FLIGHT ENDURANCE

OVERVIEW

Participants analyze flight principles with a rubber band powered model aircraft.

PURPOSE

Participants have the opportunity to build, fly, and adjust (trim) a model to make long endurance flights inside a contained airspace. Any model design is acceptable if the model complies with the event specifications. All models are to be built and test flown before the event date.

☑ Every year it's amazing all over again when students demonstrate their mastery of this event by flying planes in graceful arcs around an indoor space. Flights don't always go that way, but when they do, they're beautiful.

ELIGIBILITY

Participants are limited to two (2) individuals per chapter, one entry per individual.

TIME LIMITS

A. Entries must be started and completed during the current school year.

B. Participants are provided a minimum of thirty (30) minutes for trim flights at the event site.

ATTIRE

Business Casual dress as described in Competitive Events Attire is the minimum requirement.

PROCEDURE

A. Participants report to the event coordinator at the time and place stated in the conference program to sign up for flight heats.

B. Participants proceed to the flying site for trim flying during the time designated for their heat. Time allotted for the trim portion may be extended according to the number of participants and site scheduling.

C. Participants have two (2) opportunities to fly their models for official times.

D. Participants attend a pilot's meeting to review the sequence for making the official flights.

E. In an orderly fashion, participants wind their models and proceed to a group timer for permission to fly.

F. Participants place their models on the floor and wait for the signal to release from the timer. Timing begins when the model rises off the ground.

G. Flight time ends when models hit the floor/ground or when they come to rest on an obstruction.

H. No repairs are allowed after time trials begin.

I. Each participant has the times of two (2) official flights recorded by the timer.

J. Immediately following the second flight, the participant will hand his/her motor to the judge for weighing.

K. Notebooks and planes will be placed on flight boxes for judging. Judges will begin with the top flight times and will evaluate planes, notebooks and flight boxes until the top ten finalists have been determined. Planes that violate any part of regulation C will be disqualified.

L. Ties are broken by determining the longest single flight time.

REGULATIONS

A. All documentation must be computer-generated on 8½" x 11" paper and contained in a notebook [a standard three (3)-ring binder]. Each notebook must include a flight log (see official sample that follows) with the previous ten (10) flights signed off by the participant's advisor and a written report organized to explain these specific points:

1. The technical attributes of the design and a description and identification of parts
2. The modifications and an explanation of why each was developed
3. A technical review of the flight log that explains the trim adjustments and modifications required to improve endurance. Experts from the Academy of Model Aeronautics (AMA) and the National Free Flight Society (NFFS) may scrutinize this information for validity.

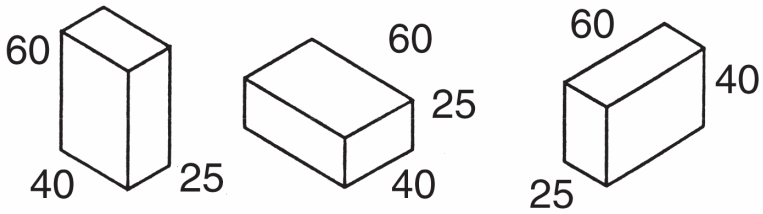
☑ Read the General Rules and Regulations in the front of this guide for information that applies to all of TSA's competitive events.

Flight Log

Member name:			Dates:		
Flight #	# of winds	Time aloft	Flight pattern	Trim adjustment	Advisor sign off
#1					
#2					
#3					
#4					
#5					
#6					
#7					
#8					
#9					
#10					

B. The aircraft and its parts *must* be contained in a flight box that does not exceed 25cm x 40cm x 60cm. Hardware, such as hinges, handles and wheels, are not to be measured.

☑ The flight box is required and is intended to protect the plane in transit.



C. Materials include the following:

1. Models are to be made of wood, tissue paper, condenser paper and plastic film (Mylar) for fuselage and flying surfaces (wings, fin, and stabilizer). No plastic foams are allowed.
2. Models use a commercially available plastic propeller or propeller assembly: minimum of 140mm to a maximum of 170mm in diameter. Trimming or thinning propellers is allowed to achieve balance and/or to reduce weight.
3. Fuselage dimension: minimum of 300mm in length measured with prop assembly attached.
4. Wingspan: maximum of 50cm horizontally projected, wing chord 12cm projected.
5. Rubber motor: maximum weight of motor is 1.50 grams, including the O-rings. No length measurement is made. Spare

motors are allowed during the official flights. Two (2) rubber O-rings may be used on the rubber motor loop for easier handling of wound motors.

6. Model weight: minimum of 7.0 grams, maximum of 21.0 grams. Models are weighed without motors attached. Clay is permitted for trim ballast. (Model is weighed with clay ballast.)
7. Steel wire may be used only for the propeller shaft, motor hook, landing gear and the connection between fuselage and tail. Small plastic tubes such as coffee stirrers may be used to connect the wings and tail to the fuselage.
8. The two wheels must be a minimum of 15mm in diameter, in plastic or wood, and they must roll.

D. Acceptable flight support equipment includes the following:

1. Mechanical rubber motor winders or battery powered motor winders may be used. No AC powered winders are allowed.
2. A winding stooge may be used to anchor the model while its motor is being wound. A person may not serve as a winding stooge.
3. Flight Endurance is an individual event. No one may assist the participant in any way during either trim or official flights. Violation of this regulation may result in disqualification.

E. The landing gear must support the airplane without sagging in its rested position.

EVALUATION

Evaluation is based on the duration of flight, written report, flight log and flight box. A bonus of ten (10) seconds is added to the flight time per flight if the airplane successfully lands on its wheels and comes to a rest on its wheels.

NOTES

The Academy of Model Aeronautics (AMA) welcomes your inquires and may have suggestions and technical information that may further your knowledge and interest in model aircraft. Here's how to contact the AMA:

AMA
5161 E. Memorial
Muncie, Indiana 47302
phone 765.287.1256 (Education Department)
fax 765.289.4248
www.modelaircraft.org
www.webwings.org

The National Free Flight Society (NFFS) is another organization that offers help to individuals who seek information concerning model building and flight technology. Learn more on the web at www.freeflight.org.

STEM INTEGRATION

This event has connections to the STEM standards noted below. Please refer to the STEM integration section of this guide.

Science, Technology, Engineering, Mathematics

PRIMARY LEADERSHIP SKILLS

Leadership skills promoted in this event:

- CREATIVE THINKING — Students develop unique ideas for their entry to increase their competitive edge. Suggested leadership lessons: *Creative Technologies* and *The Leadership Chronicles*
- EVALUATION — Students improve their entry though testing and time trials. Suggested leadership lessons: *Evaluation Imagination* and *Evaluation Methods*
- PROBLEM SOLVING — Students make adjustments to their entry to fix any problems. Suggested leadership lessons: *Finding the Right Way* and *Problem Solving Steps*

Additional leadership skills promoted in this event: communication, critical thinking, organization

TSA AND CAREERS

This competition has connections to one or more of the career areas featured in the TSA AND CAREERS section of this guide. Use *The 16 Career Clusters* chart and the *TSA Competitions and Career Clusters* grid as resources for information about careers.

CAREERS RELATED TO THIS EVENT

Aeronautical engineer
Aircraft systems engineer
Physics teacher

FLIGHT ENDURANCE
EVENT COORDINATOR INSTRUCTIONS

PERSONNEL

A. Event coordinator

B. Assistants, two (2) or more

C. Evaluators, two (2) or more

D. Timekeepers, two (2)

MATERIALS

Coordinator's notebook, containing:

A. Event guidelines, four (4) copies

B. Official rating forms

C. List of entries with finalist report

D. List of evaluators/assistants

E. Flight score sheets

F. Marking pens (felt tip, fine point)

G. Tape, rubber bands, glue and adhesives

H. Stop watches, three (3)

I. Electronic gram scale (to .01 gram)

J. 610mm metric rulers, two (2)

K. Results envelope

RESPONSIBILITIES

A. Upon arrival at the conference, report to the CRC room and check the contents of the coordinator's notebook. Review the event guidelines and check to see that enough evaluators/assistants have been scheduled.

B. Inspect the area(s) in which the event is being held for appropriate set-up, including room size, chairs, tables, outlets, etc. Notify the event manager of any potential problems.

C. One (1) hour before the event is scheduled to begin, meet with your evaluators/assistants to review time limits, procedures, and

regulations. If questions arise that cannot be answered, speak to the event manager before the event begins.

D. For participants who violate the rules, the decision either to deduct twenty percent (20%) of the total possible points or to disqualify the entry must be discussed and verified with the evaluators, event coordinator and a CRC manager. Secure the initials of the coordinator and manager on the rating form.

E. Check in participants and evaluate models for special compliance during the scheduled trim session (completed flight log is inspected).

F. Secure models in the holding area so that models remain safe until the scheduled time for the official flights.

G. Distribute a list of entrants assigned to each designated evaluator/timer.

H. Each flight is recorded to the nearest one tenth (.1) of a second. After the second flight, the times are added together. Up to three (3) groups may fly simultaneously in the assigned area for the event with, consideration for the safety of the models and participants.

I. Models and flight boxes of all contestants are checked again. Models showing deviations may be disqualified.

J. Notebooks of the sixteen (16) semifinalists are judged and rated with a factor ranging from 1.01 (low) to 1.20 (high). This factor is multiplied by the total of the two (2) official flights to determine the final ranking of 1-10.

K. Secure the signatures of the evaluators on the official rating form after they have reviewed it.

L. Complete and submit the finalist report, which includes a ranking of the ten (10) finalists, and all related forms in the results envelope to the CRC room.

M. If necessary, manage security and the removal of materials from the event area.

FLIGHT ENDURANCE

2011 & 2012 OFFICIAL RATING FORM HIGH SCHOOL

PARTICIPANT/TEAM ID#												
EVALUATIVE CRITERIA												
Flight #1 (time)												
Flight #2 (time)												
Landing bonus (10 seconds per flight)												
FLIGHT TOTAL												
Notebook 1.01 for no flight log or report 1.20 for best accurate report and flight log												
SUBTOTAL (To calculate, multiply notebook factor by flight total.)												
Rules violation (must be initialed by coordinator and manager) .....minus 20% of the total possible pts.												
TOTAL												

Comments:

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

Evaluator

Printed name: _____ Signature: _____