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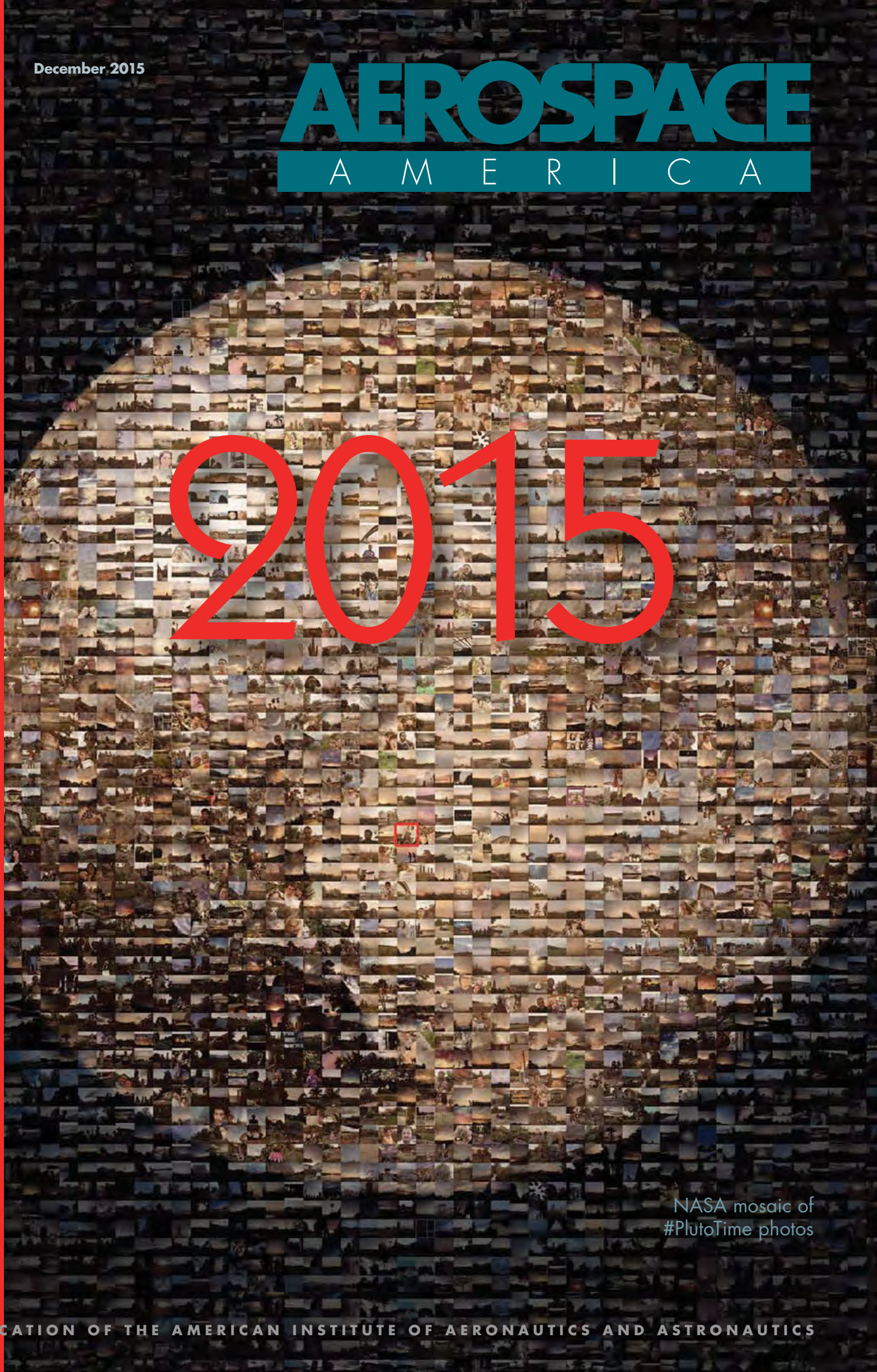

NASA mosaic of #PlutoTime photos

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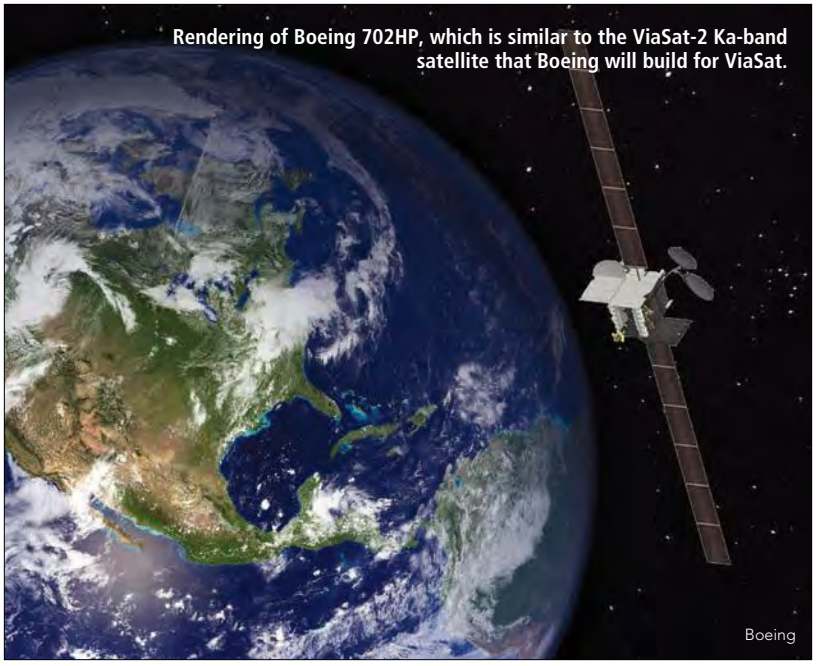
Profound transition continues for satcom

by Tom Butash, Joe Pelton and Roger Rusch

*The **Communications Systems Technical Committee** is working to advance communications systems research and applications.*

The satellite communications industry is undergoing great transition, like much of today's global economy. Technology is offering new approaches that are disrupting business as usual. Time will tell whether this will spawn successful new businesses or lead to overcapacity.

Efficient launch services are key to the SATCOM industry. **SpaceX's Falcon 9** and Falcon Heavy provide a new, essential capability, with 18 successful launches and 67 more scheduled through 2018 with a launch tempo of two launches a month during 30 months of this period — an unprecedented launch rate for a single launch system. However, a June Falcon 9 failure has delayed the inaugural Falcon Heavy flight until next spring, after Falcon 9's successful December launches of Orbcomm and SES commercial communications satellites.



Rendering of Boeing 702HP, which is similar to the ViaSat-2 Ka-band satellite that Boeing will build for ViaSat.

Artist's concept of the Jupiter 2/EchoStar 19 satellite, which will be launched in 2016.

New launch competitors include the Russian Angara, Ariane 6, Japanese H-3, and Orbital ATK's Antares as well as established systems. For small satellite constellations, new options are planned for 200 kilogram-class satellites, including Virgin Galactic's Launcher One, and the Swiss Space Systems S3 spaceplane. The late August Russian Proton M launch of the third **Global Xpress satellite** allows Inmarsat to begin operation of the first global coverage broadband GEO constellation by year end.

Another big story is the ongoing surge in Ka-band high-throughput satellites and expansion of conventional C and Ku-band satellite payloads. Intelsat plans to launch eight **EpicNG satellites** over the next three years to add about 900 net transponders — a 40 percent increase to its 2,200 on-orbit transponders. SES of Luxembourg plans to add a comparable supply. An even greater surge is underway in HTS for consumer broadband or Internet access, led by ViaSat-2 and Hughes' Jupiter 2/EchoStar 19 satellites to be launched in 2016. Overall, the industry plans to quadruple the communication throughput supply between 2010 and 2017.

The elasticity of demand and new pricing levels are big questions intriguing the industry. Other key questions include when Ka-band will become congested and when Q/V- and W-bands can be utilized to further increase capacity. The European Space Agency's Aldo Paraboni Q/V Band Payload aboard Alphasat continued to collect experimental propagation data this year to help pave the way to deployment.

The new **O3b equatorial middle-Earth-orbit constellation** optimized for Internet is now operational. This project, backed by SES, Liberty Media and Google, among others, is only the first step. Silicon Valley is seeking to provide ubiquitous worldwide broadband access. Dominant Internet companies like Facebook, Apple, Google, Amazon and Qualcomm and innovative space systems companies such as SpaceX are investigating at least 11 constellations consisting of hundreds or thousands of satellites, envisioned to cost as little as $1 million each on-orbit. Also under consideration are balloon and unmanned aircraft-based global Internet systems seeking new economies of service. It remains to be seen whether these new visionaries can achieve what was unaffordable a little more than a decade ago.

It has long been a dream to build satellites quickly and adapt hardware on-orbit to changing markets. In the past such flexibility came at a high cost and took longer to develop, but the first steps are being taken today. Intelsat is deploying its EpicNG satellites with next-generation service to begin in 2016, while **Eutelsat has commissioned the Quantum satellite**. Other R&D projects are focusing on greater flexibility in future retrofits.

Satellite orders remain strong with 17 orders as of early November, although slightly off 2014's pace of 25 by year end. Growth in revenues for 2015 is projected to be somewhat down from the 4 percent revenue growth recorded last year.