

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Astronaut Training, Accommodation, and Operations in Space (5)

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THE ELECTRONIC FIELDBOOK TOOL SUITE: FIELD SCIENCE SUPPORT TOOLS FOR
STRUCTURED INFORMATION COLLECTION AND DISTRIBUTION DURING HUMAN
PLANETARY EXPLORATION AND ASTRONAUT TRAINING

Abstract

Scientific exploration will form an important part of future human missions to the Moon. To enhance the scientific return of these missions, it is important to accurately record, index and store all the scientific information collected during exploration, and then rapidly distribute it in a structured way amongst the relevant mission support personnel. Such capabilities will be essential for the ground-based science teams supporting these future missions for maintaining situational awareness, enabling them to provide useful and timely feedback to the astronauts and thereby enhance the scientific expertise present on the lunar surface. The Electronic FieldBook (EFB) Tool Suite is a deployable and modular system being developed to address these requirements. The EFB is designed to support field mission operations, scientific data gathering and direct interaction with support teams through the automatic exchange of information. The system provides near real-time situational awareness to mission support teams during scientific traverses. It achieves this through several methods. The system provides a structured way to collect data. Users can document a sampling procedure, retrieve information from several sensors or analytical tools, look up reference information, and take notes. All the information gathered is automatically geo-located and tagged to ensure it is associated to specific sites or samples along a traverse. Decision support for tasks such as sample selection is also provided by the EFB. When interfacing with analytical tools (e.g. handheld spectrometers), the system can analyse the data produced using embedded machine learning modules to characterise the mineralogy of samples and inform on their scientific value. The tool suite comes as a fully integrated package, including portable devices for data collection and field-deployable wireless mesh data transmitters. The system ensures disruption tolerant information exchange, allowing users to continue working regardless of temporary or extended loss of connection. Provided connectivity is present, any

user of the system will receive information gathered in near real time, enabling them to direct or support the operations, and provide relevant and informed scientific advice where required. EFB has been the key supporting tool for ESA's PANGAEA/PANGAEA-X 2018, 2019 and 2021 field campaigns, which offer planetary geology training integrated with operations and technology testing. Within this context, the EFB has co-evolved to support both ESA training and testing activities, and provides a solution to the data integration challenges presented by future human scientific exploration in space.