

IAF SYMPOSIUM ON FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS  
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## Technology Needs for Future Missions, Systems, and Instruments (3)

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PROBA3 FORMATION FLYING SYSTEM, A KEY TECHNOLOGY FOR FUTURE FORMATION  
FLYING SCIENCE MISSIONS: CURRENT STATUS AND SIMULATION RESULTS**Abstract**

PROBA3 is ESA Formation Flying demonstration mission, currently in phase CD and planned to be launched at the end of the decade. The mission, composed of two spacecraft (one Occulter and one Coronagraph) flying on a High Elliptic Orbit around Earth will permit, during the apogee phase of the orbit, to 1) observe the corona of the Sun with unprecedented accuracy and scientific return and

2) demonstrate a set of technologies needed for potential future space exploration missions like highly variable focal length space telescopes. One of the core technologies to be widely demonstrated is the Formation Flying System (FFS), i.e. the software and the hardware (actuators, sensors and metrologies) which will permit to autonomously perform, with the required strict accuracy, the manoeuvres necessary for accomplishing mission scientific and technology demonstration goals, guaranteeing at the same time the mission safety thanks to the implementation of a robust perigee pass strategy, collision avoidance and go to safe manoeuvres. The paper will present a summary of the mission and its main features, an extensive overview of the FFS, showing the main components of the system (i.e. Formation Flying Manager (FFM), Formation Flying Guidance Navigation and Control (FF-GNC), Relative GPS (rGPS) and Spacecraft Service (SC-SRV)), the formation flying mission phases and manoeuvres, the interactions with other elements of the architecture (e.g. Platform Software, Ground), the current development and validation status and the main results obtained with the Functional Engineering Simulator (FES), which will preliminary show the feasibility of the FFS algorithms with respect to the mission needs. The paper will also illustrate the next steps of the FFS development and validation, where the FFSW (implemented in Matlab/Simulink) will be autocoded, integrated and tested in a real time Software Based Test Bench (SBTB) representative of the CPU and the hardware which will fly on-board the two spacecraft.