Chapter 1

General summary

In this chapter, a general overview of the project is given. The project will be explained in general, with a description of the top level requirements and a general overview of the system. The chapter begins with the top level requirements, from which a global description is extracted. Of course, this project plan is only preliminary, and there is not yet looked at specific solutions. Given figures are only included for clarification of the description.

1.1   Top Level requirements

For the system, some top level requirements are given. From these requirements, some more specific requirements will be derived, but these will be treated in the following report. Apart from the given list, important requirements are the use of multifunctional parts and that most of the aircraft will consist of "plastic" materials.
The following list shows the top level requirements given to us.

- Maximum take-off mass is not limited
- The size of the aircraft is not limited, but needs to be practical in operation (ground operation e.g.)
- Take-off and landing must be possible in wind force 3 conditions
- Maximum cross wind during take-off and landing of 5 kts
- Cruise altitude above all traffic, 15 km or above
- Cruise will take place between 0° and 55° latitude
- At cruise altitude, a 90% station keeping must be guaranteed
- Able to fly non-stop for one full year
- Payload mass is limited to a maximum of 3 kg
- Payload should be kept at operating temperature with minimum power usage, preferably below 25 W
- The payload should be able to track individuals on the ground from cruise altitude, night vision is a plus
- On board energy storage is allowed
- Communication and data handling must be designed
- The costs of a mission should be less than 1 million euro based on a series of 100 devices.
- Sustainability will be taken into account
- Stealth characteristics shall be included

These requirements must be met by the design. They are the base for further specification on system requirements. Some system requirements will be about the resolution, the frame rate, link-budget and power needed. These will be specified more in the Baseline report. The top level requirements can be used to give a description about the entire system in very general terms.

1.2   Description of the entire system

From the requirements it is clear that the system is about observation from a stationary platform at high altitude. This mission will need different subsystems that will be described now.

First of all, the aircraft will have to take-off. A ground crew will be needed to assist with this. This ground crew will also give information to the UAV on target area and objectives. After take-off, it will fly autonomously to the cruise altitude and after that to the target area. It therefore will need a system to determine it's location and flight path. Also, a propulsion system is needed to be able to cruise. When it reaches the target area, it must be able to remain stationary and observe the ground. Since it needs to be able to track movements of individuals on the ground, some sort of camera needs to be on board with sufficient resolution and field of view.

Because this data is needed in real time, and not after the end of the mission one year later, communication with the ground is needed. This is necessary in two ways, because commands can be send to the UAV as well. The link budget is important for the amount of data that can be produced by the payload. Again, a ground crew is needed for processing the data. After mission completion, the UAV needs to be able to fly back to base and land safely. It will preferably be reusable for a new mission. The UAV itself will need to stay in the air non-stop for one full year. Because all of the above will use energy, an important system will be the energy system. Whether all the energy is stored pre-flight or energy will be regained during flight, it will play an important role in the design.