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Product. No. 3007 Skill Level Three

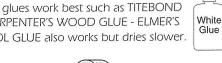


Things You'll Need To Assemble this Kit: Hobby Knife, Pencil and Razor Saw

Sandpaper (220 or 320 Grit)

White Glue

Aliphatic Resin glues work best such as TITEBOND or ELMER'S CARPENTER'S WOOD GLUE - ELMER'S WHITE SCHOOL GLUE also works but dries slower.



Tape

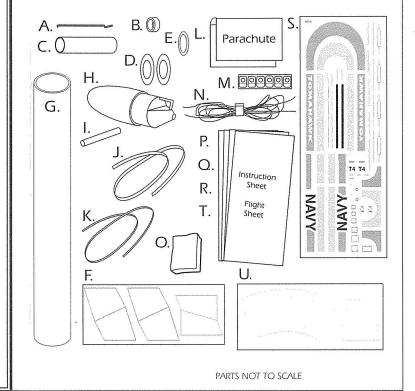
Scotch Magic Tape or Paper Masking Tape



BEFORE STARTING ASSEMBLY READ THROUGH THESE INSTRUCTIONS. IT IS BEST TO TEST FIT ALL PARTS BEFORE APPLYING ANY GLUE. READ AND FOLLOW THE NAR MODEL ROCKET SAFETY CODE.

PARTS LIST

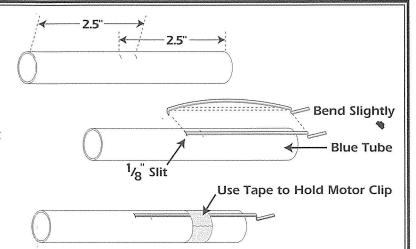
- A. 49000 Motor Clip
- B. 14000 Blue Thrust Ring
- C. 10308 Blue Motor Mount Tube
- D. 16007 Die cut Centering Rings (2)
- E. 16002 Die cut Centering Ring (1)
- F. 33024 Laser Cut Balsa Fin Set
- **G.** 11602 14.75" Body Tube
- H. 20400 Plastic Nose Cone
- I. 10001 2 inch Launch Lug
- J. 50012 24 inch White Elastic Shock Cord
- K. 50053 24 inch Yellow Kevlar
- L. 28107 14 Inch Parachute
- M. 50101 Gripper Tabs (6)
- N. 50100 Pack of 3-26 Inch Shroud Lines
- O. 49029 1/2 ounce Clay Nose Weight
- P. 90078 Instruction Sheet
- Q. 90178 Flight Sheet
- R. 90987 Scale Data Sheet
- S. 91524 Decal
- T. 90960 Launch Procedures Sheet
- U. 92309 Paper Boat Tail & Belly Air Scoop
 - * Kevlar is a registered trademark of Dupont



A. Make a pencil mark 2.5" inches from one end of the Blue Motor Mount Tube.

B. Make a second pencil mark 2.5 inches from the other end of the Blue Motor Mount Tube.

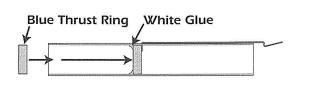
C. Use a sharp hobby knife to make a small 1/8" slit in the side of the Blue Motor Mount Tube at one of the pencil marks you made.



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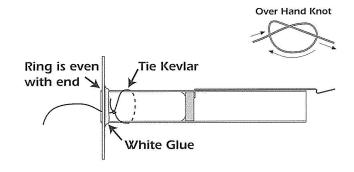
9

- **A.** Push the Blue Thrust Ring into the Blue Motor Mount Tube until it presses against the Motor Clip as shown.
- **B.** Use a stick to apply a bead of white glue all the way around the Blue Thrust Ring.



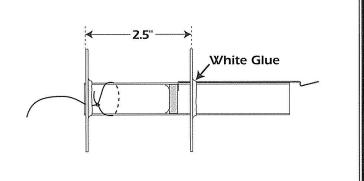
STEP 3

- **A.** Use two overhand knots to tie the Yellow Kevlar Shock Cord around the Blue Motor Mount Tube as shown.
- **B.** Apply a bead of white glue around the end of the Blue Motor Mount Tube as shown.
- **C.** Pass the Yellow Kevlar Shock Cord through the second paper centering ring. Slide the ring onto the Blue Motor Mount Tube so it is even with the end of the tube.



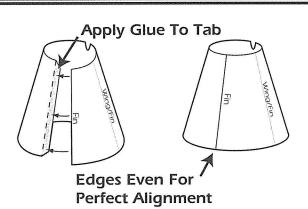
STEP 4

- **A.** Slide one of the paper centering rings onto the Blue Motor Mount Tube. Align the ring with the pencil mark 2.5 inches from the end.
- **B.** Apply a bead of white glue around the ring/tube joint. Re-check the alignment of the ring and the 2.5 inch measurement.
- **C.** Check alignment of both rings and allow to dry.



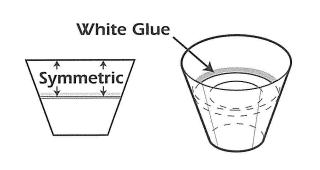
STEP 5

- A. Use a sharp hobby knife to cut out the Paper Boat Tail.
- B. Pre-form the Boat Tail by gently curling it.
- **C.** Apply a thin layer of white glue to the Boat Tail. Place the two ends together for just a moment and then allow them to come back apart.
- **D.** Allow the glue to set for one minute, then reform the two ends together and hold in position until the glue sets.



STEP 6

- **A.** After the Boat Tail is dry, test fit the small round centering ring into it.
- **B**. Check the ring to be sure it is aligned symmetric and even from the end all the way around.
- **C.** Apply a small bead of white glue around the ring/boat tail joint.

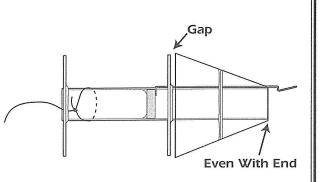


A. Test fit the Boat Tail onto the Blue Motor Mount Tube. Align the Motor Clip with the exit slot in the Boat Tail. The edge of the Boat Tail should be even with the end of the Blue Motor Mount. Remove.

NOTE: There should be a slight gap between the edge of the Boat Tail and the Black Centering Ring.

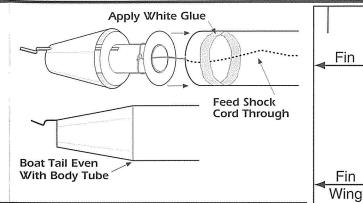
B. Apply a very small amount of white glue around the end of the Blue Motor Mount Tube.

C. Re-position the Boat Tail onto the Blue Motor Mount Tube realigning everything as you did in Part A. Wipe away any excess glue.



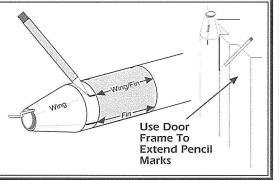
STEP 8

- **A.** "Feed" the Yellow Kevlar shock cord attached to the mote mount/bond tail assembly into the White body tube until the cord comes out the other end of the white tube.
- **B.** Apply white glue around the inside of the White body tult as shown.
- **C.** Immediately insert the motor mount/bond tail assembly ir the White body tube and PUSH INTO THE BODY TUBE WITH ONE FAST & SMOOTH MOTION.



STEP 2

- **A.** Cut out the tube marking guide from this page of the instruction sheet.
- **B.** Wrap the tube marking guide around the body tube. Align the arrow marked "wing" with the line on the boat tail marked "wing Mark the body tube at each of the arrows with a pencil.
- **C.** Use a door frame as a guide and extend each of the pencil ma 8 inches up from the rear of the body tube.

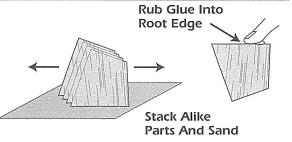


Fin

Fin Wing

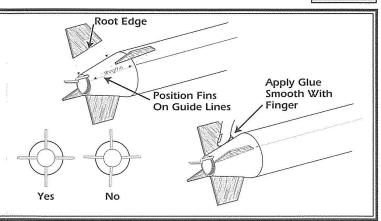
STEP 10

- **A.** Carefully remove each of the laser-cut balsa parts from the sheet with a sharp hobby knife.
- **B.** Stack alike parts together and sand all edges smooth.
- **C.** Rub a small line of white glue into the root edge of each fin or wing and set aside to dry.



STEP 11

- **A.** Apply a small line of white glue along the root edge of a fin and position it along one of the fin lines on the boat tail. Adjust the fin so that it projects straight away from the boat tail as shown. Allow the glue to set from a few minutes before attempting to glue on the remaining fins. Repeat this step for the remaining fins.
- **B.** After the glue is completely dry apply a small bead of white glue to both sides of a fin boat tail tube joint. Smooth out the glue with your finger. Wipe excess glue off your finger onto a tissue or paper towel.

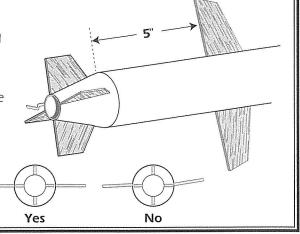


A. Make a pencil mark on both wing lines 5 inches from the tube/boat tail joint.

B. Apply a small line of white glue along the root edge of a wing and position it along one of the wing lines with the trailing edge even with the mark you made in Part A. Adjust the wing so that it projects straight away from the body tube as shown.

C. After the glue has set on the first wing, repeat **A** & **B** for the remaining wing.

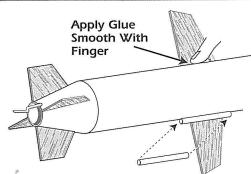
NOTE: THE WINGS MUST BE ALIGNED STRAIGHT FOR GOOD FLIGHT PERFORMANCE.



STEP 13

A. After the glue is completely dry apply a small bead of white glue to both sides of a wing-body tube joint. Smooth out the glue with your finger. Wipe excess glue off your finger onto a tissue or paper towel.

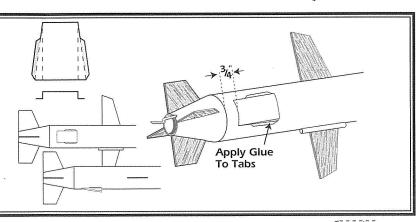
B. Apply white glue to the launch lug and place it along the underside of one of the wing/body tube joints.



STEP 14

A. Use a sharp hobby knife to cut out the belly air scoop. Fold as shown.

B. Apply white glue to the two glue tabs and position the air scoop along the belly of the model 3/4 inch forward of the tube/boat tail joint and centered between two fins as shown.

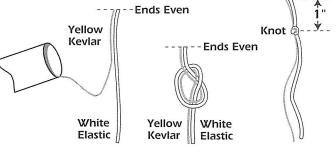


STEP 15

A. Hold the Yellow Kevlar Shock Cord and the White Elastic Shock Cord side by side. Pull one end of each cord so that they are even with each other. White holding the two cords together, tie a single parallel overhand knot approximately one inch in from the even ends as shown.

B. Gently pull on both cords to set the knot and prevent it from slipping.

C. Apply a small amount of white glue on the ends of both cords to prevent them from fraying.

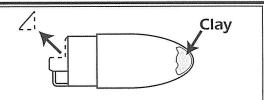


NOTE: THIS IS A VERY IMPORTANT STEP. IF YOU TIE A DIFFERENT TYPE OF KNOT THE SHOCK CORDS MAY SEPARATE DURING FLIGHT.

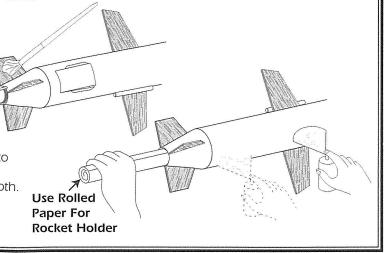
STEP 16

A. Use a hobby razor saw to cut an opening in the nose cone as shown.

B. Use the eraser end of a pencil to firmly push all of the clay nose weight into the tip of the nose cone.

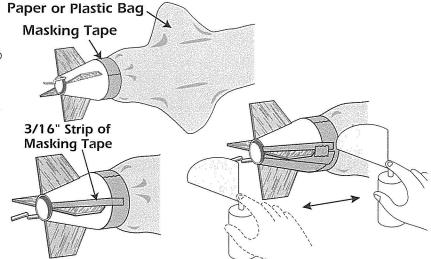


- **A**. After the glue is completely dry apply a coat of sanding sealer to each fin & wing. When sealer is dry, lightly sand each fin & wing.
- **B.** Repeat the sealing and sanding process until the surface of each fin & wing is smooth.
- **C.** Paint the entire rocket body and fins with spray primer. Follow instructions on the spray can for best results. Allow to dry completely then lightly sand all surfaces. Repeat the spraying and sanding process until the entire rocket is smooth.
- **D.** Paint the entire rocket with gloss white spray enamel. Follow instructions on the spray can for best results.



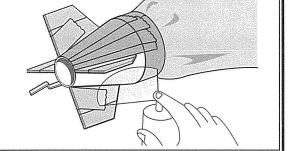
STEP 18

- **A**. After the gloss white spray enamel is completely dry, cover the body tube and wings with paper or a plastic bag. Apply masking tape to the edge of the paper or plastic bag and even with the boat tail.
- **B.** Cut a 3/16" strip of masking tape with a hobby knife. Apply the strip of tape even with the top of the left and right fins.
- **C.** Cover the exposed portion of the boat tail below the 3/16" strip with masking tape, leaving all four fins exposed.
- **D.** Paint the top half of the boat tail and the fins with gloss red spray enamel.



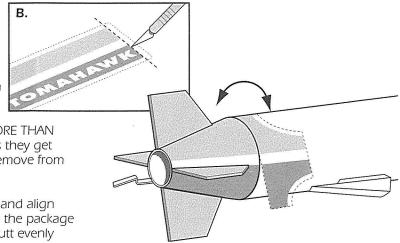
STEP 19

- **A**. After the gloss red spray enamel is completely dry, remove the masking tape from the bottom half of the boat tail. Leave the 3/16" strip of masking tape (Step 18B.) in place.
- B. Cover the fins and the top half of the boat tail with masking tape.
- C. Paint the bottom half of the boat tail with gloss blue spray enamel.

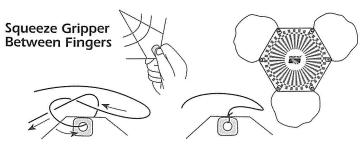


STEP 20

- **A**. After all paint is completely dry, remove all masking tape and the paper or plastic bag covering the rocket.
- **B.** Use scissors to cut out decals. Trim decals even with image where decals meet another decal or line up even with the boat tail, wing or launch lug.
- **C.** Place decals in luke-warm water. DO NOT PLACE MORE THAN ONE DECAL AT A TIME IN WATER! The decals will curl as they get wet. When they start to uncurl (aprox.20-30 seconds) remove from water and slip from backing into position on rocket.
- **D.** Apply first decal even with Boat Tail/Body Tube joint and align with red and blue painted surfaces. Using the photo on the package front as a guide apply each consecutive decal so they butt evenly against each other and do not overlap.



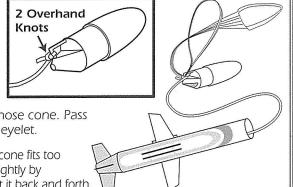
- A. Apply gripper tabs to parachute so holes in gripper tabs line up with holes in parachute. Firmly squeeze each gripper tab and parachute between your fingers.
- B. Assemble the parachute by passing the end of a shroud line through a hole in a gripper tab and tying 2 overhand knots. Tie each of the 6 ends of shroud line to the parachute through the gripper tab holes.
- **C.** Assembled parachute should appear as shown.



Tie 2 Over Hand Knots Through Each Gripper

STEP 22

- A. Remove any excess plastic from inside the molded eyelet in the nose cone using a sharp hobby knife.
- B. Use two overhand knots to tie the loose end of the shock cord onto the eyelet in the nose cone.
- C. Pass the shroud line loops of the parachute through the eyelet on the nose cone. Pass the parachute through the loop ends and pull lines tightly against the eyelet.
- **D.** The nose cone should fit snug but not too tight into the body tube. If the nose cone fits too tight, sand the shoulder to loosen the fit or stretch the end of the body tube slightly by inserting the pointed end of the nose cone into the body tube and gently twist it back and forth.



FLYING YOUR TOMAHAWK SLCM CRUISE MISSILE™ ROCKET

WHAT ELSE YOU WILL NEED

To successfully fly your rocket you will need the following items:

- QUEST Lift-Off Launch Pad (No. 7610)
- QUEST Futuristic Launch Controller (No. 7510)
- QUEST Parachute Recovery Wadding (No. 7021)
- QUEST Rocket Motors, Type B6-2, B6-4, C6-3, C6-5
- Use a B6-4 Motor for your first flights.

ESTIMATED ALTITUDES

The following is a guide to assist you in determining which motor to use based on the wind conditions and size of flying field available.

MOTOR

ESTIMATED ALTITUDE

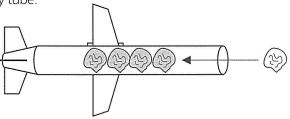
B6-4

280 FEET

600 FEET C6-5

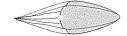
PREPPING YOUR ROCKET FOR FLIGHT STEP 1

Pull the shock cord all the way out of the body tube. Crumple five sheets of recovery wadding and insert one by one into the body tube making sure that the Knot between the Kevlar and white elastic shock cord is on the nose cone side of the wadding. Wadding should fit loosely in the tube but tight enough to form a good seal against the wall of the body tube.



STEP 2

- **A.** Grab the parachute at its center and allow the rocket to hang from it. The weight of the rocket will pull the parachute into several triangular shapes.
- Gather the triangles together into one flat triangle.
- **C.** Fold the top of the parachute down over itself once.
- **D.** Now continue to roll the parachute over itself and roll the shroud lines around it.







STEP 3

- Pack the parachute into the body tube. THE PARACHUTE MUST SLIDE EASILY INTO THE TUBE.
- If it is a tight fit, remove and re-fold the parachute.

 TIP: LIGHTLY DUST YOUR PARACHUTE WITH TALCUM OR BABY POWDER TO KEEP IT FROM DEVELOPING A SET SHAPE. THIS TECHNIQUE IS ESPECIALLY EFFECTIVE IF THE WEATHER IS HOT AND HUMID OR
- B. Push the shock cord into the tube and re-fit the payload Section onto the rocket. BE CAREFUL NOT TO CATCH ANY OF THE SHOCK CORD BETWEEN THE SHOULDER OF THE PAYLOAD SECTION AND THE BODY TUBE. IF PAYLOAD SECTION FIT IS TOO LOOSE, ADD TAPE TO THE SHOULDER.

READ AND FOLLOW THE N.A.R. SAFETY CODE **DURING ALL YOUR MODEL ROCKETRY ACTIVITIES.**



Manufactured by: QUEST AEROSPACE, INC. 6012 E. Hidden Valley Dr. Cave Creek, AZ 85331-8555 90178



SCALE DATA SHEET The Tomahawk Cruise Missile (BGM-109C/D)

The Tomahawk Cruise Missile (BGM-109 or Boosted Guided Missile model 109) is a very accurate, unmanned, expendable, subsonic airplane for delivering munitions at more than 700 miles per hour to a target more than 900 miles (1,458 kilometers) from its launching point. It may be launched from either surface ships or submarines. Other variants have been launched from land and from B-52 bombers.

During Operation Desert Storm in 1991, 288 land attack Tomahawks were launched from U. S. Navy cruisers, destroyers, battle-ships, and submarines against Iraqi targets such as command and control centers, enemy missile sites, and other military targets. In the opening moments of the Gulf War, Tomahawks preceded the F-117 stealth fighters in attacking and destroying the central intelligence facility in Baghdad, key communications buildings, and the buildings occupied by the Iraqi ministry of defense. Tomahawks were reported flying down the middle of the Baghdad streets on their way to their targets.

On June 26, 1993, an additional 23 Tomahawks were launched against the Iraqi central intelligence headquarters.

Two types of Tomahawks were used in the Persian Gulf. The BGM-109C land attack version carries a single 1,000 pound high explosive warhead. The BGM-109D version scatters 166 individual bomblets, each the size of a soft drink can, that are effective against aircraft parked on taxiways or in revetments as well as Scud missile storage sites.

From the wings aft, all Tomahawk versions are nearly identical. Weight varies from 3,435 pounds for the ship-launched C version to 3,300 pounds for the submarine launched version. The missile is highly modular in construction. It is about 18 feet long and 21 inches in diameter, the same diameter as a standard U.S. Navy submarine torpedo. Thus, the Tomahawk is an effective strategic missile that can be launched from a submerged submarine off an enemy coast and reach inland targets. The submarine launched Tomahawk was an additional strategic weapon whose existence helped bring about the end of the Cold War because any submarine could become a missile launcher.

When launched from a submarine torpedo tube, a canister on the deck of a surface ship, or a vertical launcher on a naval vessel, the Tomahawk's wing and tail fins are folded against the body. They pop out after leaving the launch tube. Initial boost is provided by a solid propellant rocket motor manufactured by both Atlantic Research Corporation in Virginia and United Technologies Chemical Systems Division in San Jose, California. This motor produces a thrust of 6,000 pounds for 12 seconds, propelling the Tomahawk clear of its launcher. Then the four tail fins unfold, the wings swing out, the jet engine intake extends from the belly, and the jet engine starts. Propulsion during flight is provided by a Williams International F107WR-400 turbofan jet engine producing about 600 pounds of thrust.

The heart of the Tomahawk Cruise Missile is its quidance and control computers and

equipment, giving it accuracy formerly unheard-of. Its TERCOM guidance system is preprogrammed before launching and navigates the missile along a ground track to its target. The on-board system matches what the missile "sees" on the ground using radar and other sensors, then compares this against the navigation data stored in its on-board computer, the output of an inertial positioning system, and (in recent models) data from the Global Positioning Satellite system. The B version Tomahawk is capable of flying a search pattern looking for an enemy warship to attack. Accuracy is so good that, at the end of a 900mile flight, the Tomahawk can fly between the goal posts of an ordinary football field.

Special highly classified technology is used to make the Tomahawk Cruise Missiles very "stealthy" to missile defense radars and air-launched heat-seeking missiles.

A Tomahawk costs about one million dollars, a bargain compared to using a bombcarrying \$50 million fighter-bomber flown by a pilot whose training costs more than several million dollars.

Tomahawks are presently manufactured by the Hughes Missile Systems Company in Tucson, Arizona.

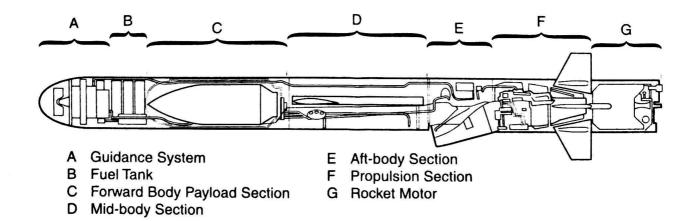
Sources and References

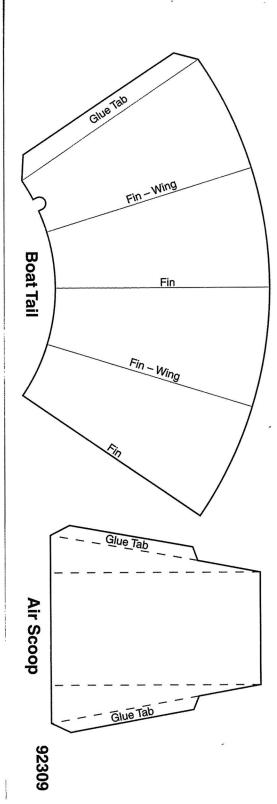
Werrell, Dr. Kenneth, *The Evolution of the Cruise Missile*, Radford University, Virginia.

Macknight, Nigel, *Tomahawk Cruise Missile*, Osceola WI, Motorbooks International Publishers and Wholesalers, 1995, ISBN 0-87938-717-3.

Chadwick, Frank, *Gulf War Fact Book,* Bloomington IL, GDW, Inc., 1991. ISBN 1-55878-094-7.

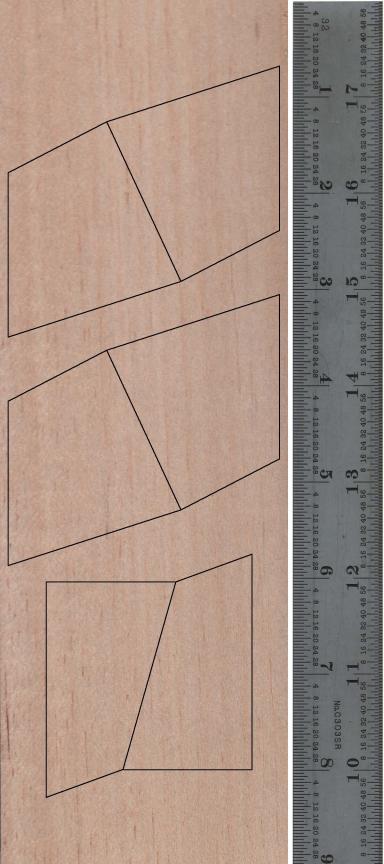
Various unclassified brochures and documents, Hughes Missile Systems Company, Tucson AZ.





25cm

NAVY NAV TOMAHAWK TOMAHAWK 25cm 91524



N.A.R MODEL ROCKET SAFETY CODE

Approved February 10, 2001

- **1. MATERIALS.** I will use only lightweight, non-metal parts for the nose, body, and fins of my rocket.
- **2. MOTORS.** I will use only certified, commercially-made model rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer.
- **3. IGNITION SYSTEM.** I will launch my rockets with an electrical launch system and electrical motor igniters. My launch system will have a safety interlock in series with the launch switch, and will use a launch switch that returns to the "off" position when released.
- **4. MISFIRES.** If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.
- **5. LAUNCH SAFETY.** I will use a countdown before launch, and will ensure that everyone is paying attention and is a safe distance of at least 15 feet away when I launch rockets with D motors or smaller, and 30 feet when I launch larger rockets. If I am uncertain about the safety or stability of an untested rocket, I will check the stability before flight and will fly it only after warning spectators and clearing them away to a safe distance.
- **6. LAUNCHER.** I will launch my rocket from a launch rod, tower, or rail that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up, and I will use a blast deflector to prevent the motor's exhaust from hitting the ground. To prevent accidental eye injury, I will place launchers so that the end of the launch rod is above eye level or will cap the end of the rod when it is not in use.
- **7. SIZE.** My model rocket will not weigh more than 1500 grams (53 ounces) at liftoff and will not contain more than 125 grams (4.4 ounces) of propellant or 320 N-sec (71.9 pound-seconds) of total impulse. If my model rocket weighs more than one pound (453 grams) at liftoff or has more than 4 ounces (113 grams) of propellant, I will check and comply with Federal Aviation Administration regulations before flying.
- **8. FLIGHT SAFETY.** I will not launch my rocket at targets, into clouds, or near airplanes, and will not put any flammable or explosive payload in my rocket.
- **9. LAUNCH SITE.** I will launch my rocket outdoors, in an open area at least as large as shown in the accompanying table, and in safe weather conditions with wind speeds no greater than 20 miles per hour. I will ensure that there is no dry grass close to the launch pad, and that the launch site does not present risk of grass fires.

LAUNCH SITE DIMENSIONS

D torter site			
Installed Total Impulse (N-sec)	Equivalent Motor Type	Minimum Site Dimensions (ft)	
0.00 - 1.25	1/4A, 1/2A	50	
1.26 - 2.50	Α	100	
2.51 - 5.00	В	200	
5.01 - 10.00	C	400	
10.01 - 20.00	D	500	
20.01 - 40.00	Е	1,000	
40.01 - 80.00	F	1,000	
80.01 - 160.00	G	1,000	
160.01 - 320.00	Two G's	1,500	

- **10. RECOVERY SYSTEM.** I will use a recovery system such as a streamer or parachute in my rocket so that it returns safely and undamaged and can be flown again, and I will use only flameresistant or fireproof recovery system wadding in my rocket.
- **11. RECOVERY SAFETY.** I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places.



Manufactured by:
QUEST AEROSPACE, INC.
P.O. Box 2409
Pagosa Springs, CO 81147
800-858-7302
www.questaerospace.com



Manufactured by: QUEST AEROSPACE, INC. P.O. Box 2409 Pagosa Springs, CO 81147 800-858-7302 www.questaerospace.com

LAUNCH PROCEDURES

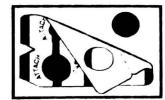
IGNITER INSTALLATION INSTRUCTIONS

Launch your model rockets by electrical means only. Use a Quest Launch Controller and Tiger Tail II igniters. Install Tiger Tail II Igniter carefully, following these instructions.

STEP 1

Remove Tiger Tail sticker from backing sheet.

Leave "dots" behind on sheet.

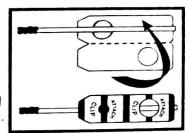


STEP 2

Center the copper igniter wire over the hole.

Fold Tiger Tail sticker over the igniter wire.

Be sure igniter wire is centered and visible through both holes.



STEP 3

Place black coated end of the igniter wire into the motor nozzle as far as it will go. Black igniter tip MUST TOUCH the bottom of the nozzle or motor will not ignite.



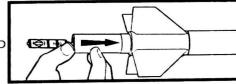
STEP 4

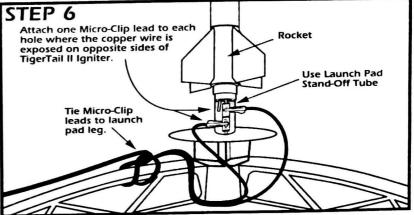
Push the plastic Tiger Tac into nozzle as far as it will go.



STEP 5

Insert rocket motor into rocket's motor mount.





IMPORTANT: To Avoid a potential Short Circuit and / or Misfire DO NOT Clamp Micro Clips too Tightly to the TigerTail II Igniter

NOTE: If you are using a different brainal rocket finds, and the figerflac does not it end the models substitute the figer fail with a $1^{+}\times 1^{-}$ square of recovery wadding crumpled into a small buill and purplied into the motor rockle with a pen or penal up to hold igniter wire in place.

Item	Comment
A. 49000 Motor Clip	ok
B. 14000 Blue Thrust Ring	ok
C. 10308 Blue Motor Mount Tube	4.75"
D. 16007 Die- cut Centering Rings (2)	ok
E. 16002 Die - cut Centering Ring (1)	18mm ID, 33mm OD,
F. 33024 Laser- Cut Balsa Fin Set	1/8"
G. 11602 14.75" Body Tube	ok
H. 20400 Plastic Nose Cone	specs on Quest website
I. 10001 2 inch Launch Lug	ok
J. 50012 24 inch White Elastic Shock Cord	1/8" x 24" Elastic
K. 50053 24 inch Yellow Kevlar	1 mm
L. 28107 14 Inch Parachute	ok
M. 50101 Gripper Tabs (6)	ok
N. 50100 Pack of 3-26 Inch Shroud Lines	ok
O. 49029 1 /2 ounce Clay Nose Weight	ok
P. 90078 Instruction Sheet	ok
Q. 90178 Flight Sheet	ok
R. 90987 Scale Data Sheet	ok
S. 91524 Decal	ok
T. 90960 Launch Procedures Sheet	ok
U. 92309 Paper Boat Tail & Belly Air Scoop	ok

