#25 - Red Air Drone

When it comes to defending from airborne threats like missiles or adversary aircraft, training in realistic conditions is crucial. During training, these adversary threats are referred to as red air. Currently, the red air team is comprised of friendly aircraft, e.g. F-16, that mimic adversary threats. There are, however, limitations to using these aircraft. These friendly aircraft do not correctly mimic the performance and detectable emissions of the real adversaries. Furthermore, they require pilots specially trained to play the adversaries and need to go through maintenance that could otherwise be allocated to operational fighters. Thus, there is a need for a UAV that can match the performance of the real adversaries, is less expensive to operate, and is more sustainable than the current alternatives to fill the role of red air. To achieve this, the UAV must have a maximum speed of Mach 1.6 or higher and cruise at Mach 0.9. Additionally, it must have a service ceiling of at least 45,000 ft, a frontal radar cross-section of 0.01 m^2 or less, and have systems that can emulate the radar and infrared emissions of real aerial threats.

Mission Objective

The system is defined as: A UAV which is used for aerial combat training in red air missions, as well as all the supporting subsystems (e.g., ground control, refuelling stations, etc.) which are needed to operate the UAV. The system will be exclusively used for red air training, which allows military personnel to experience realistic combat situations. The system will do this by having the UAV emulate an adversary missile/aircraft by adjusting its observability, as well as (partly) mimicking the manoeuvres and performance of adversaries. The main reason for developing this red air system is that it will be cheaper, better, and much more sustainable than current manned alternatives. This comes from the fact that compared to current manned alternatives it will be smaller: requiring less fuel. Focused only on red air training: no complex combat systems, but all systems for training are there. Lastly, it is unmanned: no special red air pilot is needed.

System Design

The system consists of two parts: the UAV and the control station, which will communicate with each other through a military radio frequency. The drone uses a single engine which produces 16 kN of dry thrust and is fitted with an afterburner, resulting in a wet thrust of 34 kN. Furthermore, the drone has a cropped compound delta wing with all the required high lift devices, optimised for high transonic cruising at Mach 0.9 and supersonic speed of Mach 1.6. The wing uses a supercritical airfoil to maximize the cruising efficiency. Canted fins with ruddervators are used for control, with stability achieved using computer aid. The drone carries multiple mission systems onboard; these include a radar jammer, a radar warning receiver, and two chaff/flare dispensers. To make the platform even more desirable, there is capacity for extra systems in the future, such as an EO/IR camera, spherical optical sensor or a parachute for safe recovery.