EXECUTIVE SUMMARY

Project Objectives

The Rapid Radar Mapping to Support Wildfire Response and Recovery Operations project will address challenges and opportunities for wildfire disaster management response and recovery. The objectives are:

1. Develop and demonstrate innovative RADARSAT and Sentinel burned area mapping solutions within the context of wildfire disaster response and recovery activities in Canada;

2. Demonstrate the added-value of RADARSAT and Sentinel to provide timely burned area data for wildfire disaster response, as a complimentary observation method to existing practices, and plan for its operationalization; and

3. Optimize the use of RADARSAT and Sentinel data with complimentary datasets in wildfire disaster management and plan for RADARSAT Constellation Mission.

Disaster Category and Phase of the Disaster Cycle

The project addresses the **response** and **recovery** phases of disaster risk management for **wildfire disasters**. Forest fires and wildfires affect many countries, including the United States of America (USA), Australia, and Indonesia, and while the project will focus on the Canadian context and engage directly with Canadian Federal, Provincial, and Territorial government partners, we will explore opportunities to apply the proposed solution internationally.

Partners Involved in the Project

The project objectives will be achieved by following a clear project methodology and through engagement with federal, provincial, and territorial partners. Several Canadian wildfire management agencies support the project, including: Canadian Forest Service (CFS); Alberta Wildfire, within the Alberta Ministry of Agriculture and Forestry; BC Wildfire Service, Northwest Territories Department of Environment and Natural Resources, and Quebec Ministry of Forest, Wildlife and Parks.

The project team provides the required technical, management, and subject matter expertise and experience required. Dr. David Goodenough and Dirk Werle are team members and will act as Senior Advisors.

CSA-Supported Missions Data and Complementary Data

A combination of RADARSAT-2, Sentinel-2, and other supporting remote sensing data will be exploited for the project. The primary remote sensing data will consist of RADARSAT-2 Quad Pol, but other beam modes will be used based on availability of archived RADARSAT data.

Project Activities

The project builds on the current state of the art and highly promising research results, which will be validated and exploited for operational use. To support the project objectives, Hatfield proposes the development of a **Rapid Burned Area Mapping** (R-BAM) solution that would support wildfire management agencies with geo-spatial wildfire burned area map products for wildfire disaster response and recovery The proposed R-BAM solution is applicable for larger wildfires in Canada and internationally. With larger wildfires, an Incident Command System will typically be in place and would

request products and services using the R-BAM solution. During wildfire response, the R-BAM solution would deliver up-to-date burned area mapping information from RADARSAT and Sentinel-2 for the daily Incident Action Plan (based on availability of EO data). Following the emergency period, the R-BAM methods would be applied for more detailed analysis of acquired datasets to support disaster recovery such as fire damage assessment.

The R-BAM solution will be developed and evaluated using the May 2016 **Fort McMurray wildfire** as an example large wildfire. The Fort McMurray wildfire presents a suitable forest environment, radar and optical datasets to generate burned area products, and complimentary data for validation. The project activities will include:

- **Project Inception** – includes review of requirements, challenges, and opportunities with end users.
- **Develop wildfire burned area products** – includes development and demonstration of innovative radar-based burned area mapping solutions in wildfire disaster response and recovery. We will implement radar analytical methods based on decomposition and coherence change detection. Sentinel-2 analytical methods based will focus on the normalized burn ratio. All products will be evaluated for accuracy.
- **Product Evaluation and Operationalization** – includes evaluation of the added-value of the EO solution with end users, relative to existing practices. We will plan to optimize RADARSAT-2 and Sentinel-2 data with complimentary datasets for operationalization.
- **Communication and Final Review** – we will develop communications products, scientific paper/presentations, and knowledge extension aimed towards potential Canadian and international users of the technology.

Expected Results and Benefits

We expect the project to provide the following results and benefits:

- Enhanced knowledge and experience of all project partners in the application of RADARSAT-2 and Sentinel-2 to support wildfire operations;
- Understanding of how to address information gaps regarding wildfire burned area, due to EO data acquisition timing or unfavourable atmospheric conditions (clouds and smoke);
- Opportunity to reduce costs for wildfire burned area mapping, since aerial surveys are expensive;
- Design and demonstration of a pre-operational R-BAM solution, with a plan developed for operationalization; and
- Ultimately, the benefits of the solution could be that the information provided helps wildfire agencies to better tackle wildfires through improved information availability. This could contribute to reduced damage to infrastructure, reduced loss of timber value, and the prevention of loss of life.