

PLSS 2.5 Fan Design and Development

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NASA is building a high fidelity prototype of an advanced portable life support system (PLSS) as part of the Advanced Exploration Systems Program. This new PLSS, designated as PLSS 2.5, will advance component technologies and systems knowledge in order to inform a future flight program. The oxygen ventilation loop of its predecessor, PLSS 2.0, is driven by a centrifugal fan developed using specifications from over five years ago. PLSS technology and system parameters have matured to the point where the existing fan will not perform adequately for the new prototype. In addition, areas of potential improvement have been identified with the existing fan that could be addressed in a new design. As a result, a new fan was designed and tested for the PLSS 2.5.

The PLSS 2.5 fan is a derivative of the one used in PLSS 2.0. It uses the same basic non-metallic can around the motor, but with a larger volute and impeller to meet the higher pressure drop requirements of the PLSS 2.5 loop. This allows it to operate at rotational speeds that are matched to rolling element bearings, and which create reasonably low impeller tip speeds. Development of the fan also considered a shrouded impeller design that allows larger clearances for greater oxygen safety and better performance.

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