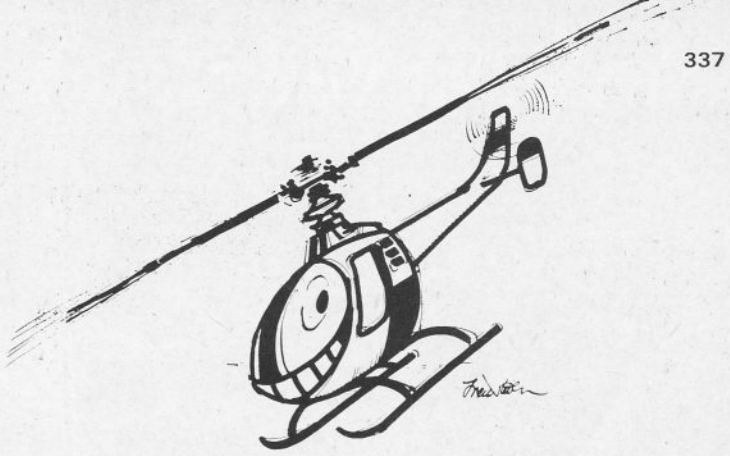
HOVERING ABOUT

by JIM MORLEY



THIS is being written on the day that the previous H.A. feature appears in the February issue. It is thus far too early to have had any feedback from readers trying to hover about on a piece of string. I look forward to your comments and feel that this issue should have the sequel and explain equally effectively how to fly beyond the hover.

Assuming that you have become reasonably confident in the hover, either by the string method or persistence or with the help of the complicated device in the photograph, what to do then?

If those who know my flying ability will stop laughing, I will try to explain, but I think the answer is to try to fly at head height to the left and right, keeping the model pointing into wind all the time. This can then be extended to more and more ambitious flight patterns, eventually almost doing mild stall turns at the extremes and eventually, on a calm day, doing a left hand circuit bringing the model back in front of you for a hover landing. Do this a few times and you will have learned the first few of the peculiar flight characteristics of your model.

But there are many other conditions to master — for instance — how much tail rotor to feed on while using sideways cyclic to bank for a turn; how much cyclic forward is needed to accelerate the model; how much to reduce throttle/pitch when pulling back cyclic to slow the model; how much power to add when pulling back cyclic to get out of a dive, how remarkably little power is needed to keep the model up in a wind; how incredibly quickly the model will drop when forward flight speed is lost as it comes close to the ground in approach. The list is almost endless but you have to learn by experience.

Good balance and good trim help controllability tremendously. The controls are jerked in the appropriate direction rather than held on (something akin to flying with reed type equipment if any of you can remember that far back) and you have to tell it what to do. In other words, anticipate instead of react.

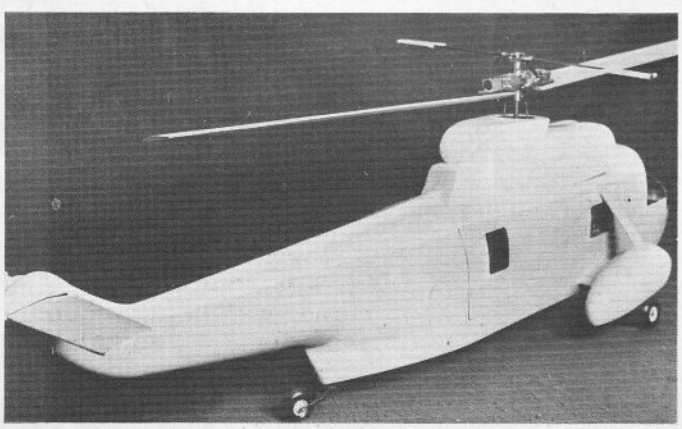
Snow

Readers from some parts of the country may be amused to know that I had never flown off snow. This was corrected in the recent cold spell as I thought it would be interesting to observe the effect of the snow blown about showing up the various air currents and vortices.

The snow was about five inches deep and beautifully powdery so the model, on floats, was started and placed carefully at arm's length on an undisturbed patch on the lawn. First surprise, the floats went straight down to grass level — load distribution is not as low as I thought. On opening the throttle, second surprise: a perfect take off with no snow in the turbulence at all — not even that kicked up by the tail rotor. All rather disappointing.

Some days later, though, when the snow had melted a bit, the floats didn't sink so deeply, and in case the idea of blowing the snow about seems silly to more clever readers, I should point out that I can effectively sweep the lawn of leaves in the autumn by flying up and down in ground effect. Our hobby can be useful too!

Below: Chris Garside's 'Sea King' is almost complete, features G.F. fuselage and home-made retracts. Power pack is Webra 61. A close-up of the 'works' is shown below right — see text 'Individual department.'



Individual department

Having said in the first *'Hovering About'* that more helicopters of a unique design will appear, the first details to be sent to me are of **Chris Garside's** *'Sea King.'* Chris made the master for the fibre glass fuselages supplied by **Preston Model Centre** and appears to have ideas on rotor heads and transmission. I look forward to info when complete. Chris's model features *Webra 61F* power and home made retracts.

The *Sea King* has scope for retractable undercarriage, winches, lights etc., plus five bladed tail and main rotor. This last attracted me and I have been practising what I preach and filling up a Seaking fuselage too. To add interest, it was decided to fit 2 x 40 engines. It could be a safety feature and the five bladed head is quite a challenge. Visitors to the **Model Engineer Exhibition** may have seen my unfinished effort.

The rotor head, with collective pitch of course, is gyro controlled and in trials on a different airframe shook itself apart on the first flight. It had promise of doing the job, though, so more on this in the next issue.

New trend

For a long time now, enterprising traders have produced rotor blades to match kitted helicopters, some better and some worse than the originals. Also, enthusiasts and experimenters have swapped flight blades and tail rotors from make to make either for convenience or effect. Now a development has begun — the availability of extras to tune your standard model.

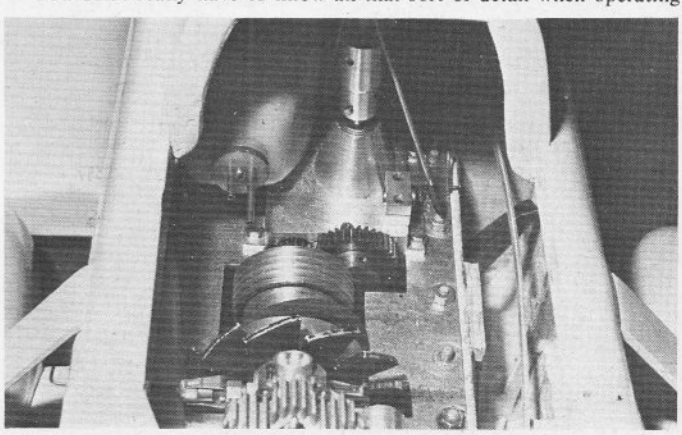
One such is the lead-lag hinge from **Dave Nieman,** shown in the photograph fitted to a *DS222.* The idea is to reduce the vibration, which happens on all helicopters, to improve reliability by reducing mechanical and radio failures. It is interesting to see why this vibration should come about in spite of the most careful balancing.

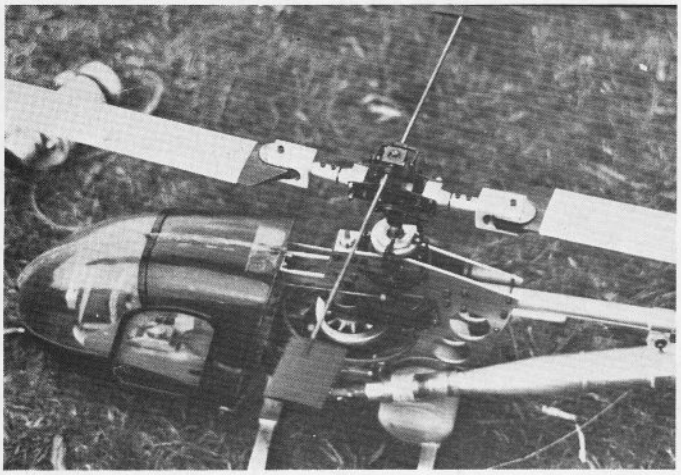
There are several sources on the main rotor and probably the most relevant on our models is the cyclic drag change on the blades, causing an oscillation in the plane of rotation in fast forward flight. As the blades change from fore and aft to sticking out sideways, there is a dramatic change in drag. On the retreating blade side about half its length is actually going backwards through the airstream, the other has the speed of the model added to its rotational airspeed. Quite a change of load on the blade root.

Secondly, there is the *Coriolis effect,* similar in mystery to the gyroscopic precession talked about when discussing control phase lag, but is more accurately described simply as an example of conservation of energy. As the blade rises or falls from its natural plane of rotation due to a gust, or in the hover due to the CG position, requiring a back cyclic control to be on continuously, the energy causes it to accelerate or decelerate. This phenomena is shown dramatically when the ice skater folds or opens the arms in a pirouette.

Also, there is a tendency known as *Hookes Joint* effect. This occurs when the rotor disc is not normal to the shaft — as in any instance except backward flight! — and the coning angle will cause a blade to accelerate and decelerate in a similar manner to the non-constant velocity universal joints used on car transmission shafts. It was this action which necessitated the need for CV (constant velocity) joints on front wheel drive cars.

You don't really have to know all that sort of detail when operating





Above left: the Dave Nieman lead/lag rotor blade hinge mentioned in text 'New Trend,' fitted to a DS222. Above: this West German training aid, the Helfe Mechanick, has a telescopic pillar and is free to rotate. Adjustable stops and spring restraint allows gradual progress to greater freedom.

model helicopters, possibly the most relevant virtue of a lead lag hinge is that it may save you a broken blade when your model topples over, so why aren't they fitted to all blades? Well, there is a great deal to be said for having your blade in the right place from the point of view of control response and load feedback into your swashplate linkage servo system and the forces described can vary by about 16 times from one design of model to another, making it almost essential on some set-ups.

There just isn't a right answer for a helicopter problem.

Questions and answers

A reader asks why the fly-bar will not seem to run true with the rotor disc in spite of all adjustments and balancing care.

Really, he is to be congratulated on achieving a set-up and flying standard to be able to observe this. The reason for it, in the hover, is that a control is 'trimmed on' in order to hold the model steady with the CG in its correct place forward of the mast.

The only way to obtain more lift from the front half of the rotor disc is to use cyclic control and this is the flyblade disc.

The CG has to be forward of the mast in order to provide a directional bias and also to give the controls something to 'bite' on in all-important hover.

I am obliged to another reader for sending in a photo of his transmitter tray. These seem to be much favoured by helicopter pilots and help to enable operation of both sticks at once and avoid the tendency to try to control with the thumbs. This is essential and difficult unless you have big hands.

Construction is of wing foam and covered in vinyl or leathercloth.

The question of the correct control mode for the transmitter appears to trouble several readers. I have said before that it is perhaps best to fall in line with the local practice, failing that or in spite of that, exchange rudder for tail rotor, elevator for fore and aft cyclic and aileron for sideways cyclic leaving motor control as is, though some say it is a good idea to reverse motor so that trouble reaction isn't closing the throttle. This last is something that you really have to overcome though, as it could be nasty opening up.

If new to radio — and people do jump straight into helicopters — and succeed — then apply cyclic on right stick, rudder and throttle on left with forward fullup and clockwise right.

The amount of control is difficult to state. In general have as much as you can and cut down the throw if it frightens you!

Event news

The latest **BRCHA** newsletter reported on the association representation at the **CIAM** meeting in Paris. From this the **FAI** helicopter rules are proposed enabling the 1979 **SMAE** rules to be drafted.

Interesting features of the **FAI** helicopter flying rules included downgrading the K factor applied to the loop (it's too easy for some machines!) and upgrading autorotation. Single pirouette and stall turn have the same factor as the loop.

SMAE BRCH meetings will be run as two part competitions apparently, possibly called 'standard' and 'expert.' There will be no helicopters at the Nationals this year due to lack of entries last year. Let's hope the new rules encourage better attendance at the 'educational' events.

A helicopter speed record of 68.571 Km/hour was established in November in Czechoslovakia by a **Mr. Nepereny.**

Helicopter events in 1979 brought to my attention —

April 8, Spring Gala, Odiham, Hants. SMAE.
May 6, RipMax Trophy, Larks, Luffenham, Leicestershire, SMAE.
June 17, Iwade, Kent, SMAE.
July 8, Fly in, Lilford Park.
July 22, Andover, SMAE.
August, Fly in, Smeathorpe, Taunton, Somerset.
August 4, Northern Helicopter Gala, Preston.
September 23, Odiham, SMAE.

SMAE events must have pre-entry.

The **Internationals.** at Riggisberg, Switzerland, are on March 30April 1 and Ausenstein JulyAugust. The **Graupner Challenge Trophy** at Lausanne September 12 and another **International,** Vilvoorde, Belgium, September 8/9. May 13/14, Sandown Park. Should have lots of helicopter interest this year.

Late News — there *will* be a helicopter event at the Nats, on Saturday August 25.

Below and below left: the home-made transmitter tray, mentioned in text 'Questions and Answers.' Simple construction from foam block — vinyl covered. Metal strap connectors are secured using wood dowels inserted through sides of tray — very neat.