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ARTIFICIAL LIGHTING IN SPACE: CREATING A COMFORTABLE ENVIRONMENT FOR
ASTRONAUTS

Abstract

How does a person feel when he is outside the earth? How will his life be organised? This article discusses one of the most important influences on human life — light. Light not only allows us to see our environment and helps us interact with it, but also affects human physiological and psychological performance.

The aim of the research is to develop an artificial lighting installation inside a space station, to maintain optimal circadian rhythms, as close as possible to the usual Earth rhythms, which will allow astronauts to fully perform work in the space station environment and maintain health. Development of lighting scenarios depending on the functional purpose of the station area, peculiarities of visual work, development of energy-efficient and healthy solutions for humans.

The research analyses and compares day and night regimes on Earth, in Earth orbit, on the Moon and on Mars. The existing ISS station and the lighting solutions used on it are also considered. The following shortcomings were identified: some of the lighting fixtures are directed in the astronauts' faces while they are working, and in some modules the lighting is too bright without the possibility of regulation, which causes visual strain. In some places there is no possibility to switch off the light completely, which complicates the process of healthy sleep. It is also worth noting the lack of light, because you have to hide from the sun, as it is radioactive and dangerous, and the level of artificial light is not enough. Due to the insufficiently developed lighting system, the production of melatonin and cortisol is disturbed in humans, sleep, mood, fatigue and tiredness, irritability deteriorate — which significantly reduces the working capacity of astronauts.

It is proposed to develop artificial lighting solutions for different modes of operation and location of the space station, aimed not only at covering the basic lighting needs and maintaining the health of astronauts, but also at creating a comfortable, hybrid, ergonomic and energy-efficient lighting system.

The research includes not only the development and adaptation of living conditions for people who will be temporarily staying in space, on the Moon or Mars, or the first settlers, but also the subsequent modification of lighting systems to meet the needs of the permanent residents, which is a new challenge to create a sustainable and healthy environment for humans in deep space.