

AN ACCURATE AND ECONOMICAL SYSTEM FOR THE RECRUITMENT OF YOUNG PILOTS.

By L. F. HESSELINK

After the end of World War II, the bombers and fighters were laid up, the needs of the air forces of the world were no longer permanent and, rich in technical experience, we could once more begin to build for peace.

The immediate need was for pilots to begin with the work which is flying's primary role, peaceful traffic between the peoples of the earth.

Even during the war plans had been made and planning authorities had realized that it was essential to build up a good sized corps of flying personnel and it was realized even then, that the great majority of military pilots were not fitted for transport work. The training system had turned out the pilots we needed, but although the military usefulness and dash with which these pilots were endowed was greatly to be admired, yet their training did not fit them to be civil transport pilots and many of them required a considerable amount of further training to fit them for this work. Add to this the fact that many military pilots were not prepared to undertake the necessary study and to undergo the necessary theoretical tests, without which civil licences could not be issued, and it looked as if considerable difficulties were ahead. In fact it seemed as though there was little chance of making up the deficiency in civil airline pilots.

The planners realised that the veteran pilots were becoming too old whilst the young pilots were untrained and doubts arose as to their mental suitability. A solution had to be found and found quickly, but all possible solutions required time. A new generation had to be reared and Holland decided to strike whilst the iron was hot and to found an organisation for the training of young pilots on the lines laid down by, and to the requirements of modern civil air transport. Young pilots would be trained by a school such as had for many years existed for the young merchant-service-officers. It was not the intention to develop all-round pilots, as in most other professions nowadays, specialisation is necessary.

Economy was an important factor, and, in view of the high costs of flying training, it was necessary to have a reasonable assurance that all candidates beginning training were going to be worth the money.

The educational qualification necessary before entry to the school was a high secondary school training. The candidate had also to submit himself to, and pass a very strict medical examination. To make fully sure of the candidate he was subjected to a psychotechnical examination.

Next came the elementary flying test during which the candidate, usually for the first time in his life, became acquainted with a cockpit, the place in which he wished to work and which can be moved in its entirety in all of 3 dimensions. It is, after all, this place of work, and the methods and manner of moving it about, which is the basis of flying.

Shall the candidate, in a stable state of mind, therefore in an unforced manner, be able to display the right amount of enthusiasm for the profession to enable him to carry out the prescribed duties correctly. To prove that he can do what is required it is in the first place necessary to prove that he, within the time laid down, can prove himself capable of moving the cockpit with all that goes with it, in a safe and economical manner from A to B. Quite apart from learning to handle his engines correctly and navigating, he must above all prove himself capable of coordinating the movements of the aircraft about its 3 axes.

In spite of the fact that the candidate has successfully passed the educational, medical and psychotechnical examinations in advance, it is impossible to make any accurate prediction of the results of the flying test. Normally 50% are found to be lacking in some essential during this primary flighttest. Even amongst those who are allowed to continue, are some who will fall by the wayside, whilst amongst those who have failed the initial

non-flying tests are some who will come into the flying world by another route and make a success of their career.

Up to now the authorities have been more or less satisfied with this state of affairs. Selection is necessary and later rejection of some who have been selected, due to the fallibility of selectors is inevitable.

We cannot, however, ignore the fact that in this manner time and money are lost, so that it is important that we try to find out in how far the primary non-flying and flying tests can be altered to increase their efficiency and to ensure that the really suitable candidates are recruited into our ranks.

If we turn to the first steps of the candidate in practical flying we realise that the coordination of eye, hand and foot which is required for the control of the aircraft around 3 axes is in many cases the stumbling block.

Unlike the birds, we are not naturally equipped for 3-dimensional movement and it was necessary for us to build a machine if we wished to move like the birds.

Man had already built machines for land and sea travel. Since this entailed movement on a flat surface on which the machine was held by gravity, it was only necessary to supply these machines with controls for backwards and forwards movements, movements to the left and right and control of speed. Slowly this has become second nature to human beings, we have complete trust in these methods of transport and consider them nothing special. The knowledge of how to use them has become almost hereditary and the finding of expert exponents of these methods is no more a problem.

However, as pilots we suddenly find that we have two extra planes of movement with which neither we nor our ancestors had ever had the chance to become acquainted. An important factor here is the fact that we have never learned to see in a 3-dimensional environment, coupled with the factor of the neutralisation of gravity. These factors are responsible for the lack of accurate and timely realisation of our position based on visual observation.

We are in the position of a child learning to walk except that the amount of mental knowledge and the mental state of the child play a smaller role and a natural action develops. On the other hand the youngster during his first flying lessons will normally be past the time when he can learn automatically. He has become a reasoning being and his mental stability plays a greater part in the solution of an artificial problem. Both, child and pupil-pilot learn by visual contact and both are inexperienced in their relative spheres. The child teaches itself since the parents cannot teach it. The parents are only smoothing the path of self-teaching by preventing the child from falling too often. They see for the child and measure the distances with which they think the child can cope. In this manner the child's reactions to what he sees and his self-confidence are developed and the child begins to walk on its own. Here the inherent tendency of the child to walk, which has been developed for generations, plays a part. If this tendency is obstructed by mental or physical aberration the child will either learn slower or fail completely, despite the efforts of those who attempt to teach it to walk.

Even though in flying the problems arising for a human being are artificial rather than natural, it is essential that we approach our instruction from the same angle as used by the parents. Flying is also a succession of reactions to what is seen. This is demonstrated conclusively by the birds, who are all natural pilots, but who are unable to fly when unable to see.

The flying instructor must realise what is the primary aim and not become confused by other theories, for example, the placing of too much emphasis on purely tactual reactions. I contend that the primary task is to learn to see, measure and calculate in a 3-dimensional environment.

Slight variations from the desired condition of flight around any one of the 3 axes must be recognised, immediate and supple reaction must follow while the amount of correction applied must be correct. The candidate can be told how to do all this and have it explained to him so that he can understand, repeat and explain it himself, but the actual execution he must teach to himself.

Those who are fitted for the work, with some guidance from their instructors, soon

find the correct and most efficient manner of working, whilst those who are unfitted are always in difficulties and have never enough time to solve their problems. This results in a reduction in their mental stability.

It is to be expected that, as with other forms of transport, a gradual increase of natural tendency for flying will take place throughout the years as aviation takes its rightful place in every day life and when this occurs we can expect the intellectual and mental performances of pilots to be of less importance. However, if we expect a modern youth to pilot an aircraft we expect from him, apart from perfect physical condition, a very high intellectual condition. Especially the tempo of thought and reaction is important since minimum flying speeds are relatively high and since the solution of a problem depends on a relaxed brain. An overtaxed brain will result in a disturbance of mental balance and the pilot will be dominated by the desire to solve his problem without being able to work out the solution calmly and correctly.

In view of the fact that the instructor can do nothing to change the basic psychological qualities of his pupils, the manner in which they tackle their first obstacles is a vitally important indication of what can be expected from them in the future. We must strive more for the discovery of the correct type of person and less for the making into pilots of whatever material is to hand.

Although I am convinced that there is at present on earth sufficient human material to man our aircraft, the finding of the correct types is at present giving some difficulty. True, we live fast, we are rushing things, because, we are in arrears. Because of this, conditions are not conducive to good planning. Before we make a mess of things we must come to our senses, call a halt and realistically face up the facts. Nothing is worse in the world of aviation than haste. Haste results from mistakes already made and sets up a chain reaction of more mistakes and even greater haste.

Whenever we, with an eye to better planning, make an analysis of the present situation, we face the following facts.

The whole preselection which takes place at the present time appears to give but slight guarantee of eventual success to candidates. In spite of the selection committees, the producing of educational diplomas and the passing of the psychotechnical tests, a high percentage of pupils still slip through the maze, who later prove themselves unfit at the flying school. Conversely we can safely assume that a number of satisfactory types are turned down during these preliminary tests.

If one inquires amongst the youth as to why flying is not considered by them as a career, one comes to the conclusion that nowadays, as it was years ago, the majority opinion is that to take up flying is an impossibility for the average man and that a sort of superman is required. Many young men consider a flying career as something inaccessible.

I find it difficult to believe that parents will suggest flying to their sons as a career, certainly not in Holland. This is primarily because this form of transport is relatively unknown. The aircraft is not continually on show, as are the other means of transport on land and sea. It is usually necessary to join a day trip to visit a civil airport before one can get any closer to flying. Military airfields are forbidden territory from which only a terrifying noise is heard, which gives the man in the street an idea of dangerous game. The majority of people only hear of very strict medical examinations and psychotechnical tests which give them the impression that only steel daredevils pass all the tests. After these tests, they think, begins a great gamble usually ending in early physical unfitness, invalidity or accident and which can hardly be considered a reasonable choice of profession. The use of this form of transport and the sensational reporting of everything connected with it, hardly assist in the awakening of trust in the heart of the people. In this manner the individual, during a valuable period of his development, has aviation excluded from his world and whenever it is mentioned, only receives a wrong impression of it. We can console ourselves with the thought that we do not want young men from a class of people which shows such a lack of the spirit of adventure, but this is a wrongful attitude since we have had sufficient time to teach the public about aviation. The authorities must decide now on the correct methods of diagnosing pilot aptitude and not carry on with their recruitment only of young men with dash who may lack other necessary

qualities and by their very possession of dash bring aviation into discredit.

As far as accidents are concerned the principle reason for these is of course, human fallibility. The factors inherent in flying make a certain number of accidents inevitable. In addition to the importance of technical factors a great deal depends on the ability, judgement, memory, mental and physical ability of human beings. With reference to these last two factors not only is there a difference between two different persons, but also between one and the same person on two different days. Even though it is possible to ensure that the aircraft being used is in good condition it would be very difficult to check all pilots daily as to their physical and mental condition and therefore accidents resulting from any abnormality in these conditions cannot be avoided. The best guarantee for the reduction in accident rate is, therefore, the use of only the most competent and stable-minded type of pilots.

Mental fallibility is a characteristic of the human race and no medicines exist for the curing of this. However, the great majority of the public is prepared to accept a certain number of accidents as normal and these will have no deterrent effect on the usage of air transport. We can see this from the public acceptance of the accident rate in other forms of transport.

It is not much use discussing whether we ourselves think that the air accident rate is too high or not. The great majority considers that it is too high, especially in military aviation and does not therefore put its trust in air transport. It is up to us therefore to see that the accident rate is reduced. Fortunately technicians and doctors all over the world are working seriously on this problem. But the findings of all who are busy with this problem must be seriously considered and their suggestions followed, most particularly by those responsible for the selection, testing and training of pilots.

As a result of the discoveries made, some selectors consider that everything possible is being done to select the best possible pilots and believe that their selections are now very satisfactory. Nevertheless this has not led to the desired result as far as those accidents are concerned which result from human fallibility.

From this we must conclude that the condition in which flights which resulted in accidents were carried out, were so difficult that the pilots could not solve their problems without making mistakes. We must also consider that the question of human fallibility was disregarded to some extent during the period of rapid expansion and development of the last few years. The designers built into aircraft so many new instruments and complications that, although the reason for their building in these so-called improvements was to increase the safety factor, in actual fact they have increased the possibility of mistakes by overloading the pilot.

As I have already stated, this is a view point of certain leaders in the aviation world. These improvements have been accepted, however, by other leaders who considered that it was possible for a certain category of people to handle all these things. This may be true, but it is difficult to select and to find the people in this category. It should be clear that wars or rapid selection and training make it even more difficult.

Personally I do not agree that selection methods can not be improved. Although improvements may result in a longer training time, in the long run both time and money can be saved, since at the present time too much time and money is spent on those who fail entirely or who are less talented.

If we ask ourselves, where can we find the opportunity to watch the possible candidate for long periods whilst he is in direct contact with the flying world, without it costing too much money, then we find, but one answer "at a gliding school!"

If a boy whilst at one of these schools shows the necessary ambition then we have our first indication as to his disposition. By using this cheap and practical flying method, selectors have the chance to make their first, unforced selection of boys who are free from examination fears. Most youths at these schools do not simulate any desire to be selected for training as professional pilots. If they are using this method of preparing themselves, then so much better, but most boys are voluntarily indulging in what is for them a game. The possibilities hidden in this game become apparent to most of them much later. The few, who deliberately use this game to further their ambitions in the flying world are obviously

only too welcome and do good work in waking up the others to the possibilities. On the whole, gliding remains a pleasant game, fitting for their youth and devoid of any artificial pressure. Also because of the many extra little jobs which arise on any gliding school, it is possible for the observant watcher to form a good idea of the character of the playing child who here reveals himself.

This type of entry into the world of aviation is infinitely preferable to the unprepared response to propaganda stunts whatever form these may take. Advertisements and catalogues of all the advantages of a flying career only succeed in awakening suspicion in the minds of boys and their parents, since aviation is not yet freely accepted by everyone. By this method of entry too, the voluntary resignations which all too often occur at grading schools, can be avoided. Usually these are the result of a too hasty choice at the moment when a young man is faced with the question of choice of career, very rarely does a glider pilot drop out of training voluntarily. In these cases of voluntary giving up, we lose not only the costs of flying already done, but also the costs of selection committees, medical and psychotechnical examinations and the wasted efforts of instructors who can at this time find better things to do with their time. When the path to a career lies through a gliding school, candidates have a better understanding of the moral and economic questions involved. Almost no other career demands from aspirants such enthusiasm and self confidence, especially this last, as a vital defence against accidents. To gain an impression of the candidate in respect of these character traits it is necessary to have him under observation for long periods and the gliding school gives this opportunity early on and in a satisfactory manner.

My personal experiences with pupils from this milieu are undoubtedly satisfactory and I should say that these are my main discoveries:

FIRSTLY: The debut of the pupil in a 3-dimensional environment has already taken place, he has here learned to see and to plan his work. He has proved that he can work in this environment and we already have gained from watching his behaviour, some idea of his mental stability. This alone is of great value. Every flying instructor will be pleased to have this guarantee of his pupil's stability. He has this guarantee with an ex-glider pupil and rejections on this score are rarely encountered.

SECONDLY: The pupil already knows the why and wherefore of flying, based on practical experience. Preliminary misinterpretations are hereby excluded and the pupil is easier to handle at an early stage.

THIRDLY: Those pupils who have seriously indulged in this sport for 1 or 2 years have already shown a good amount of airworthiness and experience shows that their training as motorpilots is usually successful.

These opinions and beliefs are not shared by all instructors on powered aircraft and I feel that we should examine some of the factors on which this difference of opinion rests.

The value of the path to powered flying which leads via gliding schools is too often assessed by its value during primary powered flying training. A direct influence on the time required during flying training, in the case of those pupils with gliding experience, is expected. Grading is expected to be much shorter for the glider pilot than for the pupil with no flying experience and in the case that both types of pupil are given the same amount of instruction the glider pilots are expected to reach a higher standard. In the majority of cases I agree with these expectations and if a reasonable quantity of material were available for comparison I am sure that the results will prove up to expectations. But if such a test is to be made and to prove anything, then it must be carefully prepared. For instance, mixed groups of pupils with instructors who are ignorant of the exact composition of these groups and standardised methods of assessing since it is constantly apparent that the influence of different instructors is sufficient to result in individual differences in talent in pupils. It can be seen that it is no sinecure to produce exact proof of these contentions.

But as I explained earlier the great advantage of this method of entry is not to be found in this stadium, due to the fact that here an easily attainable minimum is at stake. The real talent for flying is actually shown at a later stage when the pupils' assessments and decisions are based upon his mental stability. This stability is dependent on self-confidence and the glider pilot begins to develop self-confidence at an early age.

Another objection offered by the conservatives is that the glider pilot is adversely affected by his previous training when he takes up powered flight. What is here meant is possible inaccurate turning due to wrong use of rudder, the correction of which might take more time than the teaching of correct turning methods to completely inexperienced pupils. Personally this has not been my experience and if it is true that these bad habits have in the past been developed, then gliding schools can themselves watch for these mistakes. It is true that gliders have a much lower wing loading, which lessens the importance of mistakes. The speeds are lower and the control pressures therefore less, which might result in rough usage of controls. This could also result from Thermal-hunting. But the mistakes which may develop can be corrected before the pupil leaves gliding school and in the long run the positive advantages will outweigh any disadvantages. The so much desired cooperation between the two types of flying school could do a great deal towards the removal of any obstacles.

The question of air-mindedness in its broader sense, must also be touched upon. It is impossible to conceive the amount of damage done to the recruiting campaigns by lack of air-mindedness in the family and friendly circles of the possible recruits. The attempts at improvements in these matters can hardly compete with the occurrences which, although not deliberate, prevent improvement. Only civil airfields and then only by people in conducted parties, can be entered with restrictions. In this manner the way to the winning of trust in flying is almost completely blocked. Economic circumstances have resulted in the near extinction of powered flying as a sport and here also is the way to trust obstructed.

Almost the only contact left for the stranger to flying is the calm approachable sphere of the stations where gliding takes place. Here everyone receives willing attention and can become acquainted with flying from close by. Accidents are the rare exception and the playing boys in their windjackets arouse more trust than the unapproachable daredevils on 90% of the flying fields. This development of trust is very definitely lacking and we can to some extent look to gliding as an aid to improvement, since it can be observed and judged from close by. If youth begins to use this way of developing the flying instinct and an appetite for flying, then the public will realise that pilots are neither heroes nor circus artists, but normal healthy men using a safe and carefully developed means of transport.

The development of economic planning cannot be complete if the possibilities of Synthetic Training are not considered. As the chief of a Synthetic Training Department I have had experience of approximately 400 pupils and instructors and the results obtained by use of these trainers exceeded my wildest imaginations. To achieve full use of the trainers the man behind the table should be himself a pilot with pedagogic qualities and ability, someone who has practical knowledge of flying and of the type of person needed for a pilot. If these suggestions are followed then the Link becomes the cheapest method of assessing pupils whether in the grading, primary or advanced stages.

But all too often these suggestions are not followed and link instructors are signed-on, who are capable of moving switches, but are further lacking in the qualities required. When the Link is used in this manner, it deteriorates into something which is merely a help in the practising of landing procedures, and the man behind the table becomes a mere automaton, who in the long run becomes dissatisfied with his work and leaves. We must try therefore to see that Link- and flying-instruction are given by the same persons.

The conservatives still doubt the value of these machines. The sceptics base their argument primarily on the fact that the Link apparatus remains stationary and that no accelerations can be felt, also on the fact that there is no question of falling this rendering it difficult to judge the morale of a candidate.

Here also is obvious the placing of too great an emphasis on feeling. Agreed that it is impossible to fly in 10 hours from Amsterdam to New York on the Link, but that is why it

is a Synthetic Trainer. A constant speed of 600 miles per hour is rest, just as much as sitting in the drawing room reading a paper. A passenger does not wish to feel accelerations and decelerations and it is the task of the airline pilot to avoid them. If he should try to do this by feel them, it would be proof of his unfitness for the job, even the fighter-pilot would not last long if he tried this.

Once again the visual contact with the instrument panel plays the chief part. In the yawing-plane turns of up to 2 degrees per second are not to be distinguished by feel alone. Turns in the pitching and rolling plane are apparent so late and as a consequence of the alterations in acceleration of gravity so wrongly, that there can be no question of control or correction purely by feel. At the most, the touch on the rudder during take-off and landing and the visual contact outside the cockpit can play a part. One of the qualities of a good pilot is that he nips in the bud any tendency of the aircraft to fly in any but the way he wishes. For this the feeling alone is too insensitive, the visual contact with the instrument reactions which are apparent to the pilot, long before he feels any variation, is the only solution and the only way to avoid either slow reactions or overcorrections.

The constructor of the synthetic trainer can be left to decide how he should simulate and make visible on normal instruments every common force, acting on the aircraft. Modern trainers are completely successful in this aspect.

Against the argument that synthetic trainers have no value in the moral training of pupils, I dare to say, that in the forming of and checking of morale, this type of training is not inferior to flying training. After all, what do we mean, when we speak of the morale of a pilot. Instead of morale we could write SELF-CONFIDENCE, the quality which enables a pilot to relax mentally and therefore physically, thus ensuring that he is in a position to carry out his tasks in the best possible way and to overcome all difficulties. This confidence itself is normally innate in, and perfected by, the individual himself. The influence of others can at an early age destroy or prevent its perfection, but can do little to add to it. The building up occurs only when the foundation is already present and when the individual is faced with responsibility of solving his own problems. It is, therefore, difficult to make an assessment of self-confidence. One is inclined to take too much into account the easily distinguishable nervousness which can have many causes. The true state of a candidate's self-confidence is never assessable, either during ground instruction or air instruction, for the simple reason that the pupil does not, in these instances, need to have confidence in himself. He develops confidence in his machine, or in the capabilities of someone else, this increasing his experience and enabling him, when he must depend on himself at a later stage, to perfect his selfconfidence.

If morale is seen from this aspect, then it is easy to understand, that the proven instructional capabilities of the synthetic trainer can, in an economical manner, assist in developing those character traits from which self-confidence is developed and perfected.

As with the appreciation of gliding, the value of synthetic training is often looked at in the light of the saving of flying hours during primary flying instruction. The same answer applies here as was given about gliding. Not here, but later, this training will take effect, when the powers of anticipation and accurate interpretation of everything occurring within the pilot's sphere of action become important.

A great advantage of synthetic training is that it is possible to examine the pupil in an atmosphere of calm; corrections and commendations can be made in quiet conversation, an experienced instructor can, in this manner make accurate assessments of the pupil's reaction, powers of concentration, manner of thought, methods of working, planning, accuracy, keenness, tenacity, initiative.

The pupil's character becomes for him an open book. The man with the necessary qualities is easy to discover and the weaklings can be sent on their way.

It would take too much time in this dissertation to name the many examples from my experience which have proved the worth of these trainers and convinced many former sceptics. These examples were so striking that people began to think that I was not excluding my results with pupils during flying-instruction, on which I am also engaged, and was no longer objective on synthetic training matters. Realising that this was a normal reaction of the sceptics in the early period, I tried to overcome this by avoiding and or-

dering my Link instructors to avoid, referring in any way to the reports on the candidates' practical flying tests. Nevertheless the reports of the Link instructors show amazing likenesses and where, in the primary stages, the reports vary, time proves that the reports from the Synthetic Training department are almost always right.

To conclude - I see in the correct, early, and simultaneous use of Gliding and Synthetic training an accurate and cheap method of recruiting pilots economically and correctly.