MURGH-O-MAHI
CUBE SATELLITE
For Water Management

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In the commemoration of Allama Muhammad Iqbal, outlining his tremendous achievements and writings, this satellite is named Murgh-O-Mahi.
ABOUT THE BCIT SATELLITE LAUNCH PROGRAM (BCIT SLP):

- A student ran organization for academia established in 2017
- Goal of combining the capabilities of other institutions under one roof
- Currently working with two will expand even more next year
OUR LAUNCH PARTNERS:

- The University of British Columbia Rocket Team will provide this project with two launches this year alone
- Both will be at 10,000 feet for testing the satellites
- 30,000 feet and 100,000 feet rockets are currently in development
- Our satellites will be launched in future rockets as well for tests under acceleration environments
OUR PAYLOAD PARTNERS:

- The Simon Fraser University Satellite Design Team will provide consultation for the electronics going into our satellites.
- Currently are partaking in the Canadian Satellite Design Challenge.
- Have an abundant amount of experience with payloads in satellites gained over the years.
EDUCATIONAL COOPERATION UNDER ONE ROOF

Assist in the development of the electronics in the satellite

Select objectives, also provide designs and manufacturing for the satellite (Lead Organization for Murgh-O-Mahi)

Provide launches for structural testing of the satellite in various fields
“Do not waste water even if you were at a running stream.”
- Prophet Muhammad (S)
THE EFFECTS OF MISMANAGING WATER

• Water management plays a key role in the future of mankind

• Once an abundant resource is now scarce to some areas due to over-use, droughts and contamination

• Detrimental impact on economy and quality of life

How do we protect existing and potential water supply?
**SOLUTIONS TO THE ISSUE**

**REFERRING TO EXISTING IDEAS**

- There are many *larger* satellites observing water bodies already.

- Using their technology will allow *quicker and cheaper development*.

- Can broaden *partnerships* with organizations/teams who are already experienced in using different *existing* technology.

*Sentinel 3A*
*Credit: ESA*
OUR IDEAS UNDER DEVELOPMENT

MURGH-O-MAHI CUBESAT

GROUND WATER TRACKING DEVICE

• Allow users to track groundwater remotely
• Uses sensors to find water sources and remotely send data to organizations/managing bodies
• In **conceptual** development phase
WHAT IS A CUBESAT?

• A CubeSat (Cube Satellite) is a 10x10x10 cm miniature satellite
  • The small size allows researchers and organizations with limited capabilities to conduct experiments in space
  • Expandable and come in 1U (unit), 2U and 3U standard configurations
  • Internationally agreed upon parameters

Depiction of different sizes of the CubeSat
Credit: www.radiusspsace.com
EXAMPLES OF NASA’S CUBESATS

ASTERIA: technology demonstration of astrophysical measurements using a CubeSat

MarCO: demonstrate flyby (Mars) capabilities of CubeSats for communication purposes

INSPIRE: demonstrate capability of a deep space CubeSat

Credit: www.jpl.nasa.gov/cubesat/missions/
OBJECTIVE OF MURGH-O-MAHI: AFFORDABILITY

CubeSats, in comparison to traditional satellites are:

- Easier to manufacture
- Much cheaper to launch
- Lower operating costs

SOLUTIONS TO THE ISSUE

Smaller CubeSat in THE palm of a hand Credit: ESA

AFFORDABILITY FOR USERS WITH LIMITATIONS FOR WATER MANAGEMENT
SIDE OBJECTIVE OF MURGH-O-MAHI: EASE IN DEVELOPMENT

- Simple structure for lower weights
- Quicker development
- Lower launch cost
- Easier to manufacture
- In house design
- The base design of the Murgh-O-Mahi is not just limited to water resource management capabilities

EASE IN DESIGN – MANUFACTURING – DEPLOYMENT
SIDE OBJECTIVE OF MURGH-O-MAHI: SUSTAINABILITY IN SPACE

- The conceptual use of Ultra Violet degradable plastics for space is currently being tested by BCIT SLP for acceleration environments.
- Eventually incorporate plastics to allow testing in space – not necessarily eliminating use of metal but decreasing it.
- May become a stepping stone for countering the issue of space junk.

SUSTAINABILITY NOT ONLY FOR EARTH, BUT IN OUTER SPACE AS WELL.
MAIN OBJECTIVE OF MURGH-O-MAHI: SUSTAINABILITY FOR EARTH

- Allow timely response to water related disasters through imaging capabilities
- Imaging capabilities for water security
- Assist in monitoring water bodies
- Create an organized interface for developing and lower end users

PROVIDE SUSTAINABILITY FOR WATER HERE ON EARTH
TECHNOLOGY IN OUR DESIGNS

04
BASIC OVERVIEW OF OUR DESIGN

IN DESIGN & TEST PHASE

- Radiometer
- Power
- Electronics/Controls
- Imaging Sensors & Radars
MICROWAVE RADIOMETER

Remote sensing of atmospheric temperature/humidity

• Same technology used in larger satellites for similar studies (climate change and rainfall)
• Microwave Radiometer configuration for CubeSat has been developed & implemented by NASA previously

SPECTRAL IMAGING SENSORS

• Track clouds
• Widespread amongst CubeSats
• Response related efforts
• Observe waterbody levels

Also incorporating Synthetic-aperture radar (SAR)
IMPLEMENTATION OF OUR IDEAS
IMPLEMENTATION OF OUR IDEAS

SAMPLE DATA FROM PROPOSED SENSORS (OTHER SYSTEMS)

Credit: Planet Labs
https://www.planet.com/markets/impact/

Credit: A Deconvolution Technology of Microwave Radiometer Data Using Convolutional Neural Networks
http://www.mdpi.com/2072-4292/10/2/275
IMPLEMENTATION OF OUR IDEAS

SCHEDULING

**PHASE 1A/1B**
- Testing feasibility of structural components & select/finalize electrical components in regards to mission objectives
- 2018
- Finish full scale mockup of satellite

**PHASE 2**
- Testing and procurement of electrical components
- 2019
- Complete functional prototype

**PHASE 3**
- Ready for launch
- 2020
- Ready to be launched in Low Earth Orbit
IMPLEMENTATION OF OUR IDEAS

FUTURE PROSPECTS FOR DEVELOPMENT

CSDC

Prince Sultan bin Abdulaziz International Prize for Water
THE OUTCOME

All in all, this project is planned and designed to:

• allow users with limited or developing capabilities to take advantage of existing technology currently in larger satellites used for water management through affordable means by implementing them in Cube Satellites.

• develop partnerships under the BCIT SLP banner, and then cooperate with other organizations/institutions (not limited to Canada) who are currently working and are experienced in the related field for this project.

• Contribute to the community by sharing information and data with an opensource objective and demonstrate the potential of developing platforms, such as the CubeSat.
THE OUTCOME

• This effort is in the development stage with a very dynamic design.

• As technology changes in the world, so does the technology in our satellite.

• By sharing our ideas from BCIT SLP and our partners, we can grasp the attention of more experienced individuals or institutions in the audience who may assist us further in the challenges we may encounter in our project.
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