



SANDHAWK

SCALE

sounding rocket

K-51

ENGINEERED BY
JOHN SIMMANCE

FROM THE ORIGINAL DESIGN BY

MICHAEL L. POSS

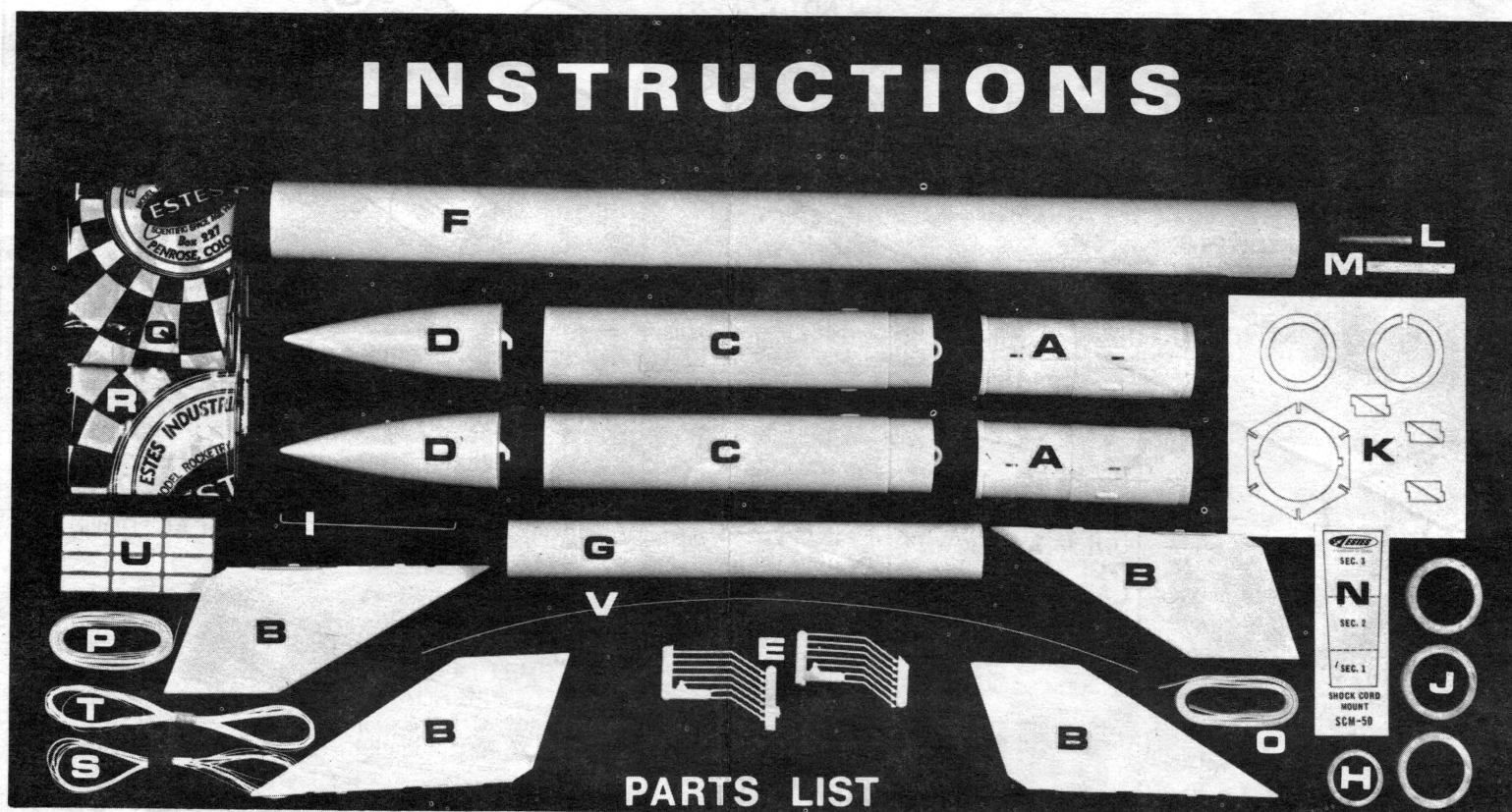
Your new Estes SANDHAWK kit is a single stage "D" engine powered model capable of being flown with "B" or "C" engines in an EM-2050 adapter, and is intended for serious scale competition work.

It is approximately 1/10 full size, and incorporating finely molded detail in the plastic components, can be built up into a top quality scale model.

The full size SANDHAWK is a single stage solid propellant sounding rocket developed for upper atmosphere research experiments. It is fitted with a Thiokol TE-M-473 solid propellant motor developing 25,000 lb. thrust for 15 seconds. At burnout, the vehicle is 10 miles high, traveling at 6,000 ft/second, and coasts to an apogee of 100 miles. The payload is returned to earth by parachute.

The 13 inch diameter SANDHAWK weighs 1820 lbs. at lift-off, and with fully instrumented payloads costs \$55,000.00.

INSTRUCTIONS



PARTS LIST

- | | | | | |
|----|---|--------------------------------|-----------|-----------------------|
| A. | 1 | Tail Section Halves . . . | #PTS-55EK | } Bagged Set. #PRP-51 |
| B. | 4 | Fins | #PRF-EK | |
| C. | 2 | Payload Section Halves . | #PPS-55EK | |
| D. | 2 | Nose Cone Halves . . . | #PNC-55EK | |
| E. | 1 | Set Antennas. | #PRA-EK | |
| F. | 1 | Body Tube | #BT-55KG | |
| G. | 1 | Engine Mount Tube | #BT-50H | |
| H. | 1 | Engine Block. | #AR-2050 | |
| I. | 1 | Engine Holder. | #EH-2 | |
| J. | 3 | Centering Rings. | #AR-5055 | |
| K. | 1 | Card Adapter Rings | #TA-51 | |
| | | and Antenna Jig (Die-cut Card) | | |
| L. | 1 | Launch Lug | #LL-2A | |

- | | | | |
|----|----|-----------------------------|-----------|
| M. | 1 | Launch Lug Stand-off. . . . | #BFS-30BH |
| N. | 1 | Shock Cord Mount | #SCM-50 |
| O. | 1 | Shock Cord | #SC-1 |
| P. | 1 | Shock Cord | #SC-2MJ |
| Q. | 1 | 12" Parachute | #PK-12A |
| R. | 1 | 18" Parachute. | #PK-18A |
| S. | 1 | Shroud Line 72" | #SLT-72 |
| T. | 1 | Shroud Line 108" | #SLT-108 |
| U. | 12 | Tape Strips | #TD-2AB |
| V. | 1 | Antenna Wire 12" | #RW-3 |

NOTE: Antennas: Set is composed of seven antennas plus spares for your convenience. You will find up to 14 in the set, however, you will only need 7 to complete the model.

NOTE: IN ADDITION TO THE MATERIALS INCLUDED IN THE KIT YOU WILL NEED: MODELING KNIFE OR SINGLE EDGE RAZOR BLADE, SCISSORS, WHITE GLUE, PLASTIC CEMENT, PENCIL, MASKING TAPE, VERY FINE SANDPAPER, EPOXY GLUE, FINE NOSE PLIERS AND PAINTS AS SPECIFIED.

MAIN ASSEMBLY

☐ **1** Build motor mount assembly; see sketch showing ring position. Use a tail section half to check positioning. Pre-cement ring edges.

☐ Mark body tube with single line for launch lugs. Pre-cement one end. Attach large shock cord to inside of other end as shown.

☐ **3** Cement both tail section halves onto motor mount assembly. Tape and leave to dry thoroughly.

☐ **4** Cement both nose cone halves and payload section halves together. Tape and leave to dry thoroughly.

☐ **5** Assemble antenna drilling and mounting jig from remainder of diecut parts on card #TA-51.

☐ **6** Glue body tube to tail section, using white glue on paper to paper joints but plastic cement on all plastic to plastic or paper joints: on these joints, make sure paper has been pre-cemented with plastic cement. Align launch lug line between fins with molded launch lug on tail section. Glue on launch lugs.

☐ **7** **ANTENNAS:** Decide at this stage whether you wish to use the semi-scale plastic antennas or make scale antennas from the music wire provided in the kit. The semi-scale plastic antennas are simply cemented on prior to painting. See diagram showing positioning of Type "A" and "B" antennas on payload section. If you wish to use the wire antennas proceed as follows:

Tape antenna jig to payload section as shown so that points of triangular templates rest on circular antenna position marks. Using jig to line up, drill six holes at correct angle with #65 (or 1/32") drill bit. Make up seven antennas with wire provided to full size pattern shown. Two type "A" and one "B" antenna are glued into the holes in each payload section half as shown, using Epoxy glue. **DO NOT ATTEMPT TO USE ANY OTHER TYPE OF ADHESIVE ON THESE JOINTS.** The jig is now used to locate the antennas in exactly the right position at the right angle while the epoxy is curing. Remove jig very carefully when epoxy glue is fully cured, cutting the card away if necessary between the antennas. Cut out one segment of the jig, tape to the tail section with the point on the position mark for the "C" type antenna. Drill out as before and epoxy the type "C" antenna in place.

☐ **8** Trim off all molding or cementing flash from fins and assembled tail section. Ensure that fins fit snugly to tail section. Cement each fin in place, taping carefully in place until quite dry. Make sure perfect alignment is maintained during drying; support the body tube during this period in a vertical position.

☐ **9** Assemble parachutes as shown. Attach large 18" diameter parachute to main rocket shock cord. Attach small shock cord to molded loop on base of payload section. Fit small 12" parachute to this shock cord. Assemble rocket and prepare for painting.



SANDHAWK

SOUNDING ROCKET

SET BACK AT LEAST

2 SPREAD GLUE INSIDE TUBE

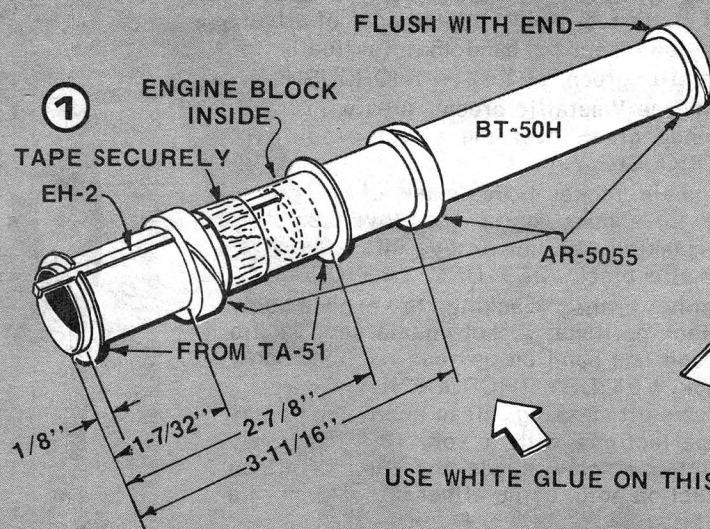
PRE-CEMENT INSIDE AND EDGE OF BODY TUBE WITH PLASTIC CEMENT

(THIS WILL BE LOWER EDGE OF TUBE)

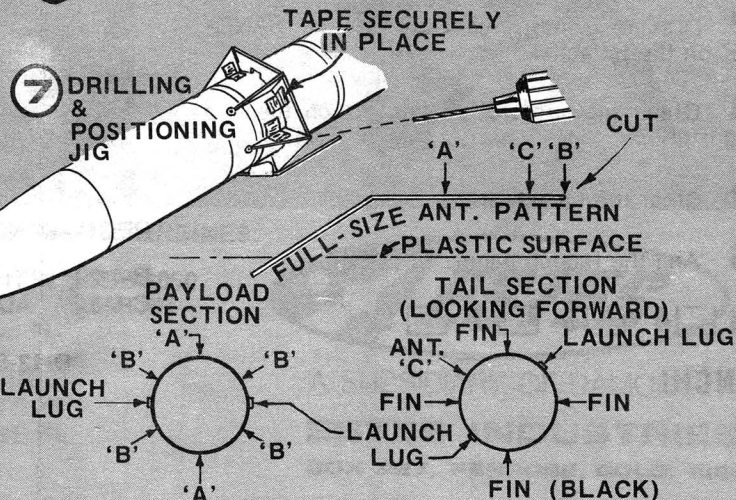
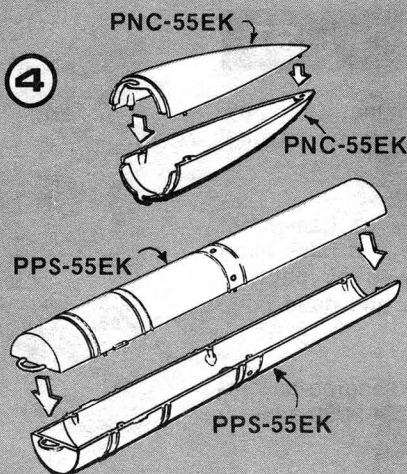
NOTE:

GLUE = WHITE GLUE


CEMENT OR PRE-CEMENT = PLASTIC CEMENT



USE WHITE GLUE ON THIS STEP



MAIN ASSEMBLY

 Mark body tube with single line for launch lugs. Pre-cement one end. Attach large shock cord to inside of other end as shown.

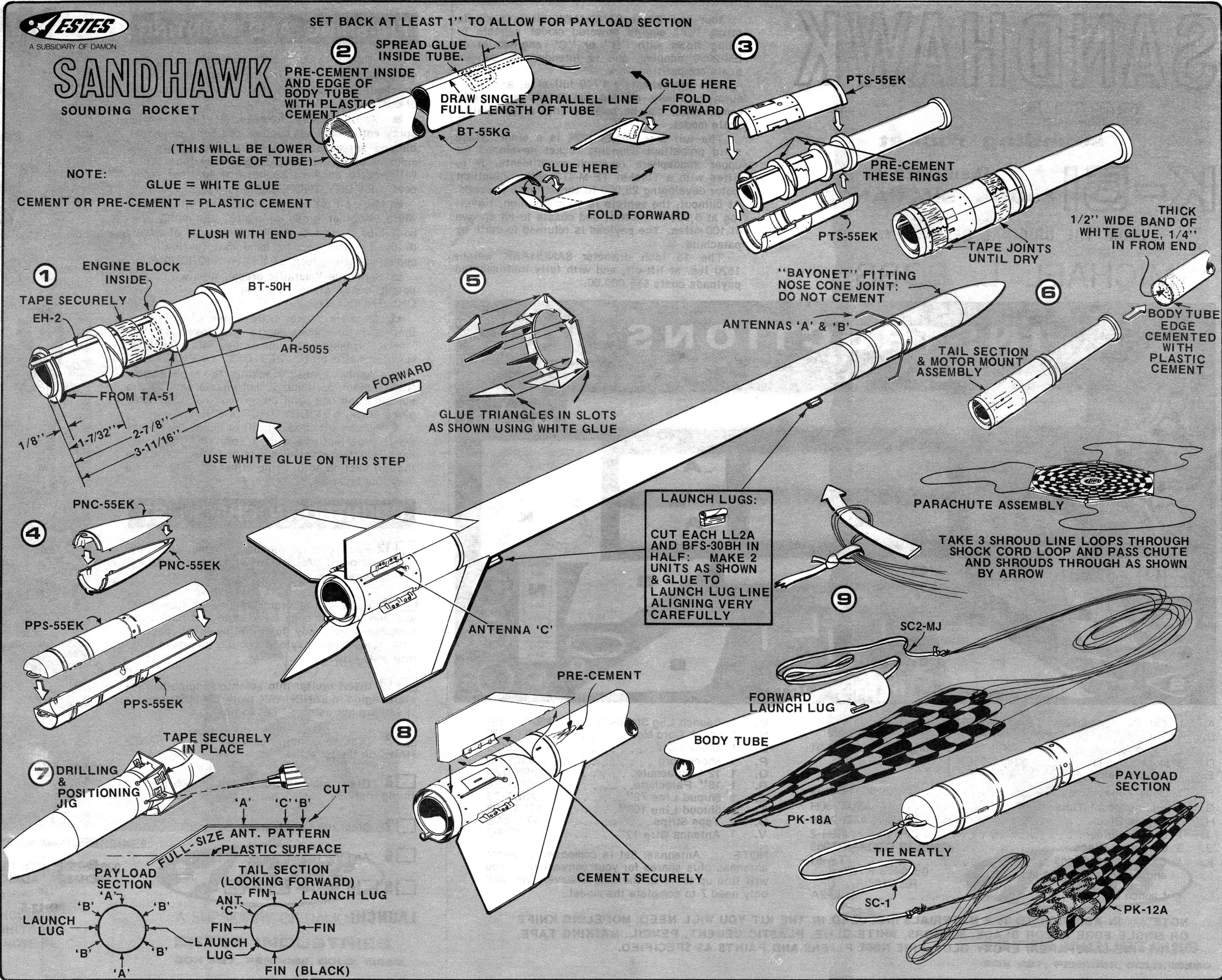
☐ **4** Cement both nose cone halves and payload section halves together. Tape and leave to

6 Glue body tube to tail section, using white glue on paper to paper joints but plastic

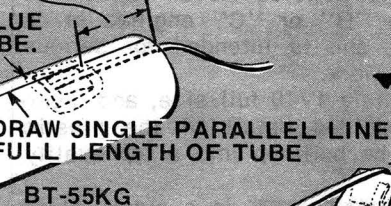
☐ **7 ANTENNAS:** Decide at this stage whether you wish to use the semi-scale plastic

Tape antenna jig to payload section as shown so that points of triangular templates rest on circular antenna position marks. Using jig to line up, drill six holes at correct angle with #65 (or 1/32") drill bit. Make up seven antennas with wire provided to full size pattern shown. Two type "A" and one "B" antenna are glued into the holes in each payload section half as shown, using Epoxy glue. DO NOT ATTEMPT TO USE ANY OTHER TYPE OF ADHESIVE ON THESE JOINTS. The jig is now used to locate the antennas in exactly the right position at the right angle while the epoxy is curing. Remove jig very carefully when epoxy glue is fully cured, cutting the card away if necessary between the antennas. Cut out one segment of the jig, tape to the tail section with the point on the position mark for the "C" type antenna. Drill out as before and epoxy the type "C" antenna in place.

9 Assemble parachutes as shown. Attach large 18" diameter parachute to main rocket shock cord. Attach small shock cord to molded loop on base of payload section. Fit small 12" parachute to this shock cord. Assemble rocket and prepare for painting.



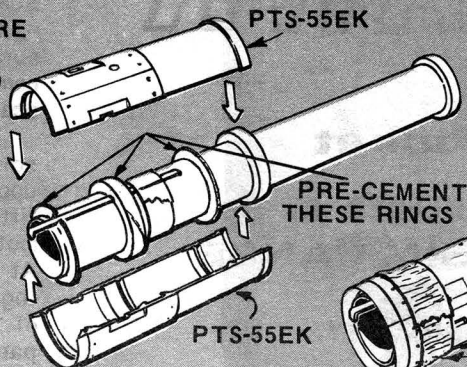
1" TO ALLOW FOR PAYLOAD SECTION



GLUE HERE
FOLD FORWARD

3

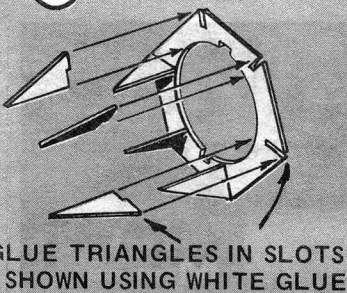
GLUE HERE
FOLD FORWARD



TAPE JOINTS
UNTIL DRY

THICK
1/2" WIDE BAND OF
WHITE GLUE, 1/4"
IN FROM END

5



"BAYONET" FITTING
NOSE CONE JOINT:
DO NOT CEMENT

ANTENNAS 'A' & 'B'

TAIL SECTION
& MOTOR MOUNT
ASSEMBLY

6

BODY TUBE
EDGE
CEMENTED
WITH
PLASTIC
CEMENT

LAUNCH LUGS:

CUT EACH LL2A
AND BFS-30BH IN
HALF: MAKE 2
UNITS AS SHOWN
& GLUE TO
LAUNCH LUG LINE
ALIGNING VERY
CAREFULLY

ANTENNA 'C'

PARACHUTE ASSEMBLY

TAKE 3 SHROUD LINE LOOPS THROUGH
SHOCK CORD LOOP AND PASS CHUTE
AND SHROUDS THROUGH AS SHOWN
BY ARROW

9

PRE-CEMENT

FORWARD
LAUNCH LUG

BODY TUBE

PK-18A

TIE NEATLY

SC-1

PAYLOAD
SECTION

PK-12A

FINISHING AND PAINTING

Carefully study paint scheme, noting the difference between the matte finished and gloss finished surfaces: note the following sequence of coats.

a. Apply LIGHT tones first: Gloss white spray entire payload section and nose cone, including antennas; matte white spray entire remainder of rocket INCLUDING body tube. This will ensure an even appearance to final color coat. LET DRY THOROUGHLY.

b. Mask off all areas that are finally to appear white, whether gloss or matte, and spray the body tube matte red. Apply a base coat of silver to the payload section band that is finally to appear metallic green. LET DRY THOROUGHLY.

c. Spray the "metallic green" area with transparent candy green over the silver base. LET DRY THOROUGHLY.

d. On main rocket body, mask off all areas that are to appear matte red (over existing "white" masking - do not remove this.) Spray remainder matte black. LET DRY THOROUGHLY.

e. Apply further masking to expose only GLOSS black portions: rocket nozzle section, fin support band and band on payload section. Spray gloss black. LET DRY THOROUGHLY.

f. Remove all masking: clean and touch up any small imperfections with a very fine brush. By hand, paint the screw heads and rivet detail on the tail section gold, using either a toothpick or a very fine brush.

COUNTDOWN CHECKLIST

☐ **12** Pack desired payload, if any, into payload section of SANDHAWK and lock on bayonet fitting nose cone.

☐ **11** Pack six to eight squares of flameproof wadding into the body tube. Fold and pack main parachute into body tube, followed by payload parachute. Insert payload section and nose cone into body tube.

☐ **10** Insert igniter into selected engine and install engine in SANDHAWK (with EM-2050 adapter if you are not using a "D" engine).

☐ **9** Disarm launch panel and place SANDHAWK on the launcher.

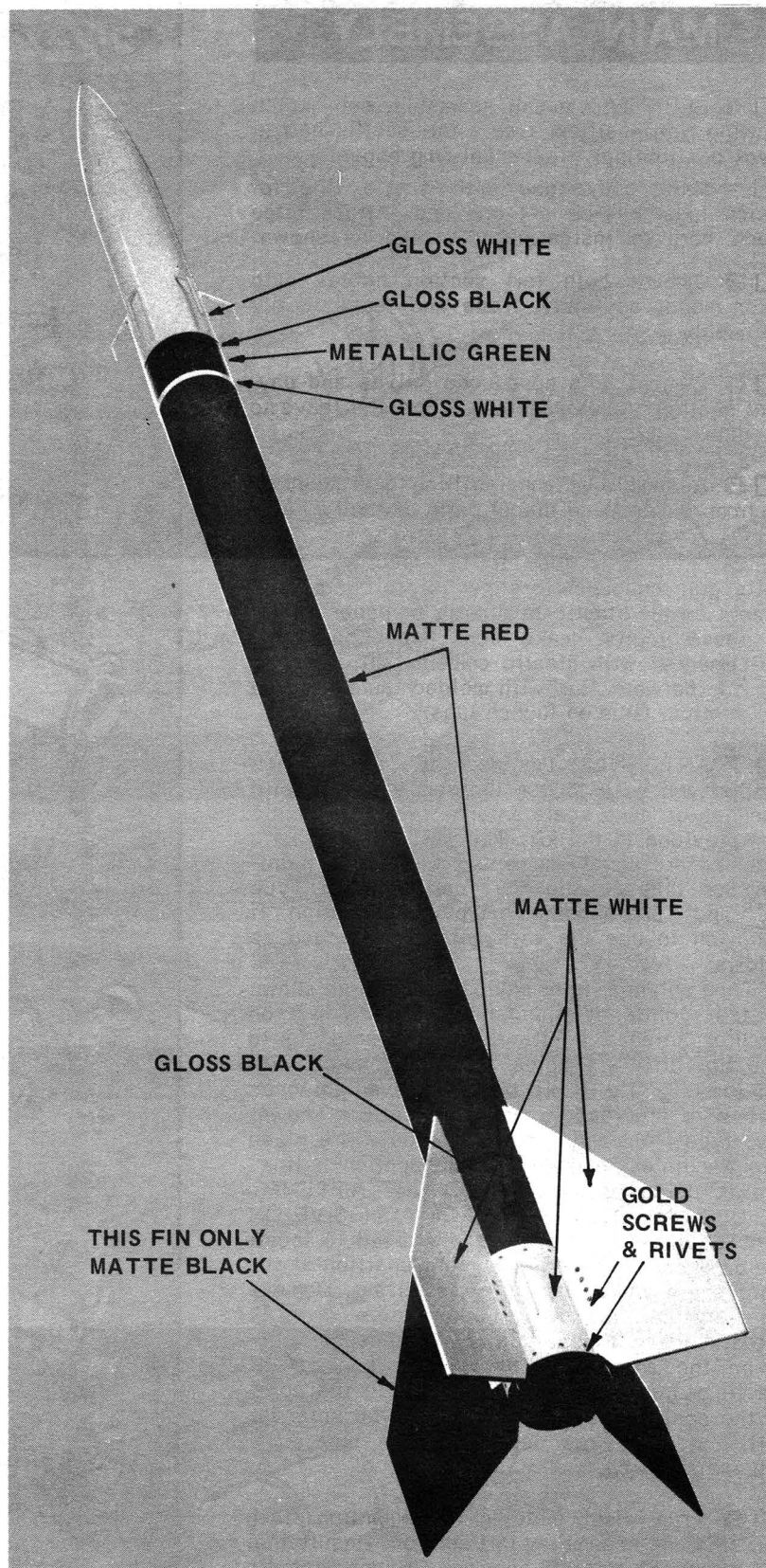
☐ **8** Clean the micro-clips and attach them to the igniter.

☐ **7** Clear the launch area.

☐ **6** Arm the launch panel.

☐ **5** ☐ **4** ☐ **3** ☐ **2** ☐ **1**

LAUNCH!



RECOMMENDED ENGINES:

B-4-2 } WITH EM-2050
C-6-3 } ADAPTER

D-13-5



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ESTES INDUSTRIES

BOX 227, PENROSE, COLO. 81240

FLIGHT PLAN SEQUENCE

Type flight plan
Plane number
Remarks
Destination
Est. time en route
Special equipment
Fuel (hrs./min.)
Est. TAS
Point of departure
Pilot's name
Proposed dep. time
Cruising altitude(s)
Route

EQUIPMENT REQUIREMENTS

X - no transponder
U - transponder with no alt. encoding capability
D - DME, no transponder
B - DME, transponder with no alt. encoding capability
M - TACAN only, no transponder
C - RNAV, transponder with no alt. encoding capability
F - RNAV, transponder with alt. encoding capability
W - RNAV, no transponder

Examples: BE-50/B, PA-30/D, C-152/U

TIME CONVERSION TO GMT (Z)

Add hrs. Add hrs.

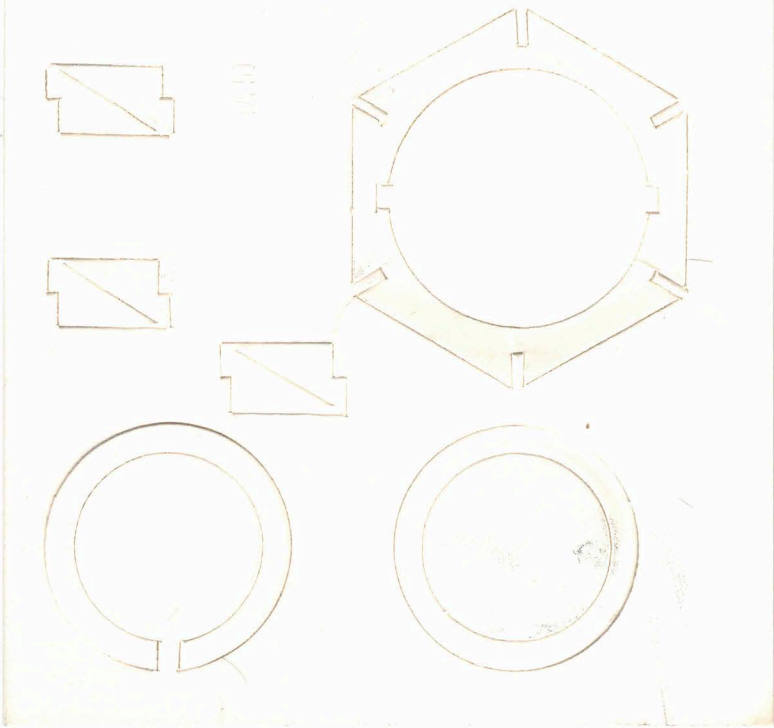
EDT...4	MDT...6
EST...5	MST...7
CDT...5	PDT...7
CST...6	PST...8

Hawaii & Alaska

MORSE CODE AND PHONETIC ALPHABET

Alfa	Sierra
Bravo	Tango
Charlie	Uniform
Delta	Victor
Echo	Whiskey
Hotel	Xray
India	Yankee
Juliett	Zulu
Kilo	
Lima	
Mike	
November	
Oscar	
Papa	
Romeo	

0 10 20 30 40 50 60 70 80 90 100 110 Fahr. Cent.



ESIES
A SUBSIDIARY OF DAMON

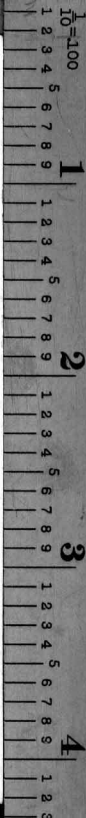
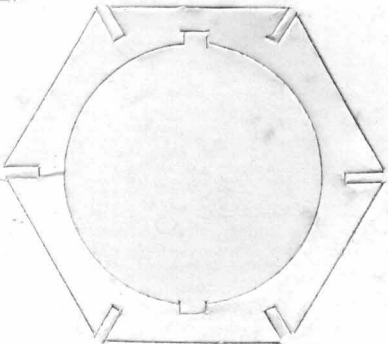
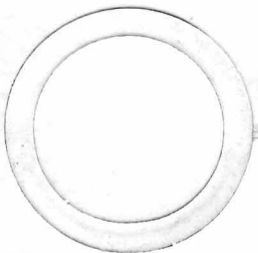
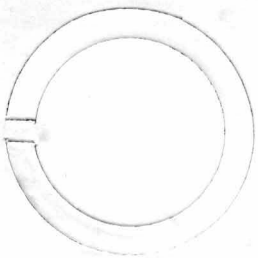
SEC. 3

SEC. 2

SEC. 1

SHOCK CORD MOUNT
SCM-50







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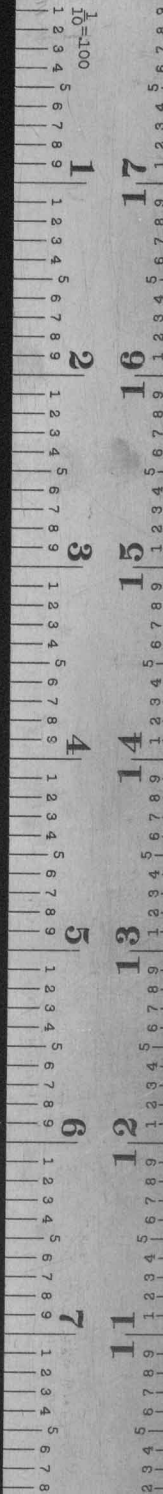
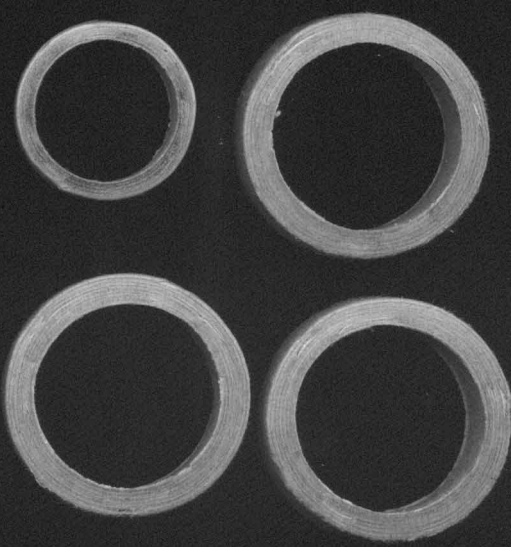
SEC. 3

SEC. 2

SEC. 1

SHOCK CORD
MOUNT

SCM-50



FLIGHT PLAN SEQUENCE

0

Type flight plan
Plane number
Remarks
Est. time en route
Destination

EQUIPMENT REQUIREMENTS

1

Route
Cruising altitude(s)
Proposed dep. time
Point of departure
Est. TAS
Special equipment
Fuel (hrs./min.)
Alternate airport
Pilot's name
Pilot's address
No. persons aboard
Plane color

X - no transponder
T - transponder with no alt. encoding capability
U - transponder with alt. encoding capability
D - DME, no transponder
B - DME, transponder with no alt. encoding capability
A - DME, transponder with alt. encoding capability
M - TACAN only, no transponder
C - RNAV, transponder with no alt. encoding capability
F - RNAV, transponder with alt. encoding capability
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Examples: BE-50/B, PA-30/D, C-152/U

TIME CONVERSION TO GMT (Z)

Add hrs.

EDT .4	MDT .6
EST .5	MST .7
CDT .5	PDT .7
CST .6	PST .8

Hawaii & Alaska .10

MORSE CODE AND PHONETIC ALPHABET

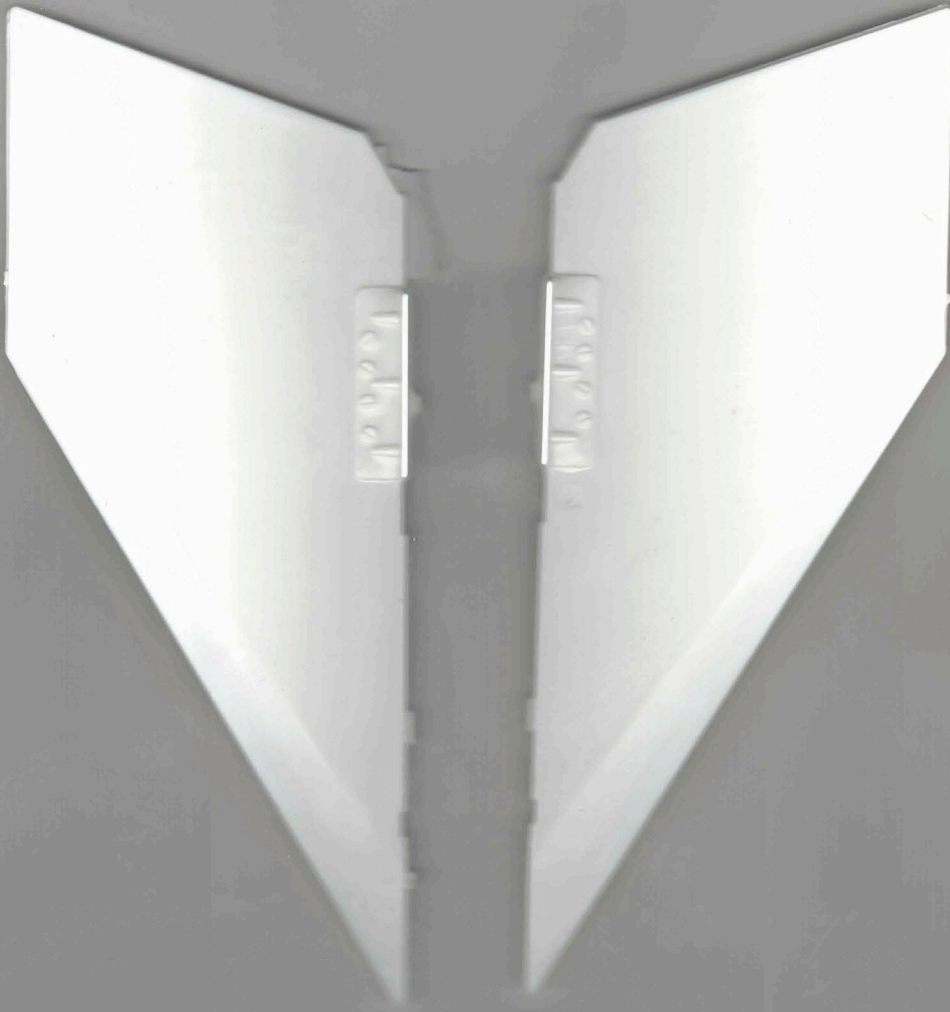
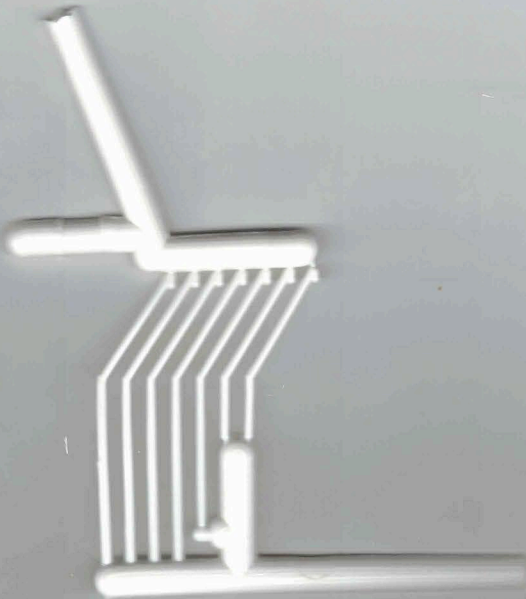
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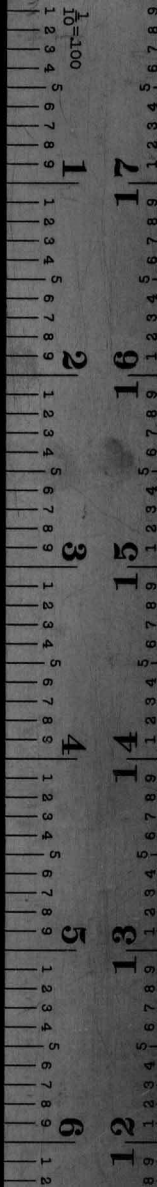
Alfa	Sierra
Bravo	Tango
Charlie	Uniform
Delta	Victor
Echo	Whiskey
Foxtrot	Xray
Golf	Yankee
Hotel	Zulu
India	1
Juliett	2
Kilo	3
Lima	4
Mike	5
November	6
Oscar	7
Papa	8
Quebec	9
Romeo	0

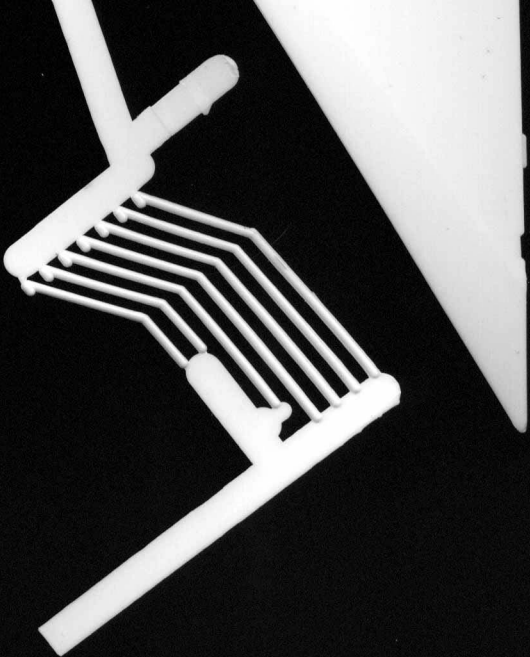
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Fahr Cent.

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20







FLIGHT PLAN SEQUENCE

0

1

2

3

4

5

6

Type flight plan

Plane number

Remarks

Special equipment

Est. TAS

Point of departure

Pilot's address

No. persons aboard

Route

Destination

Est. time en route

Plane type

Plane number

Remarks

Fuel (hrs./min.)

Alternate airport

EQUIPMENT REQUIREMENTS

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TIME CONVERSION

TO GMT (Z)

Add hrs.

MDT .6

MST .7

PDT .8

CST .9

Hawaii & Alaska .10

EDT .4

EST .5

CDT .5

PST .6

MORSE CODE AND PHONETIC ALPHABET

4

5

6

Alfa .

Bravo .

Charlie .

Delta .

Echo .

Foxtrot .

Golf .

Hotel .

India .

Kilo .

Lima .

Mike .

November .

Oscar .

Papa .

Quebec .

Romeo .

Sierra .

Tango .

Uniform .

Victor .

Whiskey .

Xray .

Yankee .

Zulu .

0

10

20

30

40

50

60

70

80

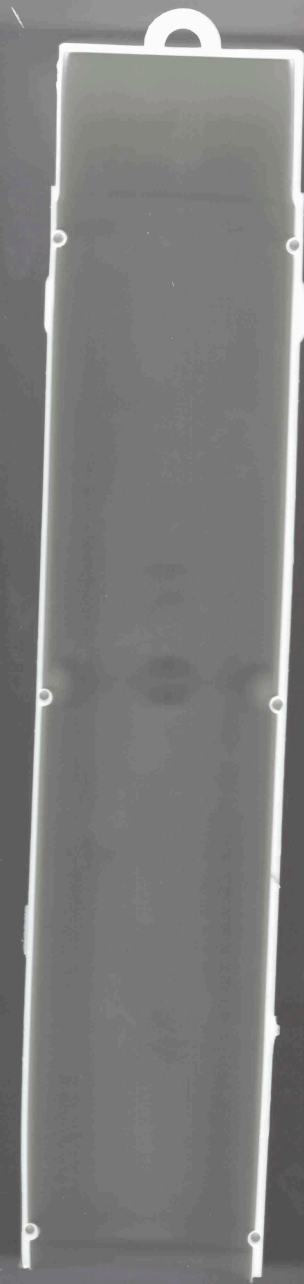
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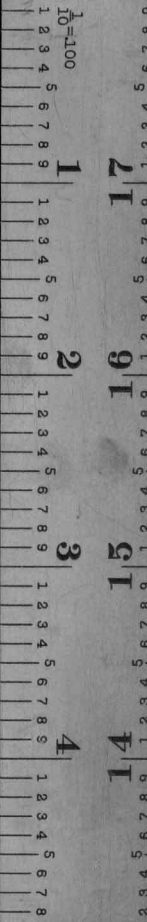
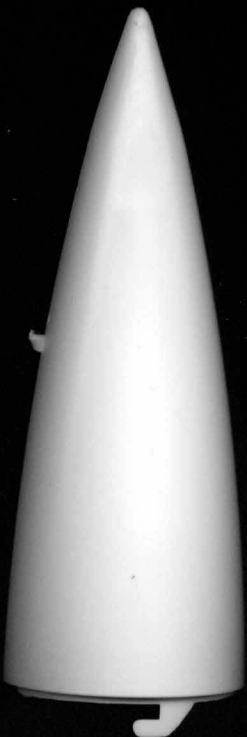
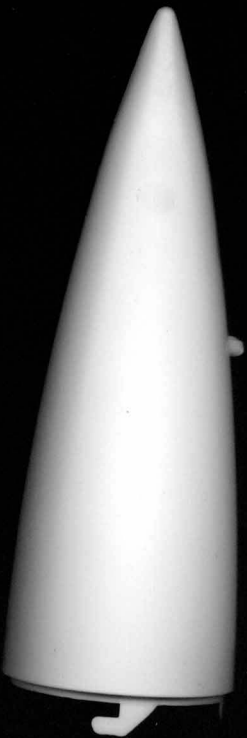
100

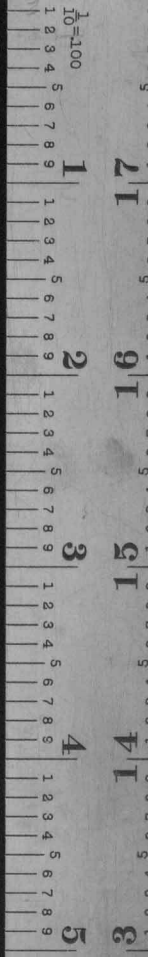
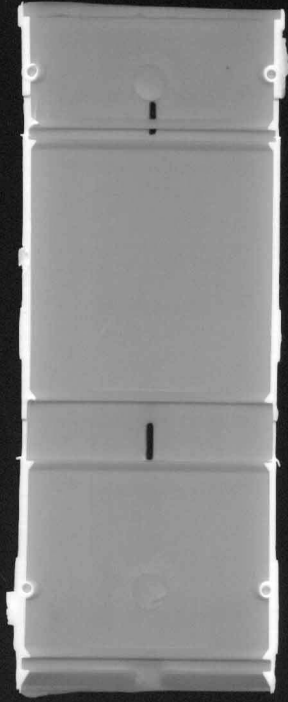
110

Fahr.

Cent.







Equipment
Departure
dep. time
altitude(s)
Remarks
Fuel (hrs./min.)
Alternate airport
Pilot's name
Pilot's address
No. persons aboard
Plane color

MENT REQUIREMENTS

Transponder
Transponder with no alt. encoding capability
Transponder with alt. encoding capability
No transponder
Transponder with no alt. encoding capability
Transponder with alt. encoding capability
only, no transponder
Transponder with no alt. encoding N
Transponder with alt. encoding capability
No transponder
E-50/B, PA-30/D, C-152/U

TIME CONVERSION TO GMT (Z)

Add	hrs.
MDT...	6
MST...	7
PDT...	8
PST...	10

Add ω hrs.



Images By: Gerry Fortin

SEMI-SCALE SANDHAWK



- SOUNDING ROCKET VEHICLE
- "D" POWERED
- HIGHLY DETAILED, SUPER SCALE MODEL
- PLASTIC PAYLOAD, NOSE CONE, & FINS
- OVER 30 INCHES TALL

SKILL LEVEL 2

1—Beginner 2—Intermediate 3—Craftsman 4—Advanced 5—Expert

SPECIFICATIONS

Length 30.1" (76.5 cm.)	Weight 5 oz. (14.2 g.)
Body Dia. 1.325" (33.7 mm.)	Parachute Recovery

RECOMMENDED ENGINES

Engines and launcher not included.
B4-2 C6-3 D12-5 Use D12-5 for first flights. Use EM-2050 adapter for other than "D" engines (adapter not included).

K-51
#1251

ESTES INDUSTRIES
PENROSE, COLO. 81240