

48th STUDENT CONFERENCE (E2)  
Student Team Competition (3-GTS.4)

Author: Ms. Cindy Angama

ISAE - Institut Supérieur de l'Aéronautique et de l'Espace, France

Mr. Anthony De La Llave

ISAE - Institut Supérieur de l'Aéronautique et de l'Espace, France

Ms. Clara Moriceau

ISAE - Institut Supérieur de l'Aéronautique et de l'Espace, France

Ms. Emma Baltide

ISAE-Supaero University of Toulouse, France

Mr. Manuel Amouroux

ISAE - Institut Supérieur de l'Aéronautique et de l'Espace, France

Mr. Thibault Lemattre

ISAE - Institut Supérieur de l'Aéronautique et de l'Espace, France

## SPACE TRAFFIC MANAGEMENT: A CHASER FOR SATELLITES AND SPACE DEBRIS

**Abstract**

On-orbit services have seen their interest growing as the number of satellites in orbit increased. Subsequently, the number of space debris is becoming higher and will reach another level with future satellite constellations. It brings a need for the creation of a space traffic management system as well as an Active Debris Removal platform. Nowadays, we have several examples of illegal launches, non-respect of space debris mitigation guidelines and non performance of collision avoidance manoeuvre. Moreover, the new space sector allows a faster development and launch of satellites at low cost, which are then less reliable. Therefore, a system to assist satellites is needed.

The space control system has several functions which are to perform control, deny, relocation and debris removal in geostationary orbit at least. This system is composed of a police station (GeoStation), a police satellite in geostationary orbit (GeoPolice), a police satellites system in several low Earth orbit inclinations (LeoPolice) and a Chaser. It has been developed during a student project as part of the Space Systems Engineering advanced master at ISAE-SUPAERO. The Chaser aims to capture other satellites or space debris and transport them. More precisely, it is in charge of far and close identification, soft deny and capture. In this context, it would intervene after the GeoPolice, in charge of identifying and providing contactless control means of the target, and before the GeoStation, to which the object would be transferred after its interception. The Chaser may also bring the defunct satellite directly to graveyard orbit instead.

This paper presents the preliminary design of the Chaser, as part of the space traffic management system. First, a market analysis is made followed by a mission analysis in order to determine the needs for our satellite. Then will be explained each sub-systems included in the Chaser, : power management, propulsion, Attitude and Orbit Control System, On-Board Data Handling, communication, thermal control, etc. The article will focus then on the payload of the Chaser, which is needed to perform identification and capture of other objects. Several solutions for capture will be assessed, taking into account cooperative and non cooperative targets. Common operations with the GeoStation and GeoPolice will also be studied. Our work focuses on the geostationary orbit mainly but includes the study of a Chaser in low Earth orbit at last.