

SDTech_AB Pillars and Themes

SDTech_AB's R&D framework includes four research themes across three pillars in space and defence:

Theme 1: Emerging Technologies *aims to identify and support the commercialization of emerging technological areas and solutions that couple to Alberta PSI strengths and industry/government needs in the space and defence market sectors.* Key challenges for emerging technologies are the pace of development, the highly specialized (and end-user driven) nature of solutions, and global competitiveness of sectors leveraging bleeding-edge research and technologies. SDTech_AB therefore draws on existing PSI areas of innovation, will identify and support cross-sectoral opportunities, and create high-value return on government investment. This includes target areas of miniaturized, low-cost, low-power solutions for air-, space-, and ground-based applications, development of dual-use (civilian + defence) technologies, AI frameworks to improve sensor hardware performance, orbital and sub-orbital platforms (CubeSats, supersonic fixed wing aircraft, sounding rockets, highly maneuverable VTOL aircraft, etc.) and associated propulsion systems.

Theme 2: Sensing our Environment builds on the inter-connected, and often common mechanisms by which technology samples, records, and interacts with our environment. Sensors are now ubiquitous in our daily lives, driving expanding markets for new information to inform decisions and leverage new observational sensor platforms (space-, air-, ground-based, on-person, etc.). *Sensing our Environment aims to advance how we acquire and synthesize high-value information across the space-defence landscape.* It includes development of remote sensing capacity via imaging technologies (hyperspectral satellite-based imaging, suborbital surveillance imaging, space environment specification, etc.), enhancing integrity and information content of multi-platform sensing (e.g., precise positioning, AI driven sensor fusion), new technologies for direct sampling (e.g., soldier wearable sensors), and multi-sensor/model informed information synthesis.

Theme 3: Situational Awareness leverages the advances sensor platforms, sensors and readily accessible data that is driving an 'innovation race' across the space and defence landscape. Governments and industries are vying to harness the efficiencies and advantages of data-informed decisions and embed situational awareness into core operational systems. Whether enhancing collision avoidance for satellites, evasive algorithms for sub-orbital defensive aircraft, or new techniques to utilize interconnected geospatial information, the goal is real-time situational awareness to facilitate smarter decision-making and industry competitiveness. *Situational Awareness aims to build on Alberta's advantage in sensor technologies and multi-layered adaptive analysis to generate made-in-Alberta solutions that support the protection of Canada's assets and enhanced industry efficiency through better decisions, founded on better information.* This includes edge-AI computational frameworks deployed onboard devices, design of novel architectures for selection/fusion of sensors, and development of capacity to create and understand common operational pictures, robustness and integrity of information and enhance decision-making.

Theme 4: Threat Detection and Intelligent Response *builds on situational awareness to better link assets to surveillance and reconnaissance, enhance natural and manufactured threat detection and support threat replication and response scenario planning/execution.* Within the framework of rapidly evolving technologies and the growing space and defence market sector, SDTech_AB leverages Alberta PSI expertise in spacebased technologies, aerospace systems, and joint-domain intelligence to enhance the technology readiness of leading-edge solutions aligned with Alberta industry and build new capacity in emerging areas of strategic importance. This includes development of technologies for AI-enabled enhance asset (e.g., sensor) deployment / positioning, target tracing solutions, evasion algorithms, and joint-domain coordination of sensing - using space-assets and advanced UAVs in hazardous environments to detect threats to soldier safety. It also leverages research into integrity of (and threats to) space-based systems and space-based technologies such as positioning and communications.



In the four themes above, SDTech_AB specifically targets areas with critical mass of world-leading Alberta researchers, and where Alberta expertise is positioned for differential impact on the future economy. These areas (pillars) are:

Pillar 1: Space Domain Solutions

Areas of focus include (but are not limited to):

- Satellite-hardware and on-board analytics to support high-value data acquisition
- Advancement of existing world-leading satellite-borne systems

- Ground-based space remote sensing capacity, dual-use applications, and spin-offs for space science instrumentation

Pillar 2: Sub-Orbital Technologies

Areas of focus include (but are not limited to):

- Development of emerging portable platforms for sub-orbital systems and miniaturized sensors to advance civilian and defence capabilities
- Development of next-generation composite materials for defence applications
- Development of inter- and intra-urban air transport sensor mobility (I2ATSM) capabilities and control and intelligence frameworks for navigation, robust guidance, and remote sensing/communication

Pillar 3: Joint Domain Intelligence

Activities under this pillar include (but are not limited to):

- Development of intelligent frameworks for wearable sensors and soldier-robot teaming
- Development of situational awareness frameworks, data fusion techniques and anomaly detection/classification across civilian and defence applications
- Development of edge-AI, sensor switching, and synthetic multi-model solutions for enhanced situational awareness and threat detection