A Prototype for NASA Educator Resource Collaboration: 
A Narrative Case Study Examining Development of EPDC’s 
*Balancing Act-Spacecraft Mass Properties* Digital Badge

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June 2019

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INTRODUCTION

Technology pervades much of today’s modern society and it has become nearly ubiquitous across the U.S. education system (Bowen, 2013; Collins, & Halverson, 2009). Whether it is “traditional” online courses, digital badges (i.e., micro-credentials), or Z-degrees utilizing open educational resources (OERs), rapidly evolving technologies are continuously changing the K-12, higher education and teacher professional development (PD) sectors (Gamrat, Zimmerman, Dudek, & Peck, 2014; U.S. Department of Education Office of Educational Technology, 2017; Wiley, Williams, DeMarte, & Hilton, 2016). Accordingly, online PD resources, as exemplified by NASA STEM EPDC’s digital badges, continue to increase in popularity (Dawley, Rice, & Hinck, 2010; Martinez Ortiz, Weis, & Merritt, 2018). Primary reasons given for this trend include: 1) it allows teachers to engage in unique learning opportunities not available in their geographic area, 2) teachers can access online resources at times that are convenient for them, and 3) educators can customize their PD to fit distinctive learning styles and current classroom needs (BCG, 2015; Gamrat et al., 2014).

LITERATURE – ENGINEERING EDUCATION

These instructional technology developments occur at a critical time for the future U.S. workforce. Members of the Baby Boom generation have reached retirement age, creating difficulties in finding enough qualified workers from this country to fill available and emerging technical positions (Boze, 2018; Rosenberg, 2018; Space Frontier Foundation, 2012). In anticipation of a potential crisis for engineering fields, the National Academy of Engineering (NAE) (2004) commissioned The Engineer of 2020, a comprehensive report of how future engineers should be prepared for differing
leadership roles in not just traditional technical careers, but also the industry, government, nonprofit and academia sectors. Panel members argued that the next generation of engineers had to learn not only technical content knowledge, but also 21st-century skills such as collaboration, writing, speaking, information literacy, and an appreciation for varied cultural and global contexts (NAE, 2004). In response, the Accreditation Board for Engineering and Technology (ABET), a global entity that accredits postsecondary engineering education programs, quickly aligned to the NAE’s recommendations, which triggered various responses in higher education as programs sought reaccreditation. ABET commissioned several National Science Foundation (NSF)-funded studies in order to examine some of the most effective strategies colleges and universities were using to meet ABET’s new accreditation guidelines (Lattuca, Terenzini, Knight, & Ro, 2014; Terenzini, Lattuca, Kremer, Plumb, & Trautvetter, 2008). More recently, leaders of professional organizations, such as the Society of Allied Weight Engineers (SAWE), are taking more proactive roles in identifying steps their members can take to support formal and informal education efforts that inspire students as early as middle school grades to consider future careers in their particular engineering discipline (Boze, 2018).

OVERVIEW – *Balancing Act-Spacecraft Mass Properties*

For over a century, employees of NASA’s Langley Research Center (LaRC) have made contributions in the fields of aeronautics, science, and technology that provide game-changing innovations across all of NASA’s missions and enhance U.S. STEM education with one-of-a-kind assets. LaRC’s Office of Education, now Office of STEM Engagement (OSTEM), team collaboratively works with subject matter experts (SMEs) across all mission directorates to identify openings for placement of interns (workforce development) and mission resources for inclusion in various
face-to-face and virtual events (educator professional development and student engagement). An ongoing partnership with the Flight Test Management Office (FTMO), tasked with mass properties [allied weight] engineering testing of flight test hardware for NASA’s Orion spacecraft and its Launch Abort System (LAS), and Public Affairs Office (PAO) yielded an opportunity in 2018 for OSTEM to develop a series of educational products in support of the Ascent Abort-2 (AA-2) flight test, scheduled for summer 2019. The purpose of this paper is to document the novel customer-service business model approach that yielded NASA STEM EPDC’s Balancing Act-Spacecraft Mass Properties digital badge, which blends EPDC’s expertise in digital badging and culturally relevant teaching (CRT), FTMO’s mass properties technical knowledge, and PAO’s outreach needs in advance of the AA-2 flight test.

METHODS – Digital Badge Development

This paper utilized a narrative research case study design in order to document the ‘life’ history of the Balancing Act-Spacecraft Mass Properties digital badge from concept to development to publication (Creswell, 2013; Stake, 2000). Highly contextualized, narrative research collects data from a variety of qualitative sources in order to construct collaborative, chronological stories about a specific individual, location or situation (Creswell, 2013). Furthermore, case study methodologies afford investigators the opportunity to conduct exploratory and descriptive research about single (or multiple) object(s) within a real-life scenario bounded by space and time (Creswell, 2013; Stake, 2000). The overarching objective, therefore, of any case study research is to advance understanding of the general phenomenon under examination and extend the boundaries of that particular research field (Yin, 2014).

The researcher utilized two data collection methods during badge development: visual observation and document analysis. An unobtrusive observation occurred informally
during a late January 2018 meeting for selected OSTEM, FTMO and PAO members, who briefed each other on Orion Ascent Abort-2 flight test mission objectives, mass properties technical knowledge, and possible solutions for effectively disseminating the project’s content and message to students, teachers and the public. For document analysis, the researcher reviewed email messages, previously produced photographs and videos, FTMO technical documents, and EPDC badge development materials from mid-spring to summer 2018 (Altheide, & Schneider, 2017; Bowen, 2009). In doing so, the author constructed a timeline of salient events, or “turning points” (Creswell, 2013, p. 72) in the evolution of a high-quality STEM education resource, NASA STEM EPDC’s Balancing Act-Spacecraft Mass Properties digital badge, using a highly collaborative creative process. Finally, to verify the badge’s accuracy, the writer conducted member checks with representatives of the OSTEM, FTMO and PAO teams (Creswell, 2013).

**CONTEXT – Pre-Badge History**

“For the first time in a generation, NASA is building a human spacecraft for deep-space missions, …including to the vicinity of the Moon and Mars. Named after one of the largest constellations in the night sky and drawing from more than 50 years of spaceflight research and development, …Orion will serve as the exploration vehicle that will carry the crew to space, provide emergency abort capability (emphasis added), sustain astronauts during their missions and provide safe re-entry from deep space return velocities” (NASA, 2017).

In 2010, NASA conducted the Pad Abort-1 (PA-1) flight test, which was an initial assessment of Orion’s fully integrated Launch Abort System (LAS), with a crew capsule, for the Agency’s Space Launch System (SLS). NASA EDGE, a Langley Research Center (LaRC)-based video podcast (vodcast) team, took viewers on a behind-the-scenes look at
Orion’s LAS project before documenting the entire PA-1 event in New Mexico (NASA EDGE, 2010a-c). With NASA EDGE serving as a public outreach and education initiative, its staff frequently contribute to other LaRC Office of STEM Engagement (OSTEM) events (e.g., educator professional development institutes) as their schedules permit. Most notably though, NASA EDGE also serves as a potential resource to connect the OSTEM team with subject matter experts (SMEs) in support of educator and student engagement activities.

As the NASA EDGE team documented PA-1 in 2010, they prominently featured mass properties engineers from LaRC’s Flight Test Management Office (FTMO); these individuals had also appeared in several NASA Launchpad (eClips) featurettes (NASA EDGE, 2010a-c; NASA eClips/Launchpad, 2009a-b). Through these productions, LaRC’s FTMO mass properties engineers became familiar with individuals in the then-Office of Education (OED), now OSTEM. Independent of these developments, senior leadership of the Society of Allied Weight Engineers (SAWE), the professional organization for mass properties engineering, commissioned a podcast series for release at their 2008 International Conference. Intended as a recruiting tool to inspire the next generation of mass properties engineers, the podcasts featured careers of selected SAWE members, including a NASA LaRC FTMO engineer working on Orion’s LAS (SAWE, 2008).

CATALYST – Langley Research Center’s Centennial

NASA had originally planned a series of tests for the Orion LAS after PA-1, but before its final integration with the SLS for the Exploration Mission-1 (EM-1) flight. However, given budgetary constraints, the Agency opted to combine them into a single follow-up verification event: Ascent Abort-2 (AA-2) (Cutright, 2018). A key step in ensuring that Orion and its LAS was ready for its tentative summer 2019 AA-2 flight was mass properties measurements of a full-size Orion.
command module boilerplate. While this particular test article will not fly in space, it replicated the anticipated flight mass configuration for the one that will. By placing ballast blocks in known locations of instrumentation and crew, Langley FTMO engineers were able to take measurements for precisely calculating the capsule’s center of gravity (CG) down to an area no larger than a 6-sided dice on the 11-foot x 16-foot, 22,899-pound structure. As it turned out, the FTMO mass properties engineers were making final preparations for these measurements as the Center held an Open House, the culminating event of Langley’s Centennial Year celebration, “A Storied Legacy, A Soaring Future.”

Given a rare opportunity to visit the normally restricted-access research facility, over 20,000 people from across the country came to tour LaRC’s historic facilities and learn about the work that “…continues to equip the nation with technology for the future…” (Vitug, 2017). Exhibits showcasing Langley’s contributions to Orion and SLS were among the day’s highlights, serving as tangible reminders of NASA’s commitment to human exploration of space beyond low-Earth orbit (McDonald, 2017). Prior to the Open House, the FTMO team had deliberated over how best to engage a non-technical audience with the mass properties research they were about to conduct in support of the Orion LAS Ascent Abort-2 flight test. The engineers brainstormed ideas and they eventually selected two activities: a pipe cleaner/craft stick modeling activity for Orion’s LAS (using paper clips as “ballast blocks”), and a mechanical forearm lever exercise (using a PVC-pipe T-assembly with S-hooks for a two-pound weight). Both were well-received, impressing upon Open House visitors of all ages the importance of calculating Orion’s center of gravity so that the SLS does not experience torque (i.e., rotation) during launch.

COLLABORATION – Balancing OSTEM, FTMO & PAO

Observing the success of these simple instructional activities at Langley’s Centennial Open House led the FTMO
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February 2018. In early March, the lead engineer forwarded the slide deck she had used for January’s joint meeting without any modifications, although she had planned on:

“…adding pictures from the actual [mass properties] testing and further connecting the dots between the importance of mass properties and ‘Stability and control’ which is a function of mass properties, geometry, and aerodynamics [which is also a function of mass and geometry]…” (Cutright, personal communication, March 8, 2018).

With the focus on technical content, the Education Specialist Lead still envisioned a “training” when the OSTEM team met for its regularly scheduled tag-up a week later. However, based on Specialists’ schedules, the Lead formally assigned the project to Langley’s EPDC Specialist who was, at the time, focusing more time on a variety of badge development projects (e.g., “soft skills” badges for NASA Internships & Fellowships [NIFS], Virginia undergraduate engineering programs, etc.). In the email detailing parameters of the commission, the Lead instructed that:

“The idea is to create a training similar to the digital badges, that can be used on the [Texas State] website but also as a Satern training. … Objective: To create a training module on the AA-2 (Ascent Abort-2) that provides necessary background knowledge to give educators and partners the understanding needed to confidently present the activity and relate it to the real world challenges NASA’s AA-2 mission is addressing” (Brush, personal communication, March 15, 2018).

With a preferred deadline of April 30th, the Langley EPDC Specialist replied approximately two weeks later with a rough outline for a digital badge. Langley’s EPDC Specialist was intentional in the decision to select this format for the new “training,” as opposed to the previous frontrunner SATERN module, because EPDC’s digital badge committee had concurrently received a charge to develop and release five [5] new badges per month (Culivan and Weis, personal communication, March 22, 2018). In addition, the EPDC
Specialist had much more experience in constructing online digital badges, first with NASA’s Teacher Learning Journeys (TLJ) and then the NASA STEM EPDC badging site, than with SATERN training module environment. Thus, with approval of both Langley and EPDC teams, the EPDC Specialist submitted the following notes to the Education Specialist Lead for an AA-2 educator badge with five [5] modules:

“Description: From the earliest days of manned spaceflight, NASA has incorporated various safety systems into its launch vehicles, including an escape system that could pull a crew capsule to safety during the earliest moments of a rocket launch. Although critical to the success of any mission, a launch abort system adds mass and alters the physical properties of a launch vehicle. Thus, NASA engineers carefully model and measure the mass properties of an abort system before its integration with the launch vehicle.

Objectives: 1) Learn about the Orion crew capsule, its Launch Abort System (LAS), & mass properties associated with rocket design
2) Discover the history behind launch abort systems & their importance to crew safety
3) Design a replica (or rocket prototype), measure/observe mass properties, & make improvements as necessary; and
4) Demonstrate how these activities can be implemented in the classroom”

(Weiss, personal communication, March 27, 2018).

With minimal revisions and approval to move forward, Langley’s EPDC Specialist crafted the first draft of the Orion Ascent Abort-2 educator professional development digital badge, tentatively titled, 'Finding Balance: Rocket Mass Properties.’ As part of the development process, it was necessary to reach back out to the FTMO mass properties engineer and Langley’s Orion Public Affairs Specialist for access to pictures that would illustrate various concepts in the badge. Although the EPDC Specialist had received the
original slide deck provided by FTMO, she had to request the external website link where presentation pictures were located due to a unique uploading quirk of the EPDC digital badging platform. Given an uncertainty over what updates the FTMO mass properties engineer and Langley’s Orion Public Affairs Specialist had received, the EPDC Specialist respectfully included a short progress report on development of the “training materials” with her request. To build consensus for the project’s changed format, the EPDC Specialist also extended an invitation to participate in the review process:

“…requested that I create training materials related to the AA-2 test. The first product will be a potential digital badge that K-12 STEM educators can complete for professional development (PD) credit. …introduces educators to mass properties, Orion’s LAS and the AA-2 test, and educational activities… Once I have a draft ready, it will go through a review process, which includes feedback from you… If it meets your and EPDC’s approval, the digital badge will also be eligible for a blog post and several PD webinars (broadcast from Langley) to advertise its availability to K-12 teachers nationwide” (Weiss, personal communication, April 24, 2018).

The response was overwhelmingly positive as both Langley’s Orion Public Affairs Specialist, “can’t wait to help promote this!,” and the FTMO’s mass properties engineer, “I look forward to seeing what you have created!” replied with enthusiastic support (Damadeo and Cutright, personal communication, April 24, 2018). Most importantly, FTMO granted access to their team’s shared drive to both the Education Specialist Lead and EPDC Specialist. No longer was the prospective digital badge restricted to pictures from the slide deck; now there was a full-range of material to draw from for both ensuring accuracy of the badge’s content as well as making it more visually appealing. With selected photos and instructional activity diagrams exported to an external website for successful incorporation into the badging platform, the first iteration of the Orion Ascent Abort-2 digital badge was released to both the EPDC badging committee and Langley collaborators for their feedback.

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The badge ultimately went through three rounds of peer review before its publication in early July 2018. While the Orion Ascent Abort-2 badge received the same stringent appraisal from EPDC Specialists as every other digital badge does, this particular effort benefitted immeasurably from the novel step of soliciting evaluations directly from a NASA technical expert and a public affairs specialist. To the best of anyone’s knowledge, this was the first time a NASA digital badge had both outside perspectives blended with EPDC’s distinctive instructional and culturally relevant teaching (CRT) expertise. Although there were many instances where this unique collaboration influenced the final product, three representative examples are presented here as illustrations.

As the first round of peer review commenced, it soon became clear that the FTMO mass properties engineer and Langley’s Orion Public Affairs Specialist may not have been entirely certain of what to expect when they first sought OSTEM’s assistance in disseminating their Centennial instructional products to teachers and students. After viewing screen shots of how the badge would look to educators in the EPDC badging system, the Orion Public Affairs Specialist replied, “I think this looks great!” before suggesting that ALL of the instructional graphics they had provided be updated, “…so they look more uniform and maybe a little ‘snazzier’ for lack of a better word?” (Damadeo, personal communication, April 27, 2018). FTMO’s mass properties engineer concurred, explaining that the originals had been, “created…by a bunch of engineers…a few days before Centennial” (Cutright, personal communication, April 27, 2018). Although the EPDC badging committee’s original plan had been to publish this as one of its five badges for May, Langley’s EPDC Specialist recognized the value in adjusting that timeline to meet the “customers’” request so that they would be truly happy with the finished product – “the Orion and SLS comm [communications] teams will definitely want to promote this!” (Damadeo, personal communication, April 27, 2018). Thus, the EPDC Specialist alerted the badging committee leads of the graphics delay, who were supportive of it (Weiss and Buckner, personal communication, May 1, 2018).
With the badge’s primary focus on technical engineering content (i.e., mass properties), Langley’s EPDC Specialist sought to also incorporate instructional activities for educators who wished to present the complex mathematics involved in a format that could be easily grasped by their younger students. This would broaden the badge’s potential audience, especially to elementary-grade teachers who may not necessarily be as familiar with trigonometric calculations. Based on informal feedback from EPDC’s technical manager, the EPDC Specialist created an alternate version of the mechanical forearm lever activity (Blystone, personal communication, May 23, 2018). This alternative instead asked students to qualitatively (rather than quantitatively) describe what they had observed with the T-assembly as the two-pound weight was moved further away from their hands.

Additionally, drawing upon some of EPDC’s best practices for culturally relevant teaching (CRT), Langley’s EPDC Specialist designed a brand new interdisciplinary activity that would give educators an opportunity to integrate social studies, art and STEM subjects (Garcia, Ortiz, Smith and Torres, personal communication, November 6, 2017). For the activity, a badge earner selects a real or mythical object, which may have cultural significance, that does have mass properties (e.g., mass, weight, volume and center of gravity). They then create an artistic representation of it and qualitatively describe the object’s mass properties in a 150-200 word summary. The EPDC Specialist selected a picture depicting the Hindu and Native American beliefs that Mother Earth piggybacks through the Universe on elephants and/or a giant cosmic turtle, similar to the Space Shuttle orbiters piggybacking on a modified Boeing 747 plane. During the peer review process, EPDC’s Field Coordinator recommended an authenticity check in order to ensure that “the examples are accurate and capture these alternate beliefs respectfully” (Duclos, personal communication, May 9, 2018). Accordingly, Langley’s EPDC Specialist invited a Texas State University-based EPDC Specialist to guest review the badge, paying particular attention to the interdisciplinary, cultural activity. He replied:

“The description and info. looks good. My only recommendation would be to indicate that the myth of...
Mother Earth riding on the back of a turtle is a creation story believed by certain Native American tribes, namely the Iroquois” (Garcia, personal communication, May 23, 2018).

The unique CRT application and activity captured the attention of the FTMO mass properties engineer, who remarked:

“Option #3 and the elephant/turtle/earth picture? Seriously, where did this come from, can I use the graphic? I learned something new and makes me want to know more! Great spin on mass properties too… I may challenge some senior SAWE leaders to answer the CG [center of gravity] question on that one!” (Cutright, personal communication, April 27, 2018).

Lastly, as the digital badge’s review process progressed, the Langley FTMO mass properties engineer increasingly advocated for items that would not only benefit the Orion Ascent Abort-2 test, but which would also be of keen interest to the Society of Allied Weight Engineers [SAWE], the international professional organization for mass properties engineering. Langley’s EPDC Specialist tentatively proposed naming the new badge ‘Finding Balance: Rocket Mass Properties,’ which fit the badging system’s character limit. When she first saw it, the FTMO mass properties engineer remarked:

“Love the title (I know I’m biased), but I promise the…(SAWE) is going to be very impressed the words ‘mass properties’ made it into some STEM curriculum” (Cutright, personal communication, April 27, 2018).

However, Langley’s Orion Public Affairs Specialist caught the ‘rocket’ misnomer, noting that, “Orion isn’t a rocket/launch vehicle” (Damadeo, personal communication, May 25, 2018). The FTMO mass properties engineer agreed, confirming that the badge title should be changed to more accurately reflect what Orion is (i.e., a spacecraft). With the badging system’s character limitation, this presented a minor challenge in that the words “mass properties” had to survive,
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can take one last look before it goes live. ...Hopefully, we’ve made SAWE’s day/year/decade (century? 😊) by incorporating BOTH “mass properties” in the badge’s title and links to ALL…suggested SAWE resources [I needed to beef up the badge’s workforce connections…and those SAWE websites fit the bill perfectly]. …Unless I hear otherwise, I will publish tomorrow morning and provide…links for the Orion comms plan. Here we go! 😊” (Weiss, personal communication, July 5, 2018).


FUTURE DIRECTIONS

Although the Orion and SLS comms teams requested that full-scale marketing of the Balancing Act-Spacecraft Mass Properties digital badge commence in late spring 2019 (closer to the time of the Ascent Abort-2 test itself in the summer), its development and publication has led to several smaller publicity efforts. Immediately after its release, the badge, along with a standalone video interview with the FTMO mass properties engineer, became part of a larger flipped classroom unit that was introduced to a group of high school mathematics teachers attending a two-week professional development institute at the Langley Research Center (Smith, personal communication, July 18, 2018). Beyond that, the pipe cleaner/craft stick modeling activity for Orion’s Launch Abort System has indeed taken its place in OSTEM’s rotation of instructional kits for face-to-face events (e.g., Langley Youth Day, Naval Air Station Oceana Air Show, etc.), as originally envisioned by the Education Specialist Lead (Brush, personal communication, January 25, 2018). Presenters even demonstrated the activity at the 2019 Space Exploration Educators Conference (SEEC) in Houston, TX (Smith, personal communication, February 11, 2019). In the months to come, Langley’s EPDC Specialist plans to broadcast several webinars to advertise the badge’s
availability to K-12 teachers nationwide in support of the public relations strategy devised by the Orion Communications team for AA-2.

The unique collaboration between Langley education specialists and researchers that produced *Balancing Act-Spacecraft Mass Properties* attracted the attention of both OSTEM and Langley Research Center leadership. This partnership demonstrated what could be possible when two constituencies, which have not traditionally collaborated much if at all, worked together to produce educational products. The development process served as an early and indirect template for the STEM Education Accountability Project (SEAP) Pilot Opportunity for Centers; what would later become the Next Gen STEM Pilot Project, which includes themes for aeronautics (Small Steps, Giant Leaps), deep-space human exploration (From Moon to Mars), and NASA’s Commercial Crew Program (CCP) (Cherry, personal communication, May 23, 2018). The collaboration’s early success even landed it in the Center’s annual report (NASA Langley Research Center, 2018). Depending on how the Next Gen STEM Pilot Project unfolds over the coming months, the novel customer-service business model approach between education specialists and subject matter experts that produced NASA STEM EPDC’s *Balancing Act-Spacecraft Mass Properties* digital badge may become a foundation for OSTEM’s work in the future.

Successful production of two OSTEM educational products related to Ascent Abort-2 (i.e., the standalone video interview for flipped classrooms and the educator professional development badge), which incorporated Society of Allied Weight Engineers (SAWE) resources, led to an unexpected invitation from the professional organization. Based on a recommendation from the FTMO mass properties engineer, the SAWE Technical Papers Lead reached out to Langley’s EPDC and Education Specialists to inquire whether they might be able to present at SAWE’s Hampton Roads Chapter Coastal Virginia Conference later in the fall (Cerro, personal communication, August 16, 2018). Designed for a highly technical audience, the regional conference affords SAWE members the opportunity to network with each other.
as well as to hear presentations on mass properties research from academic, government and industrial projects. In the context of the forthcoming AA-2 test and SAWE leadership’s continuing efforts to leverage educational outreach and student recruitment in support of their mission, the Society’s President, Vice President-Technical Director, and Vice President-Academic Affairs were all “very interested in the NASA mass properties badge presentation that you are presenting at the regional conference…” (Gerren, personal communication, August 16, 2018). Langley’s EPDC and Education Specialists ultimately discussed the changing education landscape and 21st-century undergraduate engineering education before presenting their created educational products, complete with a hands-on demonstration of the pipe cleaner/craft stick modeling activity of the Orion Launch Abort System (Weiss & Smith, 2018). The concurrent session was so well-received that SAWE leadership inquired whether the Specialists would be able to repeat it:

“Several folks had told me how great it was to have your and Anne’s presentation at the Regional [Conference], and of course the follow up question is, would you like to do it again in May [2019] at the International Meeting. …If you want to go so far as to provide a paper on the topic, that would be great. (Cerro, personal communication, December 12, 2018).

Langley’s EPDC and Education Specialists promptly accepted the offer with submission of an abstract; a technical paper is forthcoming and the presentation will be made at the 78th SAWE International Conference on Mass Properties Engineering in Norfolk, Virginia.
For more information about NASA STEM EPDC, please visit txstate-epdc.net.

This work was supported by NASA STEM EPDC Collaborative agreement NNX14AQ30A

For additional information, contact: Dr. Araceli Martinez Ortiz, Executive Director of the LBJ Institute for STEM Education & Research at araceli@txstate.edu
References


Boze, W. (2018). Everything you wanted to know about mass properties engineering but were afraid to ask. Paper presented at the Society of Allied Weight Engineers [SAWE] Hampton Roads Fall Regional Conference, Norfolk, VA.


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NASA EDGE. (2010c). Orion launch abort system (part 3 of 3). Retrieved from https://www.youtube.com/watch?v=kln-INpXx2I&t=0s&list=PLBD9ED1A7703328C2&index=3.


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