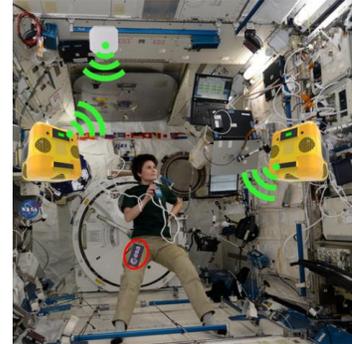


# 2020 Wearable Technologies Workshop Challenge Request

**Challenge Title:** Wearability of On-Body Sensing Units

**Organization Name:** NASA Johnson Space Center

**Team Assignments Available:** 2



## Summary of the Challenge and Team Project

### Background:

The Wireless and Communication Systems Branch at NASA has developed and will be deploying a wireless sensing system to the International Space Station (ISS) in the next few years. The goal of this system is to transport sensor data (e.g. CO<sub>2</sub>) using an existing RFID infrastructure. One of the main aspects of the system is to have a sensor package that is wearable by the crew member, so that we have sensor information exactly where the crew roams.

The hardware that the crew wears consists of:

- An antenna
- A circuit board
- A sensor (e.g. CO<sub>2</sub>)

### Problem statement:

To design and implement a human factors study to determine:

- Optimal aspect ratios of the hardware combination (antenna & circuit board)
- Preferences between rigid and soft textile antennas
- Optimal on-body location map of the hardware combination (antenna & circuit board)

### Important design considerations (These can be discussed, and possibly negotiated, in more detail after the Team has been assigned):

- Human Factors Study:** Teams will create a study to test various configurations of hardware with test subjects. Metrics of the study should include factors that help predict astronaut compliance (e.g: overall comfort, stability, etc).
- Antenna Aspect Ratio:** Teams will either be given 3D models or referred to common fabrics to represent the antenna, rather than have functional antennas. For the antenna, a fixed surface area will be given along with minimum dimensions. Within these given bounds, teams are expected to test several aspect ratios for the 2D shape of the components and incorporate with the designed study.
- Antenna Rigidity:** As mentioned above, the study must include a brief investigation of using a rigid antenna or soft textile antenna. Teams will be advised on materials to represent each configuration.

**What funding and/or resources can be provided to each Team? (The details of the payment arrangements must be negotiated with the Team.)**

Teams will be sent either 3D models or 3D printed prototypes of hardware combinations for the human factors study. Any further materials / samples needed for the study will be provided, but no funding is available.

**Deliverables (the final product you expect the Team to provide – such as a report, garment, user evaluation, ...):**

A designed and implemented human factors study which includes elements of wearability (comfort, stability, etc.). The report will include the option which emerged as 'best', and other recommendations / lessons learned going forward.

**How will the results be used?**

The results of the proposed study will directly influence the design of our hardware for products that will fly to the ISS.

**What deliverables (if any) do you want transferred to you at the end of the project?**

Results from the aforementioned study, other recommendations / lessons learned for future development of the hardware configuration, and any materials given to the teams throughout the challenge.