FOREWORD

The Canadian Reduced Gravity Experiment Design Challenge (CAN-RGX) is a competition for Canadian post-secondary students run by SEDS-Canada in association with the Canadian Space Agency (CSA), and the National Research Council of Canada (NRC). In the CAN-RGX, students are challenged to build and test a small scientific experiment in the fields of physical and life sciences to be flown on board the NRC's Falcon 20 research aircraft. This aircraft, which has been modified for reduced gravity experiments, produces short periods of microgravity by performing parabolic flight maneuvers. Any student team at a Canadian post-secondary academic institution can submit a proposal for their experiment, after which, 4 teams will be selected to fully design, build, and fly their experiments. Four members of each team will be selected as Mission Specialists to fly on board the aircraft to run their experiment.

CAN-RGX trains students to complete a full engineering design cycle from conception to execution. This is a valuable opportunity to gain transferable professional skills applicable to careers in Canada's space industry. Student teams will gain exposure to project management and risk mitigation which are essential components of many projects in the space industry. In addition, students will have the opportunity to work with Subject Matter Experts (SMEs) who will coach and mentor them throughout the competition. At the end of the competition, two awards will be given: one for the team showing Overall Excellence in all aspects of the competition, and one for the team who demonstrated Exceptional Outreach Efforts.

This CAN-RGX Application Guide is a resource detailing the Proposal writing process for the competition. The guide begins with a set of instructions for the Proposal writing process, alongside grading rubrics that describe the Proposal evaluation process. Next an overview of the competition is provided, including timeline information and an introduction to microgravity research aboard the Falcon 20. Teams must consult this section to guide their decision making with regards to the conceptual design of their proposed experiment. Finally, a series of templates and examples are provided to assist students with Proposal writing. Please contact canrgx@seds.ca with any questions regarding the application process.

1. APPLICATION INSTRUCTIONS

1.1. Overview

A complete application to the CAN-RGX competition consists of two components:

- A completed CAN-RGX Application Form
- A completed research proposal document

These two documents must be submitted electronically to SEDS-Canada at canrgx@seds.ca prior to the application deadline **Sunday October 8, 2023, 11:59 p.m. (EST)**. The following section contains the instructions for completion of the research proposal document.

1.2. Proposal Guidelines

A required element of a complete application to the CAN-RGX competition is a Proposal. The Proposal is the first of a series technical documents that must be submitted for a team to advance through to the Flight Campaign. Proposals will be scored by a panel of SMEs with experience in the field of reduced gravity research using parabolic aircraft and should be written with this audience in mind. Proposals must be limited to 20 pages, not including appendices.

The proposal must include the following four sections:

Section 1. Introduction
Section 2. Experiment Concept Design
Section 3. Concept of Operation
Section 4. Project Plan

The instructions for each section are provided in Table 1.1 - Table 1.4

NOTE: Proposals which do not meet all experimental constraints outlined in the CAN-RGX Application Form will not be reviewed.

Table 1.1 - Required information for proposal Section 1: Introduction

Number	Section Title	Description
1.1	Research Motivation	Provide a high-level summary of the problem you are trying to solve. Provide general context for the problem by addressing the following questions: What is the problem? Who does this problem impact? Why is this problem important to solve? How is the effect of gravity related to this problem? Include references to recent and relevant peer reviewed publications to support this section.
1.2	Novelty of Experiment	Describe the current state of academic research in this topic. Highlight the limitations of past research and questions that remain to be answered. Indicate how your experiment fills these gaps in knowledge. Include references to recent and relevant peer reviewed publications to support this section.
1.3	Goals	Summarize the overall goal(s) of the experiment into a series of singular, high-level statements. Goals should be directly motivated by the content of the previous sections. If applicable, rank the goals based on the relative importance.
1.4	Importance to Canada's Space Sector	Describe the value of this research project to Canada's space sector. Make specific reference to how the proposed research aligns with the Canadian Space Agency's Departmental Plan and/or other relevant market evaluation.
1.5	Relevance to the Reduced Gravity Environment	Describe the reasons why parabolic flight is required to conduct your experiment. Indicate the reasons why other microgravity research platforms (ie. drop towers, rocket freefall, etc.) are not suited to the requirements of your experiment. Provide evidence to support that 20 seconds of microgravity will be sufficient to conduct your experiment.
1.6	Research hypothesis	Present a scientific hypothesis statement that addresses your project goal. This statement must provide a proposed explanation for an observed natural phenomena under investigation. The statement must be presented such that the explanation is testable via experimentation.

Table 1.2 - Required information for proposal Section 2: Experiment Concept Design

Number	Section Title	Description
2.1	Scientific Objectives	Present a list of specific objectives for the experiment design. Indicate the measurement techniques that will be used to investigate these objectives. Make a clear connection to demonstrate how each Scientific Objective serves overall goals defined in the proposal.
2.2	Science Traceability Matrix	Present a Science Traceability Matrix (STM) for the experiment. Accompany the STM with text that explains how the low-level performance requirements logically follow from the high-level goals and objectives. **Note:** the STM is an industry standard tool used to translate overall mission goals and objectives into quantifiable experiment performance requirements. Consult Section 3.1 for best practices on developing a STM.
2.3	System Architecture	Propose an engineering solution that will achieve the Scientific Objectives of the STM. Identify all subsystems of the design at a high level. Describe the important mechanical, electrical power, and data transmission interfaces between these subsystems.
2.4	Block Diagram	Include a schematic to accompany the design of the system architecture. The block diagram must include all subsystems listed in the System Architecture. Draw the mechanical, electrical power, and data transmission interfaces between these subsystems in the diagram. Consult Section 3.2 for best practices on developing this block diagram.

Table 1.3 - Required information for proposal Section 3: Concept of Operation

Number	Section Title	Description
3.1	Equipment Requirements	Identify any specialized equipment, if any, that is required to meet the Scientific Objectives identified in the STM. For example, a biological experiment may require an autoclave for sterilization procedures. List any specialized equipment that is required for the project.
3.2	Environmental Requirements	Identify the environmental conditions at the integration site and on the aircraft that pose a risk to the Scientific Objectives identified in the STM. For each identified risk indicate the mitigation strategies and engineering controls that will be used to reduce the severity and/or probability of occurrence.
3.3	In-flight Operations	Describe at the high-level the sequence that must be performed by the Mission Specialists during parabolic flight maneuvers. Divide the tasks into the four regimes of the parabolic maneuver; (1) level flight prior to parabola, (2) first 2g-pull, (3) microgravity, (4) second 2g-pull.

Table 1.4 - Required information for proposal Section 4: Project Plan

Number	Section Title	Description
4.1	Funding Strategy	Describe the funding sources your team will pursue over the course of the competition. Indicate the status of these funding sources, the amount, the eligibility requirements, the deadline to apply if funding is not already obtained, and any conditions this funding is contingent on.
4.2	Outreach Strategy	Describe the outreach events your team will host over the course of the competition and beyond the flight campaign. Indicate the specific names, dates, and persons responsible for each event. Include a series of events that target audiences from the general public, K-12 students, and the academic community. Describe the measurable outcomes your team will record to quantity the success of your outreach activities.

1.3. Proposal Review Criteria

Each submitted proposal will be evaluated and scored according to a standardized rubric by a panel of subject matter experts (SMEs) in the field of microgravity research. In addition to the criteria listed in the marking schema a qualitative assessment may also be applied based on the experience of the SMEs. The scoring rubrics are found in Table 1.5 - Table 1.8**.** If one of the sections listed in the rubrics cannot be found in the submitted proposal, it will be scored as 0.

Table 1.5: Scoring rubric for proposal Section 1: Introduction

Section Number	0	1	2	3	Score
1.1		The overview is not well-aligned with the proposal or the main focus is not clearly presented.	The motivation identifies the major topics and stakeholders.	All necessary background context is succinctly summarized. The scope of the problem, key stakeholders, and motivation for the experiment is completely described.	
1.2		Marginal evidence is provided from literature to justify the experiment.	Some literature review was conducted that supports the need for the experiment. Knowledge gap is identified but evidence is lacking.	A comprehensive review of current and relevant literature is presented. Knowledge gaps are clearly identified. All claims are well supported by a variety of current and relevant peer reviewed publications, books, or other credible sources.	
1.3		Goals are too vague, too complex to reasonably address, or otherwise not well-described.	Project goals are aligned with the overall proposal. The primary project goal is achievable but some elements of secondary goals may be infeasible.	Project goals are well presented and in alignment with the previous evidence of the research proposal. Strong evidence is provided to demonstrate that all goals are achievable within the competition scope.	
1.4		Motivations for the research are lacking in justification. Limited connections are made with the goals of Canada's space sector.	The proposal is aligned with some goals of Canada's space sector. The motivations are logical, but not directly applicable.	Direct and measurable impacts to key strategic initiatives within Canada's space sector are clearly demonstrated.	
1.5		The experiment is not suited to parabolic flight. The experiment could reasonably be conducted on ground, or is unachievable in the 20 sec window.	The necessity of parabolic flight is argued. Some evidence is provided to indicate the experiment is feasible in parabolic flight. 20 sec will be sufficient time to observe the phenomena under investigation.	A comprehensive argument describing the necessity of parabolic flight to perform this experiment is clearly presented. Strong evidence is presented indicating that 20 sec will be sufficient time to observe the phenomena under investigation.	
1.6		Hypothesis is not testable, or not aligned with the project goals.	Hypothesis is testable and is somewhat aligned with the primary project goal. More development is required.	Hypothesis statement is well-crafted and is indicative of a testable experiment that directly addresses all project goals.	
				Total:	

Table 1.6: Scoring rubric for proposal Section 1: Experiment Concept Design

Section Number	0	1	2	3	Score
2.1	Objectives do not logically follow from the project goal.		Objectives support the project goal. The core objective is feasible with minor modification. Too many Objectives might be presented.	Clear and concise objectives are present that directly serve the project goal. Objectives are written to follow specific lines of scientific inquiry that can be investigated with quantifiable experimental techniques.	
2.2	Significant logical inconsistencies are evident in the STM. Measurement and instrument requirements are not well-described, missing units, or are unrealistic to achieve.		The STM is logically consistent. The core experiment is feasible, but the STM requires more development. Elements of the measurements or instruments are unclear or under defined.	The STM presents clear, logical flow from each of the high-level Scientific Objectives down through the low level measurement and instrument requirements. All requirements are fully-defined and achievable.	
2.3	System architecture is incomplete or does not address the design requirements.		A complete list of subsystems and interfaces is presented. Some technical specifications are missing or unknown. Minor modifications are needed to meet the design requirements.	A complete list of subsystems is presented with appropriate specifications. All interfaces between subsystems are identified with appropriate specifications. The proposed design meets all requirements.	
2.4	Diagram is unclear or incomplete.		Diagram identifies all subsystems and interfaces. Some specifications for components or interfaces require additional development.	Diagram clearly outlines all subsystems with appropriate specifications. All interfaces are completely described with specifications.	
				Total:	

Table 1.7: Scoring rubric for proposal Section 3: Concept of Operation

Section Number	0	1	2	3	Score
3.1		Obvious specialized equipment requirements are not accounted for.	Specialized equipment is identified. Procurement plan is reasonable but underdeveloped.	Specialized equipment is identified and a clear plan for procurement is presented.	
3.2		Considerations for the integration-site and/or aircraft environment are not accounted for.	Some risks due to the integration site or aircraft environment have not been addressed. Further development of risk mitigation strategies is required.	Risks to the Scientific Objectives due to the aircraft environment are clearly identified. Appropriate mitigation strategies are presented to address each risk.	
3.3		Procedures are incomplete or not feasible on aircraft.	On-aircraft procedures are achievable with minor modification.	On-aircraft procedures are clearly presented and achievable.	
				Total:	

Table 1.8: Scoring rubric for proposal Section 4: Project Plan

Section Number	0	1	2	3	Score
4.1		Few funding sources are identified. No clear plan is presented for project funding.	Some funding sources are identified. Project finances are concentrated on one key source.	A robust funding strategy is presented which targets a diverse set of sources throughout the entire course of the project. Specific team members have been assigned to specific sponsorship and funding tasks.	
4.2		Outreach plan is nondescript or does not indicate any measurable outreach impacts.	Outreach plan contains some events that involve the general public, K-12 students, and the academic community. Dates and key stakeholders are not presented for all outreach events. Some outreach goals are defined	A series of diverse outreach events are presented to involve the general public, K-12 students, and the academic community with outcomes of the project. Specific events are planned with dates and stakeholders. Clear, measurable outreach goals are defined for the entire course of the project.	
				Total:	

2. COMPETITION OVERVIEW

2.1. Competition Timeline

2.1.1. Selection

Students must adhere to the following timeline and requirements to qualify for the selection process.

- **Sunday October 8, 2023, 11:59 p.m. (ET)**: Submit your **Application.**
- **Monday October 30, 2023**: Teams will be notified of their selection and feedback will be provided by SMEs.

2.1.2. Project Milestones

NOTE: An updated timeline can be found on the CAN-RGX website (seds.ca/can-rgx). It is each team's responsibility to monitor the website and communications from SEDS-Canada for timeline updates.

- **Week of November 6, 2023:** CAN-RGX Kickoff meeting with selected teams and Faculty Advisors.
- **Sunday December 3, 2023, 11:59 PM (ET):** Submit a short **Progress Presentation (PP1).**
- **Week of December 4, 2023:** Progress Meeting with SEDS-Canada.
- **Week of February 12, 2024: Preliminary Design Review (PDR)** via teleconference (comments and feedback provided shortly after).
- **Sunday February 17, 2024, 11:59 PM (ET):** Submit your first **Test Equipment Data Package (TEDP)** for preliminary review.
- **Sunday March 17, 2024, 11:59 PM (ET):** Submit a short **Progress Presentation (PP2).**
- **Week of March 18, 2024:** Progress Meeting with SEDS-Canada.
- **Sunday April 14, 2024, 11:59 PM (ET):** Submit a short **Progress Presentation (PP3).**
- **Week of April 15, 2024:** Progress Meeting with SEDS-Canada.
- **Sunday May 19, 2024, 11:59 PM (ET):** Submit Critical Design Review (CDR) Presentation.
- **Week of May 20, 2024: Critical Design Review (CDR)** via teleconference (comments and feedback provided shortly after).

- **Sunday May 26, 2024, 11:59 PM (ET):** Submit your revised **TEDP** for critical review.
- **Sunday June 9, 2024, 11:59 PM (ET):** Submit your ground test video verification.
- **Sunday June 24, 2024, 11:59 PM (ET)**: Submit your final **TEDP** for airworthiness acceptance.
- **Sunday June 30, 2024, 11:59 PM (ET)**: Submit your **Outreach Activities Report (OAR).**
- **July 22 to 26, 2024:** Flight Campaign period.
- **August 19, 2024, 11:59 PM (ET):** Deadline to submit your **Post-flight survey** (sent out as a Google Form).

NOTE: Milestones requiring document submission should be made to canrgx@seds.ca. Specific instructions for submitting these documents will be provided to selected teams.

2.2. Pelican Case

All experiments must fit into a hard-shell case. The case serves as a protective envelope which allows for containment of the experiment's potential hazards to reduce risk to the aircraft and its crew. The case is a Pelican product 0350 Cube Case, modified for parabolic flight.

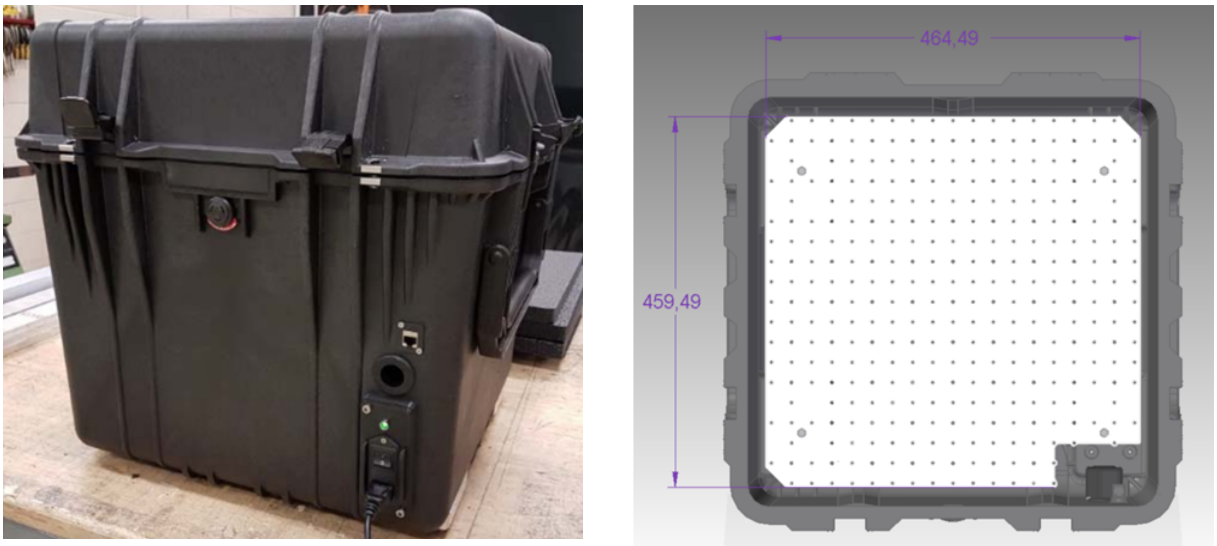

Figure 2.1: (a) Pelican case exterior with modifications (bottom-right corner) (b) Pelican case interior mounting plate with dimensions 459.49 x 464.49 mm.

The case has external dimensions 57.2 x 57 x 54 cm (L x W x D) and inner dimensions 50.8 x 50.8 x 46.6 cm (L x W x D). The modifications include the addition of a 115VAC outlet, power switch, cable pass-through and an ethernet port (bottom-right corner in Figure 2.1a).

Inside is a threaded mounting plate, with outer dimensions are given in Figure 2.1b). This plate contains a grid pattern of 10-32 tapped holes spaced at increments of 25mm and are the intended mounting points for components of the experiment. A complete STP file of the modified case will be provided to the selected teams for exact dimensions. If the experiment requires the use of a laptop, a RAM Tough Tray Spring-Loaded Laptop Tray will be provided and attached at the top of the Pelican case. The tray accommodates laptops up to 15 inches in size.

2.3. Microgravity Research

2.3.1. Falcon 20 Research Platform

The Falcon 20 aircraft shown in Figure 2.2 is operated by the NRC's Flight Research Laboratory (FRL) in Ottawa, ON. FRL operates from an aircraft hangar, which is fully equipped for the modification, maintenance, and operation of its fleet of experimental aircraft.

Figure 2.2: Photograph of the NRC's Falcon 20

The aircraft layout for the CAN-RGX configuration is shown in Figure 2.3. Two teams fly on each flight, one team forward facing (ie. facing the nose of the aircraft) and the other team aft facing (ie. facing the tail of the aircraft). Each seat is equipped with an intercom headset to facilitate communication with teammates, pilots, and other NRC crew. All students will receive training for on-aircraft procedures while at the campaign site.

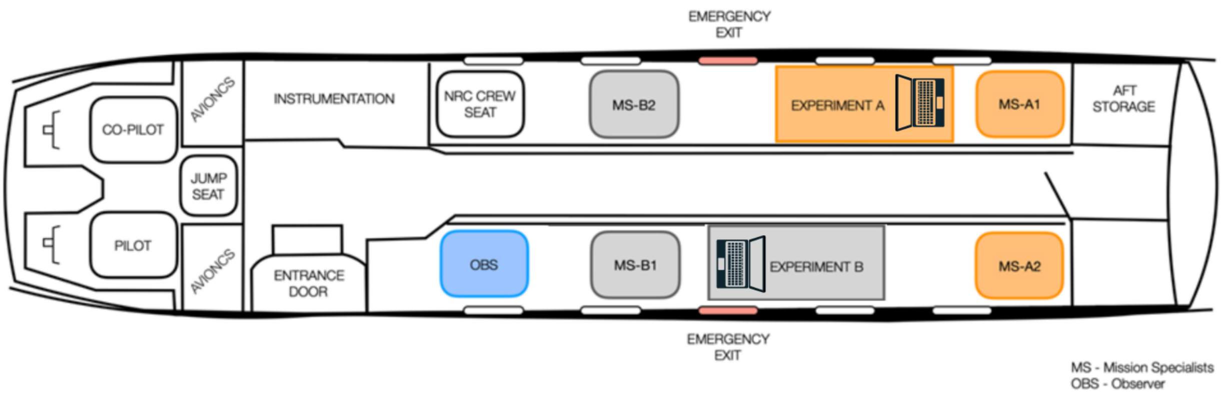

Figure 2.3: Typical CAN-RGX cabin layout; MS = Mission Specialist.

Cabin pressure is typically maintained between sea level (14.7 psi) and 1000 ft Mean Sea Level (MSL) during the parabolic maneuvers. However, loss of cabin pressure could result in a cabin pressure as low as 7 psi. This is to be considered in the design of the test equipment. In-flight cabin temperature is normally maintained within a comfortable level (nominally 22°C). On the ground, before and after flight, cabin temperatures can approach (and in summer exceed) outside air temperature. During take-off, taxi, and landing vibrations from flight are felt in the cabin. The experiment design must demonstrate functionality within these environmental parameters. Environmental data from past CAN-RGX flights will be provided to participating teams. If environmental data collection is required for the experiment, SEDS-Canada can provide an ENDAQ brand S3-D16 vibration sensor [Ref] for use during flight.

2.3.2. Parabolic Flight Sequence

A typical parabolic flight sequence begins with a series of preflight procedures. During this time, the experiments and crew are loaded onto the aircraft, a series of preflight checks are performed, and a short taxi to the airport runway is performed before takeoff. Following takeoff, the aircraft makes a transit to the research airspace. This transit takes approximately 15 minutes. Upon entering the research airspace the aircraft performs a series of parabolic maneuvers while each team performs their experimental operations. The total time in research airspace is approximately 60 minutes. Finally the aircraft takes a second transit back to the airport. The total length of a typical flight sequence is 90 minutes.

An illustration of a parabolic maneuver is shown in Figure 2.4; altitude is shown in blue and acceleration is shown in orange, with distinct periods of 2g and 0g acceleration. The maneuver begins with a 2g-pull, when the aircraft climbs in altitude and the occupants experience approximately double nominal gravity. Next the aircraft pitches over into microgravity. At the end of the microcavity portion, the aircraft pulls up into a second 2g-pull.

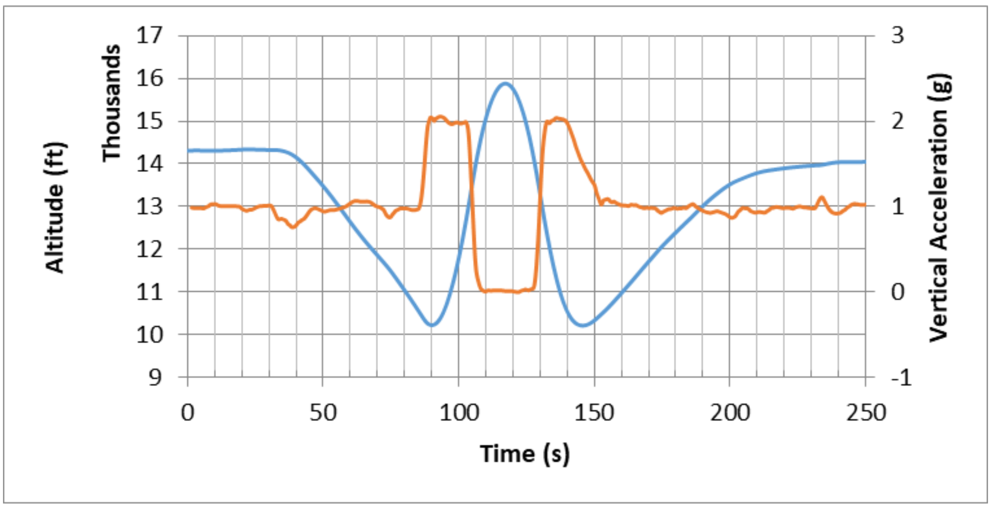

Figure 2.4: Typical microgravity parabolic profile; altitude is in blue and vertical acceleration is in orange.

The parabolic maneuver sequence may take different forms depending on the scientific objectives of each experiment. During the design review process, each team is expected to communicate the ideal parabolic sequence needed to meet the research objectives. In general, the parabolic sequence may be continuous (ie. back-to-back parabolic maneuvers) or individual (ie. a single maneuver followed by a period of level flight). Figure 2.5 contains an illustration of the two sequence types. The nominal CAN-RGX sequence consists of 6 back-to-back parabolas, followed by a period of level flight, followed by a second set of 6 back-to-back parabolas. Deviations from this sequence will be evaluated during the design review process to ensure the scientific goals are achieved. The exact sequence of procedures will be determined prior to the flight, in consultation with the flight crew, SEDS-Canada and both teams. It should be noted that during the 2g pull-up maneuvers equipment adjustment cannot be safely performed. These actions are not permitted during 2g pull-up and pull-out maneuvers and the Pelican Case must remain closed.

Note: The ability to tailor the parabola sequence is limited in that the overall flight time cannot exceed 90 minutes (i.e. 15 parabolas with 5 minutes in between each parabola would exceed the total flight time). Therefore, experiments that can accommodate back-to-back parabolas are preferred when possible as to maximize data collection in microgravity. Furthermore, the experiment should be designed with flexibility as the other team you fly with may not have the same requirements for the parabolic sequence.

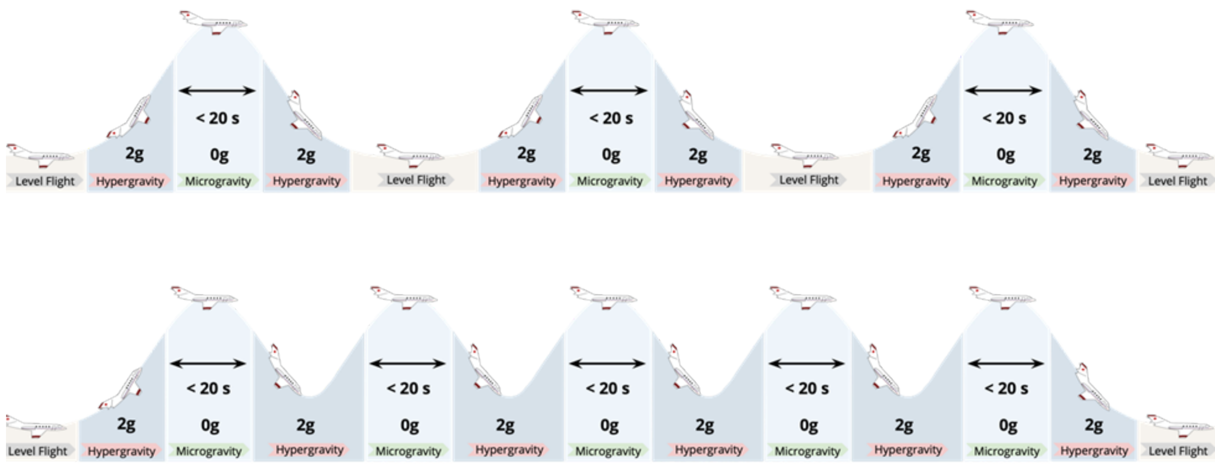

Figure 2.5: A visual representation of the difference between individual parabolas which have level flight time in between (top) versus back-to-back parabolas (bottom).

2.3.3. Flight Campaign

The flight campaign occurs over a period of five days. Teams must ensure they are able to deploy to the campaign location during the entire campaign. It is expected that teams will arrive at minimum the night before Day 1. The general schedule for a flight campaign is given below.

- Day 1 includes a series of orientation activities, training, and final integration checks before installing the experiments onto the aircraft.
- Day 2 is the first flight day. The first group of students flies in the morning, then the second group of students flies in the afternoon.
- Day 3 is the second flight day. The procedures are largely duplicated from the previous day.
- Day 4 is a reserved weather contingency day.
- Day 5 is a reserved weather contingency day.

For the first time, the CAN-RGX flight campaign will be hosted in association with the Canadian Space Agency (CSA) and collaborating institutions out of Saint-Hubert, QC. Details of the campaign site will be released to participating teams following the selection process. Assume that any special requirements such as biological lab space, clean rooms, etc. are not available. It is the team's responsibility to supply any specialty tools or equipment required for their experiments and to secure additional lab space, if required. For questions or assistance, please contact the SEDS-Canada team.

Note: The CAN-RGX campaign nominally takes place at NRC's Flight Research Lab (FRL) in Ottawa, ON. In the event that the flight campaign cannot be held in Saint-Hubert, the flight campaign will be hosted out of FRL in Ottawa.

2.3.4. Integration onto the Falcon

Pelican cases will be integrated onto the Falcon 20 on the day of your flight. This takes up to 1 hour. On flight day, your experiment may sit in the hangar or on the tarmac for up to 4 hours. The experiment must be designed and tested to withstand the constraint where access could be limited. Sensitive materials, such as biological samples, that may require special handling procedures that will be assessed on a case-by-case basis.

3. TEMPLATES

This section contains templates to assist students in writing the research proposal. For questions regarding use of these templates please contact canrgx@seds.ca.

3.1. Science Traceability Matrix

A Science Traceability Matrix (STM) is a communication tool that is used to simply explain the importance of a scientific investigation and clearly outline how that investigation will be carried out. A good STM provides a high-level view of what an experiment sets out to accomplish and provides a continuous flow of logic to translate how the high-level objectives translate into quantifiable measurement requirements, and instrument performance metrics.

There are six columns that must be included in the Science Traceability matrix (STM):

Table 3.1: Required content for a Science Traceability Matrix (STM)

Scientific Objective	A specific line of investigation that supports the overall mission goal. The Scientific Objective should indicate the core question that is under investigation, and the type of physical phenomena that can be measured.
Measurement Objective	A description of one observable physical phenomena that is key to understanding the question posed by the Scientific Objective. Multiple Measurement Objectives may be required to meet the Scientific Objective.
Measurement Requirement	Quantify the specific characteristics of the measurement that are needed to meet the Scientific Objective. Description the range and type of measurement data that is needed to achieve the Scientific Objective.
Instrument	A description of the tool that is needed to conduct the measurement. In this section, name the tool that is needed to collect the experimental data.
Instrument Requirement	Quantify the minimum performance metrics for the instrument that will satisfy the corresponding measurement requirement. Units of measurement are needed for all instrument requirements. Common instrument requirements include the range, accuracy, precision, and repeatability of the instrument.
Mission Requirement	Describe the sequence of events that must occur which would result in a successful measurement. The experiment design must facilitate this sequence of events from occurring and provide the opportunity for the instruments to collect data at the appropriate events.

Table 3.2: Example Science Traceability Matrix

Scientific Objective *A specific line of investigation that supports the overall Mission Goal*	**Scientific Measurement**		**Scientific Instrument**	
	Measurement Objective *Description of a observable physical phenomena that is key to understanding the Scientific Objective*	**Measurement Requirement** *Definition of the minimum measurement characteristics required to meet the Scientific Objective*	**Instrument** *Name of the tool that is required to conduct the measurement.*	**Instrument Requirement** *Definition of the minimum instrument performance metrics to meet the measurement requirement.*
Quantify the “sloshing” phenomena during fluid transfer in micro-g	Force transferred to the fluid chamber during filling in micro-g	Average force (N) in the direction of fluid transfer	Parallel beam type load cell	0-500 N range 0.1 N resolution 1 kHz sampling rate
Quantify the impact of flowrate on “sloshing” forces	Amount of fluid flowing through the test chamber during filling in micro-g	Average fluid flow rate (L/min) through the test chamber	Flowmeter	0-20 L/min range 0.5 L/min resolution 1 kHz sampling rate
Explore the impact of slat design on “sloshing” forces	Compare forces from fluid cells with different slat geometries	Use 2 different slat designs, plus a control design.	N/A	Experimental design must include 2+1 slat geometries

Mission Requirements *Describe the scenario that must occur to result in a successful measurement for the mission.*
The Mission Specialists must initiate the experiment after entering micro-g. Fluid must be forced through the test chamber during the period of micro-g. Load cell and flowmeter data must be sampled during this period and saved for post-processing. Three replicates for each of the experimental conditions must be captured for analysis. Fluid transfer must be completed within 20 sec, and should be completed in less than 15 sec.

Note: Additional resources to generating STMs may be beneficial to consult to further your understanding [1], [2], [3]

3.2. Block Diagram

A block diagram is a communication tool that is used to identify the design intent of the experiment. The diagram contains a series of blocks which indicate different components of the design. Each component is connected with a series of interfaces represented by lines. At minimum, the diagram must indicate the various mechanical, electrical, and data transmission interfaces between the different components. For the CAN-RGX competition, the block diagram is necessary to quickly identify the following information:

- What components will be brought onto the aircraft
- How each component is mechanically connected together
- How does electrical power flow through the system, and where are the electrical inhibit systems
- How are command and data signals sent through each component

If any of the previous information is not clearly evident from the block diagram, that is a sign that the design requires more development. An example block diagram is provided for reference.

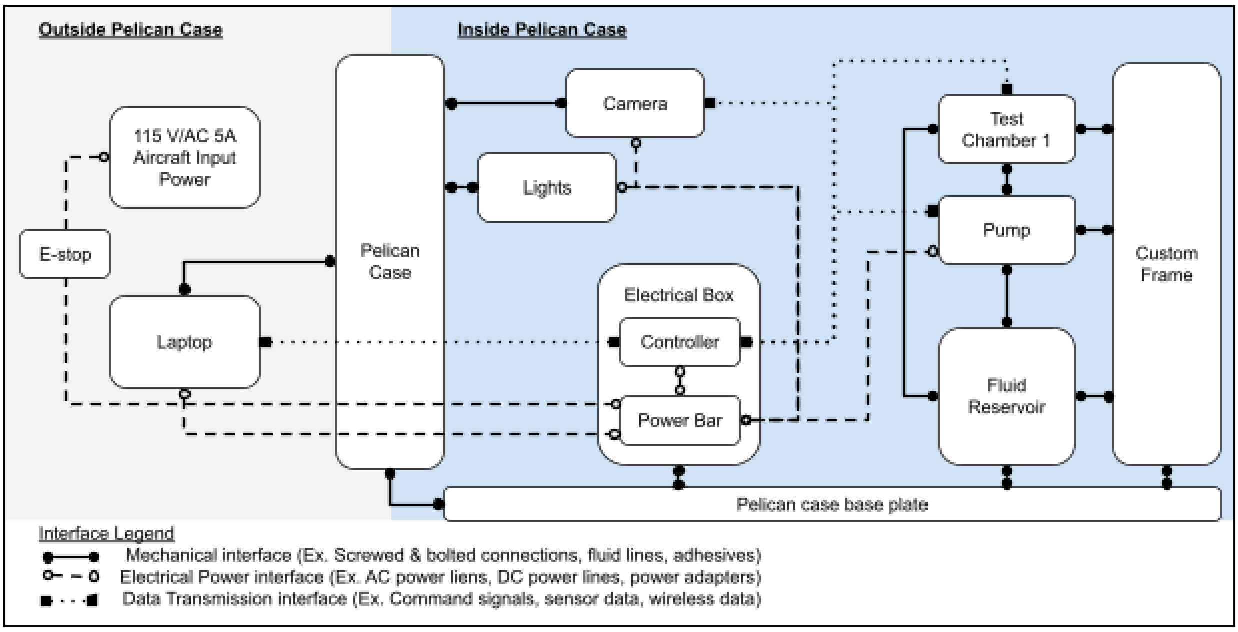

Figure 3.1: Example Block Diagram