



# 5<sup>TH</sup> INTERNATIONAL CONFERENCE ON KNOWLEDGE & INNOVATION IN ENGINEERING, SCIENCE & TECHNOLOGY

21 - 23 JUNE 2019

VIENNA, AUSTRIA

## Adjustable Counter-Weight for Full Turn Rotary Systems

<sup>1</sup>Caner TURKER, <sup>2</sup>Mete ANAKLI, <sup>3</sup>Gurkan KARAKAYA

<sup>1,2,3</sup> Aselsan INC.

### Abstract

In order to perform optical tests of an optical device such as a camera, a precision two axes rotary system (gimbal) is needed where the optical device (Unit Under Test, UUT) is mounted. By the help of gimbal system, precision positioning of the UUT can be achieved and optical tests can be performed with a high accuracy. During the tests, there is a moment applied by the off-axis weight of the UUT and its mounting fixture. This moment can act against the motion direction for some orientation thus elevation axis must apply higher torque level to direct and stabilize the system. In literature, there are some studies about balancing robot arms but generally the robot arms work on a limited range. Hence, designed mechanisms do not operate for full turn, 360 degrees. In addition, off axis length and the weight of the UUT & mounting fixture are changeable for the tests of different UUTs. In this study, a four bar mechanism with an adjustable preloaded spring will be used to minimize the moment applied by the off axis weight of the moving parts. Two possible methods for preloading the spring will be introduced and optimization will be carry out to eliminate all moment applied by the off axis weight.

**Keywords:** balancing; gimbal; tension; preload; spring;