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Human travel into deep space using current, or imminently, available technology

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Since the inception of space flight no human has yet traveled beyond cislunar space into interplanetary space. The question thus arises: Is it possible to devise a spacecraft capable of sustaining crew in good physical and psychological health in long-duration missions using technologies that are either proven or in an advanced stage of development? Several semesters of space system design classes at Texas A&M Aerospace Engineering Department were challenged to find an answer, culminating in the efforts of the recent senior capstone design class as reported in this paper. Specifically, the class designed a human-crewed spacecraft with the mission to travel to asteroid 99942 (Apophis), gather samples, and return them to earth. Long-term habitability and adequate mobility motivated a number of challenging derived requirements, viz.: 1) maintain artificial gravity at 32.2 f/s2, 2) provide nuclear generation of electric power, 3) use electric propulsion, 4) include the cultivation of on-board food crops, 5) radiation protection, and 6) use the three-body problem method of trajectory design to develop a low-energy trajectory to 99942 Apophis. This paper will discuss the development and evolution of the spacecraft design including problems that remain and technologies requiring further development.

Biography

David C Hyland earned the SB, MS and PhD degrees at MIT in 1969, 1971 and 1973, respectively. Through 1983, he was staff member of the MIT Lincoln Laboratory. Beginning in 1983, he led an advanced technology group at Harris Corporation and became Senior Scientist. He joined the University of Michigan in 1996 as Professor and Chairman of Aerospace Engineering. In 2003 he joined Texas A&M University as Associate Vice Chancellor, Associate Dean of Research, and Professor of Aerospace Engineering, and Physics. Most recently, he gained the position of Director of Space Science and Engineering Research.