

THE HERITAGE OF FLIGHT

To many people in today's world, flight has become commonplace and seemingly very natural. They board today's flying carpets (jet airliners) and are whisked across the countryside at speeds considered impossible less than 100 years ago.

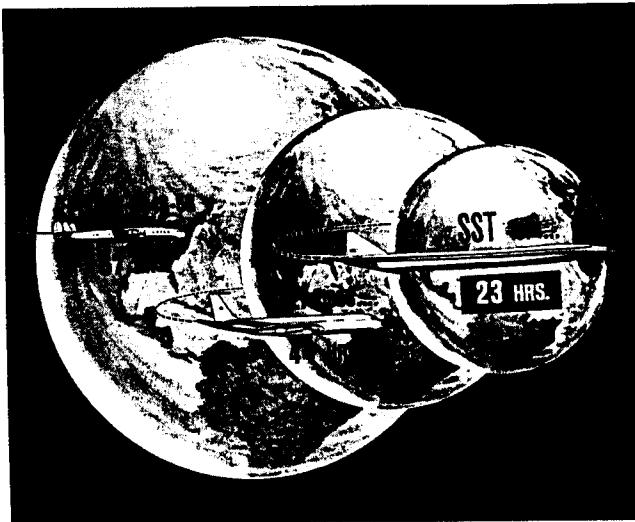
Modern air travelers seldom have thought about mankind's centuries-long struggle to fly or perhaps have passed it off as something unimportant.

Mankind's ability to fly was accomplished only by years of trial and error, success and failure. Many natural laws needed to be overcome.

Many hundreds of skilled and dedicated men and women have slowly, step-by-step, built the base upon which our present day aviation is working.

These individuals came from different nations and varied backgrounds, but they all had one thing in common.....the imagination to look into the future and the genius to mold their ideas into a reality.

This heritage has led us into today's aerospace world which is the prelude to tomorrow's even greater advances in our global society.



The Shrinking World

To Circle The World

1954----	87 Hours
1960----	44 Hours
1990----	23 Hours (SST)

JET AGE SHRINKING THE WORLD...NO TWO PEOPLE MORE THAN 24 HOURS APART

SPACE EXPLORATION INCLUDING MAN'S VENTURE INTO SPACE

WORLD WAR TWO BROUGHT ABOUT A NEW SOPHISTICATION IN AIRCRAFT...OVER 200,000 BUILT

ALL THIS IN ONLY NINE DECADES.....90+ YEARS

THE 1930'S WHEN GOVERNMENTS ACTED TO SUPERVISE AVIATION

The roaring 1920's with the barnstormer's and adventurous feats which captured the public's imagination

World War I forced a great advances in the technology of flight

Wright Brothers 1903 first flight in a heavier than air powered flight

A little over 200 years ago the hot air and gas balloons were flown during the industrial revolution period

Leonardo da Vinci's treatise on flight about 500 years ago

The wheel and sail were first used some 5,000 years ago

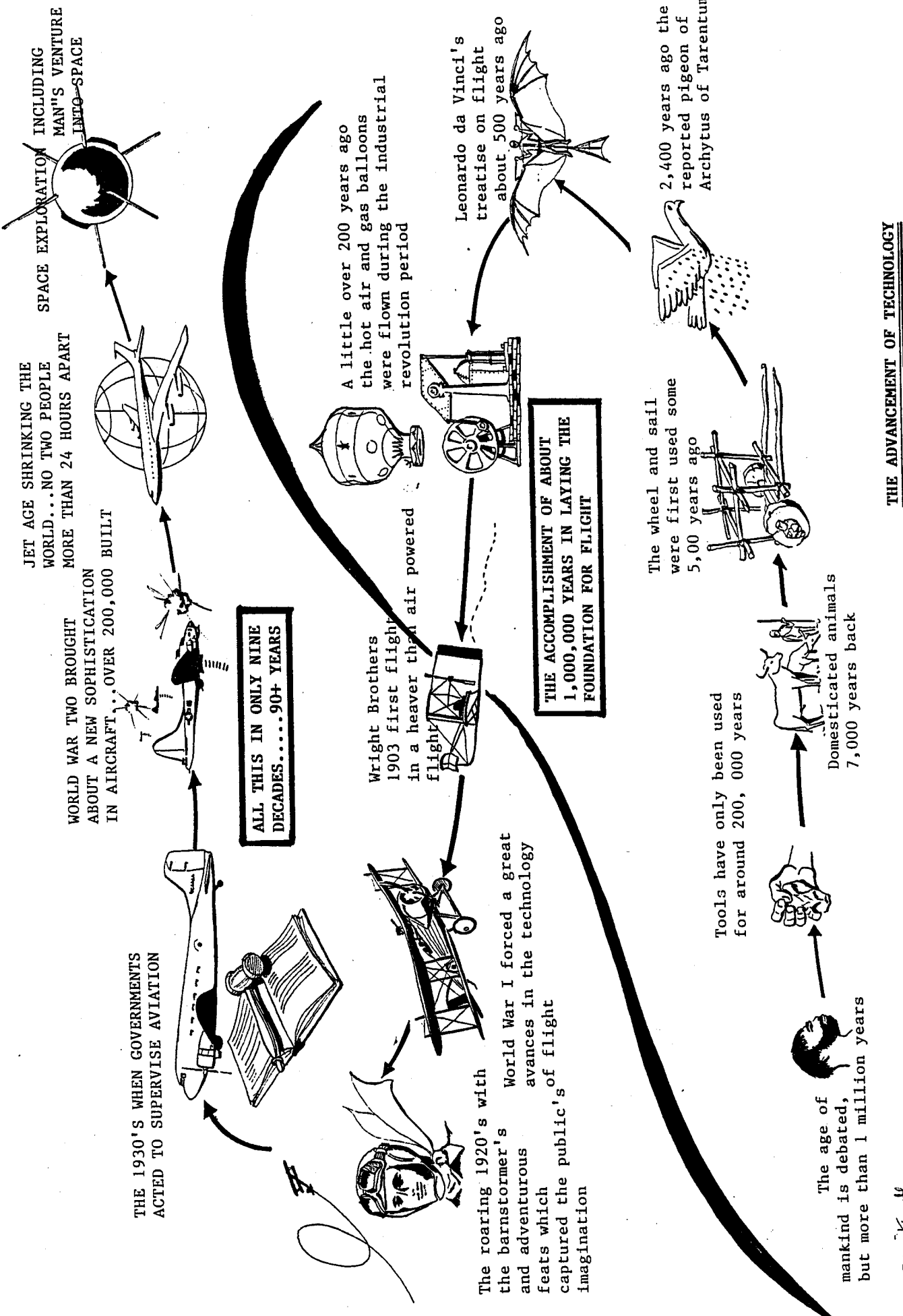
Tools have only been used for around 200,000 years

The age of mankind is debated, but more than 1 million years

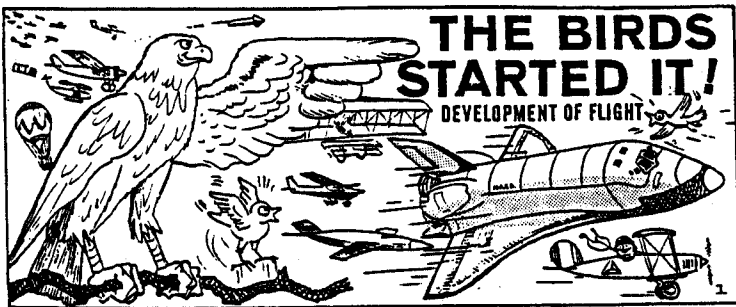
2,400 years ago the reported pigeon of Archytus of Tarentum

Domesticated animals 7,000 years back

THE ACCOMPLISHMENT OF ABOUT 1,000,000 YEARS IN LAYING THE FOUNDATION FOR FLIGHT



Stankin



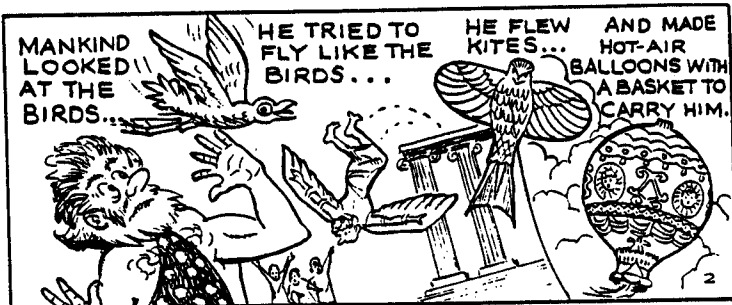
THE SAGA OF MANKIND'S STRUGGLE
TO MASTER FLIGHT

WHAT DID LEONARDO da VINCI
SKETCH ABOUT FLYING?

DO WE KNOW WHEN MAN FIRST
WANTED TO FLY?

WHO INVENTED THE BALLOON?

WHAT COUNTRY
INVENTED KITES?



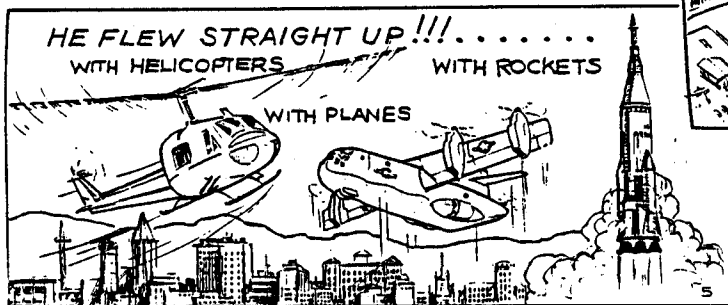
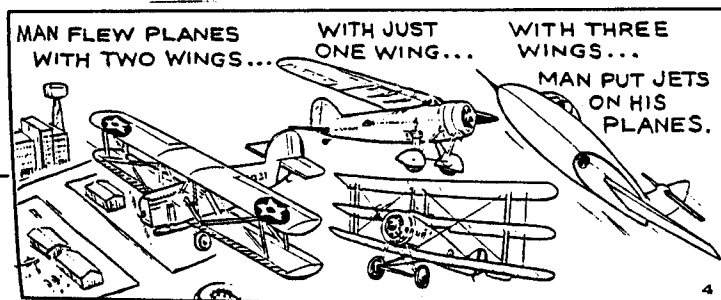
HOW DO YOU THINK PEOPLE LEARNED TO
BUILD AIRPLANES?

HAVE YOU EVER WISHED YOU COULD FLY?

WHAT MATERIALS WERE USED TO BUILD
THE EARLY AIRPLANES?



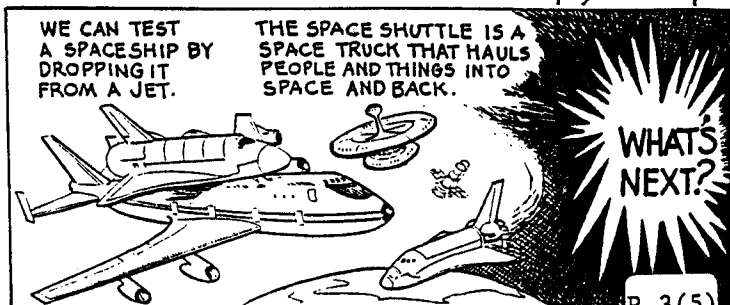
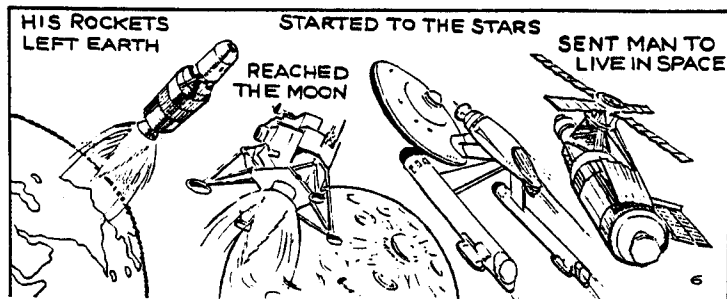
WHO WERE SOME OF THE EARLY HEROS?
WHAT DID THEY ACCOMPLISH?



HOW WAS THE AIRPLANE FIRST USED IN WAR?

WHY WAS THE JET ENGINE AN IMPORTANT
INVENTION?

WHAT MAJOR AVIATION AND SPACE EVENTS
HAVE TAKEN PLACE SINCE YOU WERE BORN?



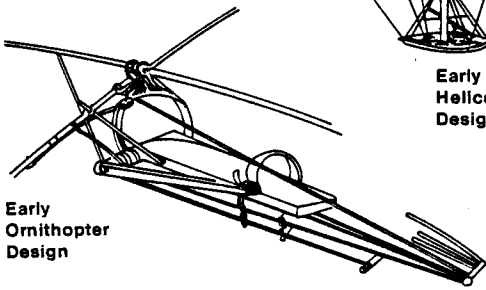
HOW ARE AIRPLANES AND SPACECRAFT
USED TODAY?

WOULD YOU LIKE TO FLY IN SPACE

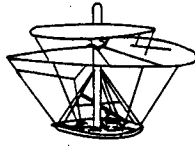
CAN YOU WRITE AN ADVENTURE STORY
ABOUT AIR TRAVEL?

Aviation Pioneers

The pioneers of aviation experimented with models to understand what it took to achieve flight, just as we will with our models. What do you think are some advantages of the use of models over full sized prototypes?



Early Ornithopter Design

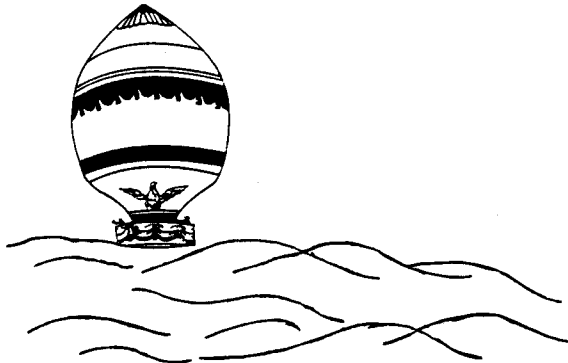


Early Helicopter Design

Leonardo da Vinci

Late in the 1400's, Leonardo da Vinci drew the designs for a variety of flying machines, including the *ornithopter* and the *helicopter*. His work however, was quite secret, and did not influence the development of these aircraft, as the drawings remained unpublished until late in the nineteenth century.

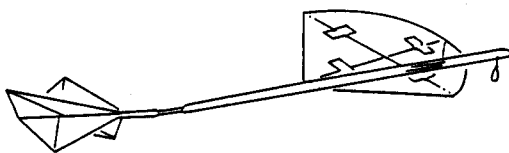
Da Vinci's notebooks contained some 150 sketches of flying machines which might have advanced the course of aviation history, had it been known.



Montgolfier Brothers

The first successful man-carrying free flight occurred over Paris in 1783. Carrying two frenchmen, the Montgolfier's balloon traveled more than five miles across the city in some twenty five minutes.

Soon after this flight, balloons and ballooning became a craze that spread throughout the civilized world. This excitement soon led to experiments with heavier-than-air flying machines.

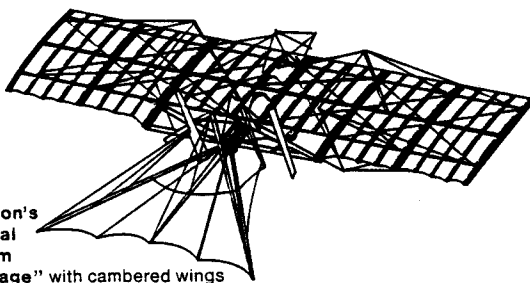


Cayley's Fixed-Wing Glider

Sir George Cayley, *The Father of Aerial Navigation*

In the early 1800's, Sir George Cayley of England discovered the principles which form the foundation for modern aeronautics. His work with model airplanes and full-scale airplanes replaced the flapping wings of the ornithopter with a *fixed wing glider*. These aircraft introduced the forces of *lift*, *thrust* and *drag*.

Cayley's model experiments uncovered the importance of *control surfaces* and *stabilizers* that are essential to today's aircrafts.

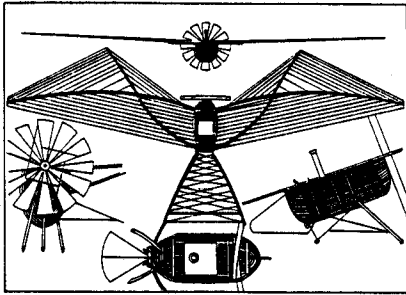


Henson's "Aerial Steam Carriage" with cambered wings

William Samuel Henson

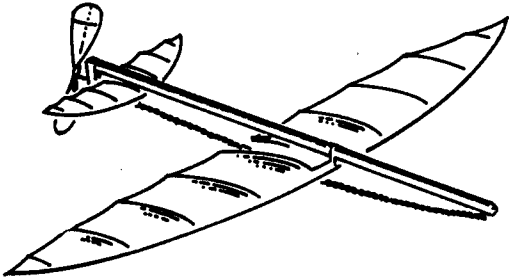
In 1845, W.S. Henson published his design for a *monoplane* "Aerial Steam Carriage." Although the full-scale machine was never built, his designs and testing of models led to the eventual development of powered airplanes.

DuTemple's design shows a slight dihedral in the wings



Felix DuTemple

In 1857, DuTemple patented his design for the first airplane device that rose into the air under its own power (hot air). The design had been tested successfully with a scale model. His design included a tractor propeller, swept-forward wing and tail, and retractable landing gear.



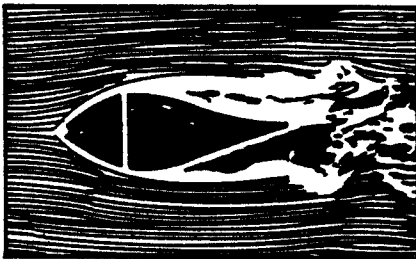
One of Penaud's "model planophones".

Alphonse Penaud

In 1870, Alphonse Penaud began experimenting with model airplanes powered by twisted rubber bands. His model "planophones" had raised wing tips and a negatively positioned tail plane. Some even incorporated a vertical rudder which added stability.

A few years later, Penaud proposed using a new method of instantaneous photography to record the actions of birds' wings in flight.

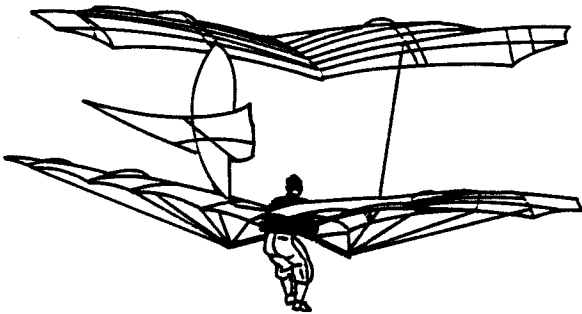
Marey's wind tunnel photography



Entienne-Jules Marey

Late in the 1800's, Marey put Penaud's photography methods into practice. The resulting photographs allowed man to study the birds' motions of flight in great detail.

Later, Marey studied *airflow* by photographing the smoke displaced in a *wind tunnel* by different shapes. These studies eventually led to the development of *airfoil* designs to create better lift.



Otto Lillenthal

By 1891, Lillenthal had built and flown the first of several successful *gliders*. In 1896, Lillenthal flew the first hang glider himself, with movable wing tips that were powered by a small carbonic acid gas motor.

Lillenthal was the first person to study gliding flight scientifically, and is regarded as the "greatest pioneer" of the late 1800's. His successful manned flights inspired a great deal of future glider pilots, including Wilbur & Orville Wright.

Wilbur & Orville Wright

The Wright brothers began studying aviation in 1899. They built their first glider in 1900, and for several years, they conducted test flights at Kitty Hawk.

Through these test flights, the Wright brothers managed to control the *pitch*, the *yaw* and the *roll* of their gliders. They went on to make the world's first powered, sustained and controlled airplane flight in 1903.

By 1905, they had built and flown the first practical flying machine which could be banked, turned and circled with ease. This plane, the "Flyer III", could fly for over half an hour.

