

Tuesday May 5th Plenary Talk
8:15 -9:15 AM

Aerospace Applications Demand Efficient Use of Electrical Power



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ABSTRACT: The ever growing demand for more electric power in modern aircraft coupled with the shrinking available space for the onboard electric equipment bays translate into rising power density requirements for airborne electrical equipment. The situation is further complicated by the increasing use of composite materials in equipment and structures with lower temperature limits and poor thermal conductivity. This forces lower operating temperature limits of the electrical equipment and prevents the use of structures as a heatsink as they have conventionally been used. Combining these opposing requirements drives the design of the electrical equipment to be at the highest efficiency possible throughout all operating modes. The high efficiency requirement applies to all electrical systems on the aircraft, including the

generation system, the primary and secondary distribution systems and all the systems that utilize the electrical power.

The aerospace industry is addressing these challenges with bold measures, designing the most efficient equipment possible and combining the intelligent use of this equipment to perform multiple duties during the different flight profiles. This maximizes the utilization of the allotted space and minimizes the cooling requirement. This is achieved by tasking one power electronics controller to serve a number of motor loads through a matrix of contactors. As the flight profile changes and different loads are required, the flight computer commands the power electronics controller to perform different functions. The controller then reconfigures the contactor matrix and resumes its new role with different operating conditions. This is just one example of “doing more with less”.

The talk will cover the above challenges in more details and will attempt to define efficiency and its drivers to the aircraft industry. The constraints of power quality and EMI/EMC requirements on both the generating and utilization equipment will be described. The steps taken to make the electrical system and the use of electrical power on the aircraft as efficient as possible will be elaborated. A few examples of both aircraft and space based power electronics equipment will be presented.

Biographical Information on Dr. Said

Dr. Said worked in the aerospace industry for the majority of his career. He joined Hamilton Sundstrand in 1985 as a Sr. Research Engineer working on solid state control of variable speed constant frequency (VSCF) aircraft electric power systems and on electrically driven torpedo propulsion engines. He later led the design and development of a number of power electronic controllers for the electromechanical actuation (EMA) products for high lift flight actuators for regional jet airplanes. Dr. Said was also the principle investigator for the USAF sponsored Advanced Motor Drive program that produced fault tolerant high power motor and motor controller concepts. After that Dr. Said became the principle investigator of the electrical system on the Space Shuttle Electric APU program sponsored by NASA Johnson Space Center. The program was to power the Space Shuttle Auxiliary Power Unit with Li-Ion Battery system and electric motor driven hydraulic pumps. Dr. Said is currently in charge of all power electronics and motor controls technology at Hamilton Sundstrand. Parts of his responsibilities include technology maturation, research and technology roadmap strategy for future aircraft systems.