


TRACK 2: UAV
“INSECT FLIGHT CONTROL THROUGH ELECTRICAL STIMULATION AND BIOSCIENCE ENGINEERING”

BY
ME4 TNEE CHIN KIAT
REPUBLIC OF SINGAPORE AIR FORCE

ABSTRACT

In recent years, there is growing interest in the development of small aerial flying vehicles, also termed Micro Air Vehicles (MAVs). Being relatively small, they usually range from 7.4cm to 15cm in terms of wingspan, making them maneuverable in tight spaces, hard to detect, one-man operable and low costs for large quantity productions. This presentation aims to demonstrate the research work in the field of insect anatomy, bioscience engineering, and how Cyborg Beetles are being developed in its various aspects from flight control to improving its flight endurance.

The key subject of study is the *Mecynorrhina Torquata* beetle, which is one of the largest flower beetle in the world, capable of flying additional loads approximately 20-30% of its own body weight. Anatomical studies performed on the beetle to learn the various muscle groups that affects flying, flight initiation and cessation. Another area of research involved the encapsulation of drugs into lipid-based nanocapsules (liposomes). These liposomes could deliver and activate on demand compounds that can trigger muscle inhibition or encourage muscle recovery.

The Cyborg Beetles being hybrid have great potential in the areas of HADR operations and military reconnaissance. Furthermore, the research knowledge can aid the development of biomedical and cancer treatment.

BIOGRAPHY OF SPEAKER

ME4 Tnee Chin Kiat is an Air Force Engineer by vocation and is currently the Deputy Officer Commanding (Dy OC) for the Logistics Flight of 140 Squadron, Fighter Group, Air Combat Command. He graduated from Nanyang Technological University (NTU) with a Bachelor of Engineering (Mechanical Engineering) and he is also currently pursuing a Master of Engineering (Mechanical Engineering) in NTU. Under the guidance of Associate Professor Hirotaka Sato, he completed an internship with WABIOS (Waseda Bioscience Research Institute in Singapore) and SP TIE (Singapore Polytechnic Department for Technology, Innovation and Enterprise) to help further develop the Cyborg Beetle project.

Co-Authors:

- Associate Professor Hirotaka Sato, Nanyang Technological University
- Professor Keitaro Sou, Waseda Bioscience Research Institute in Singapore [WABIOS], Waseda University
- Mr Le Duc Long, Nanyang Technological University