UNIVERSITY OF OTTAWA
Faculty of Engineering

GNG1103 Design Project – Deliverable B

Group C2

Adrianna Chouliotis	300225514
Hunter Fleming	300213232
Minjung Gong	300080238
Toby Thai	300201869

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PROBLEM STATEMENT

National Defence of Canada needs a robotic arm designed to use on Halifax Class steel ships in open and defined spaces. The arm should be safe, open source, straightforward to use and maintain. The arm needs to be able to scan the workspace, hold a tool to remove paint or corrosion, hold a painting tool, and paint with precision.

NEEDS

Priority	Need	Description
5	Safety	Safety of the users is of the upmost importance. The product will need a way to turn it off quickly in case of emergency. Potentially, a scanner to identify others in its workspace. The product is assumed to be fastened to the floor. The use of a robotic painting device means that there is no exposure to fumes for the workers.
5	User-Friendly	The user will be someone with little-to-no technological experience. The product needs to be very easy to operate, manage and monitor.
5	Mobility	The client wants the product to have three degrees of freedom. The arm should be able to move inside of confined spaces. The arm itself will need to be able to hold a water blaster, a pen, and a scanning system.
4	Compact	The product needs to be small enough to work in confined spaces.
4	Open Source	The design should be able to be distributable and open to editing. The design could potentially be built upon for future designs.
4	Autonomous	The product needs to be self-running, to be able to press start and it works until it is finished.
4	Camera	The product needs a camera to scan the workspace. It would be used to view confined spaces and report back to the user.
3	Lightweight	The client wants the device to weigh at most 20 lbs or to be able to disassemble to be carried up a ladder. The arm needs to be able to lift a maximum of 1 kg.
3	Made by a 3D printer	The product must be made with a 3D printer. All ships have one printer for immediate product replacement.
2	Inexpensive	The client would prefer the product be as cheap as safety requirements would allow.
2	Lighting System	The product will be used in a dark environment, a lighting system would be useful.

USER BENCHMARKING

	Pros	Cons
PictoBot	Can work in the dark. Creates a 3D model of the workspace with the use of an optical scanning device. Autonomous.	Battery life is 4 hours.
FANUC Paint Mate 200iA/L	Capable of painting moving and multiple parts. High accuracy.	Has a reach of 892 mm. Has a combined weight of 37 kg.