AIAA/CSF S-143-2016

Standard

Occupant-Imparted Loads for Commercial Suborbital RLVs

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Sponsored by

American Institute of Aeronautics and Astronautics

Commercial Spaceflight Federation

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Abstract

Specifies human engineering design practices and recommendations to assist the designer in determining expected intentional load conditions on commercial space vehicle controls and mobility elements.

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Contents

Foreword

This Standard was developed by the Commercial Spaceflight Federation to provide engineering design practices for human suborbital spaceflight. The standard establishes processes and recommendations for determining the expected load conditions on sub-orbital commercial space vehicle controls and mobility elements. It is the intent of this standard to provide an experienced designer with the information necessary to evaluate a particular system design as appropriate for their vehicle, the intended use, and target population in order to minimize safety and performance risks for sub-orbital spaceflight.

The requirements, design practices and anthropometric data in this standard is informed by established sources including the FAA, NASA, DoD, and academia. As the commercial space flight industry gains experience, this document will continue to be improved.

For questions about this standard, please contact the Commercial Spaceflight Federation at:

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At the time of approval, the members of the AIAA **Commercial Space Committee on Standards** were:

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Chair Jane Kinney	Commercial Spaceflight Federation
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Carl Ehrlich	Space Transportation Technical Committee
Jason Schmidt	a.i. solutions
Ho-Jun Lee	NASA

The above consensus body approved this document in October 2016.

The AIAA Standards Executive Council (Allen Arrington, Chairman) accepted the document for publication in October 2016.

1 Scope

This standard specifies human engineering design practices and recommendations to assist the designer in determining expected intentional load conditions on commercial space vehicle controls and mobility elements.

The requirements of this standard apply to designers of suborbital rockets licensed by the Secretary of Transportation or designee.

The provisions of this standard are not retroactive.

2 Purpose

This standard applies to all commercial human suborbital spaceflights governed by the Commercial Space Launch Amendments Act of 2004.

The design principles included in this document are written with the intent that an experienced engineer, trained in the specific technical area under consideration, should be able to interpret, tailor, apply, and evaluate a particular system design as appropriate for their vehicle, the intended use, and target population. This standard presents design practices and recommendations for determining expected intentional load conditions on commercial space vehicle controls and mobility elements. Unintentional loads should be considered in overall vehicle designs, however they are not addressed in this standard.

While this standard provides design principles with respect to human capabilities and limitations, it is not intended to limit innovation in design.

3 Tailoring

Not all of the requirements in this standard apply to every type of suborbital rocket. Platform-unique requirements may need to be added to fully address load conditions of unique configurations. Identify the set of requirements necessary and sufficient to determine expected load conditions.

Tailoring rules are as follows:

a) Identify each step in this standard, or each portion of each step, as either applicable or non-applicable, considering design and intended use.

b) Develop additional requirements, as appropriate, for any capabilities or systems not fully addressed by the requirements contained in this standard.

4 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

Element
hardware within the vehicle used to actuate, control, or provide input to a vehicle system or subsystem

Intentional Load
purposeful load imparted by an occupant, which can be in response to either a nominal or off- nominal event

5 Process Definition

The design for a given element is determined through the process detailed in sections 6 and 7. A designer is not expected to anticipate all possible interfaces between a potential occupant and an