

UNIVERSITY CONSORTIUM FOR ELECTRIC VEHICLE RACING TECHNOLOGY RULES

Version 1.4
February 21, 2001

VERSION HISTORY:

- 1.0 [file = vote951.wpd] APPROVED By Consortium, January 1995.
- 1.1 [file = vote952.wpd] January 26, 1995
{Version 1.1 was submitted to the consortium by Tom Erikson, BGSU; William Berry, Notre Dame; Roy Nutter, WVU; Kevon Mikal, Centerior Energy, and Don Kramer, on January 24, 1995. No formal vote was taken.}
- 1.2 [file = rules797.wpd] APPROVED By the Consortium, August 1, 1997
- 1.3 [file = rules Jan 2000. APPROVED by the consortium, January 22, 2000.)
- 1.4 [file = rules 2001 Feb.doc APPROVED by the consortium, Feb 18, 2000, April 15, 2000, and May 15, 2000)
 - I.G. 1.1 → 1.8 approved Feb 18, 2000
 - I.G. 2.0 approved April 15, 2000
 - I.G. 3.0 → 3.0 approved Feb 18, 2000
 - I.G. 4.0 → 6.3 approved April 15, 2000
 - I.F. 1.0 → 2.0 approved April 15, 2000
 - II.D. 1.1 approved April 15, 2000
 - II.E. 1.4 → 1.5 approved April 15, 2000
 - II.G. 3.2 → 3.3 approved May 15, 2000
 - II.G. 3.2.1 → 3.2.3 approved April 15, 2000
 - II.E. 3.6 approved January 15, 2001 [This needs rules committee work...rsn]

Mission of Rules: 1) Safety is first in all considerations
2) Maintain Competitiveness among the teams while keeping costs reasonable.
3) Maintenance of a Professional Image

Formula Lightning is a registered Trademark of Holden Motor Co , Inc.

To obtain copies of the Figures:

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e-mail: rsn@ece.wvu.edu] (Proposed by Roy Nutter, WVU)

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I. General Regulations

A. Valid Version

1.0 The version of the Rules that is approved by the consortium when the letter of intent for an event is executed shall be the version used for that event.

B. Changes to the Rules

1.0 The consortium reserves the right to amend these Rules.

2.0 Proposals for a rule change shall be reviewed by the Rules Committee and then submitted to the full consortium for consideration. A two-thirds majority of the quorum at a meeting of the consortium shall be required to change or add to the Rules. An e-mail vote of the consortium may be taken allowing one week for responses from the mailing to the last known official e-mail address of the registered faculty member.

3.0 At an event, a two-thirds vote of the consortium members entered at the event may modify the rules for that event only. Such an exception shall be reviewed by the Rules Committee afterward to determine if this modification should be submitted to the full consortium for inclusion in the Rules.

C. Choice of Vehicles or Chassis

1.0 The Consortium shall select and specify the Official Race Vehicle.

2.0 Race vehicles not specified in the Rules may not be entered in the Event .

3.0 The Official Race Vehicle is the "Formula Lightning," licensed by Holden Motor Co, Inc. ("HMC"), Phoenix, Arizona.

The Formula Lightning chassis may be obtained from:

Stewart Enterprises
3733 East Southern
Phoenix, AZ 85040
Attn: Rick Stewart
Tel: 602-268-6296
Fax: 602-470-1133

D. Insurance

1.0 The Event Promoter shall provide insurance for each Entrant and each Participant. The applicable insurance is to be described in the Letter of Intent.

E. Driver (last update 1/22/2000)

1.0 To be eligible to participate in a UCEVRT event, a driver must meet one of the following criteria: 1) have a valid SCCA National Competition license; 2) have a valid FIA license; or 3) have the approval of at least two-thirds of the UCEVRT teams participating in the event.

1.1 In order to be approved for an event, the driver must provide a racing resume that details his/her qualifications for the type of racing that will take place at the event. This resume should be distributed to the participating teams as early as possible before the race, but no later than 24 hours before the first scheduled practice session. The vote for approving a driver should take place as early as possible, but no later than 4 hours before the first scheduled practice session. It is expected that the drivers will represent the participating teams in this vote, but any team representative can enter the team's vote.

F. Penalties for Rules Violations

1.0 Any vehicle that violates the version of the rules in effect at the time of an event is not permitted to participate (practice or race) in the event until the rules violations have been reviewed and ruled upon by the Chief Steward. The Chief Steward must take one of the following actions: 1) If the rules violations do not compromise the safety of the event, the Chief Steward can recommend to the consortium that the specific rules being violated be waived for the event to allow the vehicle to participate in the event "as-is"; 2) If any of the rules violations have the potential to compromise safety for the event, the Chief Steward can require the vehicle's team to take specific actions to improve safety before the vehicle is allowed to participate in the event; 3) If additional information is necessary to make a decision, the Chief Steward can inform the team that the decision will be deferred until the team is able to provide specific information.

1.1 All decisions of the Chief Steward that impact a team's participation in an event must be documented in writing and presented to each participating team within 1 week after the event.

2.0 Any vehicle that violates the version of the rules in effect at the time of the event but is permitted to participate in the event due to an action of the Chief Steward may be assessed a penalty in that race. The actual penalty will be determined by the Chief Steward in consultation with the Technical Inspector. Possible penalties include (but are not limited to): 1) The vehicle must start in the last qualifying position at race start; 2) The vehicle must complete one stop-and-go (coming to a complete stop in their pit box) within the first 5 laps of the race; 3) The vehicle must be held in the pit box after a normal pit stop for 15 seconds after the all clear signal from the pit crew leader.

2.1 Multiple rules violations may be assessed multiple penalties from I.F.2.0.

3.0 In order to be able to participate in future UCEVRT events, any team with

rules violations must either correct them before the next event or propose and have approved a permanent change to the rule that was violated

G. Race Regulations

1.0. Rules of the Pits: Pit area corners will be defined prior to the final practice session by tape or paint according to the local track procedures. The size of the pit area will be no less than twice the width of the race vehicle X twice the length of the race vehicle.

1.1. All personnel in the pit area must wear closed-toe shoes and be clothed in matching team uniforms, including long pants and sleeved shirts.

1.2. Each team must have a working fire extinguisher (minimum ten pounds ABC type extinguisher) and a two bottle eye wash in their pit area at all times.

1.3. For any pit stop that occurs during a practice, qualifying laps or a race, only the pit stop supervisor is allowed over the wall before the car comes to a complete stop. At that point, up to 8 additional crew members can go over the wall to work on the vehicle.

1.4. No repairs of any type may be performed on a race vehicle on the race course.

1.5. The Chief Steward may order any race vehicle off the race course if in his judgment it poses a hazard to the other competitors.

1.6. Loss of bodywork that poses a safety hazard is grounds for the race vehicle to be removed from the course.

1.7. Fluid additions are permitted at a pit stop during the race as long as the Chief Steward is satisfied that no additional leakage will occur when the vehicle re-enters the track.

1.8. Penalties for infraction of the pit lane rules or other infractions during the race are assessed immediately by the Chief Steward. Possible penalties are according to rule I.F.2.0 .

2.0 Technical Inspections: A Technical Inspector and an inspection team will be appointed for each event to verify conformance with UCEVRT rules and any other applicable rules for the event. The Technical Inspector will report any rules violations to the Chief Steward for review per rule I.F.

2.1 No vehicle shall be allowed to participate in a practice session until that vehicle has passed a preliminary safety inspection conducted by the Technical Inspector.

2.2 No vehicle shall be allowed to participate in a qualifying session or a race event until that vehicle has completed and passed a technical inspection conducted by the Technical Inspector and the technical inspection team.

3.0 Track incidents: In the event of a track incident, the race will be red flagged and the vehicles must line up at the start/finish line in the order that they finished the last complete lap. No work will be permitted on the vehicles under red flag conditions. For the red flag restart, the field will take a partial pace lap and will receive the green flag on the first pass of the start/finish line. Racing shall resume at the instant the starter waves the green flag.

4.0 Start procedure: Unless otherwise specified, the start procedure for UCEVRT races will be a rolling start. A pace lap will be run at a speed significantly slower than race speed. No passing or improving of race position is allowed during the pace lap. At the end of the

pace lap and when the lead car is still a sufficient distance from the start line, the field will be slowed to allow orderly grouping for the rolling start. The race is considered underway throughout the field at the instant the starter begins to wave the green flag; however, no passing or improving of race position is allowed until crossing the start/finish line to complete the pace lap. A race official will brief the drivers on the pace lap speed and the start speed before each race.

4.1 **Yellow Flag Restart:** For a yellow flag restart, racing shall resume throughout the field at the instant the starter waves the green flag.

5.0 Service Disconnect: The service disconnect is a visible disconnect that is used to visually show that no power from the batteries can reach the controllers (see section II.G.3.3). The service disconnect must be in the disconnected position at all times when a driver is not in the car. Drivers shall assure that the service disconnect has been placed in the disconnect position before they exit the vehicle.

6.0 Race Staff: The race staff includes the Chief Steward, the Technical Inspector and the Starter.

6.1. **Chief Steward.** The Chief Steward manages all aspects of an event, with all other race staff reporting to him. The Chief Steward is responsible for the conduct of all aspects of a race. The Chief Steward will ensure that all provisions of the UCEVRT rules, the sanctioning body rules and track rules are conformed to. The Chief Steward will:

6.1.1. Ensure that all Officials know their duties and have sufficient information on the event to perform their duties.

6.1.2. Execute the schedule of the event in a timely manner by managing the drivers, their vehicles, the Officials and the workers.

6.1.3. Ensure that only eligible drivers and vehicles can participate, which includes verifying that drivers meet or exceed the requirements listed in section I.E of the rules.

6.1.4. Prepare a report on the event, including the official results, details of all accidents, and full details on all protests, actions taken and penalties imposed.

6.1.5. Take under advisement any proposal to modify the schedule of the competition, or any report dealing with rules violations by a vehicle and/or driver.

Gather sufficient information to make a determination on the changes in the schedule and rules violations and after hearing any protests, render a decision.

Administer any penalties for rules violations.

6.2. **Technical Inspector.** The Technical Inspector is responsible for verifying conformance with the UCEVRT rules, technical regulations, safety and pit lane operations. The Technical Inspector is assisted by a technical inspection team which should include one representative from each participating race team (preferably a student) who is familiar with the UCEVRT rules. The Technical Inspector and his team report to and work for the Chief Steward. The Technical Inspector will report any rules violations to the Chief Steward for review per rule I.F. One very important duty is to ensure that the driver's safety equipment is in compliance with the UCEVRT rules, the rules of the sanctioning body and the track rules. The Technical Inspector is to assure that all safety decals and required sponsor decals are displayed on the car.

6.3. **Starter.** The Starter works with the Chief Steward to control all cars when they

are on the course. The Starter relays the orders from the Chief Steward to the drivers during practice and during competition. One of the Starters most important duties is to execute the start procedure defined in section I.G.4.

H. Technological Innovations (last update 1/22/2000)

1.0 The UCEVRT encourages technological innovations that improve the performance or safety of the race vehicles. Any individual team or collection of teams may research, develop, and test innovations either on their own initiative or as a result of a consortium directive.

2.0 Technological innovations outside of the existing rules must be sufficiently analyzed and tested to ensure safety prior to being used in a UCEVRT event. The procedure for getting an innovation accepted for use in UCEVRT events is: 1) Conduct sufficient analysis and testing to validate the innovation; 2) Document the validation of the innovation in a technical report; 3) Distribute the technical report to all active UCEVRT teams at least 90 days prior to the first event at which the innovation is planned to be used, and at the same time provide the text for a proposed UCEVRT rule change that would allow the use of the innovation; 4) A rule change for a single event must be voted on according to I.B.3 prior to the next event, and if approved the innovation will be allowed to be used by any team in the event; 5) After the first event at which the innovation is used a vote on a permanent rules change for the innovation must be held. If the permanent change is rejected the innovation cannot be accepted for future events unless it is significantly modified and is circulated again through this approval procedure.

II. Vehicle

A. Bodywork

1.0 Modifications to the body of the race vehicle are prohibited, except to provide access and as provided in Rule II.

1.1 All access panels or removable sections of the body shall be securely fastened. Only battery hatch doors may be latched.

1.2 All original body contours shall be maintained as supplied.

1.3 Modifications to the body of the race vehicle necessary to accommodate the Battery Pack changing system are permitted provided:

1.3.1 The bottom of the race vehicle remains flat relative to the frame;

1.3.2 Any part of the body made removable for work access must be replaced with materials equal to the original bodywork in type and dimension including the flat .050-inch aluminum sheet;

1.3.3 Deleted beginning with Version 1.2.

1.4 Modifications to the tail bodywork of the race vehicle necessary to accommodate a transaxle will be allowed provided that reasonable efforts are made to maintain original contours.

1.5 Modifications to the body are permitted to make the body easier to get on and

off provided:

1.5.1 All original body contours shall be maintained as manufactured.

1.5.2 All access panels or removable sections of the body shall be secured by fasteners.

1.5.3 The appearance of the race vehicle shall be identical as supplied.

1.6 Air exhaust outlets shall be no greater than a total of 325.12 square centimeters (128 square inches) and shall be located as shown in Figure 1.

1.7 Any specific part of the vehicle influencing its aerodynamic performance must comply with the rules relating to body work.

1.8 Any device or construction that is designed to bridge the gap between the sprung part of the car and the ground is prohibited under all circumstances.

1.9 No wings or other aerodynamic structures may be attached to the vehicle.

B. Graphics

1.0 General

1.1 The Consortium shall assign various identification markings for each Entrant and its race vehicle.

1.2 Each Battery Pack Section shall have Battery Type Decal. (See B.7) and also be marked with car number.

1.3 The Consortium shall assign car numbers.

2.0 Car Numbers

2.1 The Rules Committee shall coordinate assignment of vehicle numbers. Requests for car numbers shall be submitted to the Chairman of the Rules Committee.

2.2 The number must be displayed on both sides of the vehicle in position "5" as shown in Figure 2. This position is on the motor cover aft of the roll bar cover "top hat" by approximately 3 inches.

2.3 The number must be displayed on the nose of the vehicle.

2.4 Each number must have a minimum of two (2) inches of unobstructed background color on all sides and be highly contrasting with the body color.

2.5 The numerals themselves must be a minimum of ten (10) inches high and in proper proportion.

3.0 Series Sponsor Decals

3.1 The Series Sponsor logo shall be displayed if requested on both sides of the vehicle in position "2" as shown in Figure 2.

3.2 The Series Sponsor shall provide the Series Sponsor Decals of specified size to each team at least 14 days before any event at no cost to the entrant.

4.0 Event Sponsor Decals

4.1 The Event Sponsor Logo shall be displayed if requested on both sides of the vehicle in position "3" as shown in Figure 2.

4.2 The Event Sponsor shall provide the Event Sponsor Decals of specified size to each team at least 14 days before the event at no cost to the entrant.

5.0 Sanctioning Body Decals

5.1 The Sanctioning Body Logo shall be displayed if requested by the sanctioning body on both sides of the vehicle in position "1" as shown in Figure 2.

5.2 The Event Promotor shall provide the Sanctioning body decals of specified size to each team at least 14 days before the event at no cost to the entrant.

6.0 Consortium Sponsor Decals

6.1 Sponsors with the approval of the Consortium rules committee, may request special treatment or space for logos. Each team will make a best effort to honor such requests for logo space.

6.2 The current consortium tire sponsor (Goodyear at present) decals are required on all vehicles. These shall be on the right and left side of the lower nose, and across the top of tail of the vehicle.

7.0 Battery Decals

7.1 Decals shall consist of the following letters:

Lead Acid	"Pb-Acid"
Nickel-Cadmium	"Ni-Cd"
Nickel-Iron	"Ni-Fe"

7.2 Battery decals shall be located on each side of the vehicle behind the drivers head and on each battery section.

8.0 Team Sponsor Decals

8.1 All remaining Space shall be available for Team Sponsor Decals.

9.0 Contingency Sponsor Decals

9.1 Last minute sponsors for an event are "contingency sponsors." These decals may occur as "last minute" additions and may be placed anywhere on the outside of the vehicle as chosen by the race team.

C. Dimensions

1.0 The vehicle dimensions as manufactured may not be modified. The following vehicle dimensions, as original equipment, are mandatory and will likely be verified at each event.

1.1 Width: The overall width of the vehicle including complete wheels shall not exceed 81.5 inches with the steered wheels in the straight ahead position. The original width of the body parts is not to be altered.

1.2 Length: The overall length of the vehicle shall not exceed 165.5 inches. The original length of all body parts may not be altered.

1.3 Wheelbase and Treadwidth: The original wheelbase and treadwidth are not to be altered except within the necessary limits of proper wheel alignment for caster, camber, toe-in and bump-steer.

1.4 Height: The overall height of the vehicle shall not exceed the limits obtained through the normal use of the authorized shocks and springs designed for the Formula Lightning.

1.5 Offset: No offsetting is permitted.

1.6 Ride Height: A fully loaded vehicle with driver shall have a minimum of 2 inches a bottom clearance at all points beneath the vehicle when vehicle is fully loaded. Under no circumstances shall any part of the vehicle drag the race surface during competition.

D. Weight

1.0 Minimum Weight: The vehicle's minimum race weight must not be less than 750kg (1655 lbs.) in race ready configuration without the driver.

1.1 **Maximum Weight:** The vehicle maximum race weight permitted is 1261 kilograms (2,781 pounds) with Yokohama tires, but without the driver. The weight on the right or the left side of the vehicle cannot exceed 52% of the total vehicle weight.

1.1.1. Actual weight limit may vary based upon the approved tire.

1.1.2. The weight on the right or the left side of the vehicle cannot exceed 52% of the total vehicle weight.

1.2 **Ballast:** Ballast can be used provided it is secured in such a way that tools are required for its removal. It must be possible to affix seals if desired by the tech inspectors. Maximum allowable ballast is 62 lbs.

E. Frame

1.0 General:

1.1 **Structural modifications** to the vehicles are prohibited except as provided for in II-E of the Rules.

1.2 **Transaxle:** Frame modifications are allowed to accommodate transaxle or transmission installation provided the suspension mounting points are not altered and the structural integrity of the frame is not compromised.

1.3 **Drive batteries and Drive battery packs** shall be securely enclosed and securely mounted on the race vehicle to prevent any movement or spillage. The packs and all batteries must be located outside the driver compartment. The driver compartment must be enclosed with at least .035 aluminum or equivalent. Space between upper frame and body edge need not be tightly sealed.

1.4 **Battery Support Structure:** Original support may be used if it is adequate to support the batteries and they are securely fastened to the vehicle. If existing structure is not used, the substitute must be adequate to the loads imposed. Adequacy is evaluated by the Technical Inspector, with the aid of documented analysis reports supplied by the teams.

1.5 **Battery Support Limit:** Battery Support Structure must meet 1.4 and be enclosed under the original body panels.

1.6 **Flat pan:** A flat under pan, mounted on the underside of the battery support structure tubing, must cover the bottom of the battery support structure.

1.7 **Roll Bar:** Access to the roll bar must be available to pass a strap through to lift the car. Immediate removal of the Air box (top hat) to provide access to the roll bar is acceptable.

1.8 **Composite materials:** Composite Materials are not to be used to replace any portion of the vehicle as manufactured.

1.9 Drive systems shall be **securely mounted** to the 1.5 inch tubes of the main frame.

1.10 **Frame modifications** as shown in Figure 3 shall be allowed in the front box area of the frame in front of the drivers feet. (Content submitted by Oklahoma and approved by the Consortium in 1996.)

2.0 Cockpit

2.1 The cockpit opening shall not be modified from the original body

design.

2.2 The driver must be able to enter and exit the seat without altering the opening in any way except for removing the steering wheel.

2.3 The cockpit must be so designed that the driver can exit the normal driving position in less than five seconds when dressed in all driving equipment, all safety belts fastened, and the steering wheel in place.

2.4 The steering wheel must have a quick release mechanism.

2.5 The internal cross section of the vehicle is to remain as originally designed.

2.6 The drivers seat may be the original seat with padding, two part foam,

2.6 The drivers seat may be the original seat with padding, or two part foam, or a modification to the original seat with padding or two part foam provided it is similar to the original seat and constructed of the same gauge material or a commercially available and consortium approved racing seat. Commercial seat must be firmly attached to the frame of the vehicle.

3.0 Suspension

3.1. The suspension is to remain as designed and built by the manufacturer except as approved Section II-E-3 of the in the Rules.

3.2. Aftermarket parts that differ from the original equipment or original spec intent are prohibited unless specified in this section of the rules.

3.3. Springs: This section deleted.

3.4. Shocks: Only Penske shocks as originally supplied are allowed.

3.5. Original equipment Lower A-arms should be replaced by using 1.25 inch diam 4160 Steel Tubing A-arms. Most teams have purchased from:

Surrey Motorsports
1990 S 11th Street, Unit #10
Niles, MI 49120
Tel: 800-472-4440
Fax: 616-684-1554
Attn: Bill Farr

3.6. Motion: John Fagan moved to approve the "Oklahoma A arms" that Bill Farr has constructed. Given no information and no drawings, Nutter was opposed. Motion: approved (not unanimous.) [JOHN FAGAN will e-mail photographs of A-arms to owners.] {[I have not seen them...Nutter 2/6/01]} [Minutes of the January 12, 2001]

3.6 Roll Center Cable Modification:

A suspension travel limiting cable may be added to the rear lower suspension arms. The cable shall connect the lower arms and shall incorporate pulleys mounted to the upper shock absorber mounting points. See Figure 4. (submitted to Consortium for mail ballot 3/97 by Giorgio OSU and available on the OSU web page.)

4.0 Steering

4.1 Steering Column: Modifications to the length of the steering column are permitted.

4.2 Collapsible steering columns are** not** allowed.

4.3 Four Wheel Steering is prohibited.

4.4 Power Steering systems are allowed to reduce the physical effort required to steer the vehicle. Any other use is prohibited.

5.0 Brakes

5.1 Any modifications to the race vehicle brakes as supplied or as approved in the Rules in Section E-5 must be approved by the safety committee and the rules committee at least 60 days before a race.

5.2 Must be capable of locking all wheels at any speed.

5.3 Dual-circuit brake systems operated by a single pedal are required.

5.4 The same pedal shall activate the brakes on all wheels.

5.5 Given failure of either master cylinder, the braking force must act on at least one axle of the vehicle.

5.6 Regenerative braking may be used. Caution is urged however for such use in a racing system could be dangerous.

(Below modifications are as I perceive us to be working.)

5.7 Front hubs must be as delivered from Holden Enterprises or Stewart Racing.

5.8 Rear hubs may be webbed in by filing the structure triangles above and below the bearing for added strength.

5.9 Both front and rear rotors may be increased in diameter over the original equipment provided that original wheels may be used with them. (Many believe that the rear rotor should be increased in diameter to allow for Wilwood brake calipers to be installed on the rear without wheel spacers being required as done in the present "approved mod". To my knowledge, no one has yet attempted this on the rear however. Recommended by Keith Grider of Ohio State.)

5.10 Original equipment rotors and calipers may be used.

5.11 Solid, straight, vented rotors are required.

5.12 Rotors must be a minimum of 7/8 inch thick. (I picked this for no good reason except the stock front rotor is 26.4 mm or 1.035 inches by my measurement and I couldn't find a stock 1 inch rotor that is 12.25 in diameter for the rear. I looked for a larger diameter disk (12.25" is needed according to Keith Grider) but I don't see anything in the Wilwood catalog that seems to work...rsn)

5.11 Wilwood Dynalite II Calipers Part Number 120-1054 R/H may be used on front and rear. (Part number Per Keith Grider e-mail to owners, 12/29/1994) (Keep in mind that this does require changes to the rotors, and to the uprights in order for this to fit inside the wheel....rsn)

5.12 Alternate brake pads may be used.

5.13 Any hydraulic master cylinder may be used.

5.14 Antilock brakes: This section deleted.

5.15 It is allowable to use a front/rear brake bias adjusting mechanism

accessible to the driver.

5.16 Wheel Spacers up to 0.75 inch may be used in the rear to allow clearance of Wilwood brakes in combination with original rotor disks.

5.17 Wheel spacers up to 0.75 inch may be used with original equipment brakes and rotors to give teams competitive rear track with those teams using Wilwood brakes.

6.0 Wheels

6.1 Only Consortium approved wheels shall be allowed.

6.2 Approved wheels are those supplied as original equipment with the vehicle. These are Weld Racing 16x7 specially made for the Holden Motors Formula Lightning.

7.0 Tires (last update 1/22/2000)

7.1 All vehicles participating in a UCEVRT event shall use the same tires.

7.2 Tires that are provided for an event by a tire sponsor must be approved for the event by the acting safety committee and must be provided equally to each participating team.

7.3 Deleted.

F. Fasteners

1.0 All bolted connections shall have a locking mechanism to prevent separation. This shall consist of either nylock nuts or safety wire.

1.1 A lock washer is not considered a locking mechanism.

1.2 A minimum of Grade 8 fasteners are mandatory to attach all structural and drive train components.

G. Electrical System

1.0 Connections

1.1 All electrical connections shall have insulation appropriate for the voltage level contained.

1.2 All electrical connectors shall have a positive locking mechanism to prevent separation. (This is not to exclude integrated connectors but to ensure no inadvertent disconnections from vibration.)

2.0 Contactors (Drive Current)

2.1 Contactors shall be enclosed in a fireproof shield.

2.2 Contactors shall not be located in the driver's compartment

3.0 Circuit Protection

3.1 Fuses:

3.1.1 A separate main fuse shall be placed in series with the Drive Battery output.

3.1.2 The fuse rating shall not exceed two hundred percent (200%) of the maximum drive current requirement.

3.1.3 The fuse shall have an interrupt rating of at least 20,000 amps DC. For fuses that are rated for AC current interruption, the fuse shall be derated by 50% to

determine the DC current interrupt rating.

3.1.4 Fuses shall be rated at a higher DC voltage than the nominal system voltage.

3.1.5 Any auxiliary batteries shall be fused using standard electrical practice.

3.2 Power Shut Off Interlock Devices

The power shut off interlock devices are the series connected switches that are used to power the main contactor. These interlock switches are located 1) on the dash for the driver (required to be within easy reach of the driver when belted in) and 2) on the left and right side of the car in the area behind the drivers head and below the top hat. The external switches should be located in the general area indicated in Figure 6. An exact location for the switches will not be given so that each team has some freedom in location to avoid cooling ducts, radio wiring, controllers, etc. Mounting to the frame rather than the fiberglass is strongly recommended. The external switches shall be operated by a red plastic key and be stable in the “on” and “off” position. These devices may be in series with any other interlock switches such as the EV-1 service disconnect or any others the team wishes to use. Each of these switches shall have the SCCA standard “Off” decal affixed beside them.

3.2.1 The main contactor shall be capable of opening 200% full load current.

3.2.2 Main contactor equipment containing polychlorinated biphenol (PCB) and/or free asbestos is prohibited.

3.2.3 The main contactor rating must be verifiable by manufacturing information or by specific test data supplied by the team.

3.3 Service Disconnect

The service disconnect is a visible disconnect that is used to visually show that no power from the batteries can reach the controllers. The EV-1 service disconnect may be used as such a device because when the plug is removed, it is obvious that the power is off. A normal Anderson connector (of large enough capacity) may also be used as a service disconnect. It must be in series with either the traction positive or negative power lines so that when the plug is removed, it is obvious that the power is off. Such a device must be located in the top hat area and with all the fiberglass installed be visible when the plug is installed and obviously missing when the plug is removed.

4.0 Energy Storage

4.0 The Consortium shall select and specify the types of batteries and other energy storage devices that can be used for any Event. Any commercially available energy storage technology will be considered provided that the working elements are packaged to minimize hazards of human contact.

4.1 Permitted Storage: Only energy storage technology constructed of the following technologies are thus far permitted:

4.1.1 Nickel cadmium

4.1.2 Nickel iron

4.1.3 Lead acid

4.2 Procedure for non-approved: Any team desiring to run a non-approved energy storage technology (ie not listed in 4.1) must submit a complete description of the technology, complete safety procedures, MSDS, Engineering safeguards, tests and certifications of the system, and mandatory and permissible recommendations for the battery pack system to the safety committee and notify all members of the Consortium at least 90 days in advance of the first event that the team proposes to use such technology. The safety committee may then make a recommendation to the full Consortium as to the viability and safety of the new technology. The Safety Committee should include recommended language for updating of the Rules should they recommend to permit the new technology. A two thirds majority of the Consortium members shall be required to permit a new energy storage technology.

4.3 Batteries must be rechargeable.

5. Battery Enclosures

5.1 All Drive Batteries shall be housed in enclosures.

5.2 Materials: Enclosures shall be of suitable material, as to provide security and containment of the batteries. The materials used should be chemical resistant and sturdy. Such materials can be, but are not limited to metal, some plastics, fiberglass re-enforced plywood, etc.

5.3 Frame: A frame shall be constructed to support the battery pack weight. The frame of appropriate materials shall as well support the sides and top of the battery enclosure.

5.4 Ventilation System: A ventilation system shall exist if there are conditions in which battery gasses could accumulate.

5.5 Containment of Solids: This enclosure should be designed to contain pieces of batteries, as much as possible, not allowing them to be scattered about the racing surface in the event of an accident.

5.6 Containment of gases and electrolyte: The enclosures should not be so constructed to prevent the escape of gasses or electrolyte. The intent is to prevent "gushers." An absorbent pad or "diaper" may assist in containing such accidents. If forced air is not used, individual ventilation holes may not be larger than 1.77 square inches

5.7 Non-standard construction: It is the responsibility of each team to provide data as to the integrity of the enclosure systems in regards to the type of battery chemistry employed.

6.0 Battery Changing Systems

6.1 Drive Battery Pack: All encased and connected batteries on-board collectively that supply power to drive the vehicle.

6.2 Drive Battery Pack Section: Any structure which is removed or replaced in the car by Participants during the Event. A Drive Battery Pack Section contains the drive battery packs, connectors, cables, strapping or similar devices, support base bindings attaching and connecting the drive batteries to each other, and attached fans or other thermal management equipment.

6.3 Maximum Weight: Total battery pack section weight is not limited, but it is subject to the following constraints: 1) no more than 200 pounds can be man-handled at any one time, and 2) transportation of battery packs > 200 pounds to the charging stations and the pit area is not guaranteed. (last update 1/22/2000)

6.4 All battery packs, battery sections, and all parts of the battery exchange system must remain within the team's designated pit area at all times during the race. (last update 1/22/2000)

6.5 Deleted (last update 1/22/2000)

6.6 Car must be completely stopped before side pods may be opened.

6.7 Deleted beginning Version 1.2.

6.8 No power sources may be used in any way as part of the exchange system.

6.9 Drive Batteries, Drive Battery Packs, and Drive Battery Pack Sections shall be securely mounted on the race vehicles to prevent any movement and must be located so as to isolate the driver compartment from battery gasses and electrolytes.

7.0 Battery Charging System

7.1 The Promotor shall contact the consortium to assist in the selection and design of the charging system supply, 60-90 days in advance of an event that requires a battery change during a race pit stop.

7.2 Drive battery charger supply voltage will be provided at 208 volts single phase AC 60 Hz through a 50A, 2 wire with ground connector at a minimum.

7.3 NEMA 14-50P plug shall be the standard. If recepticals are otherwise, the promotor shall supply the plug for each entrant with a circuit diagram of the supply end and receptacle.

7.4 During the 60-90 day period specified in section 7.1, the race promoter shall provide to the Consortium Chairman a wiring diagram for the charger supply to enable plug wiring by each team.

7.5 At least one charging receptical shall be provided per entrant.

7.6 On board charging of the drive batteries is prohibited. This is not to prevent regenerative charging during the race as given above provided proper ventilation of batteries is provided.

7.7 Drive battery charging connections shall be high quality connectors.

7.8 Alligator type clamps are prohibited.

7.9 Drive battery charging cords (AC supply) shall be:

7.9.1 1,524 cm (50 feet) in length

7.9.2 heavy duty grounding type

7.9.3 #10 AWG CU for 50 ampere charger

7.10 Grounding cable shall be at least # 10 AWG CU for 50 amp charger.

7.11 Charging rates shall be no greater than C/6. Fast charging is prohibited.

7.12 Work on drive batteries during charging is prohibited.

7.13 Drive Battery Enclosure grounding shall be installed and must be verified each time the drive charger is connected to the batteries.

7.14 No internal combustion engines or other power

plant may be used for recharging batteries.

7.15 Forced ventilation of battery sections and battery packs shall be required if hazardous gasses might accumulate during charging.

7.16 On board charging of up to 2 auxiliary batteries will be allowed.

7.17 The promoter will provide at least one 115V, 15 amp single phase receptacle in each paddock or pit. No more than four receptacles will be permitted on a branch circuit supplying the outlets.

8.0 Computers

8.1 Telemetry from the vehicle shall be allowed.

8.2 No telemetry to the vehicle shall be permitted at any time. This does not preclude Cyclic-Redundancy-Check requests for retransmission as part of telemetry transmission coding.

8.3 No remote control or remote setting of any parameters on the vehicle from off the vehicle shall be allowed.

9.0 The maximum number of battery packs that may be brought to a UCEVRT event is 5.5. (last update 1/22/2000)

10.0 Leakage Current: At no time shall the vehicle leakage current exceed 5mA. Leakage current levels will be measured indirectly by placing a 10kohm resistor first from B+ to chassis then from B- to chassis. The maximum allowable voltage across the resistor during these measurements is 50V. The B+ and B- connections will be verified by measuring the voltage between the two terminals and comparing it to the vehicle battery voltage.

Provisions must be made for safe access to B+ and B- for this leakage current measurement. Access to each of the terminals must be within 12 inches of each other so that battery voltage can be measured with standard meter leads. (last update 1/22/2000)

H. Drive Train

1.0 Motor

1.1 Only electric motors are permitted to drive the vehicles. No internal combustion engine is permitted on board the vehicle.

1.2 More than one motor is permitted provided they are arranged so any one motor can drive both rear wheels at any time.

2.0 Transmission to Wheels

2.1 Only the rear wheels can be used to drive the vehicle. Front-wheel drive and all-wheel drive are prohibited.

3.0 Drive Axles: Modifications of the length of the drive axles are permitted.

4.0 Outer CV: Outer CV joints must remain stock

5.0 Rear Spindles: Modifications of the spindles are prohibited except as provided in II-E-3.5

6.0 Drive Shaft: Drive Shaft loops are required.

I. Safety Equipment

1.0 Light

1.1 Each vehicle shall have one 15 watt running light [or equal] capable of being switched on from the drivers compartment at the will of the race steward. No brake lights will be used.

1.2 Purposely left blank.

1.3 The running light shall be located on the rear of the vehicle on the outside of the body a minimum of 24" above ground level.

2.0 Safety Belts

2.1 Driver lap and shoulder belts shall be installed per standards contained in Appendix Y of the SCCA Pro Racing Regulations.

2.2 Driver arm restraints are mandatory

3.0 Mirrors

3.1 Rear view mirrors are mandatory to provide adequate driver visibility to the rear of both sides of the vehicle. Selection is optional.

4.0 Helmet Clearance

4.1 The following minimum requirements must be met, consistent with Appendix Z of the SCCA Pro Racing Regulations addressing driver clearance:

4.1.1 there must be a minimum of two inches of clearance between the top of the drivers helmet and the top of the roll bar with the driver in normal seated position;

4.1.2 the drivers helmet must not intersect a plane drawn between the top of the roll bar and the front frame structure of the vehicle.

5.0 Crushable Structures

5.1 All crushable structures provided as original equipment must be installed on the vehicle.

6.0 MSDS

6.1 Entrants shall submit a Material Safety Data Sheet (MSDS) for batteries and any other non-consumer chemicals brought to the race facility with the Official Entry Form for that venue.

7.0 Fire Extinguisher

7.1 All race vehicles shall have at least a 2.5 pound, dry chemical 1A 10BC fire extinguisher, mounted securely to a quick release bracket inside the driver compartment, readily accessible to the driver.

8.0 Scatter Shields

8.1 The installation of scattershields or explosion-proof bell housings shall be required on all vehicles equipped with clutch or flywheel.]

8.2 Chaindrive vehicles shall be equipped with a chain case to contain the chain in the event of failure.]

8.3 Motors equipped with brush replacement windows shall be equipped with guards to contain brush and armature explosions.

8.4 Minimum specifications for the scattershields, chain cases and armature guards shall be:

8.4.1 0.125" SAE 4130 alloy steel

8.4.2 0.250" mild steel plate

8.4.3 0.250" aluminum alloy

8.4.4 NHRA approved and labeled flexible shields.]

8.5 Scattershields, chain cases, and armature guards shall be designed to contain fragments not just deflect them.]

APPENDIX A: Car Number Assignments

Last Update January 22, 2000

Car #	Owner
1	UNASSIGNED
2	UNASSIGNED (Formerly Carl Hayden HS)
3	Ohio State University
4	Bowling Green University
5	UNASSIGNED (formerly Northern Arizona University)
6	West Virginia University
7	Notre Dame University
8	Wright State University
9	Arizona State University
10	Florida A&M University
11	Ohio University
12	Case Western Reserve University (No Longer Active 3/97)
13	
14	
15	UNASSIGNED (formerly Rensselaer Polytechnique Institute)
21	Kettering University
25	Indiana University/Purdue University Indianapolis
31	University of Oklahoma
47	Brigham Young Univeristy

Appendix B: All Figures

Figure 1: Rear View showing location of air exits

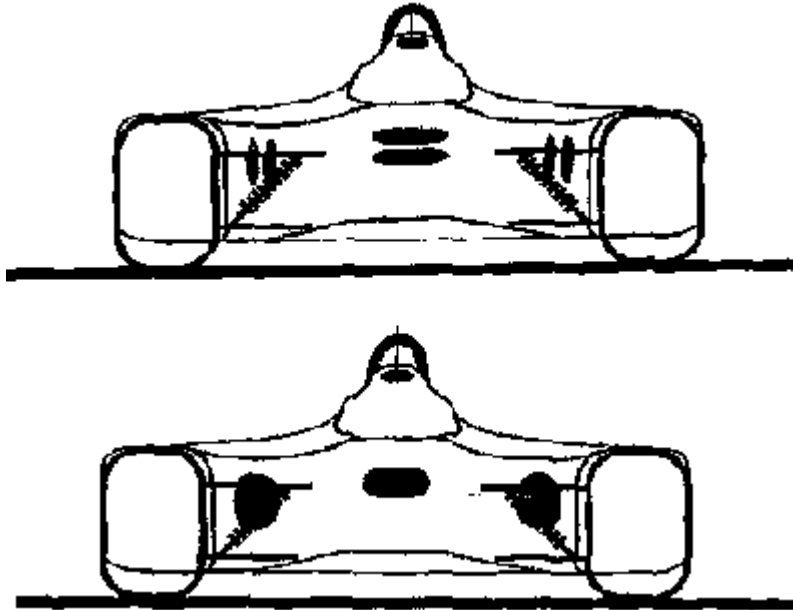
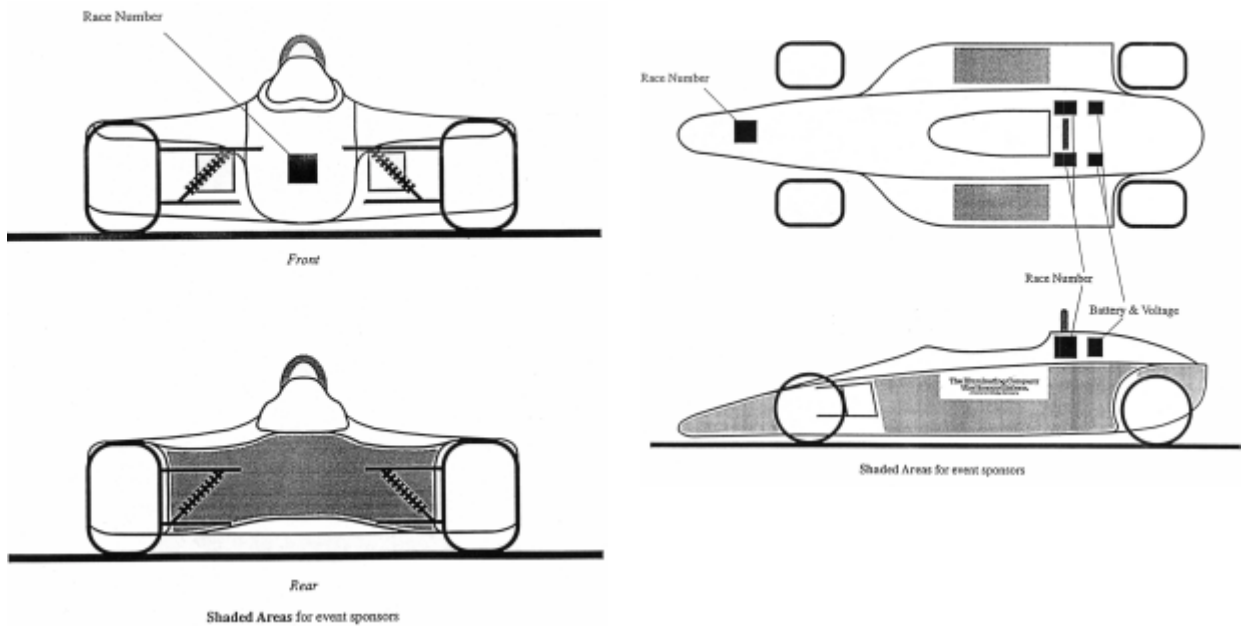


Figure 2: Side View showing sponsor decals and car number locations



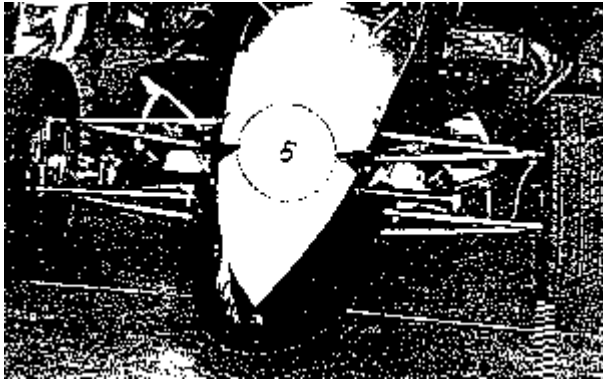


Figure 3: Front View showing car number location on nose

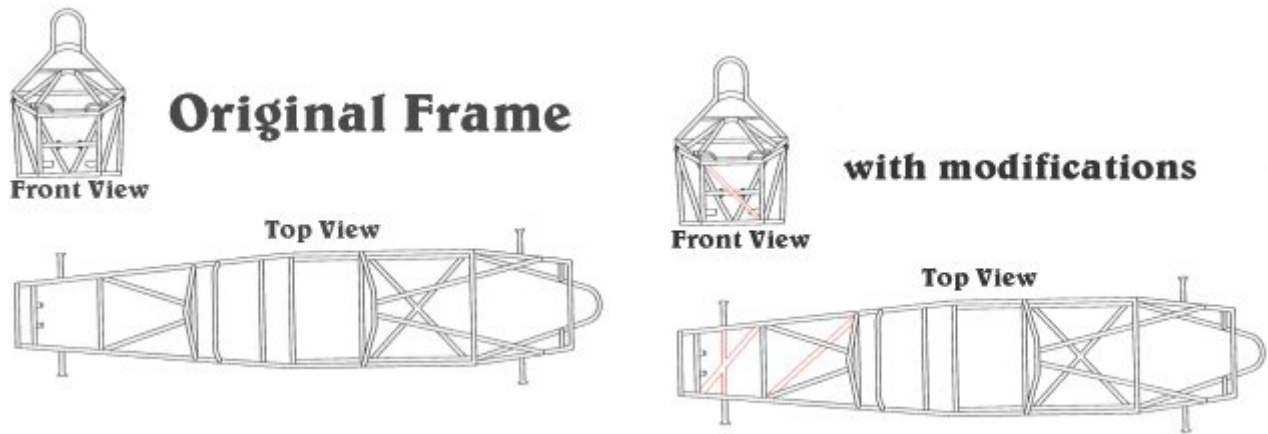


Figure 4: Oklahoma frame modifications to front box in front of feet.

Figure 5: Roll Center Cable Modification from Ohio State.

(I still need to scan this in...rsn)