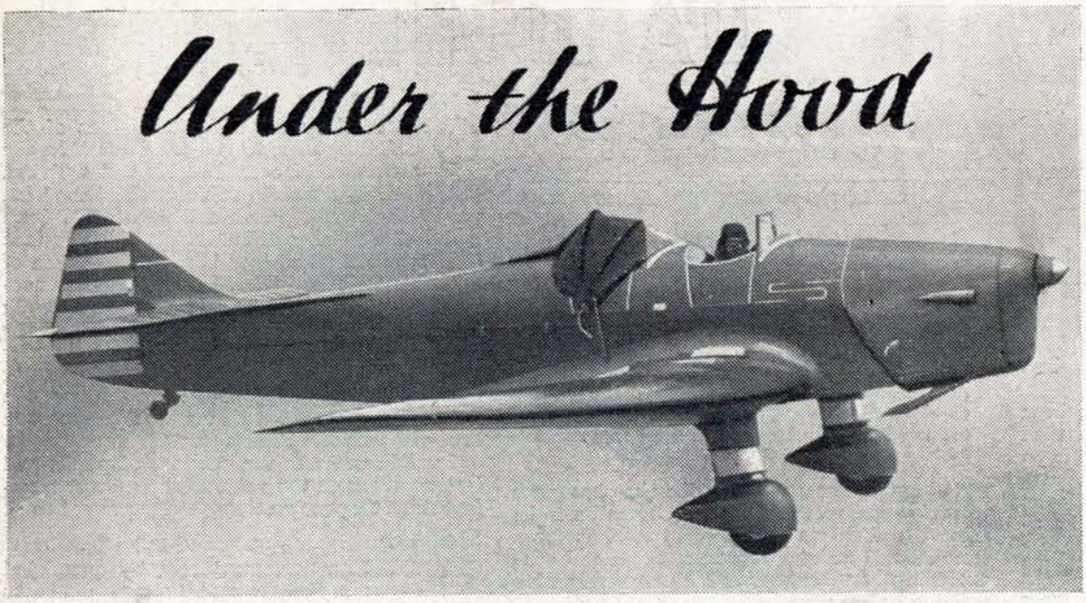
Under the Hood



A Miles Magister, with pupil under the hood and instructor in the front cockpit, flying straight and level. The striped tail, resembling the markings on U.S. Army Air Corp planes, is the "trade mark" of the Straight Corporation, which operates a number of flying schools in Britain.

When the success of every flight depended upon visual aids to navigation, the wise pilot worked to the golden rule—"No see, no fly." To-day science has given the pilot artificial aids with which he can fly when visibility is poor, and here

NIGEL TANGYE

Author of "Teach Yourself to Fly"

explains the methods by which the modern pilot reaches his destination in bad weather conditions

I HAVE just been sent by the Sperry Gyroscope Company, the well-known manufacturers of aircraft instruments, a copy of an absorbing yet rather frightening publication. The book is called "Instrument and Radio Flying," and it is written by Karl S. Day, Assistant Flight Superintendent of American Airlines, Inc. I'm afraid I do not know the price of this book, but it is published by Air Associates, Inc., Roosevelt Field, Garden City, New York.

I have said that the book is absorbing, and it is. I have also said that it is rather frightening. I find it so because, in reading it, I stand appalled at the vast knowledge that is necessary nowadays for a pilot to acquire before he can fly his airliner along the air routes efficiently. The frontispiece of the book—a photograph of "A Pilot's Compartment of a Modern Transport Plane," showing a vast, incredible array of instruments and levers—is enough to strike horror in the heart of a lay reader without his even starting to read the book; for the simple reason that apparently air line pilots have to be supermen if they are going to be safe flyers in all weathers.

Only the very few of us are supermen, and I see no reason to think that there is a larger proportion among air line pilots than among other groups of men; so that one is left with the feeling that many of the pilots cannot be properly equipped; they cannot possibly have absorbed the knowledge that such a book as this reveals as being necessary for efficient flying. But I need not malign the race of transport pilots by having such qualms. They *do* acquire the knowledge, and the skill, and they *are* supermen, to the layman at any rate.

Heavier-than-air flying has only been possible in the last thirty years or so, and for the greater part of that time the most uncertain factor in an aeroplane's structure was the engine. Upon the reliability of the engine depended the safety of the passengers, for one must admit that there is a certain amount of danger attached to any forced landing. But engines no longer are the weakest link in flying. Engine failure is almost unheard of in air-line flying, anyway.

More important than engines even is the correct operation of instruments and radio, for it is on these that the safe conduct of air-liners now depends. Instruments and radio have made flying possible under conditions of bad weather and poor visibility that kept all machines on the ground only a few years ago. It stands to reason, therefore, that under such conditions the correct operation and functioning of instruments and radio is vital to the safety of the machine. So we find that every pilot is now taught blind-flying as early in his career as possible. He learns to appreciate the value of the instruments at his disposal.

The method of teaching in the early stages is for the pupil to go up with his instructor in an aircraft which is fitted with a hood which can be pulled over the top of the pupil's cockpit. The pupil can see nothing outside, so is forced to fly by his instruments. The instructor not only acts as an instructor but also keeps a look-out for other aircraft. A pilot flying solo under a hood is justifiably considered to be a menace to other pilots!

And here may I be allowed to interpolate an experience of mine in this connection. Some years ago I was an instructor at Stag Lane. At the same time I was a pilot in 600 Squadron, Auxiliary Air Force, which was based at Hendon, just across the other side of Watling Street. One afternoon I was flying with my squadron on a practice run of a show we were going to give at the Hendon Display. This consisted of a fly-past of three squadrons in line abreast. Our machines were Wapitis, and I was flying the one on the extreme right of this wing of twenty-seven machines.

As we approached Hendon I saw that one of the yellow Moths belonging to the Stag Lane school was slowly flying from left to right directly across our path. If it continued to hold its course, those of us on the right of the formation would have to break up and our exercise would be spoilt. But there was no sign of the little Moth giving way.

It was, I thought, inconceivable that its pilot had failed to see twenty-seven large machines coming straight at him at 120 miles an hour! However, we were forced to break formation

[FLYING photo

in order to avoid a collision with him. Just as I broke away I suddenly saw the Moth whip over into a dive. The pilot had obviously woken up and had suddenly seen us.

Arrived back at Stag Lane I made inquiries as to who was responsible for this lax behaviour. It was a pupil of mine, I regret to say. And when I asked him why the dickens he didn't keep a better look out, he replied, "I'm awfully sorry, but I was trying to see how long I could fly with my eyes shut!" That is the best example of "blind" flying I have ever come across.

To return to the subject of blind-flying in its more serious form. As an alternative to full-scale training under the hood, it is possible to receive realistic training in an apparatus known as the Link Trainer, which was fully described in last week's FLYING. This can be used to teach a pupil the most elementary lessons in blind-flying up to the most advanced lessons, including blind approaches on to an aerodrome. But as each apparatus costs more than £1,000, and the average school does not attempt to teach the more advanced forms of blind-flying, the usual form of teaching is in the air under a hood.

The instructor gives his pupil last-minute directions before closing the door and lowering the cockpit hood. Towards the end of the course the pupil will learn how to take-off by instruments alone and how to recover from a spin.

Some people think instrument flying to have a value over and above what the instruments actually set out to do. They even say you should master instrument flying before you start visual or "contact" flying. In case you think such a conception ridiculous, listen to what Mr. Karl S. Day has to say in his book:

"If my small son were old enough to fly and wanted to learn, I would start him out under the hood in a Link Trainer, then put him under the hood in an airplane and have him acquire a reasonable mastery in the fundamentals of instrument flying before he started to do *any* contact flying. After that he would learn take-offs and landings and contact flying in the usual way. I may be prejudiced on the subject of the necessity and value of an understanding of the principles of flight control by instruments, but I know that a great many experienced instructors agree with me.

"Certainly in this day and age no pilot who is not a good instrument pilot can lay claim to be an expert pilot. It is easier to learn the principles of instrument flying *first* and to follow with contact flying than to reverse the order. There is much less to unlearn; misleading sense-of-feel will not be encouraged, and flying by instruments will be a natural way of flying instead of an artificial way—difficult to learn after mastering contact flight.

"In order to fly by instruments you must know just what information each instrument will give you and what it will not give you. You must know just what each movement of each instrument means in terms of corresponding movement of the airplane and what you must do to control that instrument; *for when you control the instruments you control the airplane.*"

There are three instruments necessary for the primary stages of blind-flying. These are the usual air speed indicator, the turn and bank indicator, and the rate of climb indicator. When you are engaged in blind flying you have to trust these instruments implicitly. There will be many occasions when, for instance, the turn indicator tells you that you are turning to the right and you will swear that you are turning to the left. This is because your physical reactions have little or no relation to the behaviour of the aircraft.

A flat turn to the right feels, to a blind-folded pilot, the same as a sideslip to the left; and a loop is very difficult, if not impossible to distinguish from a tight turn to the left or right. But you will find that it is extremely difficult to disregard these false messages conveyed to your brain by your senses, and you *must* trust your instruments. Suppose you are blindfolded in a room which is filled with obstacles and you wish to get to the other side. Even if your best friend, in whom you trust implicitly, is guiding you by verbal directions, you will not step out boldly although you are quite certain he will not lead you into an obstacle.

So it is with instruments flying. Although you know your instruments to be your best and most infallible friend, it will take you much time and concentration before you permit yourself to place your trust in them. But the sooner you do so the better.

Another tendency that is difficult to overcome is the urge to over-control. In order to correct a climb when you are supposed to be flying level you will ease the stick too far forward and you will start a dive. You must remember that there is an inevitable time-lag before the attitude of the aircraft is registered on the instruments. For instance, if your cruising speed gradually drops back from the normal 100 miles an hour to 70 miles an hour without your having altered the throttle setting, you will know that you have unconsciously put the machine into a climb. Therefore you will ease the stick forward to bring the nose down again.

Unless you are very careful you will put the machine into a dive, because your air speed will take what you think to be an eternity to regain the 100 miles an hour if you move the controls the correct amount to resume level flight. The time will, of course, be much shortened if you put the nose down too low. But then you will find the A.S.I. shooting up far above the 100 miles an hour, and too late you will realise you have over-corrected. To an observer from without, your flight will appear to follow a path of steep undulations!

On the other hand, it is my experience that with rudder corrections the very opposite is often the case. You will see from your turn indicator that you are turning to the right, and you therefore apply, or try to apply, left rudder. But your impression may be that the rudder simply won't move to the left. You apply what you think to be immense pressure, and still it won't move, and still the aircraft continues to turn to the right. Then you begin to feel panicky, and your instructor in the front seat

[FLYING photos

Blind flying is part of the training of all R.A.F. pilots, particularly of those who fly long-distance machines, such as the Avro Anson reconnaissance monoplane shown on the left. This Anson belongs to the General Reconnaissance School at Thorney Island, and is being refuelled from a mobile tender. Photo above gives a close-up view of the refuelling operation. Without petrol in the tank the most elaborate instrument equipment would be useless; hence, watch your petrol gauge as closely as you watch your turn-and-bank indicator!

has to pull you out of the subsequent horrific manoeuvre.

The truth is that once more your senses will have betrayed you. Your "immense" pressure will have been simply non-existent. To anyone who has not experienced blind-flying these remarks must sound puerile. But, believe me, they are not that. They merely go to show that, by intense concentration, you must obey your instruments under all circumstances. But the paradox to that advice is that instrument flying becomes much easier once you have learnt to relax. And this you will do as soon as the preliminary period of intense concentration is passed.

For the professional pilot's "B" licence test you have to do twelve hours of this elementary blind-flying training. By the end of that time you should be fully capable of extricating your machine from any attitude that it may get in when flying in cloud; and you should be able to do this with very little loss in height. You will find that after you have had twelve hours of intensive instrument training you will be as at home "under the hood" as you are when you are indulging in normal contact flying.

But you will also find that unless you keep this practice of blind-flying up, you will very soon lose both your confidence and your skill in it. It is one thing to fly blind, secure in the knowledge that you have an instructor in front who will pull you out of any jam that you may get yourself into; it is quite another to keep cool in a real emergency and get yourself out of a jam when you find yourself hard up against the elements.

For this reason it is essential to keep in practice; and even though air line pilots have to fly blind every day of their lives on their lawful occasions in many companies they have to do a fortnight's course in instrument flying every year.

Let me conclude with the golden advice tendered by Mr. Day to his pupils :

"I have said that it is vital for each pilot to know his limitations, and to stay well inside them—that the most important thing to know about instrument flying is when *not* to do it. That is not just a phrase, but a thing I mean in all sincerity and on which I am amply qualified to speak. I had several reasons for writing this book, not the least of which was to do my part in bettering the general proficiency of my fellow pilots. But if in bettering your proficiency I have also extended an invitation for you to go out and break your neck, it would be better if the book had not been written. Take it easy; play it safe. Bad weather is serious business. Instrument flying can be done safely under proper conditions by a properly trained and experienced pilot having the proper equipment and aids to work with.

"But there are very definite limits even for the best pilots and the best equipment. Know yours. Respect them. Live long."

NIGHT FLYING AND BAD WEATHER FLYING is the title of next week's flying article by Nigel Tangye. Previous articles in this series—Cross country Flight, and Aerobatics—appeared in issues dated July 22 and 29, respectively. Copies can be obtained, fourpence each including postage, from the Publishing Dept., Tower House, Southampton Street, Strand, London, W.C.2