

NUS UAV team tops International Micro Air Vehicle Challenge 2014



NUS UAV Team AeroLion at the Oostdorp Military Camp, The Netherlands.



Part of the NUS Engineering UAV team who have returned earlier to Singapore (from left): Mr Lai Shupeng, Mr Liu Peidong, Prof Wang Biao, Mr Cui Jinqiang, Dr Lin Feng and Prof Ben Chen with three of their UAVs.

OVERCOMING powerful winds -- and strong international teams -- the NUS Unmanned Systems Research Group's Team AeroLion returned recently from The Netherlands as champions of the International Micro Air Vehicle (IMAV) Competition. The 2nd and 3rd places went to Germany and France respectively.

This was the first time the team from the NUS Department of Electrical & Computer Engineering and Temasek Lab took part in the contest. But one certainly wouldn't attribute beginner's luck to their winning. They are veterans in the art of designing and flying UAVs. Since the annual Singapore Amazing Flying Machine Competition (SAFMC) started five years ago, organized by DSO National Laboratories and Science Centre

Singapore, the team has only missed one contest – in 2012 when they decided to try their hand at DARPA's UAVForge, a year-long competition organized by the US Department of Defense.

Recalling their experience at IMAV held in Delft, Professor Ben M. Chen who led the team, said, "When we first tested our UAVs, they couldn't take off because of the strong winds. We re-designed our UAVs on the spot and quickly resolved the problem. On the actual competition day, all drones flew very well."

The team has a number of "secret weapons". One was having a 5th quadrotor – on top of the four which they brought to IMAV. While each of the four went about performing different missions required by the contest, the 5th hovered above them acting as a "Command Centre" providing communication to the other four vehicles. They were the only team with a 5th vehicle, and this was an innovation much talked about by the other teams.

Another "secret weapon" was the ability of their UAVs to stitch images together automatically -- while still in the air. Explained Dr Lin Feng, a member of the team, "This enabled the team to piece the entire surveillance map together as fast as possible. Normally, the stitching process is done only when the UAVs have landed."

Their vision-aided navigation method with GPS guidance was also precise enough to enable their crafts to enter a building through an opening that was almost the same size as the crafts. Said team member, Mr Lai Shupeng, PhD student from the NUS Graduate School of Integrative Sciences & Engineering (NGS), "Our UAV was able to maneuver round obstacles in an indoor territory that was only partially known."

The team agreed that taking part in the SAFMC was a good stepping stone for them to test their skills and knowledge in the international arena. Said the team leader and coordinator, Mr Cui Jinqiang, an NGS PhD student, "SAFMC tested our UAVs in an indoor environment. So we have become very good in that area. However, we have to prove ourselves in the outdoor environment as well. Which was why we decided to take part in the IMAV which tested us in both areas."

The team was runner-up in the Fully Autonomous Category of the SAFMC 2014, receiving the Best Performance Award and Overall Championship Award (Silver). "We lost marginally as we were slightly heavier than the team in the first place," said Mr Cui.

NUS UAV team's hybrid aircraft, however, was the overall champion in the Unconventional Category of the SAFMC 2014.

Related links:

No sky's too high for NUS Unmanned Systems Research Group: <http://www.eng.nus.edu.sg/ero/announcement/2013/web-uav1013.pdf>

NUS Engineering teams sweep gold awards at S'pore Amazing Flying Machine Competition: <http://www.eng.nus.edu.sg/ero/announcement/2013/web-amazingfly03-13-final.pdf>

ECE team's robust vision system for UAVs wins Best Application Award: <http://www.eng.nus.edu.sg/ero/news/index.php?id=790>

Team's work on automated flight control system wins ASCC Best Application Paper Award: <http://www.eng.nus.edu.sg/ero/news/index.php?id=362>

Amazing race to design smaller and smarter helicopters for 3D indoor surveillance: <http://www.eng.nus.edu.sg/ero/news/index.php?id=898>