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Aeronautical and Aerospace Sciences

EVOLUTION OF U.S. MILITARY AIRCRAFT. M. Leroy Spearman & Robert W. Heath, Langley Research Center, Hampton, VA & Independent Contractor, Newport News, VA. The airplane was accepted as a part of the military system in August 1907 with the establishment of an Aeronautical Division of the U.S. Army Signal Corps An airplane was procured from the Wright Brothers and flight training began at Fort Meyers, VA. In August 1909 an improved Wright Flyer was formally accepted and was identified as `Airplane No. 1`.Another U.S, designer was becoming well known and in 1911 a Curtiss airplane was the second airplane to be sold to the U.S. Army. The first appropriation for military aeronautics was in the 1912 War Department budget for the sum of $125.000 and orders were placed three Wright airplanes and two Curtiss airplanes. European countries, on the brink of World War I, were making progress in the development of military aircraft. The U.S. entered the war in1917 but had no military aircraft. U.S. volunteer pilots did gain experience while flying British and French aircraft and the U.S. industry gained experience by manufacturing some European airplanes. Following the war, the U.S. acquired a number of British and French airplanes for the Army Air Service. Native aircraft were soon to appear, primarily trainer airplanes and early Martin bombers. Concern that the U.S. was lagging in aeronautical research lead to the establishment of the National Advisory Committee for Aeronautics (NACA) An aeronautical laboratory was constructed at Langley Field, VA and, since 1920, the laboratory has contributed to the technological growth of U.S. military aircraft as they evolved from the classic propeller–driven fabric-covered biplane to the all-metal monoplanes In the 1940`s jet-propulsion was introduced and the flight envelop was changed to include transonic and supersonic flight More recently some military aircraft designs have employed stealth technology that is intended to make the aircraft less visible to most tracking systems – example is the F22 Raptor stationed at Langley Field, VA.

DELINEATION OF AERODYNAMIC PROBLEMS WITH WIND TUNNEL TESTS. M. Leroy Spearman, Langley Research Center, Hampton, VA. The use of wind tunnels in the development of new aircraft and missile concepts is well known. However the wind tunnel is also useful in establishing the characteristics of existing aircraft or missiles. As flight speeds increased compressibility of the air became a major problem. Regions of sonic flow caused some separated flow that reduced the control effectiveness. Wind tunnel tests indicated that blunting the trailing edge of flap-type controls to reduce the surface slope would eliminate the separated flow and restore the control effectiveness. Blunted trailing edges. were applied to the ailerons and the horizontal tail of several high-speed aircraft and the roll control and pitch control was restored. Further research lead to the development of the all-moving tail that could be moved symmetrically for pitch control and differentially for roll control. In1949 Convair produced the delta-winged F-102 supersonic aircraft that had difficulty in achieving the desired supersonic speeds. Production was halted and NACA-Langley undertook an investigation of the concept. A major revision involved the application of the transonic area rule that resulted in sliming the body in the region of the wing attachment- the coke bottle` contour. The transonic drag rise was reduced, supersonic speed was achieved and production was resumed. Wind tunnel tests in conjunction with analytical results can be useful in determining the performance characteristics of existing aircraft. One example is the Soviet MiG-25 airplane first seen in a 1967airshow. The airplane was said to be capable of Mach number 3 flight. There was some doubt of this performance in the Western World Estimates of the overall planform and profile shape could be gotten from airshow photographs. A study was undertaken at NASA-Langley to determine the cross-sectional shape that would be required to meet the speed. A wind tunnel model was built and tests verified the speed. In 1976 a MiG-25 defected to Japan and a detailed examination of the airplane indicated that the NASA-Langley model was essentially correct.

VARIATIONS OF VARIABLE GEOMETRYAIRCRAFT. M. Leroy Spearman, Langley Research Center, Hampton, VA. The geometric shape of an aircraft usually consists of a fuselage, wing and tails and a propulsion system. The fuselage provides the space required for the cargo, equipment and crew. The wing provides the lift required to sustain flight. The tails provide for stability and control The propulsion system provides for forward movement of the aircraft. The shape and arrangement of these components are designed in such a way as to assure that the mission requirements for the aircraft are met Thus for different mission requirements a different geometric shape is required. This lead to the concept of a single aircraft having variable geometry that would be suitable for multiple missions An example of such an aircraft is the General Dynamics F-111 in which the wing panels can be set at a low sweep position for take-off and landing and low-speed flight – for high-speed flight the wing panels are rotated back to a high sweep angle. With the F-111 the entire wing panels are moved using inboard pivots. Some research has been done with outboard pivots in which only a portion of the wing panel is swept. And some research has been done with only a single pivot wherein the entire wing is rotated into what is known as a skewed wing. Several aircraft having variable sweep wings have been produced in the U.S., and in several European countries and in the Soviet Union.

Agriculture, Forestry, and Aquaculture

DOES PROXIMITY TO COMPOST PILES AFFECT FLY POPULATIONS IN HIGH TUNNEL TOMATO? Mark Kraemer, Walter Mallory & Steven Pao, Agricultural Research Station, Virginia State University, Petersburg, VA 23806. Compost is commonly used in organic vegetable production but it is not known if nearby compost piles pose a health threat. This study evaluated fly populations in two high tunnels,