

On-Orbit, Immuno-Based, Label-Free White Blood Cell Counting System with Microelectromechanical Sensor Technology (OILWBCS-MEMS)

For counting multiple cell types in space flight and terrestrial environments

Aurora Flight Sciences, in partnership with Draper Laboratory, has developed a miniaturized system to count white blood cells in microgravity environments. The system uses MEMS technology to simultaneously count total white blood cells, the five white blood cell differential subgroups, and various lymphocyte subtypes. The OILWBCS-MEMS detection technology works by immobilizing an array of white blood cell-specific antibodies on small, gold-coated membranes. When blood flows across the membranes, specific cells' surface protein antigens bind to their corresponding antibodies. This binding can be measured and correlated to cell counts.

In Phase I, the partners demonstrated surface chemistry sensitivity and specificity for total white blood cells and two lymphocyte subtypes. In Phase II, a functional prototype demonstrated end-to-end operation. This rugged, miniaturized device requires minimal blood sample preparation and will be useful for both space flight and terrestrial applications.

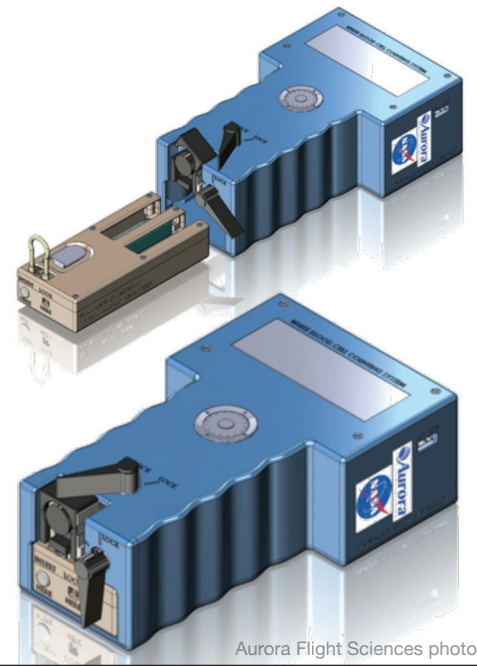
Applications

NASA

- ▶ On-orbit white blood cell counting
- ▶ Ground-based biomedical research and development

Commercial

- ▶ Immuno-based cell counting in biotechnology and medical industries
- ▶ Cell counting in remote locations:
 - Battlefield environments
 - Mobile triage units
 - Medical centers in the developing world



Aurora Flight Sciences photo

Phase II Objectives

- ▶ Refine surface chemistry design
- ▶ Continue long-term storage studies
- ▶ Transfer surface chemistry to nanohole array device
- ▶ Miniaturize subsystem prototype design and development
- ▶ Integrate, test, and verify functional prototype
- ▶ Report results

Benefits

- ▶ Simultaneous counting of multiple cell types
- ▶ High specificity and sensitivity
- ▶ Compact size
- ▶ Low power consumption
- ▶ Fully automated

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