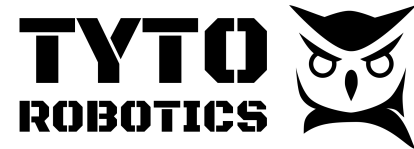


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2022-08-29

Certificate of Security - Flight Stand 15/50 for dual powertrain testing

The object of this *Certificate of Security* is to certify that the products listed below have been designed, developed, tested, and validated by Tyto Robotics to its internal standards of safety. The products respect the datasheet limits, and, when used within their specifications, operating conditions and with the specified protective equipment, are safe. Large propellers rotate at high speed and are inherently dangerous to humans. Tyto Robotics has performed a variety of safety analysis on its products and conducts physical tests to determine their reliability and their safety.

Manufacturer information

Manufacturer Name	Tyto Robotics Inc.
Design, final manufacturing, and testing	Canada
Manufacturer Address	B1-80 Adrien-Robert, Gatineau, QC J8Y 3S2, Canada
Product name	Flight Stand 15 Standard Flight Stand 15 Pro Flight Stand 50 Standard Flight Stand 50 Pro
Product application	Two powertrains spinning in a counter-rotating fashion, to generate thrust in a single direction, with the propellers in a coaxial or offset configuration
Product setups	Two Flight Stands on the Dual-motor Testing Fixture, with or without the use of the coaxial attachment plate

Listed safety analysis and tests

Ground Railing System	Four rails for linear X and Z movements
Ground Fixtures	Fifteen L corner brackets used for ground fixtures with ¼" concrete screws
Overall safety factor	Minimum 2.0
Structural natural frequency for the Flight Stand 15 in dual-motor testing	Mode 1: 26.80 Hz; Mode 2: 43.71 Hz; Mode 3: 86.30 Hz Supposing a total mass of motor and propeller of 1 kg on each powertrain Distance between two FMUs: 50 mm
Structural natural frequency for the Flight Stand 50 in dual-motor testing	Mode 1: 18.69 Hz; Mode 2: 31.30 Hz; Mode 3: 44.59 Hz Supposing a total mass of motor and propeller of 3 kg on each powertrain Distance between two FMUs: 50 mm
Tested dual-motor setups	Coaxial and Offset Coaxial testing with distance between two FMUs: 6 to 62 mm Overlapping testing with offset between two FMUs: 0 to 73 mm
System dynamic test	Run tests with 6 powertrain combinations, powered by power supply DC output up to 100 V - 200 A
System endurance test	Run 40 sets, a total duration of 24 hours of testing with spinning motors and propellers on both powertrains

Confirmed by:



Baiyun Tang, mechanical engineer, Tyto Robotics Inc.