

ARVP

AUTONOMOUS ROBOTIC VEHICLE PROJECT

Sponsorship Package 2025 - 2026



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arvp.org



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WHO WE ARE

Founded in 1996 at the University of Alberta, The Autonomous Robotic Vehicle Project (ARVP) is the oldest interdisciplinary Project Team on campus. ARVP develops technologies and students in robotics. Currently, ARVP focuses on Autonomous Underwater Vehicles (AUVs) to compete annually in the international RoboSub Competition held by the US Navy.

We serve students from all faculties, particularly engineering and computing science, so they may solidify their understanding with real-world problems through our four sub-teams. Each member is provided with the education and experience to become a subject matter expert in one portion of ARVP's vehicle design. ARVP also engages in community outreach to promote post-secondary education and demonstrate practical uses of robotic technologies.

MISSION AND VALUES

ARVP advances, advertises, and applies autonomous robotics to large-scale systemic issues. Self-managed by students, our members from all disciplines are provided opportunities to solve complex design problems, manage projects, give back to the community, and develop worldwide professional connections within a cohesive social network.

ARVP'S TRIPLE MANDATE

SKILL DEVELOPMENT

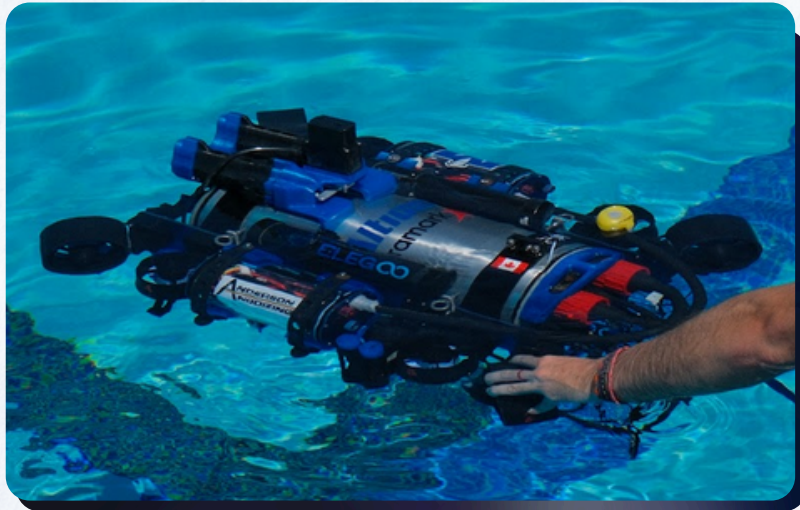
- SubTeam Onboarding Challenges
- Ongoing Project Mentorship
- Industry-Related Project Portfolios

SOCIAL NETWORK

- Monthly & Weekly Social Events
- Philanthropic & Educational Outreach
- Cross-ESP & RoboSub Engagement

CAREER OPPORTUNITIES

- Company Visitations
- Industry Partnerships
- Vetted Resume Database



ACHIEVEMENTS

In our aim to provide members with experiential learning opportunities, ARVP's team has successfully achieved many technical milestones.

- Developed **2 AUVs** from the **ground up** in the 2024-2025 year
- Won **9th Place** in the international **RoboSub 2024 Autonomy Challenge** and **5th Place** in **Design Documentation**
- Executed the **highest-scoring practice run** in the team's **29-year history** at RoboSub 2025
- Maintained a **team size** of **60 contributing members** from 2024-2025 after 80% turnover
- Won **3rd Place** in the international RoboSub 2023 Autonomy Challenge, making us the **highest-performing North American Team**

WHAT IS ROBOSUB?

RoboSub is an international competition where **55+ teams** develop an Autonomous Underwater Vehicle (AUV) to complete an obstacle course.

Tasks include seafloor mapping, sonar localization, and underwater object manipulation. The week-long competition normally takes place at the San Diego US Naval Warfare Systems Transdec Pool.

This event is held by RoboNation, a non-profit partnered with companies such as SolidWorks, Blue Origin, and Nvidia to promote STEM through 9 student competitions that engage more than 250,000 students annually.



03. ARVP HISTORY



1997-2000



Polar Bear
2nd in Design
Employed by
Canadian
Armed Forces

2000-2001



Bear Cub
1st in
Navigation

2001-2004



Kodiak
Top 5 in
Design

2003



Kodi-Hack
Complications
due to shipping

2005



Ursa Major
Never
Competed

2006



Ursa Minor
2nd in Navigation
Ran for SU
President

2008

In Autonomy
Challenge | 11th



Bearacuda

SubmURSA



8th

In Autonomy
Challenge

2011

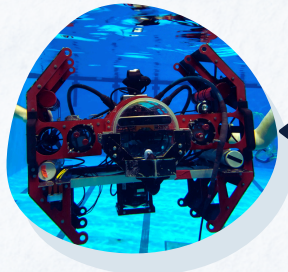
2013

In Autonomy
Challenge | 8th



AquaURSA

Auri



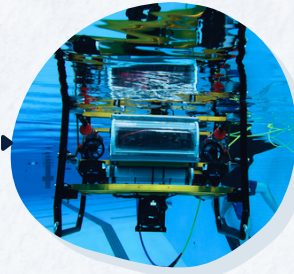
4th

In Autonomy
Challenge
2019 & 2022

2017

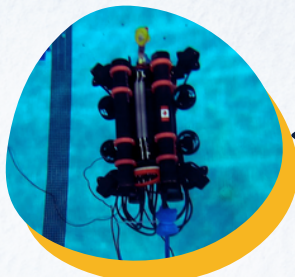
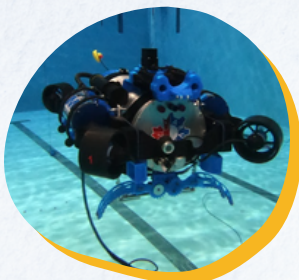
2020

In Autonomy
Challenge | 3rd



Arctos

**Kenai
and
Koda**



2025

04. KENAI SPECIFICATIONS



Torpedoes

The spring-propelled torpedo system is actuated by a single high-torque waterproof servo using a custom servo horn. A metal rod opens a series of links connected to two metal levers that releases a spring plate and shoots the torpedoes. Fires two torpedoes accurately to distances up to 3 meters. Torpedoes are balanced internally with foam and weights to improve flight stability, but primarily 3D printed.

Electronic Trays

The electrical trays host Kenai's internal camera, printed circuit board, and wire harness. The boards have been optimized to reduce weight, provide space for labeling, and allow clean routing. Ample space has been left on the bottom electrical tray for future continuous improvement.

Aluminum Hull

Has two entry points. The top lid allows quick access to the printed circuit board for repairs and modifications. Both entry points utilize double O-ring seals and the hull contains leak sensors for additional risk management. Hull seams have been improved for a 20m depth rating.

Battery Pods

Four custom lithium ion batteries are located in two external cylindrical battery pods connected by SubConns. This solution eliminates thermal and water damage risks related to battery swaps. It also allows hot-swapping, ensuring a continuous power supply with one battery always active.

Doppler Velocity Log

Kenai's Nortek Nucleus 1000 Doppler Velocity Log provides positional, velocity, and angular information - meaning only one sensor is used to guide motion. The Doppler Velocity Log has been positioned to minimize both vibrations and electromagnetic interference.

Dropper & Markers

Release two dropper markers that sink straight down accurately for 10m, as the markers' helical fins induce the gyroscopic effect. The nose of the marker is machined out of aluminum in-house on a CNC mill.

Claw

Utilizes a parallel plate claw mechanism with a soft gripper design for ease of software integration and robust manipulation of complicated geometries. The grippers were made compliant using a combination of 3D printed flexible TPU and rigid resin; the tapered wedge shape causes the gripper to curve around the object as it's closing

Bottom Cameras & Hydrophones

Bottom facing obstacles are identified through two methods. Three hydrophones allow Kenai to detect the angle and distance to pingers. Two external cameras rated to 10m allow vision models to detect tasks and confirm objects have been picked up by the claw.

Key Software Stack Components

• Mission Planner

Controls Kenai's decision-making via a custom behavior tree. By looking at sensor data from our cameras, DVL, and IMU, the mission planner runs every feasible calculation required for decision making. The mission planner will simply listen for the required information and launch the necessary missions as determined by the tree.

Software Dependencies

- ROS2
- Python 3
- C++
- OpenCV
- NVIDIA CUDA
- YOLOv7
- Py Trees
- Gazebo Simulator

• Motion Planner

The motion planner handles long time horizon movements, based on waypoints provided by the mission planner. A custom motion planner was developed that receives a sequence of waypoints (relative or absolute), allowing the robot to move around the world while looking elsewhere.

• Sensor Fusion

The Doppler Velocity Log and Inertial Measurement Unit, which are both in the Nortek Nucleus 1000, allow Kenai to determine its present state. This data is combined together using an extended Kalman filter to allow for temporary dropout in either data source, resulting in a robust estimation of the robot's state through time.

• Vision Pipeline

Data is labeled by hand using CVAT, transformed, and then fed into Ultralytics' YOLOv8 framework for model training. The resulting .pt model is converted into TensorRT format to enhance inference speed and efficiency. In the final stage, multiple instances of a ROS2-based vision node are deployed, each running a different task-specific model.

• Mapper

The mapper takes data directly from our vision pipeline and uses the scale of bounding boxes to estimate relative poses of objects of interest. Using our robot's estimated pose in a static world frame allows us estimate a position and orientation in the world.



2025 Annual General Meeting



ARVP Community Showcase 2025

Building Skills

- DiscoverE
- APEGA Science Nights and Olympics
- Science Fun Day
- Mecha Mayhem

Social Support Network

- BBQs, Board Game Nights, & Seasonal Events
- Labeling Parties
- Community Showcase
- UofA Showcase



2025 ARVP Mecha Mayhem Booth



2025 Copperstone Technologies Visit

Industry Networking

- Copperstone Technologies Tour
- Rail Shop Services Tour
- Correct AI Interactive Presentation



2024 Annual Barbecue

Public Events

- Project Group Development Workshop
- University Consultations
- UofA Days & Open Houses



ARVP Team Photo



2024 Halloween Party



CORE OBJECTIVES

Sweep RoboSub 2026

- Maintain Performance in Gate, Buoy, Bins, and Torpedoes
- Completion of Pinger and Claw Tasks

Boost AUV Reliability

- Remove Hardware Failure Points
- Sensor Upgrades
- Backup Electronics and 1:1 Spares of Components

Refine Internal Processes

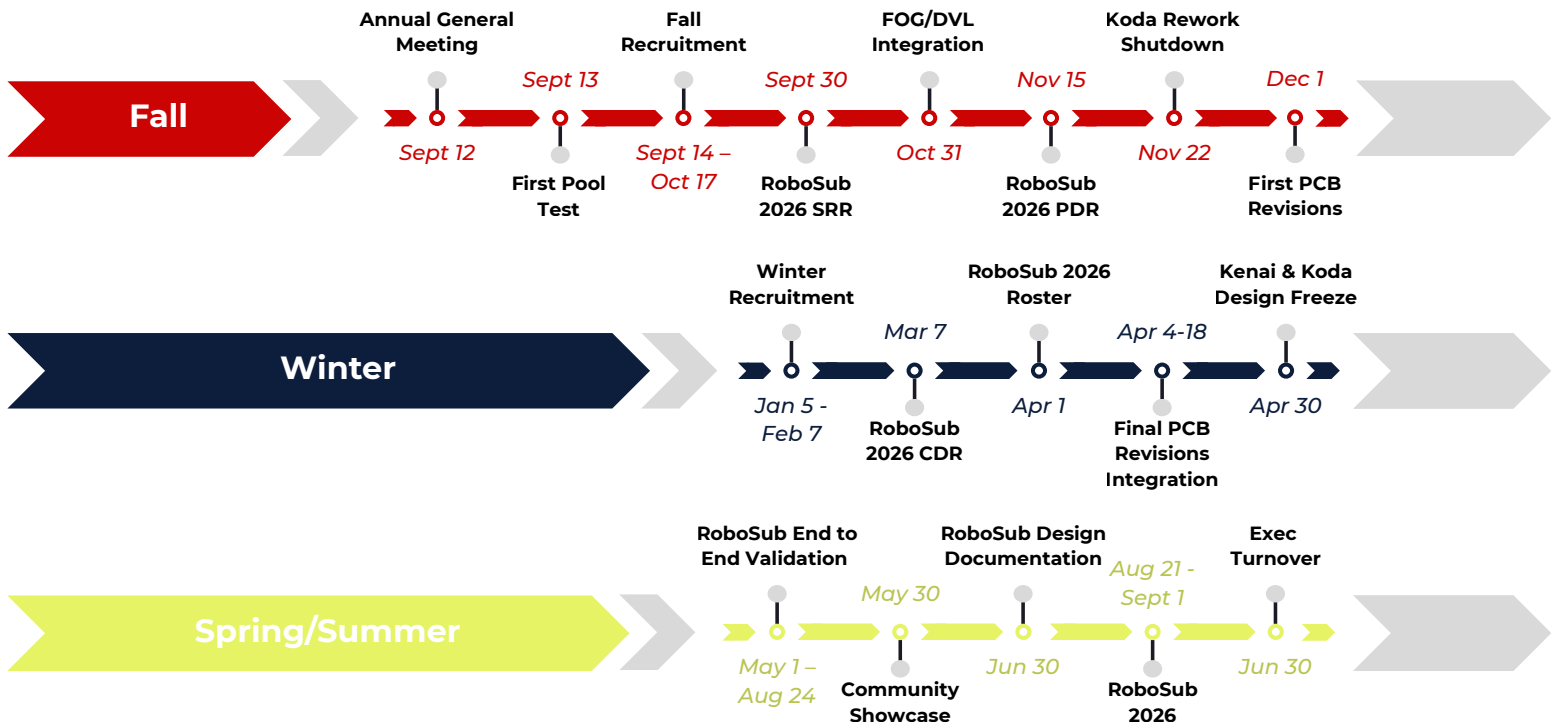
- Robust System and Subsystem Requirements
- Standardized Testing Protocols
- Design Reviews for Major Subsystem Projects

Uphold Triple Mandate

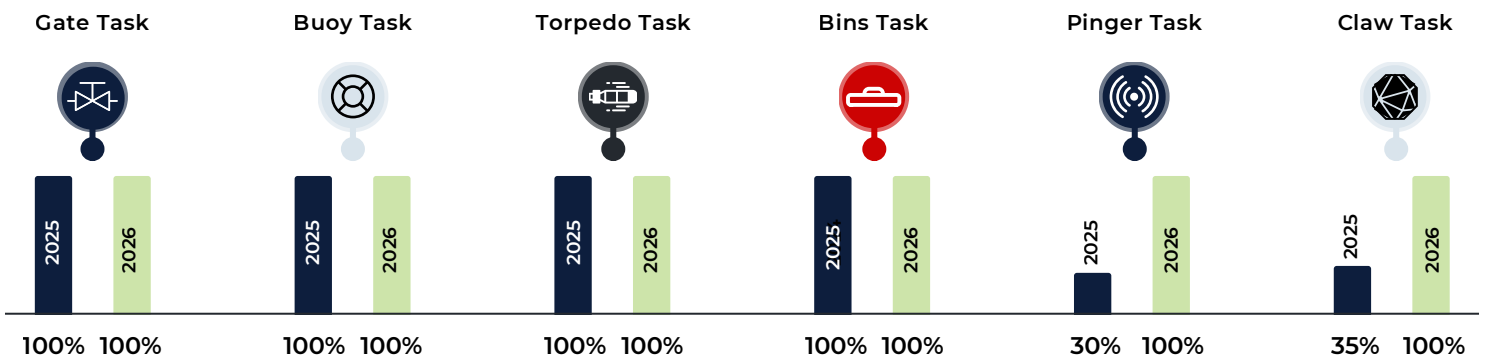
- Provide Onboarding & Skill Building
- Connect Members to Industry Opportunities
- Hold Consistent Social Events

Acquire Sufficient Resources

- Acquire Sufficient Funds & Equipment
- Maintain a Healthy Team Size

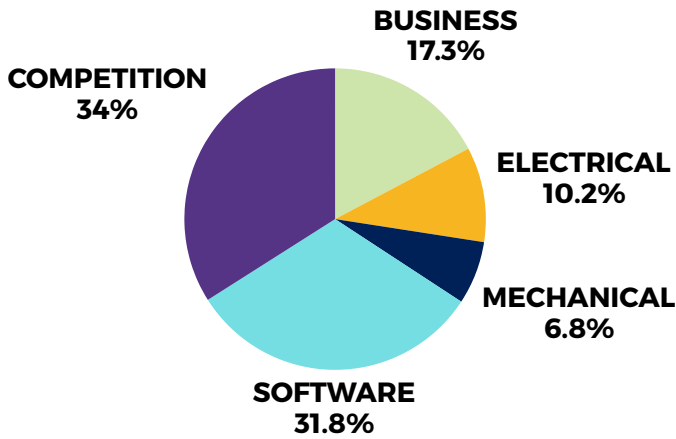


KEY PERFORMANCE INDICATORS



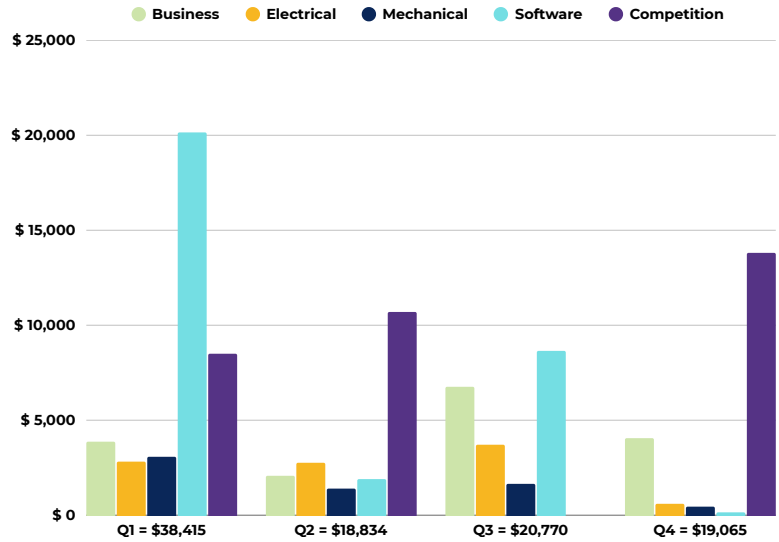


BUDGET



Total = \$97,084

BUDGET BY QUARTER



B Business - \$16,760

Events	\$6,390
Marketing	\$3,900
Pool Testing	\$6,470

C Competition - \$33,009

Transportation	\$14,960
Accommodation	\$12,400
Food	\$4,500
Registration	\$2,149

S Software - \$30,850

Critical Sensors	\$29,500
Equipment	\$1,350

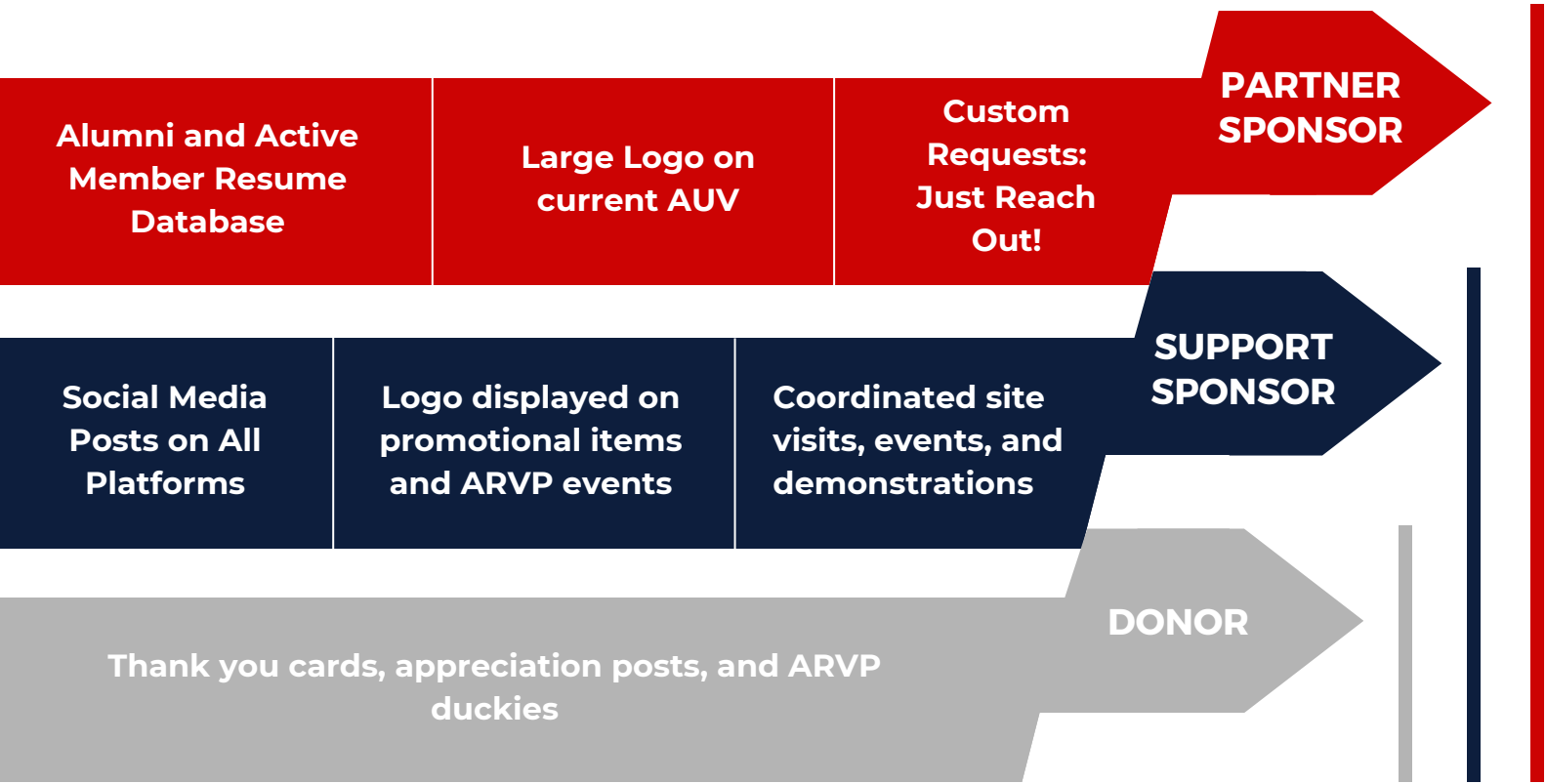
M Mechanical - \$6,575

Kenai Upgrades	\$3,025
Koda Upgrades	\$1,150
Equipment	\$1,100
Consumables and Stock	\$1,300

E Electrical - \$9,890

Kenai Upgrades	\$5,250
Koda Upgrades	\$1,640
Equipment	\$800
Consumables and Stock	\$2,200

09. SPONSOR BENEFITS



CONNECT WITH QUALITY TALENT	EXPAND YOUR REACH	OUR SUCCESS IS YOUR SUCCESS
<p>ARVP's core objective is to serve as a wholesale development process for young adults interested in robotics. By sponsoring ARVP, you can directly connect with undergrads and new grads with years of hands-on experience in their respective disciplines. Our vetted resume database can also help speed up your company's search for talent.</p>	<p>Our team is composed of passionate students starting internships, running community outreach events, presenting our work to UofA donors, and sharing their passion with other young adults internationally. By sponsoring ARVP, you allow the team to champion your brand through our events, achievements, and testimonials to help reach your target audience.</p>	<p>Our triple mandate drives us to be a social hub for students, where community, skill-building, and shared goals come together to create a support network. Your sponsorship directly fuels this mission, enabling us to elevate the university experience for every member. By investing in ARVP, you're not just supporting our team—you're shaping a generation of community-driven leaders. Together, our success becomes your success.</p>

Donations and sponsorships are accepted in both cash and in-kind contributions. Benefits are maintained for 1 year.

Lifetime contributions are maintained through ARVP's website and support plaque. The plaque is displayed predominately in the ARVP workspace with a banner stand-in at the international RoboSub competition.



Thank you to our generous sponsors. Our continued success is only possible through your contributions and support!



www.arvp.org



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