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EARTH OBSERVATION AND MARINE/AIR TRAFFIC MONITORING WITH A MULTIPLE
CUBESAT CONSTELLATION

Abstract

In the past decade, Cubesat has gained more and more attention in space communities, has evolved from purely educational tools to an useful platform for technology demonstration and scientific instrumentation, and has walked out of university labs into commercial companies targeting for both technologies and commercial applications. Networking and/or constellation with multiple Cubesat carrying different payloads to perform an integrated service are foreseen an important direction for many different application space programs. This paper presents a small Nano satellite constellation, the TW-1 mission, to explore the integrated services for Earth observation and marine/air traffic information collection and monitoring, based on the low-cost and off-the-shelf Cubesat technologies. It consists of 3 Cubesats, by one 3U Cubesat and 2 2U Cubesats, carrying different payloads and instruments, to be put into an LEO orbit, forming an along-trace satellite network and/or constellation. The main tasks and objectives of this mission are listed in the following:

- (1) Monitoring the sea ice situation, especially for the North and South polar regions, with an on-board optical camera,
- (2) Monitoring global marine traffic information with an on-board AIS receiver,
- (3) Monitoring global air traffic information with an on-board ADS-B receiver,
- (4) Demonstration of Cubesats adaptive networking technologies based on Gamalink
- (5) Demonstration of Cubesat inter-satellite link based on Cubesat Space Protocol(CSP)
- (6) Demonstration of new technologies for Cubesat, including a SoC dual-band GPS/Beidou receiver, a MEMS cold-gas micro-propulsion system, and a multi-channel inertial sensor.

This mission is designed and being implemented by a consortium led by the Shanghai Engineering Centre for Microsatellite in China, together with partners including the GomSpace from Denmark, the Tekever Space from Portugal, the NanoSpace from Sweden, and the Nanjing University of Science and Technology from China. It is currently in the engineering phase, to be launched in Sept 2015 towards an SSO orbit at 475km, by piggy-backing on-board a Chinese launcher. This paper will discuss the mission and the satellite design, the innovative technologies and instruments or devices being used, and the test scenario for networking and the satellite constellation control or maintenance.

Key Words: Nano Satellite, CubeSat, Satellite networking and constellation, AIS, ADS-B