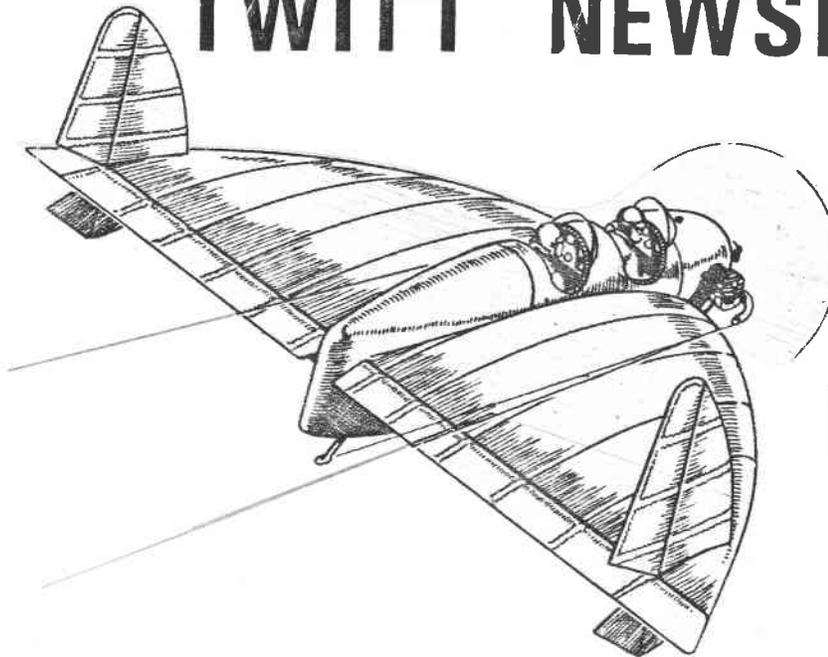


TWITT NEWSLETTER



TSCHERANOVSKY
AN EARLY RUSSIAN AP-
PROACH TO TRUE DEL-
TA CONFIGURATION

PERMISSION IS GRANTED to reproduce this publication, or any portion thereof, provided credit is given to the author, publisher & TWITT. If an author disapproves of reproduction, so state in your article.

TWITT
 (The Wing Is The Thing)
 P.O. Box 20430
 El Cajon, CA 92021



The number to the right of your name indicates the last issue of your current subscription, e.g., 9010 means this is your last issue unless renewed.

Subscription rates are \$15 per year for U.S. mailings and \$19 per year for foreign mailings due to higher postage rates.

Next TWITT meeting: Saturday, July 21, 1990 beginning at 1330 hrs at hanger A-4, Gillespie Field, El Cajon, Calif. (First hanger row on Joe Crosson Dr.)

PRESIDENT'S CORNER

For those of you who came to the Anniversary Party, I hope the cake and ice cream have been worked off. Some of you did that chasing your new creations around inside the hanger and up and down Skid Row. For those who didn't make it, you missed a good time, good cake and good hanger flying.

The only down side to the meeting was that we didn't have enough members present to hold an election. This means we will try it again in July, by which time we should have a proposed slate of officers to present the membership.

Bob has been working overtime to come up with programs for the next several months. Among them will be Fortunato Figueroa giving a talk on powerplants and Lee Klaus bringing in some Rotax hardware for show and tell. Other things in the works may include a meeting dedicated to Hawley Bowlus and many more interesting topics that Bob has not yet been able to finalize. Thanks go to Bob for his fine work in finding excellent programs.

Hopefully, you will be seeing some new ideas coming forth for moving forward with concepts and construction. I have been hearing some good things lately, so we will try to get them locked down and out to the membership for consideration.

Well, that's it for this month. This column, the Letters and Minutes are all being kept short so we can publish the Russian technical articles that Bob covered during the meeting.

Andy

JULY'S PROGRAM

Marvin Crane will be bringing in his Mitchell B-10 Ultralight to discuss its construction and talk about its flying capabilities.

Phillip Burgers, if available, will tell us about the flying wing symposium he attended in Los Angeles in May. This was sponsored by the Edwards Air Force Base Museum and Phil found out some interesting things, although they do not all apply to our type of research.

If the video machine is working we will try to show the recent Discovery Channels's "Wings" presentation of "Strange Airplanes", which includes some good shots of flying wings.

MINUTES OF JUNE 16, 1990 MEETING

The meeting was opened by Andy with a brief explanation of the day's activities, which would include election of officers if enough members showed up before the end of the meeting. The Bylaws call for a quorum, which is about 34 members based on our current roster. If we do not get a quorum by the end of the day, the elections will be postponed until July's meeting.

There were two guests. Mark Lane of Coronado whose interest included obtaining a patent on a space station, and Larry Smothers who is just learning how to fly sailplanes.

Marc de Piolenc got up and gave us a brief overview of his involvement with Dr. Karl Nickel's book project. He hopes to be receiving a German manuscript very shortly, from which he will begin the English translation. He could use help if anyone besides Harald has the time and German language abilities.

Andy then introduced Bob Fronius who gave a short slide presentation to accompany a poem he extracted from *Arizona Highways*. He then showed slides of early Russian efforts at producing flying wings. This information was provided by Kevin Renshaw, and it appears to have come from a *Jane's All The World's Aircraft* volume. No detail is presented here since the text and illustrations are reproduced elsewhere in this issue.

Since the video machine wouldn't cooperate, the group moved to the building tables and began cutting and gluing their dream machines. Although there was no official fly-off to determine a winner, it appeared Mark Motley was getting the best and most consistent flights from his high aspect ratio bird. However, by the end of the day Harald Buettner had his semi-scale version of his latest design performing quite well. It appeared to be a toss-up between the two of them. Congratulations to all of you who tried your hand at designing, building, and flying.

While all this was going on June cut the

cake and served the ice cream. Unfortunately, she did it before Bob got a picture of this year's cake, so we will not have one to include in the newsletter.

That was all there was to it for this meeting. Enjoy the Russian technical material. There are some very interesting concepts that never really got to far due to lack of knowledge, experience, desire, etc.

AVAILABLE PLANS/REFERENCE MATERIAL

Tailless Aircraft Bibliography

by Serge Krauss

Cost: \$20

Order from: Serge Krauss
3114 Edgehill Road
Cleveland Hts., OH 44118

Horten H1c construction drawings with full size airfoil layout. 30 sheets 24" x 36" with specification manual. Price: \$115.

Horten Newsletter

Cost: \$5 per year for US/\$7.50 foreign

Order from:

Flight Engineering and Developments
2453 Liberty Church Road
Temple, GA 30179
(404) 562-3512

WANTED

MITCHELL WING or other powered glider or truly soarable ultra-light, preferable with trailer.

Have cash or will trade for high performance (L/D 34:1) sailplane with enclosed trailer, oxygen, and instruments

Call Chuck at (619) 447-2519 (San Diego)

The following was found in the Los Angeles Times newspaper on about May 4th or 5th. Hopefully someone from TWITT will be able to provide some help.

RESTORING '40s Northrop N9MB Flying Wing, need experienced volunteer woodworkers. Saturday work only. Call David Murray at (818) 369-8056 for details.

ADDITION TO TWITT LIBRARY

Jack Green obtained the following item from Alphonse Faulkner of Shelton, Washington, during a recent vacation trip, and it is now in the library.

Model blueprint and dimensional layout of the Granger Archaeopteryx as drawn by Bill Young in November 1985. This is from the:

Shuttlework Collection Flight

March 1971

Airplane Monthly, November 1978

Antique & Classic Airplanes

by Davies & Vines Airportraits

From Bleriot to Spitfire

LETTERS TO THE EDITOR

April 15, 1990

To TWITT - Subscription Renewal

Sorry this is late. Keep up the GOOD work. I sure LOVE TWITT and the publication. Look forward to it every month.

Thank you,

Don S. Mitchell

(Ed. Note: It is always gratifying to receive letters like this one from Don. We have learned that many TWITTs subscribe to very few publications, and TWITT is usually one of them. We will continue to do our best to provide a good newsletter and further the goals of flying wing development.)

June 9, 1990

TWITT:

This letter is just to touch bases and show you some things I am doing to keep out of trouble while my next wing is on the drawing board. None of these pics is good enough for reproduction in the newsletter, but they may allow you to assist me with a missing part.

First, the polaroid is of my 3/4 scale reproduction of a 1929 era primary training glider. Fuselage and tail are just about finished, and yes, my head will fit between the wings with the upper surface of the

center section being plexiglass.

I enclose three pictures of a target drone. At last a World War II project I can afford! The airframe is nearly complete but as you can see I need a tail and information on the lower wing strut fuselage attach fitting.

I'm sure some of your members can identify this particular drone and might help me find a surplus tail. Also, I would appreciate a letter from a member who can identify the type, manufacturer, and any other interesting data such as a picture of the tail surfaces.

My next letter will fill you in on details of my next wing.

Thank you for your assistance.

Yours truly,

Lewis Dewart
29 Fairway
Selinsgrove, PA 17870

(Ed. Note: We will try to publish the pictures Lewis included with this letter. If they don't come out, they show a strut braced high wing, made of wood, mounted on a tubular steel fuselage which appears to need a turtle deck to complete the aerodynamic shape. It's hard to tell if it has front or pylon mounted engine. Lewis is looking for the carry through structure which will join the struts together at the bottom of the fuselage which is the bottom point of a triangular structure. Hopefully someone out there will have some ideas which will give him a starting point for more research. Go to it guys.)

(Ed. Note: The following notes were received from Alan Lewis, along with an article from Australian Gliding, October 1957 on the Flying Plank.)

I have enclosed an answer to Reg Todhunter. I realize that I would have upset him and I sincerely appreciate his answer, however, I feel that members would like to know what the Plank was.

When you read the flight report of the EAA Museum machine on top of the Wortmann FX66-H-159 airfoil, you do not know what to think.

I built a Stits Playboy 2 seater with a NACA 23012 airfoil. This airfoil has a bad stall, which is quite true, however, the Cessna 172 is okay with it and so is my

Playboy and the Maske Machine uses it reflexed.

All this upset is very expensive and I am forced to realize that Fauvell uses no twist and a forward CG. Hang gliders and jumbo jets all use wing twist. If I only knew how the FX66-H-195 performs in Fauvell's designs. To put it into the Museum with the Plank is not nice to say the least. The EAA Plank says NO WAY. Fauvell himself told me that his wing works, but does not reach the stall since the CG overcomes the wing first.

Thank you for printing the letters.

Yours sincerely,

Alan Lewis

June 1, 1990

Dear TWITT:

Thank you for printing Reg Todhunter's letter of March 27. Reg has written a very true letter. He was in the middle of the controversy. In Australia if you get an unusual aircraft you really cop it. (I tried to fly a Motorized Hang Glider and despite them being the English Ultra Light I received just as rough treatment.)

Unfortunately, my information came from what should have been a reliable source and because of what I wrote I have never used elevons. (I was possibly told the story to stop me using elevons.)

I have been unable to check very much so far about what I wrote. Reg has described the legal side beautifully, unfortunately, legal is not of educational value. Just what was the machines? What airfoils, etc.? And why touch down at 60 mph? Why land like a 172? Reg, if you read my note on the same page re the FX66-H-195 (this is the reason why I wrote as I did.)

Little Splinter (or one of the type) is being rebuilt. Yes I obtained and supplied the drawings. I hope to supply the only flight report of Little Splinter that I have.

To me it is heartbreaking to see the Flying Plank in the Museum. To read the report of the Plank in the EAA Museum, to not receive ANY reports of the FX66-H-195 machines built and flown, and for me to have such a machine which is bluntly not worth finishing. Ready Naflugel there is no failures. Why is Charles Fauvell the only design to hold a Commercial C of A (AV-36)?

The Maske machine flies okay here in Australia. It appears to be a very normal

machine. Reg, you and I know that it has never flown. Reg, can we please hear what the Plank is?

Yours sincerely,

Alan Lewis

Baveno 6 June 90

TWITT

Dear Friends. I have just received the May 1990 issue of the TWITT Newsletter, which I find very interesting. I am going to mention it on the "Modellistica" Magazine, where I run a regular column.

Gale Ferdinando
Baveno Navara Italy

(The following was extracted from Arizona Highways Magazine, date unknown)

SILENT CREATURES OF THE WIND

by Paul Dean

You come to me and I will give. But accept my moments as a loan, for I award no full citizenship to man.

From Icarus, through Kitty Hawk, to Tranquility Base, I have tolerated earth's wise couriers but forgiven no impious trespassers. Shakespeare called me a chartered libertine. Gerard Manely Hopkins believed my blessings mothered the world. True. Their descriptions touch my unpredictability, the invisible irritation, and seductive sanctity of my element.

I am the air. And foolhardy, magnificent, stubborn, implacable, anxious, breakable, indomitable, questing man persists in taunting me.

Why your urge? What do you relish rising in me, falling through, or moving against air and in pursuit of sport, not simply as a medium of exploration or transportation?

The quest certainly cannot be to survive my risks. That's falderal. Nature offers as much if not more of this on mountainsides and in oceans. Nay, you find a unique freedom in me. It's common to all airmen, this severing of an umbilical tie which then transforms man's earthbound, clumsy lumberings into effortless movements of smooth motion.

I know a pilot's perceptible surge when tires stop clattering and squeaking against ground, lift conquers drag, and a machine is thrust aloft and once again borne to the air, borne to me.

Sky divers actually talk of the rebirth of free-falling, when I become their sensory isolation tank, and the necessity of tugging a rip cord produces mild disappointment, an end to this bathing. In a sailplane, I produce only restlessness to flight until, clack, steel jaws open and a rope is detached, and that noisy, struggling towplane no longer is a jailer. The moment I am beneath a hot air balloon and my forever is above it, a man's fetters are in suspense, and the liberty is absolute.

Soaring. Skydiving. Ballooning. To each his own, and, although there is no similarity among vehicles, I allow the three avocations to merge into a single population. My citizens, in turn, harvest common benefits which transcend my gift of freedom.

You find an inner superiority with me. I give you a taste of immortality unknown to lesser persons who live among concrete cubes and travel asphalt strips. You can look down. You have preeminence.

There is no clarity like mine, when wind and rain have done their scrubbing. My purity becomes yours. I cleanse you.

You play among my clouds and chase my winds, and I can make conundrums of both for your pleasure. Sometimes I'll leave you alone to hang in stillness, and there you will find peace like no other. And sometimes build silence you can actually hear, and the only invasion will be your breathing.

Dawn is my replenishment and your refreshment. I dare. You challenge. We meet again. Then we achieve communion.



Maurice Brockington

THE PLANK FLIES

BY REG TODHUNTER

THE FIRST TEST FLIGHTS OF FRED HOINVILLE'S EPB-1A FLYING PLANK WERE CARRIED OUT AT THE MOORABBIN AERODROME, NEAR MELBOURNE, ON 30TH AUGUST. ALTHOUGH ONLY THE INITIAL AUTO-TOWS AND ONE AERO-TOW WERE MADE, THE AIRCRAFT LOOKED AND FLEW VERY WELL.

A LOT OF PEOPLE WERE PRESENT TO WITNESS THE TESTS, INCLUDING REPRESENTATIVES OF THE DEPARTMENT OF CIVIL AVIATION AND THE GFA.

THE PROCEEDINGS WERE FILMED FOR TELEVISION AND NEWSREELS AND THE TWO MELBOURNE AFTERNOON PAPERS CARRIED FRONT PAGE STORIES OF THE MACHINE. SEVERAL DAYS LATER, THE SYDNEY SUNDAY TELEGRAPH ALSO RAN A FRONT PAGE PICTURE AND STORY ON THE PLANK.

WITH FRED HOINVILLE AS THE PILOT, THE TESTS WERE BEGUN BY AUTO-TOW. FOR THIS PURPOSE, JACK IGGULDEN LOANED HIS FORD. AS JACK IS VERY EXPERIENCED IN THIS PHASE OF GLIDING HIS OFFER WAS APPRECIATED.

UNFORTUNATELY, ON THE FIRST TOW THE PLANK DID NOT LEAVE THE GROUND. THIS WAS BECAUSE OF THE 40 LBS OF BALLAST WHICH HAD BEEN PLACED IN THE NOSE BY DIRECTION OF DCA OFFICERS.

THIS RESULTED IN THE PLANK BEING SO NOSE HEAVY THAT IT COULD NOT BE LIFTED FROM THE GROUND.

DCA OFFICIALS THEN REMOVED 10 LBS OF THE BALLAST AND ON THE NEXT ATTEMPT, THE PLANK GOT OFF THE GROUND -- BUT ONLY JUST. AGAIN, IT WAS TOO NOSE-HEAVY.

ANOTHER 10 LBS WAS REMOVED FOR THE THIRD ATTEMPT AND A PERFECTLY SMOOTH HOP WAS MADE, REACHING ABOUT 10 FEET HEIGHT. FRED HOINVILLE REPORTED THAT THE AIRCRAFT WAS STILL NOSE-HEAVY, SO ANOTHER 10 LBS WAS REMOVED.

THE FINAL AUTO-TOW WAS THEN MADE AND FRED CLIMBED TO ABOUT 100 FEET BEFORE RELEASING AND LANDING STRAIGHT AHEAD. THE LANDING WAS VERY SMOOTH AND THE WHOLE FLIGHT WENT VERY WELL.

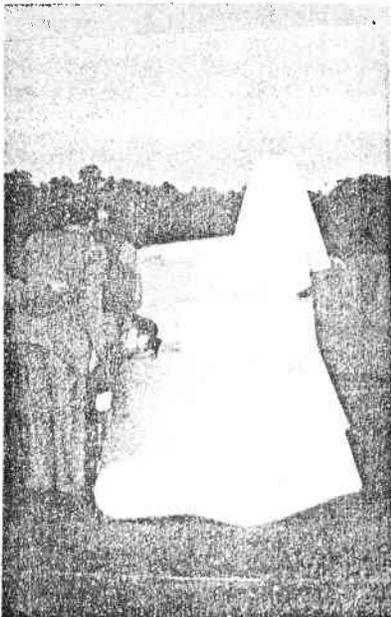
THERE WAS JUST SUFFICIENT DAYLIGHT LEFT BY THEN TO MAKE ONE AERO-TOW. A TIGER MOTN, FLOWN BY KEITH HEARN, TOWED THE PLANK TO 1500 FEET.

AFTER RELEASE, FRED FLEW ACROSS THE 'DROME ONCE AND THEN JUST DID A FAST CIRCUIT AND LANDED.

IN THE AIR, THE PLANK LOOKED RATHER STARTLING BECAUSE OF ITS UNORTHODOX LINES, BUT IT ALSO LOOKED VERY IMPRESSIVE.

MY MAIN IMPRESSION OF THE MACHINE WAS THE SMOOTH MANNER IN WHICH IT FLIES. THERE IS NOT THE SLIGHTEST HINT OF ANY PITCHING. EVEN ON THE GROUND, THERE IS NO PITCHING.

FURTHER TESTS ARE SCHEDULED DURING SEPTEMBER.



THE PLANK DRAWS A CROWD OF SPECTATORS AT MOORABBIN



EDITOR'S NOTE : SEVERAL OTHER PEOPLE WHO WITNESSED THE FIRST TESTS OF THE FLYING PLANK HAVE WRITTEN TO GIVE THEIR IMPRESSIONS OF IT.

ONE OF THE CONSISTENT COMMENTS WAS ON THE HIGH STANDARD OF WORKMANSHIP IN THE CONSTRUCTION OF THE MACHINE.

ALL THOSE WHO WROTE SAID THE PLANK FLEW QUITE WELL AND SEEMED STABLE AND EASILY CONTROLLED.

ONE PERSON COMMENTED THAT THE FLAT BOARD SEAT AND LACK OF BACKREST MIGHT RESULT IN DISCOMFORT ON LONG FLIGHTS.

IT HAS BEEN REPORTED THAT AFTER RELEASING FROM AERO-TOW AT 1500 FEET, THE PLANK TOOK ONLY 3½ MINUTES TO REACH THE GROUND, BUT IT IS UNDERSTOOD THAT THE PLANK WAS BEING FLOWN WITHOUT AN ASI, AS THE INSTRUMENT WAS DAMAGED EARLY IN THE DAY WHEN AN OFFICER OF THE DCA BLEW DOWN THE PITOT TUBE!!

WE HAVE BEEN TOLD THAT FRED HOINVILLE HAS INVITED SEVERAL OTHER PILOTS TO MAKE FLIGHTS IN THE PLANK, TO GIVE THEIR OPINIONS ON IT.

PRESS HERE

PUBLICITY --- IT'S WONDERFUL !!

(OR, WHO TOLO THEM THAT?)

UNDER THE TITLE "AUSTRALIA FIRST WITH FLYING PLANK", THE SYDNEY SUNDAY TELEGRAPH RAN A FRONT PAGE PICTURE OF THE PLANK WITH THE FOLLOWING CAPTION --

"FORMER SYDNEY PILOT FRED HOINVILLE AT THE CONTROLS OF THE TAILLESS "FLYING PLANK" GLIDER WHICH HE FLEW IN THE AIR AT MOORABBIN AIRPORT, MELBOURNE.

"MR HOINVILLE CONCEIVED THE IDEA OF THE GLIDER AND HAD THE CO-OPERATION OF AMERICAN GLIDING EXPERT A.L. BACKSTROM, OF TEXAS, IN THE ULTIMATE DESIGN.

"THE GLIDER WAS BUILT BY A BANKSTOWN (NSW) ENGINEER, WHO HAS 30 MORE UNDER CONSTRUCTION."

FRED HOINVILLE AT THE CONTROLS OF HIS EPB-1A FLYING PLANK READY FOR ITS FIRST TEST FLIGHT.

THE PLANK WAS DESIGNED BY AL BACKSTROM, OF TEXAS, AND BUILT BY GLIDAIR SAILPLANES OF SYDNEY



What's left of the cake and ice cream.
Candy was courtesy of Ralph Wilcox



Mark Motley & Jerry Blumenthal refining Mark's flying characteristics.



Ralph Wilcox, Mark Motley & Larry Smothers test flying Ralph's pendulum theory craft.



Harald Buettner & Mark Motley hard at work building.



Marc de Piolenc, Ed Lockhart & J.C. Pemberton discussing flight theory.

Chyeranovskii

Boris Ivanovich Chyeranovskii was born in 1896 and deeply interested in aeroplanes as a boy. Throughout his 64 years he concentrated on various forms of tailless machine, building more than any other designer in history and in general successful, though often at the expense of ease of handling. He was the pioneer of the so-called Parabol wing with curved leading edge. He was able to enter the Zhukovskii Academy in 1922, and in the same year proposed his first published design, a flying wing with aspect ratio 1.5. Many TsAGI aerodynamicists were convinced such a wing was useless but tests with model wings of aspect ratio 1.5, 3 and 6 did much to refute their predictions. Via the route of simple gliders in the Crimea Chyeranovskii progressed to aeroplanes, most of them constructed at the Academy but in some cases as projects of TsKB. He remained a loner, never really having an OKB, and it is sad that in the jet era when his tailless forms came into their own his failing health prevented construction. He died on 17 December 1960.

BICH-1 Simple tailless glider, the first Parabol actually constructed (1923). Thick (so-called 'inhabited') wing almost hid pilot. Aspect ratio 4. Trailing edge occupied by inboard elevators and outboard ailerons; rudder not necessary because turns possible on trailing-edge controls alone. All wood, fabric covering doped tight.

BICH-2 Refined successor, still with aspect ratio 4. Taken to Koktebel 1924 where made 27 flights at heights up to alleged 570 m.

BICH-3 Chyeranovskii's first aeroplane, based on previous gliders. Single-seater with cockpit faired into low vertical tail with rudder. Parabol type wing with ailerons, worked by differential bell-cranks, and elevators, all with inset hinges and aerodynamic balance. Single trussed wheel and wingtip skids. Test-flown and demonstrated by B.N. Kudrin at Moscow 1926. Rudder powerful because of slipstream, but on the whole BICH-3 not stable. Control improved by minor changes and final assessment was that aircraft safe.

DIMENSIONS Span 9.5 m (31 ft 2 in); length 3.5 m (11 ft 6 in); wing area 20.0 m² (215 ft²).

ENGINE One 18 hp Blackburn Tomtit driving 1400 mm propeller.

WEIGHTS Empty 140 kg (309 lb); fuel 10 kg (22 lb); loaded 230 kg (507 lb).

PERFORMANCE Max speed not known (probably about 140 km/h, 87 mph); landing speed estimated only 40 km/h (25 mph).

BICH-4 Last of original series, a flying-wing glider which dispensed with vertical surface entirely. Built 1927 but no further information.

BICH-5 Largest of the BICH series, this was to have been aerodynamically clean bomber with two BMW VI engines and retractable main wheels. No data but tested as model in tunnel 1928. Much research done on trailing-edge controls which became multi-segment elevons hung below trailing-edge with convex undersides. Work terminated 1929.

BICH-6 Not known.

BICH-7 Enlarged development of BICH-3, first flown 1929. Scale said to be 1.5 times on area basis, but in fact larger than this. No tail, but small rudders, without fins, on tips of wing. Centreline wheel, with skids under rudders. Two tandem open cockpits. Directional stability and control poor, and take-off almost impossible. Urgent modifications, first being conventional landing gear.

DIMENSIONS Span 12.2 m (40 ft 0½ in); length 4.7 m (15 ft 5 in); wing area 30.0 m² (323 ft²).

ENGINE One 100 hp Bristol Lucifer.

WEIGHTS Empty 612 kg (1349 lb); fuel 93 kg (205 lb); loaded 865 kg (1907 lb).

PERFORMANCE Max speed 165 km/h (102.5 mph); landing speed 70 km/h (43.5 mph).

BICH-7A Chyeranovskii completely rebuilt BICH-7 and the resulting BICH-7A did not fly until 1932. Enclosed tandem-seat cabin with fin and rudder downstream. No wing-tip surfaces. Normal landing gear with two wheels and tail-skid. Totally transformed, with good directional stability, fine flying qualities and immediate response to pilot demand. Main problem was loss of speed in turn because large elevons caused high pressure on rudder. Test-pilot N.A. Blagin (later collided *Maksim Gorkii*) gradually improved by adding strips to elevons and setting at lower incidence. Control surfaces hung in Junkers double-wing style on five inset hinges below trailing edge of wing. Only other problem was vibration of engine, fault common to all Lucifers which had three Jupiter-size cylinders whose firing pulses could be strongly felt.

DIMENSIONS Span 12.5 m (41 ft 0 in); length 4.95 m (16 ft 3 in); wing area 34.6 m² (372 ft²).

ENGINE One 100 hp Bristol Lucifer.

WEIGHTS Empty 627 kg (1382 lb); fuel 93 kg (205 lb); loaded 880 kg (1940 lb).

PERFORMANCE Max speed 165 km/h (102.5 mph); landing speed 70 km/h (43.5 mph); range 350 km (217 miles).

BICH-10 Nothing is known of BICH-8 and BICH-9, and the BICH-10 never flew and led to BICH-14. BICH-10 was first Chyeranovskii twin, with two M-11 engines, tested as tunnel model 1933. Few changes led to:

BICH-14 (one modification was addition of Townsend ring engine cowls) which was built at TsKB at Menzhinskii works and received additional designation **TsKB-10**. Built to double scale of BICH-7 on area basis, with twin engines on leading edge and from two to five seats in fuselage of same length as wing chord on centreline. Usual wood/fabric construction apart from light alloy in cabin and fin. Centre section of 3.3 m span and outer panels, with total of four spars and 60 ribs. Three surfaces on each side below trailing edge hung on four inset hinges. First flight at end 1934 by Yu.I. Piontkovskii. By 1936 BICH-14 tested at NII VVS, pilots including P.M. Stefanovskii, M.A. Nyukhtikov, and I.F. Petrov. General stability and control marginal. Trailing-edge aileron/flaps and inboard elevators of symmetrical section—largely ineffective. Considerable stick force needed to get tail down on landing. Rudder without slipstream and ineffective. Testing discontinued after 1937.

DIMENSIONS Span 16.2 m (53 ft 2 in); length 6.0 m (19 ft 9 in); wing area 60 m² (646 ft²).

ENGINES Two 100 hp M-11.

WEIGHTS Empty 1285 kg (2833 lb); loaded 1900 kg (4189 lb).

PERFORMANCE Max speed 220 km/h (137 mph); landing speed 70 km/h (43.5 mph); range 370 km (230 miles).

BICH-11 (RP-1) Designed 1931 in parallel with BICH-12, this tailless machine was first purpose-designed rocket aeroplane in world. All-wood flying wing, with vestigial central nacelle. Wing-tip rudders, trailing-edge ailerons and elevators. Originally centreline wheel, later changed for normal gear and tailskid. First tests as bungee-launched glider, on skis, early 1932. Intended to become RP-1 (*Raketyii Planer*, rocket glider) with two of F.A. Tsander's OR-2 rocket engines rated at 50 kg (110 lb) thrust each. Ahead of each engine large lagged spherical tank of liquid oxygen and smaller capsule of gasoline. OR-2 never regarded as safe for installation, though run on bench 18 March 1933, so BICH-11 flown with small piston engine.

DIMENSIONS Span 12.1 m (39 ft 8½ in); length (rockets) 3.09 m (10 ft 1½ in), (piston) 3.25 m (10 ft 8 in); wing area 20.0 m² (215 ft²).

ENGINE Intended two Tsander OR-2 rockets, finally one 35 hp ABC Scorpion.

WEIGHTS Only known figure: empty (rockets) 200 kg (441 lb).

PERFORMANCE No data.

BICH-12 Single-seat tailless glider using basically same wing as BICH-11. Flown on centreline ski early 1932.

BICH-16 More than any other country the Soviet Union has tried to build ornithopters (flapping-wing machines). Chyeranovskii schemed one in 1921 and finally got Osaviakhim support to build it in 1934 as BICH-16. Few details, but birdlike appearance: wood/fabric gull wing, tailless with central cockpit. Small auxiliary horizontal surface at rear to preserve stability in pitch. Pilot drove wings by means of pedals oscillating actuating rod projecting slightly forward of vertical on centreline below wing, joined on each side by pivoted links to wing spar at about 30% semi-span. How wing made flexible not recorded but probably two sets of pivots on each side. Pilot could walk aircraft on his own legs, and skid fitted to underside of central actuating rod. First tested August 1935 at Podlipki (Moscow) as glider with bungee launch, with lightweight (58 kg) pilot, R.A. Pishchuchyev. Stability unimpressive. Attempts to take-off by flapping unsuccessful, given up in 1938 after various modifications. No data.

BICH-17 Fighter described under Kurchyevskii.

BICH-18 Named *Muskulyet* (from muscle-power), this was another man-powered device but one with much better chance of success. Again supported by Osaviakhim and assigned to unfortunate Pishchuchyev to fly, it was basically a high-performance sailplane in style, with nose cockpit and conventional tail. Wings in form of two pairs crossing over in X form on centreline so that lower right plane became upper left and vice versa. Both wings pivoted axially on centreline and driven by pedals and bell-crank linkage. Large portion of each wing freely pivoted to rear of main spar and able to flap up and down. Thus, as pilot pedalled, wings rocked in unison, tips never quite touching, oscillating rear portions giving forward thrust. Wing tips in form of ailerons. Light balsa wood structure. Flown 10 August 1937 at Poplipki off bungee launch without pedalling, gliding 130 m from release. On launch No 4 Pishchuchyev pedalled and accomplished six wing oscillations. Glide extended to 430 m, pilot reported noticeable forward thrust. Numerous demonstrations but sustained flight impossible.

DIMENSIONS Span 8.0 m (26 ft 3 in); length 4.48 m (14 ft 8½ in); wing area 10.0 m² (108 ft²).

ENGINE Pilot's muscle-power.

WEIGHTS Empty 72 kg (159 lb); loaded 130 kg (287 lb).

PERFORMANCE Max range attained 0.45 km.

BICH-20 Pionyer Chyeranovskii's smallest aeroplane, this also marked a shift away from the parabola wing to a short-span straight-tapered wing of almost delta shape. Trailing-edge ailerons and elevators now of inverted lifting profile. Short fuselage with pilot canopy in effect forming leading edge of fin. Latter broad, to house pilot, and relatively small, but effective because of slipstream. Extensively tested making turns of about 35° in horizontal flight at different heights: stability judged acceptable. Originally flown early 1938, on skis, and then re-engined in same year.

DIMENSIONS Span 6.9 m (22 ft 8 in); length (original) 3.5 m (11 ft 6 in), (re-engined) 3.56 m (11 ft 8½ in); wing area 9.0 m² (97 ft²).

ENGINE First, one 18 hp Blackburn Tomtit; later, 20 hp Aubier-Dunne.

WEIGHTS Empty 176 kg (388 lb), (re-engined) 181 kg (399 lb); fuel 24 kg (53 lb), (re-engined) 26 kg (57 lb); loaded 280 kg (617 lb), (re-engined) 287 kg (633 lb).

PERFORMANCE Max speed 160 km/h (99 mph), (re-engined) 166 km/h (103 mph); ceiling 4 km (13,120 ft); range 320 km (199 miles); landing speed 49 km/h (30 mph).

BICH-21 Satisfactory behaviour of BICH-20 prompted Chyeranovskii to design a similar aircraft, but with a much more powerful engine, as an entrant in the Osoaviakhim all-union air race planned for August 1941. Minimum aircraft capable of taking chosen engine which filled fuselage back to rudder pedals, with hinged canopy forming leading edge of fin. Small fuel tanks in roots of 1.5 m centre section. anhedral with straight leading edge. Bolted-on outer sections with dihedral and sharp taper to round tips. Except for steel-tube and light alloy engine installation, structure all-wood, with polished surface. Ailerons and elevators of usual form below trailing edge. Pneumatically retracted landing gears, folding to rear with wheels partly exposed ahead of fairings under lowest part of wing. Ratier two-blade v-p propeller of 2 m diameter. BICH-21, also styled **SG-1** (*Samolët Gonoch-nii*, racing aeroplane), was projected in 1938 but not completed until 1940 after numerous model tests at TsAGI. First flight June 1941, when results were good. In view of problems with SAM-13, widely expected to win race, but Nazi invasion came first.

DIMENSIONS Span 6.9 m (22 ft 8 in); length 4.4 m (14 ft 5½ in) (Shavrov's figure 4.7 m); wing area 9.0 m² (97 ft²).

ENGINE One 220 hp MV-6 (Renault 6-inline).

WEIGHTS Empty 526 kg (1160 lb); fuel 37 kg (82 lb); loaded 643 kg (1418 lb).

PERFORMANCE Max speed 417 km/h (259 mph); landing speed 80 km/h (50 mph).

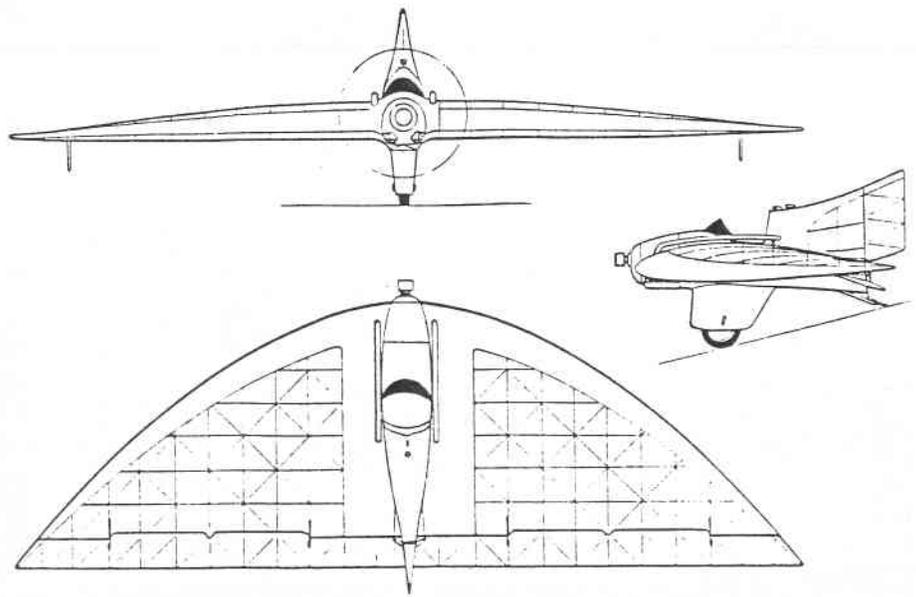
BICH-26 Between November 1947 and June 1948 Chyeranovskii ran what was in effect an OKB working on advanced jet fighters. BICH-24 and BICH-25 were the first Soviet variable-sweep designs, with plan shapes remarkably like those of modern combat machines, with pivots outboard. These were tunnel-tested but not built, and their place was taken by BICH-26, again with a most modern style of wing and tailless configuration remarkably like 1990s fighter projects. Powered flight controls of typical BICH form, light-alloy structure and pressurized cockpit. Design incomplete.

DIMENSIONS Span about 7.0 m (23 ft 0 in); length about 9.0 m (29 ft 7 in); wing area 27 m² (291 ft²).

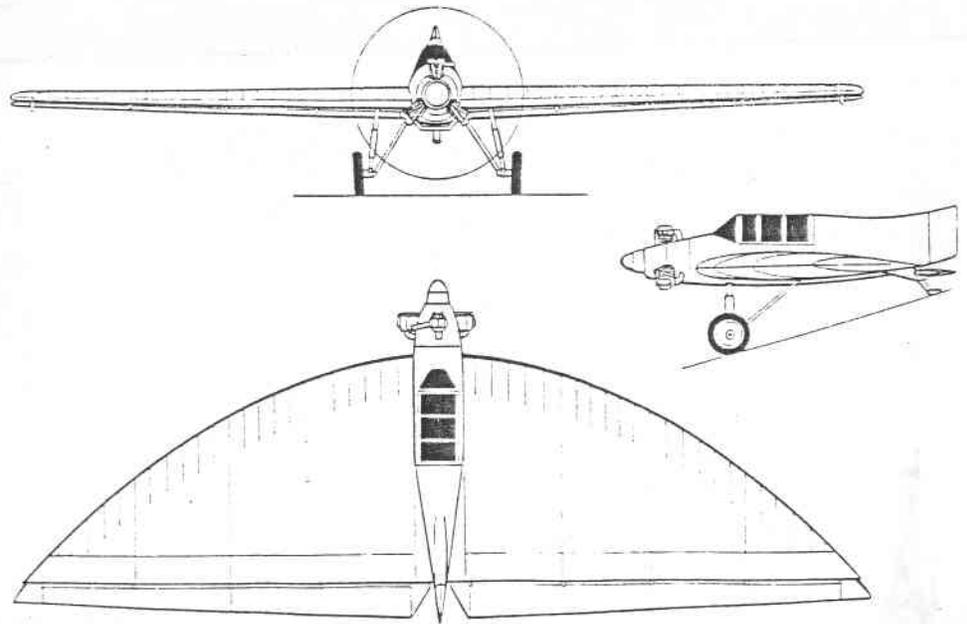
ENGINE One 2000 kg (4410 lb) AM-5 turbojet.

WEIGHTS Loaded 4500 kg (9920 lb).

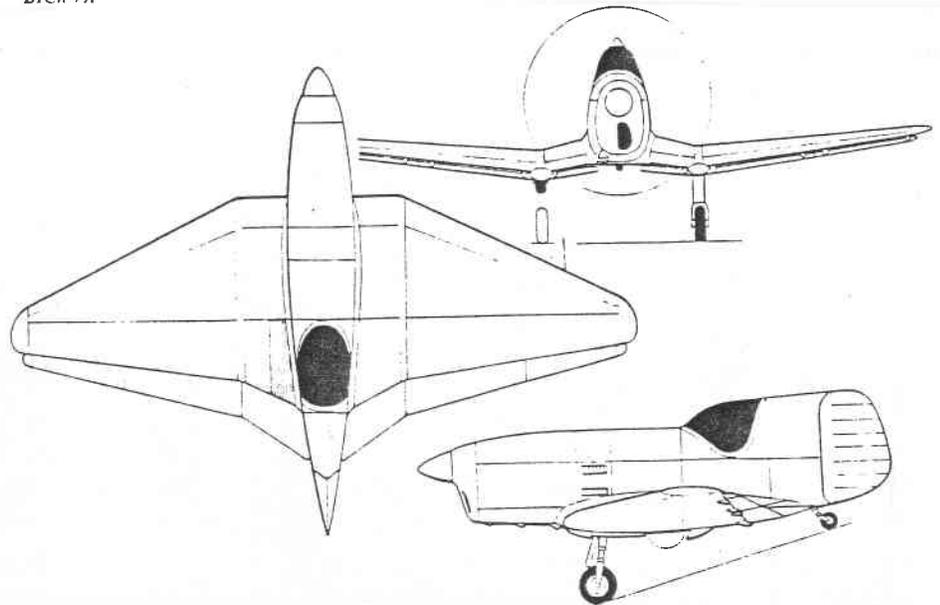
PERFORMANCE Max speed Mach 1.7 at 7 km (22,960 ft); ceiling 22 km (72,000 ft).



BICH-3



BICH-7A



BICH-21

Kharkov KhAI

KhAI-3 Named for *Sergei Kirov* and also known as *Aviavnitio-3*, this unconventional transport was a project of Aviavnitio brigade and designed under supervision of Aleksandr Alekseyevich Lazarev. It was one of numerous *Plannerlyet* motor-glider transports of period (1936) intended to reduce costs. Basic concept: all-wing machine with two axial gondolas each with six seats in line, first seat in right unit being for pilot. Engine mounted on truss pylon above wing on centreline in first drawings, but finally placed on leading edge. All-wing idea adhered to closely, with no other parts except fin/rudder and landing gear. Tapered only on leading edge, giving effective 16° sweep on $\frac{1}{4}$ -chord. Profile V-106 throughout, thickness 14% on centreline and 7% at tip. Rectangular centre section 5 m chord and 4 m span made of welded KhMA steel tube; four spars and six ribs, with covering of 0.5-mm dural. Outer wings, each 9.2 m root to tip, all-wood structures with 8° washout carrying inner and outer trailing-edge controls all driven by single pairs of cables to operate as ailerons or elevators. Flat turns in gliding flight by large rectangular interceptors (operating as airbrakes) near wingtips, opened differentially by pedals; pedals always operated rudder on centreline, with area (inc fin) of 2 m². Engine on steel tubes off front spar. Four pairs of wing-root attachments. Tailwheel landing gear, main tyres 800 × 150 mm, ground angle 15°. Four fuel tanks between gondolas for 8 h endurance. First flight 14 September 1936; pilots V.A. Borodin and E.I. Schwartz, prototype having dual control from front of both gondolas. First flight with sustained turns 27 September; results discouraging, with great difficulty in getting good turn no matter how elevons, rudder and interceptors were used or not used. Prolonged effort improved control considerably; stability always satisfactory. No production, though at conclusion of SNII GVF trials overall assessment was positive.

DIMENSIONS Span 22.4 m (73 ft 6 in); length 6.8 m (22 ft 3½ in); wing area 78.6 m² (846 ft²).
ENGINE One 100 hp M-11.
WEIGHTS Empty 1440 kg (3175 lb); fuel/oil 200 kg; loaded 2200 kg (4850 lb).
PERFORMANCE Max speed 135 km/h (84 mph); cruise 115 km/h (71.5 mph); climb 25 min to 1 km; ceiling 2 km; range 850 km (528 miles); take-off 210 m; landing speed 60 km/h (37 mph).

KhAI-4 Institute's numbering was not consecutive; this small experimental machine antedated KhAI-3 and was probably intended to assist in proving tailless configuration. Single example, named *Iskra* (spark, flash of light) and also *Osoaviakhimovyets Ukrainy* for local branch of Osoaviakhim which helped finance KhAI-4. All-wood tailless tandem-seat ultralight, with relatively high power (same engine as 12-seat KhAI-3). Designers: P.G. Benning, A.A. Lazarev and A.A. Krol, determined despite great difficulties to master difficult layout. Wing tapered on leading edge carrying normal ailerons outboard (65% semi-span) with elevons inboard. All surfaces driven together by hand-wheel as in KhAI-3; fore/aft pilot input moved inner surfaces only. Fins and rudders on wingtips, with separate pedal control. Streamlined but stumpy central nacelle with enclosed tandem cockpits and pusher engine, uncowed. Short landing gears with balloon tyres: described as first nosewheel-type in USSR but drawings

show trad layout with main wheels under leading edge and third wheel under engine. Many elements of KhAI-4 similar in concept to KhAI-3. First flight October 1934 by B.N. Kudrin; inadequate elevon moment to lift nose to take-off angle of attack. Left ground at about 180 km/h; trajectory in undulating flight, Kudrin explaining difficulty controlling in longitudinal plane. Severe problems with ineffectiveness of fin also, and concluded that drastic and unconventional measures needed to achieve positive take-off and controlled flight.

Acknowledged dangerous, and after third flight KhAI-4 grounded.

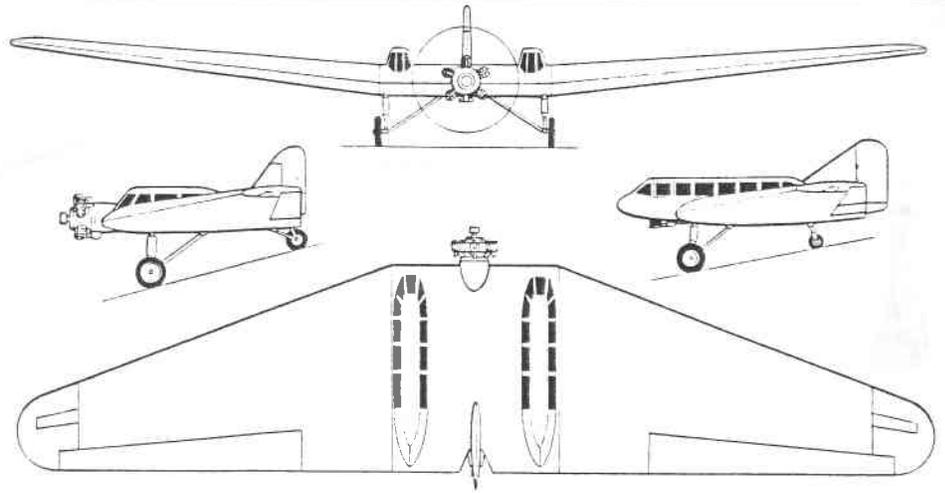
DIMENSIONS Span 12.0 m (39 ft 4½ in); length 4.2 m (13 ft 9¾ in); wing area 21.25 m² (229 ft²).
ENGINE One 100 hp M-11.

WEIGHTS Empty 550 kg (1213 lb); fuel/oil 120 kg; loaded 850 kg (1874 lb).

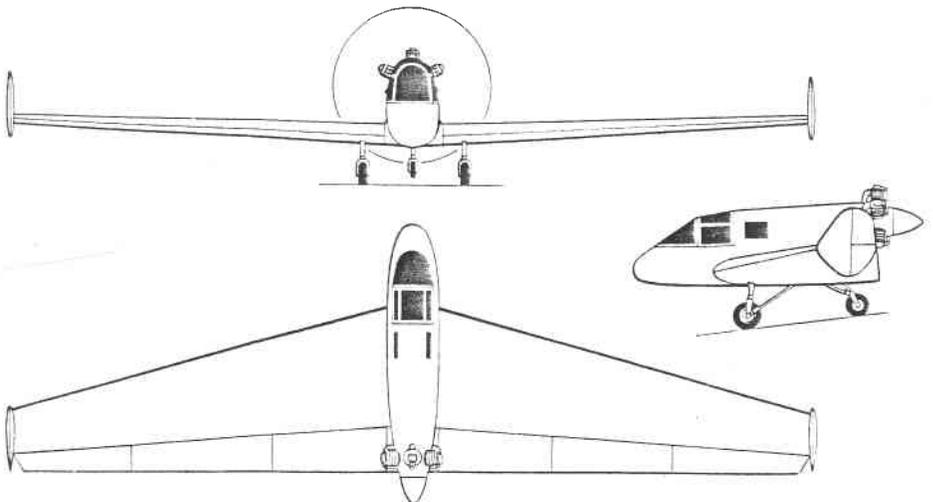
PERFORMANCE Max speed at SL 180 km/h (112 mph); est service ceiling 3,25 km; design range 600 km (373 miles); landing speed 100 km/h (62 mph).

KhAI-5 (R-10) One of few Soviet aircraft of its day to become known to outside world, this undistinguished machine was one of several competing in 1936 for Ivanov specification for light tactical attack and reconnaissance aircraft for VVS. KhAI-5 was essentially derivative of KhAI-1, with closely related airframe made from wood. Its design was completed well before Ivanov requirement was issued, and in many respects successor to KhAI-1B (-1VV) and a running-mate to KhAI-6, which appeared a year earlier, in 1935. KhAI-6 was one of many Soviet

aircraft to use F-series Cyclone engine, and this was again adopted for KhAI-5, in long-chord cowl with radial air shutters at front, driving two-blade Hamilton propeller. Monocoque fuselage with integral centre-section carrying two-spar wings. Unlike KhAI-1 and KhAI-1B, fitted with split flaps; power system (believed electric) worked flaps and KhAI-1 type landing gear. Pilot and radio/gunner widely separated, pilot with sliding canopy and optical sight for two ShKAS in top decking and gunner in power-driven turret aft of wing with single ShKAS (turret design, I.V. Vyenevidov and G.M. Mozharovskii); internal bomb bay for 300 kg bombload (eg. six FAB-50). Small series put in hand at Kharkov 1935 with US engine, and thus three available for NII VVS testing 1936. Generally satisfied VVS demands, but Ivanov competition still held to bring in rival designs. I.G. Nyeman, lead designer of KhAI-5, produced a specially modified version designated Ivanov to fly against ANT-51. Polikarpov Ivanovs and DG-58bis; this prototype built September 1937 and flown April 1938. Long before this, in June 1937, original KhAI-5 had been accepted and ordered into production as R-10 (R. *Razvedchik*, reconnaissance). Later Ivanovs were undoubtedly better, but R-10 met requirements and was available, whereas rivals were much later in timing. Decision often thought precipitate, and ascribed to Stalin personally. In 1938-1940 Kharkov factory made 490, the first 180 with engine given in data and final 310 with M-62 engine driving V1Sh-6 pro-



KhAI-3 (side elevation on right as modified)



KhAI-4

Moskalyev

Aleksandr Sergeevich Moskalyev was one of indefatigable Soviet constructors who, despite having no assured finances and no production base, yet managed to build an impressive run of aircraft. Many were of outstanding merit. By sheer enthusiasm on part of pilots who flew them, some gained production orders; many more Moskalyev aircraft would have served their country had not GUAP Commissar Kaganovich been antagonistic and done all he could to hamper work of this dedicated and good-natured enthusiast. Born 1898, Moskalyev qualified at Univ of Leningrad and then joined *Krasnyi Lyetchik* plant as stressman in Grigorovich KB, being assigned to structure of I-2bis. He showed promise and made major contribution to improved I-2bis radiator installation. Continued post-grad studies at Lensovyet Tech Inst as external student, whilst beginning design of SAM-1 and -2 described below. Successful flight of second of these resulted in its designer being sent in 1933 to vast newly built GAZ-18 at Voronezh, where under impossible conditions in makeshift shed he created further designs which included tailless configurations as well as conventional production transports. He also engineered 1935 and later TB-3 for production, designed installation of Charomskii diesel in RD, and made many contributions to other constructors' aircraft. In 1936 he was permitted to organize his own OKB, No 31, but with no official support. Following year appointed Director of Voronezh Aviatekhnikum (air commercial school). Partly through aiming too far ahead of available technology OKB was shut 1946, Moskalyev becoming lecturer at VVA (facilities went to Chyvetverikov). Now works at MAI.

SAM-7 Sigma As major interim step along long road to ultimate *Sigma* (SAM-4) Moskalyev designed piston-engined two-seat fighter intended to offer superior speed and manoeuvrability and, from tailless layout, perfect rear field of fire. All-metal stressed-skin construction with two-spar wing R-II profile 12%, with CG 13/15%. Smooth skin 2/2,5 mm, fixed leading edge, trailing-edge inboard elevators and outboard ailerons with neat drives from stick via push/pull rods and bell-cranks. Scheibe fin/rudder on each wingtip. Moskalyev wanted Hispano 12Ybrs but had to settle for direct-drive M-34 with four-blade wooden propeller, probably from TB-3. Cooling by surface radiators, supplemented at low speeds by retractable radiator similar to that on Stal-6. Single-strut main gears pivoted to front spar and retracting inwards, small wheel at extreme tail. M-34 prohibited *moteur canon* so armament two fixed ShKAS above engine and one (option two) aimed by rear gunner. No good photograph and, though completed and flown October 1935 (Shavrov 1936), fin/rudder shape differs in all six known Soviet drawings. Dimensions are Shavrov's and conflict with other Soviet sources. Aircraft judged dangerous, with fast landing and difficult to keep straight on ground. Never reached maximum speed.

DIMENSIONS Span 9,46 m (31 ft 0½ in); length 7,0 m (22 ft 11½ in); wing area 20,0 m² (215 ft²).

ENGINE One 750 hp M-34.

WEIGHTS Empty 940 kg (2072 lb); loaded 1480 kg (3263 lb).

PERFORMANCE Max speed (est) 435 km/h (270 mph) at SL, 500 km/h (311 mph) at height; ceiling est 9,2 km; range est 800 km; landing speed 138 km/h (86 mph).

SAM-9 Strela SAM-8 not known. SAM-9 *Strela* (arrow) was major step towards supersonic gothic delta SAM-4, and in recent years hailed (justifiably) as aerodynamic pioneer of today's SSTs. Again failing to get 760hp HS12Y engine Moskalyev had to settle for low-powered Renault; and permission to build such radical machine granted only in late 1936 after prolonged aerodynamic testing by TsAGI which, taking cue from Kaganovich, failed either to comprehend or show interest in concept. Wooden construction with high surface finish, fabric-skinned control surfaces. Wing root extended entire length of aircraft except for spinner; aspect ratio 0.975, aerofoil RAF-38 with Moskalyev's local modifications. Pilot in small enclosed cockpit with linkage to two large trailing-edge elevons. Cantilever fixed main gears as on SAM-5-2, and tailskid. Prototype also known as **Aircraft L**, built in first 70 days of 1937. V.P. Gorski tested model in tunnel at TsAGI, and N.S. Rybko then made first flight at Voronezh. Controllable, but demanded in-

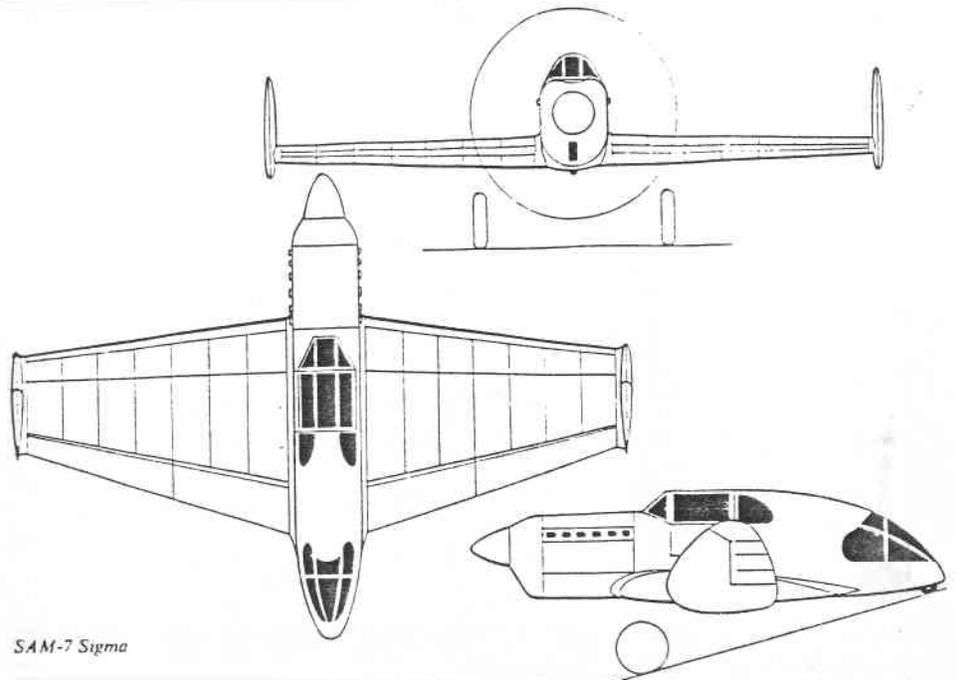
tense concentration and 20° attitude on approach then novel and frightening. Flown by A. N. Gusarov and further flying then at TsAGI field in Moscow by Rybko and A.P. Chyernavskii (Němėcek, B.N. Kudrin also). Moskalyev's unofficial status and supposed fantastic ideas warped judgement, especially with opposition of Kaganovich; new style of flying slender delta was proclaimed dangerous, and project banned mid-1937.

DIMENSIONS Span 3,5 m (11 ft 5¼ in); length 6,15 m (20 ft 2 in); wing area 13,0 m² (140 ft²).

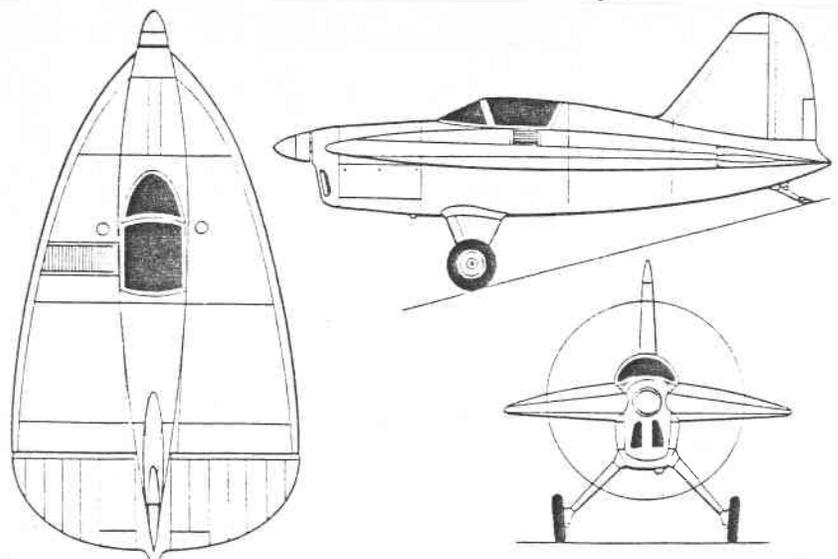
ENGINE One 140 hp Renault MV-6.

WEIGHTS Empty 470 kg (1036 lb); fuel/oil 60 + 10 kg; loaded 630 kg (1389 lb).

PERFORMANCE Speed reached at SL 310 km/h (193 mph); height reached 1,5 km; take-off 200 m; landing 100 m/102 km/h (63 mph).



SAM-7 Sigma



SAM-9 Strela

K-12 (VS-2) One of most extraordinary aircraft of its day, this tailless bomber was second stage in development by Kalinin of a super-fast bomber with flying-wing configuration. Total break with designer's traditions, except structurally. Objective was eventual bomber, possibly propelled by rockets, in which crew and all other items would be inside wing of perfect aerodynamic form. Having proved basic flight characteristics with K-11, K-12 was to be undemanding, and quite slow, experimental bomber to about half linear scale of eventual machine. On this scale not practical to bury everything in wing, so short central fuselage for crew of three. Wing of R-II profile, unswept with straight main spar and multiple auxiliary spars, stringers and built-up truss ribs. Structure welded KLMA steel throughout (ruling section elliptical, 10 x 8,5 mm) with fabric covering. Welded steel-tube fuselage in three sections, main joints and joints between wings and centre section being bolted. Scheibe-type rudders on vertical hinges at wingtips. Double-wing trailing edge with servo-operated ailerons outboard and elevators inboard, all of inverted R-II profile. Crew of three, pilot in enclosed cockpit and two gunners each with ShKAS in manually rotated turret at nose and tail. Internal bay for 500 kg bombload. Main gears retracted backwards into engine nacelles. No attempt at large bombload or long range: two small wing tanks totalled 700 lit (154 gal).

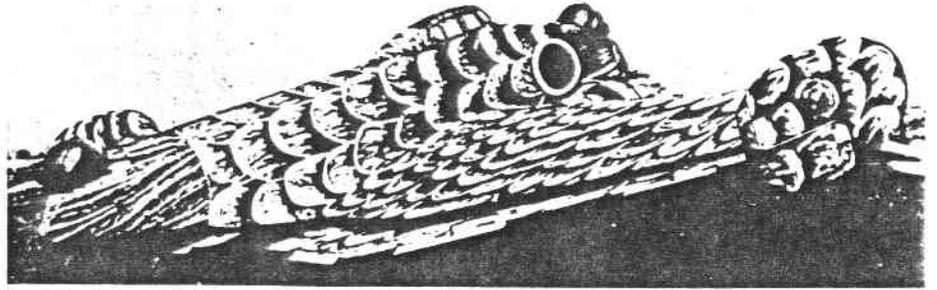
First drawings late 1934. First flight December 1936 by P.M. Stefanovskii. Long take-off and in air demonstrated poor stability and control (much worse than glider), and rudders zero or negative effectiveness at low speeds. Prolonged attempts to improve behaviour yielded slow results. Worse, though no attempt at high performance, latter seemed worse than conventional aircraft of equal power. Tailless bomber abandoned, but K-12 (service designation VS-2 from *Vystablyat samolyet*, demonstration aircraft) was painted bright red/yellow feathers and named *Zhar Ptitsa*, Firebird (Phoenix) and participated in Tushino show 18 August 1937.

DIMENSIONS Span (Shavrov) 20.9 m (68 ft 6½ in), (Němėček) 18 m; length (Shavrov) 10.3 m (33 ft 9½ in), (Němėček) 8 m; wing area (Shavrov) 72.7 m² (783 ft²), (Němėček) 72.5 m².

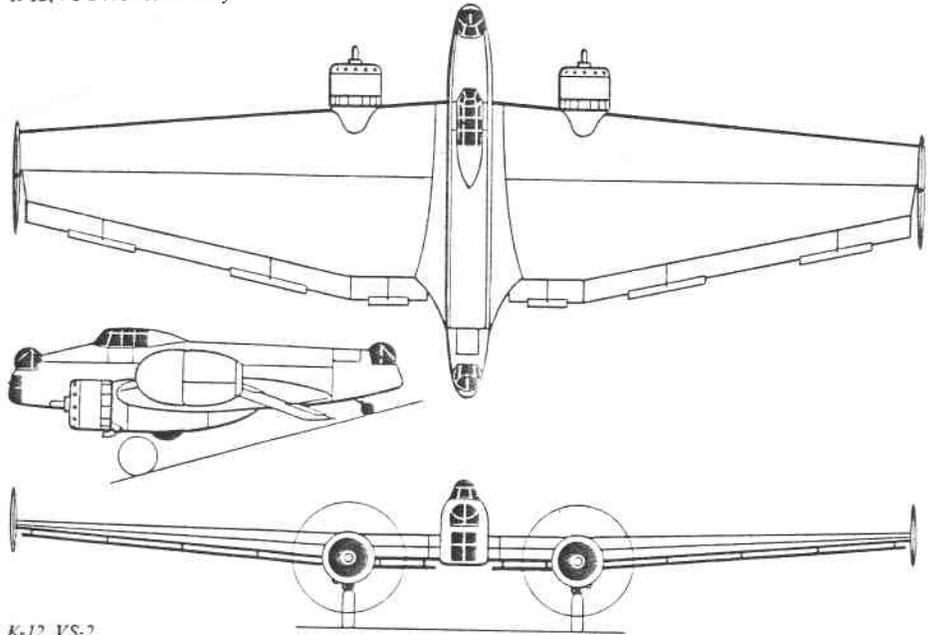
ENGINES Two 480 hp M-22.

WEIGHTS Empty 3070 kg (6768 lb); fuel/oil 500 kg; loaded 4200 kg (9259 lb).

PERFORMANCE Max speed (Shavrov) 218 km/h (135 mph), (Němėček) 240 km/h; service ceiling 7170 m (23,524 ft); range (Shavrov) 110 km (probably misprint), (Němėček) 700 km (435 miles); take-off given by Shavrov as 700 m and also as 300 m.



K-12, VS-2 in Firebird livery



K-12, VS-2

A Hitherto UNHARALDED Happening

During the model-building session at TWITT'S 4th Birthday Party, Harald Buettner hurriedly hacked out a tiny tailless glider, directly from drawings of his Precomtec "Gull" in TWITT Newsletter, May 1990.

It is common knowledge among uncommonly knowledgeable people that uncommonly complex contours on a tailless flying model won't work well when the model's tininess is anywhere NEAR as tiny as the one he flew that flew the wings off any other wing that flew at all!

We digress to state that many a murky message manufactured by one Edlock Hart, comes crystal clear when given time to settle out the serious stuff obscured by obfuscations levity.

Harald's experienced tweaking and tuning transformed marginal flights to better and better until the Gull consistently outflew itself. Flung like a boomerang by a wingtip, it would pinwheel up, pull out and glide! Long flat flights made us see the promise in a fullsize machine. Harald, we salute your multiple talents and smiling personality.