



NASA SBIR 2008 Phase I Solicitation

X14.02 On Orbit Cell Counting and Analysis Capability

Lead Center: JSC

Cell counting and analysis within the clinical hematology/immunology area generally refers to identification and enumeration of various populations of white blood cells in the peripheral blood. This capability has direct clinical relevance, as peripheral cell populations may expand (proliferation in response to pathogen, hematological malignancy) or contract (sequestered at localized site of inflammation) related to specific disease states. In medicine, the complete blood count, white blood count and CD4+ T cell counts are examples of routinely used cell counting assays. Instrumentation typically used for automated analysis includes hematology analyzers and flow cytometers. Hematology instruments generally accept unstained cells for analysis and differentiate the subpopulations based on scatter properties alone. Flow cytometers require pre-staining of specific cell surface proteins with fluorescent dyes, the emission of which will be optically detected by the cytometer upon excitation with an onboard laser. Flow cytometers may range from large, multi-laser/multi-color instruments with sorting capability, to miniaturized bench top instruments with diode lasers and less capability. NASA is interested in developing a microgravity-compatible instrument capable of on-orbit cell counting. This instrument could support medical testing of crewmembers as well as various research activities. The instrument technology is not constrained, and might range from typical cytometer fluidics, a micro fluidics approach, or some other novel method for resolving and counting cells. It is generally believed that typical sheath-fluid based cell focusing, used in standard flow cytometers, is not desirable due to microgravity incompatibility and operational constraints (fluid volume, mass and waste constraints). Extremely miniaturized and lightweight instrumentation, without high-energy lasers, and requiring minimal sample volume or exogenous (sheath) fluid to operate, and generating minimal biohazardous waste would have the greatest chance for success. An associated sample processing system may be required, that would stain, lyse or otherwise process the whole blood or cell sample is anticipated. The instrument should be capable of deriving absolute counts, in addition to the relevant percentage of various cell subpopulations.

Phase 1 Requirements: Phase 1 expectations would be at a minimum a fully developed concept, complete with feasibility analyses and top-level drawings. A breadboard or prototype is highly desired.

