



# Aeromedical Evacuation & Stabilization System (ASES)

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## Introduction

Currently, there is no go-to solution for vibration mitigation during en route care that works across various casualty evacuation transports and litters. For patients with spinal cord injuries or traumatic brain injuries, there is a presumptive risk of compounding injury from the extended exposure to intense vibration near the natural harmonic frequency of the human body.

## Goals

The goal of the Aeromedical Stabilization and Evacuation System (ASES) Project is to develop a modular vibration mitigating system for the Standard Army 7309 (7309) Litter and the modernized 7309 (78") Litter.

The ASES will comprise removable handles and feet. It may be used across various litters, and will be compatible with most casualty evacuation platforms by easily adjusting positions to adapt to any transport, i.e. fixed-wing, rotary-wing, or ground.

The handles and feet will each be individually adjustable in order to account for the varying loads that each litter will see. Once properly adjusted, both the handles and feet will reduce the transmissibility (output amplitude/input amplitude) of the litter to a fraction of a litter without damping.



## Methods

Through visits to the U.S Army Aeromedical Research Laboratory (USAARL) and Wright-Patterson AFB, transport interface dimensions were recorded and modeled. This data was critical to determine design requirements for multiple platforms.

A custom vibrating machine was designed and built in-house to perform all required testing. The machine is capable of subjecting a fully loaded litter to frequencies of 1-20 Hz at accelerations of 0.1-0.9g's while simultaneously recording transmissibility from 3 different points.



Using the in-house vibration machine, baseline transmissibility plots for the 7309 Litter were generated for frequencies of 1-20 Hz with a load of 200 lbs. evenly distributed across the litter. The litter was tested in four different orientations: Pole-Mounted, Foot-Mounted and with and without a standard Army spine board. These results

Stock 7309 Stretcher Baseline Test					
Stretcher Mounting	Spine Board Configuration	Load (lbs.)	Frequency (Hz)	Acceleration (g's)	Transmissibility Maximum
Handle	No Spine Board	200	2 to 20	0.3	900%
Handle	Spine Board	200	2 to 20	0.3	700%
Feet	No Spine Board	200	2 to 20	0.3	650%
Feet	Spine Board	200	2 to 20	0.3	700%

## Prototype Testing

In fulfillment of a Phase 3 SBIR contract (Contract Number: W81XWH-15-C-0005), with U.S. Army Medical Research Acquisition Activity (USAMRAA), Techshot developed, integrated and delivered 3 modified 7309 litters equipped with prototype vibration attenuating feet and handle systems.



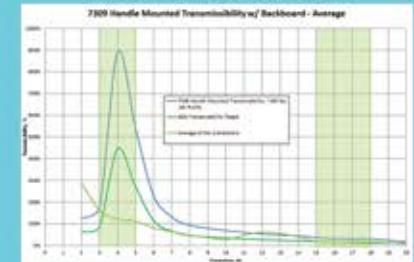
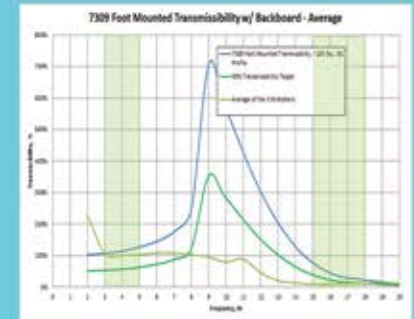
The stated goals of the Phase 3 project were to develop and deliver vibration attenuating feet and handle systems designed, for the standard 7309 stretcher, to reduce the transmissibility of the stretcher by 50%. More specifically the handle system was designed to meet this goal in the 3-5 Hz range and the foot system in the 15-18 Hz range.

Upon completion, all three prototype 7309 stretchers were tested on the custom vibrating machine at Techshot.



## Results

Results Test results when using the prototype ASES Handles were very encouraging. The worst-case transmissibility was less than 160% at the lowest measured frequency and rapidly decreased with higher frequencies. The prototype ASES Foot performed even better with a maximum transmissibility of 42% at the lowest measured frequency.



## Conclusions

Based on the results from the prototype testing, a 7309 Litter combined with the ASES system will produce a significantly improved solution for vibration isolated transport of a warfighter with a destabilization injury. Thus providing the best chance of recovery once the warfighter reaches a role 4 medical facility.