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# Transition: Eveline Gottzein

## Eveline Gottzein – a Pioneer in Aerospace Control

Challenging control systems in aerospace for satellites and rockets, but also for magnetic levitation trains fascinated Eveline Gottzein a life long. Together with her teams she elaborated groundbreaking solutions and provided a role model for women in engineering honored by many awards at highest level, including her selection as first female IFAC fellow. She passed away on 24.12.2023 in Höhenkirchen near Munich (DE).

Eveline Gottzein was born in 1931 in Leipzig (DE) to a family who encouraged her interests in technology and nature. Located in eastern Germany it was difficult to pursue her professional visions in science and technology. Thus in 1957 she decided to leave for Western Germany to study Mathematics and Control at TU Darmstadt. Despite difficult study conditions, always interrupted by industrial work to earn related costs of living, she graduated with a Diploma 1962 in Mathematics. This was thanks to her talent in engineering and her motivation to work extremely hard.

Eveline Gottzein demonstrating to experts the model of the ASTRIS-propulsion system, the 3rd stage of the European rocket ELDO (around 1970, source: HORM Archiv).

In 1959 she joined the company Bölkow AG in Ottobrunn, where the challenging and motivating tasks in the emerging aerospace sector attracted her attention. Her boss Ludwig Bölkow recognized her talents and at age of 32 she was already appointed as head of the vehicle control and simulations department. New

control challenges for rockets and satellites required interdisciplinary knowledge for mathematical modelling of complex physical processes, which she and her team mastered in an excellent way. Based on excellent engineering skills, vigor, and diligence she was well prepared to address the opportunities in this new challenging engineering field. Thus her department grew very fast to about 100 people and she demonstrated, what woman can achieve in engineering. Thus she became a paragon for the next generation of female engineers.

Europe's entry to telecommunication via space was paved by the two French-German satellites „Symphonie" (launched in 1974 and 1975). Her team received responsibility for orientation and stabilisation of these satellites and achieved a technology breakthrough by realizing the innovative 3-axes attitude control system, which became the worldwide standard replacing the spin-stabilized principles used before. A complete infrastructure to test related characteristics on ground had to be invented, leading to the realization of innovative dynamic test benches, exported by the company MBB worldwide to space industry. In this way her department grew steadily. Eveline Gottzein liked challenges and was characterized by her collaborators as a realistic visionary. She was ambitious and worked extremely hard with her collaborators to become one of the worldwide leading control departments.

In parallel, in the 1970s the magnetic levitation trains raised significant control challenges, which were transferred to her department. She summarized the groundbreaking solutions after a hard working day in her leisure time in the dissertation „The ‚Magnetic Wheel' as autonomous functional unit of modern carrier and control systems for magnetic levitation trains", submitted in 1983 at Technical University Munich. Based on these contactless, distributed, robust electromagnetic principles 1987 TRANSRAPID reached the world speed record for trains at 460 km/h.

**Eveline Gottzein was honored with the Werner-von-Siemens-Ring in 1993 as „mastermind and realizer of groundbreaking control systems for magnetic levitation trains, satellites and space vehicles". (source: Stiftung Werner-von-Siemens-Ring**

Even after formal retirement in around 1990 Eveline Gottzein continued to pursue her visions and initiated innovative use of GPS receivers for navigation of geostationary satellites. She also followed the "New Space" developments during the last decennium and was very glad to see the new role of her early dynamic simulators in the new context of formations composed of small satellites. This closed the loop on distributed, networked control systems also in the context of attitude and orbit control of satellites.

**In 2018 Eveline Gottzein visited the new installation of her dynamic simulators at S4 / ZfT in Würzburg for tests of multi-satellite systems in "New Space" context (source: S4 –Smart Small Satellite Systems).**

In recognition of her outstanding achievements in science and technology, but also her inspiring leadership capabilities and her pioneering role for female engineers, she was selected for highest awards: 1993 Werner-von-Siemens-Ring, 1996 Bavarian Medal of Merit, 1998 Maximilians-Medal, 2000 Order of Merit of the Federal Republic of Germany, 2007 AIAA Fellow, and 2008 IFAC Fellow (she was the first female IFAC Fellow.

Beyond these technology challenges she emphasized international collaboration in space technology and supported bridges between science and industry in international professional institutions as IFAC and AIAA. She participated from the beginning in the 1960s in the IFAC Symposia on Aerospace and had chairwoman positions from the 1970s until 2002.

Eveline Gottzein was a key person for IFAC's visibility in the Aerospace sector. She organized impressive IFAC Symposia on „Automatic Control in Aerospace": 7th in Rottach-Egern (1976), and 12th in Ottobrunn (1992). Legendary are her excursions in the accompanying social programs on mountain climbing, as well as the conferences including session breaks for skiing challenges. Well-remembered are her impressive plenary presentations at the 10th IFAC World Congress in July 1987 in Munich on „Control challenges of space planes, stations, and plattforms" and at the 19th Symposium on Automatic Control in Aerospace in September 2013 in Würzburg on "The origin of satellite technology in Europe". She had the ability to inspire young people for her space visions and transferred her experience as well as her fascination in the space technology programs at the Universities Stuttgart and Würzburg to motivated students.

IFAC recognizes Eveline Gottzein's contributions with the highese respect to scientific breakthroughs in control engineering for satellites, rockets, and magnetic levitation trains. The success of the IFAC TC on Aerospace is based on her advice and leadership for a period of more than 40 years.


**The outstanding scientific contributions of Eveline Gottzein in control engineering were acknowledged 2008 by awarding the IFAC Fellow at the 17th IFAC World Congress in Seoul, KR. Also pictured: IFAC Advisors Brian Anderson (AU) and Wook-Hyun Kwon (KR).**

Submitted by: Klaus Schilling (DE)
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