

PRESENTED BY Makenna Kuzyk

LEADERS FOR THE FUTURE

How to encourage youth in the
space sector



www.makennakuzyk.space

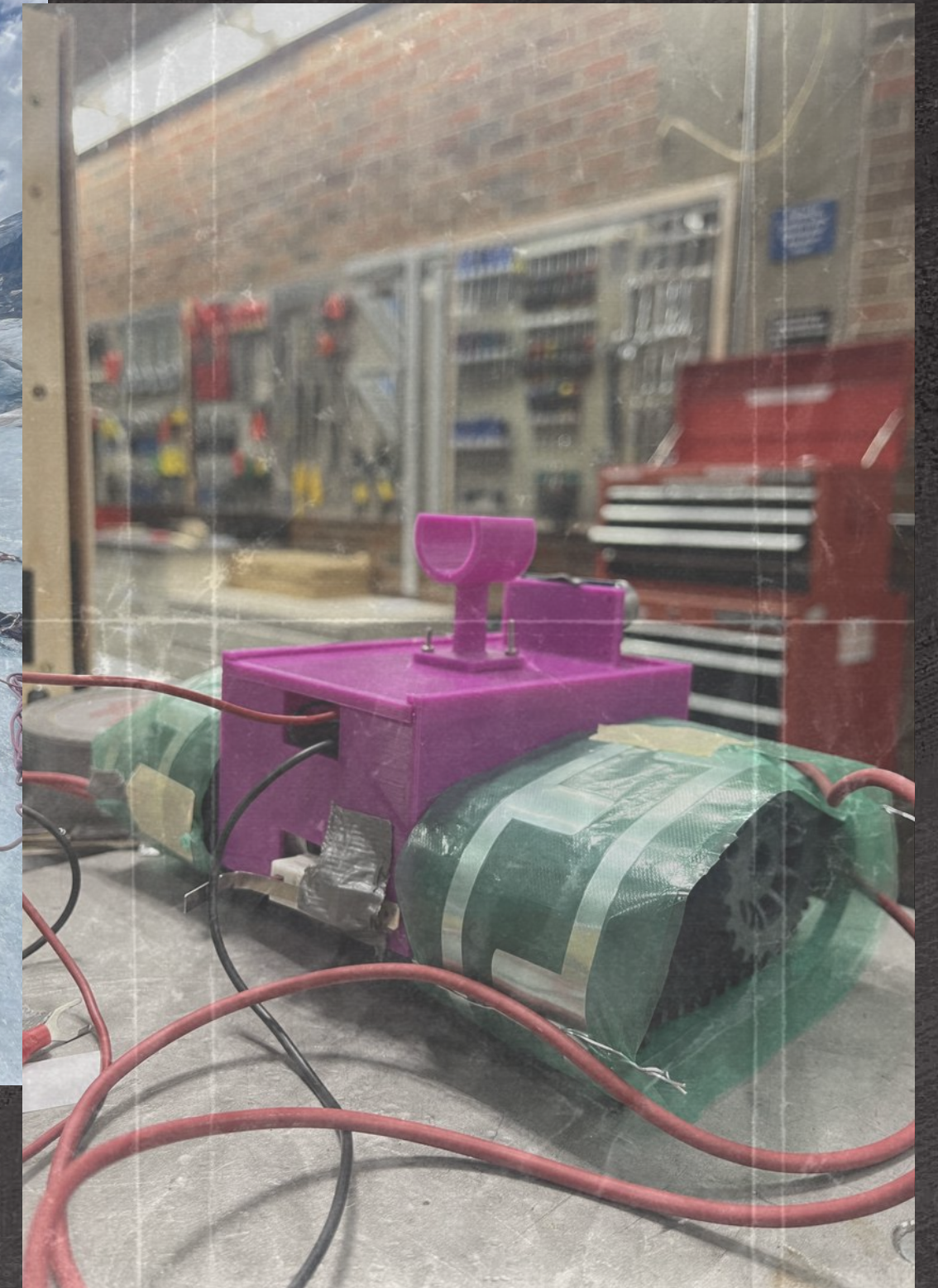


mswua@ualberta.ca
mkuzyk@ualberta.ca

MISSION SPACEWALKER

Mission SpaceWalker is an undergraduate student group at the University of Alberta primarily targeted at women & gender minorities that began in response to the Canadian Reduced Gravity Experiment (CAN-RGX) 5 Challenge.

Now, we are developing the first citizen research platform with Rockaboo Mountain Adventures and Parks Canada!



WE EXPLORE,
RESEARCH, CREATE,
AND BUILD

STATISTICS

AT OUR UNIVERSITY

2 of 60 Women in mechanical engineering at my university.

ENGINEERS CANADA
2023

- More than 20% of engineering school graduates are women
- Only 11% are practicing engineers

THIS IS CHANGE

“THIS CLUB GIVES OUR MEMBERS A VOICE”

-Jana, MSW Co-President

“I DIDN’T THINK I COULD DO THIS WITHOUT BEING AN
ENGINEER”

-Pram, MSW Science Member

“I WANT TO BE AN ASTRONAUT TOO”

-Alyson, MSW Engineering Lead

-Emma, MSW Science Lead

MSW is focused on training
leaders

*Leaders
inspired by
Leaders*

What kind of impact can one
person have?



MEET JANA: COMMUNITY BUILDER



Moved very often



Had to
homeschool



Where was the
community?



BUILDING A HOME

Mentee



Mentor

Dreamer



Creator

Member

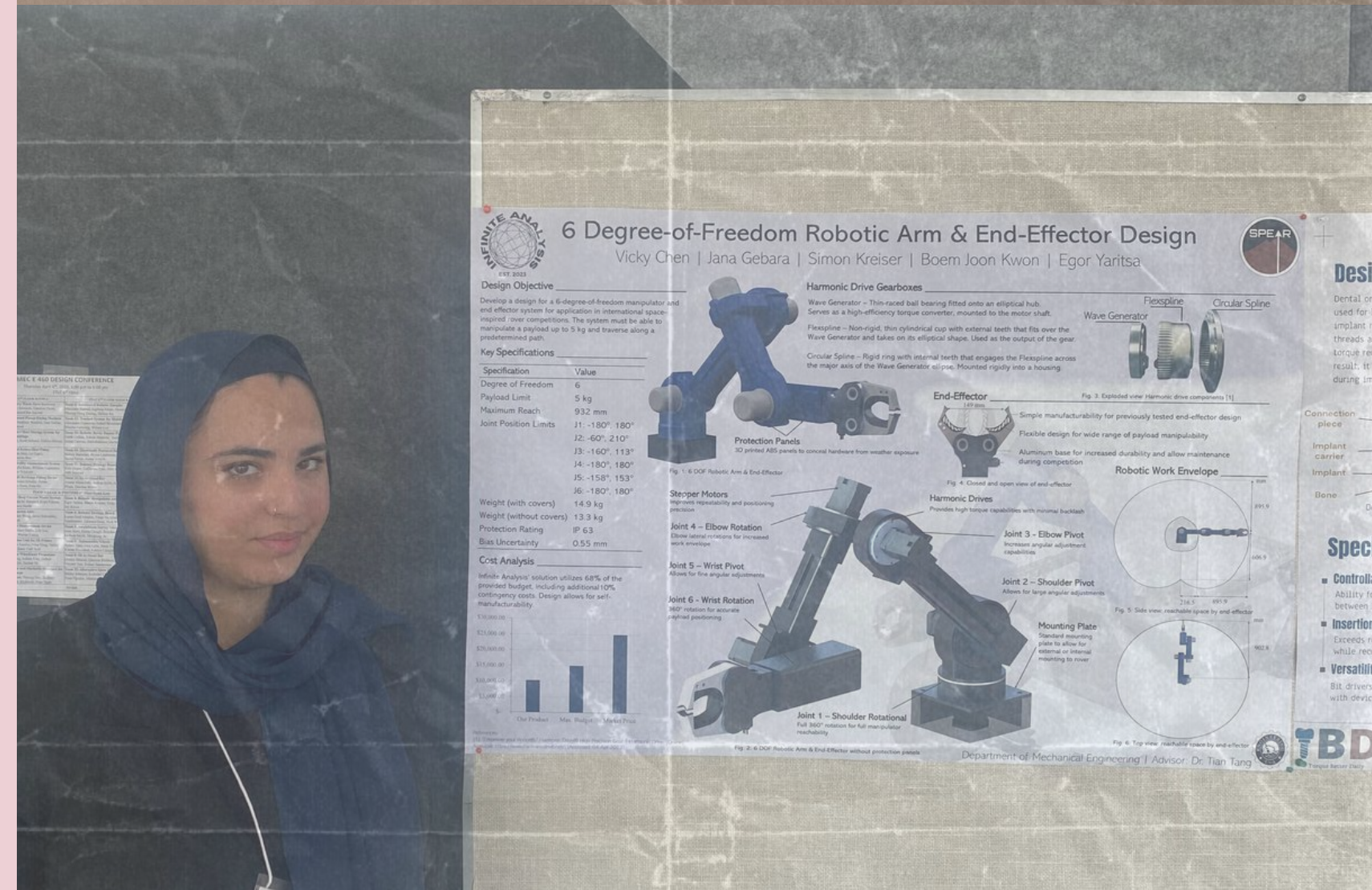
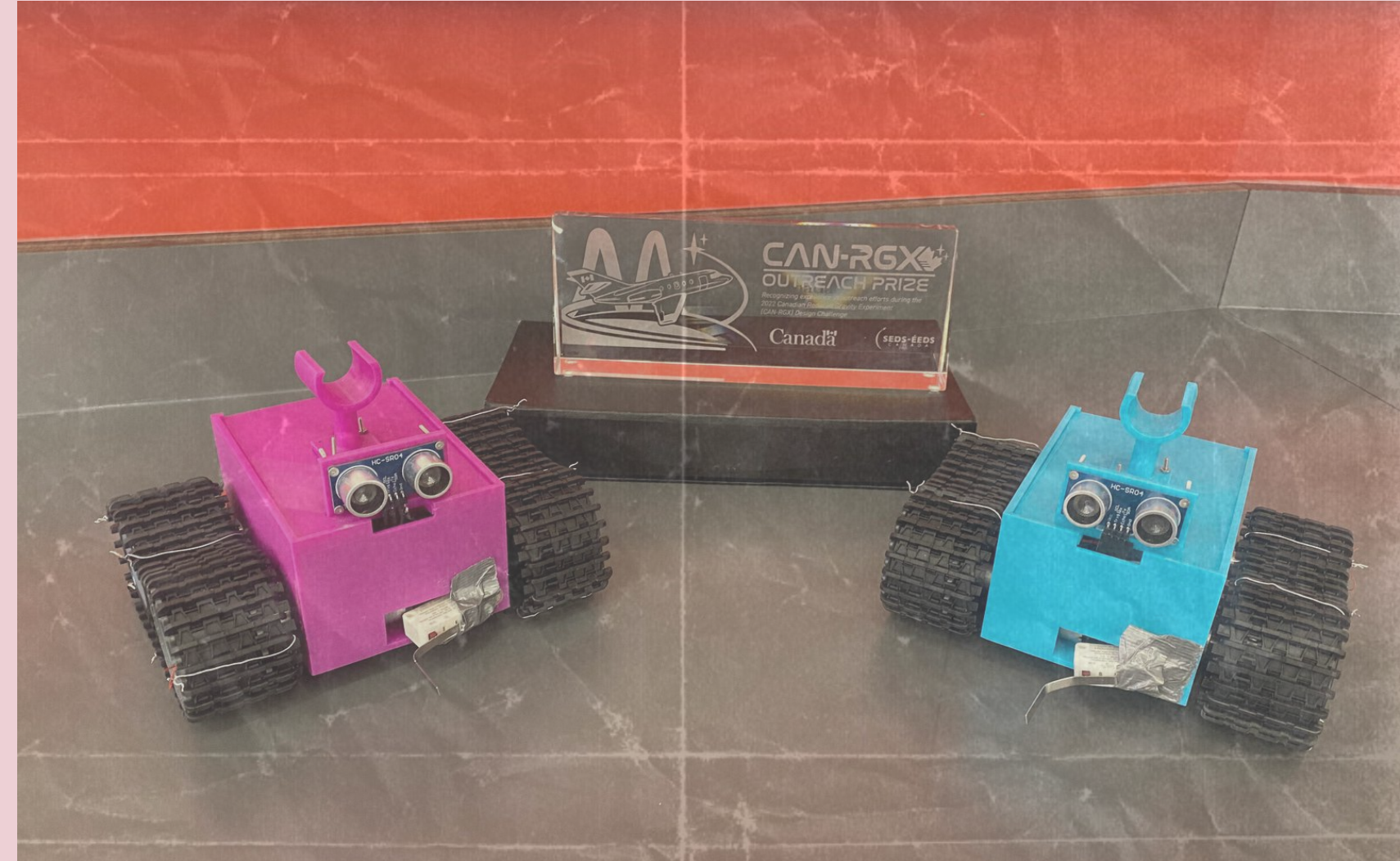


Leader

Club



Community



6 Degree-of-Freedom Robotic Arm & End-Effector Design

Vicky Chen | Jana Gebara | Simon Kreiser | Boem Joon Kwon | Egor Yaritsa

Design Objective
Develop a design for a 6-degree-of-freedom manipulator and end effector system for application in international space-based competitions. The system must be able to manipulate a payload up to 5 kg and traverse along a predetermined path.

Key Specifications

Specification	Value
Degree of Freedom	6
Payload Limit	5 kg
Maximum Reach	932 mm
Joint Position Limits	J1: -180°, 180° J2: -60°, 210° J3: -160°, 133° J4: -180°, 180° J5: -155°, 153° J6: -180°, 180°
Weight (with covers)	14.9 kg
Weight (without covers)	13.3 kg
Protection Rating	IP 63
Bias Uncertainty	0.55 mm

Cost Analysis
Infiniti Analysis' solution utilizes 68% of the provided budget, including additional 10% contingency costs. Design allows for self-manufacturability.

Harmonic Drive Gearboxes
Wave Generator - Thin-rimmed ball bearing fitted onto an elliptical hub. Serves as a high-efficiency torque converter, mounted to the motor shaft.
Flexspline - Non-rigid, thin cylindrical cup with external teeth that fits over the Wave Generator and takes on its elliptical shape. Used as the output of the gear.
Circular Spline - Rigid ring with internal teeth that engages the Flexspline across the major axis of the Wave Generator's rim. Mounted rigidly into a housing.

End-Effector
3D printed ABS panels to conceal hardware from weather exposure.
Simple manufacturability for previously tested end-effector design.
Flexible Design for wide range of payload manipulability during competition.

Robotic Work Envelope

Harmonic Drives
Provides high torque capabilities with minimal backlash.

Joint 3 - Elbow Pivot
Increases angular adjustment capabilities.

Joint 2 - Shoulder Pivot
Allows for large angular adjustments.

Mounting Plate
Standard mounting plate to allow for internal or external mounting to rover.

Joint 4 - Elbow Rotation
Eliminates external clearance for increased work envelope.

Joint 5 - Wrist Pivot
Allows for fine angular adjustments.

Joint 6 - Wrist Rotation
90° rotation for accurate payload positioning.

Joint 1 - Shoulder Rotational
Full 360° rotation for full range-of-motion reachability.

Department of Mechanical Engineering | Advisor: Dr. Tian Tang



KEY TAKEAWAY

Make it a mission

Be proud of your values, and make equity, diversity, and inclusivity a mission that is known through the culture of the company!

BIGGER THAN MSW

MSW ISNT THE ONLY SUCCESS STORY

Investing in training leaders has a butterfly effect.

Meet...

MEET VANESSA: RURAL ROLE MODEL



Grew up in a
town of 200



Lyme Disease



Had to drop HS
from sickness



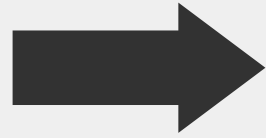
SHARPENING THE TOOLKIT

Sick



Student

Dreamer



Builder

Participater



President

Mentee



Mentor





KEY TAKEAWAY

*Make education
accessible*

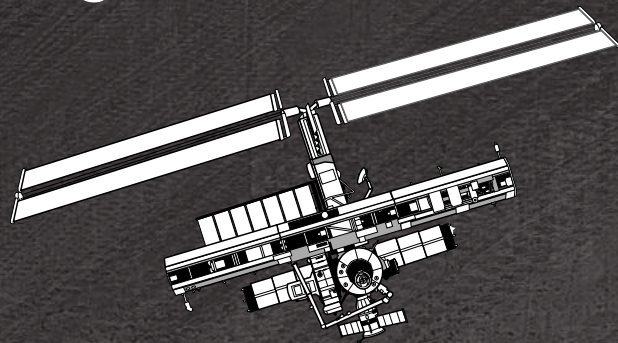
Opportunities for those who need extra time: sickness, unplanned pregnancies, immigration. And teach them how to use tools to build a better future!

MEET HIRA: DIVERSIFYING SPACE

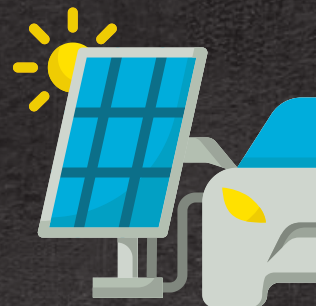
Immigrant parents, grew up living a modest life



Inspired by space figures, but all men



Science Fair with a teachers help



High school Struggles



SPACE SKILLS ARE UNIQUE

Struggling → **Self Care**

Artistic → **Poetry**

Events → **Inclusion**

Mentee → **Mentor**





KEY TAKEAWAY

*Inspire
Interdisciplinary
Interest*

Space is unique and vast, and so are the skillsets we need.
Look for ways to make opportunities for a diverse group.

Why focus on leaders?

*Leaders
inspire
Leaders*

It only takes one person to
inspire many!



PRESENTED BY MAKENNA KUZYK

THANK YOU VERY MUCH!



www.makennakuzyk.space



mawua@ualberta.ca
mkuzyk@ualberta.ca