

## SOME ASPECTS OF USING A FLOCK OF UAVS

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Today, in the world, multi-purpose drones with missions such as "lossless combat", "valuable target attack" and "drone swarm attack" are keeping on developing their techniques [1-2]. In this regard, detection of enemy targets and their resources, their automatic recognition and tracking, as well as autonomous decision-making for destruction involving high-precision weapons or armed UAVs are considered promising directions for UAVs [3-5].

The key concept in swarm UAV technology, which countries have begun to work intensively on today.

Similar behaviors of various creatures in nature, including their appearance and harmonious movement, were effective in the emergence of the idea of swarm UAVs [6]. A swarm of UAVs operating within the scope of a mission can be defined as a system of systems [7].

A system includes independent systems combined to meet mission requirements. While these systems may have their own unique features, it is also possible they have similarities.

Likewise a new system is required for a particular task. They are brought together as a system of systems to create capability.

In summary, there are two different methods for multiple use of UAVs [8]:

The initial way, various UAVs are specialized for different purposes and can constantly communicate with each other by carrying different payloads which are applied together to perform a complex task.

By benefiting from this method, very comprehensive tasks are carried out at much lower costs and a shorter period of time, thanks to the members of the swarm having various payloads such as short/long distance communication, low/high resolution imaging systems, sensors serving to different purposes.

Another method has relatively lower capabilities in order to reduce costs, but it is the use of systems consisting of many identical UAVs. In this method, instead of using a large UAV, it is possible to perform with the help of many low-cost UAVs with lower size and weight. In swarm UAV systems, each UAV is considered an independent system with a limited role in the overall mission.

Bringing together multiple UAVs under the umbrella of a system of systems creates a new capability to accomplish an intended mission.

Therefore, in missions carried out with a swarm UAV, no single vehicle is responsible for the task. Rather, the entire system is responsible for the successful execution of the task.

For example, when a UAV is designed to perform a reconnaissance mission with high-resolution cameras are integrated with a UAV capable of transmitting data at a higher speed. A new capability is created that allows images to be transmitted more quickly to the ground station.

In this example, designing a single system combining both features (high-resolution camera and high data transfer rate) could be time-consuming and costly.

Critical issues with unmanned aerial vehicles operating on swarm UAV systems, in addition to the advantages they bring to the user, also bring some difficulties and technologies with themselves that need to be developed. When these issues are grouped under main groups, they can be summarized as follows:

- By increasing the level of autonomy, reducing dependency on humans in the system and thus preventing margin of error and losses, preventing collisions and planning the route,
- Proposing solutions to the energy problem, which is one of the biggest problems faced by Class I UAVs, which is the focus of this study,
- Dealing with disruptions and similar situations that the herd may encounter during the mission.

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