

MANUFACTURING PROTOTYPE



OVERVIEW

Applying leadership and 21st century skills, participants design, fabricate, and use Computer Integrated Manufacturing (CIM) to create a product that addresses the annual theme found on the [TSA website](#) under *Themes & Problems*. The product may use additive and/or subtractive manufacturing of any traditional, Computer Numerical Control (CNC), 3D printing, or laser technology available. A documentation portfolio and one (1) completed prototype are checked in and evaluated.

Semifinalist teams participate in an on-site challenge to demonstrate their product and give a promotional "sales pitch" to the judges.

ELIGIBILITY

One (1) team per chapter may participate.

TIME LIMITS

Up to two (2) minutes for the semifinal promotional sales pitch.

ATTIRE

TSA competition attire is required for this event.

PROCEDURE

PRELIMINARY ROUND

- A. Participants report to the time and place stated in the conference program with:
 - 1. the documentation portfolio
 - 2. the prototype of the product.
(Please note the prototype must be fully functional)
- B. Judges independently assess the entries.
- C. A list of twelve (12) semifinalists (in random order) is posted.

SEMIFINAL ROUND

- A. Semifinalist teams report at the time and place stated in the conference program.
- B. Two members of the team will give the semi-finalist presentation.

- C. Each team makes a sales pitch about their product to "potential buyers" (judges) in the room and respond to questions.
- D. The sales pitch begins on the timekeeper's signal.
- E. Judges evaluate the presentations.
- F. The top ten (10) finalists are announced at the awards ceremony.

REGULATIONS AND REQUIREMENTS

Students will work to develop their leadership and 21st century skills in the process of preparing for and participating in this TSA competitive event. The development and application of those skills must be evident in their submission, demonstration, and/or communication pertaining to the entry.

PRELIMINARY ROUND

- A. Documentation Portfolio:
 - 1. Documentation materials (comprising "a portfolio") are required and should be secured in a clear front report cover with the following single-sided, 8½" x 11" pages, in this order:
 - a. Title page with the event title, the team identification number, the conference city and state, and the year; one (1) page
 - b. Table of contents; one (1) page
 - c. Photographs with descriptions showing research into existing solutions to the problem; one (1) page
 - d. Brainstorming sketching of possible solutions; one (1) page
 - e. An isometric assembly drawing showing the product and all its parts; the paper size is 11" x 17", folded, with the drawing facing out and placed in the portfolio; one (1) page
 - f. Detail drawings of each part manufactured labeled to match the items in the parts list (from the working drawing). The paper size is 8½" x 11"; pages as needed (to show all machined parts)
 - g. Photographic images (actual photographs, not renderings) showing the construction of the prototype; two (2) pages maximum

- h. Photographic images (actual photographs, not renderings) of designs tested, with a descriptive caption per image of what was improved by the testing of the design and what the team felt was the strengths and weaknesses of the final design; two (2) pages maximum
- i. Bill of Materials; one (1) page
- j. Plan of Work log (see Forms Appendix); pages as needed

B. Materials:

1. The prototype must be constructed using two (2) CNC or CIM processes, including, but not limited to:
 - a. CNC Machining
 - b. Laser Engraving
 - c. 3D Printing
 - d. CNC Vinyl Cutting
2. Traditional manufacturing methods may be used IN ADDITION to the two (2) required CNC/CIM processes.
3. The finished product must not exceed the dimensions 7" x 7" x 7".
4. Five (5) major parts are required; major parts are those with drawings that have been manufactured.
5. Plastic, wood, or metal may be used for any of the parts for the promotional product.
6. The prototype must be finished (sanded, painted, etc) as required by the design.
7. Stock fasteners may be used and may include, but are not limited to:
 - a. Nuts
 - b. Washers
 - c. Screws
 - d. Wing nuts

SEMIFINAL ROUND

A. Sales pitch:

1. Using leadership and/or 21st century skills, participants present a two (2)-minute "sales pitch" about their promotional product.

2. Participants explain the production cost per unit, the materials used to make the product, and price breaks of units based on purchase.
3. No electronic devices may be used in the sales pitch.
4. A promotional flyer or brochure may be given to judges as part of the sales pitch; the brochure size is limited to one double-sided page on 8½" x 11" paper.

EVALUATION

PRELIMINARY ROUND

- A. The documentation portfolio
- B. The component analysis

SEMIFINAL ROUND

- A. The sales pitch/demonstration

Refer to the official rating form for more information.

STEM INTEGRATION

This event aligns with the STEM (Science, Technology, Engineering, and Mathematics) educational standards.

LEADERSHIP AND 21ST CENTURY SKILL DEVELOPMENT

This event provides opportunity for students to build and develop leadership and 21st century skills including but not limited to:

- Communication
- Collaboration/Social Skills
- Initiative
- Problem Solving/Risk Taking
- Critical Thinking
- Perseverance/Grit
- Creativity
- Relationship Building/Teamwork
- Dependability/Integrity
- Flexibility/Adaptability

CAREERS RELATED TO THIS EVENT

This competition has connections to one (1) or more of the careers below:

- Commercial and industrial designer
- Engineer
- Mechanical engineer
- CNC programmer or operator

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2023 & 2024 OFFICIAL RATING FORM

HIGH SCHOOL

Judges: Using minimal (1-4 points), adequate (5-8 points), or exemplary (9-10 points) performance levels as a guideline in the rating form, record the scores earned for the event criteria in the column spaces to the right. The X1 or X2 notation in the criteria column is a multiplier factor for determining the points earned. (Example: an "adequate" score of 7 for an X1 criterion = 7 points; an "adequate" score of 7 for an X2 criterion = 14 points.) A score of zero (0) is acceptable if the minimal performance for any criterion is not met.

Go/No Go Specifications

- Before judging the entry, ensure that the items below are present; indicate presence with a check mark in the box.
- If an item is missing, leave the box next to the item blank and place a check mark in the box labeled ENTRY NOT EVALUATED.
- If a check mark is placed in the ENTRY NOT EVALUATED box, the entry is not to be judged.

- ☐ Prototype is present
- ☐ The Prototype was created with two CNC processes
- ☐ Documentation portfolio is present
- ☐ ENTRY NOT EVALUATED

DOCUMENTATION PORTFOLIO (110 points)				Record scores in the column spaces below.
CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 9-10 points	
Portfolio Components (X1)	The portfolio is unorganized and three (3) or more components or sections are missing.	The portfolio is generally well organized and may be missing only one (1) or two (2) components or sections.	The portfolio is exceptionally well organized and contains all required components or sections.	
Research (X1)	Research of previous ideas shows little effort or is missing captions	Research of previous ideas shows moderate effort or is missing a few captions of the photos.	Research of previous ideas shows exceptional effort with photographs and captions.	
Brainstorming (X1)	There are one (1) or two (2) brainstorming sketches.	There are three to five (3-5) brainstorming sketches	There are more than five (5) brainstorming sketches	
Isometric Assembly Drawing (X2)	The isometric assembly drawing is not complete, with many of the required elements missing.	The isometric assembly drawing is present, but it is missing several required key elements.	The isometric assembly drawing is complete and correct, with all required elements included.	
Detail Drawings (X1)	The detail drawings are not complete, with many of the required elements missing.	The detail drawings are present but may be missing several required key elements.	The detail drawings are complete and correct, with all required elements included.	
Photos of Construction of Prototype (X1)	Only one (1) photograph of designs tested is included or captions are not present on any of the photos.	Two (2) photographs of designs tested are included and captions are present.	More than two (2) photographs of designs tested are included and captions are present.	
Descriptions/ Product Testing (X2)	There is little description of the design testing process and analysis.	One description of design testing and analysis is included.	Several descriptions of design testing and analysis are included.	
Bill of Materials (X1)	Bill of Materials is included, but more than one (1) material is missing.	A Bill of Materials is included, with one (1) material missing; Bill of Materials is generally organized.	All components of the Bill of Materials is included and highly organized.	
Plan of Work Log (X1)	The Plan of Work log is not complete.	The Plan of Work log is included and mostly complete.	The Plan of Work log is complete and fully documents project work.	
DOCUMENTATION PORTFOLIO SUBTOTAL (110 points)				

COMPONENT ANALYSIS (60 points)				Record scores in the column spaces below.
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	
	1-4 points	5-8 points	9-10 points	
Theme (X3)	The effort is basic, with only a loose association to the product theme.	The effort adequately addresses the product theme.	The effort to address the product theme exceeds expectations.	
Craftsmanship (X3)	The prototype shows minimal craftsmanship in design and creation.	The prototype shows adequate craftsmanship in design and creation.	The prototype shows exceptional craftsmanship in design and creation.	
COMPONENT ANALYSIS SUBTOTAL (60 points)				

Rules violations (a deduction of 20% of the total possible points for the above sections) must be initialed by the judge, coordinator, and manager of the event. Record the deduction in the space to the right.	
Indicate the rule violated: _____	

PRELIMINARY SUBTOTAL (170 points)	
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SEMIFINAL SALES PITCH (50 points)				Record scores in the column spaces below.
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	
	1-4 points	5-8 points	9-10 points	
Organization (X1)	Participants seem unorganized and unprepared for the sales pitch/demonstration; illogical explanation of the project is presented.	Participants are generally prepared for the sales pitch/demonstration; explanation of the project is communicated and generally organized.	The sales pitch/demonstration is logical, well organized, and easy to follow; the project concept is communicated in a concise manner.	
Knowledge (X1)	Participants seem to have little understanding of the concepts in their project; answers to questions may be vague.	Participants exhibit a general understanding of the concepts in their project.	Participants show clear evidence of a thorough understanding of the concepts in their project.	
Articulation (X1)	Communication of the project is unclear, unorganized, and/or illogical; leadership and/or 21 st century skills are not evident.	Communication of the project is somewhat logical and clear; leadership and/or 21 st century skills are somewhat evident.	Communication of the project is clear, concise, and logical; leadership and/or 21 st century skills are clearly evident.	
Delivery (X1)	The sales pitch is full of illogical thoughts that lack clarity, and/or there is insufficient information provided describing the project.	The sales pitch is somewhat logical, easy-to-follow, and/or there is sufficient information provided describing the project.	The sales pitch is clear, concise, and there is ample information provided describing the project.	
Team Participation (X1)	The majority of the delivery is made by one (1) member of the team; the partners may be disengaged from the sales pitch.	Team members are generally engaged in the process, though one member may take on more responsibility than the others.	Team members are actively involved in the sales pitch and responses to interview questions; there is shared responsibility on the part of team members.	
SEMIFINAL SALES PITCH SUBTOTAL (50 points)				

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Rules violations (a deduction of 20% of the total possible points for the above sections) must be initialed by the judge, coordinator, and manager of the event. Record the deduction in the space to the right.

Indicate the rule violated: _____

SEMIFINAL SUBTOTAL (50 points)

To arrive at the TOTAL score, add any subtotals and subtract rules violation points, as necessary.

TOTAL (220 points)

Comments:

I certify these results to be true and accurate to the best of my knowledge.

JUDGE

Printed name: _____ Signature: _____

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EVENT COORDINATOR INSTRUCTIONS

PERSONNEL

- A. Event coordinator
- B. Judges:
 - 1. Preliminary round, two (2) or more
 - 2. Semifinal round, two (2) or more
- C. Timekeeper, one (1)
- D. Assistants at check-in, two (2) or more

MATERIALS

- A. Coordinator's packet, containing
 - 1. Event guidelines, one (1) copy for the coordinator and for each judge
 - 2. TSA Event Coordinator Report
 - 3. List of judges/assistants
 - 4. Stick-on labels for entries, as needed
 - 5. Results envelope
 - 6. Stopwatch
- B. Tables and chairs for check-in assistants, the timer, judges, and the event coordinator
- C. Tables for display of entries; chairs for each team member

RESPONSIBILITIES

AT THE CONFERENCE

- A. Attend the mandatory coordinator's meeting at the designated time and location.
- B. Report to the CRC room and check the contents of the coordinator's packet.
- C. Review the event guidelines and check to see that enough personnel have been scheduled.
- D. Inspect the area(s) in which the event is to be held for appropriate set-up, including room size, tables, chairs, etc. Notify the event manager of any potential problems.

- E. At least one (1) hour before the event is to begin, meet with judges and assistants to review time limits, procedures, regulations, evaluation, and all other details related to the event. If questions arise that cannot be answered, speak to the event manager before the event begins.

EVENT CHECK-IN

- A. Check in the entries at the time and place stated in the conference program.
- B. Late entries are considered on a case-by-case basis and only when the lateness is caused by events beyond the participant's control.
- C. In order to compete, participants must be on the entry list or must have CRC approval.
- D. Requirements for attire do NOT apply during check-in, only on the first day of the conference.
- E. Each entry must include the team's identification number in the upper right-hand corner of the entry.
- F. Instruct participants to position the entries for viewing.
- G. Secure the entries in the designated area.

PRELIMINARY ROUND

- A. Judges independently assess the entries.
- B. Decisions about rules violations must be discussed and verified with the judges, event coordinator, and CRC manager to determine either:
 - 1. To deduct twenty percent (20%) of the total possible points in this round or
 - 2. To disqualify the entry
 The event coordinator, judges and CRC manager must initial either of these actions on the rating form
- C. Judges determine the twelve (12) semifinalists.
- D. Submit the semifinalist results and all related forms in the results envelope to the CRC room.
- E. Create semifinalist sign-up sheet for the sales pitch presentations.

SEMIFINAL ROUND

- A. Participants report at the time and place stated in the conference program to sign-up for a sales pitch presentations.
- B. Participants report at the assigned time and place for the presentation.
- C. Manage the sales pitch presentation sessions.
- D. Discuss rule violations (e.g. 20% deduction, disqualification) and have all relevant parties initial the rating form.
- E. Judges determine the ten (10) finalists and discuss and break any ties.
- F. Submit the finalist results and all related forms in the results envelope to the CRC room.
- G. If necessary, manage security and the removal of materials from the event area.