

## Recycling-Programm für Satelliten gestartet



Nach Informationen der Defense Advanced Research Projects Agency (DARPA) im US-Pentagon befinden sich im geostationären Orbit (GEO) über hundert alte Satelliten, die nicht mehr benötigt werden. Der Wert an recycelfähigen Materialien wird auf 300 Milliarden US-Dollar geschätzt. Um die Satelliten, die auf sogenannten „Friedhofsbahnen“ ihre Kreise ziehen, auf die Erde zurückzuholen und verwerten zu können, hat DARPA das Recycling-Programm „Phoenix“ gestartet. Es soll geeignete Technologien entwickeln, um aus Weltraum-Abfall eine Weltraum-Ressource zu machen.

procedures to hold two parts together so a third robotic ‘hand’ can join them with a third part, such as a fastener, all in zero gravity. For a person operating such robotics, the complexity is similar to trying to assemble via remote control multiple Legos at the same time while looking through a telescope.”

### Development of special modules

To optimally use those repurposed assets, the Phoenix program will develop low-cost, scalable electronics and structural modules that would allow localized control and communication with each other and a master satellite, ala DARPA’s System F6, that together harnesses the repurposed antennas. Phoenix specifically seeks technologies for developing a new class of small “satlets,” or nanosatellites, which can be sent more economically to the GEO region through existing ride-along services with commercial satellite launches and then robotically attached to the antenna of a non-functional cooperating satellite to essentially create a new space system.

The nanosatellites may leverage the technologies, infrastructure, protocols and architecture developed within the ongoing System F6 program. Technical expertise is sought to design a payload orbital delivery system, or PODS, to safely house the satlets when they are launched aboard a commercial satellite. A separate on-orbit “tender,” or

satellite servicing station, is planned to be launched into GEO. Once the tender arrives on orbit, the PODS would be released from its ride-along host and linked with the tender to become part of the satellite servicing station’s “tool belt.” The tender plans to be equipped with grasping mechanical arms and remote vision systems to remove components and satlets from the PODS using unique space tools to be developed in the program.

Critical to the success of the Phoenix program is active participation from both U.S. and international communities involved in vital technical areas such as:

Radiation tolerant microelectronics and memory storage, distributed wireless mobile platform solutions for ad hoc connectivity and control, industrial electronic control systems, terrestrial microminiature guidance and control measurement units, industrial robotics end effectors and tool changeout mechanisms and techniques, computer-assisted medical robotics microsurgical telepresence, tools and imaging, remote underwater imaging/vision technologies used in the offshore oil and gas drilling industry, terrestrial manufacturing of high volume microelectronics and computer data storage, terrestrial thermal management design technology of electronic devices and systems, low-cost industrial manufacturing of high-volume sheet metal and other structural materials, additive manufacturing on various structural materials.

## Need for Intelligent Recycling

Foto: Marc Szombathy



Professor Philippe Chalmin

“We are definitely in the most volatile of all worlds,” declared Professor Philippe Chalmin of the Paris-Dauphine University in launching the follow-up to his survey of the world markets for recovered and recycled commodities.

Speaking in Munich at the latest Autumn Convention of the Bureau of Inter-

national Recycling (BIR), Professor Chalmin argued that prices have fallen for many commodities in recent months but remain at “very high levels” in certain instances. He noted in particular the high values retained by the main LME metals.

Focusing also on the divergence in economic performance around the globe, Chalmin underlined that OECD nations were experiencing relative stagnation whereas the economies of emerging countries were continuing to “ride high”, leading to overall growth which would entail increased investment in commodity production. With resources limited in many instances, there would be “a need for more investment in intelligent recycling.” Chalmin identified China as key to the development of markets for a significant number of recyclables, including recovered paper and non-ferrous scrap. He warned that, at some future point, a crisis would also befall China, and that the commodity markets, both primary and secondary, would be first in feeling the effects.

**Read the whole BIR-commissioned report under**  
[➔ www.eu-recycling.com/service.html](http://www.eu-recycling.com/service.html)