HYBRID™ 54/1280 3-JET TURBO™ MOTOR ASSEMBLY AND OPERATION INSTRUCTIONS

READ THIS BEFORE YOU BEGIN:

• Study the illustrations and sequence of assembly. THE SEQUENCE OF ASSEMBLY IS EXTREMELY IMPORTANT. READ ALL INSTRUCTIONS BEFORE USE. USE RMS/HYBRID™ MOTORS ONLY IN ACCORDANCE WITH ALL INSTRUCTIONS. USE ONLY ARMS/HYBRID™ PARTS TO REFURBISH YOUR RMS/HYBRID™ MOTOR.

DO NOT USE ANY PARTS OF THE RMS/HYBRID™ SYSTEM THAT ARE DAMAGED IN ANY WAY, ESPECIALLY THE FORWARD CYLINDER PIN VALVE ASSEMBLY. If in doubt, contact AeroTech™ at the number above for assistance. If ANY PARTS ARE MISSING OR DAMAGED, CONTACT AeroTech™ IMMEDIATELY.

DO NOT MODIFY THE MOTOR IN ANY WAY. Modification of the motor, flight cylinder or release kit parts could result in motor failure, lead to the destruction of both your rocket and motor and may cause personal injury, death and/or property damage. Modification of the motor, flight cylinder or release kit in any way will void your warranty.

DO NOT USE ORDINARY “PAINTBALL” CYLINDERS AND VALVES IN THE RMS/HYBRID™ MOTOR SYSTEM. Commonly available paintball cylinders are designated for use with carbon dioxide (CO2) and are not suitable for use with N2O. Cylinders intended for N2O should be certified as “oxygen clean” to prevent ignition of contained parts. “Paintball” valve cylinders use combustion by-products which have been shown to ignite in the presence of burning liquid N2O, and are not able to deliver sufficient quantities of N2O into the combustion chamber to produce designed motor thrust levels.

NEVER USE PETROLEUM-BASED GREASES OR OILS ON THE FLIGHT CYLINDER, CYLINDER VALVE, ASSEMBLY, CYLINDER FILLING ADAPTER, AND ATTACHING OR JOINING PARTS OF THE RMS/HYBRID™ FORWARD CLOSURE ASSEMBLY. Use only recommended RMS/HYBRID™ Greases and Oils. Flight cylinders are designed to operate in oxygen systems in these areas. Ordinary greases are susceptible to spontaneous ignition and/or explosion when exposed to pressurized liquid N2O. The only exception to this is that petroleum-based grease is acceptable for use in the N2O preheater charge well of the RMS/Hybrid™ forward closure.

DO NOT ATTEMPT TO REMOVE THE PIN VALVE ASSEMBLY FROM THE FLIGHT CYLINDER WITH OR REMOVE THE PRESSURE RELIEF VALVE ON THE CYLINDER VALVE ASSEMBLY. Tampering with or removal of these parts could lead to a dangerous condition, possibly resulting in serious injury or death.

DO NOT FILL THE FLIGHT CYLINDER BOTTLE WITH A FORMER THAN THE RATED CAPACITY OF THE CYLINDER. Overfilling the flight cylinder bottle with N2O may cause the flight cylinder bottle to burst violently without warning at certain elevated temperatures.

USE ONLY AEROTECH™ RMS/HYBRID™ RELOAD KITS AND MOTOR PARTS TO REFURBISH YOUR RMS/HYBRID™ MOTOR. The AeroTech™ RMS/Hybrid™ Reload kits that have been approved for use in your particular Aerotech™ RMS/Hybrid™ motor. Use of imitation components may destroy your motor, motor parts, and will void your warranty. Only use AeroTech™ RMS/Hybrid™ Reload kits that are identical to the original equipment manufacturer’s (OEM) counterparts. DO NOT CHANGE OR REPLACE ANY PARTS OF THE RMS/HYBRID™ RELOAD KIT. This includes the fuel grains, liner, nozzle and o-rings. These components have been designed for one use only and must be discarded after firing. Reuse can result in motor failure during subsequent operation and will invalidate your warranty.

Motors are not hot after firing. Although the replaceable RMS/Hybrid™ motor operates at a lower temperature than most solid-propellant rockets, the high thermal conductivity of the aluminum motor parts may make it feel as hot as an aluminum can. Handling a motor before it has cooled down, can draw a rag or similar means.

Read and follow the safety code of the Tripoli Rocketry Association (TRA) and comply with all federal, state and local laws, regulations and ordinances in all activities involving high power rockets.

PARTS:

RMS/HYBRID™ 54/1280 TURBO™ RELOADABLE HYBRID MOTOR SYSTEM:

RMS™-54 aft closure 1
RMS™-54/1280 case 1
RMS/Hybrid™ forward closure with injector plate assembly (3 jet) 1
RMS™-64 aft closure 1
RMS™-64/1280 case 1
Pyrovalve™ retainer screw 1

RMS/HYBRID™ RELOADABLE HYBRID MOTOR SYSTEM ACCESSORIES:

Pyrovalve™ retainer hex key wrench (3/32") 1
Pyrovalve™ injector plate hex key wrench (3/8") 1
Krytox™ Fluorocarbon grease (syringe or 2 oz tube) 1
Ohaus® #LS5000 5000 gram electronic balance 1
Ohaus® #51055-00 500 gram calibration weight 1

RMS/HYBRID™ SUET KASHIW™ RELOAD KIT:

Nozzle (Large black plastic part) 1
Turbo™ fuel grains (0.285” long solid propellant grains) 3
Turbo™ fuel grains (0.078” long solid propellant grains) 3
Turbo™ fuel grains (0.10” X 1/8” long solid propellant grains) 3
Fed & aft o-rings (1/8" thick 2 x 2" O.D. white disk) 1
Pyrovalve™ teflon separator disk (0.001” thick 2 x 2” O.D. white disk) 1

Chapter 2. Pyrovalve™ Forward Closure Preparation

1. Insert the Pyrovalve™ teflon separator disk (0.010” thick) for any holes, cuts or other defects.
2. Apply a light coat of Krytox grease to the Pyrovalve™ (0.332” X 5/8” O.D.) o-ring. Place the o-ring in the groove in the bottom of the Pyrovalve™ element.
3. Insert the Pyrovalve™ element (short, black block) 5/8” O.D. (1” long) into the Pyrovalve™ element holder (1-1/8” O.D. 1” long tube)

WARNING: DO NOT use petroleum grease on the Pyrovalve™ or any inside threads or surfaces of the RMS/Hybrid™ forward closure. Ordinary greases used in these areas are susceptible to spontaneous ignition and/or explosion when exposed to pressurized nitrous oxide.

4. Insert the Pyrovalve™ teflon separator disk (white 6/8” O.D. X 1/2” thick) for any holes, cuts or other defects.
5. Apply a light coat of Krytox grease to the Pyrovalve™ element (short, black block) 5/8” O.D. (1/4” thick) for chips, cracks or other defects. Check the structural integrity of the Pyrovalve™ element by grasping with the thumb and forefinger of both hands and flexing the element back and forth with moderate force.

6. Install the separator disk into the Pyrovalve™ charge well, seated against the Pyrovalve™ o-ring
7. Insert the Pyrovalve™ element (short, black block) 5/8” O.D. (1/4” thick) for chips, cracks or other defects. Check the structural integrity of the Pyrovalve™ element by grasping with the thumb and forefinger of both hands and flexing the element back and forth with moderate force.

Chapter 3. Combustion Chamber Assembly

1. Apply a light coat of petroleum-based grease to all casing threads and cover o-rings. Apply graphite to all casing threads and cover o-rings. This will facilitate assembly and prevents the threads from seizing.

Using your fingernail or other blunt object, remove the burr (rough, raised ledge) from both inlets of the liner tube (2” O.D. X 1/8” I.D. orange paper tube).
Chapter 5. Igniter Construction & Installation

CAUTION: Igniter installation in RMS/Hybrid™ motors loaded with Turbo™ reloads should be performed at the launch pad or in a designated "safe area". Motors loaded with Turbo™ reloads are potentially propulsive even without the N2O cylinder attached.

5-1. Using a hobby knife, slice a 1/8" vent hole in the edge of the nozzle cap (igniter holder (1-1/4" ID, red plastic cap). Set the vented nozzle cap igniter holder aside.

5-2. Insert the stripped end of the electric match igniter through the igniter support tube (1/4" O.D. x 1/8" long mylar tube) until the match head protrudes from the tube approximately 1/4".

5-3. Wrap a short piece of 3M wide masking tape around the head end of the electric match igniter at an angle, forming a "tapered cone" about 1/4" in diameter at the tip. Fill the cone with black powder to about 1/8" from the end. Pinch the top of this cone together with your fingers to press in the black powder from leaking out. Gently pull on the electric match leads until the finished cone rests against the end of the igniter support tube. It should protrude above the tube about 1/4". The end of the igniter guide tube should be 54/1280 3-Jet Turbo™ CONFIGURATION RELOAD KIT DATA

Width
Length
Weight

<table>
<thead>
<tr>
<th>Hardware Designation</th>
<th>Performance Designation</th>
<th>Total Impulse (Maximum)</th>
<th>Fuel Grain Weight</th>
<th>Nitrous Oxide Weight</th>
<th>Loaded Motor Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMS/Hybrid™ 54/1280 3-Jet Motor w/440cc N2O Cylinder</td>
<td>1700 N-sec</td>
<td>634 g</td>
<td>299 g</td>
<td>1961 g (4.32 lb)</td>
<td></td>
</tr>
</tbody>
</table>

Chapter 6. Safeties

6-1. If a misfire occurs and a loaded RMS/Hybrid™ motor does not ignite for any reason within five seconds of pressing the launch button, release the launch button and remove the safety key from the electrical launch controller. WAIT ONE MINUTE before approaching or allowing anyone else to approach the vehicle. CAUTION: Wear leather gloves and approved eye protection during this operation. Keep your fingers and hands out from underneath the vehicle and away from the possible path of the motor exhaust jet. Do not place any additional rights not covered by this warranty. Note: Your state may provide additional rights not covered by this warranty.

6-2. Open the aft closure. Remove the nitrous oxide preheater insulator tube and forward o-ring. Remove the aft o-ring and replace with a new one.

6-3. Remove the nitrous oxide preheater insulator tube and forward o-ring. Replace the forward o-ring with a new one.

Chapter 7. Post-Flight Motor Cleanup

7-1. After the motor has cooled down, remove the flight cylinder and the forward and aft closures. Replace the cylinder valve cap (1/2" O.D. x 1/2" long mylar tube) until the valve fitting bottoms out against the forward closure.

7-2. Remove the liner, nozzle and forward insulator assembly from the casing by pushing on the nozzle end and discard. Using wet wipes or damp paper towels, wipe the inside of the casing to remove all combustion residues.

7-3. Remove the nitrous oxide preheater insulator tube and forward insulator washer from the forward closure and discard. Using the Pyrovalve™ key wrench, remove the Pyrovalve™ retainer screw from the forward closure and discard. Using wet wipes, damp paper towels and a "Chore Boy™" steel wool pad, remove all combustion residue from the forward and aft closures and the Pyrovalve™ retainer screw.

7-4. Apply a light coat of petroleum based grease to casing threads, forward and aft closure threads and all other threaded areas at the landing of the motor case. Reassemble metal parts and store motor in a dry place.

Chapter 8. First Aid

For a minor burn, apply a burn ointment. For a severe burn, immerse the burned area in ice water at once and see a physician as quickly as possible. In the unlikely event of oral ingestion of the igniter propellant or Pyrovalve™ propellant, contact a physician immediately. Aluminum pellets must be removed by a physician. Do not induce vomiting. No attempts should be made to remove the Pellet consisting of black powder.

Chapter 9. Fire Safety

Tests show that the pyrotechnic ignition components of RMS/Hybrid™ reload kits will not explode in fire and normally will not ignite unless subjected to direct flame. RMS/Hybrid™ reload kit pyrotechnic components may become involved: direct the water at the AeroTech™ RMS/Hybrid™ reload kit pyrotechnic components to keep them below their 550 deg. F autoignition temperature. Foam and carbon dioxide fire extinguishers will NOT extinguish burning propellants of the type used in AeroTech™ RMS/Hybrid™ reload kit pyrotechnic components. Keep ideal nitrous oxide cylinders away from flames, sources of heat and flammable materials.