

A VIEW ON THE —HORIZON—

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The Horizon 60 has been manufactured by Mr. Helmut Holder in Houston, Texas since 1981, but has received only limited advertising and exposure in the US, and I would imagine little is known about this very fine helicopter outside the country. During the past several years I have seen many Horizons fly, but never had the opportunity to fly one myself or even inspect one in any detail. So when CT asked me to do this review I was very happy to take a closer look at this very unique helicopter.

Special Features

One of the first unique design features you will notice about the Horizon is the looping tail drive tube with brace going from the tail boom to the upswept tail rotor. Flexible tail drives are nothing new to model helicopters, but helicopters prior to the Horizon only used the flexible

drive to negotiate the bend in the tail boom to get to the tail rotor gearbox. But the Horizon takes this idea one step further by looping the tail drive away from the tail boom, and then back again, to directly drive the sealed bearing tail rotor without the use of a gearbox. This direct design makes for a very simple tail rotor and eliminates the many parts and complications otherwise needed in a gearbox.

The upswept tail boom is another design idea used by more full scale helicopters to improve overall handling qualities by getting the tail rotor up in the same plane as the main rotor, thereby obtaining a pure yaw movement from tail rotor commands. Tail rotors that are below the main rotor will not only move the nose right and left, but will also induce a slight uncommanded roll in the direction of yaw due to the pendulum effect of the tail rotor thrust being below the main rotor.

This pendulum effect with associated unwanted roll is eliminated in the Horizon. The other unique feature of the tail rotor is the addition of machine screws to the tail rotor hub which act as counterweights to relieve some strain from the servo. This may not seem like a very important point, but it shows the great amount of thought and attention to detail that went into this design.

Most pod and boom helicopters come with a clear plastic canopy, but the Horizon has gone one step further to provide a heavy duty three piece break-away fuselage and canopy. The two sides of the fuselage are made of very durable molded white plastic which is held together, and to the nose of the helicopter, with plastic screws. The clear plastic canopy is then mounted to the fuselage with additional plastic screws making for easy removal and access to the radio equipment. These plastic screws give the entire fuselage and canopy the capability of breaking away from the helicopter in the event of a mishap (crash). Behind the fuselage, on each side of the helicopter, are two heavy duty white plastic cowlings which house the engine on the right, fuel tank on the left and a forced fan cooling system which exists to the rear. The Horizon is designed for a side exhaust engine which is mounted to the right side frame directly under the main shaft and faces the rear, thereby providing easy access to the needle valve from underneath, the exhaust manifold on top and the glow plug from a small hole in the side. Because there is no obstruction on top of the cowling almost any muffler or tuned pipe can be used. The front of the right cowling is open to the airstream for ram air cooling of the engine when in forward flight. A three bladed pusher propeller is mounted to the engine for forced fan cooling when hovering, which provides more than ample cooling air even in the hottest Texas weather.

A 14oz (450ml) fuel tank is mounted under the left cowling directly below the main shaft. This means whether the tank is full or nearly empty the CG is not affected, thereby keeping the fore/aft trim constant throughout the flight.

A belt drive system connects the engine to the clutch shaft which completely eliminates starter shaft alignment problems as a source of high frequency vibrations. A



Paul's wife Mary Anne, and their two dogs, with the Horizon.



Horizon is easy to see and very steady in a hover and forward flight.

cone hub is also supplied for the engine which allows easy starting from the rear of the helicopter with a regular electric starter without any need for an additional extension.

The clutch is also larger and more heavy duty than others I have seen, not engaging until the engine is turning in the 3,000 rpm range. This higher engagement speed is especially nice when using a new engine since a slow idle for autorotations or adjustments may be rather unreliable.

The side frames and landing gear are among the strongest I have seen, which is a real benefit for the novice who is bound to have many bouncy landings while learning how to hover. The side frames are also completely flat, making them more resistant to bending from hard landings.

The main rotor head is also very rugged and of a unique design being of the rigid rotor type. But what really sets this one apart from any other is that it can be set up for clockwise or counterclockwise rotation just by moving the drive gear on

the clutch shaft from one side of the main gear to the other, and can also be flown with or without a flybar. But be careful when ordering the Horizon because it comes standard with a flybarless head and the flybar version must be specified. The Horizon is also designed to be flown using a standard four channel radio with the throttle servo operating both throttle and collective. However, if you have a helicopter radio it is best to use separate servos for the throttle and collective, and there is plenty of room to mount them both. The remaining two cyclic servos and tail rotor servo are mounted on a tray which is rotated by the collective control. Not only is collective control extremely precise and positive, but since the tail rotor is also rotated it provides an adjustable and automatic tail rotor compensation for climbing and descending flight. That is a real plus if you will not be using a helicopter radio because it reduces the amount of control needed by the tail rotor.

Although I would recommend you use a

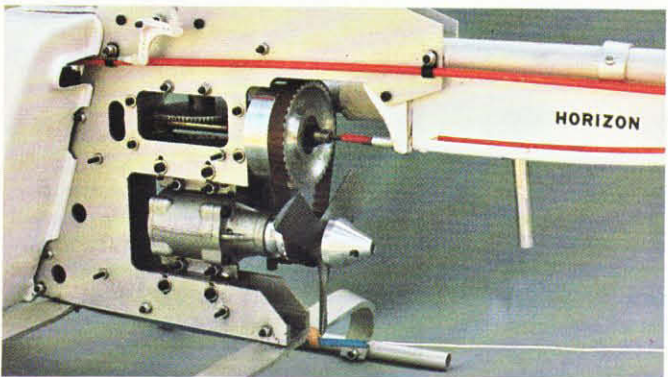
gyro, and I always use one myself, this is one of the most stable helicopters I have had the pleasure of flying and comes close to not even needing a gyro. I'm not really sure what gives it this increased stability in the yaw axis, but it may be the upswept tail boom keeps the tail rotor out of the disturbed air from the main rotor. In fact the tail rotor is so efficient that additional instructions are provided with the kit recommending $\frac{1}{2}$ inch (12mm) be cut from each tail rotor blade to slow the tail movement without any sacrifice in overall performance.

Construction

The Horizon arrived well packaged in one medium sized box with no damage and no parts missing. The kit contains the standard packaging of parts into numbered bags so only one bag is opened at a time, and here I recommend using a muffin tin or some other such container to sort out the parts once each bag is opened. It's very frustrating to be in the middle of a construction sequence only to ▶



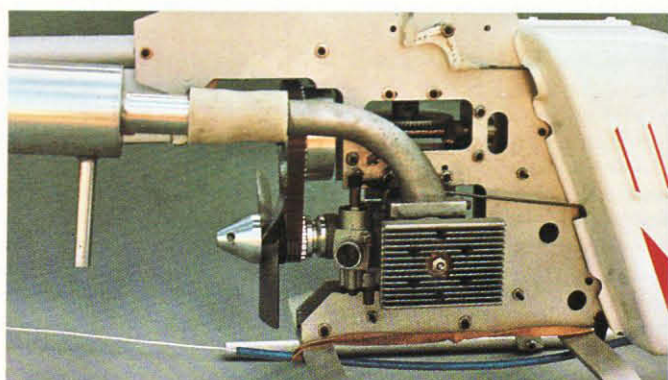
Horizon fuselage has plenty of room for any size radio. Note servo tray on top is pivoted by collective servo mounted below.



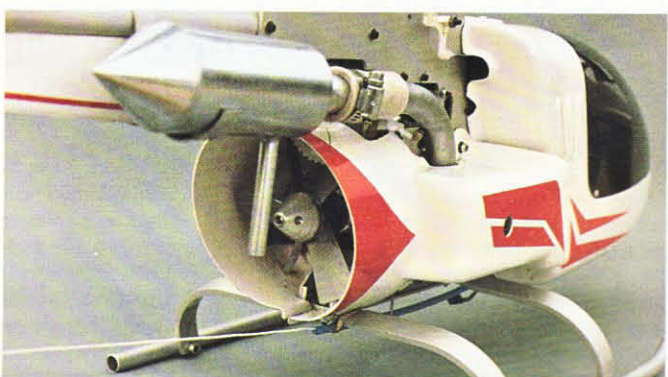
Left side cowling and fuel tank removed to show belt drive system and large clutch.



The Horizon and Airtronics 7H radio ready for the first flight. Note side cowling has cut-away to see fuel level. All red trim is red blade covering over the original plastic – very fast and easy to get a great looking helicopter.



Right cowling removed to show strong side frame, engine mounting and cooling fan.



V-Tech muffler exhausts straight down to keep the Horizon clean and quiet. Cooling fan housing gives the Horizon a Jet exhaust appearance.



Horizon's unique tail rotor is driven by a flexible cable without the need for a gearbox. Note small screws mounted on outside of blade holders which act as a counterweight.

find that a small part has been misplaced, or dropped on the floor and lost. But should this happen, an extra bag of spare parts is even supplied with the kit to keep your construction going. This has got to be another first for the Horizon and is something I would like to see other manufacturers provide in their kits as well.

The instructions take you to step by step through the building process and although they are quite adequate they could be written a little clearer in spots, and some of the photos are dark and hard to understand. But since only one specific part of the helicopter is being constructed at a time, and with a limited amount of parts to use in each bag, it becomes quite obvious where everything goes. However, I have talked to the manufacturer about their instructions and they are in the process of updating and improving them.

Construction of the Horizon begins with assembly of the side frames and attaching the clutch, main shaft, engine and skids. When the clutch shaft is installed the drive gear can be placed either toward the front of the helicopter for counterclockwise rotation of the main blades or to the rear of the shaft for clockwise rotation. The starter cone which is attached to the engine and the fan propeller must also be installed using loctight, but here the red, or permanent, type must be used. On most helicopter applications the permanent loctight is not required, but the starter cone is one place where it is needed or the cone will come loose after several engine starts and destroy the threads in the cone.

The tail boom, which is predrilled for proper alignment, is then installed followed by the tail rotor which is supported by two sealed bearings. The flexible tail rotor drive cable is then installed and does not require any lubrication because it is housed in a plastic tube.

When assembling the main rotor head be careful to follow the correct instructions depending on whether you have the flybar or flybarless version. Either version is very easy and quick to assemble, producing an extremely strong head. The only special point here is to secure the blade holder bearing blocks with loctight or they will come loose during flight and cause vibration in the head.

The rotor blades I received with the kit required quite a bit of construction to add the tip weights, glue the front and rear halves together, glue on the blade root reinforcements and then sand and finish. However, new rotor blades are being developed where most of this work will be done for you, and they should be shipping those in the kits by the time you read this review.

The two cyclic servos and tail rotor servo are mounted on a rotating tray constructed of plywood and hardwood. Two pivot points are used to secure this tray to the main frame, but yet allow the tray to rotate to provide collective inputs to the swashplate. As previously mentioned, the tail rotor servo is also mounted to this tray and the rotation provides an automatic tail rotor compensation function should you not be using a helicopter radio.

However, if you are using a helicopter radio this tail rotor compensation merely supplements the electronic mixing of your radio.

The basic plans only use four servos, with the fourth servo being used for both collective and throttle inputs. This fourth servo is mounted directly below the movable tray to provide very smooth and positive collective inputs and yet be in a position to operate the throttle. However, since I installed the Airtronics 7H helicopter radio reviewed in this magazine in a previous issue, I used separate servos for the throttle and collective.

Because Mr. Holder feels the Horizon is stable enough without a gyro, no mention of one is made in the instructions. However, since I normally recommend the use of a gyro, there was no difficulty in making a small gyro platform from the excess plywood in the kit. This I mounted directly under the movable tray, and there is enough room there for virtually any size gyro.

The receiver and battery are normally mounted directly in front of the collective servo, but since so much more room was available in the front fuselage I extended the wooden platform by 4 inches to put more of this weight forward to preclude an aft CG. As it turned out this put the CG as called for in the instructions without any additional weight being needed.

The fuselage and side cowlings were then cut to fit from the heavy duty white plastic forms provided. Be sure to work slowly, measure carefully, and don't cut too much plastic off at one time. It's a lot easier to take off additional plastic for a snug fit than to cut too much and try to reattach the pieces. One other recommendation when mounting the side cowls is to use servo mounting grommets rather than the rubber tubing provided. The servo grommets will not only act as a shock absorber, but will also keep the metal screws from wearing away the plastic.

As already mentioned, the front fuselage comes in two halves, and rather than glue the two halves together, they are joined and mounted to the main structure with plastic nuts and bolts. This gives the entire fuselage the ability to break away from the helicopter in the event of a mishap, hopefully preventing any major damage to the plastic parts. A clear canopy is provided for the fuselage, and can either be left clear or painted, and is also mounted to the fuselage with plastic screws for a breakaway feature.

Because the white plastic fuselage and cowlings looked so good just as they were, I felt my painting them a different colour could not improve the looks of the Horizon. I therefore took a large piece of red rotorblade covering and applied it to various parts of the fuselage and cowls, and with a pencil drew a design I thought to be pleasing. With a sharp knife I then cut around the designs and removed the excess, leaving the design pattern you see in the pictures. Since my painting is nothing to brag about this turned out to be a very quick and pleasant operation, producing a very handsome helicopter in

less than an hour of trimming. So far the trim has not shown any signs of peeling away, but should it decide to do so a drop or two of CA should solve that problem. The instructions then cover the initial setup in great detail and even provide a pitch gauge which can be cut from the instructions, glued to a small piece of scrap plywood, and used to measure blade pitch. This is certainly everything you would expect to find in an instruction manual, but Mr. Holder goes even further by providing a preflight checklist, additional flying tips, characteristics of the helicopter, a mishap checklist, a description of the control system and finally a safety checklist.

Accessories

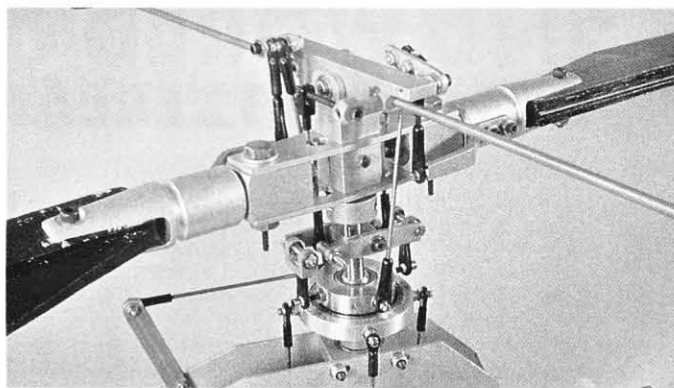
As I previously stated, I installed the Airtronics 7H helicopter radio in the Horizon using all five servos, and also used the Airtronics gyro. Since Airtronics uses a separate battery pack for both the receiver and gyro I used the standard battery supplied with the radio for the receiver and high capacity SR battery for the gyro.

An OS Max 60 H ringed engine was installed which exhausted to a V-Tech tuned pipe/muffler for a noticeable increase in quite power.

Flying Evaluation

I initially built the Horizon using counterclockwise rotation and a flybar, and after slight adjustments to blade tracking, engine mixture and minor balancing I was ready for the first flight. With the Horizon weighing in at almost ten pounds (4.5 kilos) it felt extremely stable in the slight gusty breeze of the day, with only minor trim changes required to produce a rock steady hover. I then landed and turned off the gyro to see the effect, and although it was very steady without the gyro I could tell a difference and was more used to flying with a gyro. Initial flights were made with the new engine set fairly rich, but after a short break-in the engine was leaned to a rich two cycle and aerobatics were very precise and steady. Autorotations are a little different with the Horizon in that there is no disconnect between the main and tail rotor when the engine stops. This causes a slight additional drag on the rotor system, but has the benefit of keeping tail rotor control throughout the approach and landing.

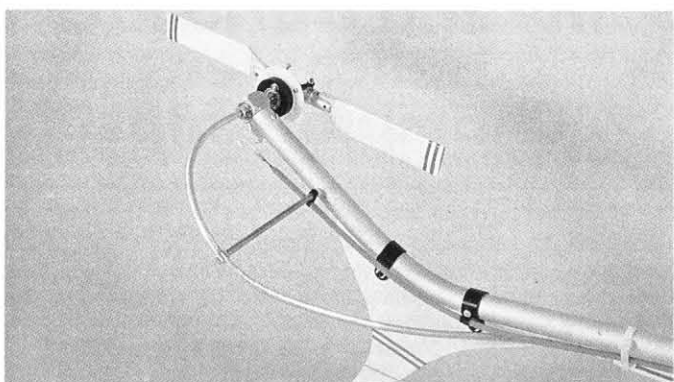
Just to check the other configurations I tried the flybarless head version, and clockwise blade rotation. Since I am used to flying both clockwise and counterclockwise rotating helicopters I found no particular difficulty in transitioning between the two, although each produces a helicopter with a different look and feel. Remember a clockwise rotating system will turn to the right more naturally while in forward flight, with just the opposite being true for a counterclockwise system. I then converted the head to the flybarless version, and the results were a helicopter which was noticeably more sensitive to cyclic commands. The flybarless version does require fewer parts in the head and a more direct setup bet-



Very strong Bell-Hiller head is supported by sealed bearings. Swashplate moves up and down to control collective.



Horizon kit is complete and neatly packaged in plastic bags.



Another view of the tail rotor system. Unusual but very effective simple design.

ween swashplate and blade holder, but also requires a more heavy duty servo with increased torque since the flybar is not present to aid in blade movement. For training I would recommend the flybar head version because of its increased stability, but the flybarless head is very comfortable with some practice and does give a more scale effect.

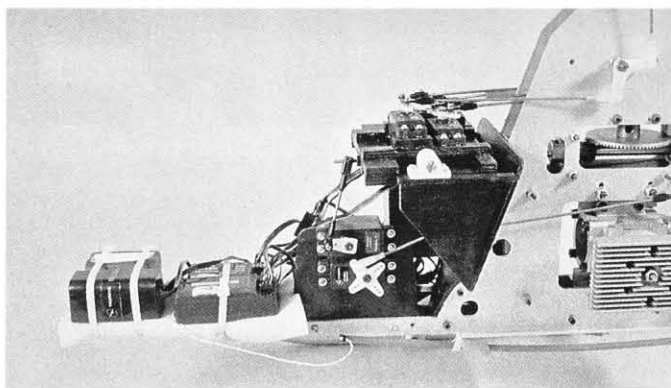
The flexible tail rotor drive was very smooth and positive throughout my testing and at no time gave any hint of a problem. The tail rotor itself was very precise, requiring only slight commands while hovering yet having sufficient control for 540 degree stall turns. This smoothness of the tail rotor, and its precise inputs, may be a product of the upswept tail boom keeping the tail rotor away from any disturbed air produced by the main rotor.

Although the Horizon is of a "pod and boom" design, the large fuselage and side cowlings make it very easy to see while in flight, with the bright red and white colour scheme standing out clearly

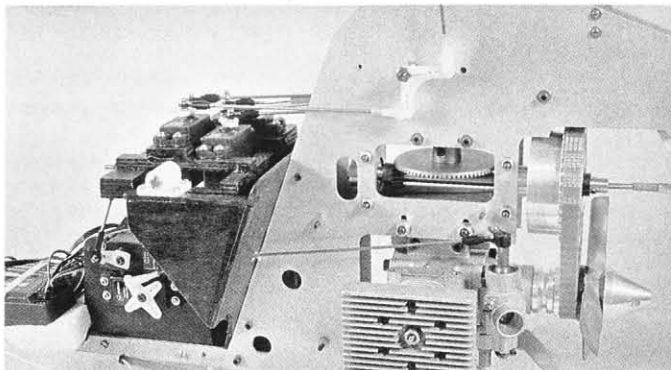
against the blue sky. The weather here in Texas in the early spring is not very warm yet (90 degrees F/40 degrees C) and between the ram air cooling while in forward flight, and the forced fan cooling while hovering, the engine never showed any signs of overheating.

Overall Evaluation

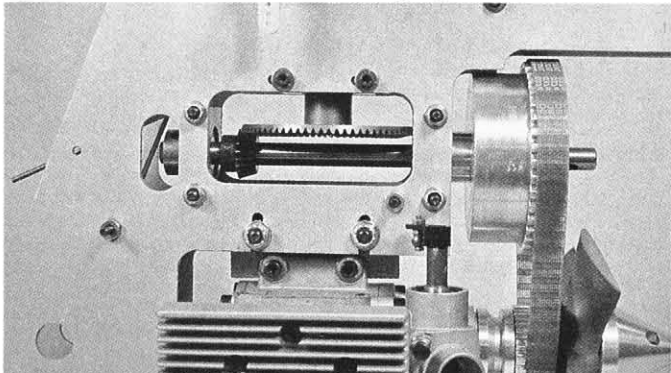
The Horizon has certainly lived up to my expectations for a deluxe helicopter using only the highest quality materials available, and I am very surprised it has not received more recognition during the past years. In the hands of a novice it is an extremely stable platform from which to learn how to hover, and is one of the most durable helicopters on the market to withstand the bumps and bounces of the new pilot. The upswept tail boom and high tail rotor is also a real benefit while learning because it keeps the tail well away from the ground and any mishaps. The heavy duty plastic of the fuselage and cowlings can also take heavy use, and yet have the capability to break



Note collective servo is connected to servo tray which also provides automatic tail rotor compensation. Plywood radio support was extended 4" to preclude aft CG.



An hours work has the side frames with main gear, shaft and clutch mounted.



Small drive gear is mounted to the right on the clutch shaft for counter-clockwise rotation. If drive gear were reversed on shaft, rotation would be clockwise.

away if needed.

In the hands of an expert the Horizon can perform any manoeuvre in the book with the greatest precision. It also gives you the opportunity to fly with either head rotation, with or without a flybar, as you desire.

The Horizon can be ordered directly from the factory, but see your dealer first so he can stock the spare parts you may need in the future. When ordering remember to specify the engine you will use so the proper size starting cone can be included, and if you want the flybar version or not. I would also recommend the following as a spare parts package if you live some distance away from your dealer: main and tail rotor blades, main shaft, flexible tail drive cable, drive belt for engine and an extra set of pitch arms for the blade holders.

For further information on the Horizon please contact Mr. Helmut Holder at Horizon Model Crafts, 1802 Afton, Houston, Texas, 77055. He can also be reached by phone at 713-683-1526. □