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The AI, Family of Soviet Avia Engines

by

A. G. Ivchenko

Kirovograd. Institution for Higher Learning for personnel of the Civil Aviation in the USSR. It would be useless to look for such an institution in any of the capitalistic countries. They do not have such schools.

The higher flight training school, it is first of all a perfection, new stages of flight mastery, it is a step forward in mastering more complex aviation equipment. Before the students, which are now completing the training course in this center of learning, is being opened the way from the Yak-12 and An-2 to the control stick of turbojet and turboprop air ships An-24, Tu-104, An-10, Il-18. Yes these fliers having acquired in the flight training schools knowledge and habits, go to the peaks of the flying mastery.

At the Kirovograd school are trained not only pilots, Here undergoing initial training are navigators of jet aircraft. With the graduation the young navigators enter the fifth ocean and guide airships over numerous avia routes of our country.

Recently to Kirovograd in visit to the students, pilots-instructors and lecturers came the chief constructor recipient of Lenin premium Aleksandr Gedgevich Ivchenko. The engines which have been constructed by the outfit headed by him, are mounted on Il-18, An-10, An-12, Yak-12 aircraft on Mi-1, Ka-15 helicopters. The school is now training crews for new turboprop airships An-24. These aircraft too are powered by A.Ivchenko engines. All these engines are united under one family, which has adopted the initials "AI".

The chief constructor acquainted himself with the engine training class, he

was favorably impressed by the stands, aggregates and other demonstrative devices contrived here, he adviced on what should and what can be done, he answered questions of interrogators and students. The conversation which enveloped around engines, left a deep impression, it enabled to better and more thoroughly understand the ideas embodied in the new engine.

This was followed by a conference in the larger auditorium instigated by the Club of interesting meetings.

I find it highly pleasant, and I would say, highly useful to become acquainted with you, dear comrades - that is how A.G.Ivchenko began his introductory speech. Direct contact with AEROFLOT (Civil Aviation) personnel, with the ones who in practice will test the service life of our constructions, enriches the constructors with new conceptions, it excites one onto a search for ways of improving equipment. The remarks, suggestions, councils which we receive from you, personnel of the AEROFLOT cannot be overestimated. The creative contact, close friendship of the ones, who produce new equipment and who exploits same , appears to be an important prerequisite of technical progress, lively development of air transportation with which all our ideas are connected, to which we and you are devoting our forces, energy, knowledge.

You know, comrades, what the party is constantly teaching us, that we cannot be satisfied and rest on the laurels of the already attained things. We must "says Nikita Sergeyevich Khrushchev, - constantly improve even the most perfect one for the given period, because with the expiration of time , with the development of science and technology, which never rests, even the most perfect things become obsolete ". This to a no lesser extent pertains to new equipment. Let us say we have built a new engine. Assuming it passed all the necessary tests but, by placing the hand over the heart, we must say, that nevertheless there are bright and dark sides which can be more thoroughly revealed only in the process of operation. And here who is better authorized to say something besides you, comrades.

That is why the collective of our construction bureau values your opinions,

listenes to your councils, remarks, wishes. We are trying to derive from life, from practice everything which helps us to better carry out our tasks, which promotes perfection of our engines.

I was very pleased to learn, that here in the school, greater interest is expressed toward the An-24 aircraft, that the students like our engine. This, I repeat, is very pleasing. It is no less comforting, that in the process of studying the new engine the lecturers and students are developing a lot of useful ideas, suggestions. In this account, as they say, your eye is observant, and the fact that you are critically accepting our new job, you evaluate it universally, - can only make me feel happy. It is in favor of the job. I can assure you, that your councils, your comradely help are accepted by us with appreciation.

We continue working over the engine for the An-24. Our group is improving its units and aggregates, we are persistently attaining a longer service life of the engine. This task is not abating, on the contrary, it will acquire greater scope after the An-24 goes into service of the AEROFLOT. Real operation will tell us a lot. In any even we will try with your active help to do everything possible, so that the engine will meet all the requirements of the AEROFLOT, to make it more economical, long living, reliable, such as you would like to see it.

You have all heard about our AI-20 engine. We hope that it will serve aviation for many more years. But in spite of the fact that it has been manufactured quite some time ago, the constructors are still working on its improvement. Each new series is always a bit different from the previous one, and this is a step forward.

In order to give a more or less full description of the operation of the AI-20 engine much time would be needed. Yes and there is no special need, because everyone who has some dealing with it knows all about it. I would only like to speak about what has been done to increase its service life, or as they say to increase its life span. Why do I place special emphasis on this subject. The economy of the engine depends in many respects upon its resource. If the engine shows a longer service life, then

of course, it is more convenient, because the cost for its operation and the cost of transportation are reduced. . And a reduction in operational costs is the basis for reducing tariffs, which in turn, leads to an influx of passengers for air transportation.

In this way, an increase in the service life and inter-repair resources of engines is one of the important conditions for the growth in the volume of transportation, increase in economical indices of the AEROFLOT, improvement in the well being of the nation.

That is why I consider it an obligation to tell you, what we have done to increase the resources of the AI-20 engine. From the moment the engine was put into series manufacture, about five years have passed. During this time its resource was increased by four times. On many aircraft of the Aeroflot AI-20 engines with pentafold initial resource have been mounted. And so, step by step, we are improving this engine in order to make it more reliable and more economical than its brothers from the first series. I can say, that in the very near future the AEROFLOT will be receiving AI-20 engines with a service life 15 times greater than in 1957.

We are doing the very same thing on an engine for the An-24, which you are now studying. The service life of this engine, we hope, will rise more rapidly than that of its brother the AI-20. I do assure you, that we will not skimp any efforts nor time.

See attachment 1a

Illustration: Chief constructor recipient of Lenin Premium A.G.Ivchenko, speaks.

I would like to call your attention to the fact, that the performance of any engine, its service life depend to a large extent upon the operating conditions. Proper, overall operation - one of the important guarantees of long life. Technology does not stand for the "Per You" version. Here a lot can be done by the collective of the Higher Aviation Training School. It is necessary to persistently improve the training of pilots and other crew members, they must adopt a liking for the equipment, for the work, they must develop a sense of responsibility for the entrusted job.

Illustration: Chief Constructor

I have succeeded in getting acquainted here with the training program of crews for flights on the An-24

Illustration: From the grand and useful conversation at the Club of Interesting Meetings.

I should say, that it well assures good training of cadres for this aircraft. But the listeners should not forget, that at school they are only making the first steps in the adoption of new technique. The main thing is to forge ahead. The fliers too cannot rest on their laurels.

Our construction group will not remain idle in the training of cadres for this machine. We consider it our duty to help you with demonstrative means. For this purpose the construction bureau is assigning to you two training engines. Here, in Kirovograd, must be created the most favorable conditions for the training of An-24 crews.

Usually we constructors are questioned by aviators " What are you working now on "? This is perfectly natural. Aviators would like to know the perspectives of developing aviation equipment, trends in this development, or will they have to learn all about the things which are being developed at the construction bureaus. But I will tell you in secret, I adhere to such a law: it is better to speak less, and do more. Still adhering to this principle, I will briefly (in two words) explain certain deliberations.

The airways of the nation will soon see the An-24 and Tu-124 aircraft, which, as is known, are intended for 40-60 passengers. It is believed that in addition to these aircraft the Aeroflot should also have 20-24 seater aircraft for flights along local air routes at a speed of 300 km/hr. Such an aircraft needs engines. This too

is a job for the constructors of avia engines.

And if we keep in mind much farther perspectives, then we must speak about powerful transport aircraft with a cruising speed of approximately 2000-2500 km/hr. Foreign press is writing very much about that. Published are also projects, models of such airships. They too will be needing power plants. And this belongs to the competence of aviation engine constructors.

Just so, comrades, to live and see.

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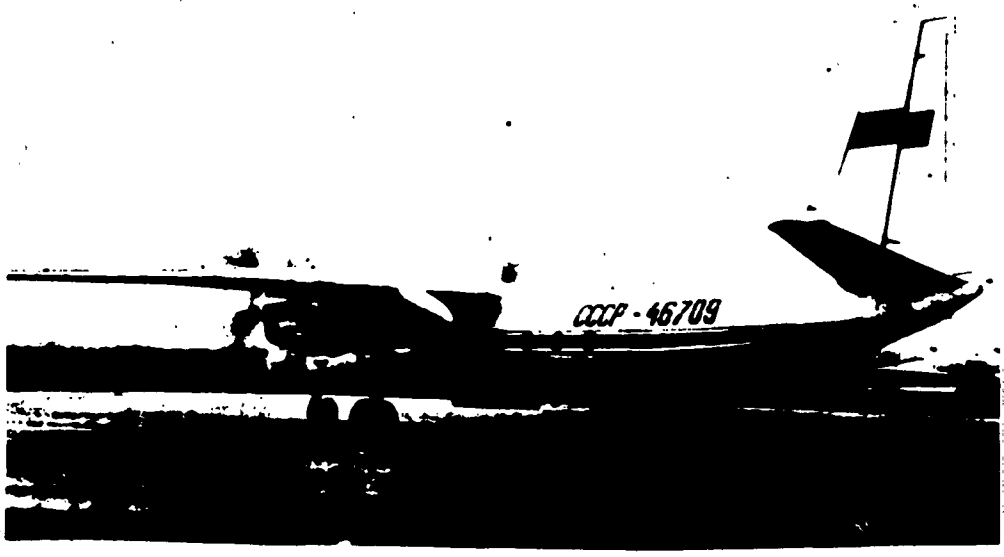

Illustration: Turboprop passenger aircraft An-24

Lines from newspapers

Many AEROFLOT publications arrive at the Kirovograd School of Higher Avia Training what to they speak about ?

Northern Territorial Control. A majority of fliers, having graduated training in the course of Li-2 ship commanders, have been permitted to fly in minimum weather one at daytime and two at night. Our recommendations: it is necessary that the students should acquire greater practical habits when flying with side wind.

The Tyumensk Avia Group. After training in Kirovograd pilot N.Kuznetsov was put to work as An-2 ship commander and he successfully executes flights on local air routes. A.Kuragin is also well trained for introduction into work.

Uzbek Territorial Control. Graduates of the school have shown excellent theoretic and flight training. V.Prokofyev flies independently as Li-2 commander. L.Usov is co-pilot.

Azerbaidzhan Territorial Control. The general impression about the training at the school is good. When put to work the pilots have demonstrated high theoretical and flight training.

Magadansk Avia Group. Sixteen graduates of the school, especially N.Levchenko, N.Mosin, A.Boroznov, I.Taran received outstanding awards on material part and aircraft piloting. They fly good and reliably.

Kazakh Territorial Control. Pilots O.Lipin and V.Kim after graduating school have considerably improved their mastery. They are making a more thorough study of piloting problems and practical aerodynamics. They show no faults in the technique of piloting. We wish the working group of the school further successes in the training of aviation cadres.

They go out on air routes

Who knows, maybe Vladimir Kotovskiy will succeed in establishing new, hitherto unknown ways in the enormous air ocean? In any event he dreamed about it! And he

studies well, diligently, to become a highly qualified navigator. These possibilities are offered to him by the school.

Vladimir Kotovskov came from Bulgaria. Already in the school years he read a lot of books about people of the winged profession. And when he has seen them on large jet aircraft he firmly decided the selection of his future life path.

Entrance exams to the Kirovograd school for the navigators course he passed with high honors. And identical honor he is now reaping in all subjects. He has already 100 flying hours to his credit.

Just like Kotovskov other students Konstantin Pirogov; Leonid Cherepakhin, Vladimir Kulin and many others, are successfully mastering the art of flying.

AN-14, PCHELKA, (The Clod)

by

N. Vladimirov

It is an unusual aircraft named at first by an absolutely ordinary name: the first letters were in way different from its brothers, which came from the very same construction bureau. Only the ordinal number of the construction indicated that it came to light between the AN-10 and the AN-24. Whatever was in the blueprints and drawings has found its way into the metal, wood and plastics, it was christened with the pet name "PCHELKA".

Otherwise, the fact is not natural to its name. The bee as a bee! We would like to speak about the other things: are "PCHELKAS" generally needed in our country when along the air-routes of our country are already for the second years flying express aircraft TU-104 and Il-18 ? Just think - after the AN 10 accomodating in its spacious cabins 85 passengers, Oleg Konstantinovich Antonov introduces to civil aviation the AN-14, which is inferior in load lifting capacity even to its predecessor the An-2.

Civil Aviation isthe largest in the world aviation unit, it services not only lines extending over several thousand of km, let us say, Moscow-Petropavlovsk in Kemchatka or Vladivostok - Odessa. The sky of our great country- from Khibin to Kara-Kumov, from the River Prut to the Bay of Zolotoy Rog, from the peak of Tamir-Tau to trans-Carpathia is densely interwoven by a multitude of local air lines, over which more than 40% of air passengers are travelling. What is particularly comforting - the local network of blue roads not shown on the map, but it is expanding continuously, in a very fast pace. In villages, workmen communities, small towns is rapidly growing the demand for high

speed transportation, and the day is not too far away when the USSR will become a country of solid aerofication. That is why the Aeroflot needs good and various air craft, heavy and light ones. The more so since the length of local avia routes varies from 150 - 200 km in the Ukraine and in Armenia, to 400-500 km in Transbaikal and Kazakh-SSR.

It could be mentioned, that Andrey Nikolayevich Tupolev after the giant aircraft Tu-114 created an airship of medium range of flight the Tu-124 carrying 40-60 passengers. To fly over a medium air-route we have the An-24, which appeared in the footsteps of the main liners An-10 and An-12.

But let us discuss the "PCHELKA". What does it represent? For what purposes has it been created? What is its destiny ?

The An-14 is a multipurpose aircraft. Depending upon its designation it can be manufactured either in passenger, or in agricultural variants. The passenger variant of the "PCHELKA" is intended for seven passengers. Its cruising speed - 190-210 km/hr. Range of flight - up to 600 km. For 200 km long avia lines, for which PCHELKA was designated for practical purposes the aircraft (PCHELKA) will be capable of carrying 9 passengers bringing up the load to 720 kg. With full tanks and commercial load of 550 km the flight range can be increased to 720 km.

The An-14 is a high wing monoplane with double fin vertical empennage. Its length is 11.04, height 4.25 m. The wing is provided with automatic [illegible] slats (forewings), dual slot extensible flaps and hinged ailerons. Wing span - 22 m, Agent native - 12.15 m. Load per square meter - 82.5 kg.

The power plant consists of two radial piston engines with air cooling AI-14RF. Its total take off power is 600 hp. The engines mounted on the PCHELKA are well known to our flight and engineering-technical cadres and consequently they do not require much introduction.

But we must repeat again about the power installation selected by the constructor for the An-14. In comparison with the single engine version it has at least two advantages. First of all - greater reliability of the aircraft. Even at full load the

PCHELKA can continue cruising in case one of the engines develops trouble. Of no lesser importance is also another advantage. We are thinking here of the training of flying personnel.

Young pilots, as a rule, for a year, two or more fly single engine aircraft the Yak-12 and An-2. Consequently when time comes to train for flying on heavy machines it is necessary for them to become familiarized (acquainted) with new more complex equipment. The pilots must also master the technique of piloting aircraft powered by several engines. Flights on the An-14 will give the young cadres the possibility from the first stages of individual (independent) operation along air lines and in agriculture to adopt these characteristics, strengthen and develop habits in piloting of aircraft with complex power plants.

There is still another feature of the new aircraft. We speak here about its take-off-landing qualities, which for local lines may be of decisive importance. The length of the take-off run of the PCHELKA - 60-90 m, length of landing run - 70 -110 m, landing speed - 65 km/hr. We like to mention, by the way, that the length of the take off run of aircraft of approximately the same class is 150-200 m. Furthermore the landing gear of PCHELKA, having a nose wheel, eliminates the possibility of nose over, and the lever suspension of the wheels and low pressure tires allow to operate same, over dirt, sand and snow covered landing strips.

Even more can be said: by its take-off-landing qualities the An-14 is placed between the categories of light aircraft and helicopters. However, if we take into consideration the cost of operating prop-wing machines, then their ability to take off and land vertically is bought at a high price.

But speaking about the take off landing qualities of the An-14 we must keep first of all in mind its operation in any given village, any given farm without any greater expenditures in preparing and equipping airfields. It can land everywhere and the cost of its operation is three-four times lower than that of the Mi-1 and Mi-4 helicopters. We of course do not desire to belittle the values of helicopters, but we cannot get away from the truth, that wherever it is possible to fly an aircraft, it

is hardly advisable to resort to rotor driven machines. That is why the An-14, in our opinion, will be profitable to employ for the maintenance of geological exploration parties, and for the execution of sanitation missions.

It dimesnions, arrangement and equipment of the passenger cabin leave a good impression. Along its sides at wide illuminators (windows) are placed six soft chairs. The seventh passenger sits in line with the pilot. Over the windows - curtains. The walls are decorated with plastic materials of pleasant color. The cabin is equipped with air conditioning systems. The noise of the power plants is dampened by thermal noise insulation. The entry door is at the tail end of the fuselage. The extendible ladder is kinetically connected with with the door flaps, it is extended and retracted automatically.

There is a reason why we speak in such great detail about the cabin. It is time, yes it is time to pay a little more attention to short range aircraft and to passenger services. PCHELKA is in this respect quite different from the An-2 and Yak-12, approaching with its interior decoration to modern heavy airships. True, in freight variant of the machine the constructors provided collapsible seats for eight passengers. Does it pay the reduce the comfort? This is a step backwards! Passenger convenience should not be infringed.

For the agricultural variant of PCHELKA the construction bureau developed two kinds of equipment. One is intended for dusting, the other for spraying processes. The chemicals are loaded on the ground into tanks, which are then rolled in into the cabin of the pilot. The tanks are interchangeable. As long as the aircraft treats seedings from one tank, the other one is being charged on the ground. Nothing more can be said, that this not only facilitates the servicing of the machine but it also reduces to a minimum its stay under loaded chemicals. The cost of treating fields from the An-14 aircraft, as shown by preliminary calculations, will be lower by 20-30%, than with the Yak-12.

The apparatus for aviation-chemical operations is easily installed and dismounted from the aircraft. When there is no work at the field, the aircraft can be

used for transportation of seeds, seedlings, chicken incubators, spawn fish, berries, milk and other agricultural loads.

The technique of piloting the An-14 is simple and accessible to young flying cadres. Navigation and communication equipment, installed on the aircraft, is intended for the execution of flights not only under visual conditions, but also in case of poor visibility.

Special de-icing measures are provided. The wing and empennage are provided with hot air system, the windshield of the pilot cabin and atmospheric pressure pick up - with electric heating. At the time of flight testing the anti-icing system functioned satisfactorily.

These are the general qualities of the PCHELKA- and aircraft for local lines and agriculture.

Illustration: PCHELKA landing near field station of a farm. The inhabitants of the village view the new aircraft with interest.

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Diskoplane, Flying Machines of the Future

by

B. Broude

If we would analyze the development of aircraft construction, then we might arrive at a conclusion, that the wing is dying away. The fact is, biplanes have given space to monoplanes. The monoplane wing with trapezoidal (fig.1) larger area and considerable aspect ratio, has first become sweptback, then it transformed into delta of small aspect ratio and small area. Now are even planned "Flying Fuselages", e.g. the Aerodyne by Lippish.

This transformation of the aircraft took place basically because of the rise in aircraft speed. With the rise in flying speed to create the necessary lift is necessary a smaller wing area. But with the reduction in wing area there is a deterioration in the take-off-landing properties of the aircraft. This deficiency is compensated by the increased power installation of jet aircraft.

On modern passenger aircraft the thrust of the engines (or propellers) is 0.2-0.3 of their take off weight. An increase in energy to 1 allows to make a vertical take off and landing aircraft. If such an aircraft is intended for flying at very high speeds, then it can be made entirely wingless. One fuselage is capable of producing the necessary lift, although its aerodynamic quality will be very poor (approximately Kf=1-2). And, of course, take off and landings should be done by increasing the thrust of its jet engines.

It is assumed, thar vertical take off and landing aircraft (SVVP) of greater take off weight and greater load lifting capacity will be technically realizable and

economically advisable when producing more powerful, lighter in weight and economical engines, than the ones which are mounted on present day aircraft. For example, in order that a Boeing 707-420 aircraft should land and take off vertically it would have to be powered not by four engines as presently, but by 18 engines ! At such a mechanical modification the aircraft would have no practical commercial value nor flight range.

We will assume that the question of engines has been solved in positive. But the "flying fuselage" having together with the wing lost the right of being called an aircraft, will not be perfectly safe in operation! in case of engine failure or shortage of fuel such a flying apparatus will not be capable of gliding down to Earth.

The press reports that as long as the problem of gravitational forces is not solved there will be no methods of controlling same, all heavier than air flying machines, regardless of their cruising speed (up to super or hypersonic and even cosmic speeds) for safety purposes will be equipped with wings or rotors for gliding descent or with brake and parachute systems for landing.

The Diskoplane is considered abroad as the suitable apparatus for flying at any possible speed with vertical take off and in case of emergency with gliding descent. In other words, the flying apparatus with one round wing, without fuselage and without empennage.

Efforts to create an aircraft with round wing have been made repeatedly, but they are still in experimental stages. The fact is, that a round wing - is a wing of very small aspect ratio $\lambda = \frac{4}{\pi} = 1.27$. It has a greater critical angle of attack. A round wing for an aircraft of conventional design (wing-fuselage-empennage), in the opinion of foreign specialists, has no advantage over a trapezoidal or delta wing of small aspect ratio (fig.2). In order to utilize the greater landing angle of a round wing the aircraft should have extremely high landing gear. It will have poor lateral stability because of the small wing span. Poor viewing from the cockpit during take-off and landing, and a number of other defects.

And, on the other hand, a "flying Wing" type aircraft (round form in plan) possesses, in the opinion of foreign specialists, a number of advantages over delta wing aircraft, not to speak about the "flying fuselage". It is assumed that the profile of such a wing (in any given section and direction) is most suitable in lenticular shape (doubly convex), with greater upwards curvature. It is mentioned that with respect of strength it can be taken of very low relative thickness (c=3-5 percent). A flat disk will have excellent aerodynamic qualities at super-and hypersonic flight speeds. To arrange the engines in the interior of this disk (fig.3), the fuel, useful load and cabins its thickness in the center ($H\delta$) should be no less than 2-2.5 meters. At relatively small profile thickness it requires a greater wing diameter. Consequently it is assumed, that discoplanes should be sufficiently large in dimensions, take off weight and load lifting capacity. For example , at c = 5 percent and $H\delta$ = 2 m, the diameter of the wing D_0= 40 m. At a specific wing load $P = \frac{G}{S}$ 420 kg/m^2 the weight of such an aircraft may reach G = 500 tons.

For a discoplane to fly at an altitude of 20 km at a speed of 3600 km/hr its engines should develop a thrust of about 90 tons (at K = 6). For vertical take off and landing they should give a thrust of over 500 tons. But the overall dimensions of a discoplane should be considerably smaller than the overall dimensions of an aircraft with such an ordinary wing area. And so, the diameter of a discoplane with an area, equalling the area of a wing of a modern multiseater aircraft, does not exceed 15 meters.

It is assumed, that a discoplane should be equipped with a greater number of engines, so that the breakdown of one of them would not generally change the general thrust force and equilibrium of the apparatus. During take off and landing the exhaust streams of the engines are directed downwards, and during horizontal flight - sideways, reverse to the movement of the disk. With the rise in speed a greater part of the lift will be produced by the wing. The engines are switched over into cruising, economical operational condition. In view of the presence of two lift forces (aerodynamic and reactive), the discoplane is capable of flying in the atmosphere, as well as beyond it -

- in cosmic space.

All vertically take off aircraft and rockets during hovering and small rates of motion do not have aerodynamic stability. Conventional rudder surfaces under these flight conditions are ineffective. The same is the case when flying in highly rarefied layers of the atmosphere and in vacuum space. That is why vertical take off and landing rockets and cosmic ships have jet rudders for stabilization and control, that is the reaction of the outflowing stream of gas.

Analogous devices, controlled by autopilot and manually, in the opinion of foreign specialists, should also be used as equipment for discoplanes. For control around all three axes it is possible to use the jet streams of the engines, and in case of emergency - compressed air, stored in bottles.

The round wing has little shifting (with change in angle of attack) wing focus. At an arrangement of the CG in the geometric center of the circle of the wing (X_{ut} = 50% CAX) the moments necessary for balancing and control will be small.

Due to total symmetry of the discoplane it will be capable of flying with 90% slide and even in reverse direction.

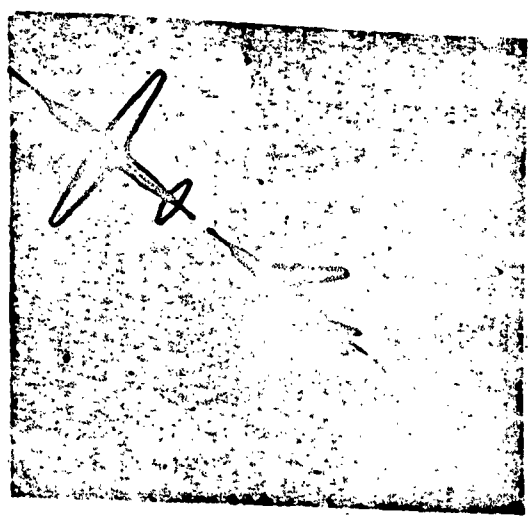

Fig.1.

The opinion is expressed, that for emergency gliding and regular aircraft landing (without reactive streams of the engines and a stream of compressed air) on the trailing edges of the disk is desirable to have aileron type rudder surfaces, and for ground stability - fins. In this case the CG should be shifted forward. The recommended centering equals X_{ut} = 32% CAX, just as on certain conventional type aircraft.

It is pointed out, that from the viewpoint of strength the round wing has also advantages over the trapezoidal one (fig.4). At the very same area it has a smaller span

and also a smaller bending moment. The base chord of a round wing is considerably greater than the base chort of a trapezoidal wing. By that many times (at same c) will be greater the structural height of the wing section and, consequently, lower the forces in its flanges. For example, if the trapezoidal wing has $\lambda = 10; \eta = 3$, then an equisized round wing will have a span by 2.82 smaller, and a base chord 2.37 times greater, than in a trapezoidal wing.

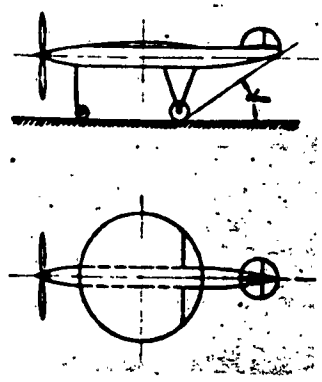

Fig.2.

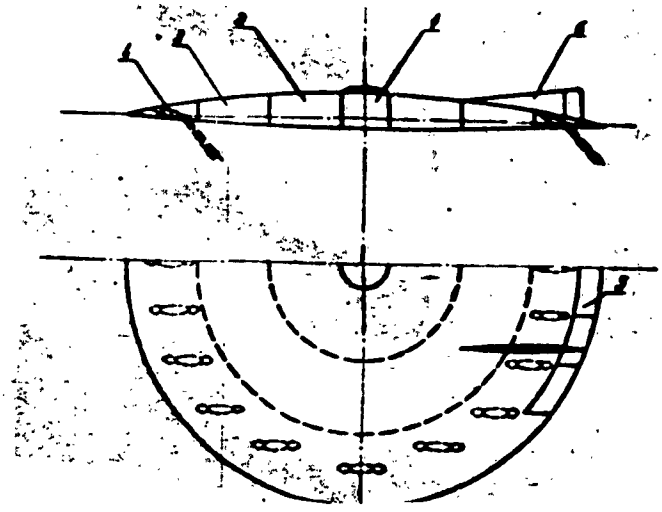

Fig.3

In this way, when using a round wing a double gain is obtained: from shortening the wing and increasing the chord. Furthermore, in the round wing will in essence be absent torsion, because the CG, rigidities and pressure of sections are approximately on the axes of symmetry of the circle (by 50% CAX).

For the very same reason it will not be subjected to vibration of the flutter type.

Because of small bending moments and greater rigidity of the round wing its deformations will appear to be insignificant.

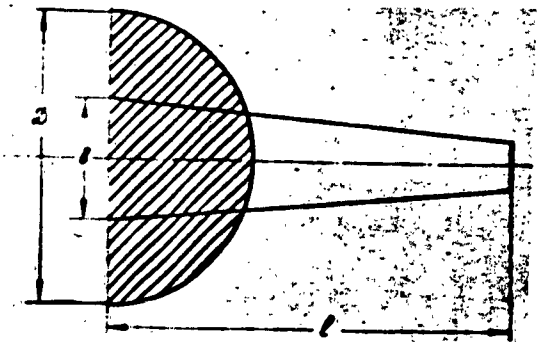

Fig.4

Judging by the descriptions given in

foreign press releases, the construction of the round wing is quite simple. The basis of the frame can be formed either by certain longerons (fig.5,a) or by certain ribs (fig.5,b).

In weight the round wing is much lighter than an equisized trapezoidal wing, because it has no fuselage nor empennage. That is why the weight yield of the discoplane will be much better, than in an ordinary aircraft. Maximum yield would be offered (at monocoque construction) by a flying apparatus of spherical form, because the weight of its construction is proportional to the surface, and the useful load to the volume. But a spherical form is suitable only for flying in airless (vacuum) space. Foreign aviation circles assume, that at an aerodynamic flight maximum weight yield in comparison with ordinary aircraft will be offered by the lenticular discoplane.

There are various concepts on the possibility of constructing a discoplane. Suggestions are made, for example, (fig.3)to place the crew cabin not in the "nose" of the apparatus, which is hampered by the low thickness of wing leading edge, but in the center (position 1). Reduced viewing is supplemented by television and periscope installations. Around the cockpit can be arranged the passenger cabins (2). In the next ring is situated the fuel (3); in the outer ring - engines (4) and control organs (5); on the upper surface - fins (6).

The landing gear, as well as for vertical take-off and landing, should be small and can represent easily retractable runners-skiis. Suitable also for take off from the spot and for sliding after emergency gliding.

All the mentioned features and advantages of a discoplane are given on the basis of rough calculations and logical conclusions. To confirm same extensive scientific investigations of the structure are necessary, investigations of strength and aerodynamics of various discoplanes. In France, especially, was already tested an aircraft-disk (Rene-Kousen) with a cockpit for two people. The aircraft-disk had a diameter of the wing of 8.2 m and one turbojet engine.

Fig.5. See attachment 19a

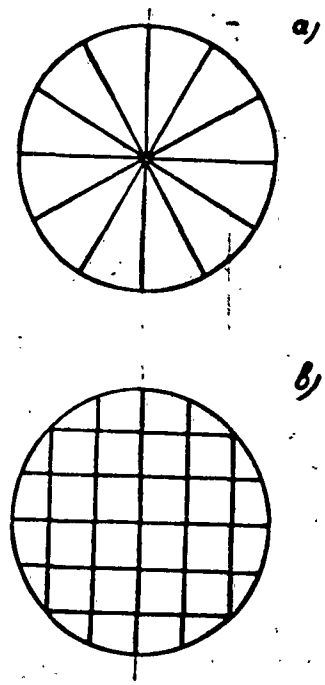

Fig. 5

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