Thank you for purchasing this Hyperion R/C Products YAK-54 "40e" 3D!
We're confident that you'll have fun building and flying the model
…and especially enjoy showing it to your flying buddies…

Before beginning construction, please carefully read the following safety notes:

- The Hyperion YAK-54 "40e" with Z4020 motor is a powerful and highly maneuverable airplane. It is NOT intended for beginners. However, anyone with experience building and flying a few models, including one with aileron control, will be able to master the YAK-54. Don't hesitate to ask an experienced modeler to check the model setup and perhaps test fly the model for you.
- Start with model balanced at CG point furthest forward recommended point from wing leading edge, measured against the fuselage. Set Dual-Rate switches at 65% for Aileron and Elevator for first flight.
- Never fly a model airplane without a current membership in the R/C organizing body in your country. That may be the AMA in the USA, or the FAI in many other countries. Membership should include liability insurance. Check to be sure that you have it.
- Always check your flying field to be sure that it is safe before launching your model. Do not fly where others, especially children, may come into the flight path without your notice.
- Be sure that your transmitter, receiver, batteries, and servos are in good condition before every flight.
- Check carefully to see that no one else is using your frequency near your flying site.
- Many problems are due to poor connectors or improper soldering between battery and ESC, or ESC and Motor. Check to be sure that EVERY solder joint is good. Re-solder with a HOT iron if you have any doubts. Use only quality long 4mm bullet connectors between Motor and ESC.
- Test motor/controller/battery setup without propeller attached first. When propeller is attached and battery is connected, be sure that the model is restrained at all times. Never put any part of your body in front of a spinning propeller. Disconnect main battery immediately after motor operation.
- ALWAYS do a range test before first flight. With antennae DOWN, range should be at least 25M (80') before servos jitter. With antennae UP, 100M minimum (330'). When flying, keep your transmitter antennae pointed near vertical; never point directly at the model.
- Model airplanes are powerful and can be dangerous. Think and move carefully; never rush.

Required Gear:

Transmitter: 4-Channel minimum, 6-Channel preferred	*With 4-Ch system, a "Y" harness is required to connect the two wing servos. Servo mixing is not possible.
Receiver: 4-Channel minimum, 6-Channel preferred	
Servos: 4 Mini to Standard Size Servos, 19g~53g ea	* Suggest Hyperion ATLAS DS13 or DS 20 series Digital Servos
Servo extensions / wires: 2x 20cm extensions for Wing Servos 1x 30cm extensions for Elevator Servo 1x Receiver Switch Harness (wings may require 30cm extensions if servo leads are <20cm long)	*Suggest #HP-WR-004 *Suggest #HP-WR-005 *Suggest #HP-WR-015
Power Setup: For "eye-popping" performance, use: • Motor Hyperion ***HP-Z4020-B14*** • ***TITAN 80A OPTO*** Brushless Electronic Speed Controller (ESC) • Prop adapter ***HP-ADAP-8-60XL*** • (the above are available with motor connectors as a motor set at discount in most shops) • 4-5 cell 2000mah receiver pack when using the OPTO ESC Recommended RX battery: ***IB-PR**-2000*** • Recommended Spinner: ***HP-SPAERO-63*** **SEE LAST PAGE OF TEXT FOR PROP RECOMMENDATIONS**	
Battery: 3700~5350mAh Lithium 15C+	*Suggest Hyperion LVX3700-5S or LCL-4200-5S for max Aerobatic/3D performance, HP-LCX5350-5S for longest flight times, or LCX4200-4S for strong aerobatics at lower weight and cost.
Suggested connectors: Motor<>ESC : 4.0mm Gold Long Bullet Connectors (included with full power set) ESC<>BATTERY : Dean's Ultra^{tm} Connectors	
Other: Velcro^{tm} "hook-and-loop" tape, and double-sided tape is handy to secure radio gear and battery	

Required Tools:

*Small and Medium-sized Phillips (+) screwdrivers
*Small "needle-nosed" pliers
*Metric Drill bits: 1.5, 2.0, 2.5, 4.0mm diameters
*Epoxy 2-Part Glue, 10~12 Minute type suggested
*Straightedge ruler (thin metal type is best)
*Measuring Tape
*Sharp hobby knife
*Sharp scissors
*A black marker pen
*CA Thin (fast setting) super glue
*CA Medium (thicker) super glue
*Metric Allen (hex) wrench set

TEXT INSTRUCTIONS BELOW MAY DIFFER FROM DIAGRAMS - IF SO, FOLLOW THE TEXT!

NOTE: The canopy is retained by dual magnets at the rear, and has a flat wood tab to retain the front section. After you pull back on the latch to release the canopy, LIFT THE CANOPY UP **NO MORE THAN TWO CENTIMETERS** (<1"). If you lift the rear of canopy too high you will break the wood tab at front. Instead, release the latch, lift the canopy only slightly, and then pull the canopy rearward to release the front tab. Before flight, always check that the canopy latch pin is fully forward, and canopy is secure front and rear. We recommend using tape or screws in addition to the magnets to keep the canopy on during wild aerobatics.

There are a number of steps in construction that are common, such as installing the control horns in the ailerons, elevator(s), and rudder, centering servos and installing the arms 90° to the servo etc. Instead of repeating them each time during individual steps, we've combined them into a section of the instructions called *General Assembly Steps*. You will be referred to these steps during construction so we don't repeat the same text over and over. If there is something special during a portion of the assembly, it will be covered in the individual step.

General Assembly Steps

Typical hinge installation:

- Fold each hinge in half so you have a center line reference. Install the hinges in the non-moveable surface half way, and tack glue with fast CA.
- Install the non-moveable surface to the moveable surface and press them firmly together until no gap exists, then deflect the moveable surface all the way in one direction, hold in position, and fix hinges with a drop of CA glue on each hinge.
- Move surface all the way the opposite direction and put a drop of thin CA on each hinge.
- There should be a hairline gap between the two parts, and no CA should be allowed anywhere but on the hinges.
- For safest operation, use pins to keep the hinges from pulling out of the surfaces and fix pins with CA
- For best flight performance, tape the hinges to seal the air gap between the surfaces.

NOTE: Hinges are inserted into each control surface at the factory, to hold the parts in alignment during shipping. If you separate two parts (aileron and wing, for example) and find one or more hinges "missing", be careful! The hinge is buried in one side or the other, but still held in place by the balsa. CAREFULLY probe with the tip of a sharp hobby knife or pin to work the hinge back out.

Fiberglass Control Horn and Base Plate Installation

*Lightly sand the contact areas of the fiberglass control horns and wipe clean. Test fit horns to surface. Sand the bottom of the horn that goes into the surface if needed to keep it from protruding from the opposite side of the surface.
*Remove a section of covering just slightly smaller than the control horn base plate.
*Lightly coat the portion of the control horn that fit's in the control surface and base plate with epoxy.
*Put the base plates on each horn in proper orientation, and insert each horn assembly into the surface.
*Remove excess epoxy. The control horn actuation hole should be aligned directly over the hinge line.

NOTE: Some kits have control horns with larger actuation holes than needed. DO NOT try to use the 2mm ball link bolt in the 3mm hole! Instead, drill a 2mm hole slightly inboard of the larger hole and use it instead.

Servo Centering/Rotation/Servo Arm Preparation

*Connect all servos (2 aileron, elevator, and rudder) to proper receiver channels, turn on transmitter and set trims and sub trims to neutral.
*Connect 4.8v test pack to receiver, and allow the servos to center. Make sure each servo rotates in the correct direction.
*Install a long servo arm on each servo so that it's 90° to the servo.
*Mark each servo and its matching servo arm and remove the servo arms.
*Turn off the transmitter and receiver.
*Once the servo is installed per its applicable step, install its servo arm so it's 90° to the servo.

Proper Ball Link Installation Sequence:

*The proper ball link assembly sequence is as follows:
Bolt, washer, ball link, washer, servo arm or control horn, washer, nut.
*For dual fiberglass control horns or pull-pull rudder with dual control arms, the proper sequence is as follows:
Bolt, washer, control horn/arm, washer, ball link, washer, control horn/arm, washer nut.
* In the pictorial manual, no washer is shown between the ball link and the servo arm or control horn, but we highly recommend using one.
*Use a small bit of removable Loctite on the nut when the nut is installed for the final time to prevent it from coming loose due to vibration.

BUILD GUIDE - Following the numbered diagrams

Servo Note: The Yak is capable of an extremely wide speed envelope, from sub-stall 3D to about 100Kph (60mph). For Pilots who fit a large-diameter, low-pitch propeller and plan to fly exclusively slow to medium-speed 3D aerobatics (like 16x8 prop with 4S battery), Hyperion ATLAS Micro Digital servos (HP-DS13ACB) are an option for lightest weight, at only 18g each. For combined 3D and "IMAC" type aerobatics at higher speeds, standard size servos are suggested, such as ATLAS Digital HP-DS20FMD. Either way, the Yak 40e is a very light model!

Diagram #1 - AILERON
*Install ailerons on right and left wing using hinging method above.
*Open the covering around the aileron mounts with sharp knife.

Diagram #2 - AILERON SERVO
*Test fit the wing servos, and drill 1.5mm holes in the ply mount for the servo screws. Remove servos and apply a TINY bit of fast CA glue to each screw hole to harden it.
* Install aileron control horns such that the clevis holes in the horn are centered over aileron hinge line.
*Attach servo extensions to the servo connectors, and feed the extensions through the wing until they come out at the wing root, through the hole behind the spar.
*Install the servos into the wings.

Diagram #3 - STABILIZER

NOTE: Experienced "3D" pilots have tested the YAK-54 "40e" and found aileron and rudder deflection adequate when only a hairline gap exists between the control surfaces and wing surface. However, elevator deflection may need to be increased - for best performance in some 3D maneuvers - such that the gap is about 1.5mm (want 45-50 degrees deflection). **If you do increase the gap at any hinge line, be sure to seal the entire length of the gap with clear tape, for proper aerodynamic performance and pin the hinges.**

NOTE: The YAK-54 has servo mount positions for elevator on both right and left side of fuselage for those who wish to use dual elevator servos. **We believe that a single servo for elevator is preferable.** If using dual servos, do not install the joiner wire.

*Install the hinges into the elevators only, as we did for the ailerons before. After checking that the hinge alignment is correct by test fitting to horizontal stabilizer, fix the hinges with fast CA glue (elevator sides only!)
*Now insert the hinged Elevators into the horizontal stabilizer, and adjust so that the elevators have small, even gaps at the end of the stabilizer. Elevators must deflect full travel in both directions without interference.
*Lay the assembly on a flat work surface, and center the 2.5mm wire joiner on top of the elevator halves.
*Mark the positions to be drilled in the elevator halves for the joiner wires with marker pen.

NOTE: It is important that the joiner rod holes be drilled in each elevator half at the same angle. Place the elevator halves near the edge of your table, and use a block of wood or other fixture to guide your drill bit. If after drilling the holes and test assembling the elevators with stabilizer, you find that the elevators are not aligned DO NOT ATTEMPT TO TWIST THE JOINER ROD. Instead, just re-size the hole in one side of stabilizer until it is loose enough to allow perfect alignment of the elevators. Epoxy will nicely fill any gaps.

*Make small "channels" in the elevators so that the joiner wire rests halfway into each elevator half.
*Remove the covering from fuselage where the stabilizer fits. There are small notches at the rear, to accommodate the joiner wire. Remove the covering there, too. 3D pilots should deepen the notches 2mm.

*See the diagram on right side - **proper alignment of the stabilizer**, and also diagram in Step 4, RUDDER and align with the wings per **C=C'** drawing at the end of these instructions.
*Install the elevator joiner in the stabilizer slot and install the stabilizer.
*Glue the stabilizer in fuselage as shown. Make sure it's aligned properly with the wings and fuselage. The diagram recommends epoxy glue, but we find a little fast CA to fix position, then medium CA to fill any gaps both easier and more effective (use a light mist of CA "Accelerator" to set the thicker CA).
*Apply two narrow pieces of plastic wrap on each side of stabilizer, where the joiner rod is met. This keeps any excess epoxy from sticking the elevators to the stabilizer.
***Lightly** coat inside each joiner-rod hole in elevators, the channels, and the ends of the joiner wire with EPOXY GLUE (no CA!)
*Insert the joiner rod into each elevator half, while working the elevator hinges into the stabilizer. Remove excess epoxy.
***DO NOT CA glue the stabilizer-side hinges yet!** Center the elevator assembly on the stabilizer, and tape the ends of the elevators to the stabilizer to hold both sides true at zero trim.
*Wait until the epoxy cures, then remove plastic wrap from stabilizer and the tape holding elevators.
*Adjust the gap at hinge line from 0.5mm (normal pilots) to max of 2.0mm (3D pros).
*Fix hinges to stabilizer using a small drop of thin CA on each.

Diagram #4 - RUDDER
*Install aluminum base plate and wheel collar onto tail wheel wire as shown.
*Mark the tail wheel wire 2cm from the top, and bend 90 degrees, TOWARD the tail wheel.

*Mark, on the hinge center line of rudder, a point 17mm from bottom.
*Drill a carefully centered 2mm hole at that point, 2cm deep. Use a guide as with elevators earlier.
*Cut a channel from the hole just drilled to bottom of rudder, such that the tail wheel wire is completely recessed into (flush with) the rudder hinge line.
*Test fit the tail wheel wire in the rudder, and carefully bend the wire as required so that the tail wheel is perfectly aligned with the rudder.
*Coat hole in rudder and channel with epoxy, and insert the tail wheel wire.
*Remove excess epoxy. Apply a strip of clear tape to rudder hinge line, holding the tail wheel wire tightly to the rudder. Set aside until the epoxy has cured.
*Insert hinges halfway into rudder. Hold the rudder against the fin. Mark hinge positions on the fin and slice covering at each hinge location.
*Glue hinges into rudder with CA. Insert hinged rudder assembly into stabilizer hinge slots.
*Deflect the rudder 45 degrees while maintaining a hairline gap, and glue each hinge to stabilizer with a drop of CA.

Diagram #5 - ELEVATOR SERVO
*Following similar routine as with ailerons before, install elevator servo and control horn as shown.

Diagrams #6 and #7 - RUDDER SERVO
*Install rudder control horns to rudder as shown, centered vertically on the pull-pull wire exit at fuselage.

NOTES: The drawing of Pull-Pull Wires in Dia. 7 is NOT correct. The wires should run parallel, not crossed as shown. Ideally, the rudder servo horn should be the same width (or nearly) as the distance between the clevises at the control horns. DuBro™ and other makers sell long control horns for this purpose. Many modelers fashion their own extensions from fiberglass or plastic plate, and attach these on top of standard horns.

*Complete linkage as shown, with trim centered at neutral as we did with ailerons and elevator before .

Diagram #8 - LANDING GEAR
*Assemble landing gear as shown in the diagram.
*Use only EPOXY to attach plywood to wheel spats. Roughen the spat with sandpaper before gluing.
*Drill a 4mm hole in the spats after the plywood is attached and the epoxy is cured. Start with 1.5mm drill bit from wheel spat side, then use a 2.5mm, and finally 4mm bit or use a “unibit” to enlarge the hole to the correct size.
*Install the axle, spats and wheel on the gear leg and tighten down the nut and wheel collars. Check to be sure that the wheels turn freely.
*Attach landing gear assembly to fuselage as shown.

Diagram #9 - MOTOR
*Install the blind nuts on the back of the firewall.
*Install the back plate onto the motor and use Loctite™ on the screws.
*Mount the motor to the firewall with the 5mm spacers if using Z4020 motor and Hyperion prop adapter.
*If you are using the 3025 motor, use the 15mm spacers to mount the motor to the firewall.
*This is a good time to mount the ESC on top of the wood “box” behind the motor mount, using Velcro™ hook & loop tape. You can put a zip-tie around the ESC but don’t cinch it down, just make it snug.

Do not mount the ESC directly to the airframe without vibration protection or “cinch” it down tight with a zip-tie! Keep Battery and ESC wires as short as possible. Do NOT exceed total length of 20cm (8”).

Diagram #10 - MAIN WING
*Assemble as shown.

TIP: Trim the nylon wing screws so 10-15 threads go into the wing. The wing screws should be just snug; “finger-tight” plus 1/8-¼ turn is fine.

Diagram #11 - COWLING AND CANOPY
* The exact position of the cowl is best determined by first installing the motor and prop adapter and spinner back plate. Ensure sufficient clearance exists between spinner back plate and cowl, with cowl centered relative to the motor shaft.
*Once satisfied with position, temporarily tape the cowl in position relative to the spinner back plate.
*Drill 1.5mm holes through cowl and cowl mounting points as pictured
*Remove Cowl, and put a SMALL drop of CA (use a toothpick to apply) in each hole in the mount points, to harden the screw holes.
*Remount cowl and install propeller and spinner.

FINAL SETUP
*Install your receiver and adjust transmitter as recommended by the manufacturer.

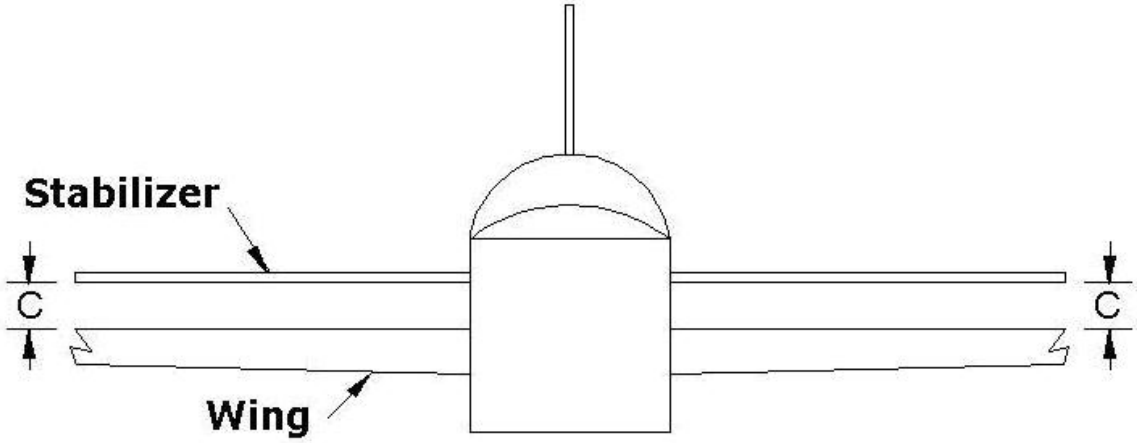
- Set control throws and CG as recommended. (Diagrams 12, 13)
  Position battery as needed to obtain 115mm CG position for first flights.
- Also check that the model is balanced Right/Left (roll axis) and add lead weight to the light wingtip if necessary.
- Set your DUAL RATE LOW Switches for elevator and aileron to 60%~70% of recommended throws, and use DUAL RATE LOW for the first flights.
- Range check your radio system before flight
- Have an experienced modeler confirm correct deflection of all control surfaces and proper CG before flight.

HYPERION Z4020 Motors + TITAN 80A OPTO Power Set

With 5S battery pack of 3300~4200mAh, start with a 14x7 APC E prop. If peak current with freshly charged pack is 60A or LESS, you can fit a 15x7 E prop. Do not exceed 70A peak current.

Be careful to check motor temperature after first short flights. Peak current of about 55A~65A is ideal.

Test	Motor	Hyperion Battery	Prop	Volts/Cell	Current 5000'ASL	RPM	Watts	Current Sea Level
#1	Z4020-14	HP-LCL4200-5S	APC 14x7 E	3.41	64.1A	8120	1093	64.0A
#2	Z4020-14	HP-LCL4200-4S	APC 16x8 E	3.48	51.7A	6620	720	60.0A



Wing to Stabilizer Alignment
C-C'