

# OSTAAT™

Wearable bone-health support  
for long-duration missions



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# Five hazards of Human Spaceflight (RIDGE)



**Space Radiation**



**Isolation & Confinement**



**Distance from Earth**



**Gravity fields  
(microgravity)**



**Hostile / Closed  
Environments**

A high-angle, close-up photograph of an astronaut in a white space suit floating in space. The astronaut's helmet is prominent, reflecting the Earth and the sun. The suit is equipped with various instruments and a device labeled 'OSTAAT' on the hip. The background shows the complex structure of a space station or shuttle against the blackness of space and the blue and white of Earth.

# OSTAAT™

“Wear-and-go” countermeasure for long-duration missions

**Target sites: hips + lumbar vertebrae**

Very low-intensity transcutaneous electrical current

In microgravity, bone loss accelerates, threatening EVA readiness, especially on **Mars-class missions**.  
OSTAAT™, a smart-garment countermeasure for astronauts and for remote and underserved populations on Earth.

# Why now: human risks in Mars-class missions



In microgravity, load-bearing bones are at high risk:

- **Bone loss is 10x faster in space**
- **ISS (6 mo): 1–1.5%/month (hip + spine)**
- **Mars transits: up to 2%/month (6-9+ mo)**

Impact: performance, fracture risk, post-mission recovery.

Impact: hip/lumbar deconditioning becomes mission-critical, raising fracture risk and slowing post-mission recovery.

The gap: crew time + logistics

**~1-2 hours/day**

of exercise countermeasures on long missions (order of magnitude)

→ The scarcest resource is crew time.

Mars-class missions: greater autonomy (Distance from Earth) → simple, portable, robust solutions.

Missions in space, require low-burden countermeasures that preserve crew time.

# OSTAAT™: targeted, non-intrusive countermeasure

## Direct targeting: hips + lumbar vertebrae

Signal: very low-intensity transcutaneous electrical current



No vibration

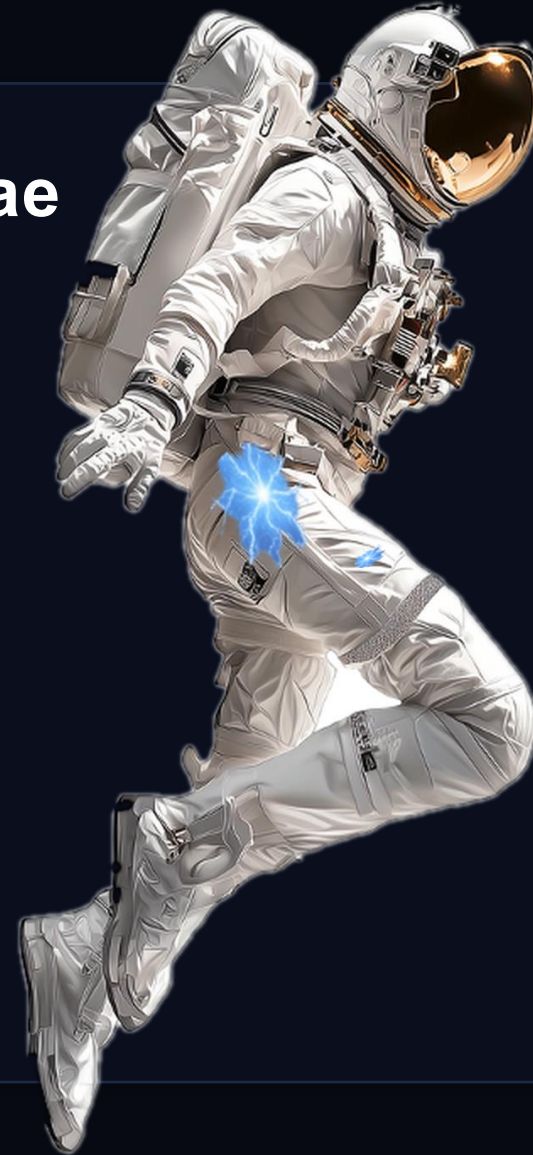


No muscle contraction



No nerve stimulation

→ Designed to be non-intrusive and compatible with daily use.



Ultra-low-intensity current to the hips + lumbar spine. No vibration, no muscle contraction, no nerve stimulation.

# Preliminary Clinical Validation

DXA Output & Primary Outcomes

PROOF-OF-CONCEPT

## STUDY DESIGN

**10 Weeks**

Intervention Duration

**48 Women**

Total Enrollment

**3 × 60 min**

Sessions per Week

## MEASUREMENT PROTOCOL

**3 Timepoints**

Week 0 – Week 5 – Week 10

## KEY CLINICAL OUTCOMES

*Stim vs N-Stim group*

**+2.01%**

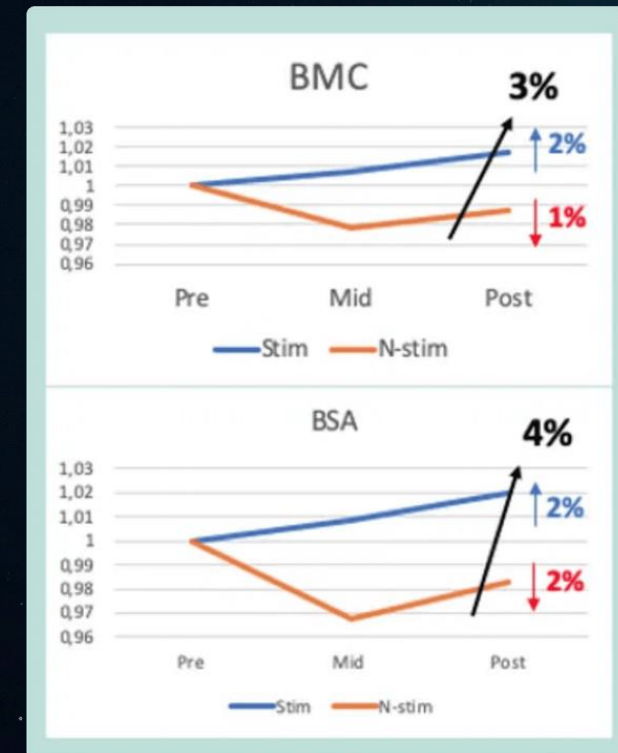
BSA increase

**+1.7%**

BMC Increase

*(P-Value = 0.013)*

## BMC ANALYSIS – DXA OUTPUT



# Operational integration (Human Factors)

## Goal: an “invisible” countermeasure that does not interrupt crew work

- Easy to put on/take off (low procedural burden)
- Worn under standard garments (base-layer, close to the body)
- Usable during intravehicular activities: science, operations, mobility
- Compatible with training (per validated HF protocol)

### **EVA: compatibility to be evaluated before extravehicular use**

Workstream: Human Factors + suit integration + electromagnetic compatibility (EMC) + thermal/mobility constraints

Electromagnetic compatibility (EMC): Flight-grade EMC plan aligned with ECSS and ISS payload requirements.

Space-grade, close-fit compression short for IVA use.

# Validation plan + collaboration request

**Goal: Mars-ready, Low-Burden,  
Scalable Countermeasure**

## Proof pathway / Ask

1) Powered osteoporosis clinical validation study  
(DXA hip/lumbar + biomarkers)

2) HF / Safety / EMC evaluation work

3) HDT bed rest + pathway to in-flight  
demonstration

Ask: CSA partnership to execute this 3-step validation pathway.

# OSTAAT™ in Space

## Advancing Bone Health Beyond Earth

### One Stim At A Time



OSTAAT

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