

ASTRODYNAMICS SYMPOSIUM (C1)

Attitude Dynamics (1) (8)

Author: Dr. Yeong-Wei Wu

Boeing Integrated Defense Systems, United States, andywu8491@yahoo.com

Dr. Hao-Chi Chang

National Space Organization, Taiwan, China, chang297@nspo.narl.org.tw

Mr. Wen-Lung CHIAN

National Space Organization, Taiwan, China, peterchiang@nspo.narl.org.tw

Mr. Chen-Tsung Lin

National Space Organization, Taiwan, China, tomlin@nspo.narl.org.tw

STABILITY ANALYSIS OF 3-AXIS ATTITUDE CONTROL SYSTEM OF SINGLE WING SATELLITE

Abstract

Steerable single solar wing satellites offer better Field of View for payload and make themselves ideal platform for many Earth observation missions. A NSPO built auxiliary satellite dedicated to the coming FORMOSAT-7/COSMIC-II polar orbit mission for atmosphere temperature measurement using GPS radio occultation technique also employs such a satellite design to provide nadir pointing attitude all over the non-Sun synchronous orbit where Sun beta angle will vary between ± 90 degrees. Given the benefit of steerable single solar wing design, the simulation, attitude estimation and control design will be complicated by its dynamics. In this paper, we will assess one of design and analyses challenges – the stability analysis for the closed loop normal mode 3-axis attitude control system when the values of spacecraft inertia tensor vary as the solar wing's track angle and trim angle change at different rates. With the well-established theorems available in the literature, a track rotating rate depending sufficient condition (required closed-loop control bandwidth) to guarantee the closed-loop control stability can be found in this work.