

## 2025-2026

# PROPOSAL GUIDELINES

NASA Spacesuit User Interface Technologies for Students





#### **Team Name**

**Optional Team Logo** 

#### **Academic Institution Name**

Address

#### **Team Contact**

Student Name Email Address Phone Number

#### **Team Members**

(Please list ALL team members) Team

Member Name --- Role

Email Address --- Academic Year / Academic Major Team

Member Name --- Role

Email Address --- Academic Year / Academic Major Team

Member Name --- Role

Email Address --- Academic Year / Academic Major Team

Member Name --- Role

Email Address --- Academic Year / Academic Major Team

Member Name --- Role

#### **Faculty Advisor**

Email Address --- Academic Year / Academic Major

Name Email Address Phone Number

<b>Faculty Advisor</b>	Signature
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(Note: **The Technical Section is limited to 12 pages**. Include enough images within those 10 pages to describe your software. If you want to submit additional images, use an Appendix. Other sections and appendices will **not** count against your 12-page limit.)

#### 1. Introduction

The Extravehicular Activity and Human Surface Mobility Program (EHP) and the Office of STEM Engagement at NASA's Johnson Space Center in Houston are excited to host our ninth year of the NASA SUITS (Spacesuit User Interface Technologies for Students) Challenge. We will conduct in-person device testing onsite at Johnson in May 2026.

This document serves as a resource and reference guide to provide potential NASA SUITS participants with the requirements needed to submit a successful proposal. Included are important steps to the challenge and required components of an official proposal. Please also review the Misson Description for NASA SUITS at our website https://go.nasa.gov/nasasuits.

#### 2. Eligibility

Each prospective onsite team member must be enrolled as an undergraduate or graduate student at an accredited U.S. institution of higher learning (community college, military academy, technical college, or university). Note, enrollment verification may be requested and must be certified for participation at any time during the activity period.

- Team members must be at least 18 before arriving in Houston.
- Each team will be allowed **eight** badged participants to participate in the onsite culminating event. These eight individuals MUST be U.S. Citizens or Legal Permanent Residents. While there is no limit on the number of participants for each team, institutions are encouraged to submit multiple different proposals if they have many interested students. *Note: In previous years NASA has provided opportunities for non-badged participation in Houston. Currently there is no plan to offer an offsite option for non-badged participants in 2026.*
- Each team must be accompanied onsite by their faculty advisor or an adult, age 21 or older, serving as the faculty advisor.
- All participants MUST attend the Orientation at 4 p.m. CST on December 11, 2025, and the Virtual Software Design Review on April 2, 2026.
- Team members may only participate with one team in the same competition.
- Student experiments must be organized, designed, and operated by student team members alone.
- All participants must be enrolled for the activity in STEM Gateway and have accepted the offer by the deadline provided by the NASA SUITS team.
- Interns involved in the design of a SUITS challenge may not participate as a member of a team in that same cycle of the SUITS challenge. However, they may serve as a team advisor.

#### 3. Letter of Intent

Please submit a letter of intent by Thursday, October 2, 2025, indicating the team's intention to submit a written proposal. You should follow the format below and write your letter in the body of an email. Send the email directly to <a href="mailto:nasa.gov">nasa-suits@mail.nasa.gov</a>. Teams may still submit a proposal even if they do not submit a letter of intent.

• Subject line: "NASA SUITS Challenge Letter of Intent."

- Sample Text: We are Team <name> from <Institution Name>. We intend to submit a proposal for the 2026 NASA SUITS Challenge.
- Provide team contact information this should be a student team member.
  - a. Sample: John Doe (DoeJ@institution.edu) Sophomore / Software Engineer.
- Be sure to provide the academic institution(s) your team represents. Your team should designate a lead institution if team members come from multiple institutions.

#### 4. Proposal Requirements

- Each team must submit one electronic copy of an original proposal for the <u>NASA SUITS</u> engagement opening via NASA STEM Gateway by Thursday, October 30, 2025.
- Your proposal must contain the following three sections: Technical, Outreach, and Administrative.
- You shall not skip/omit sections or components under any circumstance.
- The Technical section shall not exceed 12 pages.
- The report body must use 12-point font.
- All information on the title page must be complete.
- You must label and reference figures and tables within the text.

#### 5. Technical Section

The technical section must cover the design the team is proposing. This section must include any information that a Technical Reviewer will find informative or instructive in understanding the goals of the design. Evaluators ranking the proposal for its scientific and technical merit will read only this section, so teams should address all relevant factors as listed below. The Proposal Rubric is provided at the end of this document.

#### a. Abstract

The abstract is a brief (up to 500 words) summary that touches upon the elements of the proposed prototype design and how they relate to the requirements and EVA scenario in the Mission Description. Include any planned testing of the design and any proposed hardware or peripheral devices your team would bring to onsite testing.

#### b. Software and Hardware Design Description

Include a detailed description of the proposed software and how you plan to tackle each aspect of the design challenge, keeping in mind the context of the EVA scenario as stated in the Mission Description. Write in such a way that a practicing engineer or scientist can understand the design of the user interface (UI) and how you will implement a voice assistant. Present goals along with a description of the expected key components of the product (e.g., system architecture plan, hardware concepts, network diagrams). Clearly lay out how you will integrate AI (artificial intelligence) into your work and into the user experience. Show conceptual UI design ideas (portrayed via wire frames, visuals, etc.) for navigation, telemetry, rover controls, geology, EVA task instructions, etc. Also, show any peripheral

device mock-ups (e.g., external control methods, lighting methods) to help the Technical Reviewers understand the full scope of the proposed product. Be sure to highlight any unique solutions to the listed requirements your team is considering.

#### c. Concept of Operations (CONOPS)

Describe the overall high-level concept of how your design will meet the expectations and requirements. Describe the system from an operational perspective (i.e., the viewpoint of the astronaut) to help facilitate an understanding of the system goals. Address how the application will assist the design evaluator (or astronaut) in each aspect of the EVA scenario during testing. A flowchart of how your design operates throughout the mission may be a useful visual depiction. See the Mission Description document for more details on this section.

#### d. Artificial Intelligence

Provide an in-depth view of how you plan to implement AI as a force multiplier for the crew members. The goals are to increase efficiency and/or reduce cognitive load. This includes which AI models you plan to use and how you plan to control for hallucinations in mission-critical areas. This should be its own section.

#### e. Human-in-the-loop (HITL) testing

Discuss any pilot, user experience, human-in-the-loop, or human factors studies planned. A written HITL test plan should include a testing schedule (including proposed dates and times of planned testing), test protocol, possible metrics/measures, feasible subject pools, expected population/demographics of test subjects, and all planned safety measures to be used while conducting HITL tests. Include how the HITL test will inform your team's development plan as they prepare for the analog EVA scenario (e.g., planning for night/low-lighting testing, outdoor testing, and network/telemetry connection testing). A good HITL test plan will build towards a full test of the EVA scenario stated in the Mission Description before test week to identify any challenges ahead of the final test onsite. You do not need to repeat this section for both assets.

#### f. Project Management

Provide an outline of the team's development plans, along with any internal key milestones. Use a Gantt chart or similar chart. If following an Agile software development plan, outline your scrum schedule with a proposed feature development and testing plan. Describe how progress will be tracked to ensure that you meet the requirements of the EVA scenario in the Mission Description ahead of Test Week. Teams are strongly encouraged to plan time throughout their development period to test their devices in conditions close to that of the described EVA scenario before traveling to Johnson for Test Week. Expect the NASA team to hold you accountable to provided milestones.

#### g. Technical References

Cite referenced works in text and in a "References" section using formatting appropriate for a technical paper.

#### 6. Community and Industry Engagement Section

As part of participating in NASA SUITS, teams are expected to engage in their local communities. This can be a mixture of Community and Industry Engagement so long as at least one of each type of engagement is planned with the expectation of four or more total events.

#### a. Community Engagement

Information contained in this section should focus on the outreach activities the team intends to implement as well as the target audience.

A plan is an organized way to achieve a specific objective. Random activities, even good random activities, do not constitute a plan. An engagement plan should have two major components:

- The **plan** a description of the team's objectives and goals, what activities are planned for the upcoming year, where and when the activities will take place, what audience you are targeting, etc.
- The activities what will the team do when they get there? What materials will they refer to? What are the main points that they will make?

For maximum point value, the plan should include the following as appropriate:

- Describe how your team will engage with local civic and community leaders.
- A description of the outreach audience (K-12 class or school groups, undergraduate research symposiums, university outreach to local schools, informal groups such as Boy/Girl Scouts, afterschool clubs, church groups, etc.).
- Letters or agreements from institutions that accept your invitation to address their group.
- The team's objectives for each activity.
- Specific plans for activities (strengthened by alignment to state or national standards to help a
  K-12 teacher, or use of age/grade-appropriate language to engage students during the activity)
  Leading an "Hour of Code" in a classroom is the optimal outreach activity.
- A press and/or social media plan.
- A connection between curriculum/activity and NASA SUITS, a NASA Mission, or the team's code.

#### b. Industry Engagement

Create a list of potential industry partners who align with project goals. Consider technical expertise, mentorship, skills development, certifications, or resources sought to advance project goals. Your plan should assess the team's professional development strategy (choose at least one from this category):

- Summarize mentorship arrangements your team plans to target with industry experts/partners.
- Identify skills development and certification opportunities your team members plan to seek with industry partners (e.g., software, electrical).
- Explain how your team's industry connections would support team members' career goals.
- Identify potential internship, fellowship, apprenticeship, or career opportunities your team members plan to seek.
- Summarize the method your team will use to raise awareness about your NASA challenge participation.

#### 7. Administrative Section

#### a. Institutional Letter of Endorsement

This letter must be on the endorsing institution's letterhead and must come from the institution's president, dean of college, or department chair. It indicates the team's institution(s) has knowledge of the team's interest in participating in this activity and endorses the team's involvement. Failing to include a letter of endorsement from their institution(s) will result in a rejected proposal.

#### b. Statement of Supervising Faculty

A statement of support from a faculty member indicating a willingness to supervise and work with the team during all stages of the activity. There will be no consideration for teams working without a faculty advisor. The faculty advisor must also sign off on the cover of the proposal as evidence that he/she has seen the proposal and approves of the submission. The following statement should appear on an institution letterhead and include the signature of the faculty advisor:

As the faculty advisor for an experiment entitled "\_\_\_\_\_\_\_" proposed by a team of higher education students from \_\_\_\_\_\_ institution, I concur with the concepts and methods by which the students plan to conduct this project. I will ensure the student team members complete all project requirements and meet deadlines in a timely manner. I understand any default by this team concerning any project requirements (including submission of final report materials) could adversely affect selection opportunities of future teams from their institution.

If your team is comprised of students from more than one institution, submit the above from the lead institution. Additionally, supply a letter of support from a faculty member of each participating institution acknowledging that they are aware of the participation of their student(s).

#### c. Statement of Rights of Use

These statements grant NASA, acting on behalf of the U.S. Government, rights to use the team's technical data, including computer software and design concept, in part or in entirety, for government purposes. NASA, acting on behalf of the U.S. Government, may designate for certain tasks under this engagement, including software and software documentation for certain designated tasks, to be released as "Open Source" software. This term is defined by the Open Source Definition promulgated by the Open Source Initiative on its website (see <a href="https://opensource.org/osd">https://opensource.org/osd</a>). These statements are not required. However, teams with a Statement of Rights of Use will receive greater consideration in the proposal selection. If you choose to include these statements, all team members and faculty advisors must sign. The statements read as follows:

As a team member for a proposal entitled " \_\_\_\_\_\_\_" proposed by a team of higher education students from \_\_\_\_\_\_ institution, I will and hereby do grant the U.S. Government a royalty-free, nonexclusive and irrevocable license to use, reproduce, distribute (including distribution by transmission) to the public, perform publicly, prepare derivative works, and display publicly, any technical data contained in this proposal in whole or in part and in any

manner for federal purposes and to have or permit others to do so for federal purposes only. Further, with respect to all computer software designated by NASA to be released as open source which is first produced or delivered under this proposal and subsequent collaboration, if selected, shall be delivered with unlimited and unrestricted rights so as to permit further distribution as open source. For purposes of defining the rights in such computer software, "computer software" shall include source codes, object codes, executables, ancillary files, and any and all documentation related to any computer program or similar set of instructions delivered in association with this collaboration. As a team member for a proposal entitled "\_\_\_\_\_\_\_" proposed by a team of higher education students from \_\_\_\_\_\_\_ institution(s), I will and hereby do grant the U.S. Government a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States Government any invention described or made part of this proposal throughout the world.

#### d. Funding and Budget Statement

This section should include a simple columnar layout showing expected expenditures associated with the proposed design, such as materials, machining, operating, testing, shipping, etc. See Table 1 on the right for an example. It is imperative teams anticipate all costs involved and actively work to seek funding. List potential sources for funding, which can include institutional grants, state Space Grant funds, corporate sponsors, etc. Participants are responsible for **all** costs associated with their

Table 1: SUITS Example Budget					
<u>Items</u>	<u>Costs</u>				
Flights	\$4,500				
Hotel	\$2,000				
Ground transportation	\$400				
Operating	\$600				
Software	\$500				
Miscellaneous	\$500				
Total	\$8,500				

participation in the SUITS challenge, including but not limited to development, travel, lodging, and food. NASA SUITS will notify participants if any funding or student allowances become available.

#### e. Hololens2 Loan Program

NASA SUITS has a limited number of Hololens2 devices we can loan to institutions. The loans will be subject to a loan agreement, which must be signed by your faculty/institution. Please indicate your interest in a loaned device by choosing one of the following:

- A) We do not require a loaned device because we either already have one, or plan to acquire one.
- B) We need a loaned device from NASA SUITS to participate.
- C) We have a device but would still like to be considered for a loan to aid in our development.

#### f. Proposal Scoring Method

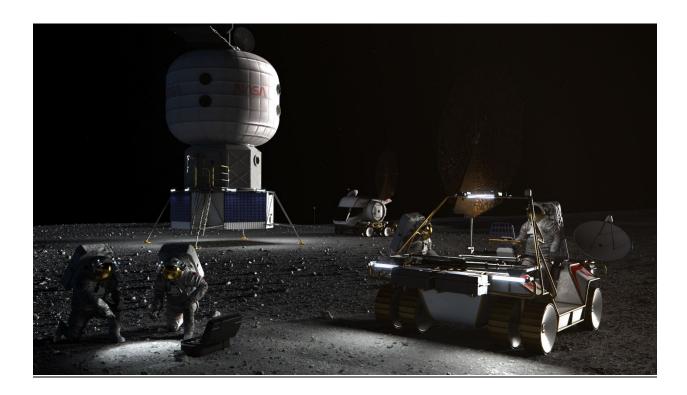
A scoring rubric, provided below, with required criteria will evaluate how well a proposal addresses each of the following required components: Technical Merit, Engagement Plan, and adherence to all proposal requirements.

#### g. Other Deliverables

Teams will create a first-person point of view video of their UIs in action. Teams will submit this video, along with their code, during the software design reviews occurring in April 2025. Teams are also required to submit a draft white paper illustrating the development of their visual informatics display system upon completion of the NASA SUITS challenge in June 2025.

#### h. Logo Use

Please supply NASA with logo files, preferably as jpg or png, for your institution(s). Please provide both a version in which your school logo and name are displayed horizontally as well as a version in which the logo and name are stacked vertically. Upload these files to your proposal in the STEM Gateway. You may also provide a public-facing link to these files.



8. PROPOSAL SCORING RUBRIC	Lowest Score 👝			Highest Score	Score	Comments
DESIGN DESCRIPTION.  ✓ Describe the goals of the design concept and expected results.  ✓ Provide roadmap for integrating Al for autonomous functions.  ✓ Tackle the following components of the challenge: Uls for both spacesuit and pressurized rover, navigation, and implementation of the autonomy and interoperability requirements.	O-6 points  The design concept description is insufficient or lacks clarity with respect to design goals and/or expected results. Proposer provides little to no evidence for an innovative UI design or display interaction method/technology.  At least one component of	7-13 points  The proposed design concept goals and/or the expected results of the design are vague.  Proposer provides minimal evidence for an innovative UI design or display interaction method/technology.  At least two components of the challenge were	14-19 points  The proposed design concept goals and/or the expected results of the design are generally described. Proposer provides some evidence for an innovative UI design or display interaction method/technology.  At least three components of the challenge were met	20-25 points  The proposed design concept goals and results are clearly and concisely written. Proposer demonstrates substantial evidence of innovative display interaction methods/technologies with visuals, etc., to support their concept. Most, if not all,		
Total 25 points	the challenge was met successfully.	met successfully.	successfully.	components of the challenge were met successfully.		
CONCEPT OF OPERATIONS  ✓ Describe the user interfaces, autonomy, and interoperability from an operational perspective (Pressurized Rover and spacesuit).  Total 10 points	O-2 points  The proposed concept description of the user interface is unclear and insufficient from an operational perspective.	3-5 points  The proposed concept description of the user interface contains few details and is difficult to comprehend from an operational perspective.	6-8 points  The proposed concept description of the user interface provides general details and provides a minimal or basic understanding of the concept from an operational perspective.	9-10 points  The proposed concept description of the user interface is clearly and concisely written in full detail and effectively explains the concept from an operational perspective.		
FEASIBILITY  ✓ Concept demonstrates a viable solution to the technical need.  ✓ Plan describes how the concept would be produced.  Total 10 points	O-1 points  The proposed concept lacks viability and/or fails to meet the technical need. No evidence is provided to demonstrate how the concept would be produced.	2-4 points  The proposed concept demonstrates low viability and minor/insignificant contributions to the technical need. Little evidence is provided to demonstrate how the concept would be produced.	5-7 points  The proposed concept demonstrates <u>sufficient</u> <u>viability</u> and describes some contributions to the technical need. <u>Minimal evidence</u> is provided to demonstrate how the concept would be produced.	8-10 points  The proposed concept demonstrates high viability and describes significant contributions to the technical need. Ample evidence is provided to clearly demonstrate in detail how the concept would be produced.		

	0-3 points	4-7 points	8-11 points	12-15 points	
ARTIFICIAL INTELLIGENCE INTEGRATION					
✓ Concept includes how and where AI	The proposal fails to	The proposal provides a	The proposal explains how	The proposal clearly and	
will be included.	adequately explain how	basic explanation of Al	and where AI will be	comprehensively explains	
✓ Includes which LLMs etc. will be	and where AI will be	integration, but it is	included but lacks some	how and where AI will be	
used and why.	included. It shows a lack of	vague or lacks depth. The	detail or innovation. The	integrated. It	
✓ Includes plans to mitigate	understanding of the	solutions may be	solutions are practical but	demonstrates a deep	
hallucinations which would pose a	problem and provides no	impractical or not well	not particularly novel.	understanding of the	
danger to mission success.	practical solutions.	thought out.		problem and provides	
			The proposal specifies the	innovative and practical AI	
Total 15 points	The proposal fails to	The proposal mentions	LLMs or other AI models	solutions.	
	specify which LLMs or	the LLMs or other AI	to be used, with some		
	other AI models will be	models to be used but	justification for their	The proposal specifies the	
	used or provides no	provides little or no	selection. The rationale is	LLMs or other AI models	
	justification for their	justification for their	reasonable but not	to be used, with a clear	
	selection. It shows a lack	selection. The rationale is	thoroughly convincing.	and well-justified rationale	
	of understanding of the	weak or unclear.		for their selection. It	
	models' capabilities.		The proposal includes a	demonstrates a strong	
		The proposal includes a	plan to mitigate AI	understanding of the	
	The proposal fails to	basic plan to mitigate Al	hallucinations, but it lacks	models' capabilities and	
	include a plan to mitigate	hallucinations, but it is	some detail or depth. The	relevance to the problem.	
	AI hallucinations, or the	vague or lacks depth. The	strategies are practical but		
	plan is inadequate. It	strategies may be	not particularly innovative.	The proposal includes a	
	shows a lack of	impractical or not well		comprehensive and well-	
	understanding of the risks	thought out.		thought-out plan to	
	and provides no practical			mitigate AI hallucinations.	
	strategies to address			It demonstrates a deep	
	them.			understanding of potential	
				risks and provides	
				practical, effective	
				strategies to address	
				them.	
EFFECTIVENESS OF THE PROPOSED	0 points	1-2 points	3-4 points	5 points	
PROJECT SCHEDULE					
✓ Comprehensive project schedule.	The proposed project	The proposed project	The proposed project	The proposed project	
✓ Effective use of available resources.	schedule does not	schedule includes few	schedule includes	schedule is highly detailed	
✓ Labor distribution.	demonstrate effective	details to demonstrate	minimum details to	and effective to meet	
✓ Documents proposed schedule for	planning. The plan	effective planning. The	demonstrate effective	objectives. Describes a	
meeting objectives.	includes little to no	plan vaguely describes to	planning. The plan	comprehensive plan that	
✓ Detailed plan to achieve each	description for meeting	meet the objectives and	minimally describes how	demonstrates how to	
objective or task.	objectives and completing	complete the task.	the task and objectives	meet the objectives and	
Total 5 points	the task.		will be met.	complete the task.	
					<u> </u>

HUMAN-IN-THE-LOOP (HITL) TESTING	1-2 points	3-5 points	6-7 points	8-10 points	
✓ Provide a test plan for all HITL					
testing to be conducted by the team.	No HITL plan provided, or	The proposed HITL plan	The proposed HITL plan	The proposed HITL plan	
✓ Include all the requested:	the components of the	includes a few of the	includes most but not all	clearly and concisely	
components for the HITL plan:	plan are insufficient,	components listed and	the components listed and	describes each of the	
<ul> <li>Schedule of proposed test events.</li> </ul>	unsafe or unclear.	deemed necessary to	deemed necessary to	components listed and	
Test protocol.		implement an effective	implement an effective	deemed necessary to	
<ul> <li>Possible metrics/measures.</li> </ul>		and safe HITL test.	and safe HITL test.	implement an effective	
<ul> <li>Feasible subject.</li> </ul>				and safe HITL test.	
pools/demographic.					
<ul> <li>How test event evaluates design's</li> </ul>					
ability to meet challenge					
requirements.					
✓ All HITL tests should be conducted					
safely.					
Total 10 points					
TECHNICAL REFERENCES	0 points	1-2 points	3-4 points	5 points	
✓ Referenced works are cited in text	No references are	1 reference is cited. Not	At least 1 reference is	2 or more references are	
and are relevant to the proposal.	included.	formatted correctly.	cited. Citation(s) and	cited. Citation(s) and	
✓ A bibliography is provided.			reference entry(ies) follow	reference entry(ies) follow	
Total 5 points			a recognized format.	a recognized format.	
				<b>Total Technical Score</b>	

PROPOSAL SCORING	Lowest Score 🛑			→ Highest Score	Score	Comments
RUBRIC	Lowest Score			Trigilest Score	Score	Comments
COMMUNITY ENGAGEMENTS  ✓ Diverse list of events and activities planned.  ✓ Includes projected audience type and number of participants.  ✓ Includes community leaders who have been engaged.  ✓ Detailed implementation plan.  INDUSTRY ENGAGEMENTS  ✓ List of potential partners and alignment with project goals.  ✓ Assesses the team's professional development strategy.	1-5 points  Only one outreach event or industry engagement is planned.  OR  Plan provides no details of implementation plan, projected audience, and number of participants.  OR  Plan provides no details of potential industry partners and how they will align to project goals.	6-10 points  Minimum of two events are planned. This can be any combination of outreach events and industry engagements.  Proposer provides minimal details of implementation plan, projected audience, and number of participants.  AND/OR  Proposer provides minimal details of potential industry partners and how they will align to project goals.	Minimum of three events are planned. This can be any combination of outreach events and industry engagements.  Proposer provides a sufficiently detailed implementation plan including a projected audience, and number of participants.  AND/OR  Proposer provides sufficient detailed list of potential industry partners and how they will align to project goals.	Minimum of four events are planned. This can be any combination of outreach events and industry engagements.  Proposer provides a highly descriptive and relevant implementation plan including a projected audience, and number of participants.  AND/OR  Proposer provides highly descriptive and relevant list of potential industry partners and how they will align to project goals.		
Engagement Total Score						

Note: Check the NASA SUITS website for the most-up-to-date activity documents <a href="http://go.nasa.gov/nasasuits">http://go.nasa.gov/nasasuits</a>.

Send questions and responses to <a href="mailto:nasa.gov">nasa-suits@mail.nasa.gov</a>