" are based on it. Among other results from GATE was the formation of the tropical "cloud clusters." These are huge areas of convection, usually over 1000 kilometers in diameter, that live only 12 hours or less. Some of them develop into hurricanes. The mechanism behind them is the "easterly wave." These atmospheric waves are between 1000 - 2000 kilometers in length, and travel around the world from east to west near the equator. The cloud clusters form in the troughs of these waves, and this is where many hurricanes are born. The question of which cloud clusters develop into hurricanes and which do not, was addressed. However, the main aspects of these projects were not ones that can be identified as "discoveries" in the normal sense. The understanding of the ocean-atmosphere coupling is what came out of GARP. The data that we collected then, in 1974, are still in use now.

Communicator: Given your wide scope of experiences, which would you say have been the most professionally rewarding in terms of accomplishments and experiences?

Kuettner: I think there are probably three. The first manned space flight is one. Unfortunately, it came just a few weeks after Yuri Gagarin's flight. That first manned space flight project (Mercury) was one of the most exciting, interesting and creative ones. During the launches of Alan Shepard and Virgil Grissom, my job was at the "booster console" of the Cape Canaveral Center. The second was GARP, including the many field projects that followed its creation. (I have been associated with about 20 of those over several decades.) Finally, I must say that from a personal sense of motivation, the use of gliders for atmospheric research was very, very interesting. I wish I could still do it.

Communicator: What are your thoughts on the recent and remarkable accomplishments made by private industry in space such as the SpaceShipOne flights, and do you feel private industry can or should play a larger role in space exploration?

Kuettner: Yes, I think it should. I think also, from the viewpoint of the spirit of exploration and adventure, which I think doesn't exist presently in the government and the public, even a modest effort like the one that was just done by Rutan's team is absolutely necessary. I think this is the way to go and to revive the spirit of space flight, for the coming great -- and expensive -- space adventures.