LOUISIANA FFA

CAREER DEVELOPMENT EVENT

SMALL ENGINES

Small Engines Career Development Event

Purpose:

It is estimated that more than 70,000,000 small engines are now in use in the United States. A large percent of these are power labor-saving machines on the farm, around the home, and in agricultural business. Predictions are that this number will continue to increase substantially in future years.

With the acceptance of and dependence on the small engines in providing a source of power in agricultural services, the Agriscience curriculum has become increasingly involved with their operation and maintenance. Students are provided learning activities in servicing, operating, maintaining, and repairing small engines.

The purpose of this Career Development Event is to provide students in Agriscience and members of the FFA an opportunity to demonstrate their practical working knowledge of the small engine through competition.

Objectives:

1. To develop the students' knowledge of the operation and maintenance of small gasoline engines.

2. To develop the students' skills in analyzing and solving problems as related to the small gasoline engines.

3. To enhance students' interest in the use of small gasoline engines as a power source for agriculture.

4. To develop students' knowledge of the parts of a small gasoline engine.

Contest Format:

PHASE I: Both team members will take a written exam consisting of technical information and parts identification.

PHASE II: Team members will participate in either engine assembly or engine problem-solving (trouble shooting) as determined by **drawing** on the day of the contest.

General Rules and Regulations

1. All general rules apply except as indicated in the specific rules of this contest.

    a. A team will consist of two members.
    b. The team members will be designated A & B.
2. The event will be conducted on the sub-district, district, area, and state levels. Sub-district and district levels will be planned and provided for by the schools involved.

3. The top four teams from sub-district advance to compete on the district level. The top four winners at district advance to area. The top four winners in each area event will participate on the state level. *(Revised 2005)*

4. The written test will consist of questions from the study guide, *Briggs and Stratton Principles and Theories of Engine Operation;* parts identification (from the Illustrated Parts List of the 126332-0036 Model Series). At least 10 questions will be on parts identification and/or use of measuring tools. *(Revised 2005)*

5. Chapters will furnish their own small engines at ALL event. The engine shall be a Briggs & Stratton 900 series or 1150 series engine with overhead valves, horizontal shaft, float style carburetor, standard or industrial grade. Crankshaft length and diameter are irrelevant for the purposes of this event. (Updated 2023)

6. The following modifications may be made to the engine without penalty:
    a. Oil alert system may be disabled or removed
    b. Kill switch may be replaced with a stop switch. (Part # 495098S or #297472S)
    c. All gaskets, except the head gasket, may be glued to the engine or part. *(Revised 2011)*
    d. The extended crankcase and head bolt used for a mounting bracket for accessories may be cut flush with the head of the bolt.*(Revised 2014)*

7. All tools and reference materials (Briggs and Stratton Illustrated Parts List) applicable to engines involved shall be provided by individual schools for each contestant. The parts list can be obtained at the Briggs and Stratton web site at www.briggsandstratton.com. *(Revised 2005)* Any hand tool may be used except electric, battery or pneumatic powered tools.

8. No one (without exception) will be allowed in the contest area except the contestants and those assisting with the event.

9. Contestants are required to furnish and wear safety gasses or goggles during the engine problem-solving phase of the contest. Four minutes will be added after the first warning to the contestant's score if he or she fails to comply with this rule. Contestant will be disqualified at the second warning. *(Revised 2005)*

10. Teachers with teams in the event will serve as time keepers and provide their own stopwatch for the contest. If a teacher cannot be present, he/she must find a qualified replacement with their own stopwatch. (*Revised 1997)*

11. There will be no smoking during the contest. Talking will be permitted only as necessary to communicate to the judge, as noted in the sub-rules. For safety reasons, all fuel containers and engine starting areas will be in an outside designated area.

12. At the Area contest a minimum of two judges will be required. One judge will be located in the assembly/troubleshooting area and one judge will be located outside in the cranking area. At the State contest a minimum of three judges will be required. One judge will be located in the assembly/troubleshooting area and two judge will be located outside in the cranking area. Judges in the cranking area are allowed to designate a time keeper for the one minute after the engine goes through the throttle phases acceptably. (Updated 2023)

    a. Observe the work of the contestants and assign demerits as per the score card.
    b. Make all decisions as to the performance of the contestant and the engine.
    c. Judges selected for the State contest will be selected from a pool of Ag Teachers that are knowledgeable of the contest and the motors used in the contest.
    d. Motors for the state contest shall be delivered to that teacher 7 days prior to the contest. (Updated 2023)

    Note: The coordinators should be people who know small engines and how they should perform.

13. All engines must have complete and permanently attached school identification.

14. Engines for all area and state contests must be submitted to the designated coordinator on or by the specified deadline and must be running properly prior to submission for the contest. Spark plug, oil, and gas must be removed prior to shipping. Engines should be started and run for the contest coordinator when delivered.

15. Any student or team found to be violating a rule which has no distinct time demerit shall be penalized a maximum of ten (10) minutes per occurrence. *(Adopted 8/17)*

16. Tie breaker: (Apply in the following order)

    a. Total exam scores
    b. Parts ID (with correct part name and part number)

Sub-Rules
Small Engine Assembly Technician

1. Contestant will furnish one approved four-stroke cycle engine to assemble along with the manual for their model of engine. See engine specifications above. Breakdown and layout will be at the discretion of the judge(s). (Revised 2025)

2. Contestant must furnish all tools needed to assemble the engine, as recommended by manufacturer. (Supplies such as oil, gas and parts may be furnished at the area and state levels) Special tools for assembly and disassembly are listed below and students should be knowledgeable in their use.

3. The contestant will have a maximum time of 45 minutes to complete this phase after the judge gives the signal to start. (If the engine does not run the first time the contestant assembles the engine, the remaining time within the 45 minutes may be used to rework trouble spots.) If the 45 minutes expire and the engine does not run according to the judge's expectation, the member will be given a score of 100 points for that phase.

4. A master stop watch will be used for timing the part of the contest. After assembly begins, it will not stop until it reaches 45 minutes. Individual times will be kept at each table to determine that individual's time for the assembly part of the contest. For the assembly part of the contest, time will be kept as follows:

   Each competitor will have his own watch that will start when the master watch is started. Time will be called for that individual watch when he/she has completed assembly and is ready to try and run for 1 minute

   If the motor cranks and runs correctly for 1 minute, then the official time for that competitor will be recorded from his/her individual watch for assembly. If the motor does not run properly for at least 1 minute, it will return to the table, the time will start on his/her individual stop watch at the point where the member called time. The individual may continue to bring the motor back to the table if it does not run properly until the issue is fixed or until the master stopwatch reaches 45 minutes.

   When the master stop watch reaches 45 minutes, the contest will end, unless an individual's time has been called before the 45 minute mark and has been brought to the floor to see if it will run for 1 minute.
   (Updated 2023)

5. After contestant has completed the assembly and tuned the engine to his or her satisfaction, he or she will notify the station judge, who records the time in minutes and seconds. Time used to add fuel and oil will not be included in contestant time. The engine will have to crank and run for one minute (this time is not counted in assembly time) before any score is received.

6. All workmanship will be based on minutes and seconds. The contestant with the fewest minutes and seconds will place the highest in this phase.

7. Rings and the torque of rod bolts, and turning back of rod locks will be judged as the student assembles the engine. (Timed watches will be used.) *(Revised 2005)*

8. Contestant will assist the judge in checking workmanship as necessary. *(Revised 2005)*

9. Prior to the beginning of the contest, the superintendent will determine whether the assembly contestants will compete in a traditional assembly or an assembly hybrid. Assembly hybrid is an assembly contest that includes 1-5 missing parts. Students must list the missing part(s) and part number(s) using the correct manual for their engine and have the judge check it off and give them the missing part requested. If the contestant lists a part that is not a missing part chosen by the judge, they will receive a 30 second demerit. If a student does not find the missing part(s) and have the judge check it off, they will not be able to finish the contest and will receive a 100 minute demerit. Judge(s) will use the Engine Assembly Score Card to score the contestant. Judge(s) must specify what the type of assembly will be prior to the contest. (Revised 2025)

10. Contestants may be disqualified at the discretion of the judge(s) if proper tools are not used.

Score Card
ENGINE ASSEMBLY

Contestant Name_____Contestant No. _____

School _____

I. Assembly time in minutes (Contestant disqualified if engine doesn't run)	Time: Start_____:_____ Finish_____:_____ Total Time_____: _____ (Minutes and Seconds)
II. Workmanship Demerits	**No. Demerit Minutes** **Total**
Parts, bolts, etc., missing or loose (each)	4
Stripped threads (each)	6
Air gap (per .001 off) Spec._____Actual _____	2
Wire routed incorrectly	2
Incorrect setting of idle and governed top on load speed (each 100 rpm)	3
Flywheel not torqued *(Rev.08)*	5
Excessive flywheel housing tabs bent (each)	2
Head bolts too tight or loose (each)	2
Head bolts not tightened in correct sequence *(Rev.08)*	3
Fuel lines not clamped to tank/carburetor *(Rev. 08)*	2 each
Recoil starter slips, malfunctions	4
Incorrect installation of internal parts (each) (rings, piston pins, locks, rods, rod dippers, valves, valve tappets, etc.)	5
Incorrect oil fill (per 1/2 cup oil) and/or excessive spillage of oil and/or fuel *(Rev. 08)*	4
Parts breakage (each)	6
Use of safety glasses or goggles (see #4 under General Rules & Regulations) *(Rev. 08)*	4 or Disqualification
	Total Demerit Minutes____:_____ Total Assembly Time_____: _____ Total Contestant Time____:_____ (Part I plus Part II)

Sub Rules
Problem-Solving
(Trouble Shooting)

The rules and regulations stated herein are to be used as basic guidelines for the trouble-shooting phase of this contest. The rules stated may not cover every situation that might possibly occur during the contest. The CDE committee and judge make all final decisions.

1. Contestants will perform problem-solving (trouble shooting) on the required Briggs and Stratton four-cycle engine, provided by the chapter in all levels of contest.

2. Contestants will provide their own test equipment and tools, sufficient to handle the normal tune-up of small engines, and provide for special tools as recommended by the engine manufacturer. A flat portable tray, stand or card table may be used to support tools and/or engine.

3. Each team must provide a stop watch.

4. Each contestant will have a minimum of three and a maximum of five malfunctions to correct or repair. Each problem must be severe enough to cause the engine not to run or to run noticeably poorly. *(Revised 2008)*

5. Students must list the bugs they find and have the judge check them off. If the contestant lists a bug that is not one of those chosen by the judge for that contest then the contestant will receive a 30 second demerit. *(Revised 2011)*

6. Students may use a check list for trouble shooting. *(Revised 2017)*

7. Trouble shooting engines must have all parts and they must be in proper working condition. If the student forgot to properly reassemble their troubleshooting engine PRIOR to shipping they will NOT be allowed to use parts from their assembly engine. However, if a student breaks a part DURING the competition then that student will be allowed to use a replacement part from their assembly engine. If the engine is not in working condition when shipped a penalty of 100 minutes will be assessed. *(Adopted 2014)*

8. The student may ask the judge if he can replace the part as long as it is still under time. (*Revised 2005*)

9. The necessary parts for correcting all malfunctions will be available. The contestant must request the defective and/or missing part that he or she wishes to replace by part name and number from the internet source: www.briggsandstratton.com. The event coordinator will provide copies.

10. A defective and/or missing part must be replaced by a new or usable part using correct procedure. If defective parts are used, they must be provided by the contest coordinator.

11. A maximum of 45 minutes is allowed to complete this phase. If the engine does not

perform correctly after this time, the contestant will receive a score of 100 minutes for this phase.

12. A master stop watch will be used for timing the part of the contest. After troubleshooting begins, it will not stop until it reaches 45 minutes. Individual times will be kept at each table to determine that individual's time for the troubleshooting part of the contest. For the troubleshooting part of the contest, time will be kept as follows:

    Each competitor will have his own watch that will start when the master watch is started. Time will be called for that individual watch when he/she has completed assembly and is ready to try and run for 1 minute

    If the motor cranks and runs correctly for 1 minute, then the official time for that competitor will be recorded from his/her individual watch for troubleshooting. If the motor does not run properly for at least 1 minute, it will return to the table, the time will start on his/her individual stop watch at the point where the member called time. The individual may continue to bring the motor back to the table if it does not run properly until the issue is fixed or until the master stopwatch reaches 45 minutes.

    When the master stop watch reaches 45 minutes, the contest will end, unless an individual's time has been called before the 45 minute mark and has been brought to the floor to see if it will run for 1 minute.
    (Updated 2023)

13. Starting fluids other than gasoline may not be used. Use of starting fluids other than gasoline will disqualify the contestant.

14. The judges will use the Problem-Solving (Trouble Shooting) Score Card to score contestants.

15. Broken parts associated with a set bug must be fixed or replaced with a part from the judge.

The following malfunctions are the only ones which may be selected for all competitions:

IGNITION	VALVES
1. Sparkplug gap closed completely 2. Damaged sparkplug 3. Armature or Armature ground wire grounded out 4. Armature turned backwards 5. Damaged flywheel key or flywheel key taken out and flywheel rotated 180° *(Revised 08)* 6. Armature air gap too large or too small 7. Coil is defective	1. Incorrect valve tappet clearance 2. Remove valve to simulate a broken or burned valve 3. Leave the spring off the intake and/or exhaust to simulate a broken spring 4. Place timing marks on cam and crankshaft out of timing (more than 3 notches) 5. Valve stuck open 6. Defective valve
CARBURETION	**MECHANICAL SYSTEM**
1. Water in the fuel 2. Stuck Choke 3. Loosen the carburetor bolts so that air is sucked in 4. Obstruction of manifold intake 5. Remove needle and/or float to simulate damaged valve/float 6. Obstruction of air intake 7. Obstruction of fuel intake (must be easily removed) 8. Governor out of adjustment *(Revised 2025)* 9. Loose governor bolt *(Revised 2025)* 10. Pin prick in float valve (the float valve MUST be filled with a liquid) *(Revised 2025)*	1. Pull cord is cut or knot cut or untied 2. Loosen the head bolts to simulate a burned gasket 3. Remove the cam shaft to simulate a broken camshaft' 4. Remove the piston to simulate a broken connecting rod. 5. Head gasket damaged or removed 6. Clogged muffler 7. Seized crank shaft *(Revised 2025)* 8. rod cap bolts not torqued *(Revised 2025)* 9. remove piston ring or rings (to simulate a broken piston ring) *(Revised 2025)* 10. remove spring from rewind starter (to simulate a broken starter spring) *(Revised 2025)*

Score Card
ENGINE PROBLEM-SOLVING
(Trouble Shooting)

Contestant Name_____Contestant/Team No. _____

School _____

I. Correction time for malfunctions (Contestant disqualified if engine doesn't run)	Time: Start_____:_____ Finish_____:_____ Total Time_____: _____ (Minutes and Seconds)
II. Workmanship Demerits	No. Demerit Minutes Total
Parts, bolts, etc., missing or loose (each)	4
Parts breakage (each) *(Rev. 08)*	6
Requesting parts not needed (each)	4
Stripped threads (each) *(Rev. 08)*	6
Excessive spillage of oil and/or fuel	4
Recoil starter malfunctions	4
Use of safety glasses or goggles (see #4 under Rules and Regulations)	4 or Disqualification
Inappropriate behavior and/or profanity	10
Used improper tools	4
Air gap(per .001 off) Spec._____Actual_____. *(Rev. 08)*	2 each
Head bolts not torqued in correct sequence *(Rev. 08)*	2 each
Head bolts or connecting rod bolts not torqued *(Rev. 08)*	2 each
Fuel lines not clamped to tank/carburetor *(Rev. 08)*	2 each
Flywheel not torqued *(Rev. 08)*	5
	Total Demerit Minutes____ : _____ Total Assembly Time_____ : _____ Total Contestant Time_____ : _____ (Part I plus Part II)

Sub-Rules
Examination on Technical Information and Identification of Parts

1. Both team members will participate in this phase of the contest.

2. An examination, in objective form, will consist of 50 questions and 10 identifications of parts. Students must identify parts by specific name and part number as identified in parts manual. These will be developed by the sponsors and committee members of the small engine contest. In addition, a physical examination of worn parts may be made to determine serviceability of such parts using precision instruments such as a micrometer*. (*Revised 2005*)

3. Each question and/or identification answered correctly will have a zero value. Each question and/or identification missed will be given a value of one which will be added to the minutes in the other two phases. Example: If 60 questions and/or identifications were given and one of the contestants missed five, five would be added to his or her score on the skill phase.

4. Parts used in the identification will come from any acceptable engine for this contest.

5. The official guide to parts and parts numbers will be the Briggs and Stratton web site as of January 1 of the competition year: www.briggsandstratton.com. Event coordinator will furnish hard copies of appropriate Illustrated Parts list from web site and score sheets. (*Revised 2005*)

6. Pictures may be used instead of parts or tools in identification phase.

7. All questions will come from the study guide of multiple choice questions.

8. Tools used in the identification part can be any tool that a member might use in the repair of an engine.

9. I.D. will be given 1 minute per part for identification.

RESULTS RECAP SHEET
For
SMALL ENGINES CDE

Contestant's No.	Team's School	Written Exam Demerit Minutes (# misses)	Summary Recording (Low Score Best) Grand Total/Combined Score		Rank