

# In Memory of Wernher von Braun

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It is now thirty years that Wernher von Braun passed away. At that time the field of astronautics, as we know it today, had been established by his technical contributions, existing for just twenty years. On the 16<sup>th</sup> of June 1977, twenty years of rapid evolution of launchers, satellites and manned spaceships lost their *spiritus rector*, an engineer of ultimate competence, an exceptionally gifted manager and team leader, visionary and realist, whose life's work had released new industrial capacities around the world who had paved the way to reach other celestial bodies.

Without him and his crystal-clear technical *ingenium*, his perspectives, conclusive decisions and actions, his restless efforts of convincing people whether in projects, political arenas or quite openly in public – without all that there would be no astronautics at all today with its orbiting satellites, probes scouting the Solar System, landings on distant celestial bodies, no sailing on the New Ocean with unmeasurable growth in scientific knowledge.

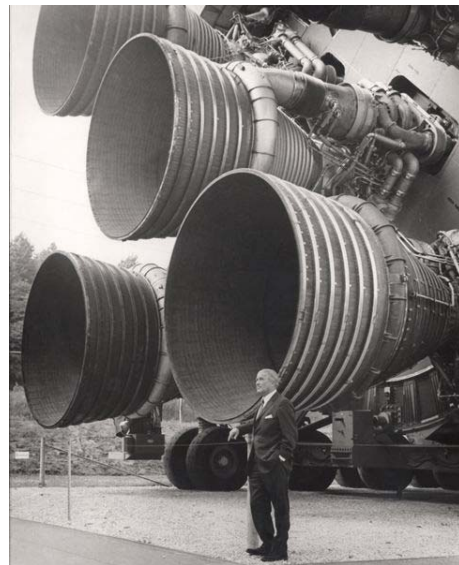
“The heart of astronautics is propulsion”, a motto often attributed to Wernher von Braun – in the beginning to propel a weapon system, the “mother” of all rockets, the Aggregate 4 (A4), as a result of years of cultural and technological development work. It began in the Twenties of the last Century, was boosted in the Forties and continued strongly after the Second World War. Wernher von Braun and his team demonstrated to the world how to do it, “the way it works” – the world saw the complete system A4, was eager to immediately catch up, and a technical evolution took place worldwide with a tremendous drive, unheard-of before. Mighty rockets, those totally innovative transport systems, capable to leave Earth, emerged in astonishingly short time intervals – initially for military purposes amidst the Cold War but from the beginning always destined for civil spaceflight.

Thousands of rockets have been launched meanwhile, almost entirely for peaceful missions into Earth orbit, to the Moon, to orbit the Sun, to visit the planets. Yet until today thousands and thousands of them are lurking in stand-by in the arsenals of mutual strategic balance, as ultimate weapons. It seems that only their possession and technical command promises “true” international sovereignty – since more than six decades nothing has changed in this respect and probably won't change in future.....



source: NASA

Wernher von Braun in his office in Huntsville



source: NASA

Wernher von Braun in front of the Saturn rocket engines

The uninitiated layperson of today, being questioned about the historical role of Wernher von Braun, will hardly raise his head from his newspaper, maybe reading a report on the latest images from Mars, and reply automatically: “Oh yes, Wernher von Braun has invented the rocket.”

Well, his name, his life's work were entirely dedicated to launchers, firstly to the Aggregate A4 as **the** prototype of large liquid propelled rockets, then to the Redstone, the Jupiter, the Saturn-5 – but he has not invented them. His major achievement lies in his charismatic leading competence: With the broad support of the technical and scientific research potential of major German science institutes and universities, the large research Center at Peenemunde, succeeded under his technical leadership in establishing the technical prerequisites for the Space

Program. These prerequisites, concepts, know-how – as initial ideas that sparked it all off – caused the USA and the USSR within a few years to establish enormous industrial capabilities to sail on the New Ocean, “to know how to do it”. Meanwhile, many other countries followed them on this road.

It is a shame that only in the USA Wernher von Braun’s life work was honored with high awards and has been given marks of distinction, mostly from the political point of view of his achievements in winning the Race for the Moon. Rarely, however, has there been a deep appreciation with respect to the extent of acerbic system engineering and performance of the team around Wernher von Braun – engineers do not indulge in honoring themselves nor do they pay too much tribute to their own or team work, they are committed to progress, and the progress of tomorrow is the critical improvement of today’s technology – and rather not its sheer praise.

In the “normal”, not technically educated world thinking, assessing, valuing, taking action is usually performed on the basis of interests and emotions and much less within the realms of engineering, natural science or mathematics. Hence, engineers are only seen as acting human beings, caught within their social fabric of dependencies, but there is usually little understanding of their work and even less paying tribute to its interdisciplinary complexity, its degree of high-technology and systems engineering as a cultural performance in the context of the technical-scientific age which we live in. Such deep appreciation can only be given by someone who has been educated in technical-scientific engineering thinking. He can understand, even re-enact mentally, what it means to develop a fully functioning system of completely new technology, starting from pure scratch on a white sheet of paper, resulting in an advanced system, technologically far ahead of the rest of the industrial world by twenty years as it was the case when the systems know-how from Peenemunde became available to the world, leading furtheron to the development of large space rockets.

What actually is systems engineering?

Systems engineering for astronautics comprises the whole process of all engineering disciplines, work areas and management activities in order to be able to make the concept of a complete system from scratch, the design, building and manufacturing, verification and validation, operation, maintenance and training for the operators. This systematic process was first performed in Peenemunde for the development of the A4. Because it is a reasonable approach and the only way to success it has become the very basic approach until today and worldwide when space systems are to be developed and fielded.

The technical part of the process systematically works off all questions relating to the functions and characteristics concerning the performance of the system, its mechanical-structural, electrical/electronic and thermal configuration and interfaces, software, environmental impacts on Earth and in space, all quality measures starting from concept, over manufacturing, material selection, tests until delivery, then solving all questions on redundancies, failure management, maintenance and spare parts management, test methodologies, test equipment and test sites.

This thorough approach does not leave any gap in the whole process with respect to control; it guarantees success and it is the only way when one wants to leave Earth with reliable technical hardware and to return safely.

Such approach cannot be simply invented on paper, such process has to validate itself against an ultimate objective like the very demanding development contract assigned to the large research center at Peenemunde for the A4. Wernher von Braun was its technical director. Under his leadership the ultimate goal was achieved: a brilliant engineering performance with the principal potential for future intelligent scaling development to achieve even larger and much more powerful systems: Redstone, Jupiter, Saturn, Space Shuttle in the USA – Soyuz, Proton, N-1, Energiya in the USSR, Ariane in Europe, launchers in Japan, India, People’s Republic of China, the list goes on.

The multitude of new work areas and research directions in the engineering sciences, which were to emerge and to establish themselves during the last 60 years, in order to solve so many tasks, shall only be shortly highlighted here: In the fields of mathematics, astrodynamics, material science, aerodynamics, thermodynamics, mechanical engineering, plant construction, computer hard- and software, medicine, bio-technology, propulsion, test equipment, in all of these areas thousands and thousands of workplaces were generated by previously complete unforeseen innovations in the industrial countries which were and are active in astronautics.

With the dilemma of weapon development in the background, his first homeland denied to Wernher von Braun any sincere and public honoring. While it was already clear to Korolev in 1934 that “the rocket is defence and science” /1/, Wernher von Braun was now accused of having dedicated his life to astronautical visions under military command, visions which, since seventy years ago astronautics didn’t exist at all, must have been of nothing else than infantile and gaming nature, instead of heading for civil, hence serious, objectives and aims: The engineer limited to being just *homo ludens*, what an arrogant and absurd understanding! This unrelenting attitude pretending to claim ethical categories simply ignores the important role of visions as guiding principles of progress, it ignores that man is less *homo ludens* but rather *homo faber*: Each technical thing can be helpful or serve destruction. We may admire Leonardo’s masterpieces then and only then if we accept his weapon

constructions at the same time. The most monstrous weapons of our age are the nuclear weapons. They were firstly applied in wartime by dropping them from an airplane. Are we to condemn the airplane as transportation means, or condemn her engineers?

At this stage, let us listen to Wernher von Braun's own words /2/:

"It is simply unfair to make us scientists and engineers responsible for the cruelties of modern wars. The rocket engineers are exposed to the same, apparently inescapable conflict, which Michelangelo was exposed to when, in times of crisis and war, he was forced to stop all work at the St. Peter's church and to direct his attention to the design of fortresses. It is the same conflict which confronts the airplane engineer when his beloved child of brainwork is used as bomb carrier to deliver death and destruction. And it is the same dreadful conflict for the nuclear physicist of the 20<sup>th</sup> century, knowing the abundant potential of the energy spending chain reaction in a controlled nuclear reactor, and equally knowing that under only slightly changed conditions the same chain reaction releases the destructive power of the nuclear bomb."

And another quote /2/:

"Should Einstein, when writing down his famous formula on the relation between matter and energy contents, have laid aside the pencil with trembling hand, because he had the vision of releasing unimaginable amounts of atomic energy? Should we today stop our activities to conquer space just because rockets and airplanes can be used for military purposes?"

Wernher von Braun and his team offered to the world the gift of the completely functioning "rocket" system. The world grasped it immediately, rebuilt first samples for the weapons arsenals, but always with the potential of doing astronautics later. And this happened:

The scientific work of Wernher von Braun and his team led directly to what we call today "astronautics". This new science and application field enables us today to perceive our world in its entirety (the "One World" of modern environmental awareness), to measure and politically recognize its environmental damages and deficits from orbit, to visit other worlds to research them. The scientific striving, a profound human characteristic, may go beyond all limits.

His first homeland, Germany, does not recognize this at all, irrespective of all honors and signs of appreciation in the USA, including those granted at the Oval Office, and in other countries for example in Russia today. His second homeland, the town of Huntsville, Alabama, owes a lot to him as US citizen, while not the glory is meant here (which also fell on Huntsville – glory is a transient item), but owes a lot to him for those of his achievements which the community is continuing to benefit from: The university, the Convention Center, the Marshall Space Flight Center – that means culture, infrastructure and workplaces date back to his initiatives and were boosted then. Were Huntsville a town in Germany, the "Bundesverdienstkreuz" (Order of Merit of the FRG) would appropriately be awarded for all of those merits. However, Huntsville lies in the US, and the American "Bundesverdienstkreuz" is the undiminished reverence for his name and his team, of which a very few still live in Huntsville, very advanced in years and highly respected.

Wernher von Braun and his team, the "rocket scientists", rendered a great service to

- The scientific strive of man towards new worlds with the new technology of astronautics,
- The Natural Sciences and engineering,
- Their second homeland, the USA, during the times of the Cold War, and the Race to The Moon,
- The successful six landings on the Moon.

Their second homeland needed them, respected them, supported and honored them.

Wernher von Braun and his team were German natives, their brilliance and efficiency were based on their talents, their reliable dedication to the tasks given and to a first-class education in the high school and university system of their first homeland.

They have established the basis of astronautics for all men.

Their first, their old, homeland can be proud of them.

#### References:

/1/ Erichsen, Hoppe, "Peenemunde – Mythos und Geschichte der Rakete 1923-1989"

/2/ Translation from German acoustical quote from: Deutschlandradio Kultur, January 2007, Feature, „Sterne unter Tage....“

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