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DESPITE RECENT fears of delays in the assembly of the International Space Station (ISS), Daimler-Benz Aerospace (Dasa) is still working on the assumption that its key contribution – the Columbus Orbital Facility (COF) – will be launched on time, or perhaps earlier than expected.

Russia is running into short-term difficulties funding its \$6.2 billion share of the ISS. Although the launch of the first Station component, the Russian Control Module, remains officially set for June, this could be delayed until October. The launch of the Russian Service Module – carrying Germany's first contribution to the station, the DMS-R data management system – will be delayed to March 1999, while the USA is discussing possible delays to the launch of its own Boeing-built Laboratory Module.

The core of the ISS, to which US, Russian and Japanese modules will be docked, is scheduled to be in position by the end of this year. According to Dasa's Columbus project leader, Joachim Gülpen, delays are expected, particularly on the second Russian module. He believes, however, that political pressure from the partner nations will ensure that funding is released and the delays will amount to "possibly only 10 weeks".

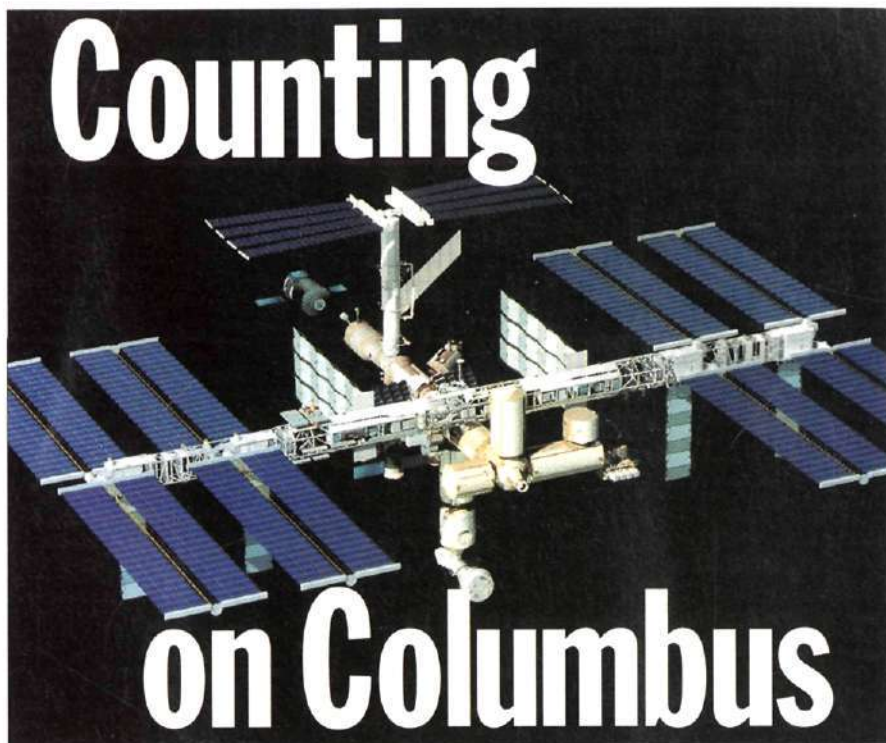
In the later stages of construction, the sequence of attachment of the ISS modules may be reshuffled if necessary, says Gülpen. Columbus will be delivered in February 2002, and may end up being launched ahead of schedule if other partners meet delays.

The leadership of the COF project, which includes contributions from many European partners, rests with Dasa's space infrastructure division in Bremen. This unit is also involved in the Automated Transfer Vehicle, the European Robotic Arm, and research on future crew transfer vehicles and rescue systems.

The Columbus is Europe's primary contribution to the ISS, and is to be launched by the US Space Shuttle in 2002. Germany not only holds the prime contract for Columbus, but is the leading European contributor to the project overall, pumping in DM2.5 billion (\$1.3 billion) funding – about 41% of Europe's total contribution.

The ISS is designed to circle the Earth on a sine wave-shaped flight path at an altitude of between 335km and 460km, completing a single orbit in under 90min. The station will initially be manned by three, and later by six, astronauts and scientists, working in the various laboratories for periods of three months at a time.

The European Space Agency signed a ECU660 million (\$725 million) fixed-price contract on 26 March, 1996, for Columbus development, construction and operation. Dasa says that the contract was seen as a guarantee of the future of Europe's manned spaceflight programme, and the key to European participation in the ISS, granting access to the other research labs and facilities on the station.



Counting on Columbus

The German-led Columbus Orbital Facility is Europe's biggest contribution to the International Space Station

Dasa engineers drew on experience gained in the earlier Spacelab programme – Europe's first space laboratory, carried in the cargo bay of the Space Shuttle. Columbus will be 6m-long and 4.5m in diameter, with a launch mass of about 12.4t. The lab is laid out with 10 payload racks designed for materials, fluids, life sciences and fundamental physics research. All racks are designed to an international standard, and can be interchanged with those in the US and Japanese modules.

As prime contractor, Dasa is responsible for system design, management of the industrial team, assembly and qualification of the overall system, as well as the integration of the launch payload. The Bremen engineers are also responsible for the operating software, ground systems and the procurement of electrical and electronic components.

CONSERVATIVE DESIGN

Gülpen says that, since Dasa is aiming for a 10-year service life, it has avoided taking technical risks and has instead adopted a "very conservative" design. "As far as possible, we are working with proven technology," he says, although some new technology such as the COF's fibre optic data transmission cables, is inevitable.

The company is now preparing for the preliminary design review in December, which should confirm the current Columbus design.

On the systems level, an electrical test model is being built this year, ready to begin software and electrical systems testing in 1999. This will remain in use throughout the COF's planned operational life, to develop and improve systems and procedures, says Gülpen.

Construction of actual Columbus elements is to begin at the end of this year, while assembly of the laboratory is due to start in mid-2000.

In the COF project, Dasa is leading a team of 30 companies from 10 countries: many are former Spacelab partners. The biggest subcontractor is Turin, Italy-based Alenia Spazio, responsible for the COF's structure, temperature control, life support system and cabling. The main French partner is Matra Marconi Space, in charge of the data management system. This covers four computers, all data acquisition and distribution systems, as well as software. Belgium's Alcatel Bell Telephone is responsible for the electrical ground testing system.

Gülpen believes that the laboratory is critical to Germany as a demonstration that its space industry can produce major space structures at a fixed price, and that international co-operation on this scale – particularly with Russia – can succeed.

Apart from that, science is gaining "a real orbital laboratory" which can be used to generate practically applicable results, he says. What kind of results, and what sort of applications they may be put to, only time will tell. □