SPACE FLIGHT EXPERIMENT REQUIREMENTS SUMMARY

In addition to the actual proposal, this part of the proposal is required for the Flight Feasibility Review. This form has been designed for a description of all pre-flight, in-flight and post-flight components of the flight experiment. It consists of two sections:

- A section to be completed only for experiments that require human subjects, and
- A section to be completed only for experiments that require non-human specimens i.e. biology and/or exobiology experiments.

If an experiment requires both human and non-human specimens, both forms must be completed. If no specimens are required (e.g., radiation dosimetry), complete applicable hardware and procedures questions as required. If the proposal consists of distinct segments with different requirements, fill out multiple forms to fully describe all segments. **This form is mandatory for flight experiments.** Flight experiment proposals submitted without this completed form will not be evaluated.

Please read the questions carefully and keep answers brief but thorough, ensuring that all requested information has been provided. Expand tables/response space as needed.

Part I: Research Involving Crewmembers as Subjects

1. Principal Investigator: _____

2. Investigation/Activity Title: _____

3. Type of Study (check one). Also indicate the minimum number of days on-orbit required:

		On-orbit Duration Required (minimum)
☐	Long Duration: Pre/Post-flight only	
☐	Long Duration: Pre/In/Post-flight only	
☐	Long Duration: In-flight only	

4. How many subjects are required?
   a. Long Duration: _____
   b. Ground Duration: _____

5. Provide a pre- and post-flight testing schedule for baseline data collection (BDC). Include the name of the test/activity, dates required (L-X days preflight, R+X days post-flight, R+0 indicating landing day), and estimated crew time requirements in the table below. Crew time estimates should reflect the time required for testing of one subject. *NOTE: Training sessions should not be included unless they are considered part of the data set.*

Preflight Test/Activity	**Schedule**	**Crew Time (min)**		**Post-flight Test/Activity**	**Schedule**	**Crew Time (min)**	
		per session	**total**			**per session**	**total**
E.g., DEXA	***L-180 and L-45***	***60***	***120***	***DEXA***	***R+6 and R+180***	***60***	***120***
TOTAL PREFLIGHT BDC (per subject)				**TOTAL POSTFLIGHT BDC (per subject)**			

6. Launches and landings of long-duration crewmembers will occur in Russia (via Soyuz) until an alternate U.S. crew transportation vehicle is available. Crewmembers typically depart the US in the L-60-45 day timeframe (in addition, some crewmembers also take vacation time or visit their home country prior to going to Russia) and current plans are to nominally return USOS crewmembers to JSC within 24 hours of landing. Please address the following:

   a. If preflight BDC is required within 45-60 days of launch, please explain why it cannot be moved earlier so it can be performed at JSC prior to the crew departing for Russia, and explain what

equipment, facilities, and personnel are required to conduct the test.

b. Do you have any unique facility requirements for conducing BDC and/or performing analysis of data at JSC? If so, please describe below.

7. Due to current logistical limitations, it is very difficult to gain immediate access to crewmembers returning via Soyuz on landing day. Currently all USOS crewmembers are directly returned to JSC within 24 hours of landing. There is some time available after the crew returns to JSC for minimal testing, which is still considered "R+0". If you have an R+0 requirement, please describe the nature of the testing and state whether or not this is a firm requirement; i.e., what are the science impacts of delaying the session to R+1 and, if this occurs, are the objectives of the experiment compromised.

8. The amount of time available for BDC in the first week of post-flight is extremely limited. If you have additional requirements in the R+0 to R+7 day timeframe that are not addressed in #7 above, for each session please explain any flexibilities in the schedule and provide the impact if the session cannot be scheduled by R+7 days.

9. Provide an in-flight testing schedule in the table below. Include the name of the test/activity, dates required (Flight Day (FD) X days in-flight), and estimated crew time requirements. Crew time estimates should reflect the time required for testing of one subject; however, if an operator is

required for an in-flight activity, their time should be included as well. Activities that are performed once regardless of the number of participants (e.g., set-up and stow) should be listed separately. Please assume a six-month mission in calculating the crew time estimates.

Test/Activity	**Schedule**	**Crew time (min)**	
		per session	**total**
E.g., Experiment Protocol (per subject)	*FD 30 and monthly thereafter*	*60*	*360*
TOTAL IN-FLIGHT CREW TIME (per subject)			

a. Is real-time data transmittal to the ground either required or highly desirable*? (NOTE: "Required" means that the experiment cannot be performed if downlink is not available; "highly desired" means that the experiment data will be transmitted if the downlink is available.)*

b. How critical is the timing of the in-flight sessions? Please explain any flexibility in the schedule provided in the table above. Examples of in-flight timing requirements that may be difficult to implement are: early in-flight (especially during the first 10 days and through the 3rd or 4th week), late in-flight, any activity that must be performed daily or weekly, and any activity requiring precisely timed operations.

10. Please list all of the flight hardware required for in-flight data collection along with the quantity required (indicate if item is for one subject, one increment, etc.) and the estimated total mass and volume for the given quantity (N/A for equipment already on board ISS). In the comments, provide additional explanatory information such as development status, past flight history, assumptions made when calculating quantities required, etc. If new flight hardware is required, indicate in the

comments if it is Commercial-Off-The-Shelf (COTS) or if it will be experiment unique equipment.

Hardware Item	Qty.	Mass (kg)	Volume (m^3)	New, Previously Flown, or On-Orbit (specify)	Comments
E.g., Urine Collection Kit	*5 kits/ 3 subj.*	*10*	*0.045*	*Previously Flown*	*Flown on ISS Increments 3-6, 8, & 11-12; five kits provide supplies for three 24 hr urine collections with three subjects*

11. If flight software is required, please answer the following:
    a. Is the software equipment-unique or commercial off-the-shelf?

    b. If it is experiment-unique, what is the status of development and who is the developer?

12. Storage of equipment and samples (for all flight experiments):

Is temperature control of equipment/supplies needed:	Yes	No	Not Known	Temperature (ºC)	Estimated Volume (cm^3 or *x* number of *y* ml vials)
-- for launch?					
-- in flight?					
-- for return?					

13. Can all of your flight hardware and supplies be stowed for launch at L-2 months?
    ☐ Yes ☐ No
    If "No", list each item that must be late-loaded along with the L-requirement (indicate if units are in hours or days):

14. Do any flight hardware or supply items expire in two years or less? ☐ Yes ☐ No
    If "Yes", list each item along with estimated shelf life (indicate if units are in days or months):

15. Return of hardware and samples are limited after Space Shuttle retirement. Does your experiment require timely return of hardware or samples? ☐ Yes ☐ No

If "Yes", explain the nature of the requirement and the impacts if it cannot be met. Also indicate if early retrieval of items is required.

Part II: Research: Biology & Exobiology

Science Team Coordinator name: _____

Proposal title: _____

_____

Use the table below to list the requirements for non-human specimens. *Add more rows if necessary.*

Biological sample / Specimen type (eg. species, strain, age etc)	Treatments / conditions (eg. activators, drugs, tracers, fixatives)	Required g-levels	Number of samples required for each g-level / condition

General description of experiment protocol: *Describe in general terms the types of procedures required for the experiment from preparation of the experiment in the lab until postflight handover of the sample to the investigator.*

- Parameters measured: *Describe the type of parameters measured inflight, such as realtime / recorded measurements (eg. temperature, with accuracy & time resolution, timing of experiment steps) and parameters measured in postflight analysis*
  -
  - *Inflight parameters measured;*
  -
  - *Postflight parameters measured*

- Imagery requirements: *List any requirements for photography or video observation / recording of samples*
  - Photography:
  - Video

- Requirements on telemetry / data downlink / storage: *List any potential requirements for telemetry downlink (e.g. fluorescence measurements, facility housekeeping data, downlink of photo's)*

- Requirements on commands uplink: *List any potential need for remote command of the experiment & whether this is dependant on downlink of telemetry from the experiment (eg. modification of experiment timeline based on results of video observation)*

Ground reference experiment(s): *Indicated whether a ground control reference experiment*

Pre-launch late access: Specify the maximum and preferred period in hours that can be accepted between hand-over of the experiment and transfer to either ISS stowage or activation on orbit

Early retrieval: Specify the maximum and preferred time in hours between landing & hand-over of the experiment samples that can be accepted.

Describe the method for delaying experiment activation until it is installed on the ISS (eg. dry unactivated seeds or cultures, freezing).

Describe the method for preserving samples after the experiment run for up to 365 days, or longer, on the ISS (eg. chemicals, freezing temperature, refrigeration temperature, dessication).

Hazardous materials and controlled/radioactive substances used in experiment

What is the preferred sample layout for the experiment? (Number of samples per condition) What is the minimal sample layout?

What is the estimated mass and volume of each sample?

Experiment Steps: Use the table below to list the experiment steps from prelaunch experiment hand-over until postflight retrieval, with the required environmental parameters & allowable range for each parameter. Add rows as necessary:

Experiment Step description	Duration (preferred, min & maximum) *1	Temperature (preferred, min & maximum) *2	Gravity requirements (eg. micro-g or 1.g control) *3	Humidity & gas composition requirements (eg. CO2, ethylene) *4	Light requirements *5	Data, imagery or other requirements *6

*1 - Specify duration of experiment step, including margins (i.e preferred time, minimum & maximum acceptable times if known)
*2 - Specify required temperature of experiment step, including margins (i.e. preferred temperature, minimum & maximum temperature if known)
*3 - Specify required g-levels (ie. Microgravity, 1.g reference control, intermediate g-level & any requirements on quality of g-level)
*4 – Specify any requirements for humidity control, (including preferred, maximum and minimum rh if known), gas composition, including oxygen and CO2 concentrations / pressure. Also indicate if there are any requirements concerning maximum allowable trace gas concentrations (eg. Ethylene)
*5 – Specify light requirements, flux, quality / spectrum, light dark cycles as applicable. For exobiology experiments include the solar UV wavelength ranges desired (eg. >110nm, or >200nm to simulate Martian conditions)
*6 – Specify data recording requirements, such as temperature logging , imagery requirements, eg. Photo / video, frequency of imaging, and any additional requirements not covered by the other columns in the table