OBJECTIVE
To establish the need for a shared definitional model of long duration human space flight, that would provide a framework and vision to facilitate communication, research and practice

BACKGROUND/MOTIVATION
In 1956, on the eve of human space travel Hubertus Strughold first proposed a “simple classification of the present and future stages of manned flight” that identified key factors, risks and developmental stages for the evolutionary journey ahead (Strughold, 1956). As we look to new destinations (Figure 1 & 2), we need a current shared working definitional model of long duration human space flight to help guide our path. Here we describe our preliminary findings and outline potential approaches for the future development of a definition and broader classification system.

METHODS
Initial review of formal and grey literature augmented by informal and preliminary consultation with eight subject matter experts (SMEs) from the National Aeronautics Space Administration (NASA) and the Canadian Space Agency (CSA) from space life sciences, habitability and engineering. The search strategy focused on both the use of the term long duration mission and long duration space flight, as well as broader related current and historical definitions (Table 1) and classification models of space flight (Table 2). The related sea and air travel literature was then explored with a view to identify useful analogous models or classification systems (Table 3).

ANALOGOUS DEFINITIONS
Few national and international standards defining long duration space flight missions exist. The NASA’s Flexible Path strategy has determined possible future human space flight destinations (Figure 1 & 2). Many terms have been sporadically used to define these missions (Table 1), and a shared definition of long duration human space flight would be beneficial. To begin to identify a useable definition, it is helpful to study precursors to human spaceflight such as robotic missions as well as other analogous expeditionary arenas such as sailing, which share operational considerations to human spaceflight.

RESULTS
- The concepts of long duration mission and long duration space flight are infrequently and inconsistently operationally defined by research authors, and no commonly referenced standard definition emerged from the search. Interviewees did not identify any current initiatives to develop a common definition.
- Of the interviews conducted, a majority of interviewees believed a common definition would be of value to the space community. Though questions and concerns were raised regarding this (see Discussion).
- In the case that a multi-axial categorization system is developed, SMEs identified a number of constraints that should be incorporated (Table 4).
- The categorization system for sailing was found to be of potential analogous utility, with its focus on understanding the need for crew and craft autonomy at various levels of potential adversity and ability for outside support or return to a safe location, as well as factors of time, distance and location (Table 3).

DISCUSSION AND IMPLICATIONS FOR THEORY AND PRACTICE
While a shared definition would be beneficial, concerns raised were:
- The potential users of a common definition for long duration space flight missions must be determined. NASA departments and disciplines use the terms in varying degrees in daily operations. This preliminary research suggests a shared definition would be most used by NASA Medical Operations, the NASA Behavioral Health Program (BHP) and by extension the NASA Human Research Program (HRP), in addition to their international counterparts, as well as any discipline that commonly uses the term in published papers.
- The scope of the definition must be determined. Loose definition, vs. a complex categorized system. SMEs advised a simpler definition is more relevant and easier to implement.
- Technological advances in the near future may change the nature of constraints and mission requirements thus affecting the categorization system. Therefore, the system should attempt to be broad enough to accommodate these potential changes.
- Questions emerged in considering the constraints for a multi-axial system:
  - Nature of mission: This constraint will play a major role in the day to day experience of future astronauts. Very different selection, training, and mission profile will be experienced by crews depending on the focus of their mission: construction vs. science vs. maintenance.
  - In regards to the ability to return to Earth, the orbital mechanics on what are points of no return?
  - As missions reach even longer durations, at what point does a mission become a relocation (a more permanent habitation in space)?

CONCLUSIONS
- There is a need to examine the drivers that cause a shift in mission profiles (spacecraft capabilities, technology, propulsion) where multiple crucial requirements change.
- Broader survey of international perspective is needed.
- To successfully implement a system, support should be encouraged amongst technical planners, international standards teams.
- Further research on analogous category systems is needed to inform the development of an adequate system.
- Current standards documents should be reviewed for their relevance and utility.