SCIENCE AND YOU
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BEYOND THE SPEED OF SOUND

Sonic. Transonic. Supersonic.

Until recently, these were just dictionary and scientific words. Today most youngsters use them as familiarly as they do baseball, football, and basketball.

These are a few of the words that have leaped from the notebooks of scientists to living room and playgrounds. And what brought them out? The terrific pace of science during and following World War II.

The public got its first taste of these particular words when mysterious "booms" reverberated around otherwise peaceful and quiet cities and suburbs. The consternation and at times fright of citizens demanded an explanation.

And it came--man had broken the sound barrier. Man had conceived, designed, and built an aircraft that flew faster than the speed of sound. Man had attained sonic speeds.

With the cracking of this new frontier of scientific know-how, the next steps were relatively simple and logical. Next came transonic speeds -- slightly faster than the speed of sound -- and then supersonic, beyond the speed of sound.

Until as recently as 1943, many in the aeronautical fields believed man would never fly faster than the speed of sound. Now, in 1957, these same skeptics are confidently talking of the "thermal barrier"-- another new phrase that will be explained some other time.

What does it mean to fly faster than sound travels. Well, let's take the familiar word and object--bell. If someone standing near you strikes it with a hammer, you hear it.

When the hammer touched the bell the metal vibrated back and forth very rapidly--hundreds or thousands of times each second. At the same time, the metal pushes along air molecules. One molecule bumps into another until your ear is reached.

There the molecules collide with your eardrum and, after certain sensitive nerves are excited, you "hear" the sound of the bell.

The speed at which the molecules can travel depends on the temperature of the air. On a normal day in early summer, for example, molecules travel at about 760 miles per hour. This is the speed of sound under these conditions.

On a cold winter day this speed slows down, or, as you might say, the air molecules become sluggish when it gets cold.

Now take an airplane. On the warm summer day it must travel 760 mph at sea level to reach the speed of sound; on a cold day, it can fly slower.

Picture an airplane flying a little slower than the speed of sound. The air molecules, when struck by the plane, bump others ahead and "notify" them that the plane is coming. This action disturbs the flow of air over the wings--the same air that provides the lift for the plane to fly.

This disturbance is the bucking and rough riding pilots describe as they near the speed of sound. This is the sonic barrier.

However, if the plane is moving faster than the speed of sound, the air particles ahead have no warning of the approach and when the nose or wing hits this type of air a shock wave occurs--the sonic boom.

The roughness encountered when a plane moves through the transonic region has been almost eliminated now with new fuselage designs based on aerodynamic research (study of air flow over bodies).

Beyond this transonic line, in the supersonic region, smooth flight is reached again with speed limited by heat resistance of the plane's skin and new designs demanded by the new air flow patterns.

Why does man want to travel so fast? The basic reason is quite simple--to get there first. The military, responsible for our nation's safety, must have supersonic planes and missiles to ward off attack from potential enemies with similar weapons.

But there is more. The knowledge gained through studies at supersonic speeds has brought one of man's oldest fantasies within the reach of reality--flight to the moon.

Scientists are predicting that man will fly into space and land on the moon before today's diapered citizens become tomorrow's retired citizens.

And the final link in the chain is expected to come from facts sent back from the pilotless satellites to be launched during the coming International Geophysical Year.

Meantime, the Air Force is continuing to probe the problems of supersonic flight with its research airplane, the X-3. Although its flight speed is still classified information, it is obvious from its long pointed nose and short stubby wings that its primary mission is the mystery of speeds far beyond those of sound itself.
