

# HELICOPTERS

## History

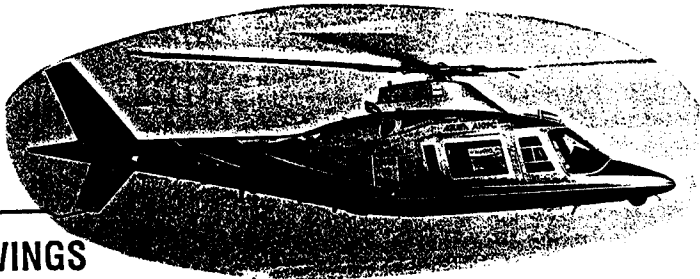
Helicopters, like most aerospace vehicles, started out with a dream of defying gravity. Early inventors realized such a vehicle was not possible without a light weight powerplant that produced tremendous amount of horsepower. As early as the 15<sup>th</sup> century, an Italian inventor and artist named Leonardo da Vinci proposed detailed sketches of how to build a helicopter. Most of the early designs proposed using such materials as wood and rope for construction and utilizing human muscle power for propulsion. Unfortunately the materials and technology for this type of flight did not exist yet. However, these early designs triggered interest in many inventors to research the complex problems associated with an operational helicopter.

It wasn't until the early 1900's before a suitable gasoline engine was manufactured that was light weight and produced adequate horsepower for helicopters. Many of these early engines had been developed to power the combat aircraft of World War I, but were also found compatible for helicopters. It was at this point that inventors turned their attention toward making the helicopter a viable means of transportation.

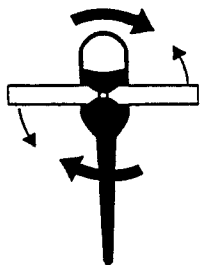
One of the world's most notable contributors to helicopter development was Igor I. Sikorsky. Igor was born in Kiev, Russia in 1889, and as a boy developed an early fascination with the concept of helicopters. It was this curiosity that lead him to a career in aviation. Igor Sikorsky first developed large bombers during World War I. He made many successful aircraft designs until Russia began experiencing upheaval and unrest. Sikorsky then immigrated to the United States where he worked on helicopters. On October 14, 1939 he piloted his VS-300 a few inches above the ground, proving that this type of aircraft could fly. Igor went on to make many more successful helicopters during his lifetime. His notable achievements have contributed to the safety and reliability of today's helicopters.

Another notable contributor to helicopter development was Lawrence Dale Bell of Bell Helicopters. He began work in this area in 1941 with the assistance of Arthur Young. By 1946 the United States Civil Aeronautics Administration granted Bell Aircraft the world's first commercial helicopter license. During the Korean war, the Bell Model 47 became legendary as it served as a rescue vehicle to transfer wounded soldiers to Mobile Army Surgical Hospitals (M\*A\*S\*H) units.

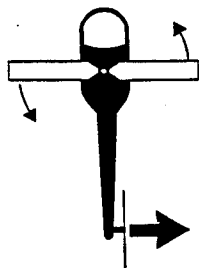
The use of the helicopter has expanded to include search and rescue, medivac, heavy lifting for construction, forest fire fighting, traffic reporting and oil drilling. The multi-mission helicopters of today are the result of the perseverance and dedication of many inventors who refused to quit when the complex mechanical problems of helicopter flight seemed insurmountable.



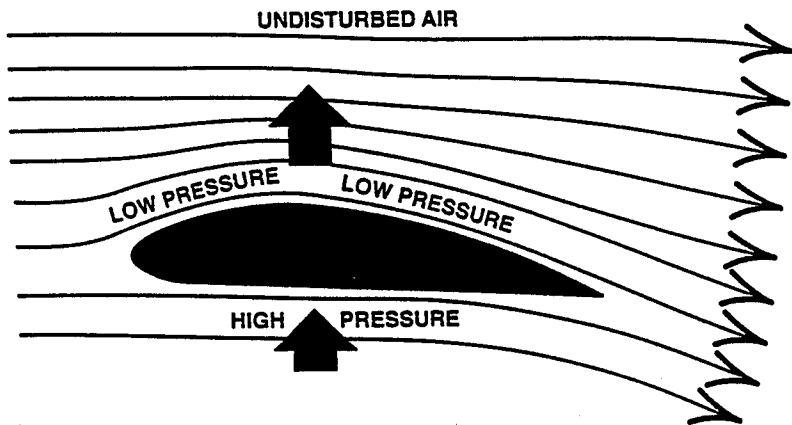
### WHIRLING WINGS



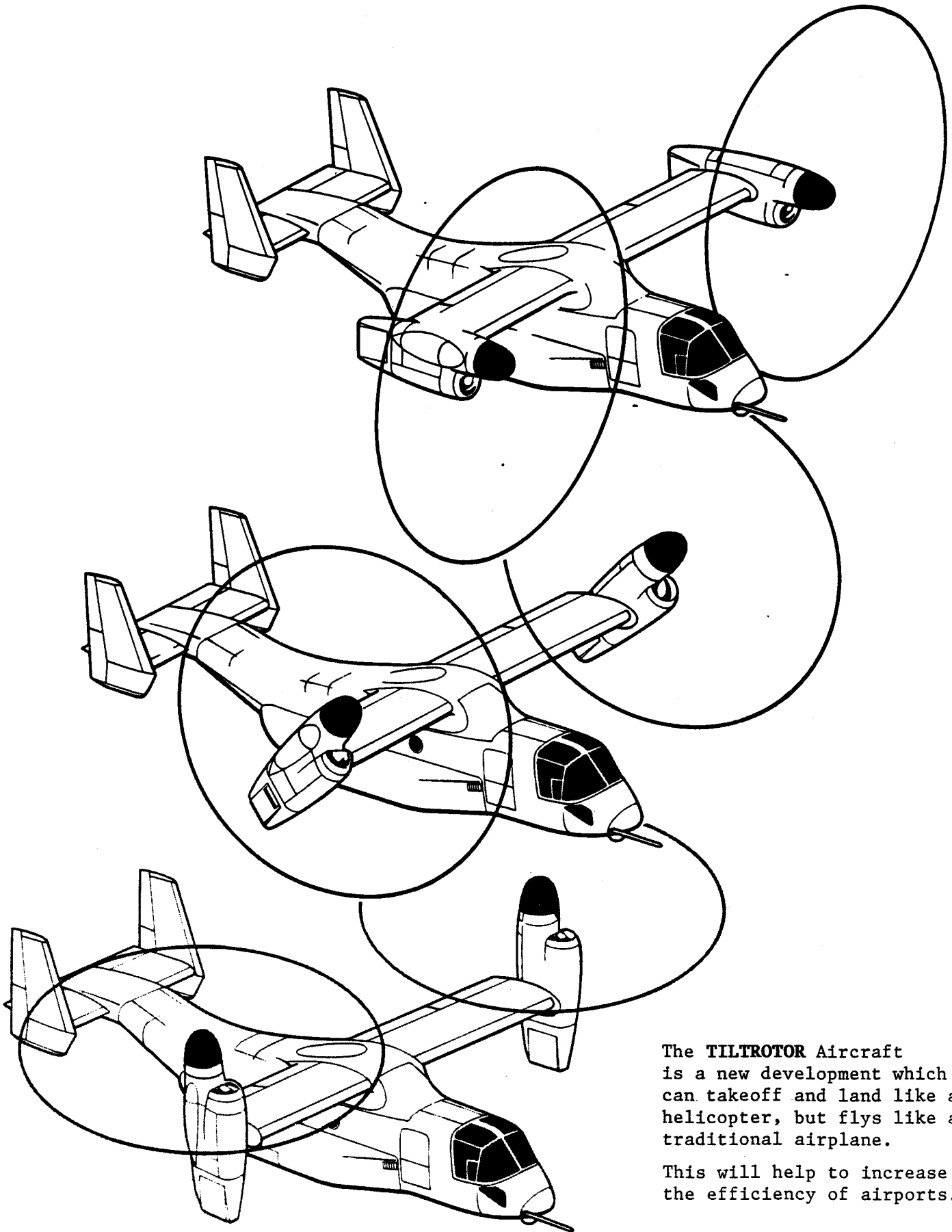
Look at a helicopter main rotor blade from the side, and you'll see that it is arched like the wings on an airplane. These "whirling wings" create LIFT.



Problem is, as the main rotors whirl, the torque (turning force) they create tries to rotate the helicopter fuselage the opposite way. Without a tail rotor, which creates force against this "counter-rotation," the helicopter would spin out of control.

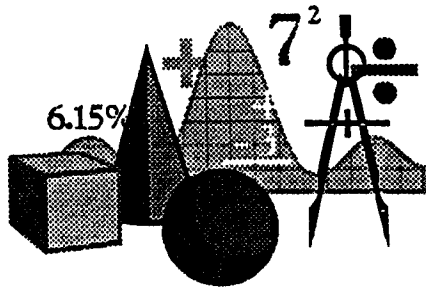


Wings on aircraft are cambered (arched) on top to create LIFT. How? The curved shape forces the air flowing over the wing to move faster than the air flowing under the wing. According to Bernoulli's Principle (see the Aviator's Glossary), this faster-moving stream of air has lower air pressure relative to the pressure below the wing. The higher pressure area below forces the wing upward. That's LIFT!



The **TILTROTOR** Aircraft is a new development which can takeoff and land like a helicopter, but flies like a traditional airplane.

This will help to increase the efficiency of airports.



# MATH - Helicopters

## ADDITION

1. A Bell Jet Ranger Helicopter burns 27 gallons per hour. If the helicopter flies for 2 hours how many gallons will the helicopter use?
2. An United States Army Apache helicopter is on a night training mission in the desert. The helicopter is flying at 165 miles per hour towards its training area. How far will it fly in two hours?
3. You are flying a helicopter traveling at 124 miles per hour. Your destination is 248 miles away. Will you make your destination in two hours?

## SUBTRACTION

1. If the total weight of an over-loaded helicopter is 2,300 pounds and the helicopter can haul only 1,986 pounds how much weight must be eliminated to safely fly the helicopter?
2. You are piloting your helicopter on a cross country flight. Your helicopter weighed 2,250 pounds when you lifted off the ground. You fly for one hour and burn 17 gallons of fuel. If the fuel weighs 7 pounds per gallon how much does the helicopter weigh at the end of the flight?
3. You decide to purchase a new helicopter that cost \$156,000. You have \$20,000 in the bank. How much more money will you have to borrow to make the purchase?

## MULTIPLICATION

1. How far would a helicopter traveling at 213 miles per hour go in 3.3 hours?
2. A helicopter is carrying 205 pounds of cargo, but is capable of carrying 4 times that amount. How much cargo can the helicopter carry?
3. One gallon of fuel for your helicopter weighs 7 pounds. How much would 49 gallons weigh?

## DIVISION

1. A U.S. Coast Guard Helicopter is on a rescue mission to a ship that is sinking in the ocean. The helicopter can haul six people at a time. If there are 36 people aboard the ship how many trips will the helicopter have to make in order to rescue all of the people?
2. A helicopter is 230 miles away from its destination traveling at 115 mile per hour. How long will it take the helicopter to reach its destination?
3. If you are traveling by helicopter at 117 miles per hour, how long will it take to fly 351 miles?