



**Institute of Transportation,
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and Communications,**

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Contact Persons: Director, Cheng-Wei Su

Researcher, Jyun-Hao Huang

Telephone: 02-23496800 or 02-23496813

Mobil : 0912-597498 、 0920-805566

E-mail: jason@iot.gov.tw or herry219@iot.gov.tw

Website: www.iot.gov.tw

Innovative Tool for Bridge Inspection ~ UAV Autonomous Flight Inspection

Taiwan has more than 30 thousand bridges throughout the region, approximately 0.8 bridge per square km for the entire area of Taiwan; such distribution density is far greater than most advanced countries (approximately 0.4 for Japan and approximately 0.1 for the U.S.A.). To facilitate the bridge managerial institute to perform inspections in a fast, safe and effectively manner, the Institute of Transportation of Ministry of Transportation and Communications (Institute of Transportation) has developed an Unmanned Aerial Vehicle (UAV) autonomous flight inspection module such that the goal “Bridge inspection at your fingertips” is achieved for actual practice.

With the changes of the climate and the environment, bridges often age and deteriorate gradually over time, requiring periodic inspections and a sufficient budget for improvements of these bridges. As the total length of bridges in our nation is over 2,070 km, nearly 1.8 times of the coast line of the entire island, to ensure the safety of the bridges, the bridge maintenance agency often is required to act in a way similar to a Spiderman across the country to inspect all parts of the bridges in order to check their status, which is not only dangerous but also time consuming. When high bridge pillars or river crossing bridges are encountered, bridge inspection vehicles, aerial operation vehicles or small boats are required to assist the inspection operations. In addition, for bridges of high traffic volume or located at remote areas, the inspection can be even more time consuming and higher costs due

to the large size of the inspection vehicles. As a result, how to increase the efficiency of the on-spot inspection and perform effective inspection are important issues to bridge inspections.

To facilitate the bridge managerial institute in conducting bridge inspections, the Institution of Transportation has integrated various communication equipment and technologies including UAV, global positioning system, obstacle detection and avoidance, sports camera and tablet computer etc. in order to successfully develop the “UVA Autonomous Flight Inspection Module”, allowing bridge inspection personnel to use tablet computer for setting the flight route swiftly and easily in addition to the control of UAV with autonomous flights in close distance to the bridges and to take photographs of the current conditions of all bridge parts according to the route defined. The flight inspection routes can also be used repetitively. The cost of this set is approximately NT\$ 150,000 dollars, which is far less than the cost for purchasing a bridge inspection vehicle (6~1.5 million dollars), and it requires no road clearance nor traffic controls during the operation; therefore, such module is indeed “excellent value for the money”. To further improve the technology in demand, currently, the Institution of Transportation is developing the use of image stitching process technology for generating a 3D model, and is also conducting research on new risk control functions of fixed spot hovering for interrupted communication, immediate return to base upon loss of contact and parachute for device stall in order to increase the UAV application value and reduce the risk of the flight. It is expected that the goal of “Bridge inspection at your fingertips” can be realized in near future.



FIG. 1 Bridge inspection UVA developed and assembled by the Institute of Transportation

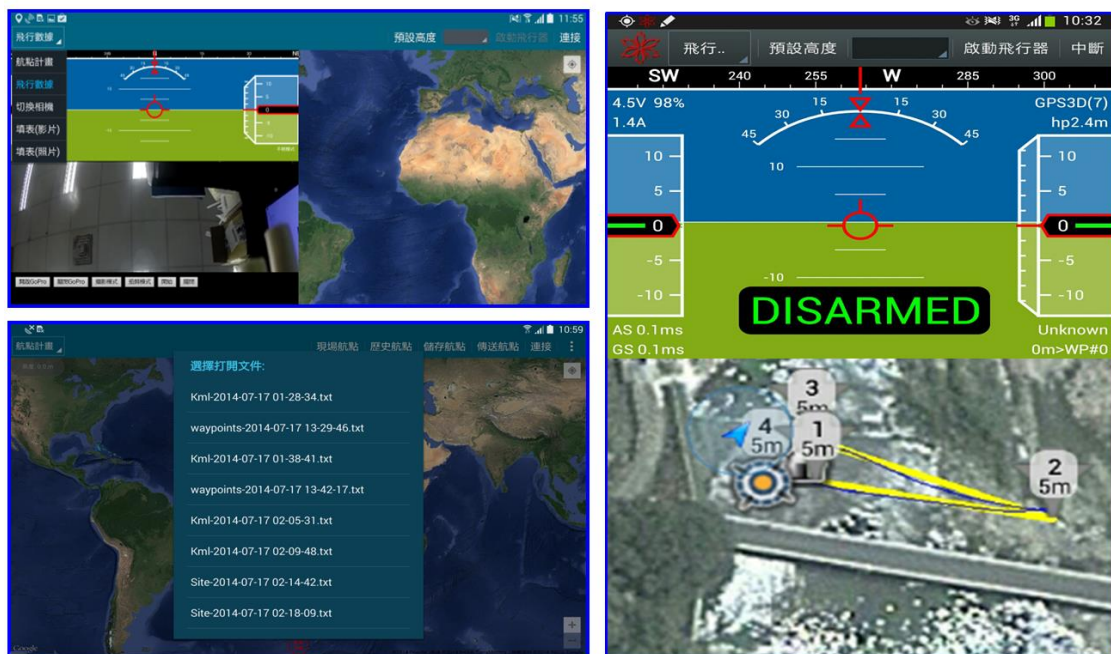


FIG. 2 UAV Ground control program operation screen



FIG. 3 Photographs of Balin Bridge and Neiwan Bridge taken during UVA Autonomous Flight Inspection



FIG. 4 3D prototype model for Nanshan Bridge and Rainbow Bridge