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**Aircraft 1:**

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|  | This F-15 Eagle. In this report, you will:   1. Investigate the performance and design features of F-15. 2. Answer the following questions using the knowledge learnt from this course:  * What type of engine does it use? Why does not it use turbojet engine? * How it can achieve a maximum speed of Ma 2.5? * What kind of landing gear does it use? Why does it use this type of landing gear? * Why there is a dog tooth at the leading edge of its horizontal tail? * What’s the device on the back of the aircraft (In the red circle)? What is it used for? |
| **The F-15 is a fighter aircraft with large shoulder mounted wings. The wing is delta-shaped with a leading edge of sweepback angle of 45 degrees. Ailerons and a simple high lift flap are located in trailing edge. Airfoil thickness varies from 6% at the roots to 3% at tips.**  **F-15 is a twin-jet aircraft. It is powered by two Pratt and Whitney F100 axial compressor turbofan engines. These types of engines are more fuel efficient than the basic turbojet as it generates more thrust for nearly equal amount of the fuel it uses. Therefore this engines offers more fuel efficiency to the aircraft. Due to this reason twinjet engine is used instead of turbofan in F-15**  **The aircraft is lightweight with low weight to wing area ratio with high thrust to weight ratio which enables the aircraft to turn lightly without losing airspeed. It can climb upto 30000 feet in 60 seconds. The speed of this aircraft is around 1875mph which results in its ma 2.5 plus at sea level.**  **This aircraft is a fighter jet. It uses retractable tricycle landing gears. Retractable gears are hydraulically operated and are used in low weight aircrafts. In case of power failure in light weight planes like this, this type of landing gears can provide emergency extension system allowing the gears to fall under gravity.**  **The dog tooth in the leading edge of the aircraft’s horizontal tail is to induce a vortex over the wing to control the boundary layer spanwise expansion. Resulting in the increase of life and improvement of resistance to stall.**  **The device marked in red on the top of the aircraft is a spine mounted airbrake. This is used in order to create frag using hydraulic press forcing the plane towards the ground. Airbrakes are used to reduce airspeed increasing the drag. Its also used for reducing the stall speed.** | |

**Aircraft 2:**

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|  | This F/A-18. In this report, you will:   1. Investigate the performance and design features of F/A-18. 2. Answer the following questions using the knowledge learnt from this course:  * What kind of air inlet does F/A-18 use? Please describe the pros and cons of this type of inlet. * What is the name of the device in red circle? * Why does the vertical tail sit between the wing and the horizontal stabilizer? * What is the benefits of putting missiles at wing tip? * Why does the wing have small leading edge swept angle as F/A-18 is a supersonic fighter? |
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**Aircraft 3:**

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|  | This Boeing-747. In this report, you will:   1. Investigate the performance and design features of Boeing 747. 2. Answer the following questions using the knowledge learnt from this course:  * What kind of air inlet does Boeing 747 use? Please describe the pros and cons of this type of inlet. * What’s the type of its landing gear? Why does it use this type of landing gear? * What is the type of its engine? Why does it use this type of engine? * Why Boeing 747 can travel at Ma0.8? Why does it have a humpback? * What kind of airfoil it uses and why? |
| **The inlet is an asymmetric pitot type with a variable geometry auxiliary passage. It is installed in the high bypass ratio fan on the engine.**  **Retractable hydraulic Landing gear is used in this aircraft in order to minimize air drag. The Boeing 747 was given four separate and independent hydraulic systems and four main landing gear posts.**  **Wing mounted turbofan engines are used in this aircraft. These engines have excellent specific impulse at useful range of speeds. Quieter than turbojet and many other jet engines.**  **Boeing 747 can travel at Ma0.8 because it’s wing was designed to have a high sweep angle of 37.5 degrees to achieve fast and efficient speed. It’s wings are designed to delay the shock waves and reduce aerodynamic drag rise caused by fluid compressibility near the speed of sound which improves performance. When engineers designed Boeing 747 they did not see the Boeing 747 as the future of passenger transport but rather as a cargo plane. They made the hump so that the Boeing 747 can be used both as a passenger and cargo plane just in case it loses popularity. To Make this possible the engineers made changes to the design which required the aircraft nose to lift. This made the loading and unloading of cargos easy while making space for the first-class passengers in the upper deck.**  **Boeing 747 uses supercritical airfoil. The main reason to use this airfoil is to primarily to delay the onset of wave drag in the transonic speed range. It also minimizes this effect by flattening at the upper surface of the wing.** | |

**Aircraft 4:**

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|  | This Bombardier Q400. In this report, you will:   1. Investigate the performance and design features of Q400. 2. Answer the following questions using the knowledge learnt from this course:  * What kind of engine does it use? Briefly describe the pros and cons of this type of engine. Compare it with piston engines. * Describe the features of its wing and explain why. * Where is the center of gravity? How to maintain the static longitudinal stability of this aircraft? * Where is its rudder, elevator and flap? Briefly explain how flaps works. * If this aircraft can move backwards on the runway, how can it do this? |
| **Type your report here:** | |