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The "Von Braun Paradigm" and Trends in the US Manned Space Program

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The talk that I am giving today may be useful in providing a context for Mr. Augustine's lecture which looks at current and future US Human Space Flight policy and I am about to give you a little tour of some earlier policy or attempts to have a policy for human space flight in the US influenced by the character that I have written about in the biography that I published three years ago, namely Werner Von Braun.

I am about to specifically address something that has been called the found-round paradigm. This term that was actually coined by a colleague of ours in Washington DC - he is now with the Space Studies Board of the National Academy of Sciences, in 1994-95 Dwayne Day coined the term in response to the failure of the space exploration initiative of 1989 into which I shall go further when I get to that point of the lecture. However, this was the attempt by the first President Bush to send a new policy for going back to the Moon, going back to Mars, and Day's comment was that said plan was fundamentally going back to the plan that Werner Von Braun had laid out in the 1950s. It had four fundamental elements - that we have a space shuttle, a space station, then we go to the Moon and then we go to Mars - in that order. This concept has been developed further by my colleague in the Museum Roger Launius who actually spoke at this conference last year, and he has proposed that it actually had more than four stages and other various details that do not really concern us here since I am talking more about the policy part than the history part of the story. But this concept has been employed by Space historians and when I set out to do this lecture my fundamental purpose was to understand whether this found-round paradigm actually worked, did it exist and what it was made up of and how much influence did it actually have. Can you actually prove that this was a determining influence on the way the US tried to go into Space?

Now of course it is essentially my story that the United States Human Space Flight policy has never adhered to Von Braun's paradigm but it has been influential at times on how the US tried to have its space program, its Human Space Flight

program. To go back to the beginning Werner Von Braun as you may know had been working for Nazi Germany as a chief engineer of the V2 ballistic missile program, was brought over to the US very quickly after the end of the war as the US scooped up a team of about 125 Germans to start working on American ballistic missile programs and other missile programs in the late 1940s and in the process sweeping under the rug many of the scandals that had taken place in Nazi Germany, including concentration camp labor.

Well, Von Braun was employed at first when he reached the US, in El Paso, Texas on the Mexican border at Fort Bliss, for the US army. There was no NASA. NASA was not even created until 1958 after Sputnik and in his spare time since budgets had been cut back and money was not available for an ambitious rocket program, he had time on his hands and he decided he was going to try to sell US people on a Space program.

In the late 1940s the space program was just a dream of the future, there was no space program except launching V2's into the upper atmosphere to gain a little bit of knowledge. This obsession with Space goes back to Von Braun's childhood in the Weimar republic in the 1920s, it was the first flourishing of Space travel ideas in the world particularly in the Soviet Union, in German speaking central Europe and the US, these were the areas where Space dreaming certainly started and the first theorists like Oberth and Tsiolkovsky first wrote and published books. He was obsessed with the idea of going into space, going to the Moon, in fact as I discovered in the process of writing the book, he really felt he wanted to lead an expedition to the Moon, he wanted to land on the Moon himself. That he was seized by this ambition led him into a bargain with the Third Reich but that is a story for another day.

As he began thinking about how to sell the American people on Space travel in the 1940s, he decided he would write a Science Fiction novel about how to go to Mars, aiming just to lay out the feasibility of sending humans to Mars, figuring if you could prove that it was feasible based on the extrapolation of 1940s technologies you could prove to people that Space travel was not just Science Fiction, not just a Buck Rogers fantasy but it could actually come about.

He sat down to write a feasibility study which is like a mathematical treatise imagining a trip to Mars and then he wrote a novel called Mars Project on this idea of sending humans to Mars and the first landing of humans on Mars. Well,

the novel was terrible - I mean Von Braun was incredibly talented, he was a great musician, he had many talents but novel writing was not one of them. The novel was never published until just a few years ago when a small Canadian publisher issued it. But no New York publisher would take the novel, and so the mathematical appendix was published in 1952 1953 as the Mars Project which you can still buy in German and in English. The Mars Project was this mathematical study which laid out the basic foundation for his ideas that you would have a wing space shuttle, a space station shaped like a wheel and that you would use that infrastructure in low-earth orbit to go to the Moon and to Mars. The real breakthrough that he had in Space took place in the 1950s and when Collier's magazine which was an influential magazine for the general public devoted some eight issues advocating Space travel, published between March 1952 and April 1954.

I think Space historians as real important in terms of trying to establish the credibility. It is interesting we are only at the beginning of the series, we are only 5 years before Sputnik but as far as many people were concerned Space travel was still a remote and European idea.

In this series Von Braun lays out this central infrastructure he thought necessary to go into Space. Interestingly, there is almost no anticipation of robotic space travel, unmanned satellites, in this early generation of Space advocacy humans traveling to Space was the whole point and unmanned Space travel was really not even considered very much, due partly to electronics being very primitive, computers were lacking and people could not do it, even fervent advocates could not imagine the sort of computerized electronics unmanned spacecraft we have. But they were obsessed with the idea of exploration and for them sending humans was the point. At the end of this series Von Braun laid out his program for the US and for any other country, for what he thought was human space flight for anybody: the logical way to go about it is build your winged space shuttle to take things into orbit, you would construct a space station and then go on to the Moon and to Mars.

As a result of the Collier series Von Braun received an invitation from Walt Disney Company, then just starting a new television series, very famous at the time. As part of this new TV series they decided to do programs about Space travel; these programs were first broadcast in 1955 and the last one was broadcast in December 1957 just after Sputnik. The first couple of shows about building space station, going into Space and to the Moon and back again were important since they legitimized

Space travel especially human travel, showing it was not a crazy idea.

Interestingly, as soon as the Space race came along Von Braun was the first person willing to give up his whole apparently logical way to go into Space and rush into going to the Moon anyway because he was really fascinated by the idea of Moon travel, landing on the Moon, he hoped to travel to the Moon himself but Space travel did not develop fast enough to ever make that a feasible possibility, still he repeatedly talked about a Moon expedition during his lifetime.

He talked about two ways: one is to assemble things in orbit, maybe by the space station, maybe not; alternatively, you go direct: would you just send a rocket directly to the Moon and land there? In fact it was the second idea that he published in a short book, he did have a success in publishing a short Science Fiction novella in 1959 called *First Man to the Moon*. It actually talks about launching two guys directly to the Moon in one rocket, that rocket lands on the Moon and comes back and obviously they thought that if you came back to Earth you should have wings on your spacecraft and took that as a fundamental idea.

Many people have taken this found-round paradigm as gospel: this is the way Von Braun said we need to go into Space. Von Braun himself was quite willing to think about it in a completely different way. As a result of Sputnik, as a result of the space race starting suddenly the US was throwing money at Space travel, human space travel then came on the agenda; obviously we were in a race with the Soviet union: we had to get a human into space quickly and so instead of a winged Space shuttle the first spacecraft were capsules because that was the quick way to get into Space and not to build something complicated like a space plane.

Von Braun advocated another plan from 1958 to 1960 when he was in transition from the army to the new NASA, formed in 1958, using his new Saturn booster, funded after Sputnik to build a bigger booster, to launch many, many pieces into Space, assemble them in Earth orbit and go to the Moon, ultimately to construct a Moon base. This was the objective.

What happened in the early 1960s was that we went to the Moon via Apollo which was very much not in line with Von Braun's paradigm. This was a specific decision of the Kennedy Administration. Eisenhower who had been president until the beginning of 1961 was very skeptical of a big human Space program, he did not want to put money into it, he did it very reluctantly and thought going to the Moon was crazy and a big waste of money. Kennedy came into office and immediately

was faced with a number of challenges, one of them was that on the April 12th 50 years ago Yuri Gagarin went into orbit and right after that the US was submitted to the humiliating defeat of the Cuban exiles who landed on the Bay of Pigs hoping to overthrow Castro. During a single week there were two kinds of embarrassing political events and Kennedy became convinced - he was already thinking that way - and these two events kind of precipitated a discussion in the Kennedy Administration: what are we going to do now in order to show the Soviets that we can keep up, when they are getting all the firsts, winning all the early space flight prizes? This is how the Apollo program came into being and that meant doing away with any kind of plan to build a space plane or a space station and going directly to the Moon. Interestingly, whatever Von Braun's earlier plans were, disregarding the paradigm he had laid out so carefully as the logical way to go to the Moon, was not difficult. He said 'oh, great' and jumped on board with enthusiasm. His center became the booster center for Apollo program. He accepted the fact that this lunar orbit rendezvous method where you had a small ladder to go down was the logical way to solve this problem in a hurry.

One of the effects of Apollo was to foreclose any real discussion of what else we could do because Apollo was so expensive there was no money for our human Space program. The first objective was to get to the Moon and land on the moon, that was a 20 billion dollar program in 1960s dollars and all other planning was pushed to the side even though there were some plans to have a space station, to build a wheel like Von Braun had advocated so strongly, that rotating wheel space where you create artificial gravity. But all that was shelved by the mid-1960s in favor of short term programs using Apollo hardware, What was later called Skylab space station. to build a temporary space station using Apollo hardware was one of the things that came out of Apollo hardware and any systematic planning was put away.

Beyond that in the later 1960s Von Braun and Miller started to advocate the space shuttle, the idea that we would have a winged space plane as that was the logical transportation system we needed to get back into space, so after Apollo we needed to think to go back from this rush program and try to return to systematic planning. This came to a head in 1969 with the landing on the Moon. President Nixon came into office in January 1969 said we needed a plan for post-Apollo, 'what are we going to do with human space travel after that'? He created a Space task group.

Von Braun was still in Huntsville with the military Space flight center and had a lot of direct influence and what I think is very interesting about this story is the extent to which they went back to the Von Braun paradigm when they said: what should the future of the Human program should be? – if it should be building a shuttle, building a space station, then we use that infrastructure to go back to the Moon and go to Mars.

In fact just before Apollo George Miller had developed a so-called integrated space program plan, a transportation system both to Earth orbit with a shuttle with a nuclear engine that would go shuttle things back and forth from earth orbit to the Moon and back. Thomas Pane went to Von Braun and said we need a Mars plan. We want to present landing humans on Mars after Apollo after we have succeeded landing on the Moon we have to go to the President, go to the Congress and say we need to land on Mars. That is the next major thing we want to do. In fact that became the centerpiece for presenting the post-Apollo plan; when the Space task group presented its plan in the fall of 1969 going to Mars was as politically disastrous for this plan as anything because the public was not in the mood for a new incredibly expensive Space program. You have to remember the historical context of this time was Vietnam, riots, urban problems, growing concern about air pollution, water pollution and people said, well, we have proved our point; we beat the Russians to the Moon, why do we keep spending billions on going to the Moon? Why do we want to go to Mars now? A minority of the public was enthused by going to Mars but nobody else was and it was a political failure which dragged down this whole systematic plan except for the one element that survived - the shuttle.

NASA budget was cut in half from the mid-1960s to the mid-1970s, in purchasing power maybe even more than half given how high inflation was in those years so NASA did not have money for an ambitious Space program except for the shuttle and sold the shuttle as a program that would be economical, that you could launch a lot and you can make money from it. The shuttle became the only thing that was approved out of that plan in 1972 by Nixon and Congress and in many ways it became an end in itself.

The next time this kind of idea, the Von Braun paradigm, came back was 20 years later in 1989, in the meantime Von Braun had died. After 1984 his past as a SS officer came back to haunt him and I kind of wonder if his name became less popular although I cannot actually prove that connection,

There were many other discussions throughout the 1970s and 1980s about alternate plans; Gerard O'Neil outlined plans for space colonies in libration points near the Moon, there were discussion going to the asteroids and comets. However, in many ways again NASA and the political leadership of the US said we needed to go back to the script and in 1983 Reagan approved the building of a Space station; it was originally a US station with US allies and the only international Space station came about in the 1990s under Clinton when the Soviet Union collapsed. But that was the beginning of the space station program which had essentially always been stage 2 of the Von Braun plan. In 1986 came the first Challenger accident, the first shuttle accident. There were many reports about what the US should do, what is the future of American space planning. None of these reports seem to have yielded anything very solid. In 1988 Reagan's term was finished, and George Bush the elder came in as president and he went to NASA and said, what is your vision for going into space? What is your vision for the future of human exploration? He gave this speech actually on the steps of our Museum at the Air and Space Museum on July 20, 1989, the 20th anniversary of the Moon landing. He then effectively endorsed again this plan for the space shuttle, space station and flight to the Moon and Mars.

Once again that plan became subject of controversy and was rejected by the public and by Congress because the best estimates that NASA came up with were 400 billion dollars at least for going to Mars. Mars has always been kind of the symbol of this ultimately ambitious program.

The space shuttle has gone on and on and only now it is going to be retired after 30 years of service, so we had the space shuttle and with building the space station there were already two very expensive programs which foreclosed other options. Only at the beginning of this last decade the US political establishment and NASA began talking again about what the future of human space flight should be and that led to something called the decadal planning team which was internal planning in NASA but it came to a head only after the Columbia accident which very unfortunately killed the seven astronauts including Ilan Ramon.

After the Columbia accident discussions were resumed as to what do we do: what should the future of human space flight for the US be? Should it be simply to keep going around in low earth orbit? No human has been further than 400 miles from the earth since 1972; so should we always be in low earth orbit, should the space

station be an end in itself, like the space shuttle? This led to something called the vision for space exploration which was NASA's plan presented to George W. Bush in 2005. George W. Bush went to NASA headquarters, gave the speech about how we need to go back to the Moon, how we need to go back to Mars; that took place at the end of 2004 and interestingly enough is how that all has again it played out to be less than what was hoped for. In 2005 under the new NASA administrator Griffin planning then went forward for a constellation. constellation became very quickly in the planning in 2005 and after a Moon program because I think [it was a] basic political reality. Landing humans on Mars is going to be incredibly expensive, it requires a lot of development and unless we have Deep Space voyaging experience we cannot really go back to Mars so maybe we should practice by going back to the Moon first and so it really became a Moon program with the Mars thing way off in the distant future.

There were people who have been advocating that instead of a very expensive program for landing on the Moon and building a Moon base we go to the asteroids which are relatively accessible, they have very low gravitational fields, you can land on them easily and that idea certainly comes back to us. The end of this process brings us right back to today and the last couple of years and Mr. Augustine will give us a much more expert account of what has happened and what is going to happen with these programs but clearly Constellation failed politically because it was under-funded by the Bush Administration, the analysis was that it was going to take far too long to land on the Moon under the existing funding and that it was an unsustainable course and the Obama Administration thanks in part to the Augustine Report has decided that to cancel the Moon landing, it cancelled going back to the Moon for the foreseeable future and is talking about an asteroid mission as an alternative.

So as far as the Von Braun paradigm is concerned, it appears that it's in decline or dead now. That does not mean it cannot be revived sometime in the future. It certainly may have a future, my conclusion for my historical study is that the found ground paradigm really does consist of those four elements, it greatly influenced US plans for going into Deep Space with humans, but in fact this has never actually come about because of the political cost, the cost to the economy of very, very ambitious Space flight programs and with the cancellation of Constellation and with thinking about going into other objectives for human Space flight like the

Asteroid missions and doing it in a different way the Space shuttle program also came to an end with the decision to build a capsule for the Moon program and which under Orion presumably continues to exist, the space plane is no longer viewed with as much enthusiasm as it used to.

We shall probably go for humans in Deep Space in a different way than Von Braun really laid out but he certainly had influence for 20 or 30 years over how the US imagined it was going to go into Space.



Left to right: Prof. Rabbi Daniel Herskowitz - Minister of Science & Technology, Jean-Jacques Dordain - Director General of ESA, Brig. Gen. (Res.) Asaf Agmon - Head of the Fisher Institute and Menachem Greenblum - Director General of Ministry of Science & Technology