

INTASAR PROGRAM

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1. INTRODUCTION

The INTASAR Program, developed by the Radar Laboratory of the Spanish National Institute for Aerospace Technology (INTA) has as main goal to acquire know-how in all the frames of SAR technology, from airborne SAR systems development to SAR signal processing and remote sensing applications implementation, encouraging the development and use of SAR technology and data in Spain, in research, business and civil services frameworks.

The strategy that follows the program to achieve these objectives is to obtain a technological base by means of the development of SAR prototypes, on board aerial platforms, that allows to test SAR sensors in a flexible and controlled way, to implement SAR signal processing and to get imagery products and tools for the use of SAR data by users in applications such as ships and pollution detection, traffic monitoring, ground use, etc.

At present, INTASAR program is deploying in three lines:

- Development of SAR systems for INTA's CASA-212 platform.
- Development of SAR systems in POD for light platforms (motorgliders / UAV's).
- Participation in the Spanish SAR satellite: PAZ.

These lines will be detailed in next sections.

2. DEVELOPMENT OF SAR SYSTEMS FOR CASA-212 PLATFORM

The aim of this program line is the development of SAR prototypes, including the design and integration of the systems on board the platform CASA-212, as well as the ground segment development (mission definition, image generation, calibration, design of applications, etc.). To achieve our goals, this research line is structured in three systems:

2.1. RIX – SAR System

The RIX prototype is an X-Band Stripmap SAR system. The first version of this prototype started its operation in 2004, getting bidimensional imagery up to 5 meters resolution, with HH polarization. Since this first version, the system has been updated, reaching at the present prototype, whose put into operation was in October 2008, with an improved resolution up to 2.5 meters, and with the addition of interferometric and polarimetric capacities.

The RIX – processor performs the image generation based on Chirp Scaling algorithm, including first order motion compensation (using precise localization and attitude data obtained by the GPS-INS system integrated in RIX prototype), radiometric and geometric calibration and image geocoding.

2.2. RBX – SAR System

The RBX system constitutes the evolution of RIX system to obtain a system with improved capacities as well to get a system with modular design in order to simplify its updates. At present, RBX prototype is in phase of design, being expecting to carry out the first flight test in the last quarter of 2009.

The added values with respect to RIX system are:

- On-board real time processor.
- Design based on the massive use of programmable logic, for the control of the instrument and for the generation, acquisition and pre-processing of the data. This design introduces flexibility in our researches, allowing to modify the system working mode via the reconfiguration of the FPGAs, without modification of the hardware.
- Emphasis in the internal calibration of the system. To achieve this goal they have been included internal loops to signal analysis, automatic amplitude control of the transmitted signal, replica acquisition of transmitted chirp, temperature control, etc.

2.3. RMB – SAR System and future developments

The future objective of the INTASAR Program in the research line of prototypes on board CASA-212 platform is to develop the RMB prototype: a SAR system multi-band (L, P, X bands), including at least, along track interferometry and rise in storage capacity.

3. DEVELOPMENT OF SAR SYSTEMS IN POD FOR LIGHT PLATFORMS

The aim of this research line is to overcome the limitations in the design of SAR systems to be integrated in the platform CASA-212 and to optimize the execution of remote sensing missions in real time.

To achieve this goal, in 2008 it starts the project QUASAR (Quicklook Unmanned Aerial SAR), with this project, the RADAR Laboratory starts a new research section in the environment of light platforms, like motorgliders and UAVs. For it, the Laboratory has acquired the motorglider Stemme S15.

The development of the project on the platform Stemme S15 has as objective to get SAR systems on board light platforms, completely and autonomously exploitable and exportable to commercial versions of our prototype, with performances in agreement to the needs of potential users.

With respect to the RADAR Laboratory, this field of research will contribute our R+D+i in four directions:

- New processing algorithms: real time processing, developments in navigation support, spotlight mode processor, MTI, algorithms of control on board and on ground, developments for design and support of missions in real time, etc.
- Design of a new generation of sensors, operating in K Band, with patch antenna technology and miniaturization of prototypes.
- Developments on lighter platforms, with greater of flight, use of PODs and data links in LOS, data compression, etc.
- Design and development of portable ground segment stations for planning, configuration, control and operation in real time of the onboard systems.

4. PARTICIPATION IN THE SPANISH SAR SATELLITE: PAZ

Within the framework of the Spanish National Plan of Observation of the Earth by satellite, Spain is going to put in operation two satellites, one optic: named Ingenio, and another RADAR: named PAZ, of which the Area of Flight Segment and Project Management of INTA is in charge of the ground segment.

The know-how obtained by the RADAR Laboratory throughout the evolution of its INTASAR Program will be shaped in PAZ project, with the participation of our Laboratory mainly in the fields of System Engineering and Instrument and System Calibration. At the moment, PAZ project managers are involved in the organization of the satellite working group.

At present, the RADAR Laboratory has started its participation in PAZ project working on the development of an end-to-end PAZ system simulator.