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Aeronautical and Aerospace Sciences

A HYBRID AIRSHIP CONCEPT M. Leroy Spearman Langley Research Center, Hampton, VA. An airship differs from an airplane in that the lift required for flight is provided by a lighter-than-air gas contained within the airship hull. For an airplane the lift required for flight is generated by moving air over an airfoil shaped wing. The lift for an airship is called buoyant lift and it requires no forward motion. The lift for an airplane is called kinetic lift and requires forward movement of the vehicle through the air to produce the lift. A large airship is capable of lifting very heavy loads but is limited in speed and range. A hybrid airship is one in which buoyant lift is combined with kinetic lift. The proposed concept would be a twin-hull airship with a connecting inboard wing. The use of twin hulls would provide the required amount of lighter-than-air gas to be contained in a length half that of a single hull. Jet engines would be attached to the wing to provide for the forward flight that would create the kinetic lift. Particular designs can be developed by manipulating such factors as the volume of gas, the wing area, the airfoil contour and the engine thrust. Designs could be made that varied from small, lightweight systems to very large, heavy-load systems. Such a vehicle would also permit access to almost any remote location because of the vertical landing and take-off capability provided by buoyancy. Such a vehicle would be suitable for military logistic support missions. In commercial use the vehicle could serve small airports, could reduce community noise, could relieve air traffic delays, and could improve fuel efficiency.

SOME LESSONS LEARNED WITH NACA/NASA WIND TUNNELS. . M. Lerov Spearman. Langley Research Center, Hampton, VA & Robert W. Heath, Canon of Virginia, Newport News, VA. The NASA Langley Research Center in Hampton, VA has been engaged in improving our nations aircraft for over 92 years. Named after aviation pioneer, Samuel Pierpont Langley, the Langley Memorial Aeronautical Laboratory was the first laboratory of the National Advisory Committee on Aeronautics (NACA). When the first of many wind tunnels went into operation at Langley in the early 1920's the typical aircraft was a low-speed, propeller-driven airplane Early research at Langley led to airfoil shapes that maximized the lift and minimized the drag. Other drag reduction led to the development of engine cowling for propeller-driven airplanes, the covering of the open cockpit, the cantilevered monoplane wing, and the retractable landing gear. When jet-propulsion was developed for aircraft the aerodynamic research was extended to transonic, supersonic and hypersonic speeds. New techniques and new wind tunnels were developed at Langley to address the problems at speeds beyond the speed of sound. One of the models tested at Langley, the Bell XS-1, was the first airplane to fly through the sound barrier. Essentially every supersonic aircraft built in the US has been influenced by Langley wind tunnel results.

When further results lead to shapes that permitted access to space the NACA was replaced by the National Aeronautics and Space Administration (NASA) and research related to both aircraft and spacecraft continues at the Langley Research Center.

VARIABLE GEOMETRY AIRCRAFT. M. Leroy Spearman. NASA-Langley Research Center. Hampton, VA . A given aircraft design is generally a fixed shape that fits the mission requirement and different requirements require different shapes. Since the early days of manned flight aircraft have generally had a lift-producing wing that was aligned normal to the airstream direction. As the air moves over the wing surface the air begins to compress and with increased speed a point is reached where the air cannot be moved any further and increased flight speed is not possible. By sweeping the leading edge of the wing back at an angle to the flight direction the air flow over the wing travels a greater distance from the wing leading edge to the trailing edge and this apparent slimming delayed the onset of compressibility. While swept wing designs did permit high speeds they had poor stability at low speeds that required translating the wing fore and aft as the sweep angle was changed. NASA Langley resolved the problem with a design in which only a portion of the wing was swept. This lead to the concept that a wing with variable sweep could combine the speed advantage of high sweep with the good stability characteristics of low sweep. In 1961 the U.S. Secretary of Defense, Robert McNamara initiated the Transonic Experimental Fighter (TFX) program to develop a common airframe suitable for the Navy and the Air Force. The General Dynamics F-111 airplane was produced that met the mission requirements but the Navy cancelled out because the airplane exceeded weight and size limits imposed by aircraft carriers. Other airplanes that have made use of variable sweep in the U.S. are the Navy Grumman F-14 and the Air Force Rockwell B-1.

Astronomy, Mathematics and Physics / Materials Science

AN INEXPENSIVE RADIO TELESCOPE IN A COLLEGE PHYSICS LAB. T.C. Mosca III, Dept. of Mathematics & C. Crook Dept. of Chemistry and Physics, Rappahannock Community College. An amateur radio telescope was established on the Glenns campus of Rappahannock Community College. The components included a commercial amateur radio receiver, an antenna designed to operate in the 15-30 MHz range, and a laptop computer running a freely available software package. Data were collected in 24-hour increments at 20.100 MHz, which is a frequency reserved for radiotelescopy. Numerous events were recorded, several of which were simultaneously observed at sites up to 3000 km away, indicating that these events originated from extraterrestrial sources. Physics students experienced a tangible application of electromagnetism principles, and learned that extraterrestrial objects are radio emitters. They also learned that real and valid research can be conducted without sophisticated and expensive equipment. In the future, we hope that students can be more directly involved in the collection and analysis of data, and that data can possibly be collected from sources other than our sun.

THE ACCELERATING JET OF 3C 279. S. D. Bloom[1], C. M. Fromm[2], and E. Ros[3], [1]Department of Physics & Astronomy, Hampden-Sydney College, [2]Max Planck