

**2011  
Kansas Science Olympiad  
HELICOPTERS**

## Helicopter?



- REVOLVING ROTOR
- STATIONARY ROTOR
- MOTOR STICK
- VERTICAL STABILIZER
- RUBBER MOTOR

### CONSTRUCTION PARAMETERS

- DESIGN
- MATERIAL
- MASS
- ROTORS
- ROTOR CONSTRUCTION
- POWER

### DESIGN

- Published plan(s)
- Commercial kits
- Student's design

### TIPS

**Published plan:**

Indoor Flying Models by Lew Gitlow (9min. 16.2 sec.)

**Commercial available kits:**



A2Z Corp, Englewood, CO

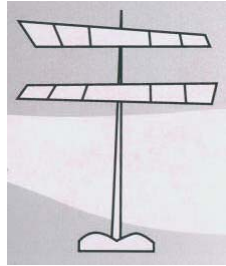


TURNERTOYS  
1958 ELMORE RD  
MORRISVILLE, VT 05661

## MATERIALS

### Functional components:

- Rotor
- Rotor blades
- Vertical stabilizing surface
- Motor stick



## Functional components

- Wood
- Paper
- Plastic film covering
- Glue

No rigid plastic or composite materials!

## TIPS

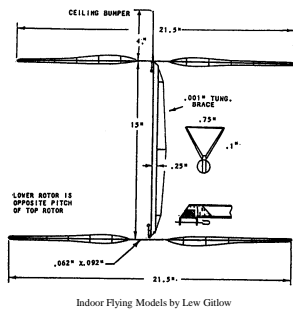
- Paper – Japanese tissue paper
- Plastic film covering  
OS FILM  
[www.osfilm.com](http://www.osfilm.com)  
2115 State Route 31, Glen Garner, NJ 08826

## Method of attaching functional components

- Tape
- Thread
- Music wire
- Malleable wire
- Paper
- Metal or plastic tube



Helicopter may be braced with string of any base material?



## Rubber O-Ring



## Helicopter Mass

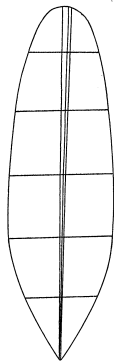
4 grams or more!



## ROTORS

**Rotors are defined as surfaces that contribute lift by rotating on a common path around a vertical axis.**

- Up to three (3) sets of rotors
- Must be fixed pitch
- Maximum dia. of 40.0 cm
- No limit on number of blades per rotor
- No limit on blade's chord
- **No other lifting surfaces**



## ROTOR CONSTRUCTION

- Competitor must construct the rotor themselves.
- Commercially available rotors or propellers must not be used in whole or part.
- Commercially available thrust bearings may be used.



## POWER

**Motor = The big rubber band!**

- Rubber motor must be 2.0 g or less
- Including any attachments such as O-rings
- May be lubricate before or after impound
- Motors must be removable from helicopter
- Motors will be massed at check-in
- Qualified motors will be impounded for official flights

## TIPS

- Impound more than two rubber motors!
- Do not lubricate the rubber motors before impound.
- Find Rubber Lube at F.A.I. Model Supply

## MARKING

- Must have team name or number on helicopter or will be ranked after all teams that do not violate the construction rules.

## COMPETITION

- Room dimensions (Aprox. length, width and ceiling height)  
CMLE@ COX.NET
- Cordoned off competition area
- No supports or assistance from outside cordoned off area
- 8 minutes for two (2) official flights
- Must present a flight log

## FLIGHT LOG

- Data must include 6 parameters with at least ten (10) flights
- Three of the six parameters must be:
  1. Motor size
  2. Number of turns on the motor before launch
  3. Flight time

## SCORING

- Team with incomplete flight log will have 10% deducted from their flight time of each flight.
- Team without flight log will have 30% deducted from their flight time of each flight.
- Team that violate "Construction" or "Competition" rules will be ranked after all teams that do not violate those rules.

## Common failure modes

- Rubber motors exceed weight limit
- O-ring failure during winding
- Lack of marking
- "Forgot" the flight log
- Hangar rash!

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What questions do you have for  
me?