APPENDIX L
OUTREACH ACTIVITIES

Since our inception in 2012, Team Bumblebee has steadily grown, becoming a recognizable student team in the maritime robotics community. We remain deeply grateful to this community and our sponsors for their unwavering support over the years. We firmly believe in fostering new relationships and are committed to sharing our knowledge and experiences as a way of giving back.

A. Lab Visits

As part of Team Bumblebee's public relations efforts, we regularly host lab visits for fellow robotics teams and marine robotics enthusiasts from around the world. Following last year's success, we continued to welcome several international teams who traveled to Singapore for the Singapore AUV Challenge. Through these visits, we aim to exchange knowledge and build lasting connections with equally passionate teams.

Fig. 40: Lab visit by Team Offset from Plaksha University, India.

Fig. 41: Lab visit by CityUHK Underwater Robotics and PolyUHK Engineering Entrepreneurship Club teams from Hong Kong.

B. Industrial Partnership and Appreciation

Team Bumblebee is incredibly grateful to our industrial partners and sponsors whose support is fundamental to our continued excellence.

To deepen our understanding of real-world challenges, we also regularly organize visits with these partners. This year, we were honored to receive an invitation from the Singapore Chief of Navy to experience the Republic of Singapore Navy's unmanned capabilities and tour the Maritime Security Unmanned Surface Vessel (USV) at their Naval Base.

Fig. 42: Our 2024 Sponsor Appreciation Event.

Fig. 43: Visit to the Republic of Singapore Navy at a Naval Base.

C. Hornet Training Programme

Team Bumblebee is dedicated to fostering students' passion for maritime robotics. This objective is accomplished through the implementation of the Hornet Training Program and its recruitment drive. Our team actively engages new students by conducting sharing sessions during orientation camps and setting up booths at freshman welcome talks.

Fig. 44: Hornet X in action during SAUVC 2025.

The Hornet Training Program serves as a hands-on introduction to engineering and robotics. In this program, students are tasked with designing, building, and testing a low-cost Autonomous Underwater Vehicle (AUV) for the Singapore

AUV Challenge (SAUVC). This initiative encourages students to explore and experiment with novel designs, fostering a vital spirit of innovation and creativity.

We recently concluded the tenth iteration of the Hornet Training Program (Hornet X), which culminated in the team's participation at SAUVC 2025. Following its completion, we've welcomed 20 eager new members into Team Bumblebee. We're also actively working with the university to incorporate the Hornet Program as an unrestricted elective course (CDE1301B), allowing members to gain modular credits in recognition of their year-long efforts.

A key motivation behind the development of the Mini-AUV is for it to serve as a dedicated training platform for the Hornet Program. Feedback from previous Hornet batches highlighted a critical need for a ready-made vehicle. This addresses a significant bottleneck, particularly for the software team, by allowing new members to gain early exposure to the internal systems and operations of an AUV without being constrained by hardware development timelines.

By providing a stable and accessible base vehicle, the Mini-AUV aims to accelerate the learning process, enabling new team members to understand AUV architecture from the very start of the program. We believe this approach will not only build technical competence more quickly but also help sustain engagement and interest across all subteams throughout the training program.

D. Academic Research

Team Bumblebee is committed to engaging with researchers in their academic work, offering advice and support whenever possible. Recently, we collaborated with the NUS Soft Robotics Lab, led by Professor Cecilia Laschi, on their research into soft robotic arms. As part of this partnership, we conducted several pool tests where our BBAUV 4.5 served as a mobile platform to film and demonstrate the capabilities of their soft robotic arm. These tests directly contributed to a research publication by the Soft Robotics Lab, which is set for future release.

Fig. 45: Testing of a 2 DOF arm with a gripper underwater to benchmark against their research product.

E. Collaboration with Local Schools

Team Bumblebee is dedicated to inspiring the next generation. We conducted sharing sessions with local high school students to encourage them to pursue engineering in their undergraduate studies and to spark their interest in maritime robotics. During these sessions, we shared our experiences competing in RoboNation's competitions (RoboSub, RobotX), along with insights into the development and rigorous testing of our autonomous vehicles.

Fig. 46: Sharing with local high school students for their project work.