EXAMPLE ONLY Project Title: Radome for High Altitude Synthetic Aperture Radar (R4SAR)

BACKGROUND

• **Participant Organisation:** University of Bourke
• **Department & Group:** Composites Engineering
• **Point of Contact:** Prof. Joe Bloggs, E: joe.bloggs@UoB.edu.au, P: +61 2 5555 5555
• **Background to work:** The University of Bourke (UoB) has been collaborating with DST, and Queensland defence industry in the development of a rapid Composite Forming Technique (rCFT) for use in the mass manufacture of high curvature ballistic protection for personnel and vehicles. More recently UoB has been approached by Acme Radomes Australia Pty Ltd to explore the possibility of utilising rCFT for the manufacture of radomes to protect miniaturised Synthetic Aperture Radar arrays they have developed for use on UAS. On the basis that many of the composite materials utilised for ballistic protection are compatible with radome applications the collaboration has identified this program as an opportunity to explore the adaptation of rCFT for manufacture of radomes for miniaturised SAR arrays (MicroSAR). Development of an automated manufacturing route for these items would lead to reduced attenuation, improved lifespan and increased platform performance for UAS or satellite outfitted with MicroSAR. This is due to the repeatability of an automated process combined with the protection and aerodynamic advantages a SAR radome would enable when compared to hand manufactured radomes or exposed sensor arrays.

TECHNOLOGY

• **Basic description of technology relevant to Proposal:** The rCFT relies on single sided CNC cut female tooling and a combination of diaphragm/tool vacuum and flexible male tooling to deep draw stacks of composite materials. It can accommodate a range of component thicknesses from sub mm single layers of material to tens of plies at 2-3 cm in thickness. A range of composite fibre geometries can also be accommodated from uni-axial non-woven materials through to multi-axis non-woven and plain woven composite fabrics. With active heating and cooling it is capable of co-processing thermoset and thermoplastic composites such as CFRP and UHMWPE both with applications in radomes.
• **Current stage of development (TRL):** With respect to the forming and manufacture of ballistic combat helmet shells rCFT currently stands at TRL 7. In order to adapt the technology for this application, starting with a component design concept & materials specification, new tooling will have to be designed and simulated dropping us back to a starting point of *TRL 4.*
• **Describe the Technical Goal:** The aim of the activity will be to demonstrate a repeatable manufacturing route for a protective MicroSAR radome that has been developed with reference to an existing sensor array and application platform (e.g. UAS or small satellite). (TRL 6-7)

APPLICATION TO DEFENCE OR DEFENCE INDUSTRY

• **Are you or have you worked with the ADF (or other military) on this technology? Who?:** The team previously worked with Dr. Hector Bowlin and Dr. Mack Long in the soldier performance division of NZ Defence Technology Agency. However since reaching TRL 6 with respect to ballistic helmets the team has largely continued development of rCFT in house with Queensland defence armour manufacturers.
• **How might the military or defence industry use this technology?:** Starting with UAS and satellite platforms defence industry would use the rCFT technology to reduce the reject rate and increase the repeatability and quality of radomes used with MicroSAR and other radar related applications. This in turn would lower the costs of acquisition for Defence and increase the effectiveness and longevity of their MicroSAR arrays on UAS and satellite.
• **Domain (Land, Sea or Air):** SAR is used across joint applications.
• **Development path:** With Acme Radomes Australia Pty Ltd as part of the collaboration the project can proceed with comparatively little active support from defence. Integration guidance will be required from a relevant platform prime or designer, as well as ADF assistance in identifying acceptable attenuation vs. sensor protection vs. platform performance trade-offs for development of milestone Target Performance Measures (TPMs). With these guidance mechanisms in place the project would proceed with virtual design & forming simulations, followed by ground based testing at an EM facility, followed by UAS trials, and ultimately qualification for satellite application.

PROGRAMMATICS

• **Other organisations collaborating in the Project (Industry/Research/Other):** Acme Radomes Australia Pty Ltd (note: additional defence guidance and Tier 1 platform integration guidance would be welcome additions to the collaboration).
• **Approx. how many people?:** 1.0 FTE Post Doctoral Research Fellow & 1.0 FTE Defence / Industry engineering support
• **Given that number of people – how long?:** 2 years
• **What resources is the group able to bring to the project – financial, in-kind staff, in-kind facilities:** Use of the rCFT equipment, composite lay-up facilities and process disposables can be contributed in-kind by UoB. Acme Radomes Australia Pty Ltd is willing to provide materials, radome design expertise and 0.4 FTE engineering support in-kind to the activity, as well as making a financial contribution to the conduct of the project in exchange for commercial rights to the technology. UoB is already a participant of the DMTC.
• **Other resources required:** Over the life of the project external services will be required to facilitate tooling simulation, manufacture of revised tooling, EM testing and ground or platform based component qualification. Some or all of these could be provided through a combination of Defence and industry prime participation, however if purely outsourced would cost approximately $150-$200k over the two years of the project.