Design of a Unmaned Aereal Vehicle for Synthetic Apertures Radar Applications

Jarrah Alhammadi[(1)], John Pantojaa[(1)], Felix Vega[(1)], Chaouki Kasmi[(1)], Jamal Zeddoug[(2)], John Mempin[(2)], Igor Campos[(2)], and Anouar Dhouibi[(2)].
(1) Directed Energy Research Center, Technology Innovation Institute, Abu Dhabi, United Arab Emirates
(2) Autonomous Robotics Research Center, Technology Innovation Institute, Abu Dhabi, United Arab Emirates
Jarrah.alhammadi@tii.ae

Abstract— This paper describes the design and final integration of an Unmanned Aerial Vehicle to be used as a platform for a Synthetic Aperture Radar. There are many advantages to using UAVs for synthetic apertures radar surveys, including cost reduction and flexible data acquisition through linear, helical, and elliptical. Compared with satellites or airplanes, this reduces operation complexity and flying time. The paper presents the general requirements of the platform and some examples of the images acquired with the final design.

Keywords- drone, synthetic apertures radar, UAVs

I. INTRODUCTION

Nowadays, drones play a significant role in many fields of industry, having an excellent financial return because of their flexibility and multipurpose uses. This paper shows the design process of a new UAV specifically adapted to the SAR (Synthetic Aperture Radar) system RD350 from Radaz (https://www.radaz.com.br). The SAR has three- band operations P, L, C (horizontal and vertical) and can produce polarimetric and interferometry SAR images from linear, helical, and elliptical flights at low flight altitudes of 120 m [1].

Fig. 1 shows a block diagram describing the UAV and its integration with the SAR system.

The general requirements of the platform are: 20 minutes of flight autonomy, 5 kg minimum payload, 15 W power supply for SAR power consumption, and wireless data transfer from flight segment to ground station.

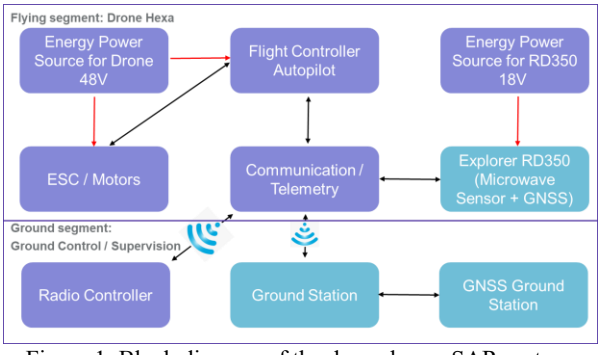

Figure 1. Block diagram of the drone-borne SAR system.

II. TEST

The system, shown in Fig. 2, was tested in realistic conditions in a rural area around the city of Abu Dhabi, UAE. A multiband system detects various objects and details within the area of interest without comprising the resolution. The three frequency bands of the system were used to clearly identify the crops, trees, and structures. The P and L-band pictures also revealed hidden objects at a depth of 1 m.

Figure 2. Microwave sensor Cabinet of Explorer RD350.

Figure 2. Drone-borne SAR during survey in a rual area in Abu Dhabi, UAE

REFERENCES

[1]L. Moreira et al., "A Drone-borne Multiband DInSAR: Results and Applications," 2019 IEEE Radar Conference (RadarConf), 2019, pp. 1-6, doi: 10.1109/RADAR.2019.8835653.