

# **Spin and angular velocity reduction of a Sub-Orbital Platform (PSO) using gas jets.**

W.C.C da Silva & L.C.G. de Souza

Instituto Nacional de Pesquisas Espaciais - INPE/DEM  
Av. dos Astronautas, 1758 - S. J. dos Campos - SP  
12201 - 970 - Brazil

## **Abstract**

The Sub-Orbital platform (PSO) is a recoverable vehicle which is being developing at INPE (Instituto Nacional de Pesquisas Espaciais) to be launch by a rocket (SONDA-III) of the IAV (Instituto de Atividades Espaciais). The objective of PSO is to test some attitude control equipments which are being developing by INPE as well as to measure the acceleration in three axis in order to carry out some kind of microgravity experiments in future missions. After the rocket last stage burn the PSO is released in free flying with a spin of about 180 rpm. This paper presents the procedure adopted to perform the despin and the three axis angular velocity reduction of the PSO up to residual values of the order of 0.001rad/s. The PSO control system is composed of only four thrusters of 2N strategically placed across the PSO longitudinal axis, which cannot coincide with PSO mass centre. This configuration allows to produce torques about only one axes or about all three axis, simultaneously, depending of the control strategy used. In order to check the control system performance one analyses these two control strategies. In the first one, the despin is performed initially only about the axis with greater angular velocity followed the despin about the others two axes. In the second one, the despin is performed in the three axes simultaneously. The results of the simulation have shown that in both cases the control system was able to perform the despin very rapid as well as to reduce the angular velocities to values required for the mission.