

Technical paper

For

International Aerial Robotics Competition
2004

Present to :
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by :
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É.T.S. May 2004



Abstract:

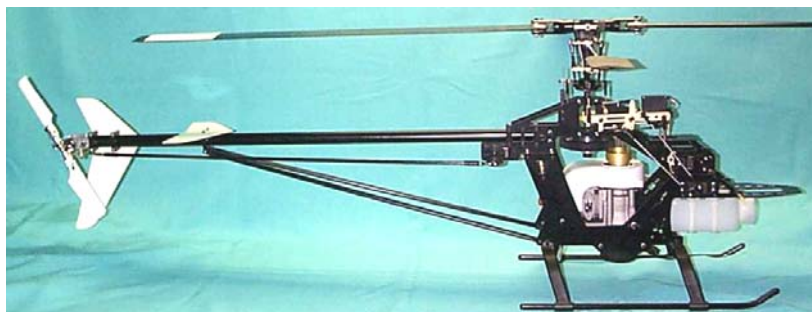
The objective of this document is to present our vehicle which we will be use in order to take part in the 'International Aerial Robotics Competition'. We will discuss in this document the technical aspects of our vehicle while passing by the type of vehicle used, the system conceived by our team in order to make it autonomous as well as the member's safety taken into account at the time of the systems design.

Introduction :

Our objective is to conceive a reduced helicopter model in an autonomous way for our first participation at the competition. As we are a new team taking part in this competition it goes from either that our vehicle does not have undergoes any improvement as well on the level control system as mechanical. We have to develop our first system with the resources which were accorded to us and with best our knowledge. A copy of the diagram of the developed system is included in the last page of this document.

Air vehicle :

For this year's competition our team will use a prefabricated helicopter of the Bergen company. The model used is the INTREPID. This model was modified and equipment were added in order to allow us to take part in this summer's competition.



The list of the added equipment are enumerated in the following section.

Payload :

On the level of the equipment on board our drone, we count multitudes of systems / sensors allowing us to make a success of the mission. We will use on our drone the equipment according to:

- ✓ a compass to indicate the direction of the vehicle;
- ✓ a ultrasonic sensor of distance for the measurement of altitude;
- ✓ a sensor to measure the speed of the engine;
- ✓ a sensor of gasoline level
- ✓ Several temperature sensors to allow us to be notified of all the problems that may occur;
- ✓ a GPS system to indicate the direction as well as the position of the vehicle;
- ✓ batteries which will make it possible to supply the different systems;
- ✓ an inertial system for the stability of the drone;
- ✓ a modem to allow us to transmit information to the ground;
- ✓ a host computer for the management of the mission.

The GPS system and the compass will be combined for the direction in order to give us more precise measurements.

For the stability of our drone, an inertial system developed by our instrumentation-control team is used. The objective of this system is to stabilize the drone in all the axes. This system is independent with any other system for reasons of safety.

For the communication, we will use a modem in order to communicate all relevant information with our computer positioned on the ground. There will be also a bond of communication for the lever of control to ensure us that the remote control is usable in any time.

On the level of the electrical supply system, we will use batteries to supply all the equipment on board. There will be also batteries which will be used only for the servo-motor and the receiver of the lever.

In order to see the overall picture and the positioning of this equipment you can refer to the system's diagram provided to the end of this document.

Operations :

Several procedures on the level of the preparation of flight were written by our director of safety in order to ensure us that nothing is forgotten and all is done in an order preestablished. Several Checklists were defined in order to be ensured to make the steps in the good order, in order not to miss any step and especially in order to limit the risks of accident.

A PC interface was developed by our software division in order to see the state of our vehicle in any time at the time of the tests or at the time of the competition.

Risk Reduction :

In order to limit the risks of danger, a director of safety was named to check and to limit the risks during all the stages of developments, the periods of tests and the competition.

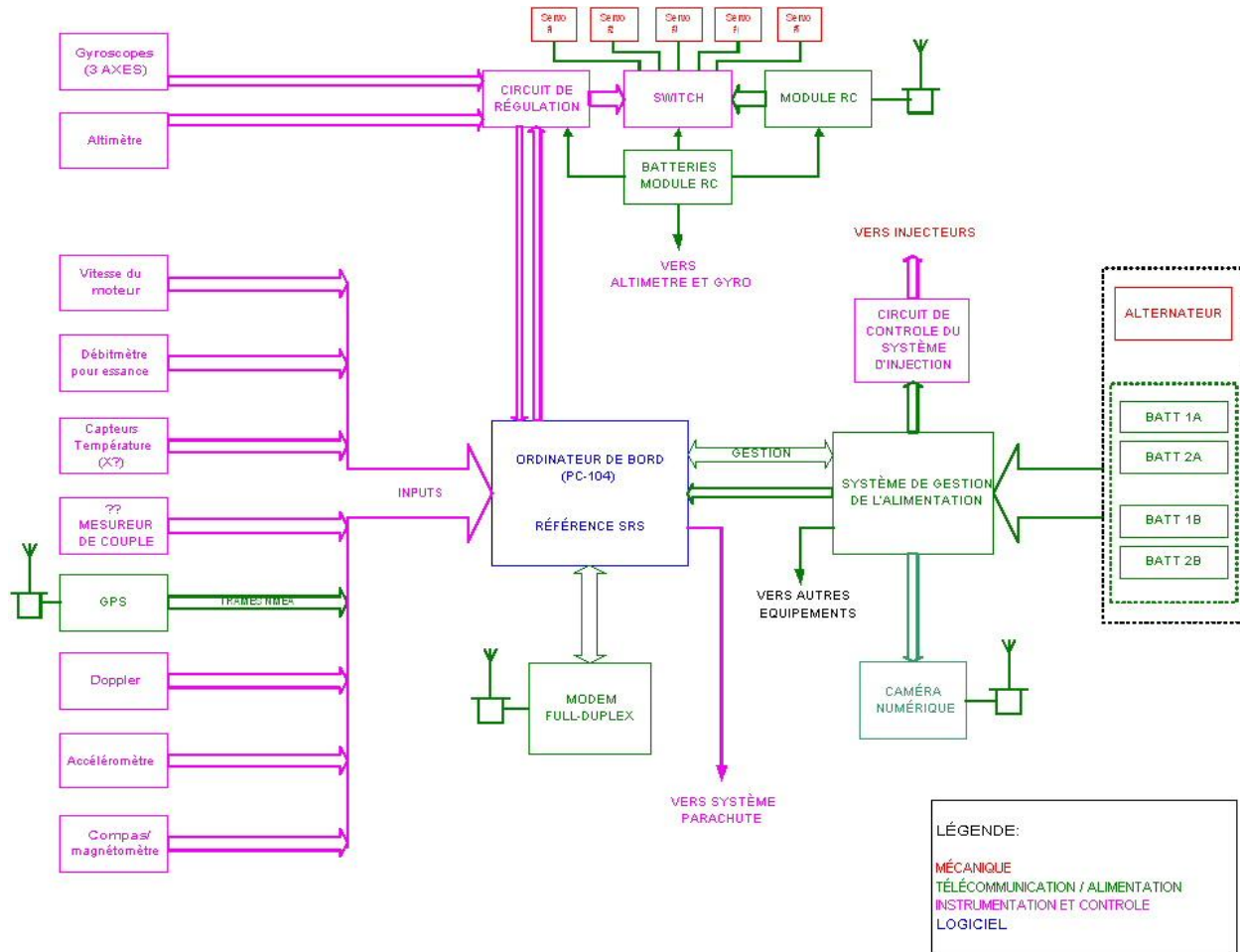
As regards the system, this one at summer conceived in order to limit the risks at least. Consequently, the inertial system makes it possible to keep stability even if the computer aboard drone is defective. The food was doubled on the level of the communication of the lever in order to enable us to take again the control of the drone it does not matter the state of the system. For the various mechanical tests, our mechanical division developed a platform. This platform enables us to make the tests of stabilization of our inertial system.

This platform is also used in order to check the functionality of the majority of our systems present at edge of the apparatus. In this way, we can keep a physical control in any time at the time of the phases of tests.

Lastly, if ever an accident arrived and that the life of people could be in danger, several members of the team received training in first aid in order to intervene in the event of urgency.

Conclusion :

To conclude, our objective for this summer is to achieve the first level of qualification of the competition by showing that our vehicle is able to accomplish a completely autonomous flight without any intervention of our team. Thereafter, if time allows it to us, our drone will be able to accomplish an autonomous flight on a course of 3 Kilometers (Level 1 Qualification).



Dronolab UAV system diagram