The Balloon Program Office (BPO) is soliciting innovations in two specific areas:

1. Currently, the Balloon Program Office is developing an Ultra Long Duration Balloon (ULDB) vehicle targeting 100 day duration missions in mid-latitude. This added capability will greatly enable new science investigations. The design of the current pumpkin shape vehicle utilizes light weight polyethylene film and high strength tendons made of twisted Zylon® yarn. The in-flight performance and health of the vehicle relies on accurate information on a number of environmental and design parameters. Therefore, NASA is seeking innovations in the following specific areas:
   
   - Tendons are the load carrying member in the pumpkin design. During a typical mission, loading on individual tendons should not exceed a critical design limit to insure structural integrity and survival. A key technology challenge is the development of devices or methods to accurately and continuously measure individual axial loading on an array of up to 200 separate tendons during a ULDB mission. Tendons are typically captured at the fitting via individual pins. Loading levels on the tendons can range from \(-20\) N to \(-8,000\) N and temperature can vary from room temperature to the troposphere temperatures of \(-90^\circ\)C or colder. The devices of interest shall be easily integrated with the tendons or fittings during balloon fabrication and shall have minimal impact on the overall mass of the balloon system.
   
   - Ambient air, helium gas, and balloon film temperature measurements are needed to accurately model the balloon performance during a typical flight at altitudes of approximately 120,000 feet. The measurement must compensate for the effects of direct solar radiation through shielding or calculation. Minimal mass and volume are highly desired. For film measurement, a non-invasive and non-contact approach is highly desired for the thin polyethylene film, with film thickness ranging from 0.8 to 1.5 mils, used as the balloon envelope.
(2) The Balloon Program Office is also seeking innovations to reduce the effects of parachute opening shock on gondolas and balloon subsystems. This shock is produced by the rapid opening of a flight system's parachute after the payload is released from the balloon at mission termination.

Innovations may address the problem either by reducing the termination shock via modifications to the recovery system or by attenuating the shock produced by current recovery systems. Proposed technologies will be evaluated for their mass efficiency, ease of integration, effectiveness at reducing shock levels, compatibility with balloon flight environments, and cost effectiveness, among other factors.

Research should be conducted to demonstrate technical feasibility during Phase 1 and show a path toward a Phase 2 hardware/software demonstration, and when possible, deliver a demonstration unit for functional and environmental testing at the completion of the Phase 2 contract.