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SPACE SYSTEMS SYMPOSIUM (D1)  
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NETSAT: A FOUR PICO/NANO-SATELLITE MISSION FOR DEMONSTRATION OF  
AUTONOMOUS FORMATION FLYING

**Abstract**

Innovative scientific and commercial missions based on fractionated space systems require a high-level of on-board autonomy and inter-satellite coordination. Such missions may take advantage of small satellite formations to provide high temporal or spatial coverage and resolution at reasonable costs. In this context, the Networked Pico-Satellite Distributed System Control (NetSat) mission conducted at the Zentrum für Telematik e.V. will demonstrate in orbit the autonomous control of a formation of four pico/nano-satellites.

The development and in-orbit demonstration of such a system will make significant contributions in the areas of on-board autonomy, distributed formation control, relative navigation, inter-satellite commu-

nication and protocols, and miniaturised attitude and orbit determination and control systems for future satellite formation flying missions.

With tentative launch in the period 2017/18, NetSat leverages on previous work at the Zentrum für Telematik e.V. and the University of Würzburg in the areas of pico-satellite technologies and distributed space systems. Key technologies in the area of communication, attitude determination and control and on-board data handling have already been demonstrated in orbit in the scope of the “Universität Würzburg Experimental (UWE)” satellite program with UWE-1, UWE-2 and UWE-3. The fourth satellite of the UWE series is currently in preparation and will test a miniaturised electrical propulsion system in-orbit.

This contribution starts by introducing the NetSat mission objectives, requirements and drivers, discussing how they can be implemented in highly constrained pico/nano-satellite platforms. Different formation orbit geometries are evaluated with respect to their potential future applications and their V cost, taking into account different formation orbit acquisition and maintenance strategies. Finally a mission design is described, including a preliminary satellite system design, system budgets and target formation orbit.

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