THE FORCES OF FLIGHT

Microsoft®'s *Flight Simulator X* allows you to choose from dozens of amazing aircraft and 50 exciting missions, and even choose your role in the mission. You can explore the ocean and island of St. Maarten from the air, drop sacks of flour onto targets in the ocean, or land a Bombardier in an extremely difficult location.

You must first understand the forces involved—**drag, thrust, weight, and lift.**

DRAG

When a plane flies through the air, it is moving through a fluid. This fluid offers resistance to the plane's motion. This resistance is called *drag.* Drag occurs because the airplane is experiencing collisions with the air molecules. In these collisions, momentum is gained by the air molecules, therefore momentum must be lost by the plane. The direction of the force is opposite of the direction of the plane's velocity.

Drag can be reduced by reducing the surface area of the plane and the plane's speed.

WEIGHT

Gravity is always pulling the plane towards the center of the earth. The magnitude of this force is proportional to the mass of the plane and its altitude. At or near the surface of the earth, all objects are accelerated towards the earth with an acceleration of $g = 9.8\ m/s^2$ (ignoring all effects of air friction).

Newton's 2nd Law shows us that the force on an object is the product of the object's mass and its acceleration. So the weight of an object is equal to the product of its mass and the acceleration due to gravity: $w = mg$

THRUST

Thrust is the force created by the airplane through its jet engines or propellers. It is a reaction pair (see Newton's 3rd Law) created when one mass (air) is accelerated in one direction causing another mass (the plane) to accelerate in the other. The direction of the thrust is the same as the velocity of the plane.

For a plane to accelerate forward, the amount of thrust must be greater than the drag created by the air. For the plane to travel at constant speed, the amount of thrust must equal the drag. To slow down, the plane's thrust must be less than the drag.

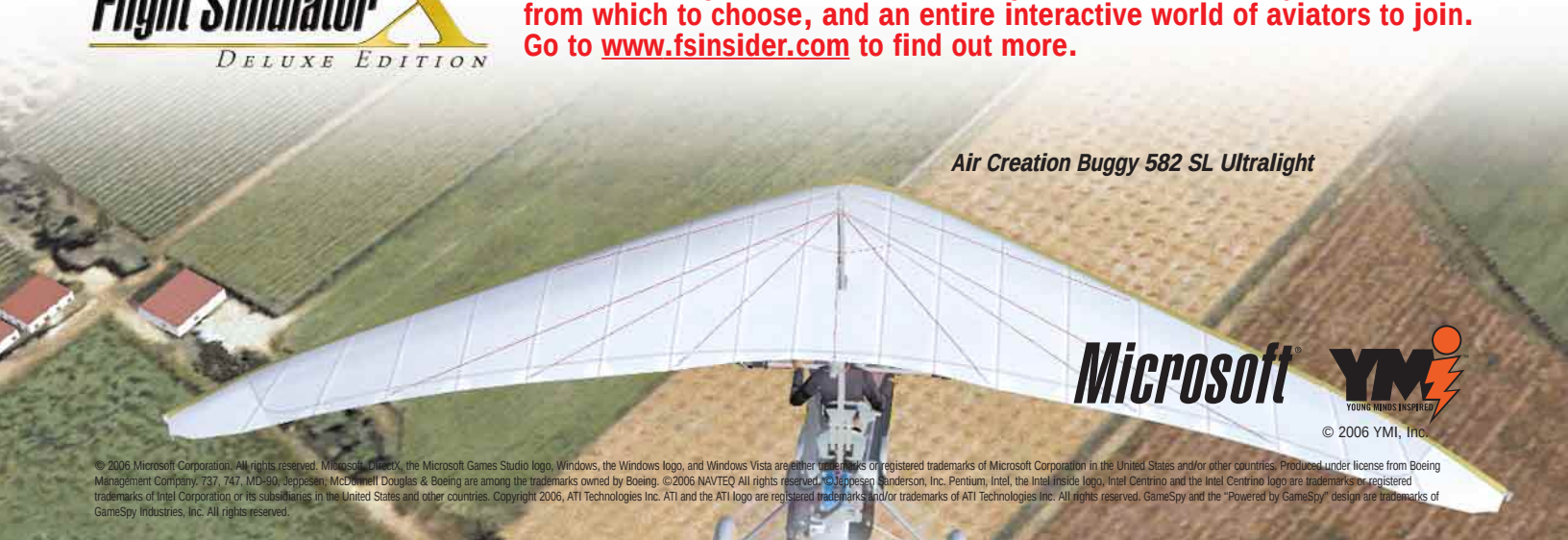
LIFT

Lift is created when an object moves through the air. A wing is shaped so the air flows faster over the top of the wing than at the bottom, causing there to be lower pressure acting on the top of the wing than at the bottom. This pressure difference produces the lift.

For a plane to rise, the amount of lift must be greater than the plane's weight. For the plane to travel at constant altitude, the amount of lift must equal the weight. To lose altitude, the plane's lift must be less than its weight.

Microsoft Flight Simulator X Deluxe Edition

***Flight Simulator X* immerses players in a beautifully rich and realistic world, offering dozens of aircraft to operate, a wide variety of missions from which to choose, and an entire interactive world of aviators to join. Go to www.fsinsider.com to find out more.**



Air Creation Buggy 582 SL Ultralight

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