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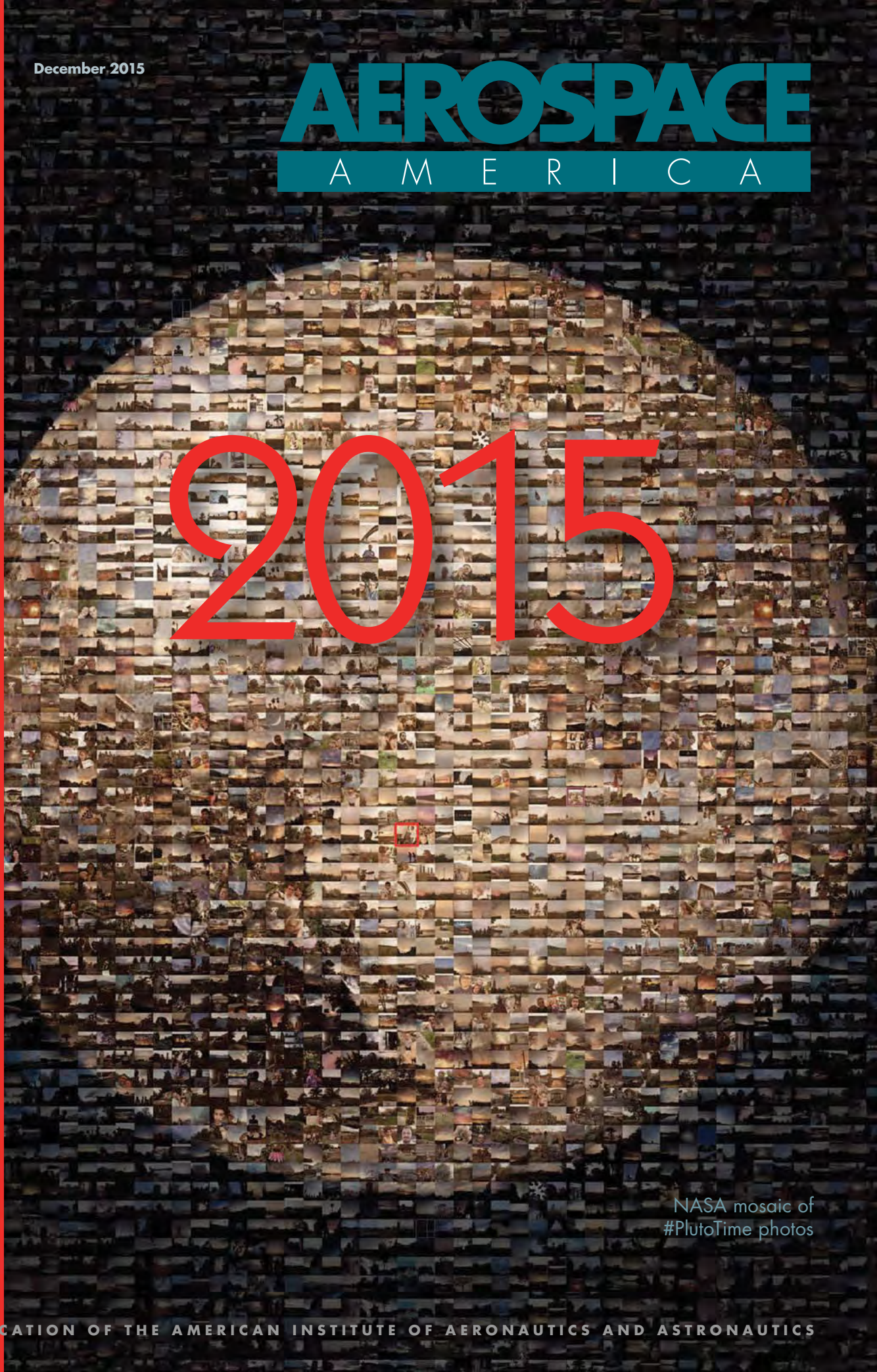

NASA mosaic of #PlutoTime photos

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Expandable space habitats ready for launch

by Maria Joao Durao, Barbara Imhof, Donald Barker, Mark Kerr, and Sandra Haeuplik-Meusburger

*The **Space Architecture Technical Committee** focuses on the architectural design of the environments where humans will live and work in space, including facilities, habitats and vehicles.*

Between 1950 and the early 1990s NASA investigated several inflatable or expandable space structures, most notably the **Transit Habitat (Transhab) module**. Following its cancellation, Bigelow Aerospace purchased the rights to this technology. To date, Bigelow Aerospace has flown two pathfinder spacecraft and — after a roughly two and a half year development, fabrication, and testing cycle — has developed the **Bigelow Expandable Activity Module**.

BEAM, now being prepared for launch at Kennedy Space Center, will be transported to the International Space Station within the trunk of the upcoming SpaceX CRS-8 resupply flight. Once berthed to the ISS, BEAM will deploy to provide 16 cubic meters of volume and act as a technology demonstration platform for validating material and structural interactions in the space environment. BEAM, the first expandable space structure used for long-duration human habitation in space, will remain on orbit for a minimum of two years.

Bigelow Aerospace has grander plans for space structures, including their B330 module; encompassing a volume of 330 cubic meters it will support a crew of six. Additionally, in July, NASA and Bigelow Aerospace signed up to cooperatively develop concepts for using the B330 in support of crewed missions to the Moon and even Mars.

In an effort to explore human missions on Mars, habitation options were explored under the NASA **Human Spaceflight Architecture Evolvable Mars Campaign**. In particular, a modular habitation system was devised that can be applied to planetary surface and deep space human exploration missions. Small cabins derived from the modular system can fit into the Space Launch System Orion "trunk" or can be mounted with mobility systems to function as pressurized rovers, in-space taxis, ascent stage cabins or propellant tanks. Larger volumes could also be created using inflatable elements for long-duration deep space missions, and planetary surface outposts.

This year marks the conclusion of the **Self-Deployable Habitat for Extreme Environments**, SHEE, project, a three-year effort developed under the European Commission's Seventh Framework Program. Space architecture companies, LIQUIFER Systems Group of Austria and Space Innovations of the **Czech Republic**, helped develop the project along with five other European institutions and companies. SHEE is the first deployable habitat simulator to be designed and constructed in Europe and is now available to the larger research community for conducting simulations. Distinctive features of the SHEE project include its easy transportability with a flatbed truck and its capacity to automatically deploy — increasing the size of the habitat and usable space to accommodate a crew of two. The habitat is outfitted with interior furnishings permitting different usage and activity by crew members, including sleeping cabins, a work area, a multi-functional common area, hygiene compartment and small workshop. SHEE's environmental control and life support system can sustain a two-person crew for two weeks. The SHEE habitat can be placed in various environments for simulation testing ranging between Antarctica (-60 Celsius) and in the desert (50 Celcius). The habitat is ideal for conducting scientific research on the affects of confinement and for testing space-related systems and technologies.

An artist's rendering shows the Bigelow Expandable Activity Module attached to the International Space Station.

The Self-Deployable Habitat for Extreme Environments, SHEE, the first deployable habitat simulator to be designed and constructed in Europe, concludes a three-year project in 2015.