SNS COLLEGE OF TECHNOLOGY

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DEPARTMENT OF AEROSPACE ENGINEERING

19ASO301 BASICS OF AERONAUTICAL ENGINEERING

UNIT 1 –HISTORY OF FLIGHT

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HISTORY OF FLIGHT

- *History of Flights*
- *Ornithopters*
- *Hot Air Balloon*
- *Development of Flight - 18th & 19th century*
- *Development of Flight - 20th century*
- *Summary*

TEXT BOOK

- ***Anderson. J D, "Introduction to Flight", McGraw-Hill, 1995***

- ***Richard S. Shevel, "fundamentals of Flight", Prentice Hall, 2010***

DEVELOPMENT IN 20TH CENTURY

- ***Wright Brothers***

- *Airfoil shape & wing design of the glider based on aerodynamic data published in 1890's by Otto Lilienthal & Samuel Pierpont Langley*

- *First glider in 1900 produced no meaningful lift*

- *Wright Brothers increased the wingspan area from 165 to 290 Sq ft and also increased the wing camber (airfoil curvature)*

- *Larger the Camber, more Arched is the airfoil*

- *Lifting capacity still 33%*

DEVELOPMENT IN 20TH CENTURY

- ***Wright Brothers***

- *They built a wind tunnel 6 ft long and 16 Sq ft powered by two-bladed fan connected to gasoline engine*

- *Tested 200 different types of airfoil viz. flat, curved, rounded*

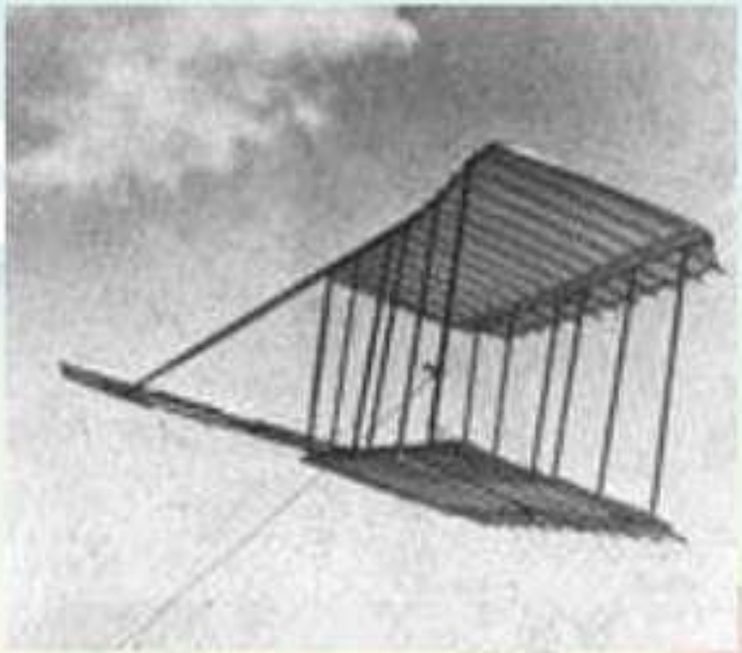
- *New glider designed in 1902. Airfoil much more efficient. Camber is reduced considerably*

- *Success achieved due to good aerodynamics*

DEVELOPMENT IN 20TH CENTURY

1900

- The Wright brothers fly their biplane kite with the wingspan of 1.5m at Kitty Hawk, North Carolina to test their control system.
- It does not produce enough lift to make more than a handful of flights.
- Kitty hawk was the area suggested by the U.S.Bureau is an ideal spot for glider experiment



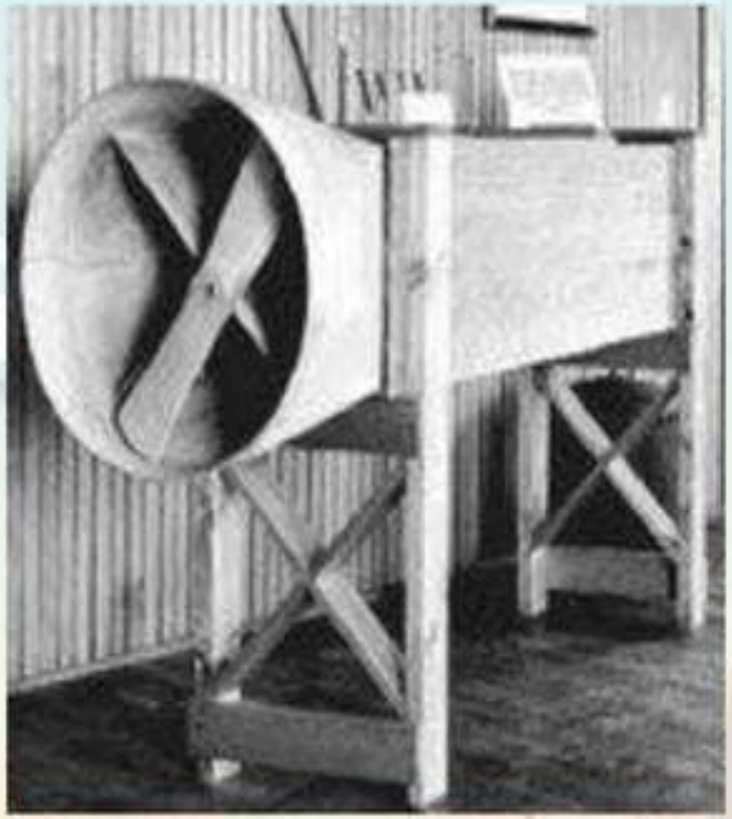
29-07-2020

Fundamentals of Aeronautical Engineering
KIT-Kalaignarkarunanidhi Institute of Technology

DEVELOPMENT IN 20TH CENTURY

1901

- The Wrights test their second glider at Kitty Hawk. and it also performs poorly.
- At home in Dayton, Ohio, they build a wind tunnel and conduct research on wing shapes.



DEVELOPMENT IN 20TH CENTURY

1902

- The Wright build a third glider based on their wind tunnel tests and it flies well.
- They refine their control system at Kitty Hawk.

DEVELOPMENT IN 20TH CENTURY

1903

- The Wright brothers make the first controlled, sustained powered flight at Kitty Hawk.
- Samuel Langley of the Smithsonian Institution also tries to fly a manned version of his Aerodrome and fails

DEVELOPMENT IN 20TH CENTURY

1904 Wright Flyer II

- The Wrights begin to refine their powered airplane, making test flights at Huffman Prairie near Dayton, Ohio
- Now it is Known as **Wright Patterson Airforce base**
- Longest Flight last for **5min 4sec traversing more than 4426m**

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DEVELOPMENT IN 20TH CENTURY

1905 Wright Flyer III

- Wing area is smaller than the Flyer II
- Airfoil camber is increased ,biplane and double rudder
- The Wright brothers develop the first practical airplane and demonstrate it before a small audience.
- They offer their invention to the U.S. Army, but the Army is not interested.
- More than 40 flight
- Longest Duration 38min 3Sec covering 38640m

DEVELOPMENT IN 20TH CENTURY

1906

The U.S. Patent Office grants a patent to the Wright Brothers on their airplane control system.

DEVELOPMENT IN 20TH CENTURY

1907

- Wright type A airplane similar to the Flyer III but has a engine of 40hp

DEVELOPMENT IN 20TH CENTURY

1908

- The Wright Brothers procure contracts for the sale of airplanes from French investors and the U.S. Army, provided they can demonstrate their invention.
- Wilber flew to France made around 104 flight in France land

Signal Corps, Unit

These Articles of Agreement

------ February ------, nineteen hundred and
--------- Captain ----------, Signa

Wilbur and Orville Wright, trad:
1127 West Third St:

county of ---------- Montgomery -------
second part. WITNESSETH. that in conformity wi
al hereunto attached. and which. in so far as the
---------- Chas. S. Wallace

DEVELOPMENT IN 20TH CENTURY

1908

- The Wright brothers demonstrate a two-passenger airplane in Europe and America. While Orville was experiencing similar success in US
- Demonstration for Fort Meyer near Washington ,Columbia ,Longest flight : 1hr 14min
- Orville crashes during a demonstration flight, propeller crashed and is badly injured. His passenger, Lt. Thomas Selfridge, becomes the first person to die in an airplane crash.

DEVELOPMENT IN 20TH CENTURY

1909

- The Wrights demonstrate a new airplane and the U.S. Army buys its first military aircraft. The Wrights begin to manufacture airplanes and teach pilots.
- Two technical features where adopted by Wright Machine : Lateral control and propeller

DEVELOPMENT IN 20TH CENTURY

ORVILLES ACCOUNT

"Wilbur started the fourth and last flight at just about 12 o'clock. The first few hundred feet were up and down, as before, but by the time three hundred ft had been covered, the machine was under much better control. However, when out about eight hundred feet the machine began pitching again, and, in one of its darts downward, struck the ground. The distance over the ground was measured to be 852 feet; the time of the flight was 59 seconds. "

- Five people witnessed the flights: One was John T. Daniels (who took the famous "first flight" photo using Orville's pre-positioned camera). Another was Johnny Moore, a teenage boy who lived in the area.

DEVELOPMENT IN 20TH CENTURY

WILBURS EARLY DEATH

- Wilbur became ill on a business trip to Boston in April 1912. This was thought by some to be due to eating bad shellfish at a banquet.
- After returning to Dayton, he was diagnosed with typhoid fever. He lingered in and out of consciousness for several weeks until he died at home on May 30, at age 45.
- His father wrote about Wilbur :

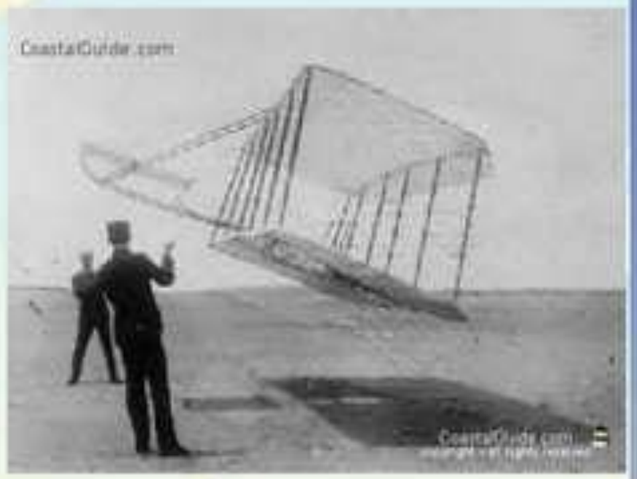
"A short life, full of consequences. An unfailing intellect, imperturbable temper, great self-reliance and as great modesty, seeing the right clearly, pursuing it steadfastly, he lived and died."[

DEVELOPMENT IN 20TH CENTURY

ORVILLES DEATH

- Orville died on January 30, 1948, after his second heart attack. He had lived from the horse-and-buggy age to the dawn of supersonic flight.
- He was followed a day later by John T. Daniels, the Coast Guardsman who took their famous first flight photo.
- Both brothers are buried at the family plot at Woodland Cemetery, Dayton, Ohio.

DEVELOPMENT IN 20TH CENTURY



Wilbur and Orville Wright flying 1901 glider as a kite.

Wright Brothers National Memorial

Kill Devil Hills, North Carolina

DEVELOPMENT IN 20TH CENTURY

- The brothers never married.
- Wilbur Wright died at age 45 of typhoid.
- Orville Wright died of a heart attack at age 77.

SUMMARY - DEVELOPMENT OF FLIGHT

Scientist/ Person	Period	Development/ Findings
Daedulus & Icarus	*Greek Mythology*	*Wings. Wings were fastened with wax and strapped to arms for flapping*
Leonardo da Vinci	*15th Century*	*Ornithopter, flapping of wings by a mechanism powered by movement of hands or legs*
Montgolfier Brothers	*18th Century*	*Hot Air Ballon*
Sir George Cayley	*18th & 19th Century*	*Whirling arm with to study Aerodynamics* *Concept of separate Lift & Propulsion* *Modern airplane with fixed wing, horizontal & vertical tail* *Biplane & Triplane*

SUMMARY - DEVELOPMENT OF FLIGHT

Scientist/ Person	Period	Development/ Findings
John Stringfellow	*18th & 19th Century*	*Built several steam engines* *His recognized work was steam powered triplane (1868)*
William Samuel Henson	*19th Century*	*Fixed-wing airplane powered by steam engine driving two propellers. Aerial Steam Carraige*
Felix Du Temple	*19th Century*	*In 1874, flew the first successful powered monoplane in France*
Alexander F. Mmozhavskiy	*19th Century*	*Second steam powered monoplane with pilot* *Launched at St.Petersburg, Russia*

SUMMARY - DEVELOPMENT OF FLIGHT

Scientist/ Person	Period	Development/ Findings
Otto Lilienthal	*19th Century*	*Glider Man. Flew the first & successful controlled Glider. Flew more than 2000 successful gliders* *Insight into flying only by actual flying experiments*
Percy Pilcher	*19th Century*	*His most noted machine was Hawk*
Samuel Pierpont Langley	*19th & 20th Century*	*American aviation pioneer* *Worked on rubber-band powered models & gliders* *Aircraft needs Thrust to overcome Drag* *Unpiloted model flew 700 m, 1000 m & 1500m*

SUMMARY - DEVELOPMENT OF FLIGHT

Scientist/ Person	Period	Development/ Findings
Wright Brothers	*20th Century*	*Built wind tunnel and tested 200 different types of airfoil* *First Glider in 1900 not successful* *New Glider designed in 1902. Success achieved* *In 1903, made first controlled & sustained power flight (flyer II)* *In 1905, first practical airplane (flyer III). Wing area smaller than flyer II. Camber increased, biplane and double rudder* *In 1907, airplane similar to flyer III, with 40hp engine* *In 1908, two passanger airplane in Europe & USA* *In 1909, new airplane demonstration to US Army. Army buys its first military aircraft. Two technical controls were adopted: Lateral & Propeller*

SUMMARY - DEVELOPMENT OF FLIGHT

Scientist/ Person	Period	Development/ Findings
-	*1930's*	*Douglas (DC 3)*
	End of WW II	*Need for High-Speed, Supersonic flight*
	1950's	*Boing 707, high-speed sub-sonic flight* *Bell X-1 – faster than sound* *Lockheed Martin F-104 – First supersonic airplane (2 mach)* *Lockheed Martin F 22 – Sustained supersonic*
	1970's till date	*MIG 29 – 2.3 Mach (Russia), 4th generation* *F-16 – 2 Mach (USA), 4th generation* *Rafale – 1.8 Mach (France), 4.5 generation*