

LARGEST CIRCULATION OF ANY AVIATION MAGAZINE

AIR TRAILS

★ **BILL BARNES**

AIR NOVEL

JULY 1937



ANNUAL
LIGHT PLANE
SURVEY
1937

INSLEY
31

FAMOUS "TAYLOR MADE TAYLOR CUB" GAS MODEL

You'll have to admit **AIRCRAFT** It's a far better kit
"THE PRODUCT OF SKILLED CRAFTSMEN" NOT HURRIED PIECEWORKERS

AUTHENTIC



TAYLOR CUB

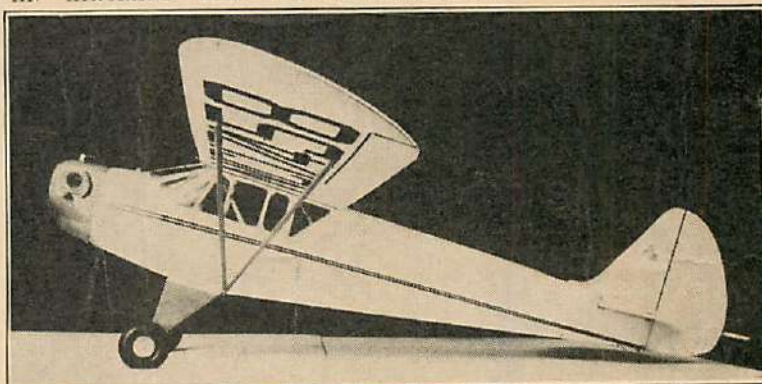
TAYLOR "CUB" BUILT FROM AN "AIRCRAFT" KIT. 6 FOOT WING SPAN.

EACH KIT CONTAINS

Completely formed shock absorbing landing gear struts. Cut out wing ribs. Semi finished monel metal motor mount. $3\frac{1}{4}$ " Super Balsa balloon wheels. Detachable wings for convenient carrying. Adjustable dihedral. Finished cut to shape celluloid windshield. Aluminum for cowlings. Selected straight grain balsa. Spring steel tail skid and many other features too numerous to mention.

Price \$4.95, plus 50c for packing & mailing.

This is a dry kit, Motors, Cement and Dopes are not included, these articles are fully described below.



COMPLETE WEIGHT READY TO FLY 2 3/4 POUNDS

WE CARRY THE FOLLOWING MOTORS IN STOCK

Gwinn Mighty Midget Motor Kit.....	\$ 9.85	Baby Cyclone Model D.....	\$17.25
Gwinn Aero Finished Motor.....	\$17.50	Brown Jr.....	\$21.50
Ohlson.....	\$17.50		

No C.O.D. shipments.

"AIRCRAFT SPOTWELD"

Clear Quick Drying Cement

Our own special preparation, known the world over for quality and recommended for Gas model work where the strain is very severe. Pint.....60c
 $\frac{1}{2}$ ".....35c

COLORED LACQUER

High gloss, quick drying, Red, Yellow, Blue, White, Black, Olive drab, Green, Cream and Silver. Pint.....75c
 $\frac{1}{2}$ ".....40c

CLEAR DOPE

For sticking tissue to frame, doping surfaces, etc. Pint.....50c
 $\frac{1}{2}$ ".....30c

M & M AIR WHEELS

$3\frac{1}{4}$ ".....	Pair \$1.50
$3\frac{1}{2}$ ".....	" \$3.50
$4\frac{1}{2}$ ".....	" \$3.75
6 ".....	" \$4.50

Authentic One-Quarter Inch to the Foot Solid Scale Models EVERY ONE A CONTEST WINNER

MARTIN



BOMBER

A PERFECT MODEL OF AMERICA'S MOST BEAUTIFUL BOMBER

The Kit To Build The Model Of This Modern Giant Contains: selected balsa parts cut to outline shape, turned hardwood cowls and wheels, 3 super-detailed pilot busts, 2 three-bladed Hamilton propellers, a replica aircraft machine gun, a finished transparent gunner's turret, formed to shape, drilled Aluminum landing gear struts, liberal portions of authentic army colored lacquers, wood filler and fillet making material, colored insignia, full-size detailed drawings, etc. \$1.00. Plus 20c packing and postage.



DOUGLAS TRANSPORT $22\frac{1}{4}$ " span color all silver with black detail or blue and yellow as shown \$1.50 plus 25 cents postage. Also furnished in 16" size at \$1.00 plus 20 cents postage.

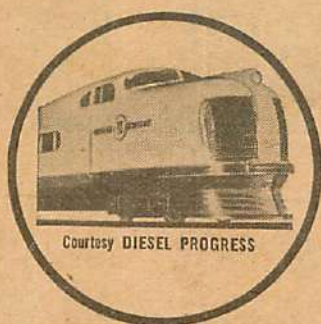
Foreign
ship-
ments
add 20%.



MARTIN "CHINA CLIPPER" $\frac{3}{8}$ " TO THE FOOT SCALE, SPAN 16" \$1.00 Plus 20 cents postage.

NOTE. These are actual photographs of models built from AIRCRAFT kits.

AIRCRAFT, 4346-48 NORTH PULASKI RD., DEPT. B. 7., CHICAGO



DIESEL POWER

A COMING AMERICAN INDUSTRY

The internal-combustion engine represents man's supreme triumph of machine power. Diesel engineers are in great demand. Many are acquiring necessary knowledge through spare-time study of this modern I. C. S. Course on Diesel engines. Free booklet!

ELECTRICAL ENGINEERING

—A Great Industry with a Great Future

The new course in Electrical Engineering covers this fascinating field thoroughly. If you are just starting or are partly on the way to a real paying position in this industry, this new course brings the broader knowledge necessary for advancement. The coupon brings complete information.



MECHANICAL ENGINEERING

—A Field with a Future

This course has meant advancement to hundreds of ambitious men, mechanics, draftsmen, blacksmiths, foundry-men, patternmakers, apprentices, and mechanical engineers — men who wanted to get ahead and to earn more money. You will find, as they have found, that enrolling for an I.C.S. Course is an investment in a Bigger Future.



AUTOMOBILE EXPERTS

are always in demand

The rapid progress in manufacture and service of the modern automobile brings new opportunities to thousands of ambitious and forward-looking men. There's always a demand for trained men. The new I. C. S. Automobile Course will make you a trained man! The time to act is now.



INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 4935-B, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," ★ and full particulars about the subject *before* which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

- ☐ Architect
- ☐ Architectural Draftsman
- ☐ Building Estimating
- ☐ Contractor and Builder
- ☐ Structural Draftsman
- ☐ Structural Engineer
- ☐ Electrical Engineer
- ☐ Electric Lighting
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ Refrigeration

- ☐ Electrician
- ☐ Radio

- ☐ Welding, Electric and Gas
- ☐ Reading Shop Blueprints
- ☐ Machinist
- ☐ Patternmaker
- ☐ Sheet Metal Worker
- ☐ Plumbing
- ☐ Heating
- ☐ Pipefitter
- ☐ Air Conditioning
- ☐ Automobile Mechanic
- ☐ Coal Mining
- ☐ Toolmaker
- ☐ Foundry Practice
- ☐ Boilermaker
- ☐ Steam Fitting
- ☐ Ventilation
- ☐ Tinsmith
- ☐ Navigation

- ☐ Bridge Engineer
- ☐ Bridge and Building Foreman
- ☐ Highway Engineer
- ☐ Civil Engineer
- ☐ Surveying and Mapping
- ☐ R. R. Locomotives
- ☐ R. R. Section Foreman
- ☐ R. R. Signalmen
- ☐ Air Brakes
- ☐ Train Operation
- ☐ Diesel Engines
- ☐ Aviation Engines

- ☐ Mechanical Engineer
- ☐ Mechanical Draftsman
- ☐ Steam Engineer
- ☐ Steam Electric Engineer
- ☐ Marine Engineer
- ☐ Chemistry
- ☐ Cotton Manufacturing
- ☐ Woolen Manufacturing
- ☐ Agriculture
- ☐ Fruit Growing
- ☐ Poultry Farming

BUSINESS TRAINING COURSES

- ☐ Business Management
- ☐ Industrial Management
- ☐ Traffic Management
- ☐ Accounting
- ☐ Cost Accountant
- ☐ C. P. Accountant

- ☐ Bookkeeping
- ☐ Secretarial Work
- ☐ Spanish
- ☐ Advertising
- ☐ Salesmanship
- ☐ Complete Commercial
- ☐ French

- ☐ Business Correspondence
- ☐ Stenography and Typing
- ☐ Civil Service
- ☐ Mail Carrier
- ☐ Railway Mail Clerk
- ☐ Grade School Subjects

- ☐ High School Subjects
- ☐ College Preparatory
- ☐ First Year College Subjects
- ☐ Illustrating
- ☐ Cartooning
- ☐ Lettering Show Cards
- ☐ Signs

DOMESTIC SCIENCE COURSES

- ☐ Professional Dressmaking and Designing
- ☐ Home Dressmaking
- ☐ Advanced Dressmaking
- ☐ Tea Room and Cafeteria Management, Catering
- ☐ Millinery
- ☐ Foods and Cookery

Name..... Age..... Address.....
City..... State..... Present Position.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

A
STREET & SMITH
PUBLICATION

AIR TRAILS

Reg. U. S. Pat. Off.

Volume VIII No. 4
July, 1937

Editor
F. Orlin Tremaine

Associate Editor
Clyde Pangborn

Model Editor
Gordon S. Light

Art Editor
W. R. Lawler

Technical Editor
Arch Whitehouse

Department Editor
William Winter

Advertising Director
Harry Brown

Ass't. Adv. Director
Ralph Whittaker

Model Board
Gordon S. Light
Frank Tinsley
William Winter

Single Copy, 15 Cents
Yearly Subscription, \$1.50



The entire contents of this magazine are protected by copyright, and must not be reprinted without the publishers' permission.

Monthly publication issued by Street & Smith Publications, Inc., 79-89 Seventh Avenue, New York, N. Y. Artemas Holmes, President; Ormond V. Gould, Vice President and Treasurer; Henry W. Ralston, Vice President; Gerald H. Smith, Secretary; A. Lawrence Holmes, Assistant Secretary. Copyright, 1937, by Street & Smith Publications, Inc., New York. Copyright, 1937, by Street & Smith Publications, Inc., Great Britain. Entered as Second-class Matter, January 11, 1937, at the Post Office at New York, N. Y., under Act of Congress of March 3, 1879. Subscriptions to Cuba, Dom. Republic, Haiti, Spain, Central and South American Countries, except The Guianas and British Honduras, \$1.75 per year. To all other Foreign Countries, including The Guianas and British Honduras, \$2.25 per year.

We do not accept responsibility for the return of unsolicited manuscripts. To facilitate handling, the author should inclose a self-addressed envelope with the requisite postage attached.

**STREET & SMITH
PUBLICATIONS, INC.**

79 Seventh Avenue
New York, N. Y.

CONTENTS

5 Articles:

- Light Planes of 1937 by Frank Tinsley 8
Latest developments in the low-priced field.
- 1937 Annual Light Plane Survey 10
An analytical review of the light plane field—prices, performances, construction, technical points.
- Canada's Transcontinental Airway Ready by James Montagnes 14
Completion of the Canadian arterial network of lines—aviation's conquest of a wilderness.
- Gliding and Soaring 24
What the gliding clubs are doing—developments and news from everywhere.
- Getting into Aviation by Clyde Pangborn and Lieut. W. M. Wood 30
Concluding this powerful series on opportunities in air-line operation and civil-service activity.

8 Features:

- This Winged World 4
News photos of airplanes, air events, airmen.
- Air Progress 7
The current news review of aviation.
- The Flier's Dictionary by C. B. Colby 23
The twenty-second lesson in the technical terminology of the air.
- Split-second Action by Jon L. Blummer 29
Aerial adventures that come only once in a lifetime.
- Pictorial History of Man in the Air 33
The early days of powered flight.
- Air Trails Gallery 37
Photographic studies of new planes.
- Cross Winds 38
The Air Trails Aviation Crossword Puzzle page.
- Launching Development 66
A pictorial lesson in basic principles.

3 Stories:

- "Dear Harry—" by George Swift 13
Letters of an Air Student to his friend.
- The Lancer's Ready (Bill Barnes Air Novel) by George L. Eaton 16
A breathless adventure in which Bill Barnes meets a mystery submarine.
- Let the Kids Fly the Airways by Harold Montanye 26
Nothing else mattered but the technical task of conveying an airplane from one point to another—

2 Departments:

- Air Adventurers Club Conducted by Albert J. Carlson 34
An association for the advancement of aviation.
- What's Your Question? Conducted by Clyde Pangborn 36
A page of expert information on technical questions for Air Trails readers.

13 Model Building Items:

- The Model Shop
Model contents are listed on a separate contents page—Page 39.

How Jerry Got His Start in AVIATION

HOW'S THAT FOR A LAIRD TRANSPORT MODEL? WHAT HAVE YOU BEEN DOING LATELY, BILL? BUILT ANY MORE MODELS?



NO, JERRY. I DECIDED AVIATION WAS A BUSINESS TO MAKE MONEY IN—NOT TO FOOL AROUND WITH. I'M WORKING AT THE AIRPORT NOW. COME ON OUT.



YOU'RE IN AVIATION NOW? AND A LICENSED PILOT ALREADY? HOW COME?

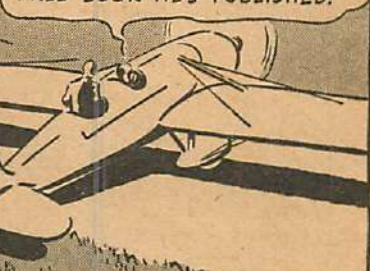


LET'S TAKE A HOP. I'LL TELL YOU WHILE WE WARM UP THE MOTOR.

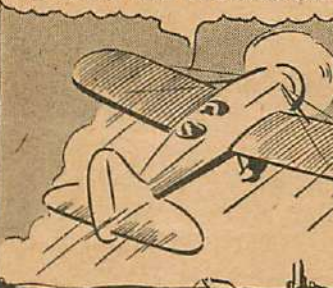
YOU HAD TO GIVE UP YOUR JOB, DIDN'T YOU, TO GET AVIATION TRAINING?



I DID NOT. WALTER HINTON TRAINED ME AT HOME. THEN I GOT A GROUND JOB AT THIS AIRPORT AND GOT MY FLYING INSTRUCTIONS AT A VERY LOW COST. HINTON TELLS YOU ALL ABOUT HOW TO GET INTO AVIATION IN A FREE BOOK HE'S PUBLISHED.



GEE—THIS IS GREAT. I'LL SEND FOR WALTER HINTON'S BOOK TONIGHT AND LEARN HOW HE TRAINS MEN FOR AVIATION.



WHAT A COURSE. HINTON GIVES ME THE DOPE ON MOTORS, AIR PLANE DESIGN—AIRPORT MANAGEMENT—GIVES ME THE GROUND TRAINING FOR MORE THAN FORTY DIFFERENT TYPES OF AVIATION JOBS. AND HE'S HAD MORE THAN EIGHTEEN YEARS EXPERIENCE TRAINING MEN FOR AVIATION. I'M GOING TO START TRAINING RIGHT NOW.



THIS SHIP HANDLES BETTER THAN EVER SINCE YOU'VE BEEN SERVICING IT.



THANKS BILL. HINTON CERTAINLY KNOWS HIS STUFF. I'M TAKING FLYING LESSONS NOW. I'LL SOLO NEXT WEEK.



I'M SO GLAD YOU GOT INTO AVIATION. WITH THAT NEW JOB AS PILOT FOR THE AIRLINE WE CAN GET MARRIED RIGHT AWAY.



AND THERE'S PLENTY MORE AHEAD FOR US IN AVIATION, DEAR. IT CERTAINLY IS THE INDUSTRY FOR AMBITIOUS WIDE-AWAKE MEN.



MY FAMOUS COURSE trains you quickly at home in spare time for AVIATION'S OPPORTUNITIES

Many make \$40-\$60-\$75 a week in this fast-growing industry

My up-to-date home study Course gives you the ground work you need to get and keep a real job in this fascinating, fast-growing industry. Many of my graduates, who didn't know a thing about Aviation before they enrolled, are holding down fine jobs right now—in the air and on the ground. Get the facts about my practical training and what it has done for others. Mail coupon now.

I Teach You QUICKLY—at Home in Your Spare Time

You don't need to give up your present job—don't need to leave home, to get your training in Aviation. I've made it easy for you. I've put my own eighteen years of experience—five years of instructing in the Navy—into my thorough, quickly mastered home study Course.

No Previous Experience Needed

You don't need a high school education—don't have to know anything about planes or engines to learn the ground work of Aviation with my Course. Everything is clearly explained—illustrated by hundreds of pictures, drawings and charts—simple and easy to understand.

You Have Many Types of Jobs to Choose From

You have over 40 different types of jobs to choose from once you have the necessary training. You get all the information you need to pass the Government's written examination for Mechanic's or Pilot's Licenses, in a few short months. If you want to learn to fly, I can probably save you more than the cost of my Course at good airports all over the country.

Aviation is Growing Fast

Don't wait and let the other fellows get ahead of you. Think about your own future. Get the FACTS. Mail the coupon on the right today—right now—while you're thinking about it. I'll send you my big new FREE Book—packed with interesting facts about your opportunities in Aviation. Do it NOW.

WALTER HINTON, Pres.

Aviation Institute of America, Inc.

1115 Connecticut Avenue, Washington, D. C.



Walter Hinton: trail blazer, pioneer, explorer, author, instructor, AVIATOR. The first man to pilot a plane across the Atlantic, the famous NC-4, the first to fly from North to South America. The man who was a crack flying instructor for the Navy during the War: Hinton is ready to train you at home in spare time. Send for his Free Book—TODAY.



These Men Made Good With My Training

COURSE HELPED PASS GOVERNMENT EXAMINATION

"I am a holder of an aeroplane and engine mechanic's license and a private pilot's license. Your Course helped me a great deal to pass the examination." JOHN HALEN-DA, 329 S. Balliet St., Frackville, Pa.

RECOMMENDS COURSE TO ALL

"I can honestly recommend your Course to all who are interested in Aviation as worth the time and money spent on it, and much more. I am proud to have been a student of your Institute." A. J. W. Slabber, Darling Road, Malmesburg, Cape Province, South Africa.

ACCEPTED FOR ROYAL CANADIAN AIR FORCE

"I sent your letter with an application for enlistment in the Royal Canadian Air Force and I received a letter stating that my application is accepted and I can enlist as soon as there is a vacancy." JOSEPH J. BEISIG, Melville, Sask., Canada.

PERFECTLY SATISFIED WITH COURSE

"I am perfectly satisfied that the results obtained to date from your Course have made its cost insignificant. Rest assured that you have a life-long booster for Aviation Institute training." L. W. Archer, P. O. Box 38, Curacao, D. W. I.

MAIL Today FOR FREE BOOK

Walter Hinton, President
Aviation Institute of America, Inc.,
1115 Connecticut Avenue, Washington, D. C.

A3J

Please send me a Free copy of your book, "Wings of Opportunity." I want to know more about my opportunities in Aviation, and your tested method of home training. This request does not obligate me. (Write clearly.)

Name

Address

City

Age

State

This Winged World



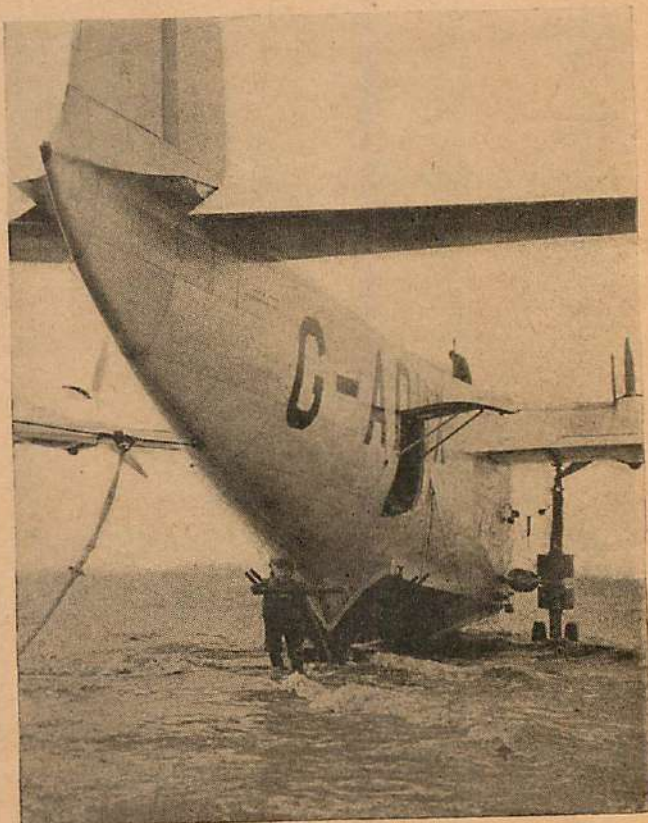
The versatility of seaplanes, such as this Stinson at rest on the water at Miami, makes travel by air unparalleled for quickly reaching the more inaccessible vacation spots.



A group of women launching a primary glider at a women's glider day in Germany.



The Dutch version of a foolproof plane—it crashed on test flight—is equipped with a 40 h.p. pusher engine.



This striking view of the English flying boat Cassiopeia, being drawn from the water for overhaul, clearly reveals the flowing hull lines of the giant.

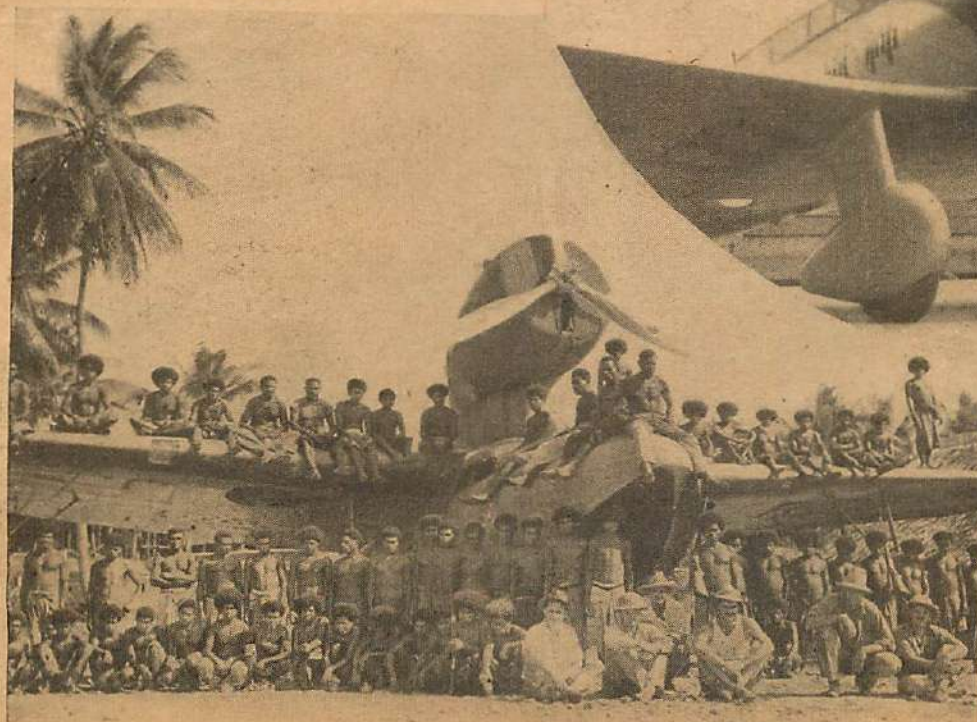
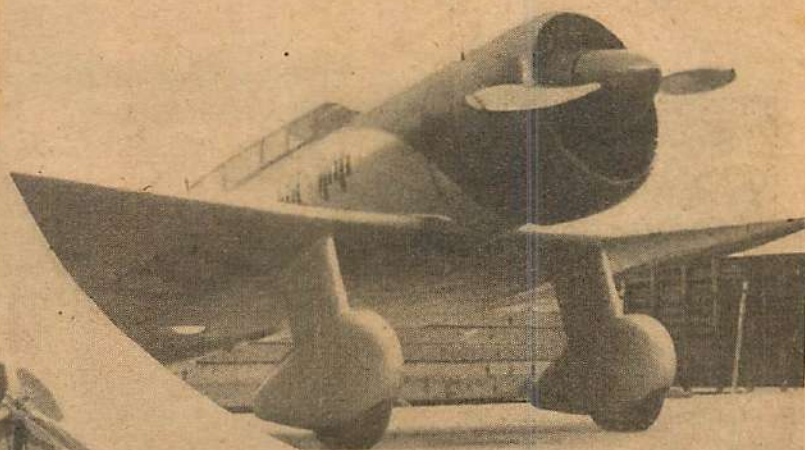


The Douglas DC-4 will carry 40 passengers and a crew of 5 at 237 m.p.h. With a span of 138 ft., 3 in., this 5,000 h.p. Goliath will dwarf existing transports. The ceiling is 24,000 ft. and the cruising range 2,200 miles. 5 major transport companies pooled their resources for its development.

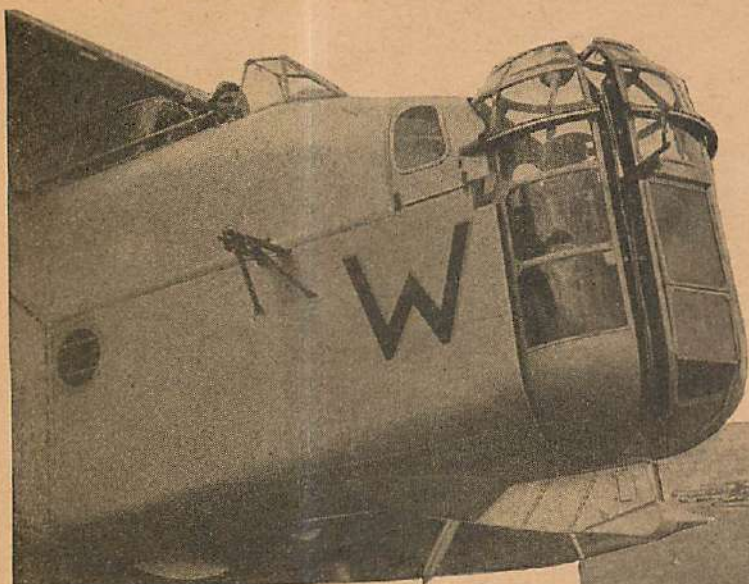


The Hindenburg, its nose attached to a mooring mast on rails, emerges from its hangar.

Right: The Divine Wind, Japanese record-smashing plane which averaged over 200 m.p.h. on its 3 1/2-day trip from Tokio to London, shown after landing at Karachi, India.

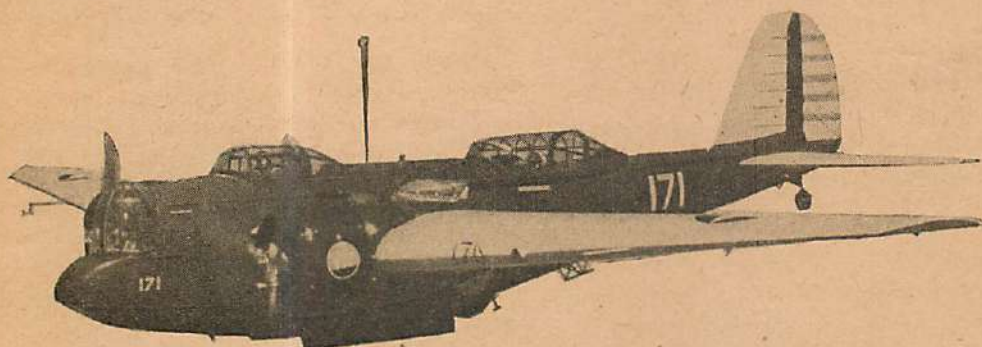
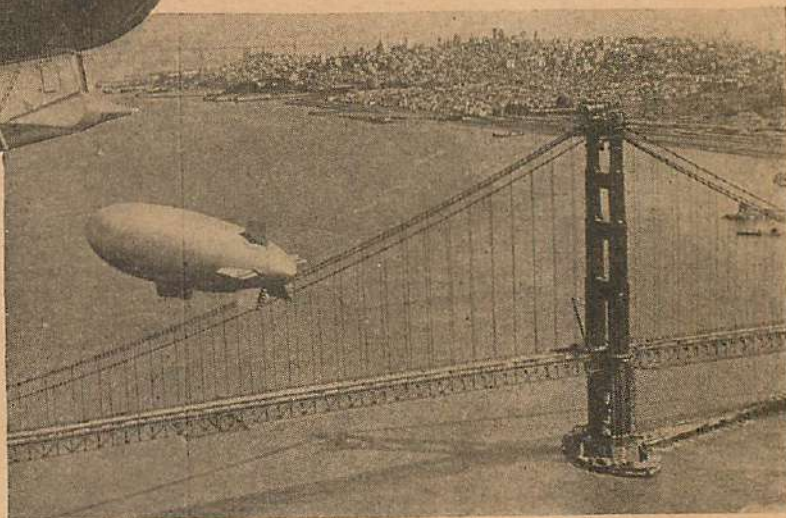


Left: Fairchild amphibian used by an aerial expedition into the land of the cannibal and head-hunter. Posed here are the 6 members of the band and a number of the more courageous natives of New Guinea, who have overcome their fear of the plane.



The revolving nose turret of this British bomber utilizes the lowly zipper to shield the gun openings from the air blast. Modern high-speed bombers make such protection necessary so that accurate gunnery is possible.

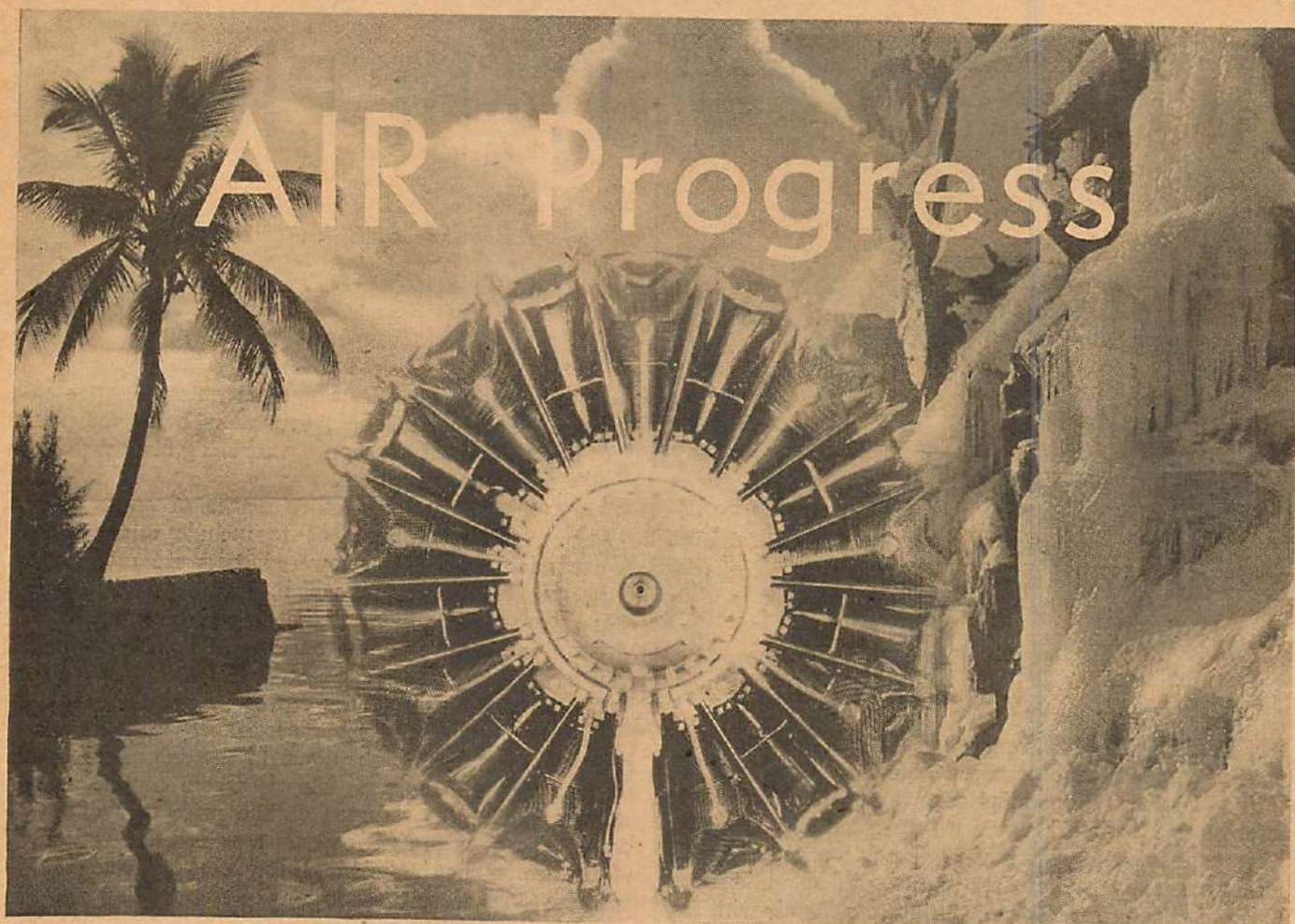
Right: An army blimp, encircling San Francisco, noses over the new Golden Gate Bridge, thus completing an all-army picture; the bridge bases one approach on the San Francisco post, the other in the Fort Baker reservation.



Left: Nine thousand feet up, this Martin bomber has just released a missile, aimed at a 30-foot target moored in San Pablo Bay, as practice for coming aerial maneuvers on the coast. Note the open bomb hatch.

Mussolini, inspecting his ultra-modern air force assembled near Rome. Although most nations favor 2- and 4-engined types, with conventional nose turrets, Italy has developed trimotored bombers in large numbers, placing the bombardier beneath the nose.





A Summary of AVIATION NEWS

TRANSPORT

The first air-passenger service between the United States and China was scheduled to start on April 28th. Pacific Clippers leaving San Francisco will accept passengers for Hong Kong and Macao, as well as for Honolulu, Guam, and Manila. Pan American Airways said that the eastbound schedule will start on May 6th. Fares for the all-air route from San Francisco to Hong Kong will be nine hundred and fifty dollars. The Honolulu trip will cost six hundred and fifty dollars.

The Martin company of Baltimore, discouraged by the delays faced in transatlantic air-line operations, as planned by Pan American and the Imperial Airways of Great Britain, has decided to attempt a line using their own new proposed airliners, which will cover the New York-to-Europe run in eighteen hours. The westward run will take twenty-one hours. The new planes will have a cruising range of five thousand miles and will carry forty passengers.

Much of the trouble arising in the plans of the Pan American and Imperial Airways comes from the insistence of Canada, which demands that any service which touches any part of the Canadian mainland must be brought inland as far as Montreal. Other diplomatic problems, and those involving the management of general operations, have been the stumblingblocks for several months.

Portugal has given the Pan American Airline rights to use Madeira, the Azores, and certain ports on the Portuguese coast. Imperial Airways was also given these

The modern aircraft engine is the key link in shrinking the traveling time between north and south to a matter of hours.

rights, but Air France and the Deutsche Lufthansa, which also applied, were turned down. Under the terms, Pan American and Imperial Airways will have the use of Portuguese radio and weather services, the right for free importation of fuel and machines, while Portugal will share in the passenger and freight revenue originating in its territory.

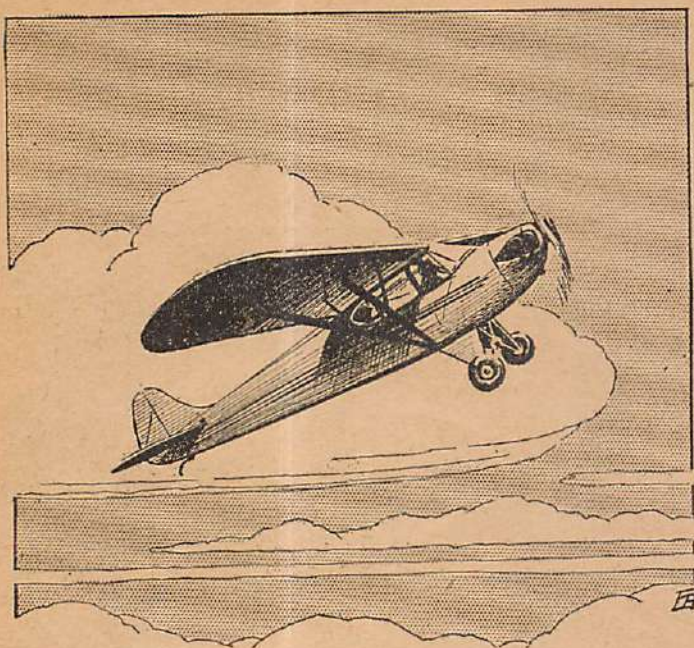
The *Santa-Maria*, a Pan American flying boat encountering engine trouble off the coast of South America recently, had a forced landing on the water near Lima, Peru. No damage was done; no passengers were injured and all were safely picked up by an amphibian plane belonging to the company.

Air France, the French-government transportation company, recently signed an order for twenty American Bellanca transport planes, which will be used on postal runs. The purchase price was about eight hundred thousand dollars. Six of the planes have already been completed.

A special summer-season service by the American Airlines, using the new Douglas sleeper planes, was started recently. The interesting feature of this new service is to be noted in the fact that the company is using the Floyd Bennett Field in Brooklyn, and not Newark. Whether the company plans to eventually move its hangars and operations out of Newark has been the big question.

Wireless operators connected with Imperial Airways went on strike recently and completely tied up service in and out of Alexandria.

(Turn to page 94)



The Taylor Cub

IN PREPARING this survey of the present light-plane situation, we have proceeded on the theory that low initial price and operating costs are of more immediate interest to Air Trails readers than relatively expensive high performance. With very few exceptions, none of us happen to be millionaires or the sons of millionaires. Our only hope, therefore, of getting into the air with any regularity, lies in the purchase or rental, either individually or in groups, of inexpensive airplanes.

With this thought in mind, the editors of Air Trails have limited the 1937 survey to low-priced aircraft developing 100 horse power or less. Within these limits we have tried to provide as complete, accurate, and up-to-date data as possible. All of the specifications, dimensions and performance figures appearing in the comparative tables below, come directly from the various manufacturers and relate to the latest models of the ships listed.

The demand for reasonably priced sport planes of modest performance is increasing by leaps and bounds. It has resulted in a rapidly expanding production of the more popular types of ships and is affecting both plane and engine manufacturers. On the strength of bigger and bigger orders, several of the latter have been able to institute modified mass-production methods with a consequent lowering of the price of their product. A perfect example of this lies in the experience of Continental Motors Corp. with their A-40 engine. The increasing popularity of the well-known Taylor "Cub" two-place sport plane, powered with the A-40, resulted in a speeding up of the builder's production schedules. In anticipation of even greater sales this year, the directors of the Taylor Aircraft Co. decided on a bold forward step. Conferences with the Continental firm led to an agreement on a reduced, mass-production price for the A-40 and a contract was signed for the largest order of non-military engines on record.

Quick to take advantage of the lowered price, several competing light-plane manufacturers promptly jumped aboard the band wagon by designing their new models around the popular Continental motor. This completes the healthy cycle of cheaper engines=cheaper planes=

Light Planes

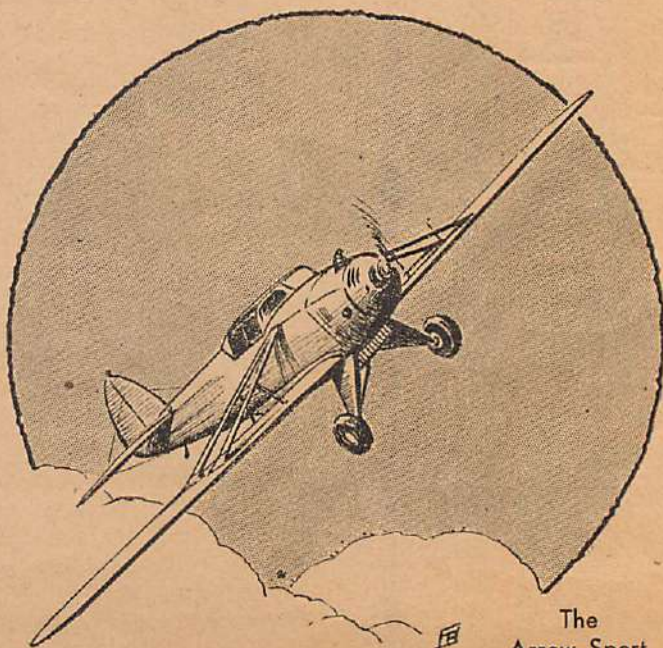
Latest Developments in the Low-priced Field.

more sales; more sales=more engines=cheaper engines. This cycle should eventually bring the price of the A-40 down to a figure comparing favorably with automotive-engine prices.

As the demand for other makes of sport planes grows, the cycle broadens to include other engine manufacturers. Their lowered costs are reflected in lowered airplane prices which, in turn, create a competitive market similar to that in the automobile field. All this operates to the advantage of aviation, with more fliers buying cheaper and better planes and cheaper and better planes creating more fliers.

By now the prices of several excellent two-place sport planes have been brought down to the neighborhood of thirteen hundred dollars. This is a considerable reduction of the figures stamped on the price tags of these same ships as little as two years ago, and is a reflection of the ever-mounting sales during that period. Many of these sales were to operators of small flying schools who double in brass as the agents of the ships they fly. These outfits are turning out large numbers of amateur pilots, all of whom are either immediate or potential customers of the light-plane manufacturers. Many of them are readers of this magazine, and it is for these newly fledged fliers that the annual Air Trails survey is primarily intended.

Detailed descriptions of the aircraft now available are given in the accompanying tables and are unnecessary here. Suffice it to say that practically all of them bear

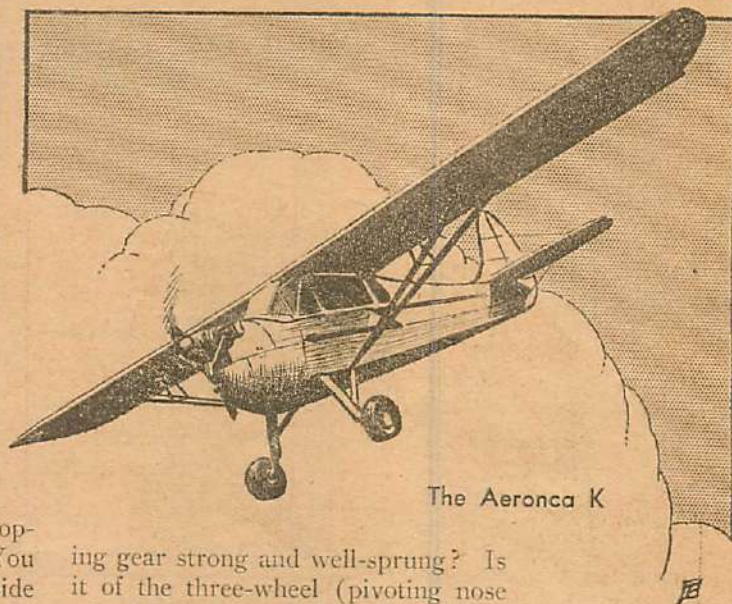


The Arrow Sport

of 1937

by FRANK
TINSLEY

the O. K. of the department of commerce as to airworthiness and excellence of construction. All that is left for you potential buyers to do is to study the figures and decide which features you like best. You have been given a choice of power plants developing from twenty-five to a hundred horse power. You will find planes featuring single, tandem and side-by-side



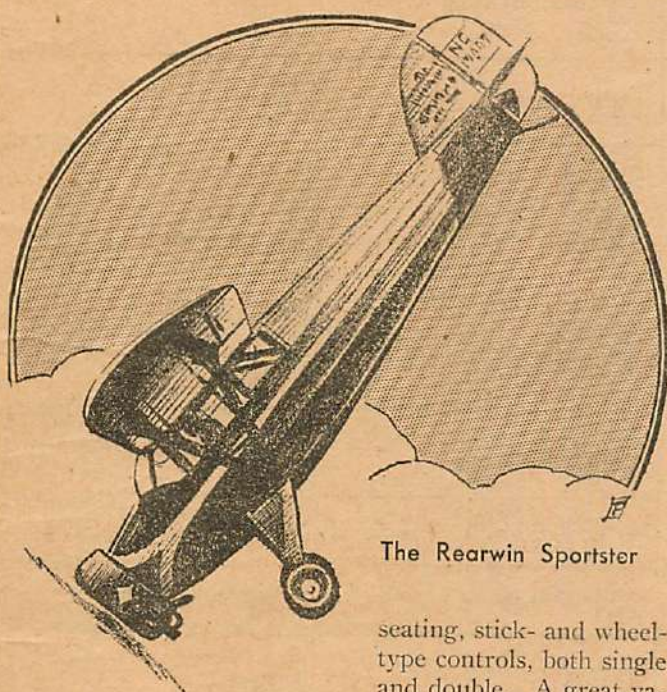
The Aeronca K

ing gear strong and well-sprung? Is it of the three-wheel (pivoting nose wheel) safety type? What is the normal take-off run—rate of climb—ceiling? What is the ship's cruising speed? Normal range fully loaded?

Go over these points very carefully before making a selection. In choosing between a standard model and a little-known type having a slight edge in performance, consider the fact that the standard job is known and understood at almost any airport. In many of them you will find authorized agents prepared to furnish repairs and service for your particular make of plane. Weigh the advantages and disadvantages of each before reaching a decision.

Certain of the so-called experimental types have now reached a stage where they can be described as standard aircraft. Prominent among them are a number of the automobile-engine-powered ships such as the Arrow-Sport, Ace, Campbell, etc. While the performance of these planes is definitely lowered by the relatively great weight of their power plants, they can rightfully claim certain important advantages: Their engines are cheap to buy, understood by every garage mechanic in the land, and run on inexpensive, standard

(Turn to page 82)

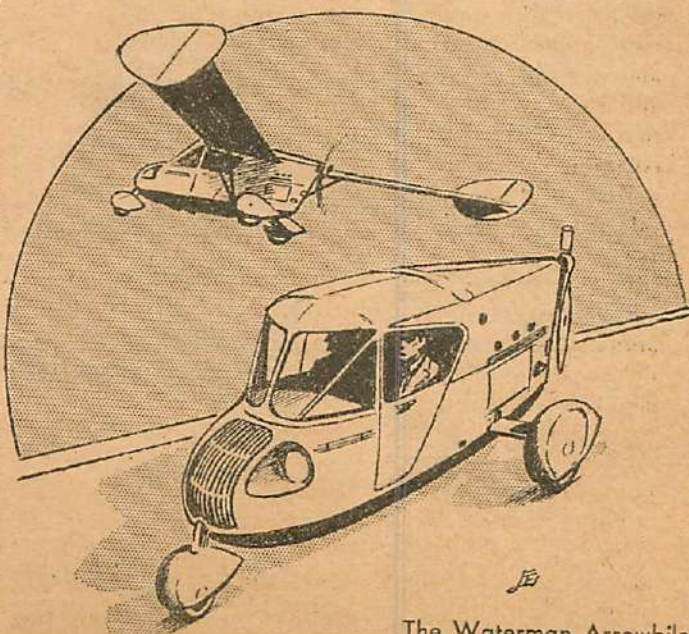


The Rearwin Sportster

seating, stick- and wheel-type controls, both single and double. A great variety of inside and outside colors and finishes are offered with both open and inclosed cockpits. It is all there in black and white, set out in a form designed to make comparison easy.

Some of the questions you should ask yourself in selecting a motor are: Is it a time-tested, standard job, manufactured in sufficient quantities to make repairs and replacements convenient and inexpensive? How does its fuel and oil consumption compare with other available engines of similar horse power? How does it function in extremes of weather? Is it designed to facilitate adjustment and repair? How often does it require an overhaul, and how much does it cost?

In regard to the plane: Is it of standard make, licensed by the department of commerce? What is its initial price? Is financing possible at a reasonable rate? Are the cockpit arrangements comfortable, seats large enough? Is the visibility adequate in flight—while taxiing? Is the ship inherently stable? Easy to fly? What instruments are provided? What is its landing speed—normal landing run? Are brakes provided? Is the land-



The Waterman Arrowbile

1937 Light

GENERAL DATA	Name	Taylor Silver "Cub"	Porterfield Zephyr CP-40	Rearwin * Sportster 7,000
	Model	A.T.C. 595	ATC 2-530	ATC 574
POWER PLANT	License	Taylor Aircraft Co.	Porterfield Aircraft Corp.	Rearwin Airplanes
	Manufacturer	Bradford, Pa.	Kansas City, Missouri	Kansas City, Missouri
PERFORMANCE FIGURES	Factory	H. W. Monoplane	H. W. Monoplane	H. W. Monoplane
	Type	Enclosed (pyralin) \$28 extra	Open (enclosed \$60 extra)	Pyralin enclosed
DIMENSIONS	Cockpit	Two—tandem	2 tandem	2 tandem
	Seats	\$1,270.00	\$1,295 open	\$2,595
AREAS	Price (at factory)	\$425.00 down payment	1/4 down, balance monthly	Time payment plan available
	Finance Terms			
WEIGHTS	Manufacturer	Continental Motors Corp.	Continental Motors Corp.	LeBlond Aircraft Engine Corp.
	Model	A-40	A-40	5E
WINGS	Total rated h.p.	40 @ 2,575 r.p.m. @ sea level	40 @ 2,575 r.p.m.	70 @ 1,950 r.p.m.
	Fuel Consumption	3 gals./hr. (cruising)	2.8 gallons per hour (cruising)	4.8 gallons per hour (cruising)
FUSELAGE	Oil Consumption	1/2 pt./hr. (cruising)	1/2 pint per hour (cruising)	
	Fuel Capacity	9 gals.	9 gallons	24 gallons
TAIL SURFACES	Oil Capacity	1 gal.	1 gallon	2 gallons
	Propeller	Sensenich 69-D wooden	69" Fahlin or Sensenich wooden	Fahlin 76" wooden
LANDING GEAR	Maximum Speed	85 m.p.h. @ sea level	85 m.p.h.	115 m.p.h.
	Cruising Speed	72 m.p.h. @ sea level	75 m.p.h.	103 m.p.h.
ENGINE INSTRUMENTS	Landing Speed	30 m.p.h.	35 m.p.h.	38 m.p.h.
	Initial Climb	450 ft./min.	325 ft./min., 375 ft./min. solo	625 ft./min.
EQUIPMENT	Service Ceiling	12,000 ft.	9,000 ft.	15,000 ft.
	Cruising Range	216 mi.	225 miles	500 miles
FLIGHT INSTRUMENTS	Wing Span	35' 2 1/2"	34 ft. 8 in.	35 ft.
	Length o.a.	22' 5"	21 ft. 7 1/2 in.	22.3 ft.
GENERAL DATA	Height o.a.	6' 8"	6 ft. 11 1/4 in.	6 ft. 9 in.
	Wings (inc. ails.)	178.5 sq. ft.	169 sq. ft.	166 sq. ft.
PERFORMANCE FIGURES	Ailerons (total)	19.2 sq. ft.	18.9 sq. ft.	19.75 sq. ft.
	Fin	3.18 sq. ft.	4.75 sq. ft.	5.17 sq. ft.
WEIGHTS	Rudder	6.0 sq. ft.	6.7 sq. ft.	6.92 sq. ft.
	Stabilizer	14.65 sq. ft.	12.4 sq. ft.	15.04 sq. ft.
WINGS	Elevators (total)	10.64 sq. ft.	12.12 sq. ft.	12.12 sq. ft.
	Weight (empty)	563 lbs.	580 pounds	853 pounds
FUSELAGE	Useful Load	407 lbs.	460 pounds	607 pounds
	Pay Load	175 lbs.	220 pounds	220 pounds
TAIL SURFACES	Weight (gross)	970 lbs.	1040 pounds	1,460 pounds
	Wing Loading	5.42 lbs./sq. ft.	6.17 lbs./sq. ft.	8.8 lbs./sq. ft.
LANDING GEAR	Power Loading	24.2 lbs./h.p.	26 lbs./h.p.	20.8 lbs./h.p.
	Spars	Solid spruce	Solid spruce	Solid spruce reinforced
ENGINE INSTRUMENTS	Ribs	Aluminum alloy	Spruce built up	Spruce (girder type)
	Covering	Fabric	Fabric	Fabric
FLIGHT INSTRUMENTS	Frame	Warren truss, steel tubing	Welded steel tubing, Warren truss	Welded steel tubing
	Covering	Fabric	Fabric	Aluminum and fabric
EQUIPMENT	Frame	Welded steel tubing	Welded steel tubing	Welded steel tubing
	Covering	Fabric	Fabric	Fabric
LANDING GEAR	Type	Fixed split type	Fixed, split	Fixed, divided
	Wheels	Hayes	Goodyear	Goodyear
ENGINE INSTRUMENTS	Tires	Goodrich	Goodyear	Goodyear
	Brakes	Hydraulic	Mechanical	Goodyear (extra)
FLIGHT INSTRUMENTS	Springs	Shock cord	Goodyear rubber disc shocks	Hydraulic spring
	Tail Skid	Leaf spring	Fixed, spring leaf type	180 degree swiveling wheel
EQUIPMENT	Tachometer	Waltham Watch Co.	Yes	Yes
	Oil Pressure Gauge	U. S. Gauge Co.	U. S. Gauge Co.	Yes
FLIGHT INSTRUMENTS	Oil Temperature Gauge	U. S. Gauge Co.	U. S. Gauge Co.	Yes
	Fuel Gauge	Taylor		Ford
EQUIPMENT	Ammeter			
	Throttle			
FLIGHT INSTRUMENTS	Water Temperature Gauge			
	Compass			Kollsman (extra)
EQUIPMENT	Altimeter	Aeromarine	Yes	Aeromarine
	Airspeed Indicator		Yes	Yes
EQUIPMENT	Turn and Bank Indicator			
	Clock			
EQUIPMENT	Controls	Dual stick (front remov.)	Dual stick, removable	Dual, stick
	Upholstery	Fabrikoid	Spanish leather	Seats
EQUIPMENT	Fire Extinguisher	Grinnel	Pyrene	Pyrene
	First-aid Equipment	Johnson & Johnson	Yes	Johnson & Johnson
EQUIPMENT	Navigation Lights	Wired for	Wired for	Wired for (Grimes extra)
	Landing Lights			
EQUIPMENT	Instrument Panel Lights	Indirect Lighting		Eclipse (extra)
	Engine Starter			Extra
EQUIPMENT	Cabin Heater			Reading (extra)
	Battery			

* Also manufactured by Rearwin is the Sportster model 9000L powered by the 90 h.p. LeBlond engine; the Sportster model 9000 powered by the 90 h.p. Warner engine; and 2 Speedster models, 6000M and 6000 MS. The Speedsters are not included in the survey, due to the exceeding of the 100 h.p. limit.
Data on the 9000L is as follows: high speed 123 m.p.h., cruising 110 m.p.h.,

landing 38 m.p.h., climb 1,000 ft./min., range 500 miles, empty weight 830 lbs., gross 1,460 lbs.
Data on the 9000 as follows: high speed 120 m.p.h., cruising 107 m.p.h., landing 38 m.p.h., climb 900 ft./min., range 500 miles, empty weight 861 lbs., gross 1,400 lbs.

Plane Survey

Monocoupe * 90A ATC 306 (also as seaplane on Edo Floats) Monocoupe Corp. Robertson, Missouri H. W. monoplane Enclosed 2 side by side \$3,825 ?	Arrow F ATC G13 Arrow Aircraft Corp. Lincoln, Nebraska L. W. monoplane Open 2 side by side \$1,500 ?	Campbell F Experimental Campbell Aircraft Corp. St. Joseph, Missouri Midwing Enclosed (Plastacele) 2 side by side	Porterfield † 70 ATC 567 Porterfield Aircraft Corp. Kansas City, Missouri H. W. monoplane Pyralin enclosed 2 tandem \$2,095 \$698.35 down, balance monthly
Lambert Engine & Machine Co. R-266 90 @ 2,375 r.p.m. 4.8 gallons per hour (cruising) .025 lbs. per hour 28 gallons 2½ gallons Hamilton Standard steel 78"	Ford (Arrow conversion) V-8 82 @ 2,075 r.p.m. 6 gallons per hour (cruising) 2½ pint per hour (cruising) 20 gallons 2 gallons 90" Fahlin wooden	Ford V-8 100 @ 4,000 r.p.m. 6.3 gallons per hour 25 gallons 1½ gallons	LeBlond Aircraft Engine Corp. 5E 70 @ 1,950 r.p.m. 4.5 gallons per hour (cruising) .6 lbs. per hour (cruising) 18 gallons 2½ gallons 76 in. Fahlin wooden
130 m.p.h. 110 m.p.h. 45 m.p.h., 42 m.p.h. with flaps 900 ft./min. 15,000 ft. 600 miles	100 m.p.h. 95 m.p.h. 45 m.p.h. 800 ft./min. 12,000 ft. 300 miles	112 m.p.h. 97 m.p.h. 55 m.p.h., with flaps 48 m.p.h. 350 ft./min. 12,000 ft. 350 miles	115 m.p.h. 105 m.p.h. 40 m.p.h. 700 ft./min. 15,000 ft. 360 miles
32 ft. 20 ft. 6 in. 6 ft. 11 in.	36 ft. 9 in. 21 ft. 4 in. 8 ft. 10 in.	36 ft. 19 ft. 4 in. 6 ft. 6 in.	32 ft. 19 ft. 9½ in. 6 ft. 8½ in.
132.2 sq. ft. 13.5 sq. ft. 4.1 sq. ft. 5.8 sq. ft. 10.6 sq. ft. 7 sq. ft.	180½ sq. ft. 20.8 sq. ft. 4.76 sq. ft. 6.62 sq. ft. 15.7 sq. ft. 10.92 sq. ft.	145 sq. ft. 12.66 sq. ft. 6.6 sq. ft. 5 sq. ft. 11.8 sq. ft. 7 sq. ft.	143.16 sq. ft. 17.16 sq. ft. 5.16 sq. ft. 6.33 sq. ft. 3.20 sq. ft. 9.55 sq. ft.
973 pounds 637 pounds 286 pounds 1,619 pounds 11.9 lbs./sq. ft. 17.6 lbs./h.p.	1,172 pounds 503 pounds 198 pounds 1,675 pounds 9.3 lbs./sq. ft. 20.4 lbs./h.p.	1,240 pounds 535 pounds 205 pounds 1,775 pounds 12.25 lbs./sq. ft. 17.75 lbs./h.p.	813 pounds 497 pounds 200 pounds 1,310 pounds 8.9 lbs./sq. ft. 18.7 lbs./h.p.
Spruce I beams Bass webs, spruce caps Fabric	Solid spruce Spruce and plywood truss Fabric	Dural, single, multicellular, box Dural Dural	Solid spruce Spruce built up Fabric
Welded steel tubing Fabric	Welded steel tubing Fabric	Dural monocoque	Welded steel tubing, Warren truss Fabric
Welded steel tubing Fabric	Welded steel tubing Fabric		Welded steel tubing Fabric
Fixed, divided Goodrich semi-airwheels Goodrich Goodrich Shock cord Goodyear solid wheel	Fixed, divided Hayes Goodrich Bendix mechanical (extra) Goodrich rubber cord Leaf spring, wheel extra	Tricycle Goodyear Goodyear Goodyear (hydraulic) Bendix shocks	Fixed, divided Goodyear Goodyear Goodyear mechanical (optional) Rusco shock cord rings Wheel
Yes Yes Yes	Waltham Pioneer type C-104 Ford float type Ford Nicholas Beazley compression Pioneer type C-105	Yes Yes Yes	Pioneer Centrifugal type U. S. Gauge Co. U. S. Gauge Co. Float type
Shakespeare control		Shakespeare control	
Magnetic Yes Yes Yes	Aeromarine type 51 Pioneer type C-101 Pioneer type C-100	Yes Yes Yes	Aneroid Pilot static type
Dual wheel Fyr Fyter Johnson & Johnson Grimes retractable (optional)	Dual wheel Imitation leather Pyrene Bauer & Black Wired for, Grimes extra	Throw-over Pyrene Yes Yes	Dual removable stick Spanish leather Pyrene Yes Grimes (extra)
Temperature control Exide (optional)	Hand operated (extra) Willard	Ford Exide	

* Also manufactured by Monocoupe are the Model 90W powered by the Warner 125 h.p. engine, and the 110 Special powered by the 145 h.p. Warner. The Special has a clipped wing of 23 ft. 2½ in. span. Both models exceed the 100 h.p. limit of this survey.

† The above ship is also available with the following engines: 65 h.p. Velle, having a high speed of 112 m.p.h., cruising 103 m.p.h., landing 40 m.p.h., weight empty 830 lbs., and gross 1,310 lbs.; 50 h.p. Warner, having a high speed of 126 m.p.h., cruising 115 m.p.h., landing 40 m.p.h., weight empty 830 lbs. and gross 1,320 lbs.

Only Planes of 100 Horsepower or Less Are Included in this Survey.

Turn to page 64 for additional data

Aircraft Mechanic's Flyabout * D-1 ATC 439 Aircraft Mechanics, Inc. Colorado Springs, Colorado Enclosed 2 side by side	Waterman Arrowbile W-5 ATC Pending Waterman Arrowplane Corp. Santa Monica, California H. W. tailless monoplane Pyralin enclosed 2 side by side \$2,990	Kinner † Sportster ATC-490 Kinner Airplane & Motor Corp., Ltd. Glendale, Cal. L. W. monoplane Open 2 side by side	Taylorcraft A ATC 529 Taylorcraft Aviation Co. Alliance, Ohio H. W. monoplane Plastecel enclosure 2 side by side \$1,495 \$495 down, balance monthly
Continental Motors Corp. A-40 37 @ 1,875 r.p.m.	Studebaker (Waterman conversi) S-1 100 6.72 gallons per hour (cruising)	Kinner Airplane & Motor Corp., Ltd. K-5 100 @ 1,810 r.p.m.	Continental Motors Corp. A-40 40 @ 2,575 r.p.m.
7 gallons 1 gallon Fahlin wooden	24 gallons 2 gallons Storey 96" wooden	.025 lbs./hour (cruising) 35 gallons 2 1/2 gallons Storey-Gawley wooden	3 gallons per hour (cruising) 14 pint per hour (cruising) 10 gallons 1 gallon 69" Sensenich wooden
80 m.p.h. 72 m.p.h. 28 m.p.h. 350 ft./min. 8,500 ft. 160 miles	120 m.p.h. 105 m.p.h. 45 m.p.h. 650 ft./min. 15,000 ft. 400 miles	104 m.p.h. 90 m.p.h. 40 m.p.h. 800 ft./min. 14,000 ft. 450 miles	91 m.p.h. 80 m.p.h. 35 m.p.h. 390 ft./min. 14,000 ft. 230 miles
37 ft. 9 1/2 in. 21 ft. 9 in. 5 ft. 8 in.	38 ft. 19 ft. 4 in. 8 ft. 8 in.	39 ft. 24 ft. 2 in. 7 ft.	36 ft. 22 ft. 6 ft. 8 in.
175 sq. ft.	264 sq. ft. 32.3 sq. ft. 31.1 sq. ft. 21.16 sq. ft. 32.3 sq. ft.	227 sq. ft.	155 sq. ft.
573 pounds 389 pounds 170 pounds 962 pounds 5.5 lbs./sq. ft.	1,940 pounds 560 pounds 400 pounds 2,500 pounds 9.47 lbs./sq. ft. 25 lbs./h.p.	1,257 pounds 618 pounds 221 pounds 1,875 pounds 8.25 lbs./sq. ft. 18.75 lbs./h.p.	586 pounds 464 pounds 226 pounds 1,050 pounds 5.8 lbs./sq. ft. 26 lbs./h.p.
Wood Wood Fabric	Solid spruce Formed dural Fabric, dural sheet	Spruce Spruce Fabric	Solid spruce Metal Fabric
Welded steel tubing, Warren truss Fabric	Welded steel tubing Dural sheet	Welded steel tubing Fabric	Welded steel tubing truss Fabric
Steel tubing Fabric	None None	Welded steel tubing Fabric	Welded steel tubing Fabric
Fixed, divided Goodyear Goodyear	Tricycle Firestone nose wheel Firestone Bendix Oil and spring None	Fixed, independent Goodyear Goodyear Yes Goodrich oil & spring Swiveling wheel	Fixed divided Timken bearing Goodrich Shock cord Welded steel, swiveling
Swiveling spring steel			
Yes Yes Yes Yes	Stewart-Warner Stewart-Warner Stewart-Warner Stewart-Warner Stewart-Warner Ahrens Stewart-Warner	Pioneer Pioneer Pioneer Ford Quadrant control	Yes Oil gauges combined (Taylorcraft)
Yes	Pioneer Pioneer Pioneer Air Associates	Kollsman Kollsman Kollsman	Aeromarine Aeromarine
Dual Yes Yes Wired for	Wheel Broadcloth Pyrene Yes Grimes Waterman Auto-Lite Willard	Dual Pyrene Yes Grimes Yes	Dual wheel, removable Imitation leather Yes Wired for Indirect lighting

*The model D-2, powered with the Szekely SR3-0 45 H.P. engine, differs in weights and performances as follows: Weight empty 580 lbs., useful load 392 lbs., payload 373 lbs., gross weight 982 lbs.; maximum speed 93 m.p.h., cruising speed 77 m.p.h., landing speed 32 m.p.h., service ceiling 13,000 ft., climb 700 ft./min., and range 150 miles.

†The Sportster is also available with the Kinner B-5 125 h.p. engine. This and other Kinner models omitted exceeded the h.p. limit of this survey.

Letters of an Air Student to His Friend

by George Swift



From—STEVE STERLING,
Skyways Air School,
Greenville, Calif.

To—HARRY REED,
Burton, Penn.

DEAR HARRY,

Air-school days are over! My course is completed and this letter is the last I will write you from Skyways Airport. Last—but not least. Listen hard as I relate the happenings of the past few days.

With final flying tests passed successfully, ten of us advanced students automatically became graduate students. Shortly after we took off on our valedictory flight.

This valedictory flight is a fond custom of Skyways Air School. It consists of a cross-country trip to the city of Groveton and return.

The morning of the take-off is perfect for flying: warm, sunny, a few fleecy clouds high in the sky. Sitting in the cockpit of my plane, listening to the sweet roar of my warming motor, I feel that I have never been so happy before. My ambition is realized. I am a flier—and setting out on the longest air trip of my career.

We soar into the sky, eleven ships in all. Norwood leads the formation in his big blue biplane.

An hour on our way and a bright idea hits me.

Living in a town a few miles off our course are some relations of mine. Why not pay them a visit? Quick as thought, I drop out of line. No one notices me.

Motor going at top speed, I soon sight my objective. A small field looks good for a landing and I glide into it.

My relatives duly visited, I take off to show them some trick flying. Just as I am about to start in I observe that the gas-gauge needle is flickering near the empty mark, but I figure that it must be registering wrong, for the ship's tanks were full when I started on the hop. Anyway, I will take a chance.

I begin with loops and dives and continue on down the line. The whole population of the town has turned out to watch my maneuvers.

Coming out of a falling leaf, the motor sputters. I wait for it to pick up. Instead it fails entirely. In a flash I know the answer. Out of fuel! The gas gauge *did* read correctly. The tanks must have sprung a leak.

This will be the second forced landing of my flying career—that is, the second with myself at the controls.

"Dear
Harry—"

With the memory of the first very clear in my mind, I let the plane glide down.

At the last minute I remember that a turn must be made to land into the wind. Cautiously I go into a bank. A cool breeze fans my cheek. The ship is sideslipping! I right it hur-

riedly—narrowly escaping a spin.

No chance now to make a careful landing. The plane is streaking into the small field, aiming straight for a line of buildings. The wheels contact the earth. I try to bring down the tail and ground-loop—partially succeed. All at once the ship noses over. My head hits the instrument board and darkness settles down.

I come to, lying on the field, surrounded by townspeople, having been unconscious only a minute or two. Outside of a bump on my forehead I am all right. But the plane is out of the running, with a bent propeller. To make my gloom complete a drone comes out of the sky from a circling blue biplane—Norwood's ship. Apparently he has missed me from the flight, and, making a shrewd guess, followed along my trail.

Norwood lands, steps out of his cockpit and eyes my upended ship.

"I don't know the primary reason for that, Sterling," he says quietly. "But I imagine it could have been avoided."

And that's all he has to say.

The valedictory flight continues, with me riding, ingloriously as a front-seat passenger in Norwood's plane.

Groveton is situated on the seacoast. We have not been there an hour when I decide to try some ocean flying. Lindbergh did it. Why not me? Of course, I do not intend to make a long hop, just go out a few miles to see how it feels to have nothing but ocean waves below.

I charter a somewhat rusty-looking light plane at the local airport, the fee being low enough to be covered by the graduation present my folks sent me. The fellow who rents it to me seems to read my mind.

"Better not fly out far," he warns. "Weather report says a storm's coming."

Taking off, I head away from land. It does give me a queer thrill to look down and see the rolling sea. And especially so when the coast line is out of sight.

I have been flying low. Turning to go back, I drop still lower and roar along with my wheels a few feet from the waves. Some fun! At this height the speed of the plane seems tremendous.

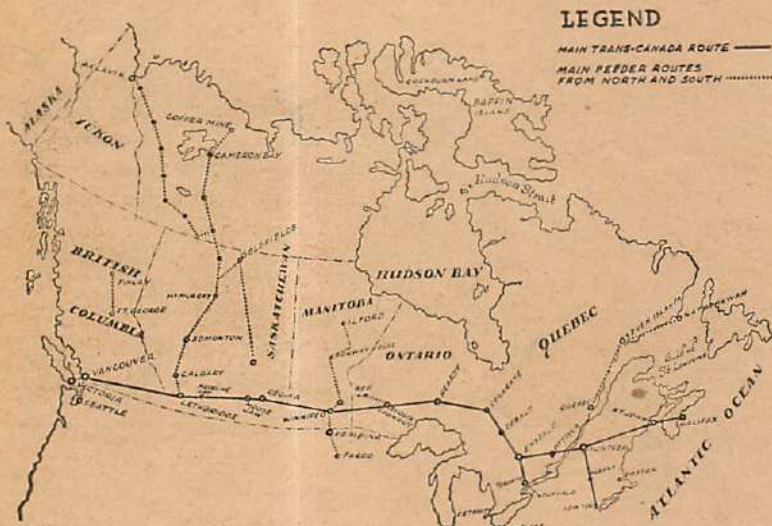
The waves are getting larger.

(Turn to page 93)

CANADA'S TRANSCONTINENTAL



Ski-equipped Fairchild 71 taking on freight and mail to be delivered along the St. Lawrence River.



Map showing the route of the new air line and the feeder lines.



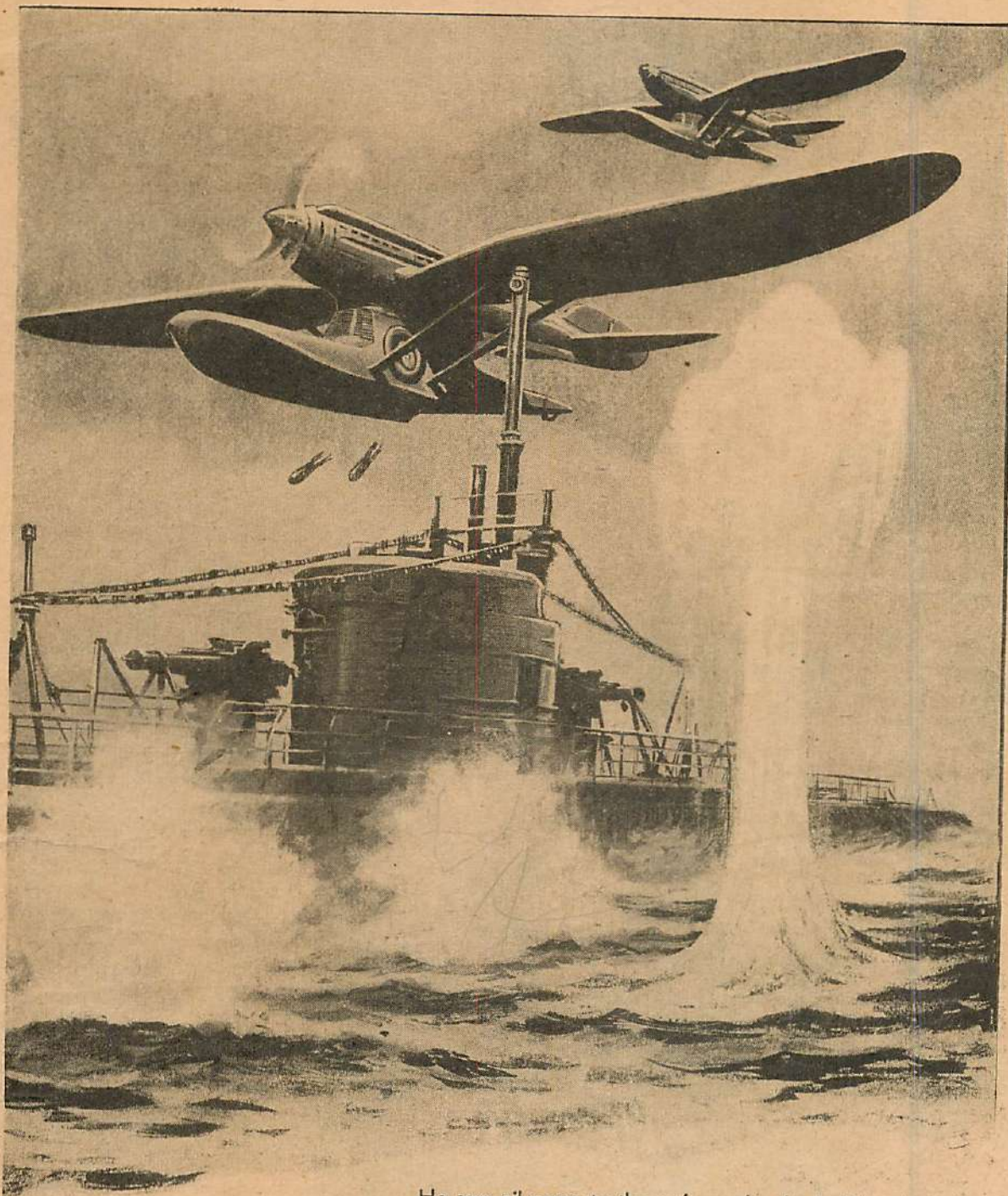
Loading a Junkers freighter with mining equipment. Nearly all such cargoes must be flown into the wilderness.

CANADA'S first transcontinental airway starts operation this summer, bringing Halifax within sixteen to eighteen hours of Vancouver, and connecting the many feeder routes into northern Canada with the cities near the United States-Canada border. During the past year, Canada has rushed her trans-Canada airway to completion to coincide with the inauguration of the England-Canada ocean air-mail service, also expected this summer.

Physical handicaps have kept the Dominion from having a transcontinental airway till this year. Vast regions practically uninhabited have had to be bridged with airports to make safe flying possible. Routes have had to be charted through the higher Rocky Mountains of Canada's Pacific coast. Because of these physical handicaps, intercity air travel in Canada is less developed than elsewhere in the Americas. Yet Canadian aviation has developed on a tremendous scale in regions north of the railway lines. Airways stretch north of the arctic circle, and the Dominion's planes carry, by latest government figures, six and a half times as much freight and express as all United States domestic and foreign airways combined.

The route of the trans-Canada airway, from the Atlantic to the Pacific, runs from Halifax through St. John in a straight line to Montreal. It crosses the State of Maine because that is the shortest route. That is the only section that is not all Canadian. And it is interesting to note no treaty was made to provide for the passage of Canadian planes across the Maine woods. Only a gentleman's agreement exists between the two nations. In return, American planes have for some time been flying across southern Ontario, on the route between Buffalo and Detroit, while two radio stations to guide those planes are located in Ontario.

At Montreal, also, will connect the chain of airports from the north shore of the St. Lawrence River, as well as the airplanes which for some years have come in and departed from there with mail from and for United States points via Albany, N. Y. From Montreal westward to Ottawa and Emsdale, which will be the junction point for mail from points south, Toronto, Buffalo, and others.



He saw oil come to the surface after he had bombed the submarine— He thought he had destroyed it—

"Not a soul in the place," Vesseli said irritably. "Come on. Let's have it."

Brown kept his right hand half concealed under the left lapel of his coat, and tense excitement made his voice a hoarse whisper when he spoke. "You once, long ago, did business for a friend of mine. That is why I come to you, Mr. Vesseli. We will make a lot of money, you and I, Mr. Vesseli. I have some very valuable information. You sell it for me. We divide what we get, yes?"

Vesseli picked up the stump of a half-burned cigar and relighted it. That this man should come to his office after dark wasn't unusual. Vesseli's clients generally did. And that he should bring with him a shady proposition wasn't unusual, either. The underworld and Vesseli knew and understood each other to their mutual financial satisfaction.

"What makes this information so valuable?" Vesseli asked.

Brown leaned closer. "A certain man will pay a lot of money to learn that some-one is planning his murder." The lawyer's lips tightened. "If the man has a lot of money."

"This man has."

"And he is completely unaware of his enemy's intentions?"

"Completely," Brown said. "He believes that his enemy is lying dead at the bottom of the ocean."

A glow crept into Vesseli's eyes. "You can give proof of what you say?"

"Yes. I know where his enemy is hiding. I know the details of the murder plot. But I tell all this only after the victim pays us much money, Mr. Vesseli."

Vesseli smoked in silence. "Who is this victim?" he asked abruptly.

Brown's voice went lower. "His name is known around the world. He will pay us a fortune, Mr. Vesseli. He is the famous airman—Bill Barnes!"

Vesseli drew in his breath softly. Then he said, "Many people have tried to kill Barnes before and have failed."

"But this enemy will not fail, Mr. Vesseli. Barnes is not on his guard against a man he believes dead. Aziz Pasha hates him and is but awaiting his opportunity to——"

"Aziz Pasha?" Vesseli said.

"Please, not so loud," the foreigner said anxiously.

"We cannot be too careful. Yes, Aziz

"Yes, Mr. Vesseli. It was to be his master stroke before he left for Turkey. And it was only due to the interference of Bill Barnes that he was unsuccessful."

Vesseli leaned across the desk. "Of course. Of course. I recall it all now. But I thought that Aziz Pasha tried to escape in a submarine and Barnes bombed him sky-high."

"Yes, Mr. Vesseli. That is what Mr. Barnes thinks, too. He saw oil come to the surface after he had bombed the submerged submarine. He thought he had destroyed it."

"And he hadn't?"

"No. The crew of the submarine released the oil to dupe Barnes. Aziz Pasha and Dr. Kara got away. And now Aziz Pasha seeks revenge, terrible revenge on the man who thwarted his life's ambition." Brown looked at the lawyer. "Do you not think Mr. Barnes will be interested in hearing all this, Mr. Vesseli?"

Vesseli said slowly, "It is a good proposition, Brown. So good that I wonder why you didn't go direct to Barnes."

Brown's lips twisted. "I do not wish my throat to be slit, Mr. Vesseli. Aziz Pasha is reestablishing his organization. I am part of it. If he suspected what I am doing—I would die. That is why I quietly come to you, Mr. Vesseli."

Vesseli toyed with his cigar. "Very well. I will think this over and perhaps contact Barnes some time this week."

"This week!" Brown came half out of his chair. "Barnes will be dead by then. He has to be warned this very night!"

The lawyer frowned. "But this sort of thing can't be rushed. It will take careful negotiating."

"We wait and Barnes will be murdered and we will collect nothing," Brown said. "You must telephone him immediately. Tell him to come to this office to-night—and bring his check book. Twenty thousand, perhaps, would be a fair price?"

Vesseli snorted. "Fifty's more like it." He pulled the telephone to him. "I'm going to have a tough job

making Barnes come in from Long Island to-night."

Brown said softly, "If he should hesitate, merely tell him that Aziz Pasha lives."

But Leo Vesseli did not mention the name of Aziz Pasha when he was finally connected by long distance

Bill, held motionless in the iron rings, stared out into the room——

Pasha is the man who will kill Bill Barnes. I think perhaps you read about Aziz Pasha in the newspapers many months ago. Yes?"

Vesseli frowned. "The name sounds familiar, but—— What is he—a Turk?"

Brown sent another worried look around the quiet room. He wet his lips nervously and whispered, "He is a famous Turkish criminal. He was the leader of the Society of the Purple Fez—a Turkish outlaw organization. He had secret headquarters on the islands of Fuada and Calibar in the Caribbean. He robbed and killed in North and South America. He gathered together a great fortune. No one could catch him. Always he worked toward one big plan: becoming emperor of the United Moslem empire——"

"Wait a second," Vesseli said. "Now I'm beginning to remember. Didn't he try to rob a gold train going to Fort Weston?"



with Bill Barnes. All the lawyer said was, "This is Leo Vesseli speaking, Mr. Barnes. It is imperative that you come immediately to my office. I have just been informed that you are about to be murdered."

And as Vesseli spoke, the office door behind him inched open. The muzzle of an automatic probed through. A finger on the trigger contracted—once, twice.

The first bullet plowed through Vesseli's head just above the left ear. The second smashed into Brown between the shoulder blades.

The two men were dead before they hit the floor.

II—THE AIRPORT

BILL BARNES bellowed into the telephone, "Hello! Hello!" Then he jiggled the hook and got the switchboard operator. "Trace that call and report—fast!"

"Shorty" Hassfurth was seated in Bill's office with his feet on the desk. He said lazily, "What's the excitement, Bill?"

Bill put the telephone down. "Nothing much. I've merely been informed that I'm about to be murdered."

The veteran pilot grinned. "Fancy any one wanting to rub you out, Bill." Shorty looked out of the corner of his eye at the open doorway, then added loudly, "Sounds as if Sandy might be back of it."

"Me murder Bill!" "Sandy" Sanders said indignantly as he came inside. "You got your nerve saying that." The kid ace of the flying organization went over to Bill. "I came to ask you to a special world-première showing of the movies I've taken. Ten o'clock at the mess hall. My new projector works grand. And I've got a swell reel of Alphonso pouring jam into Shorty's helmet that'll knock——"

Shorty came out of his chair. "So you *were* responsible, you hunk of walking cheese. You and that ape brother of yours. If I ever——"

Bill said coldly, "Cut it! And clear out of here, Sandy—pronto!"

Sandy took one look at Bill's expression and fled. When the door closed, Bill said to Shorty, "You may think this thing's funny—but I don't. The guy who phoned said he was Leo Vesseli. I heard two shots. Then the line was disconnected."

Shorty said hastily. "I thought you were kidding, Bill. You mean Vesseli, the shyster?"

The telephone bell rang sharply. Bill put the receiver to his ear and listened to the switchboard operator's report. Then he said, "Made from Vesseli's office? . . . No one answers now, huh? . . . O. K. . . . Call New York police headquarters at once. Tell them to



Up from the black waters at the side of the buoy emerged a round shape of glistening copper——

go up there—that I suspect a shooting." He hung up. "So it really was Vesseli," Shorty said. "But what the hell's that rat got to do with you?"

"Probably figured he could sell me the details of my own murder for a juicy price. He makes a business retailing tips. This time a gun may have stopped his mouth for good." Bill's face was flushed and he talked rapidly. "Shorty, I've got a lot to tell you—and not much time. I'm in on something so big that murder is just child's play. Listen to me:

"The Lancer's standing out there, all set to go. I've been waiting an hour for my passenger. I've phoned his house. He left long ago—driving with his chauffeur. He's way overdue. I'm plenty worried."

Shorty said, "Who's your passenger?"

"Eddie Walker, the son of the steel king." Bill was silent for a minute, then, "What would you say, Shorty, if some one told you that a new fuel had been invented—a fuel that would enable a short-ranged plane like a Booth job to fly nonstop from here to China and back?"

"Without refueling? I'd say nuts!"

"So would I have—until a week ago Saturday, when I talked to Eddie Walker."

Shorty said indignantly, "You aren't going to tell me that—"

"That there is such a fuel?" Bill supplemented. "So far I've only Walker's word for it—but I respect that. He's a smart chemist, despite his millions. He studied in Europe under the great Karl Schrenk."

Bill was bent over the desk, tense and eager. "What I'm telling you is hush-hush, Shorty. Now get this: Three months ago Karl Schrenk beat it out of his own country a jump ahead of a firing squad. For years he'd been working secretly on a new concentrated fuel. He almost had it licked, when the government got wise and told him they wanted it. Schrenk is a humanitarian. His idea in inventing the stuff was to promote peace and world commerce, and not to wage war."

"He beat it with the secret police hot on his trail. He managed to shake 'em and came to Eddie Walker in New York. Walker kept him hidden in his house. Schrenk told him about the new fuel and convinced Walker that it was hot. Walker set up Schrenk in a laboratory at some secret place. The old man's there now."

"Walker hired me to test the fuel in a plane as soon as Schrenk was ready. When everything was set I was to fly Walker to the secret laboratory. He was to give me directions when we got in the air. He phoned this afternoon, all excited. He'd heard from Schrenk. We made arrangements to get away at nine to-night—and I'm still waiting."

Bill daubed a handkerchief at his wet forehead. "Do you realize the tremendous value of this fuel if it's right? Can't you see that every country in the world would give their eyeteeth to have it? Absolute air supremacy would go with it. The formula would be beyond price!"

Shorty blew out his breath. "Holy gravy! Then that warning— Some one's gotten wise that you're in the deal!"

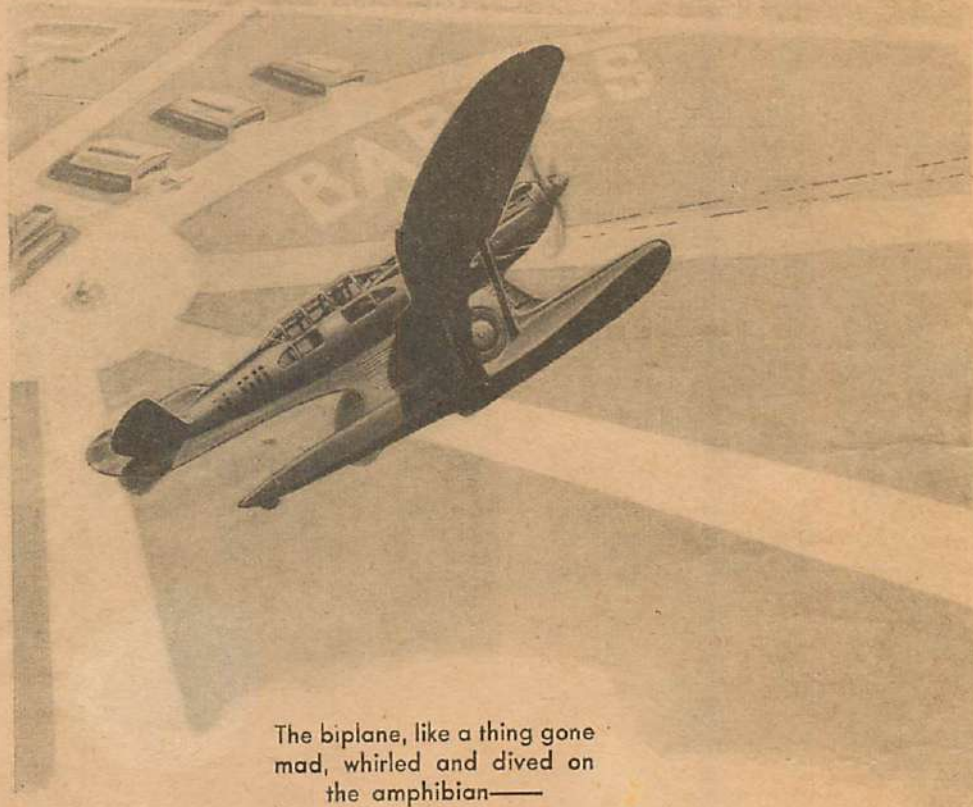
"Looks like that," Bill said viciously. "But it's Eddie Walker I'm thinking about. He's the only person who knows where Schrenk is. Some one may have grabbed him—"

The telephone rang. Bill answered instantly. He talked in staccato bursts, then hung up. "The cops. They found Vesseli—half his head blown off. Another stiff was in his office. Haven't identified him yet. I stalled off police questioning—"

Bill stopped, jerked around in his chair. From out-

side in the corridor came the sound of running feet. The office door burst open and Bev Bates rushed in. He said breathlessly, "Bill, this guy says—"

A man pushed past Bev, a white-faced man dressed in a torn chauffeur's uniform. He was bareheaded, and his blond hair was matted with dried blood. He ran to Bill's desk and said wildly, "Mr. Barnes, I'm Mr. Walker's chauffeur. We were attacked—ten miles from here. I was knocked out. When I came to, Mr. Walker was gone. I have no idea how or why it happened, or where they've taken him."



The biplane, like a thing gone mad, whirled and dived on the amphibian—

III—QUESTIONS

EDDIE WALKER, the heir to the steel millions, lay face up on a canvas camp cot. His eyes were closed, and he was breathing unevenly. His tweed suit was torn and discolored.

The room was small and bare, with a slanting ceiling. A heavy green shade was pulled down over the single window. The sole source of illumination came from a stand lamp.

At a small table near the camp cot a tall, lean man was taking a shining silver hypodermic needle from a leather case. He inspected it carefully, then went over and looked down at the unconscious man.

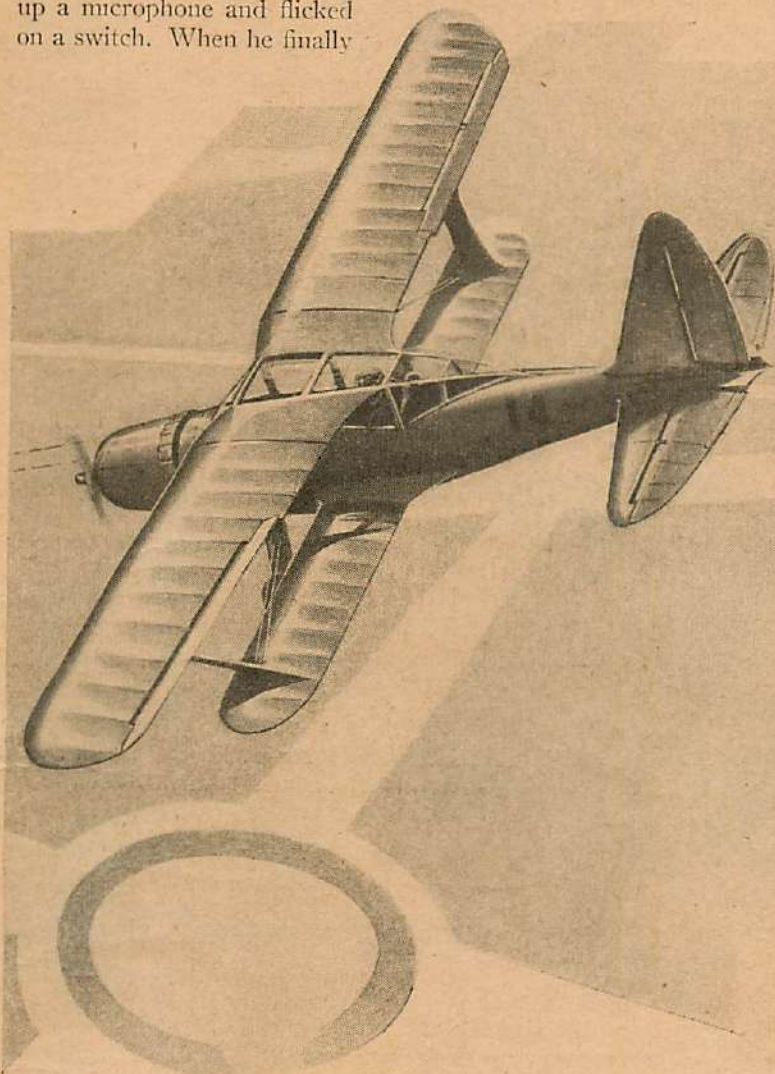
"He has not yet stirred, Ismet," he said to the other occupant of the room—a thickset man who sat before a radio.

Ismet took ear phones from his head. "I have talked with the master," he said. "He awaits our news eagerly." Ismet's eyes went to the syringe in the other's hands. He looked at it with a certain amount of awe and pride.

"You have witnessed before how this great and terrible drug works, Assaf?"

"Dr. Kara himself has shown me," Assaf said. "Once injected with this truth serum, the patient will answer our questions and will not know that he does so."

A green light flashed on the radio panel. Ismet replaced his ear phones, picked up a microphone and flicked on a switch. When he finally



turned back, his dark eyes were flashing. "By the beard of the prophet, the traitorous No. 10 has been killed, Assaf," Ismet said. "The word has just come. The master's agents stalked him to the office of one Vesseli, a lawyer. There he bargained to sell information to the infidel Bill Barnes. No. 10 and Vesseli now lie dead in their own blood."

Assaf grunted. "As Allah wills. Come, Ismet. This one now shows signs of consciousness. Bare his arm. We must not wait."

Ismet hurried across the room, deftly slipped off Walker's coat and rolled up the shirt sleeve on his right arm.

Assaf saturated a piece of cotton in alcohol, dabbed it against Walker's arm and then, with a quick, stabbing motion, plunged the point of the syringe into the flesh. He pushed the plunger down, waited a moment, then pulled the needle out.

Ismet was breathing heavily. "You know the questions, Assaf? You are certain this strange injection will work?"

"Hold your tongue. We must be still. Stand aside." Assaf leaned over the prone man. Walker was moving. A whispery groan came from his lips.

Assaf said, "You hear me, Mr. Walker?"

The man on the cot twisted. His lips moved.

Assaf said again, "You hear me, Mr. Walker?"

Walker said faintly, "I hear you."

Exultation showed in Assaf's eyes. He said, "What is your name?"

"Edward Walker." The reply was stronger.

"Where were you going this night in your automobile?"

"To Bill Barnes' airport."

"Why, Mr. Walker?"

"I am flying with him."

"Where to?"

"To see Karl Schrenk."

"Why?"

"He has finished the fuel."

"Why is Barnes going?"

"To test the fuel in a plane I have at the laboratory."

"Where is the laboratory?"

"On Cay Blanco."

"Where is that?"

"In the Florida Keys."

"Is Cay Blanco deserted?"

"Only Schrenk and two guards are there."

"He is expecting you and Barnes?"

"Yes."

"Are you the only one who knows where Schrenk is?"

"Yes. I am the only one."

"Barnes does not know?"

"No."

"He does not know the formula?"

"No one knows the formula but Schrenk."

Assaf moved silently away from the cot, caught Ismet by the arm. He whispered hurriedly to him. "We have the great knowledge, Ismet. Go now to the radio. Tell the master everything we have heard. Be careful, Ismet. Use code."

AZIZ PASHA, the infamous leader of the Society of the Purple Fez, received the verbatim report in his far-away, secret hide-out. He sat cross-legged, a microphone held tightly in his right hand, and his short, bloated body shook as he laughed silently. He said into the microphone, "It is excellent. You will keep Edward Walker completely drugged. He must never remember anything of what has happened. You will await further orders."

Aziz Pasha put down the microphone and looked across the cavelike room to where Dr. Kara was reclining. "Karl Schrenk is at Cay Blanco. I will dispatch the submarine there directly. The famous Schrenk will be brought here with all his apparatus. Your truth serum worked beyond my fondest expectations, doctor."

Dr. Kara shrugged. "Of course it worked. I knew it would." The muscles in his pale, cadaverous face

twitched spasmodically. "Yes, Pasha, once more you have success in the hollow of your hand. If this fuel is as miraculous as reported, you have boundless power and wealth. You will be able to make history and change the map of the world. But, as always, Pasha, you are a thick-headed fool. You cannot forget petty grievances. You will jeopardize everything merely to seek vengeance."

Aziz Pasha tugged viciously at his drooping black mustache, and his eyes became hard. "You are but a loose-tongued drug addict, Kara. I have made my plans. Bill Barnes will die."

Dr. Kara sneered. "You predicted that once before—and barely escaped with your *own* life."

Aziz Pasha hunched his great body forward. "Harken to me, you doubting one. It is entirely due to my constant watching of Barnes that I learned of his connection with Walker and Schrenk. And now Edward Walker is being held in New York. His family is of great wealth. We will demand eight hundred thousand dollars for his safe return. We will warn them that to notify the police will mean the victim's death, that the negotiations must be carried out privately. We will name a man of unimpeachable character to act as go-between. He will bring the money, alone and unguarded, to a designated place. And in so doing he will walk into a cleverly arranged trap."

Dr. Kara straightened up. "You mean the go-between will be—"

"Precisely, doctor," Aziz Pasha said. "This go-between will be none other than—Bill Barnes."

IV—RANSOM

IT WAS two weeks later. At three o'clock in the morning there was no moon, no stars. Heavy blackness cloaked the sea and sky. A rolling swell rhythmically humped the surface of the water and caused the rowboat to pitch and yaw.

Bill Barnes braced his feet against the stretcher and pulled steadily on the oars, holding the boat into the wind and on a due-east course. One mile distant, straight ahead, he would find—if his calculations were correct—No. 3 Buoy, where he was to leave the ransom money.

The kidnaper's written instructions had been clear, and Bill, having driven his roadster to the lonely stretch of New Jersey beach, had readily found the rowboat. Now it was only a question of locating the large navigational marker—the only bell buoy in those coastal waters.

His eyes strained through the darkness to the shadowy outline of the suitcase in the stern. Within its strapped, bulging sides were eight hundred thousand dollars in United States bank notes—a kidnaper's price for a human life.

The pilot's face hardened. He hated this business of being an intermediary in the ransom negotiations. Yet there had been nothing else to do. The kidnaper had inexorably appointed him to the thankless rôle, and Mar-

cus Walker, the millionaire steel man, had pleaded for his help in getting his son back alive.

But what assurance, beyond an unknown criminal's word, was there that Eddie Walker would be returned alive and unharmed? And what assurance—as Shorty had fearfully asked—was there that this wasn't just a trap for Bill—a trap that the dead Vesseli had been trying to warn him against?

The rowboat dipped down into an inky trough and swung swaying up the other side, to dip again. Salty spray whipped over the prow and stung Bill's face and hands. He checked his course with the luminous dial of a pocket compass, corrected his direction and rowed on.

More to quiet Shorty's apprehension than anything, Bill had told the veteran pilot to come looking for him if he had not communicated with the field by dawn via the roadster's radio. But now, as he penetrated farther into the thick well of blackness, the fears that he had previously shrugged off, the fears for Eddie's safety and his own, became suddenly close.

There was no sound save the lapping of the water against the boat and the *squ-ueek* of the oarlocks. Then, as Bill momentarily rested his aching muscles, he heard from far away the faint tolling of a bell. The sound seemed to waver on the air, to recede and rise again, dismal and shivery.

The ringing was nearer, clearer, as he dug in the oar blades with fresh vigor in a sudden desire to get the job over. There came to him a dull, irregular *clang, clang, clang*.

But the blackness was so intense that five minutes later, with the strident ringing dinning in his ears, he

was almost upon the buoy before he saw it. The anchored black cylinder was wallowing in the water, drunkenly swaying the pyramid of metal framework that supported the bell high above.

Bill maneuvered the rowboat alongside, grasped one of the iron bars and tied the boat's painter to it. With nervous haste he picked up the heavy suitcase and, leaning far over the gunwale, deposited the bag within the framework of the buoy's superstructure.

Lying half in the boat and half on the buoy, Bill lashed the suitcase securely to the framework. And, as he worked, his eyes probed through the night. Somewhere near by the kidnaper might be lurking, waiting for the fortune in ransom money to be left—or waiting to launch a murderous attack.

But nothing showed in the inky curtain of sky. Nothing showed upon the restless surface of those black waters.

Then, up from those black waters at the side of the buoy, almost directly under the bridged body of the unsuspecting pilot, slowly emerged a round shape of glistening copper. With silent stealth it rose clear of the sea. Human eyes gleamed out from behind a circle of heavy glass. Giant rubber shoulders came into view, and an arm, a hand.

(Turn to page 67)



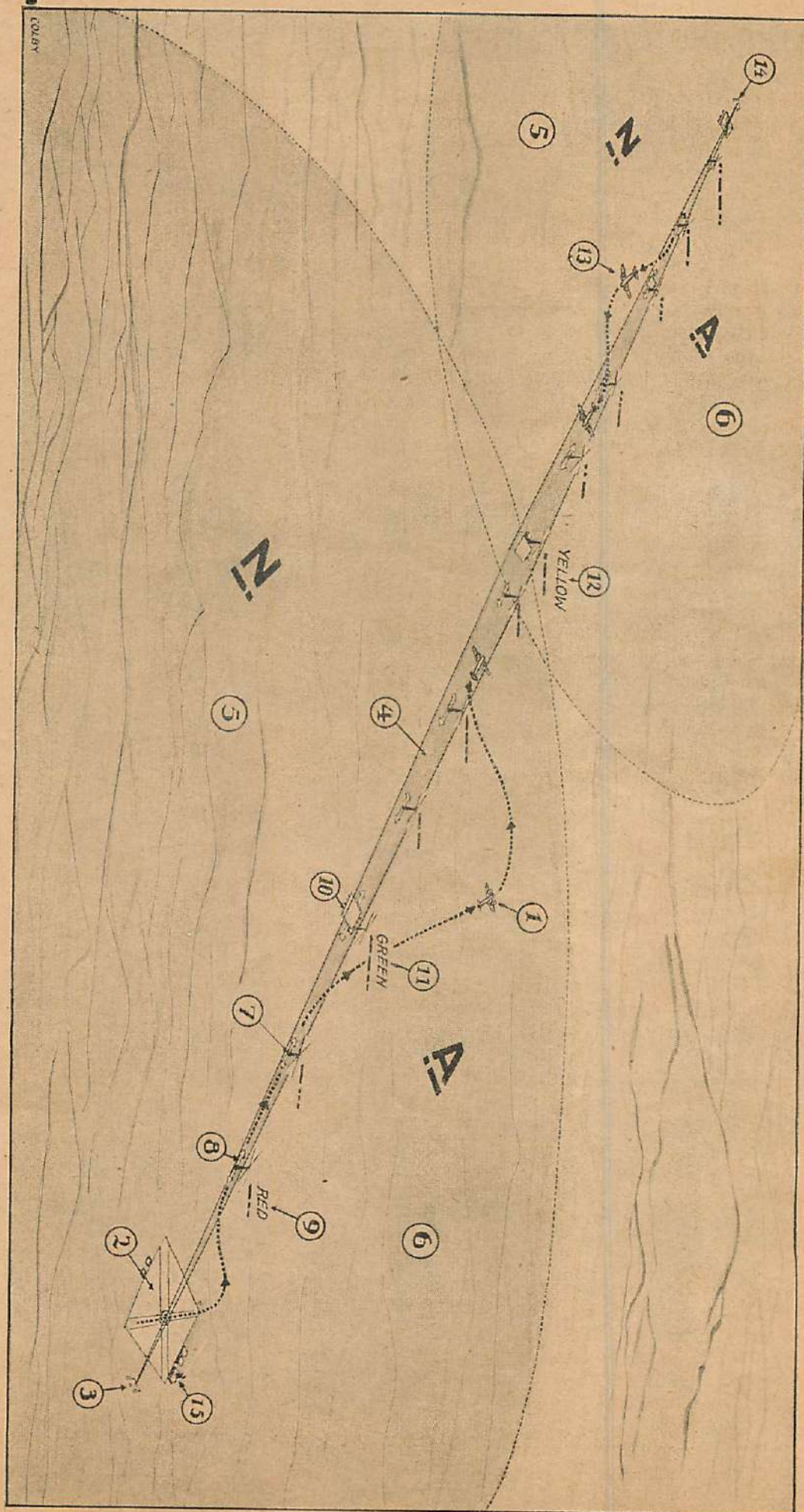
Ismet picked up the microphone and flicked a switch—

THE FLIER'S DICTIONARY

The twenty-second lesson in the technical terminology of the air. Save your files!

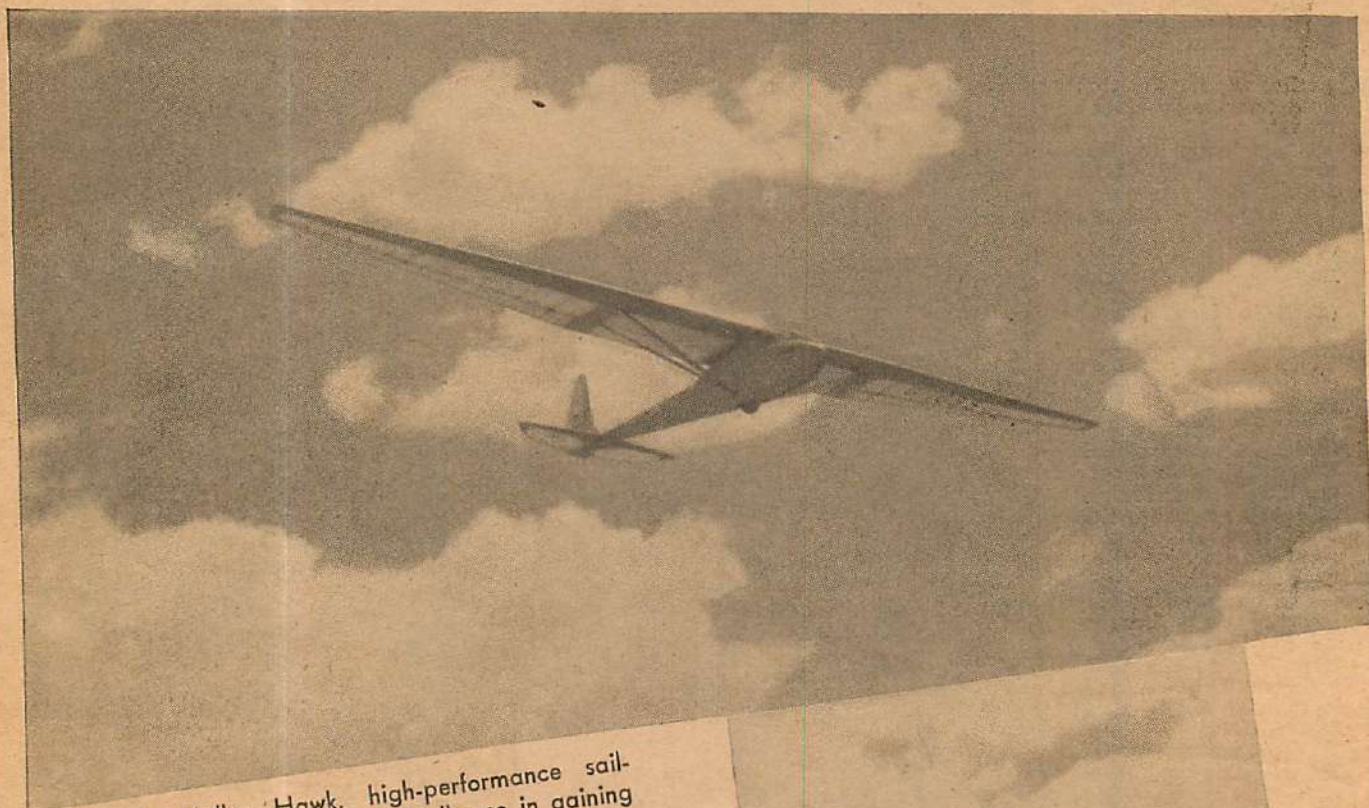
THE RADIO BEAM

- 1 Transport plane en route from the airport.
- 2 Municipal airport.
- 3 Radio-beam station beside airport.
- 4 Radio direction beam. Planes flying along this beam hear a steady note on the radio.
- 5 Planes flying in this area hear a dash, dot signal.
- 6 Planes flying in this area hear a dot, dash signal. These two signals overlap along the beam area and form the steady note. Plane "1," flying off the course to the right, hears the dot, dash signal and turns back until it is once more on the beam or steady note.
- 7 Airway beacon, which flashes a white signal alternating with a colored light that flashes in dots and dashes the code number of that particular tower or beacon.
- 8 Cement arrows at the base of these beacon towers direct the daytime flier to the next tower. These are lighted at night, also, to aid fliers.
- 9 If the code number is flashed in red, that means there is no landing field at the beacon.
- 10 An intermediate field with flood and other lights for night landing.
- 11 Green code-number light means a field equipped as per "10."
- 12 The code number flashing in yellow light means there is a field below the light but not equipped with night-landing lights.
- 13 Plane coming from the other end of the route getting off course to the right gets the dash, dot signal of "N" and turns back until it receives the steady note of the beam.
- 14 The radio-beam station at the other end of the route that handles that half of the beam with reversed signals, so that the off-beam signal remains the same on one side the entire route.
- 15 Revolving beacon at the airport that also has floodlights to aid in night landings.





The Newest Air Trails Department



The Haller Hawk, high-performance sailplane, used by Emerson Melhouse in gaining his Silver C certificate.

A SPONTANEOUS surge of interest from all over the United States has been shown since the introductory article in the June issue.

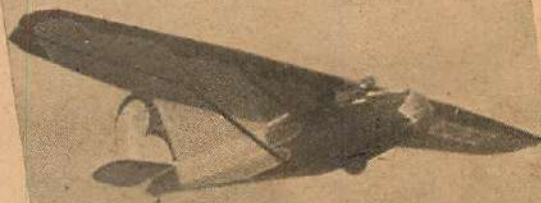
Manufacturers appear to be speeding up their plans for renewed production, and before the year is over a real choice of excellent ships should be available.

If the newly formed and to-be-formed clubs prefer to build their own ships, blue-print plans will be available, and the Department of Commerce will furnish a quick answer as to whether the specifications meet the safety requirements.

Gliding and soaring must be safe. They are both safe and practical if safe ships are built. It is necessary to emphasize the safety factor and the importance of competent instruction.

If you plan to form a club, get in touch with a licensed instructor before you take expensive steps which might

Emil Lehecka's Cadet II, Special, used by him for aerobatics.





Gliders of the Metropolitan Soaring Association grouped at a recent meet.

what it means to be a king. And when you can bring your ship around in a long circle and land it in the field from which you started, you will know a thrill which is denied to any one who has never taken a sailplane up into the sky.

There is no motor roar to hold your attention, no oil lines to go wrong, no propeller to pull you. You are alone with your wings when you're aloft. Those wings support you and carry you as far as your skill in finding the upcurrents in the air will let you glide. It is the thrill of skiing and tobogganing, of sailing before the wind, and of flying—all in one. Soaring is king of sports.



Detroit Gull primary used for instruction purposes.



A sesquiplane glider of the New Jersey Soaring Association.



Emil Lehecka puts a nacelled primary through its paces.

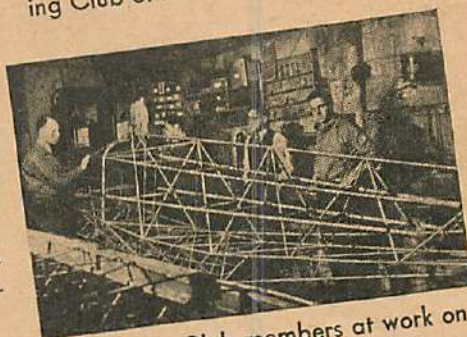
Club News

Many new gliders and sailplanes have been completed this year. Activity is more universal than it has been since 1928. Ships that have not been dusted off in four years have suddenly blossomed out again as the enthusiasm grows.

The Air-hoppers Gliding and Soaring Club of Astoria, Long Island, one of the most active groups in the East, is busily at work—and sport. This club of fourteen members was formed in 1929. The members have a well-equipped shop and have built two of their own ships. A recently purchased Franklin Utility has been re-covered in the shop, and plans are elabo-



Three gliders of the Air-hoppers Gliding Club of Astoria, Long Island.



Air-hopper Club members at work on a Franklin fuselage.



A Pruefling secondary taking off.

rate. Emil Lehecka, test pilot and instructor, is one of the eight holders of the Silver "C" license in America. Lehecka owns his own Cadet II glider, especially constructed for aerobatics, and has ordered a Rhönsperber high-performance sailplane. Astoria should be well represented in the 1937 gliding and soaring meets (Turn to page 84)



His right fist came up in a short, sharp arc—landed on the side of his son's padded jaw—

Let the Kids Fly the Airways

*Ceiling zero—visibility zero—
—a biplane boring through the
storm-swept night—*

by
Harold Montanye

YOUNG MOOSE" LAMB turned away from the long table loaded with the abracadabra of his calling and faced the operations manager of Continental Airways. His sober brown eyes were gleaming; his mop of thick, black hair was tousled and unruly. Any one who knew him well enough could have told you that underneath his calm exterior he was excited.

"How's it coming, kid?" Steve Halliday, the operations manager, had asked him as he came in the door of his workroom.

"All we need now is the proper kind of soupy weather to make a test," Young Moose answered. "All my equipment is installed."

"You'll get all the soupy weather you want," Steve Halliday said bitterly. "Foggy days are a dime a dozen around here. As for zero nights—the weather man gives 'em away with the newspapers. You think you've got a system worked out that will keep us off the front pages of the newspapers?"

"I'm not sure, Mr. Halliday," Young Moose said. "I can't tell until I've experimented a lot more. But the next test, with the proper weather conditions, will tell me a lot. My ship is already to go."

"You're going to use only Morse over the radio?" Halliday asked.

"That's right," Young Moose said. "It'll make the radio man in the air more careful. If the ground is using code, too, they'll both write down their messages and be able to check back any time. All the ground stations will have directional finders on special frequencies, operating twenty-four hours a day. If a pilot is temporarily lost, due to unusual conditions, the ground can give him his location through the triangulation system. A pilot doesn't have time to figure his bearings when he's bucking a storm."

"There's sense to that," Halliday said. "What about landings? How's he going to get down at seventy or eighty miles an hour with no ceiling?"

"The Sperry-gyro will take him in," Young Moose answered. "All the pilot has to do is ride the runway and landing beams down to the surface."

"After the pilot goes through the zone of silence at the proper altitude he holds the plane level, laterally, and pointed straight ahead, with his motors throttled. A dial on the gyro pilot steepens or flattens the path of descent to correspond with the indications of a horizontal needle behind an instrument-board dial, which tells him whether he is above or below the invisible radio beam laid for him. A vertical needle on the same dial tells him he is to the right or left of the narrow "localizer" beam laid by the runway beacon, and if he twists another dial the gyro pilot veers the ship to right or left for an on-course reading. The ship glides in at its regular landing speed, with the brakes partly set, and comes to a quick stop."

"It's quite simple if the radio operator and the pilot follow instructions to the dot and don't try to cut a few seconds off some other guy's running time."

"Yeah," Halliday said dryly. "It's quite simple. I got to hand it to you kids. You're doing things. Us old-timers ought to step out and give you a chance. They ought to retire us at forty-five, on full pay. How long you been at this stuff?"

"Since I was twelve years old," Young Moose said. "Naturally, I've heard nothing but airplanes since I kicked off my diapers."

"Naturally," Halliday said. "Being the son of Old Moose Lamb you wouldn't. They won't be able to retire him at forty-five. He'll fly his own coffin to heaven! How is the old pirate?"

"He's fine," Young Moose said, soberly. "He's coming out to the field to-day. I'm going to show him my set-up."

"Good!" Halliday said. "Tell him I surely want to see him."

"Yes, sir," Young Moose said and turned back to his tinkering. His earnest face was flushed as he forgot everything in the world but the work before him. Nothing else mattered but the technical task of conveying an airplane from one set point to another with a maximum of safety and efficiency.

Fifteen minutes later he was so engrossed in his work that he didn't hear that sturdy, low-winged monoplane with the Typhoon power plant in the nose start its power dive. He was aware of it only when it reached peak velocity at two thousand feet and began its tortured scream as it was pulled out of the dive.

He got to his feet quickly, ran down the hallway and out on the concrete apron. Here and there little knots of men were gazing into the sky, shielding their eyes from the morning sun. He could see their shoulders hunch together and shrink as the little plane nosed up safely.

Young Moose Lamb's throat contracted until it ached, as the pilot of the little monoplane put it into another

steep, inverted dive and leveled out upside down. As the pilot rolled it right side up he stuck the nose upward again. Moose held his breath. He didn't want to watch but he couldn't help it. He knew only too well whose hand was wrapped around the control column of that ship. And knowing, he shivered.

He saw the pilot level off again, stick the nose down in a steep dive and come up and over in an inverted loop that threatened to tear the little ship to bits.

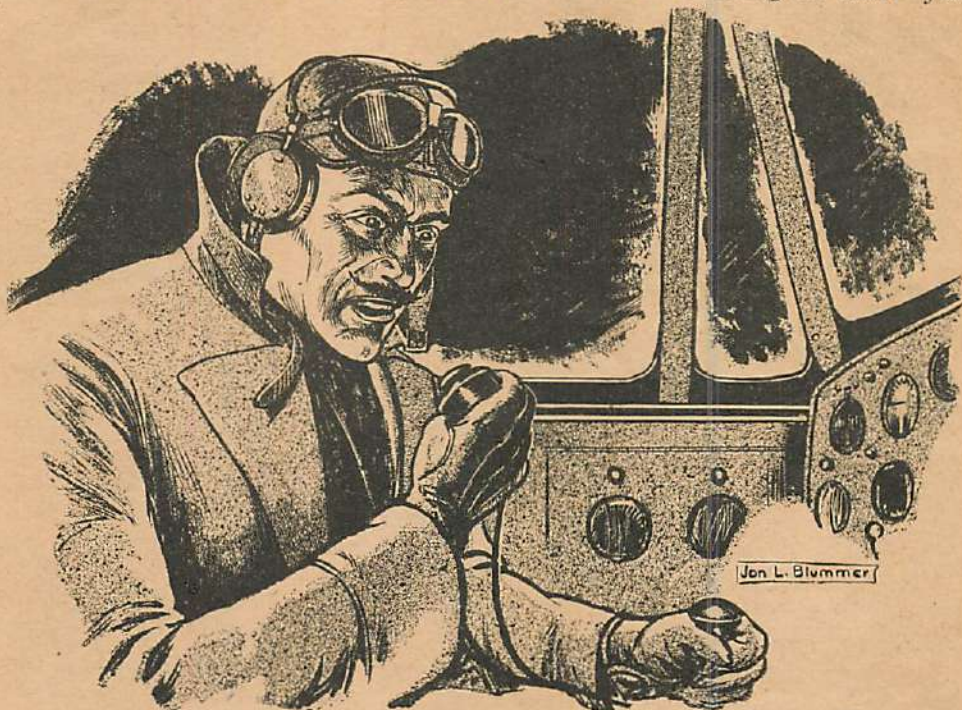
A sandy-haired young man beside Young Moose cursed and said, "The damned old fool. He ought to be grounded!"

Young Moose bristled. "What's the matter?" he asked.

"That fool up there," the sandy-haired one said, pointing as though his finger was loaded with machine-gun bullets. "He's one of those old-timers—one of the guys who won the War, I suppose. I saw him before he took off. He strutted over and climbed into the cockpit as though no one had ever flown a plane but him. The way he blasted the tail around and kicked that ship into the air was a warning. Why, he might have——"

"But he didn't," Young Moose said. "He hung it on the prop and took it upstairs the way you'd like to be able to do."

"He did it like a half-wit," the sandy-haired one exploded. "No one should be allowed to mistreat a ship that way. Look at him now! Strutting his stuff! Just



The sound of his own voice was drowned out by the scream of the storm— A million banshees wailed in his ear—

an old fool who thinks he's still doing combat work in France while he's slopped to the ears on cognac!"

"Do you know who that is?" Young Moose asked quietly.

"No. And I don't want to know."

"Well," Young Moose said, "I'm going to tell you. He went into the royal flying corps when he was nineteen years old. . . . Shut up! Let me talk. He learned to fly and then he learned to shoot, and shoot straight." Young Moose was talking like a man in a trance now.

"When he had learned how to shoot straight he went out and bagged twelve enemy ships. He got his twelfth just after he was twenty. Then he was transferred to the U. S. air force and got six more before the armistice. He ate and slept and lived flying and fighting in his most formative years.

"After the armistice his wife died, when his son was born. He was barnstorming then—doing the only thing he knew how to do. He had to make a living. After that he larruped the mail for a few years. Then he bounced a twin-motored biplane off a field on Long Island and took it to France non-stop. After that he fought in a couple of South American revolutions. He helped organize the Chinese air force. He has been decorated fifteen times by different nations. He couldn't any more stop flying than you could stop eating."

"You sound as though you were his grandfather," the sandy-haired one said, and the way he said it made the usually complacent Moose angry. "All those things don't count. The War was over years ago. He's just a damned old fool who ought to learn to be his age!"

"No," Young Moose said slowly, trying to keep his voice even. "I'm not his grandfather. I'm his son!"

And with that Young Moose laid his right fist flush on the side of the sandy-haired one's jaw. For a youth with noncombatant instincts, it was a lulu.

The sandy-haired man sat down on the seat pack strapped to his posterior, grunted and placed one hand against his jaw. His eyes followed Young Moose.

"Mebbe that'll teach you to keep your lip buttoned," a grease monkey said to him, as he pushed himself upright.

He didn't answer. He was watching Young Moose approach the side of the low-winged monoplane as it came in for a landing.

"Nice going," Young Moose said to his father, as he dropped to the ground.

The elder Lamb pushed his goggles back on his helmet so that his bronzed face gleamed in the sun. His lips parted in a grin that exposed two rows of flashing white teeth. Instinctively, he jabbed the ends of his waxed mustache upward with the second knuckle of his forefinger.

"She's a nice bit of work, Young Moose," he said. "She has what it takes." His voice was deep and a trifle husky from smoking too many cigarettes.

Young Moose gazed at him admiringly, then turned, admired the sleek lines of the low-winged monoplane.

"I didn't know you had arrived at the field even," Young Moose said.

His father looked at him searchingly. "I ran into Ned Hinton the minute I arrived," "Old Moose" said. "We got to talking about old times and he asked me if I wanted to give his new crate a ride."

Young Moose wished his father wouldn't refer to the almost perfect piece of mechanism in front of him as a "crate." That expression might have been all right in Wartime and right after it, but now it was *passé*. The airplanes being turned out nowadays deserved more consideration. It was like calling a twelve-cylinder automobile a "horseless buggy."

Ned Hinton, Steve Halliday, and a half dozen other old-timers came over and crowded around Old Moose. He had a jest, a quip, and a grin for each of them. They hung on his words. It was evident that, in the eyes of these hard-bitten old-timers, Moose Lamb was a dashing figure.

Young Moose knew only too well how highly these old-timers esteemed his father. Yet he writhed inwardly when he thought of the words of the sandy-haired youth. That was what the younger generation thought of Old Moose. They didn't see aviation as a romantic, daring adventure. To them it was a highly scientific business that needed careful, cautious development. They believed that old fools like Moose Lamb hurt the business in the eyes of the public.

They had never gone home in the War days and had their mothers and sweethearts, and even their fathers weep over the new wings on their tunics and the lone silver bar on their shoulder straps. They didn't know the hysteria attached to "getting your wings" in War-time. They hadn't been trained in "Jennies" at Kelly Field or Aero-marine "peanut machines" at Pensacola. They were young business men and scientists, seeking the advancement of a great industry. There wasn't room for heroics. They wanted to clean out the rubbish and the cobwebs and the antiquated "state of mind" of the old-timers.

Young Moose was thinking of those things and trying to excuse his father, when Steve Halliday spoke to him with a twinkle in his eyes. "Hey, Young Moose," he said, "there is a complaint against you over at the administration building. Some young squirt came in and said you popped him one on the jaw for no reason."

Young Moose flushed, mumbled something under his breath and started to move away.

"Who was it?" Old Moose asked, his eyes wide. He couldn't believe his ears. If it was true it was the first time, to his knowledge, that this quiet-spoken, studious son of his had popped any one on the jaw.

"A student flier," Steve said. "Your son didn't like his criticism of your flying."

Old Moose studied his son's face for a moment. What he saw brought a pucker between his eyebrows. "Come on, kid," he said. "I want to look over those new gadgets of yours."

He pushed his way through the men surrounding him and the two went across the apron, arm in arm.

"You'd never know he was Old Moose's son," Ned Hinton said.

"He's got the same stuff in him," Steve Halliday said quietly. "It's just that their approach to aviation is a little different. Young Moose didn't learn to fly with a firecracker tied around his neck and a flag waving in his face."

Old Moose listened with intense interest and not a little admiration as Young Moose explained the various devices with which he was experimenting.

"If they work you've got something," Old Moose said finally. "I'm frank to confess that I don't understand the principle of a lot of things. It seems to me it will take a dozen men to pilot an ordinary transport when you youngsters get through sticking new instruments and aids on the panel. A man can follow only a certain number of things at one time. I've heard of men who could do a dozen things at once. But I can only do one and do it well. It seems to me you lose track of the fact that the pilot is supposed to fly the ship instead of watching a lot of fancy gadgets."

"They all work together when you know how to use them," Young Moose said patiently. "They all interlock like the A and N on the department-of-commerce radio beam. You ought to adjust (Turn to page 84)

SPLIT-SECOND ACTION

Hair-breadth escapes, hair-trigger decisions, dangerous moments that come once in a lifetime.



CAPTAIN HORACE WILD, ONE OF AMERICA'S DARING PIONEER AVIATORS, WAS FLYING A "RUBBER COW" THIRTY YEARS AGO, WHEN THE GASOLINE LINE BROKE. THE FUEL IGNITED AND THE SWINGING GASOLINE PIPE SPOUTED A STREAM OF FLAME. THE GAS BAG WAS FILLED WITH HYDROGEN, SOON THE ENVELOPE WAS A ROARING MASS OF FLAME AND A TERRIFIC EXPLOSION WAS DUE ANY SECOND. IT WAS 200 FEET TO THE GROUND BUT WILD JUMPED. AS HE FELL THE DIRIGIBLE EXPLODED, FLAMES SHOT ALL AROUND HIM. THEN HE STRUCK. HE LANDED IN A TINY PARK LAGOON. AS HE BOBBED TO THE SURFACE THE FLAMING WRECK FELL A FEW FEET AWAY. NO BONES WERE BROKEN BUT WILD WAS COMPLETELY BLACK AND BLUE, AND HE HAD TO EAT HIS MEALS, FOR SOME TIME AFTERWARDS, STANDING UP.



ON THE FIRST ATTEMPTED CALIFORNIA TO HAWAII FLIGHT IN 1925 COMMANDER JOHN RODGERS AND FOUR COMPANIONS IN A NAVY PATROL BOAT WERE FORCED DOWN SHORT OF FUEL ABOUT 400 MILES FROM THEIR GOAL. THEIR RADIO SENDING APPARATUS WENT DEAD. AFTER FIVE DAYS OF DRIFTING THEY HEARD ON THEIR RECEIVING APPARATUS THAT "ALL HOPE WAS GONE" BUT FOUR DAYS LATER WERE PICKED UP BY A SUBMARINE AND TOWED TO SAFETY.



AFTER AN EXPLOSION PROPELLER, COWLING AND ENGINE FRAGMENTS FLYING ABOUT HIM MAJ. MCCORMICK LEFT HIS SHIP. HE STRUCK THE STABILIZER AND WHEN THE PARACHUTE OPENED THE TWISTED RISERS CAUGHT HIM AROUND THE NECK, CHOKING HIM. WITHIN 300 FEET OF THE GROUND HE SUCCEEDED IN EXTRICATING HIS HEAD- IN TIME TO "SPILL" HIS 'CHUTE AND AVOID A CLUMP OF TREES.

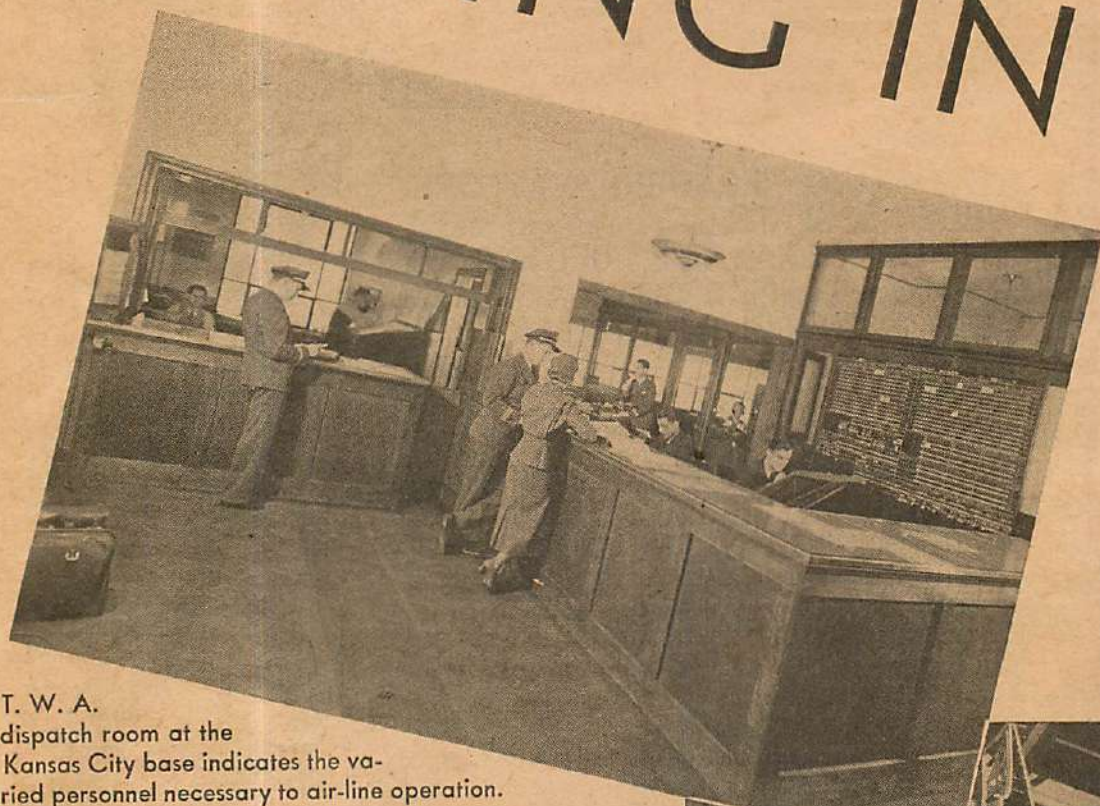
JON L. BLUMMER

PART FIVE

*Concluding an important
series of analytical articles*

by Clyde Pangborn
and
Lieut. W. M. Wood

GETTING INTO



T. W. A.
dispatch room at the
Kansas City base indicates the va-
ried personnel necessary to air-line operation.

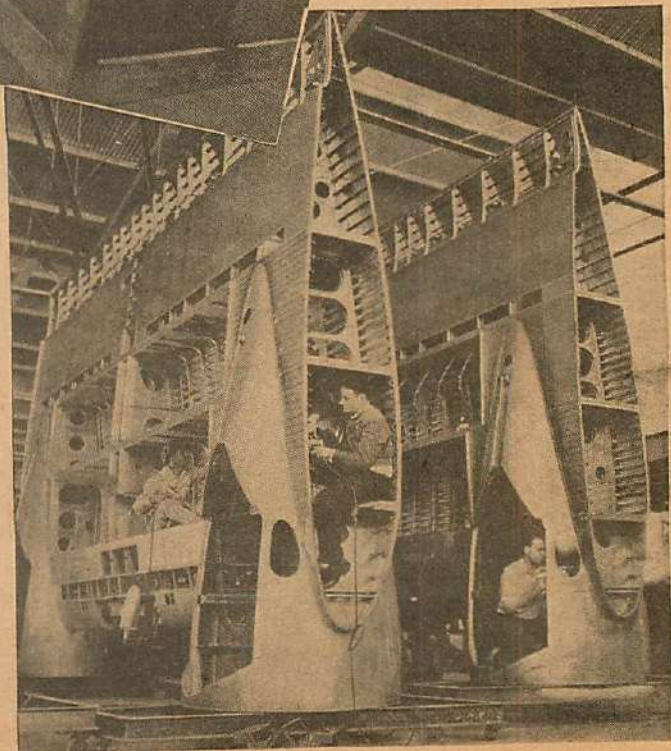
MORE PEOPLE are working at aviation jobs this year in the United States than ever before. The number is increasing rapidly, and the cry continues to be: "Give us more trained men."

Graduates, of courses, in good aviation schools, according to the latest reports, are being snapped up immediately, by factories and air lines alike. The increase in factory employment is especially striking. Last October, according to department of labor figures, the 1929 record high monthly average of about 14,700 wage earners in airplane manufacturing was surpassed for the first time since that year. The latest available estimate puts the figure at 20,000, not counting salaried employees. Since that report the number has increased still more.

The big manufacturers of military and air-line planes have millions of dollars in orders on their books. They are producing as fast as the supply of skilled workers permits.

The light planes stole the National Aviation Show in New York, and their manufacturers jotted down a million dollars' worth of orders and rushed away to make

Below: Skilled work-
men putting the fin-
ishing touches on cen-
ter-wing sections of
the Douglas airliners.



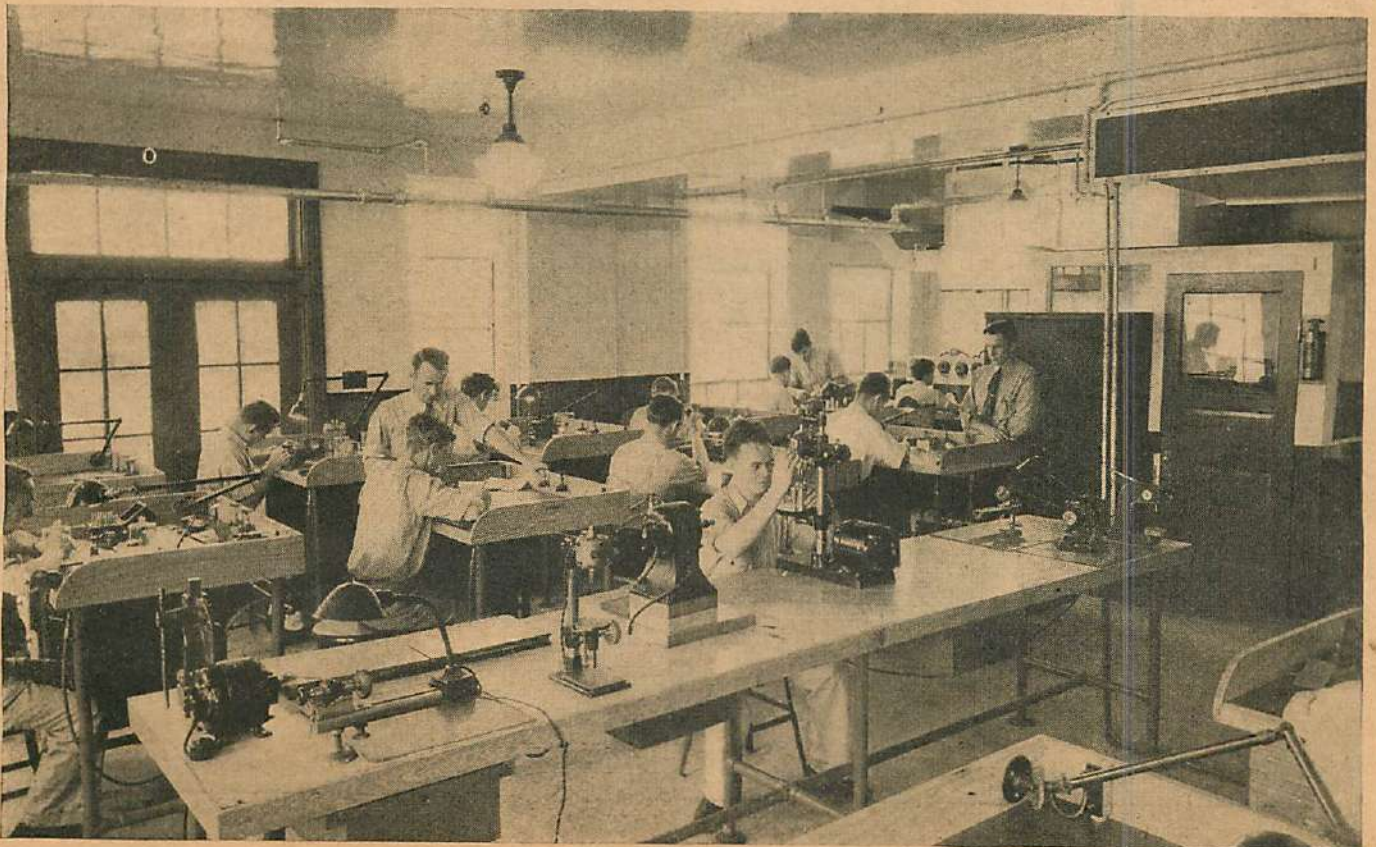
The U. S. Naval Air Station at Anacostia, D. C., where experimental work is done.

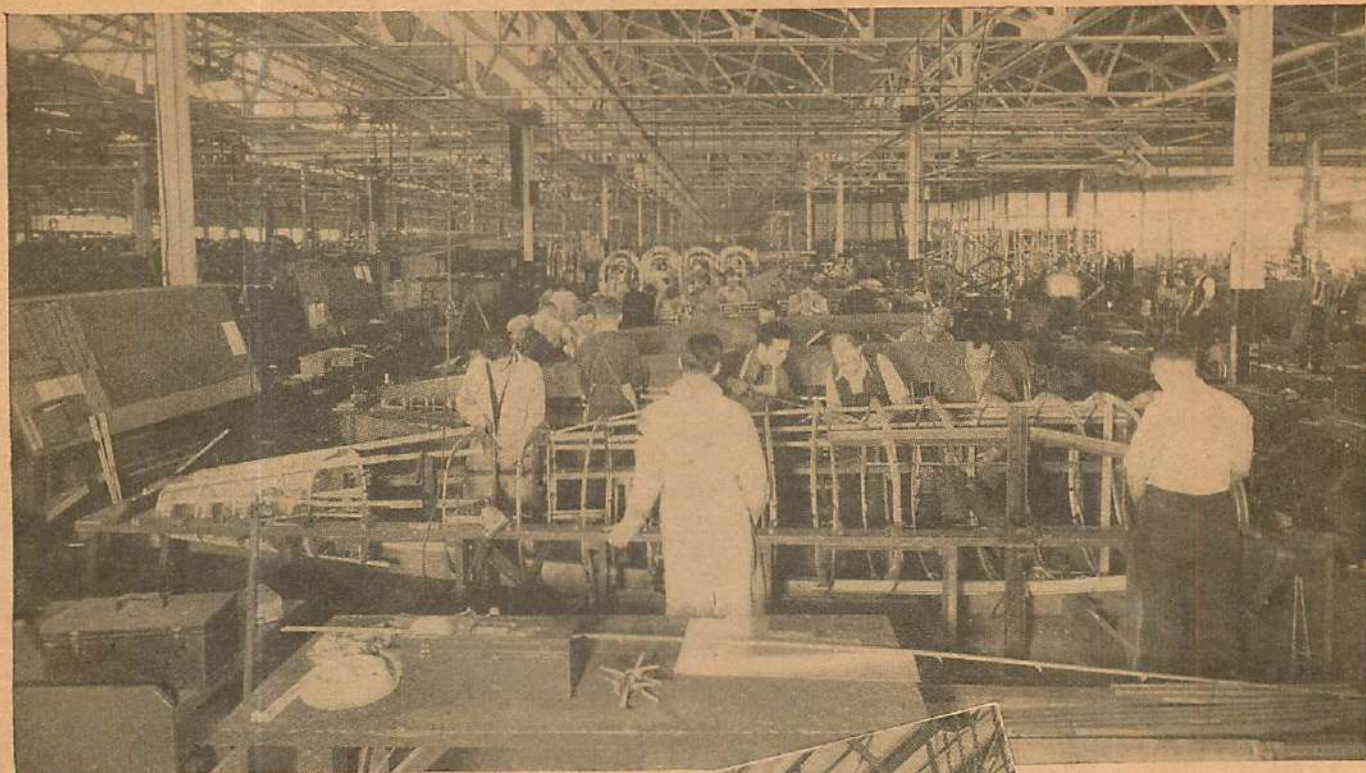


Official Photograph U. S. Navy

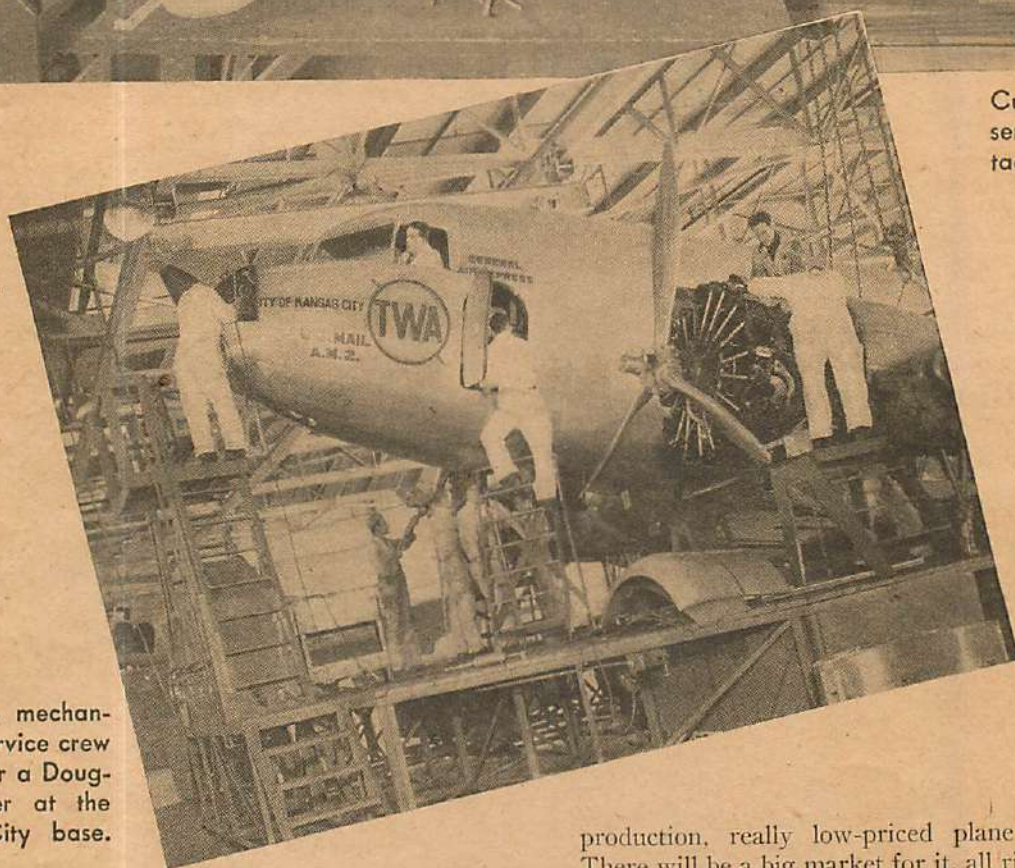
AVIATION

American Airlines instrument room, showing technicians, especially trained for this phase of aviation, at work.





Curtiss workmen assembling an A-12 Attack fuselage on a jig.



T. W. A. mechanics and service crew going over a Douglas airliner at the Kansas City base.

plans for doubling production. In 1935 Taylor Cub sales were 211; in 1936 they were 550; and in 1937 sales are expected to be more than 1,000. Aeronca sales are expected to jump from the 1936 high of 340 to 700 or more. Porterfield is expanding production and the Arrow Ford V-8 plane is attracting a lot of attention.

The much talked about Hammond Y went into production recently with a nice lot of advance orders. And Waldo Waterman's "aerobile" may be something really practical in the way of a roadable airplane. Perhaps we are getting closer to the corner around which the mass-

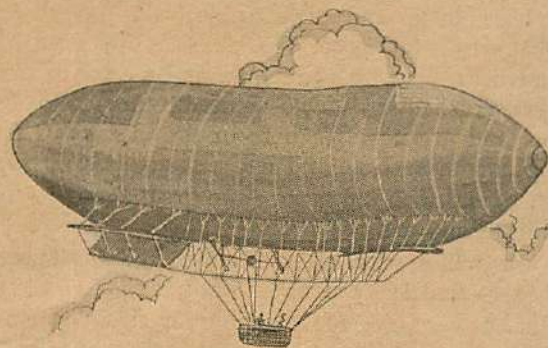
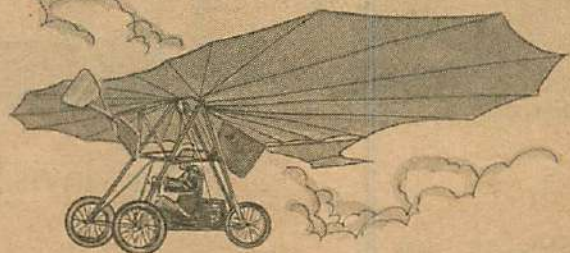
production, really low-priced plane has been hiding. There will be a big market for it, all right. From March, 1936, to March, 1937, the number of pilots' licenses, including student permits, jumped from about 40,000 to 48,000. There are altogether only about 9,000 nonmilitary airplanes in the country.

In the last four issues of *AIR TRAILS* we told you a good deal about training for aviation jobs of various kinds. And last month we promised to tell you in this article about prospects for jobs, pay, and promotion in airplane manufacturing and in maintenance, both in government service and air-transport operations. First we will talk about opportunities for nonengineers in the various branches, and then about engineering jobs.

(Turn to page 86)

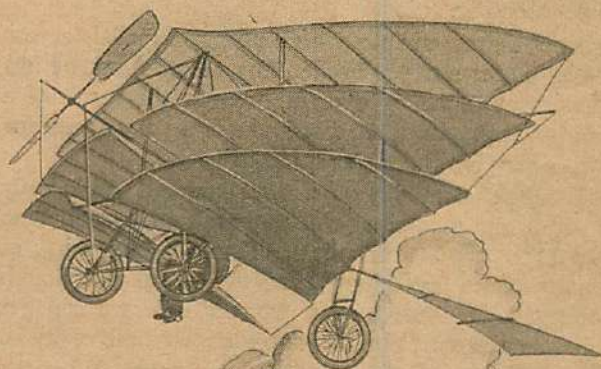
Pictorial History of Man in the Air

1907 VUIA, OF FRANCE, PRODUCES A UNIQUE MONOPLANE WITH A BAT LIKE WING AND A TRICYCLE LANDING GEAR.



1907 THE GROSS AUTOBALLOON DESIGNED BY MAJOR VON GROSS, HEAD OF THE FIRST GERMAN BALLOON BATTALION, APPEARS.

1907 HENRI FARMAN FLIES HIS VOISIN ONE KILOMETER OVER A CLOSED COURSE.



1908 ELLEHAMMER, A DANISH FLIER, IS DESIGNER OF A TRIPLANE WITH BIRD-LIKE WINGS. A NOVEL TRACTOR PROPELLER MAKES POSSIBLE A FLIGHT OF 178 METERS.



AIR ADVENTURERS

Our Invisible Member

I HAVE met a man.

He shall be nameless here, but whenever I sit down to write this department that man will always be at my side. I have read of such men in the success-story magazines. I have seen them portrayed on the screen, but I have never before actually met one.

He had no idea who I was, and he probably never heard of our organization, but if ever a man fitted completely into the Creed of Air Adventurers (Self-Reliance, Courage, Initiative, Loyalty, Integrity, Independence and Obedience), this is the man.

For that reason I shall always consider him our No. 1 Invisible Member.

He is not a great airman with a string of medals across his chest. He has never broken any records, but he has one small scar of honor over one eye as the result of a luckless landing. In other words, he is a young amateur pilot who flies for the clean sport of it.

As I talked with him on a golf course I could only think of all our members who too want to fly and who wish to become amateur pilots. I could only think of how many of us beef about hard times and how tough it is to get flying tuition and wonder how we can get any one to stake us. You have no idea what adversity is.

This young man is not much over twenty. When he was in his second year of high school, his father was taken seriously ill, and as our Invisible Member was the oldest of six sons, he realized at once that something had to be done.

He had somehow saved one hundred dollars during the summer vacation which he hoped to invest in a private flying course, but all that had to be given up. With his small capital he bought a ramshackle truck and, against all advice, went into the wholesale-produce business, absolutely on his own.

This business demanded between fifteen to eighteen hours a day of his time at first, for he had to get up before dawn to get to the New York water front to purchase his stock. Then he had to drive back to his home town and carry on with the distribution of his goods against the keen competition of established businesses. There was no choice in the matter now. There were hospital bills to meet, a home to keep up, and five boisterous,

hungry brothers to feed, clothe, and keep in school.

The flying field was miles away by now, but our man kept his chin up and stuck to his task.

That was a few years ago. To-day our man has five large trucks, his own warehouse and a crew of well-paid drivers and helpers. Two of his brothers have finished school and are now partners in the business. Another will graduate in June and will also join the firm.

Then, and then only, came the great reward—a pilot's certificate and a small plane.

I asked him why, after attaining all this success, he wished to undertake the risk of flying.

His answer gave me the hint for this department.

"There's no thrill, no pleasure, no satisfaction in the world like flying," he said. "It's the only sport I know of that demands the absolute best in me. When I fly solo I know there is nothing in the world that can do me the slightest bit of good if I fail myself. Flying demands instant decision, courage of a kind, absolute self-reliance, and a loyalty to the belief in yourself.

"These same problems come up in business every day, and if you can tackle them in the air, you certainly can face them on the ground. I may make a mistake in judgment on the ground which affects me financially. When this happens, I go out to the field and take a ship up and put myself through something of an examination. I have flown in all sorts of weather and have always satisfied myself that I still have it. I have crashed, yes. But that was part of the examination. I satisfied myself by having my eye stitched up, and then I went into the air again as soon as I could get back to the field.

"I have never crashed since."

Can you be an Air Adventurer? Can you examine yourself and make sacrifices, or would you have taken the one hundred dollars and invested it then and there in a short flying course? The story of our man is true and we offer it for what it may be worth, for we want more members to help us fight the big battle ahead. Your first move, after you have read the Creed and have assured yourself that you can live up to it, is to clip out the coupon below, fill it out and send it to me with ten cents for your Air Adventurer's wings and you are on your way. If your application is approved, your cer-



The last Condor sleeper, snapped by Walter Badger of Chicago.

tificate of membership and wings will be mailed at once.

So do me a favor before you make another move. Go back and read this story about a man again, and then, if you are still sure you can join our band, we'll be more than glad to have you.

Until next month then, we'll leave you to your own personal problems.

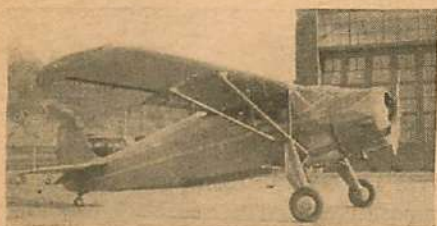
Your Flight Commander,

Albert J. Carlson

Air Adventurers News

CHESTER HOWELL of West Virginia, one of our new members, relates a hair-raising experience he and a group of his air-minded pals had a short time ago. They had a clubhouse fitted up in a cave, with benches, seats, tables and electric lights. One night, while working late on their models, they were startled by a loud crash deep in the cave and were all amazed to find that a wild cat had decided to roost there, too. Young Howell had a .22-caliber pistol with him and managed to fire at it in such a way that he drove it out without injuring the animal. He wants to become a full-fledged Air Adventurer now, and we welcome him.

Carl Maisen, of Indianapolis, is keen on our Craftsman schedule, but suggests that we also include certificates for designing and drafting, radio sets, and even short-story writing. He is pretty certain, however, that a first-class mechanic is equally as important to aviation as a first-class pilot, for without a sweet-running engine, the pilot would be grounded. Carl has the right idea, too.



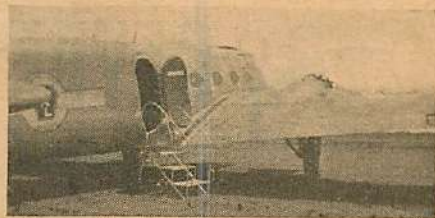
A fine shot of the 1936 Fairchild
by Bill Sobieralaski of Seattle,
Washington.

In it he shows plainly the layout of the runways, the position of the hangar, and details of the surrounding territory. Great care and patience has been shown in the drawing, and we are more than pleased to receive Duncan's splendid effort. It has been rated "Excellent" by our judges.

Another new member is Larry Miller, of Brooklyn, who is an old Bill Barnes' reader, but who has been so busy with model designing and building that he has not had time to enter active club work before. We're certainly glad to get Larry, for he knows most of the answers. He suggests we dedicate the magazine to the memory of American airmen lost in the Great War, and presents an idea for the formation of flights and squad-

rons. He would also like Arch Whitehouse to do a special series on military planes of to-day.

Donald Geery, of Garden City, L. I., is a hot lad for motor information. He knows what he wants and how he wants it served. He is of the opinion that most pilots do not know enough about their engines. Before he attempts anything in the flying business, he's going to be an expert on power plants.



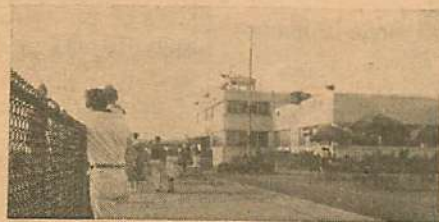
Eugene Coons of Pontiac, Michigan, took this picture of a Boeing transport.

One of our old members, G. S. Brethour, of Sutter Creek, California, holds a diploma from the Polytechnic College of Engineering in Oakland, and really knows motors, but he is confident that it takes more to build a wing section that will pass a D. of C. test than it does to design a good motor. This ought to start a roaring controversy.

John D. Phillips, of Mount Royal, Quebec, is out to become a Flight Lieutenant and turns in a swell 200-word review on a recent issue of Air Trails. He seems to prefer modern stories, likes the dictionary feature, and has a grand time working out our cross-word puzzles. He would like to see more space devoted to questions and answers.

Billy Swearngan, of Asheville, N. C., has to wear glasses, so he has given up the idea of becoming a transport pilot, for the time being at least, and is specializing in aero engines. He says he's out to become the service manager or repair foreman of some great air line, and do his bit for aviation that way.

You can't give some of these fellows enough of all this contest-and-examination stuff. Lawrence O'Hanlon, of Kearny, N. J., has been an Air Trails reader for two years. He's out to become a First Lieutenant and a full-fledged Craftsman. He wants to know why we can't consolidate Craftsman Photographer and Craftsman Air Mechanic into one by photographing a model plane built by himself. Well, he can submit the photograph on separate applications. (Honor roll on page 96.)



Chicago Municipal Airport,
snapped by Bob Peifer of that city.

Mac Duncan, of Asheville, N. C., comes through with a splendid topographical map of the Asheville Municipal Airport, drawn to a scale of $\frac{1}{4}''=75'$.

(MEMBERSHIP COUPON)

To the Flight Commander, Air Adventurers,
79-89 Seventh Avenue,
New York, N. Y.

I am interested in aviation and its future developments. To the best of my ability I pledge myself to support the principles and ideals of AIR ADVENTURERS and will do all in my power to further the advance of aviation.

Please enroll me as a member of AIR ADVENTURERS and send me my certificate and badge. I enclose ten cents to cover postage.

Name..... Age.....

Address

☐ Check here if interested in model building.

(This coupon may not be used after August 15, 1937.)

What's Your Question?

By CLYDE PANGBORN

Wing Commander



As soon as possible after the questions are received, the Wing Commander of the Air Adventurers will answer on this page such questions as appear to be of general interest to our members.

Question: Is there a 14-cylinder radial engine made in the United States? T. E. R., St. Paul, Minn.

Answer: The Pratt & Whitney Twin-Wasp Junior is a 14-cylinder engine. It is rated at 700 h.p. The Twin-Wasp SB-G is rated at 1,000 h.p. The Wright Whirlwind R1510 is also a 14-cylinder job made in many models, depending on the superchargers fitted.

Question: Why isn't it possible to reverse the prop on landing to shorten the ground run? I. O., San Diego, Calif.

Answer: It's not only possible, but it has been done, experimentally. The army tried it in 1919 at McCook Field, shortening the ground run to 50 feet, and in 1921 at Belleair, Florida, in which test the ground run on a Curtiss biplane was held to 15 feet. The reason it's not in use to-day is because it hasn't yet been made practical. Reversing the prop means reversing the pitch of the blades or reversing the direction of rotation. Either way would require elaborate mechanism for braking the prop to a halt and then gearing it to reverse effort. Wing flaps and wheel brakes are simpler.

Question: Which is the better streamline form: the teardrop or the long, pointed pencil shape? If the teardrop, why do so many European powers lean toward the in-line engine and the pencil-shaped fuselage, while we in the United States seem to hold to the radial and teardrop design? R. U., Los Angeles, Calif.

Answer: Yours is one of the best questions we have ever received. Scientific designers claim the teardrop as the most efficient form of streamlining. I believe the reason American designers hold to this form is that American radials are far superior to those of Europe, while European in-line engines, like the Rolls-Royce "Kestrel," outperform their radials. So it's a matter of making the most of what you have. Most certainly, so far, the American radial has outperformed the American in-line engine. Perhaps if a high-powered, efficient in-line engine is produced here, we may see our designers turning to the pencil as you call it. This question has so many angles, however, that it would take pages to go into it thoroughly.

Question: How many army, navy, and marine corps planes are there in the three services? How many commercial planes? W. E. F., Fort Worth, Tex.

Answer: In other words, you want to know how many planes, of all types, there are in the United States. Well, at this writing there are 7,424 licensed commercial planes in this country. Then, according to the most reliable figures, there are approximately 2,400 service planes of various types available. At that rate there are nearly 10,000 planes in this country.

Question: How many seats in the new Curtiss SOC-1 and where are the machine guns placed? G. B., Rochester, N. Y.

Answer: This ship is on the government secret list and very little official information has been given out concerning it. In general, it is a two-seater scout-observation plane which can be converted into a carrier plane, seaplane, or rigged for catapult work aboard the cruisers. I believe the pilot has one gun fitted under the engine cowlings which fires through the propeller. The observer has one high-speed Browning on a movable mounting which slides under the fuselage camel-back.

Question: What is the advantage of the offset cockpit such as is used on the German Heinkel HE-70? B. D., Fort Payne, Ala.

Answer: The only advantage one might consider is a structural advantage. It raises the pilot clear of the edge of the fuselage top for good vision. At the same time it moves him over far enough to make a clear passage through the comparatively narrow fuselage to allow the radio operator, who sits behind and below the pilot, to get to the radio set, which is mounted under the instrument board. It is a trifle confusing, but it all makes sense when you see the interior. If the pilot were placed in a dead-center position it would break up the available space. Consequently his seat is moved over and raised, so that he has good vision and at the same time gives the radio operator a reasonable amount of room to move about.

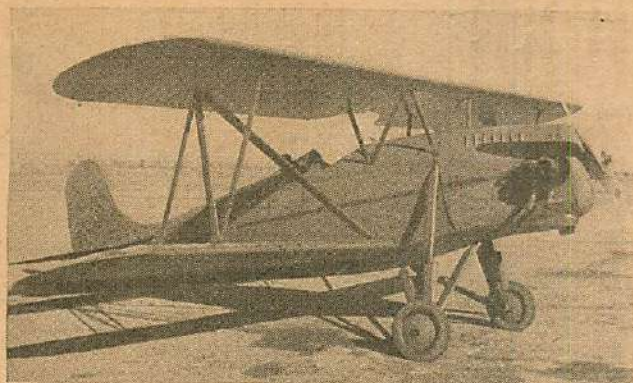
Question: I am a Canadian boy of fourteen. Would it be possible for me, later on, to get aviation training in the United States? What does a mechanic's course cost? J. C., Toronto, Can.

Answer: Only American citizens may join the United States air service, if that is what you mean, but you could take commercial training at any commercial school—if you have the money. A good mechanic's course costs from \$300 to \$500.

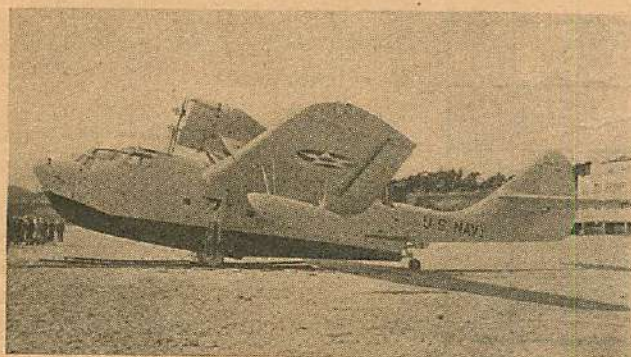
(Turn to page 83)

AIR TRAILS GALLERY

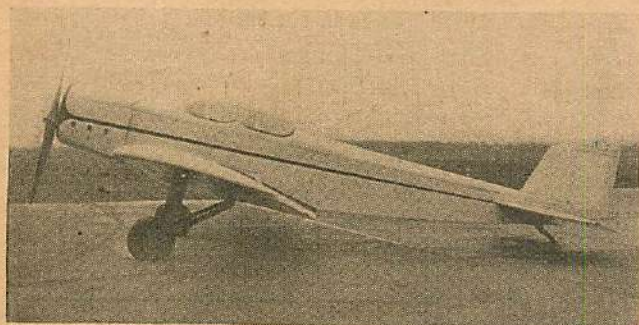
A Picture Page of Modern Planes for the Collector



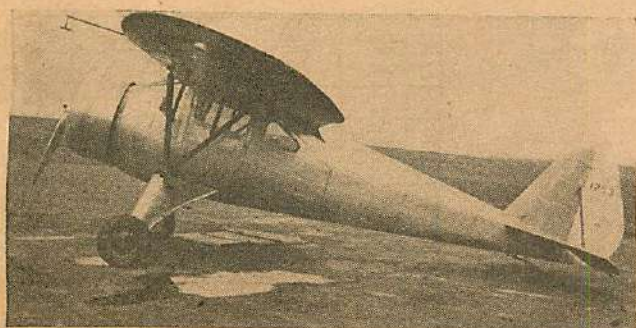
Rose Parakeet, experimental light biplane, is powered by Continental 40 h.p. engine.



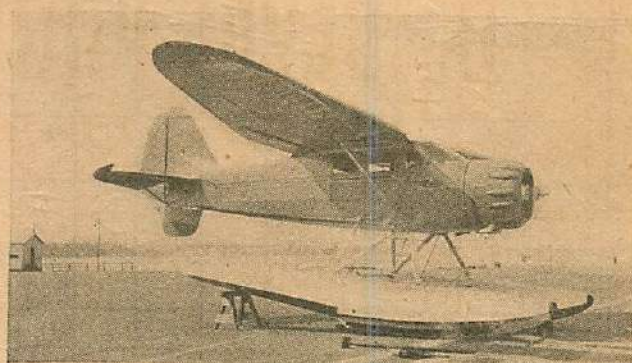
Douglas XP3D-1, navy patrol bomber, powered by two 850 h.p. Twin Wasps, is step between the Douglas Dolphin and the new DF.



Keene Ace sportplane is powered by 82 h.p. Ford V-8 convertible auto engine.



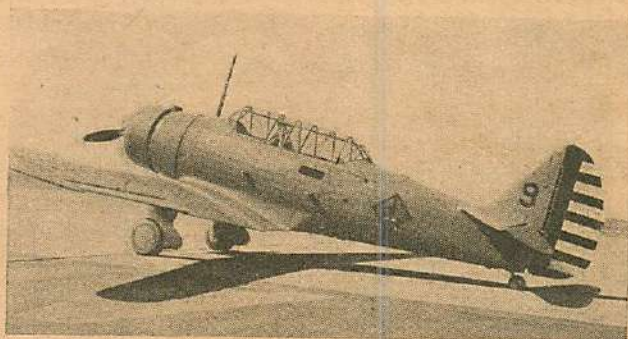
Luscombe Experimental—90 h.p. Warner Scarab—has 140 m.p.h. top and 120 m.p.h. cruising. Landing gear and tail are of new design; construction is metal.



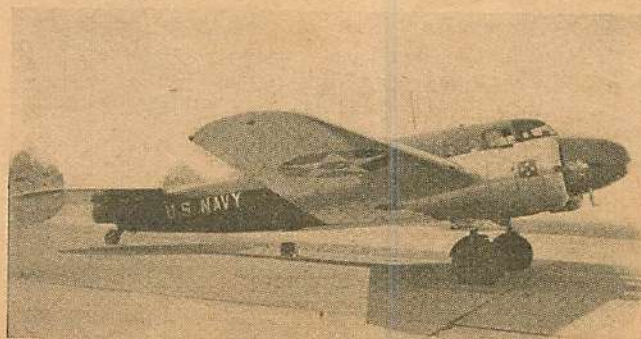
Stinson Reliant, powered by 320 h.p. Wright Whirlwind, is first of 1937 series to be equipped with floats. Rounded windshield and new-type cowl are recent modifications—small fin on seaplane only.



Porterfield Zephyr hits 85 m.p.h., cruises at 75 m.p.h., and lands at 30 m.p.h. Engine is 40 h.p. Continental.



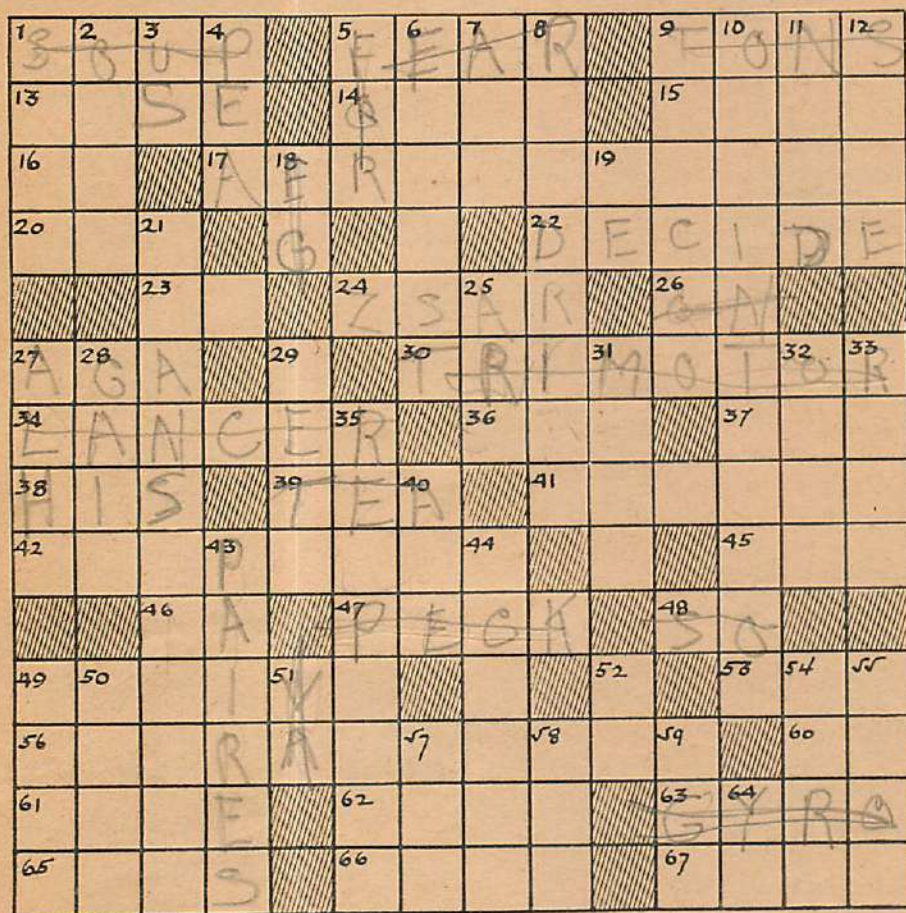
North American basic trainer BT-9A—440 h.p. Wright Whirlwind—does 184 m.p.h. Span is 42 ft.



Lockheed navy Electra XR20-1 is fitted with two 440 h.p. P & W Wasp Jrs.

CROSS WINDS

Can you answer the aeronautical definitions in this puzzle?



ACROSS

- 1—Air slang for fog
- 5—Dread
- 9—Weight units of 2,000 pounds
- 13—Otherwise
- 14—Ugly giant
- 15—Measure of effective airfoil surface
- 16—Make of Argentine plane
- 17—Lighter-than-air flight
- 20—A great deal
- 22—Resolve
- 23—Prefix meaning again
- 24—Title of former ruler of Russia
- 26—Upon
- 27—Initials of American gliding organization
- 30—Term denoting an airplane with three engines
- 34—Bill Barnes' own plane
- 36—Make of Italian plane
- 37—Make of French aero engine
- 38—Possessive pronoun
- 39—Beverage
- 41—Water duct

- 42—Storms
- 45—Anger
- 46—Iowa, abbreviated
- 47—One quarter of a bushel
- 48—Therefore
- 49—Energetic
- 53—To incline the head
- 56—Kind of airplane landing gear drawn up out of air stream
- 60—Slang abbreviation for stunning blow
- 61—Canadian Indian
- 62—Narrow woven band
- 63—Shortened term for airplane with freely revolving wings
- 65—Flock
- 66—Hurried
- 67—Cogwheel

DOWN

- 1—Type of Fairey military sea-plane
- 2—System of landing-gear shock absorption
- 3—Personal pronoun
- 4—Vegetable

- 5—In behalf of
- 6—Self-centered person
- 7—Measure of area, plural
- 8—Shy
- 9—Indelible marking on skin
- 10—Act of taking bearings
- 11—Element in air
- 12—Disintegrated rock
- 18—For example, abbreviated
- 19—Article
- 21—Radio sending apparatus
- 25—Portion of curved line
- 27—Narrow opening
- 28—Satisfy
- 29—Measure
- 31—Heavy mallet
- 32—Above
- 33—Uncommon
- 35—Venerates
- 40—Consumed
- 43—In sets of two
- 44—Disagreeable predicament
- 49—Down curve at end of a wing surface
- 50—Enshroud
- 51—Virginia, abbreviated
- 52—Initials used in plans to designate the middle line
- 54—Gumbo
- 55—Portal
- 57—Strike lightly
- 58—Couch
- 59—Air slang for bomb
- 64—That is, abbreviated

CROSS WINDS

Answers for June

O	X	Y	G	E	N	S	H	R	I	K	E
L	A	I	D	E	P	E	A	R	V		
D	A	N	G	E	R	E	N	G	I	N	E
E	L	K	N	E	A	R	S	S	E	N	
A	G	E	S	I	A	R	T	E	S	T	
L	A	D	L	E	D	Y	E	A	S	T	S
		I	S		A	S					
G	L	I	D	E	S	A	T	T	A	C	K
R	O	S	E	P	U	P	E	R	L	A	
A	L	L	B	A	S	I	C	S	A	I	
C	L	E	R	I	C	C	A	B	I	N	S
E	T	A	L	E	A	D	E	N	E		
S	I	S	T	E	R	L	I	N	E	A	R

The MODEL SHOP

(A Magazine Within a Magazine)

The Air Trails Pictorial 1938

The Flier's Dictionary
Pictorial History of Man in the Air
Development of Planes
This Winged World
Split-second Action
The Gallery

Plus

This Outstanding Feature
Ten Pages of the Latest Planes in
Four Colors. These will be printed
on heavy paper stock with no lettering
on front or back. Ideal for
Framing.

Fellow Air Adventurers:

If you could obtain at the end of every year a single issue which would be complete pictorially of all those thrilling photographs and action drawings in Air Trails, would you be interested? We have received thousands of letters requesting such an issue and telling us how they carefully cut these pictures from current issues for scrap books. If you have had to miss issues during the year, here would be your opportunity to obtain all of pictorial interest in one volume. We want very much to satisfy this demand. The material has been carefully saved and is on hand. However, you must realize the tremendous expense involved in turning out such an annual year book, and unless we obtain at least ten thousand signed orders we do not feel we can go to press. If you will sign the coupon below, signifying your intention to purchase a copy of this annual for twenty-five cents, if we decide to publish it, you will receive one of the first copies.

Let me have an expression of your opinion.

Sincerely yours,
ALBERT J. CARLSON,
Flight Commander.

13 Model Building Items

SUMMER PREPAREDNESS.....	BY GORDON S. LIGHT	40
<i>How to get the most out of vacation—a model flying program.</i>		
THE CONTEST CALENDAR.....		40
<i>A schedule of competitive events which keeps Air Trails readers up to the minute.</i>		
1936 CHAMPIONSHIP GAS MODEL.....	BY FRANCIS TLUSH	41
<i>Complete plans for constructing a duplicate of the Texaco Trophy winner—conclusion.</i>		
MODEL MATTERS.....		46
<i>Club notes, model activities everywhere, news of recent contests, pictures. This is your page. Send in your notes, news, snaps.</i>		
LIGHT CABINPLANE.....	BY ALAN D. BOOTON	48
<i>Detailed flying scale plans of the 1937 cabin Aeronca.</i>		
DISCUSSION CORNER.....		53
<i>This month readers discuss "Preferred Model Types."</i>		
MONOCOQUE SAILPLANE.....		54
<i>Something new in gliders—a sturdy, large size soarer.</i>		
THE QUESTION MARK.....		56
<i>Answering your questions about models and model problems; interesting points for every reader.</i>		
KOOLHOVEN FIGHTER.....	BY ROBERT McLARREN	57
<i>A solid model of the world's most unusual pursuit.</i>		
CHAMPIONSHIP INDOOR MODEL.....		
BY LAWRENCE N. SMITHLINE and JOHN HAW		58
<i>Another world's record model—the Stout Indoor Trophy winner.</i>		
ARROWBILE.....	BY WILLIAM WINTER	60
<i>A solid model of a striking roadable airplane—the Waterman tailless.</i>		
FOKKER D-XXI PURSUIT.....	BY MARTIN DICKINSON	62
<i>Another replica—one of Europe's foremost fighting planes.</i>		
BUILDER'S GUIDE.....	BY WILLIAM WINTER	63
<i>The seventh in the construction series—this month the subject is landing gear.</i>		

1937 AIR TRAILS ADVERTISERS

Aircraft

Charles Atlas, Ltd.
Theo. Audel & Co.
Aviation Institute of U. S. A.
Christie Batlas
Benjamin Air Rifle Co.
Bradley Models
Cleveland Model & Supply Co.
Craftsman, Inc.
Crescent Model Aircraft Co.
Diamond Model Airplane Co.
Fiala Outfits
Fleischmann's Yeast
Franklin Institute
G. H. Q. Model Airplane Co.
Gun Model Co.
Hub Model
Ideal Aero Plane & Supply Co.
Imperial Model Aero Supply
International Correspondence Schools
International Models
Johnson Smith & Co.

S. J. Jorgensen

Lee Sales Co.
Litwin Bros.
Mead Gliders
Mechanix Universal Aviation Service
Megow's
Mercury Model Airplane Co.
Midwest Radio Corp.
Miniature Aircraft Co.
Model Airplane News (Jay Pub. Co.)
Moderne Sales Co.
National Aero Reserve
Marvin A. Northrop Aeroplane Co.
Personality Ring Co.
Pitman Publishing Corp.
Reliable Dealers Supply Co.
Arthur Schenck
Scientific Model Aeroplane Co.
Skyway Model Aircraft & Supply Co.
State Model Co. (Christie Batlas)
Tlush Super Ace Motor Co.

SUMMER PREPAREDNESS

*Helpful suggestions on making
the most of the coming vacation
—off to a flying start.*

By Gordon S. Light

IN A FEW WEEKS schoolbooks will be stowed away and summer vacation will begin in earnest. More than likely every model builder has been doing plenty of model flying throughout the spring. However, when school officially ends, and with it all worry of home work, he can take up model flying without any troubling conscience.

With the entire summer ahead of us we should plan our modeling needs so that we are prepared for every possible occasion. We've listed some of the models that we've found enjoyable for vacation flying.

First on the list is a utility-type model that can be taken on picnics, trips to the country, or any other outing. It should pack into a small box, be easy to assemble, ruggedly built, and deliver a short, snappy flight. Probably you'll be able to convert the family to the model way of thinking if you're able to demonstrate some good flying.

Next on the list is the glider. You should have a collection of three or four gliders ranging from the simple-type throw-glider to the large, soaring type. Gliders are ideal for exploring the air currents in hilly or mountainous country. They can be exposed to conditions that would be too dangerous for any other type of model. And, too, they are the least painful way of allowing your younger brother or cousin to give vent to his aeronautical enthusiasm.

The most important item on the list of summer models is the hydro. Vacations are usually tied up with some form of water activity. You'll never forgive yourself if you don't prepare a hy-

dro model. Convert your favorite model into a hydro with a rugged pair of floats, and you will be set for the summer. Do your test flying when you have no audience. It's mighty embarrassing to have any one watching when the model tips over in the middle of the pond. But after the adjustments are complete, demonstrate your model to as many persons as possible. A hydro flight is probably the most impressive of any type model.

Don't neglect the endurance model for vacation flying. The first really long flight we ever had, occurred during a summer vacation. It lasted about twenty-three minutes and covered five miles. Now that I look back, I realize the excellent terrain had more than a little part in this long flight. But to a beginner, long flights are

important regardless of what sort of helpful conditions make them possible. They give the beginner's enthusiasm a helpful boost and in addition give him confidence in his ability.

Those shimmering heat waves rising from the sun-baked fields indicate perfect flying conditions for the model enthusiast—just enough turns to fly the ship into a riser and away she goes.

The thrill of watching your model dwindle to a speck directly overhead, then to disappear or drift away, is only to be appreciated from experience.

The Contest Calendar

NATIONAL Aero Reserve Contest for Rochester, New York Model Builders. Outdoor contest at Genesee Polo Field during June. Modelers in the vicinity of Rochester are invited to compete. Information from the Rochester Times-Union.

WICHITA MEET, under N. A. A. supervision, June 20th, for rubber-powered models. Planes may be built to Wakefield, Stout, or the Class C stick rules of the N. A. A. For further information, address Mr. F. X. Downey, c/o Wichita Aviation Club.

NATIONAL CONTEST: June 29th to July 1st. Sanctioned by the N. A. A. Mulvihill, Moffett, Texaco, Stout, and other trophies to be contested. Also, Wakefield elimination contest to pick entries for the event in England on August 1st. Location was still undetermined when the magazine went to press. Information from the N. A. A. Headquarters, Dupont Circle, Washington, D. C.

1937 EASTERN STATES Gas Model Meet. Sponsored by the Soaring Society of America, as a feature of the 8th Annual National Soaring Contest, July 5-9th. Sanctioned by the N. A. A. Events include altitude, duration, and payload flights, also special events for multimotored, radio-controlled, and autogiro gas models. Trophies and cash awards. Entrance fee \$2. Information from Soaring Society of America, 1614 Delaware Avenue, Wilmington, Delaware.

WAKEFIELD International Trophy Contest: August 1st, at Fahey's Great West Airdrome. Each country limited to a team of 6 entrants. Size of model must be 200 sq. ins., with a 10 per cent tolerance and a minimum weight of 8 ounces. Contest conducted by the Society of Model Aeronautical Engineers.

SUMMER CONTEST of the Jacksonville Model Club, N. A. A. rules, scheduled August 15th. Inform club headquarters, 2048 Roselle Street, Jacksonville.

1937 JUNIOR National Air Races: August 30th, 31st, 1st and 2nd, Akron, Ohio. Winners of the contest from all parts of the United States compete for \$1,500 in cash and trophies. Inform Junior Aviator Editor, c/o The Press, Cleveland.

FOURTH ANNUAL Model Builders Convention: September, New York City. Leading Eastern model builders will meet to discuss rules and regulations, plans activities, and exchange of ideas on design.

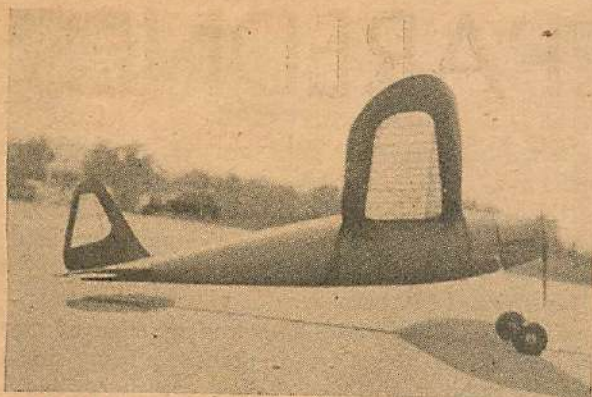
The Model Workshop asks the aid of readers and developing for their benefit a complete, detailed report of contests and exhibitions, large or small, everywhere, should be received by The Contest Calendar, AIR TIME, 7th Ave., New York City, at least two months in advance of winners and results as soon as possible.

1936 CHAMPION GAS MODEL

*Detailed plans for duplicating
the last Texaco Winner.*

PART II.

By Francis Tlush



The Texaco winner on the runway at Detroit, set to take off for the winning flight.

THE WING

IN BUILDING the wing, always keep in mind that the accuracy of the structure and its general alignment determine the success of the performance. Although gas models conjure mental pictures of heavily framed and braced structures, the design of the Texaco Winner's wing depends on flexibility for long life. In fact, the tips will flex 4 inches when the model is held suspended.

Before actual work, be advised that cement should be applied generously.

Select $\frac{3}{16}$ " spar wood from light, firm, straight-grained balsa. Taper each half spar from $1\frac{3}{4}$ " to $1\frac{1}{8}$ " and dope twice. Lay each on a flat surface to prevent warping.

Using the rib patterns given, cut each rib from $\frac{1}{8}$ " quarter-grained wood, distinguished by its speckled appearance. The 2 butt ribs are cut from $\frac{1}{8}$ " sheet.

Build each half wing independently of the other, leaving off the butt ribs for a later operation. However, do not cover with sheet, as seen on the plan, until the left and right panels have been built and butt-jointed. Slide

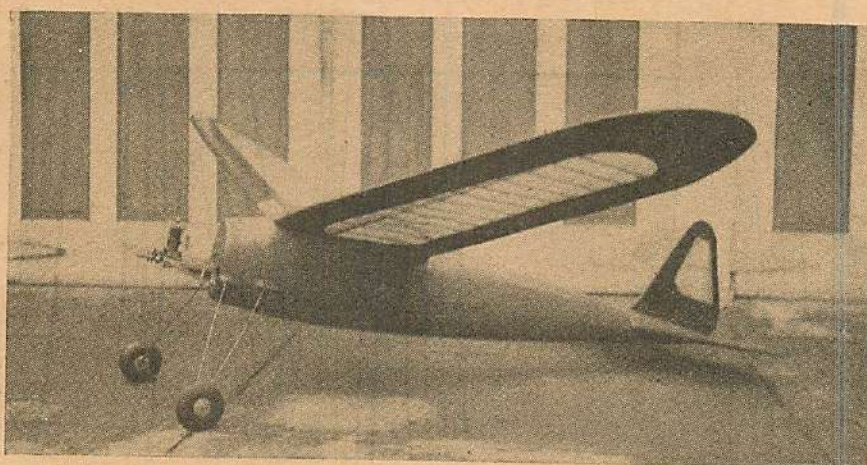
each set of ribs over a spar blank to the marked positions. Place small blocks beneath the spar and use pins to hold it in position on the bench. Cement each rib securely and attach the $\frac{1}{4}$ " sq. leading edge edgewise. Cement the $\frac{1}{4}$ " sq. drag braces in position.

The curved tip-sheet pieces are cut from $\frac{1}{4}$ " stock to a $\frac{1}{2}$ " width. Build up the tip and glue in position, tapering the spar ends to match, after the wing halves have been raised from the bench.

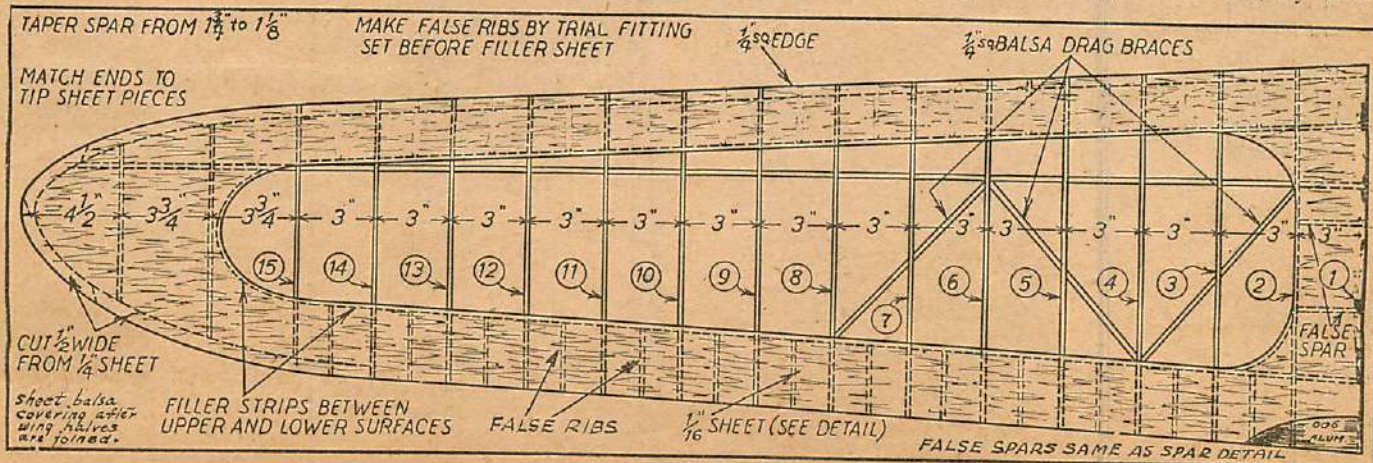
To box-joint the spars, support each tip at the required dihedral angle, then, with the aid of pins or clamps, cement $\frac{1}{16}$ " plywood, cut to pattern, to both the front and rear faces of the main and false spars. Cement the butt ribs in position.

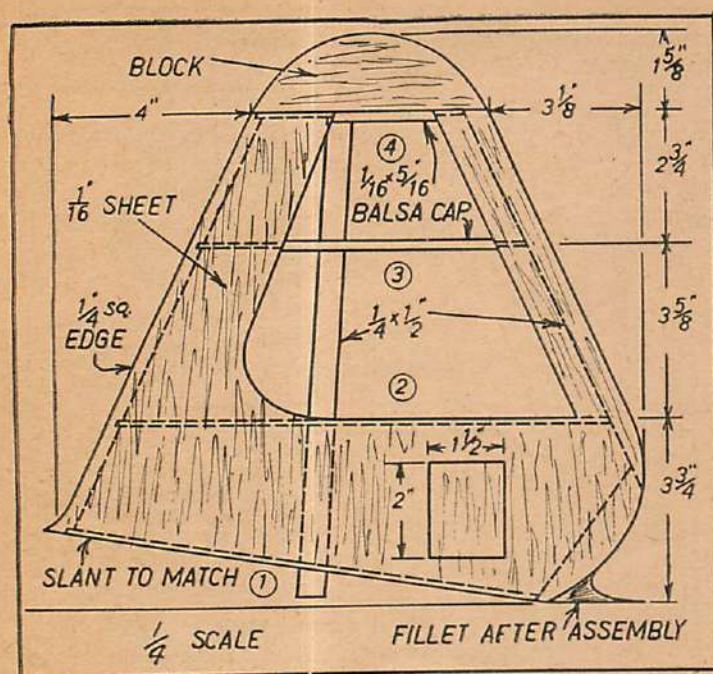
Attach the $\frac{1}{16}$ " quarter-grained sheet to the leading edge, as seen in the small detail, and sand round when dry. Having completed the leading edge, duplicate the procedure with the trailing edge, noting that an edge piece is not used, since the seam of the sheet covering should be knifelike and evenly fitted.

Cut false-rib triangles from $\frac{1}{16}$ " sheet and, by trial



Although simple in its evident details, the model is structurally rugged and efficient in flight.





fitting to determine the exact sizes, cement each in place between the large ribs at the trailing edge.

The cap strips are $\frac{1}{16} \times \frac{5}{16}$ " balsa, glued at one end, then bent to position and cemented.

TAIL SURFACES

The tail is built in the same manner; patterns are given for all ribs. The ribs are of $\frac{3}{32}$ " sheet and are slid over the $\frac{1}{4} \times \frac{1}{2}$ " hard balsa spar and $\frac{1}{8} \times \frac{1}{2}$ " false spar. The drag braces are $\frac{1}{8}$ " sq. balsa fitted to the top before sheet covering.

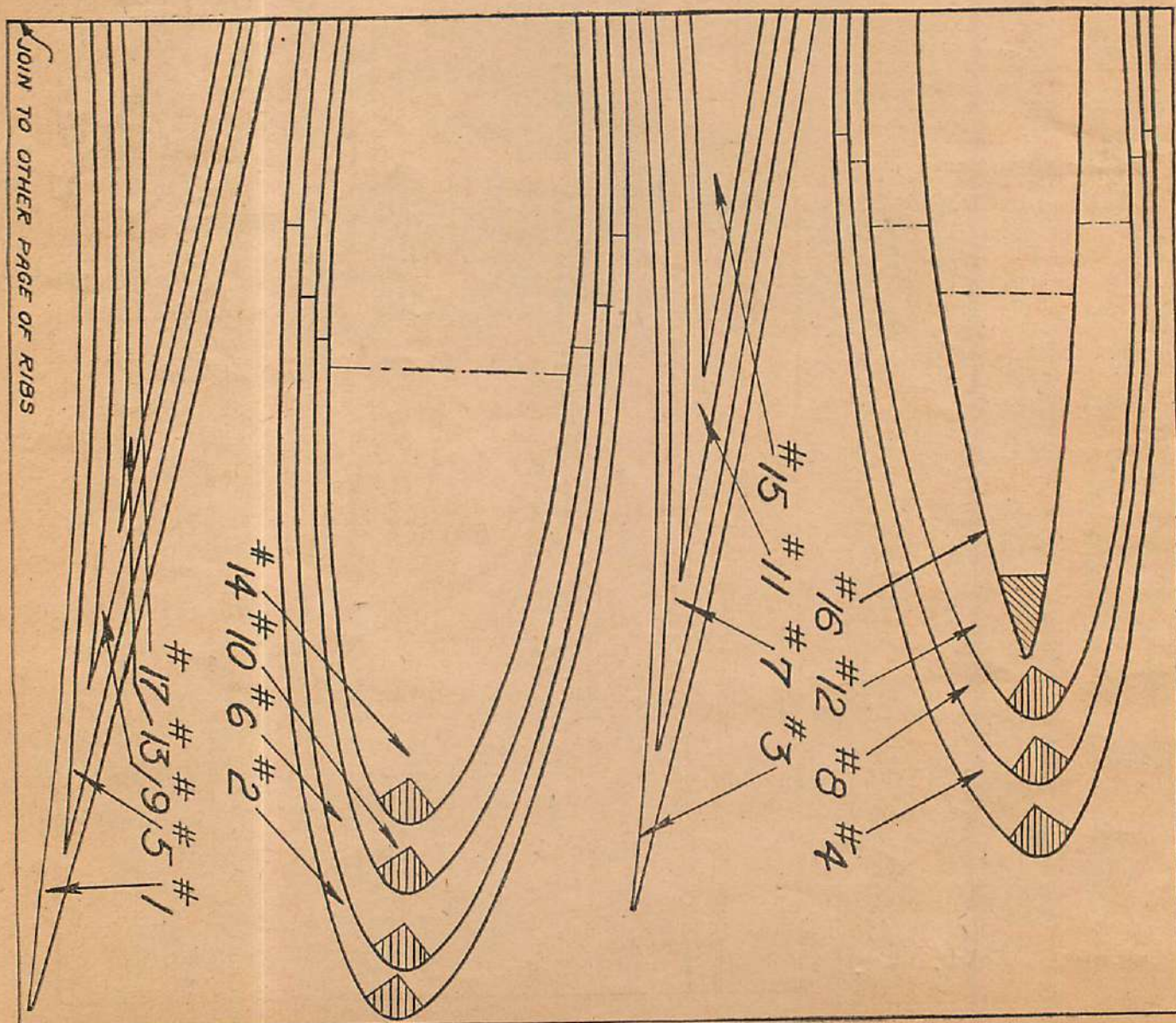
The edges of the stabilizer are $\frac{1}{4}$ " sheet cut to approximately $\frac{1}{2}$ " widths. The leading edge of the rudder is $\frac{1}{4}$ " sq., the structure otherwise being similar to the stabilizer. The $\frac{1}{16}$ " sheet covering of both units makes it necessary to make the rib edges flush by using $\frac{1}{16} \times \frac{5}{16}$ " cap strips.

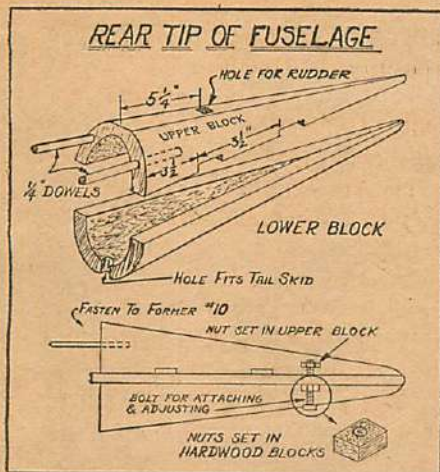
The trimming rudder is a trapdoor mounted, as detailed, to open to any determined angle.

The rudder spar extension is inserted in the upper tail block hole and cemented.

TAIL BLOCKS

These blocks are of soft balsa, hollowed and constructed as explained by the plan detail. The upper block is notched to fit over the stabilizer spars. Into its front edge are fitted 2 projecting $\frac{1}{4}$ " dowels,





spaced to fit the attachment tubes built into the rear of the fuselage. A $1/4 \times 1/2$ " hole is cut through the top of the block to take the rudder spar.

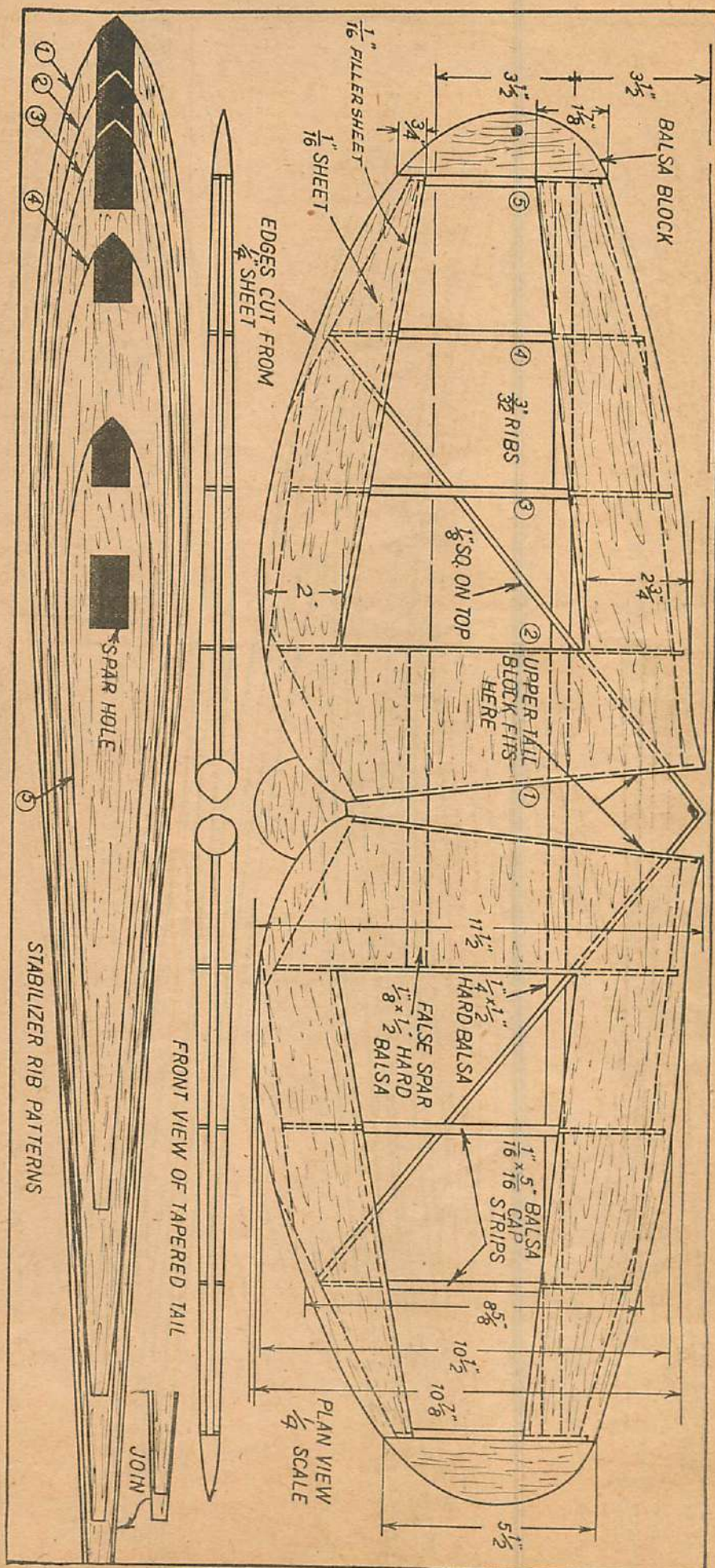
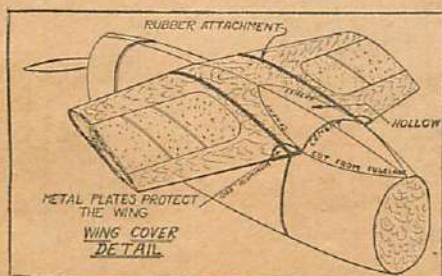
A hardwood block, large enough to countersink a nut for $3/32$ " diameter aluminium bolt, is cemented into a square depression cut into the inside of the tail block as detailed on the plan. A similar arrangement is constructed in the lower block after its



assembly to the fuselage frame at a position directly below. A bolt will be fitted vertically to reach through the nut in the lower block to the nut in the upper, holding the tail assembly in position when tightened and allowing negative adjustments to be made in the tail.

WING FILLET

Cap the wing-supporting bulkheads with $1/8$ " balsa sheet triangles to fit the wing dihedral angle. Add $1/4 \times 1/2$ " soft planking strips until the fillet is complete, continually placing the wing in position, whittling away the high spots to suit. A stiff-paper pattern may be made for trial fitting. If so, complete the plank- (Turn to page 91)

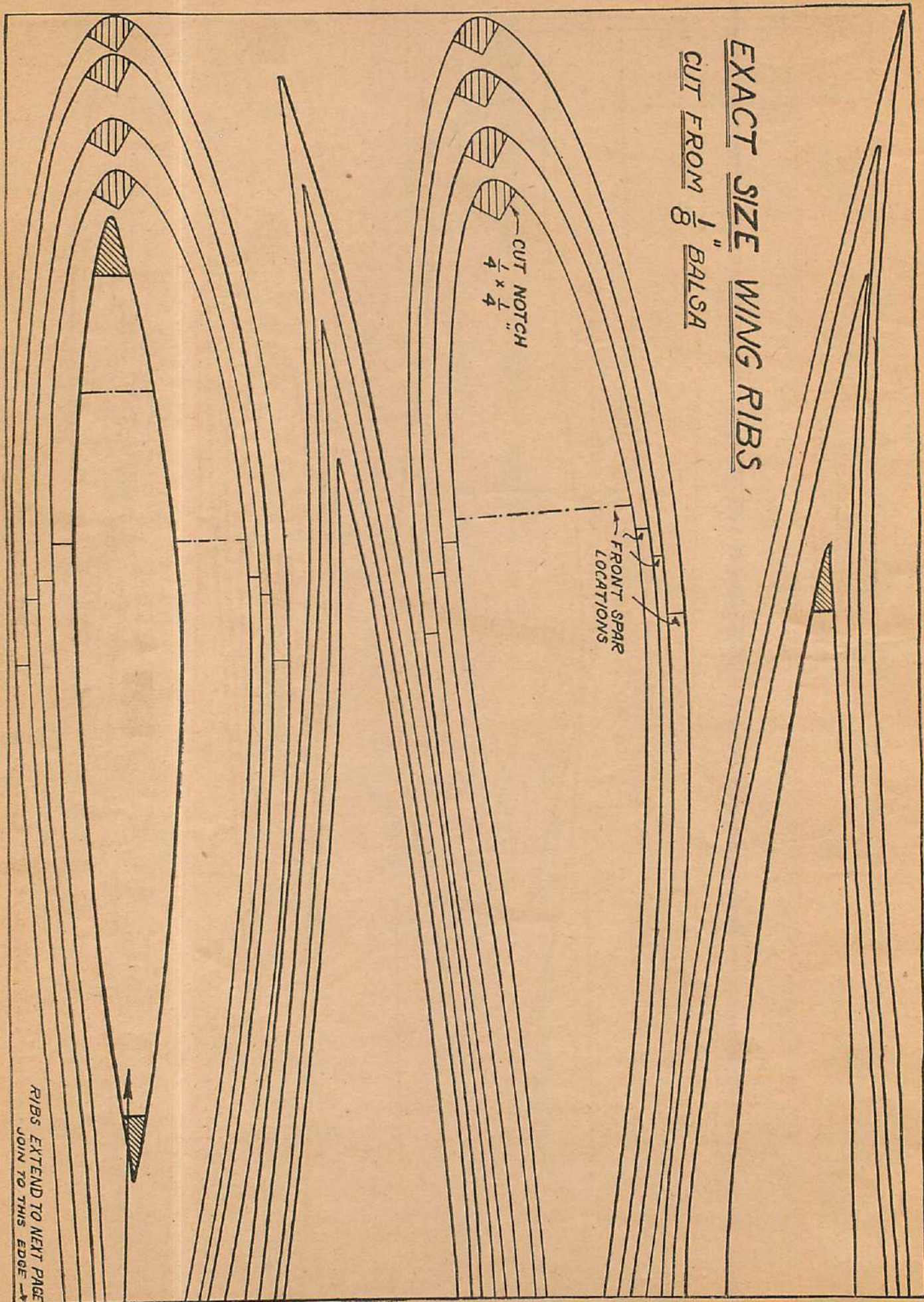


EXACT SIZE WING RIBS
CUT FROM $\frac{1}{8}$ " Balsa

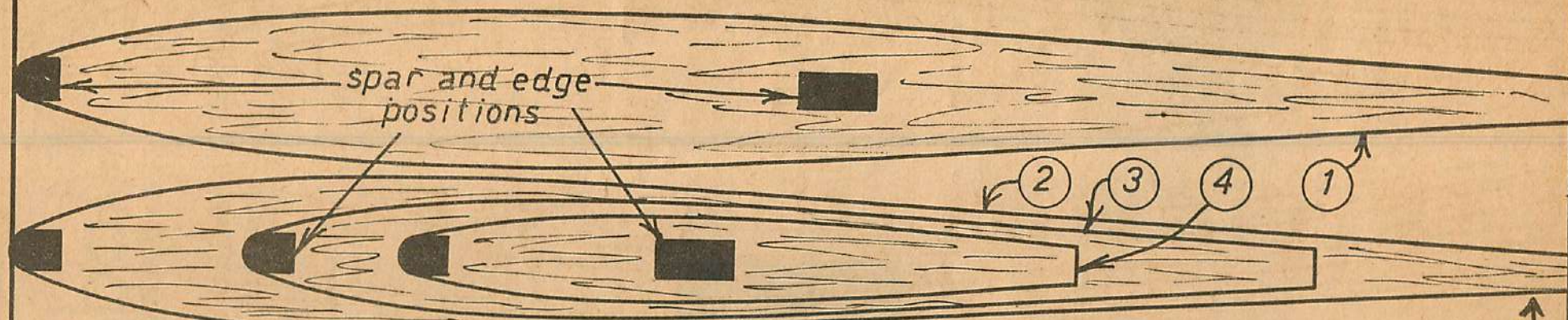
CUT NOTCH
 $\frac{1}{4} \times \frac{1}{4}$ "

FRONT SPAR
LOCATIONS

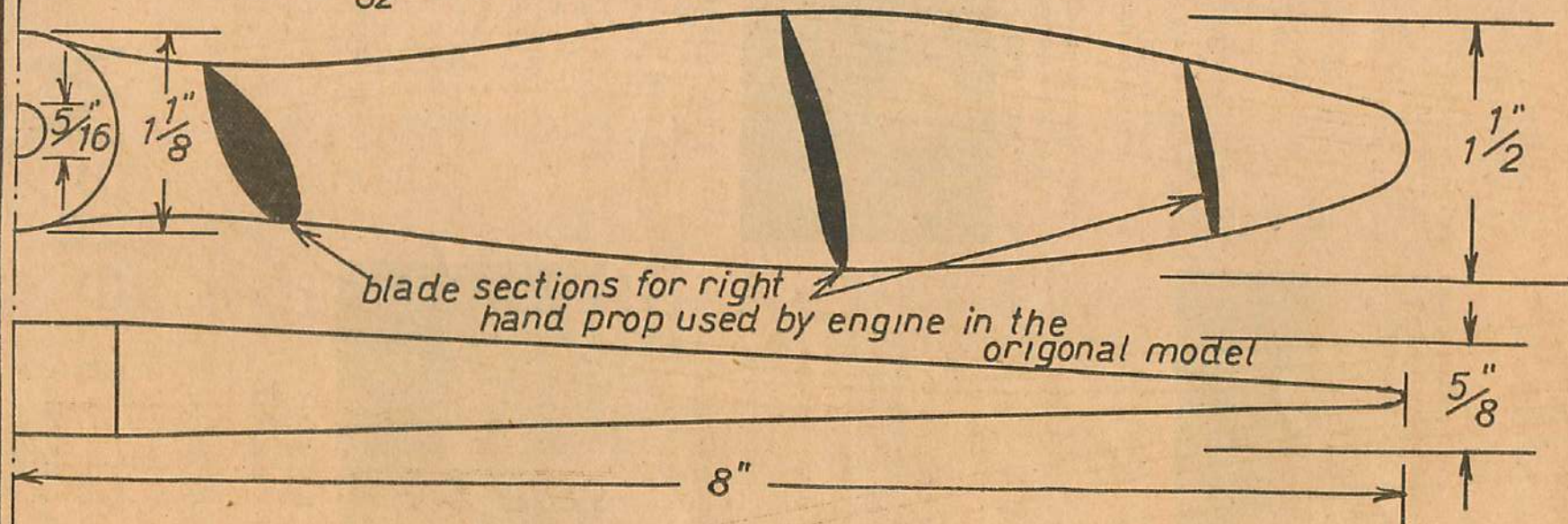
RIBS EXTEND TO NEXT PAGE
JOIN TO THIS EDGE →



rudder rib patterns and prop blank details



ribs $\frac{3}{32}$ sheet



use prop designed for motor used

*Flight records
and contestants
in competitions.*

Model Matters

*Club notes and
news of model
organizations.*

(In contest tabulations, results are to be read as minutes (to left of colon), seconds, and fractions.)

Chicago Model Show

The First Annual Gas-model Air Show held by the C. G. M. S. took place March 12th, 13th, 14th, in the exhibition hall of the Hotel Sherman, Chicago, Illinois. At 2 p. m., Friday, March 12th, more than a dozen autos, with gas models lashed to the top of each of them—the tiny motors turning up at full throttle—started down State Street. This is one of the most famous streets in the country—very busy, very crowded—but when the crowd heard the roar of those mighty motors, they stopped, looked, and read the banners that said the first annual gas-model air show was on. The parade went on, all the way down State Street, over to Dearborn and up La Salle to the hotel, where, at 3 p. m., opened one of the finest gas-model exhibits that has been in these parts.

This exhibit consisted of an aggregation of more than 50 gas models built by members of the society, together with displays of kits, supplies, motors, and planes from most of the prominent manufacturers. The show was free to the public, and marked the end of the first year of the society's activities under its State charter—a year of progress and achievement. An estimated total of twenty thousand persons attended the show.

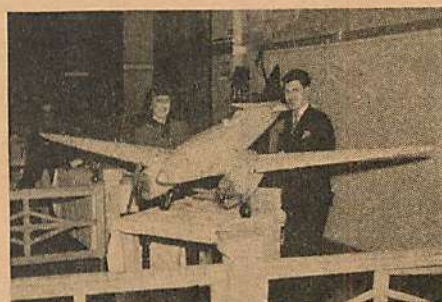
Every one was delightfully surprised at the brilliance of the gas models, ranging from a 3½-foot Elf-powered Puss Moth, built by Pat Sweeney, president of the society, to a 10-foot bimotored

which included display panels with all parts of their products pictured and explained on them and showing how they ran. A special booth was arranged for the running of motors. I need not say that it was about the hit of the show. Another big attraction was the Elf exhibit: the original 3-foot gas model, built by Daniel Calkins of Portland, Oregon, along with a very interesting panel showing all the working parts of his remarkable little engine.

Other outstanding features were the Reginald Denny exhibit, consisting of a built-up Dennyplane and the new engine called the Sky Charger; a complete showing of all the air wheels manufactured by the M. & M. Co. (16 pairs in all, ranging from 1¼ in. to 6 in.); the Power Model Boat and Plane Co. exhibit; the Lindberg Co. exhibit; the Up-

still to be selected when the magazine went to press.

Special hotel rates, workshop and sight-seeing trips, and a party for the awarding of trophies will be offered, as



James Kelly, of the C. G. M. S. of Chicago, and his 10-ft. DeHaviland Comet of planked construction, powered by 2 Brown Juniors.



Flying Keystone Club members, winners of the 5th indoor meet, held in the Allentown, Pa., High School gym.

town Model Shop exhibit; and the exhibit of the new Ohlson motor.

In one end of the large exhibition hall the movies of the club were shown every hour, and always to a full house. The movies consisted of 5,100 ft. of reels showing everything the club has done from the first meet up to the parade down State Street on the day of the opening.

The show won the praise of every one attending. In the eyes of the officers of the club it was a grand success, and every member to the last man, did his part in putting it over. The society is already planning to have a similar show again next year, but on a larger scale.

1937 Nationals

The National Championship Model Airplane Meet will be held on June 30th, July 1st, 2nd, and 3rd. H. M. Jelleson has been named contest director. Although a number of cities were suggested, the site of the 1937 meet was

usual. Many prizes, including cash, await the winners.

Events for the national battle will be the same as last year, except that the Wakefield Contest will select a team of 6 to represent the United States at the international Wakefield event at Fairey's Airdrome, Hayes, Middlesex, England, August 1st.

The official 1937 rule changes, which apply to all N. A. A. sanctioned meets and record trials, including the Nationals, are as follows:

1. Reduction of gas allowance for gas-engine models from ¼ to ⅛ oz. per pound of weight.



Paul Broccard of New York built this gas-powered seaplane, weighing 6 pounds complete with G. H. Q. engine and pontoons.

2. The weight rule for outdoor models is raised from 1 to 1½ oz. per 50 square inches of area.
3. With the exception of gliders, time allowance for delayed flights is raised from 10 seconds for both indoor and outdoor models to 60 seconds for indoor models, 20 seconds for outdoor models. Also, "in determining what constitutes an official or delayed



The exhibit of the Central Gas Model Society of Chicago, held in the Hotel Sherman, attracted 20,000 persons.

DeHaviland Comet, powered with two Brown Jr.'s, and built by Jim Kelly. These models varied in type from a true-scale SE5, by John Erker, to Cessnas Monocoups. In fact, every type of gas model was represented at the show. There were ships to suit every one's fancy, and all of them flying models.

The commercial exhibits attracted large numbers of spectators. Worthy of special mention were the motor exhibits,

flight, the official time will count and a model must remain in flight without being touched after it is officially released, unless it is apparent that it is out of control or about to strike the ground."

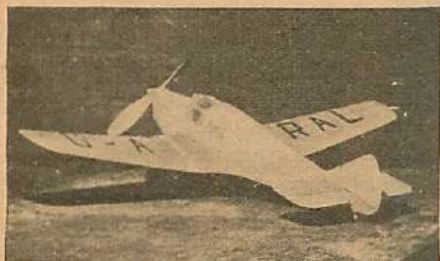
4. The number of flights allowed for gliders is raised from 3 to a permitted total of 9 flights with no delayed flights allowed.
5. With a questionable design in which classification as fuselage or stick is in doubt, the design must be submitted before the contest to the contest director for approval.

In the 1937 Moffett event the same rules will apply as for the Wakefield.

For further information, address the National Aeronautic Association, Dupont Circle, Washington, D. C.

Philadelphia Groups

Rubber-powered model activity in Philadelphia is under the Philadelphia Model Airplane Association. A group of model builders may organize into a chapter of from 10 to 15 members and



This trim Miles Falcon is the handiwork of the Windsor Model Aero Club of England.

join the P. M. A. A. as a group. There are no individual memberships. The competition is for both chapter and individual supremacy, and is under a point system.

In the fall and spring, outdoor meets are held at intervals of 2 weeks. During the winter the juniors and seniors compete separately at meets 2 weeks apart. The totals of the junior and senior meets are considered as one contest for purposes of chapter competition. The events at all indoor meets are: tractor, pusher, fuselage, R. O. G. and R. O. W.

At outdoor meets the events are: tractor, pusher, and fuselage. The indoor meets are held in the 108th Regiment Armory, which is far from ideal but seems to be the best available. Once a year the P. M. A. A. is allowed to use Convention Hall for a championship contest. Here there is a ceiling of over 90 feet.

At present the Northeast chapter, sponsored by Mr. and Mrs. Jesse Bieberman, is well ahead in the group competition, having won every monthly meet

held so far this season. Among some of the better-known members of the Northeast chapter are: John Haw, Ervin Leshner, Edward Manulkin, Robert Jacobsen, Hyman Oslick, Mayhew Webster, and Arthur Koslow. Within a



Crashproof gas model, held by Miss Mary Fowler, Boston Gas Model Society vice president, has wings and engine mounted on pegs. Designed by Hewitt Phillips, it uses the Tluth motor.

short time this group is expected to have a 100 per cent membership in the A. A. M. A.

News From England

Following is part of the letter from E. Crichton Daniels, secretary of the Windsor Model Aero Club, of Manchester, England: "I'm afraid that this first report about our club will not contain very much current news, as we are, at the moment of writing, experiencing a foul winter; perhaps, therefore, our American friends will be interested to read about the club itself.

"The W. M. A. C. of Manchester was one of the earliest northern English clubs to be formed and has about 40 members. The junior and senior divisions each have their own workroom, and the secretary is left in peace and quiet to rattle on the typewriter in his own office. New members are placed on a course of model aeronautics, and taught



Scale model contest at Pittsburgh, sponsored by the Works Progress Administration.

in easy stages to build, design, and fly correctly their own models."

Mr. Daniels sent a very short letter this time. We hope he'll utilize the typewriter in his office to keep us informed of club activities. We're looking forward to his monthly report. He invited any American club that is interested in exchanging news, photos, or plans, to contact him: Mr. E. C. Daniels, 17 Sibson Road, Chorlton-cum-Hardy, Manchester, England.

California Gas Meet

The Gas Model Airplane Association of Southern California took first, second, tied for third, fourth, fifth, and tied for seventh place in a gas contest held at San Diego, California, on April 4th. The contest was held on Kearney Mesa and attracted 89 entrants. G. M. A. A. members had practically all the prizes when the points were tabulated. The first eight winners are:

Place	Winner	Ship	Engine
1st	Alan Cummings, Los Angeles	Vail	Brown
2nd	S. L. Cramer, Los Angeles	unknown	Ohlsson
3rd	Roger Anderson, El Centro	Modelcraft Scout	Cyclone
4th	Peggy Snyder, Los Angeles	Modelcraft Scout	Cyclone
5th	W. D. Fletcher, Los Angeles	Fletcher Commercial	Ohlsson
6th	Not available		
7th	Harold Ball, Los Angeles	Ohlsson Cruiser	Ohlsson
8th	Charles Block, Los Angeles	Modelcraft Pacific Ace	Cyclone

The G. M. A. is sponsoring a contest on June 13th. It will be for maximum duration, with an allotted motor run of 35 seconds or less. This type of contest has been adopted because it is possible to run it off in approximately three



Mr. R. H. Young, Windsor Model Aero Club, and his Buhl Bull Pup gas-model framework.

hours. Modelers interested in entering this event, or in learning more about the association's work with gas-model contests, write to Frank B. Knapton, 1406 West 105th Street, Los Angeles, Calif.

Springfield Club

The Springfield Model Airplane Club, of Massachusetts, many of whose members are also Academy members, have been biding their time and struggling along until the huge Eastern States Exposition's Coliseum is available. They still have high hopes of getting the privilege of using it this spring for their weekly meets.

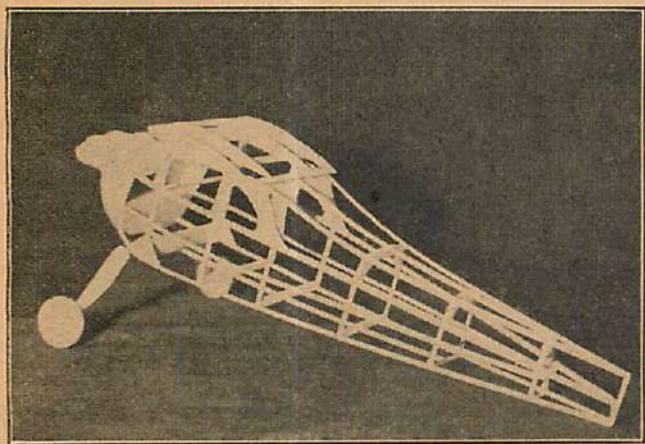
They do get a little practice, however, each Thursday night, when they fly in the Junior Achievement Hall.

Results of the flying at the meeting of March 11th are as follows:

Class A. R. O. G.'s

1st	Edwin Oatos	3:12
2nd	Alfred Bogus	2:00
3rd	Dan Clini	1:26
4th	Michael Marco	1:24

(Turn to page 95)



The framework is simple but strong.

LIGHT CABINPLANE

Flying model of a roomy sportplane—the 1937 Aeronca

by Alan D. Booton

CALLED a champion by its manufacturers, the new Aeronca K is an advanced light plane in the low-price range. Powered with the Aeronca E-113C 40 h.p. engine, the K has a top speed of 93 m.p.h. and cruises at 85 m.p.h. on 3 gallons of gas per hour.

Dual wheel controls replace the conventional stick in the middle of the cabin floor, freeing the cabin of obstructions.

The longer landing-gear struts and the wing struts enhance the appearance of the already pleasing design, which has been faithfully followed in the model.

The model design is simple and will not prove difficult for one who has only built a few.

DIRECTIONS FOR BUILDING

The instructions for the fuselage are on Drawing 3.

The wing panels are of the simplest construction. To obtain a left-wing drawing, trace the right panel onto a sheet of white paper with an inverted sheet of carbon paper under it. To add ailerons, if desired, cut through the ribs with a razor blade and cement in the $\frac{3}{16}$ " sheet spars. In this manner, fitting is avoided and a better line-up is obtained.

The tail surfaces are also simple, and, since the ribs are of $\frac{1}{16}$ " square, the units can be built in a form. The controls are not necessary, but have been drawn in, in case they may be desired. Cement soft wire hinges in, and then cover the surfaces on both sides with yellow tissue. Cement them to the fuselage, but be sure to cut away the tissue where the cementing is to be done. Sew the brace wire (thread) through the spars at the next to the last rib on the stabilizer halves, at the last rib on the fin, and tie under the bottom of the fuselage.

Cement the wings to the center section and brace them so there will be at least $1\frac{3}{8}$ " dihedral. Now make the "V" struts of $\frac{1}{16}$ " x $\frac{3}{16}$ ", streamlined. After the wings are set, cover

the center section, leaving the space for the skylight. Make a paper pattern of the windshield; then, after trial fittings, cut the real one out of thin celluloid and cement it in place, covering the cabin windows and the skylight. Add minor details to complete the model.

Power the model with four strands of $\frac{1}{8}$ " flat rubber, if the flying propeller shown on the drawing is used. The model should balance longitudinally, a third of the chord from the leading edge of the wing. Glide the ship at first, then increase the motor turns after each test and adjustment, until performance is satisfactory.



The generous propeller, the enlarged tail surfaces and ample dihedral all bespeak the expertly designed flying model.

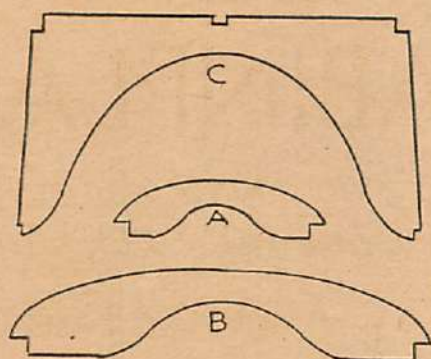
LIST OF MATERIALS

- | | |
|--|--|
| 1 $\frac{7}{8}$ x $1\frac{1}{8}$ x $6\frac{1}{2}$ " prop block | |
| 1 $\frac{1}{4}$ x $\frac{3}{8}$ x $4\frac{1}{8}$ " prop block | |
| 1 1 x $1\frac{5}{8}$ x $2\frac{1}{4}$ " cowl block | |
| 1 $\frac{7}{8}$ x 1 x $1\frac{1}{8}$ " nose block | |
| 1 $\frac{1}{8}$ x 2 x 18 " sheet balsa | |
| 4 $\frac{1}{16}$ x $\frac{3}{16}$ x 18 " strips | |
| 4 $\frac{1}{16}$ x $\frac{1}{8}$ x 18 " " | |
| 2 $\frac{3}{16}$ x 2 x 18 " sheet balsa | |
| 4 $\frac{3}{32}$ sq. x 18 " strips | |
| 12 $\frac{1}{16}$ sq. x 18 " " | |

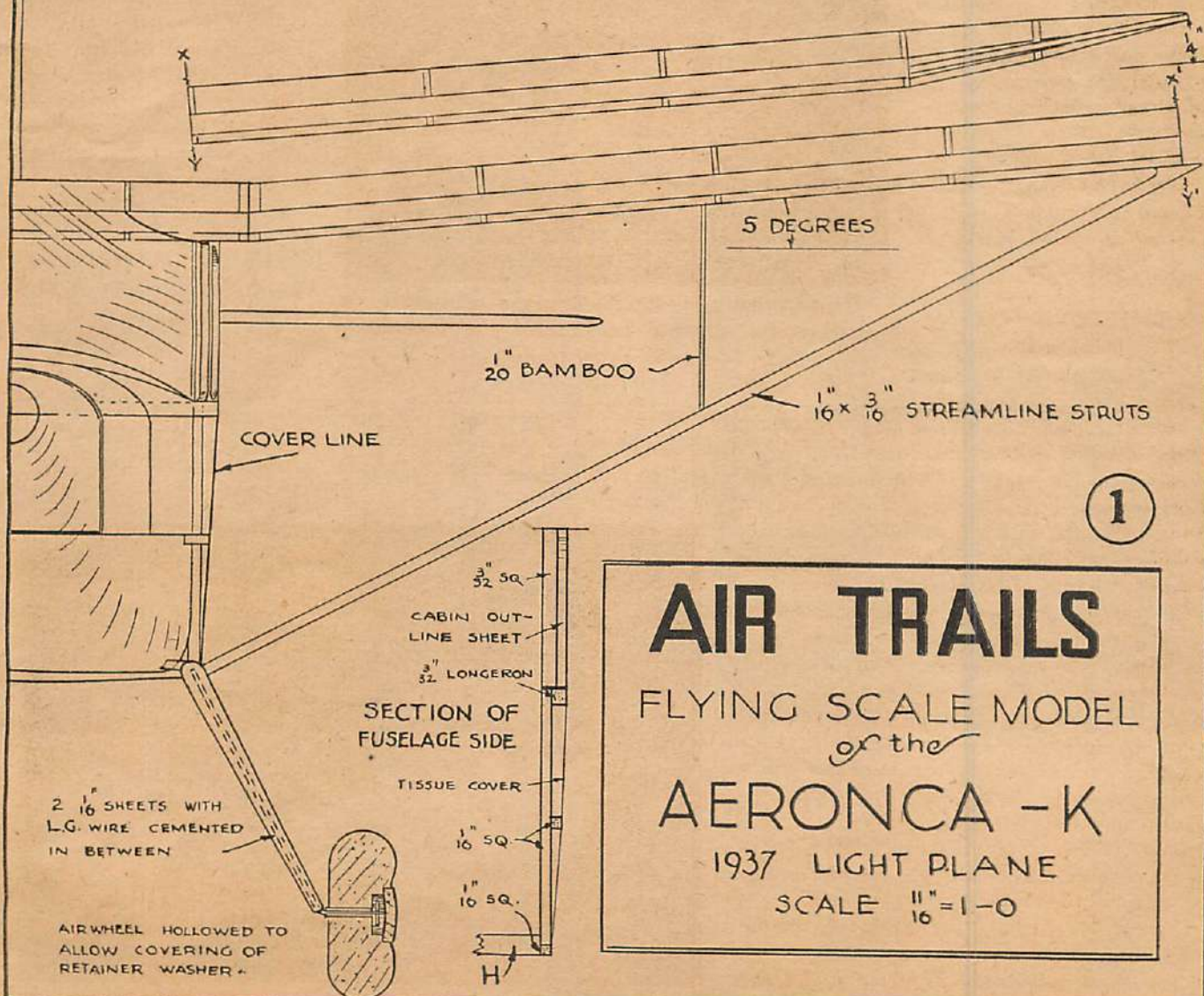
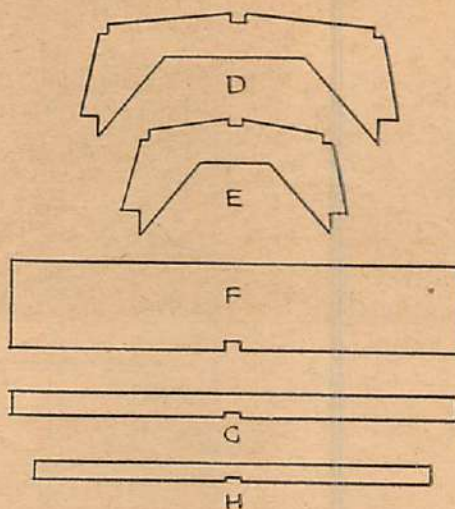
(Turn to page 95)



The model is a finely detailed, scaled reproduction of its prototype.



FORMERS
CUT FROM $\frac{1}{16}$ " SHEET



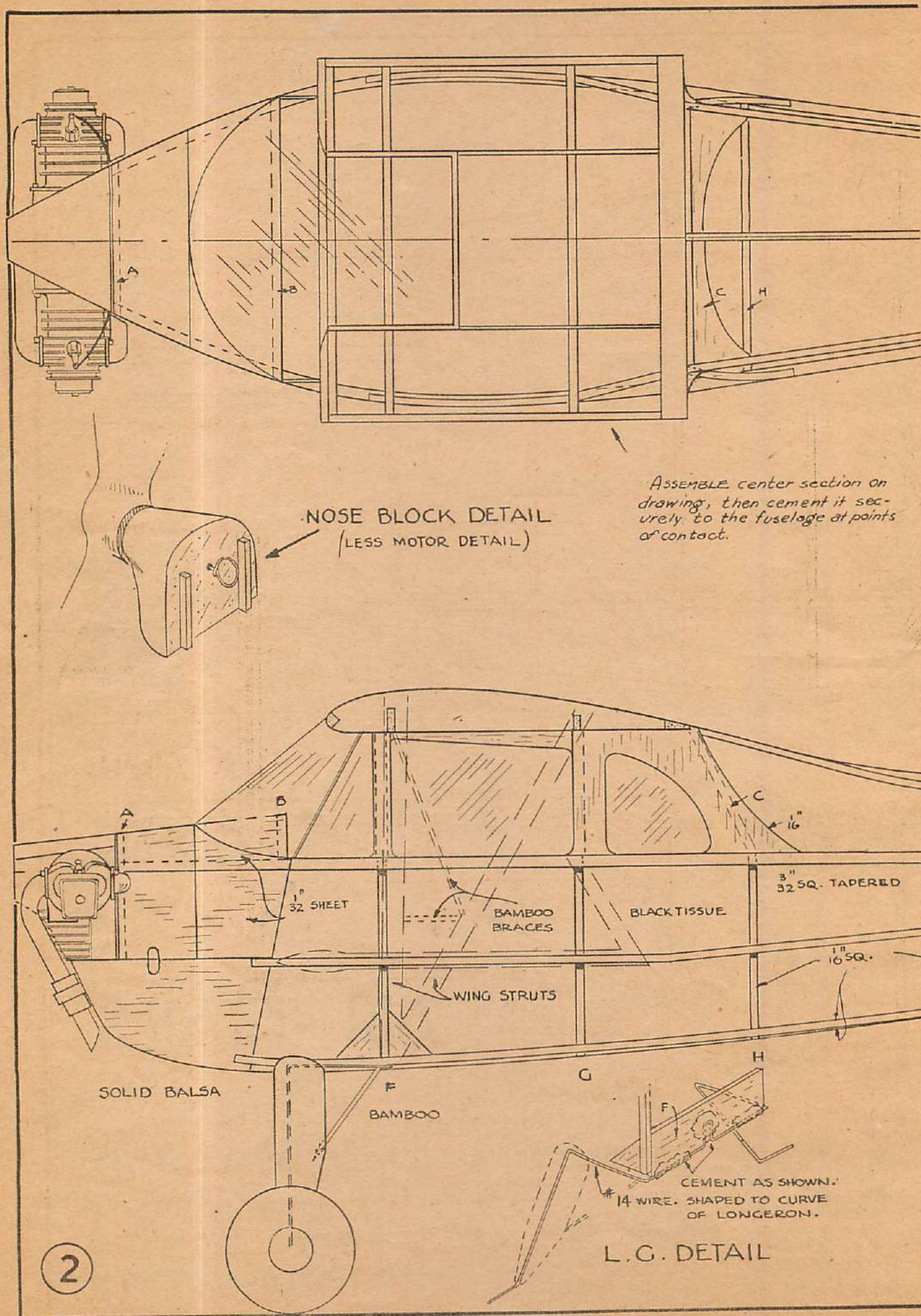
AIR TRAILS

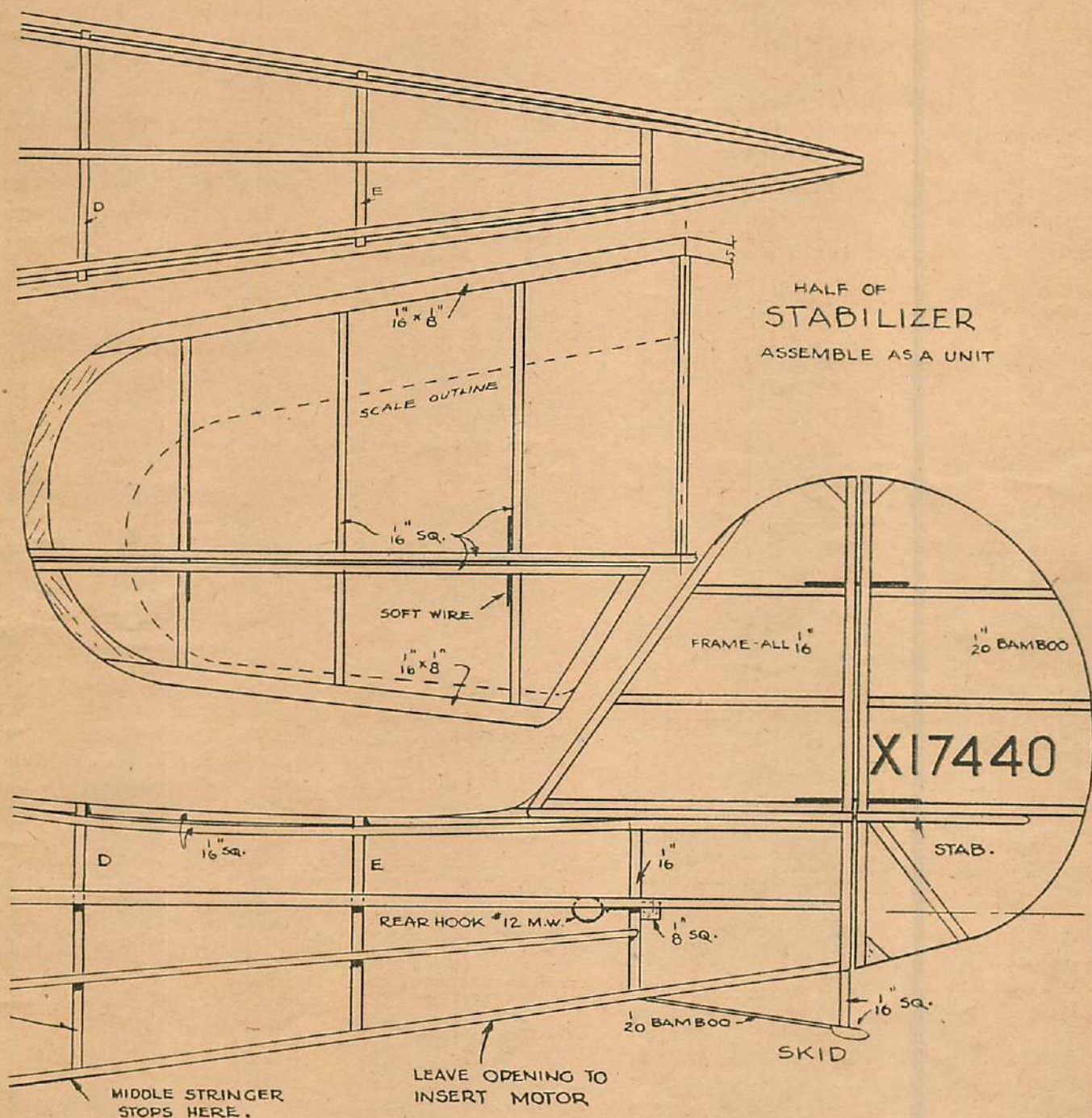
FLYING SCALE MODEL
or the

AERONCA - K

1937 LIGHT PLANE

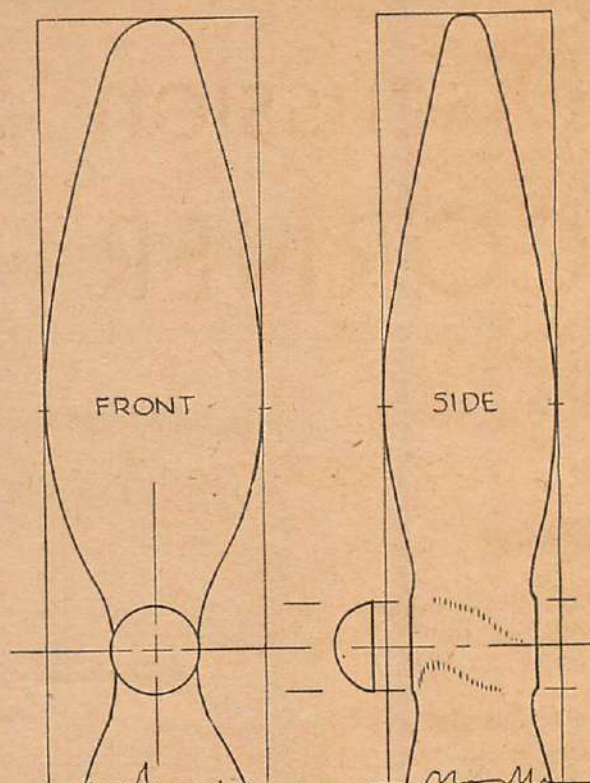
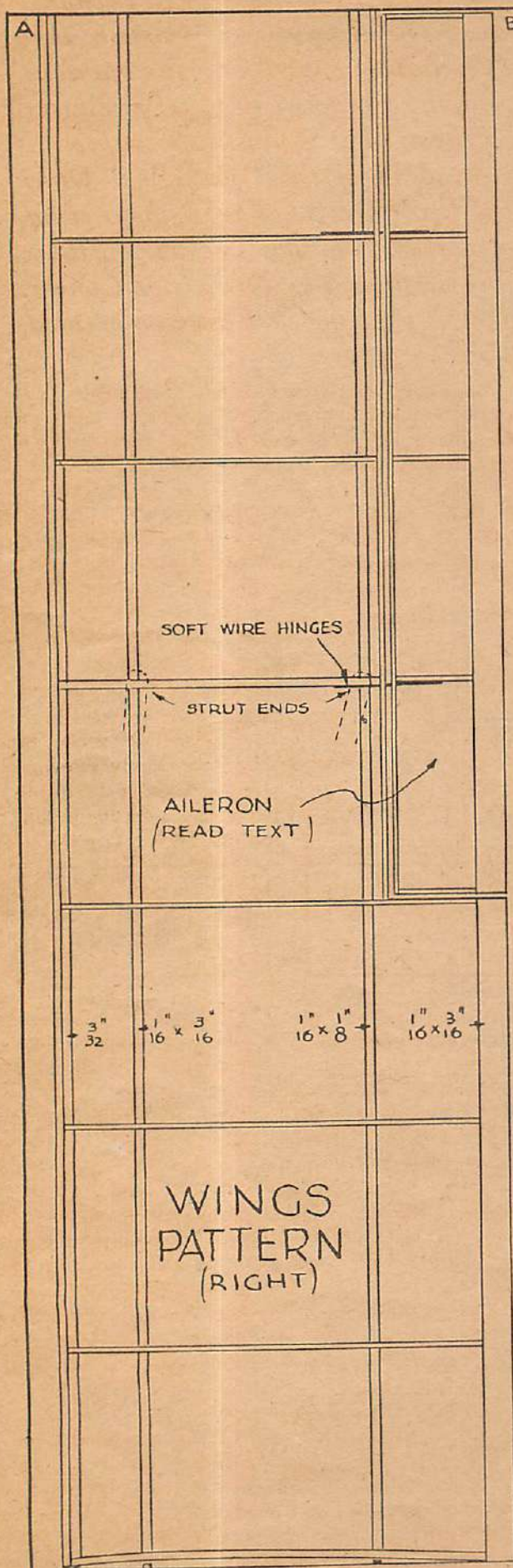
SCALE $\frac{11}{16}$ " = 1-0





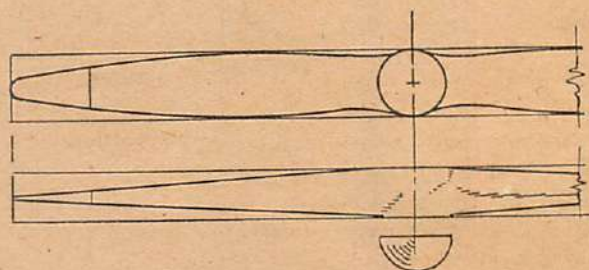
FUSELAGE NOTE. See detail of fuselageside section on drawing ①. The lower longeron is pinned directly to the drawing. The $\frac{3}{32}$ " tapered longeron is cemented on the vertical spacers instead of next to the drawing. The spacers are cut off flush with the top line of the $\frac{3}{32}$ " longeron, except the two rear ones. There must be a right and left frame. Start at rear when cementing in spacers and formers. Cement in the three top longerons, the sheet cabin outlines, then the bottom cowl block. Cover the space between formers A & B with $\frac{3}{32}$ " sheet balsa. Fit the removable nose block with $\frac{1}{16}$ " & $\frac{1}{8}$ " retainer cleats and as much motor detail as desired. Install landing gear as shown on detail and wheels as on drawing ①. Cover the fuselage with yellow tissue and add the stripes with black tissue.

3



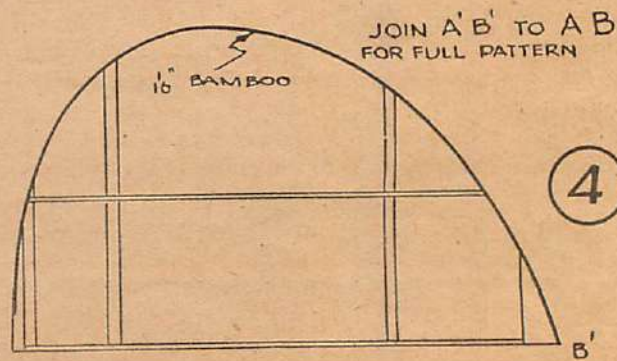
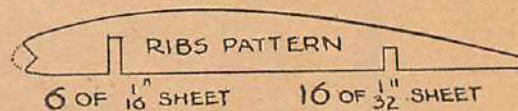
FLYING PROPELLER

BLOCK $\frac{7}{8} \times 1\frac{1}{8} \times \frac{6}{16}$ CARVE AS A
WOODEN TYPE - GLOSSY FINISH.



SCALE PROPELLER

BLOCK $\frac{1}{4} \times \frac{3}{8} \times 4\frac{1}{8}$



The Discussion CORNER

The model art progresses through exchange of ideas. The Discussion Corner is a monthly sounding board for your opinions. This month readers discuss preferred model types. For August the subject is rubber models vs. gas models. Other topics are listed below. Think about them, then write your opinion in 150 words or less and send it to The Discussion Corner. One dollar is paid for each answer printed.

THE model performs better with the wing set flush with the top of the fuselage. A parasol-type wing has a tendency to stall. With the low wing it is the opposite trouble: that is, the model tends to dive. The large amount of dihedral in a low wing usually results in a fast, short flight. With the wing flush with the fuselage, the model has little tendency to stall, is easy to adjust, and turns in a maximum-length flight.—LLOYD COOPER, Collinsville, Ill.

For best all-around results in the original flying model, I prefer the cabin type with the wing flush with the fuselage top. It is easiest to design and build, and looks most like a real ship. Low wings are tricky and hard to adjust. It is usually hard to mount the wing so it can be adjusted. However, they do make better speed models than duration ships.—RUSSELL WARD, Blackfoot, Idaho.

From past experience I prefer the parasol type of wing with a nominal amount of dihedral. The fuselage being well below the wing causes a low center of gravity, which creates stability.—THEODORE KORSU, Jersey City, N. J.

I prefer the wing mounted flush with the top of the fuselage. It seems to offer more stability with less drag. And, too, it makes a neat appearance. Low wings seem to be sensitive to adjustments—not to mention the increased trouble in mounting the wing.—CHARLES EDWARD DUFFY, Shady, N. Y.

I have found from experience that a wing that is flush with the fuselage top is desirable. With a low wing, the plane tends to tip over in a half-barrel roll and stay in that position. With a high wing, when the prop is working, the plane has a tendency to stall. When the prop is not working, the plane tends to dive.

When a model works like this, its chances of coming out safe are very few. Radial engines have become popular with model builders. With a model having this type of engine, a wing flush with the top of the fuselage is very desirable. One reason for this is that the closer to the thrust line the wing is, there is less chance of it stalling when the power is on and less chance of it diving when the power is off.—BERNARD NATOV, San Francisco, Cal.

Not so long ago I bought a low-wing model. On its first flight it cracked up. And since the wing mounts were broken off I changed their location to the center of the fuselage. Now the model flies three times as well as before. Parasol-type wings are not desirable, since they warp easily. Wings mounted flush with the top of the fuselage are satisfactory. Even low wings can be made to fly nicely, if you're careful to give the wing sufficient dihedral angle.—W. E. FOUTS, Fort Worth, Tex.

Wings mounted flush with the top of the fuselage seem to give the best results. This type of design holds practically all the outdoor fuselage-endurance records. The wing can be mounted atop the fuselage with rubber bands and the proper angle obtained by merely moving the wing back and forth, or inserting blocks under the leading or trailing edge. Low-wing designs usually have the wing fixed, making adjustment rather difficult.—EVERETT ZELLERS, Sioux Falls, S. Dak.

This Month's Topic

Which type do you prefer for best results in the original flying model: Parasol, wing flush with fuselage top, or low wing?

I prefer parasol wings. The greatest advantage is that there is no drag where the wing is attached. Another advantage is in stability. By using a high thrust line, a short, wide rudder, and little dihedral, relatively little downthrust will be needed. All these factors contribute to the improved efficiency of the model.—JOSEPH WALSH, New Bedford, Mass.

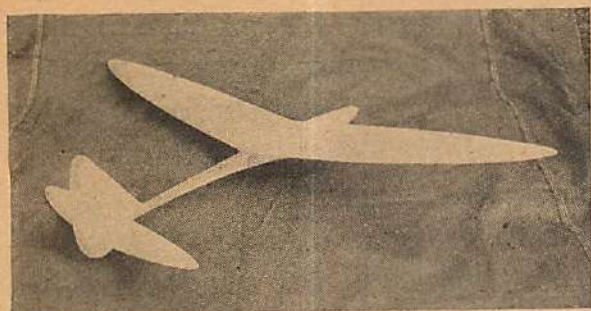
I prefer the parasol-type because, in general, it has the greatest stability. Less dihedral is required for parasols. The parasol model seems to make the most consistent flights.

Although low wings have the snappiest appearance, they are too unreliable and difficult to adjust.—MALCOLM SMITH, Minneapolis, Minnesota.

COMING UP are these topics:

For September—*For duration, has a tapered wing a marked superiority to justify its use? Which type of taper is most desirable, leading edge only, trailing edge only, or both?* Answers must reach us by June 15th.

For October—*Is performance in the outdoor model improved by using wings whose aspect ratio is as high as structurally possible? What aspect ratio do you consider to be best?* Answers must reach us by July 15th.



The smooth-flowing lines of the model are conducive to super-performance.

MONOCOQUE CONSTRUCTION can be used to good advantage in a model airplane where weight is not an important factor in the design. For the benefit of the beginner, monocoque construction is the type in which the material serves the twofold purpose of providing structural strength, in addition to being used as the outside covering.

In this model, $\frac{1}{16}$ " sheet balsa is used. It is formed to the required shape, using ribs as formers. Monocoque construction is strong and rugged; it speeds up construction and is easy to handle; and the balsa surface can be smoothed and polished to give a glossy finish. However, it is slightly heavier than balsa-framework, tissue-covered construction. But even this disadvantage is minimized in a glider, which usually requires the addition of extra weight to bring it within the weight rules.

The glider built in this way gave a pleasing performance. It had a long, flat, fast glide with a slow sinking speed. The construction was rugged enough to withstand nose dives, collisions with trees, gusty air, and a variety of other accidents that would have necessitated repairs on any other type of construction. This model will give you a double treat. The construction is interesting and enjoyable. And, too, the finished model is well worth owning. It should thrive on the air currents for which summer weather is famous. The skin-type fuselage offers least resistance.

MONOCOQUE SAILPLANE

*Plans of a sturdy soarer
—a large-size model.*

FUSELAGE

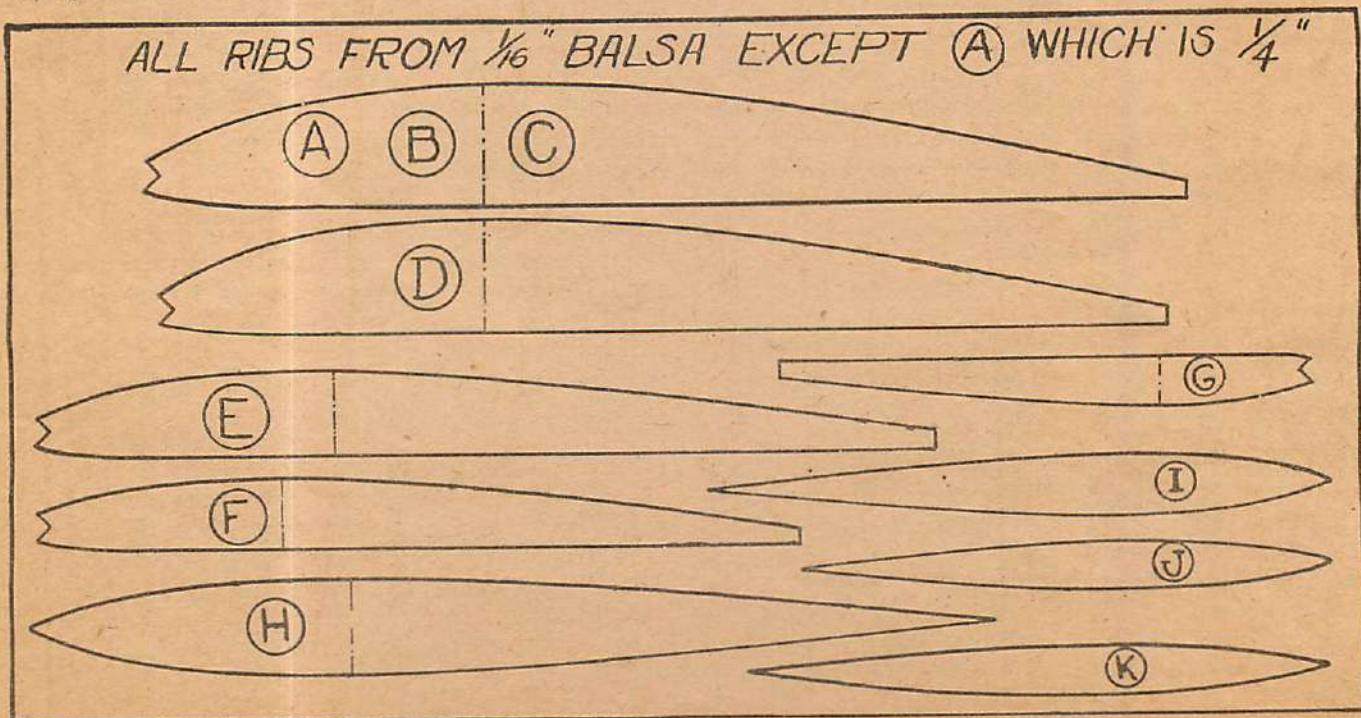
The fuselage is triangular in cross section. Start with the top panel. The front tip of the fuselage from Section B forward is added separately and is built after the remainder of the fuselage has been completed. The top of the fuselage is cut from $\frac{1}{16}$ " balsa. Reinforce with $\frac{3}{32} \times \frac{3}{32}$ " balsa cemented along the edges, plus several cross braces, as shown in the drawing. Before assembling, smooth the outside surface of the balsa and finish with either dope or glider polish.

Next, cut the 2 side panels. Start assembling by cementing the 2 side panels to the top section—that is, join them to the edge of the $\frac{3}{32} \times \frac{3}{32}$ " balsa strip. After this joint has dried, join the 2 side panels along the bottom edge. It will be necessary to reinforce by several cross braces at the front of the fuselage, where the sides are curved. These can be fitted to shape and then cemented in place before joining the bottom edges of the 2 side panels. Use $\frac{3}{32} \times \frac{3}{32}$ " balsa for the cross braces.

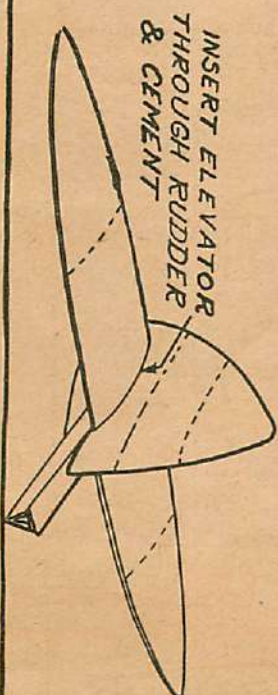
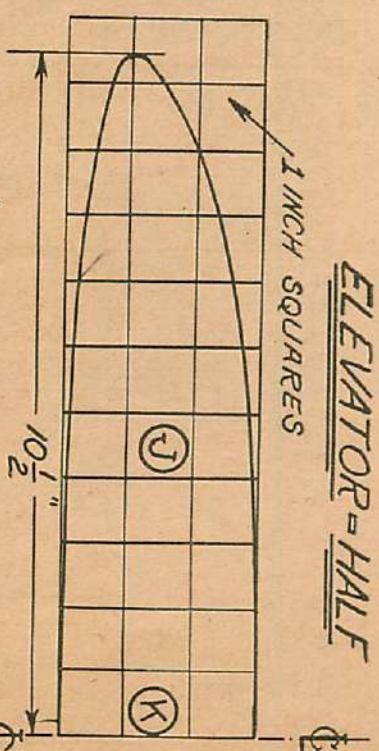
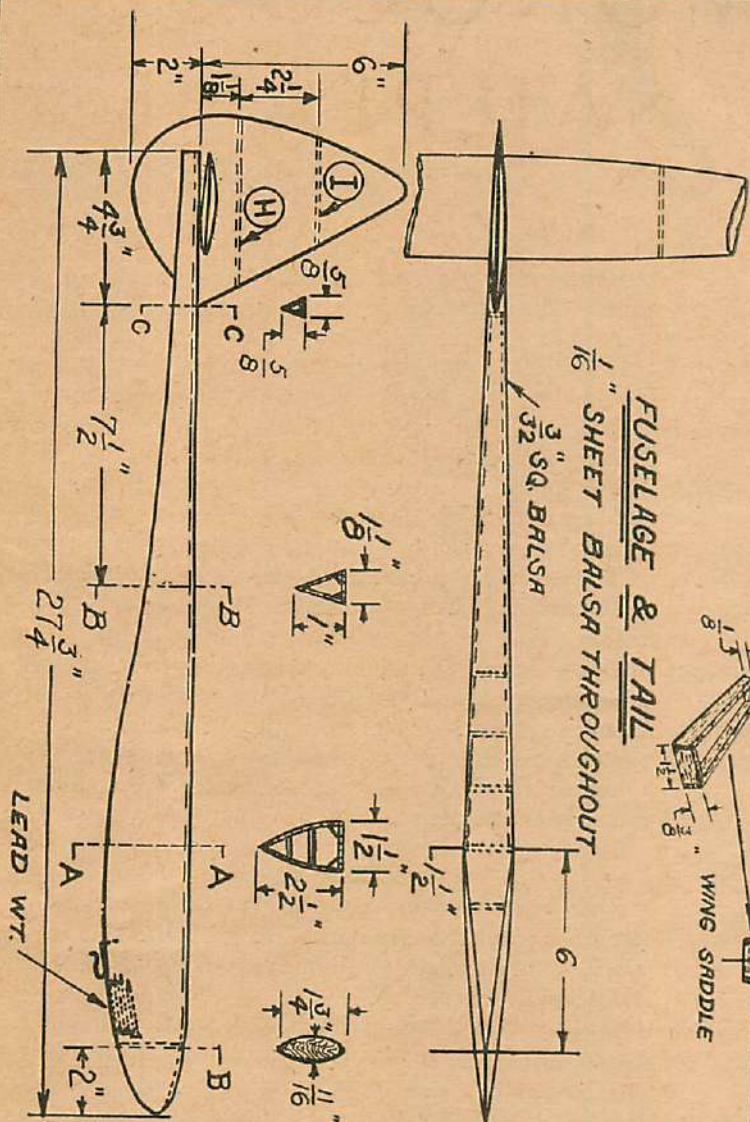
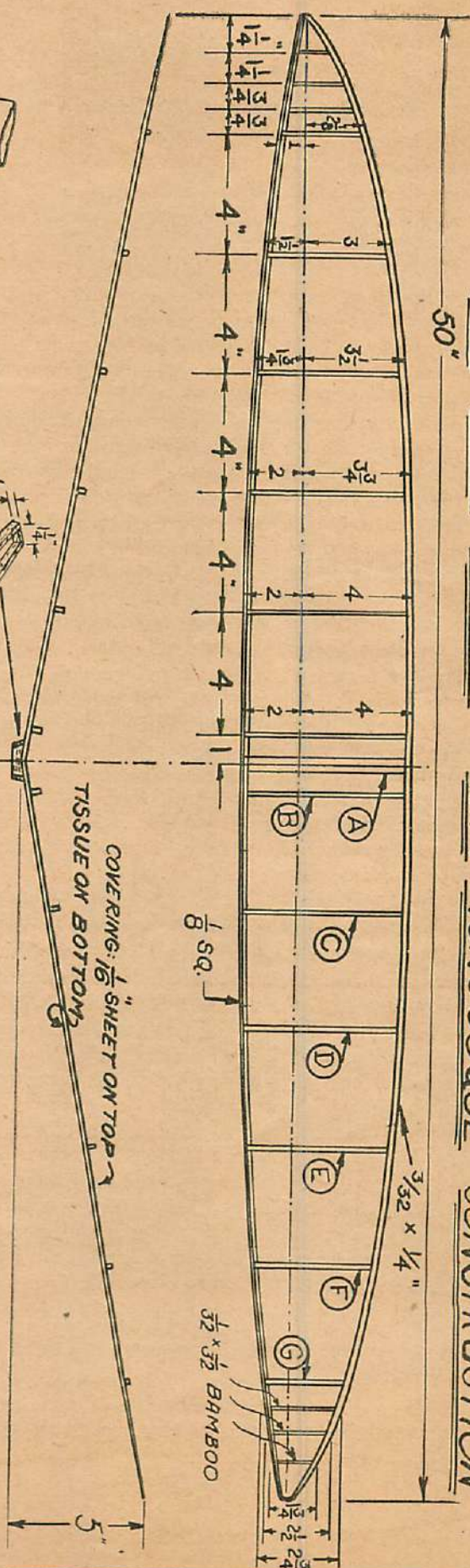
The front tip of the fuselage at Section B is added last. It is made by wrapping sheet balsa around a former, which is cut to fit the oval shape of the fuselage at Section B. It is cemented in place after the necessary weight has been inserted into the front of the fuselage. The amount of weight cannot be determined until the remainder of the model has been completed.

This weight, which is added to the front of the fuselage, can be either lead (such as fish (Turn to page 94)

ALL RIBS FROM $\frac{1}{16}$ " BALSA EXCEPT (A) WHICH IS $\frac{1}{4}$ "



TOW-LINE GLIDER SEMI-MONOCOQUE CONSTRUCTION



Have you a question on model building or flying that bothers you? Bring us your problem and



we'll answer it in the interest of readers everywhere. Replies by mail require return postage.

INCIDENCE

Question: What is meant by negative and positive incidence and how is it found? S. Y., Bronx, New York City.

Answer: Negative incidence is the condition in which the leading edge of the wing or elevator is lower than the trailing edge. That is, with negative incidence, the surface would tend to exert a downward force rather than an upward pull, as it would with positive incidence. Incidence must be measured with reference to a data line, which is usually the thrust line. Incidence is measured in degrees. Usually it is the angle between the line drawn along the bottom surface of the wing and the thrust line. Naturally, at zero degrees or no incidence, these two lines would be parallel. Incidence can best be measured with a protractor which is a half-circle divided into 180 equal divisions or degrees. Frequently model plans refer to incidence as raising the leading edge a definite amount, giving the measurement in inches rather than in degrees. To many builders this is easier to understand than degree-measurement. But regardless of what method of measuring is used the thrust line is always taken as the reference line for measuring incidence.

WEIGHT ESTIMATION

Question: In designing a new type of model, how do you determine the weight of the finished model? M. D., Brooklyn, New York.

Answer: Estimating weight of a model while it is still on the drawing board is largely a matter of past experience. Fortunately, experience is easy to acquire. A scale for weighing models and notebook for jotting down the weights are all that is needed. Keep an itemized record of the weights of every model you build. Practically all the plans which have been presented in this department have itemized tables of weights. Back issues should yield much valuable data on weights of models.

When you are working out a new design, refer to the weights of previous models. Estimate the weight of each part, and throughout the construction keep a continual check on the weight. If you see that your original estimate is going to be too high for some parts of the model, you can put this extra weight into strengthening some other part of the model. Failure to weigh the parts of the model during construction is practically certain to have disappointing results. The weighing habit pays dividends not only in better models but soon gives you the ability to closely judge the weight of practically any part of the model—an important asset in selecting material or determining the type of construction to be used.

AIRFOIL ORDINATES

Question: Where can I obtain the ordinates for the Eiffel, U. S. A. and the R. A. F. series of airfoils? What is the price? P. K., Rochester, New York.

Answer: The National Advisory Committee for

Aeronautics has prepared many reports on airfoil sections. There are two reports, in particular, which prove most helpful to the modeler. These reports contain data and information on the most commonly used wing sections. The titles of the report and the prices follow:

Report No. 352: Large Scale Aerodynamic Characteristics of Airfoils as Tested in the Variable Density Wind Tunnel. Price: \$20.

Report No. 286: Aerodynamic Characteristics of Airfoils. Price: \$25.

These reports are available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

These reports are a handy reference. From the information they contain you'll be able to reproduce an airfoil to any required size. These reports will help you to distinguish the different types of airfoils and enable you to select an airfoil that best fits the needs of the particular model you are designing.

RUBBER SLACK

Question: On my model the distance between the propeller shaft and the rear hook is $19\frac{1}{2}$ ". How much slack shall I put into the rubber motor? H. W., Ridgefield Park, New Jersey.

Answer: The amount of slack used in a motor is largely a matter of personal choice. Choices run from the extreme of using no slack, to using a motor of twice the length between the fittings. For all practical flying, three or four inches of slack seems best. If you use rubber lubricant it is certain to soil the fuselage covering to some extent. However, a small amount of slack and the using of rubber lubricant sparingly will reduce this to a minimum.

CELLOPHANE COVERING

Question: Would cellophane be suitable for covering a gas model? W. P., Xenia, Ohio.

Answer: Cellophane is unsuited for covering any type of model. It is difficult to fasten to the framework. And an even worse characteristic is that it is easily ripped and punctured. Probably the only advantage of cellophane is the attractive and novel appearance it would give the model. But remember that it would reveal all bad-construction details that ordinarily are hidden by the covering.

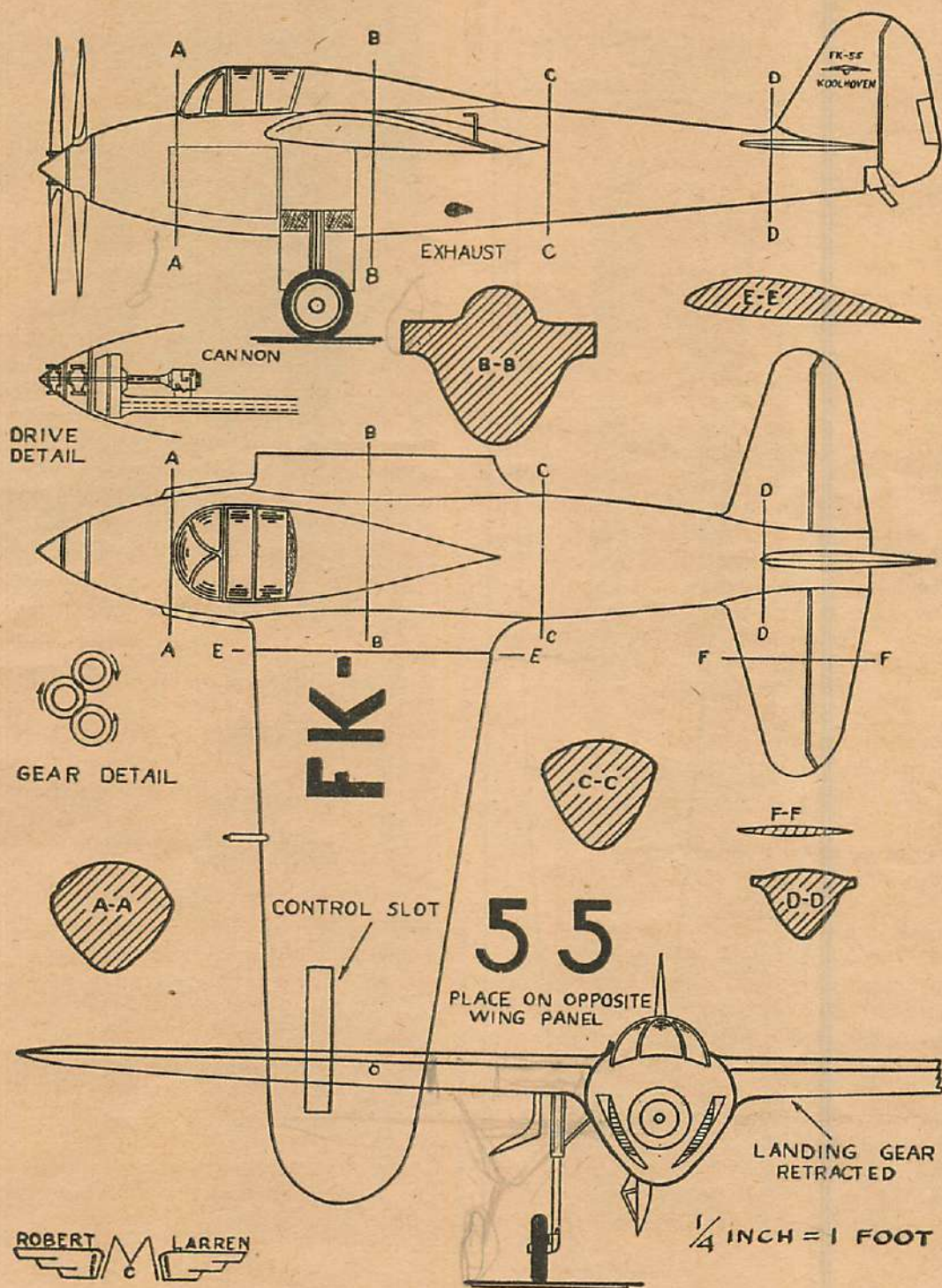
ELLIPTICAL WING AREA

Question: How do you find the area of an elliptical wing? R. B., Elmhurst, Illinois.

Answer: The area is most conveniently found by multiplying the span of the wing by the chord of the wing at the center. The product of these two is then multiplied by .785 (which is constant for any ellipse). Reduced to symbols, the area of an elliptical wing is: $S \times C \times .785$. S is the wing span; C is the chord at the center of the wing. Remember that S and C are measured in inches, to give the wing area in square inches.

KOOLHOVEN FIGHTER

A replica of the new Dutch 325 m.p.h. pursuit



THE Koolhoven FK-55 is the latest fighting plane in the European spotlight, its design having caused a sensation at the Paris air show.

The twelve-cylinder, V-shaped Lorraine 760 h.p. engine is mounted amidships and drives two propellers—one clockwise, the other anticlockwise.

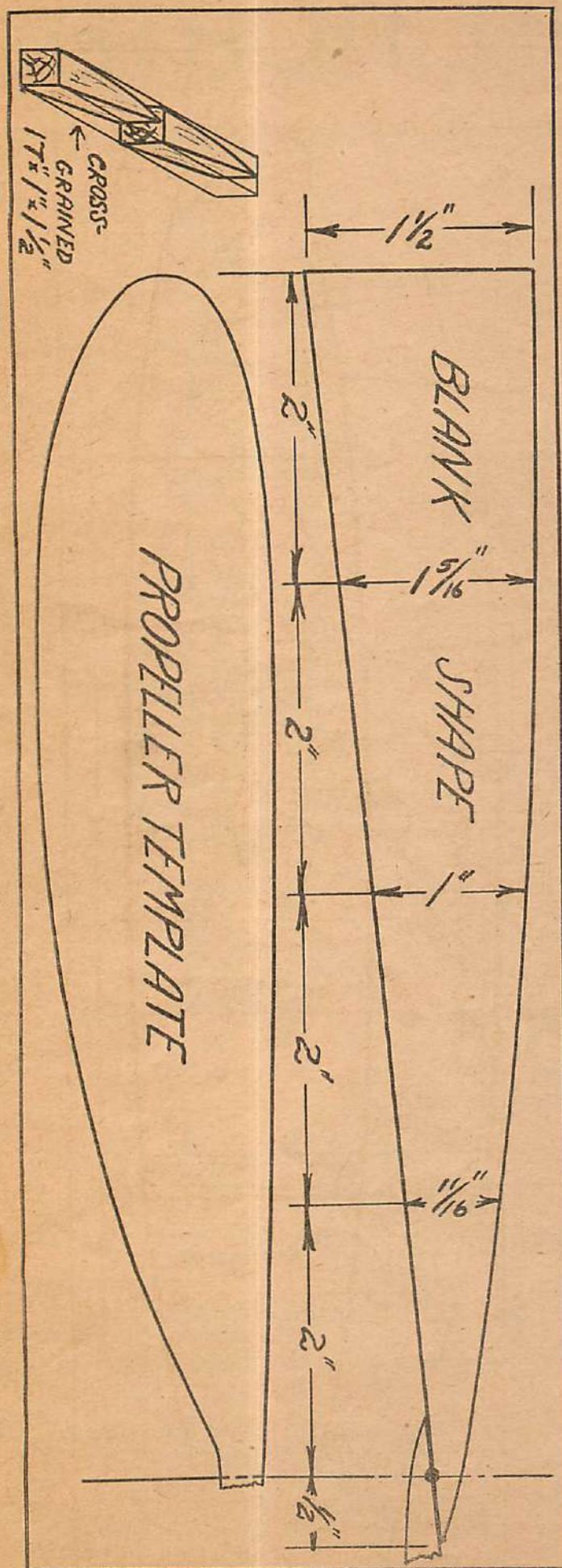
Although a secret, the lateral control is rumored to be

by roller arrangement within the rectangular wing slots.

A cannon firing through the hollow prop shafts, and two to four machine guns comprise the armament.

By keeping the weights near the center of gravity, the maneuverability has been enhanced. Full advantage of the design was taken in placing the pilot forward and as high as possible for maximum visibility.

Championship Indoor Model



John Haw, right, receiving the Stout Trophy, after the stick-model flight of 18 minutes 10 seconds.

The Winner of the Stout Indoor Trophy

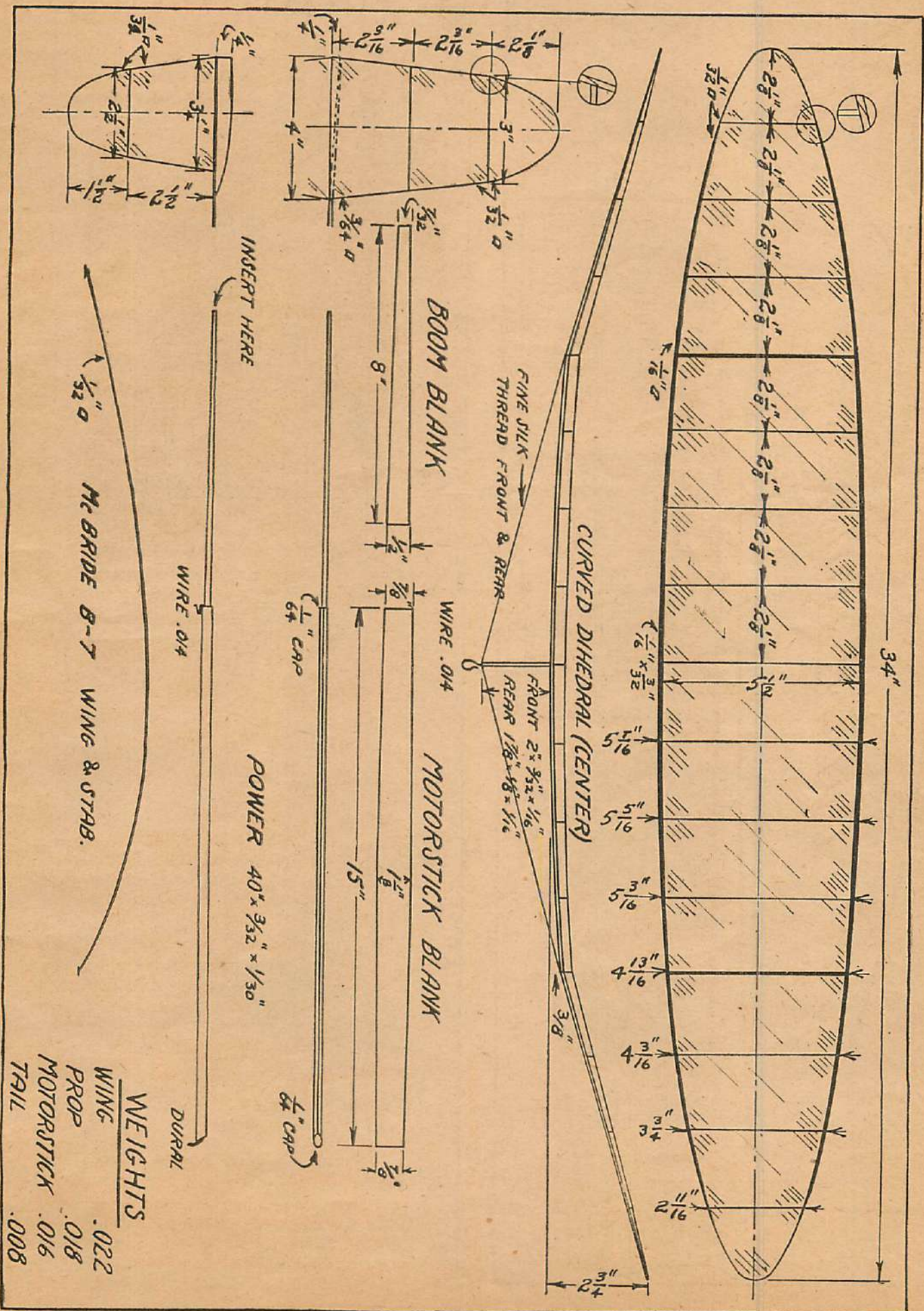
By Lawrence N. Smithline
and John Haw

WING

THE WING of this model is elliptical in shape for efficiency. It incorporates two ideas of John's: a front clip which is weaker than the rear and which acts as an automatic stabilizer; and curved dihedral in the center section.

Make a full-sized drawing on paper and pin your spars (which are cut from a piece of light, soft balsa sheet $\frac{1}{16}$ " thick— $\frac{3}{32}$ " tapered to $\frac{1}{16}$ " square where the dihedral is put) down. Note that the spars have only 3 edges rounded. The square edges go toward the inside of the wing, or toward the ribs. The effect of this is to make the spars more streamlined. Wet them with water and allow them to dry.

The ribs are cut from light $\frac{1}{32}$ " quarter-grained sheet, $\frac{1}{32}$ " square. They are made as follows: Make a template of the shape shown in the drawing. Then lay the template on the sheet and slice along the edge with a razor. Slide the template down $\frac{1}{32}$ " and parallel to the first cut, and slice again along the template. This will give you a rib. The drawing should clear this up for you. Cement the ribs in place, cutting off any excess from the rear. Note that at the dihedral 2 ribs are used, as the wing is covered in 3 pieces and joined later. (Turn to page 92)



ARROWBILE

*A solid model of the
Waterman flying auto.*

By William Winter

THE GROWTH of lightplaning activity in the past few years has been sensational. As encouraging as the rebirth of private flying has been to the manufacturers, it represents but a small part of those who would take to the air, were landing fields more conveniently located and non-flying expenses, concurrent with owning a plane, drastically reduced. The conventional airplane must be hangared at the field at considerable expense, the owner having the lesser inconvenience of operating a car to and from the field, where it also must be parked for the duration of the trip. Then, too, the special airplane engines require mechanics trained in the routine of their overhaul.

Waldo Waterman's Arrowbile, designed to eliminate these and other retarding factors, promises to make lightplaning a sport of the air-minded multitude. Sheltered in the family garage at night, it is ready at a moment's notice to be driven to the airport, where, unlike the car, it dons its wings—stored in racks, if the popularity warrants it—and soars into the sky.

Equipped with a six-cylinder Studebaker engine, the hybrid can speed along the road at 55 m.p.h.; in the air at 125 m.p.h. Its tailless design and detachable wings make it adaptable to road-driving conditions.

The span is 38', the length 19' 4", and the height 8' 6". The color scheme is entirely silver.

MODEL BUILDING DIRECTIONS

The material sizes are listed at the close of the article.

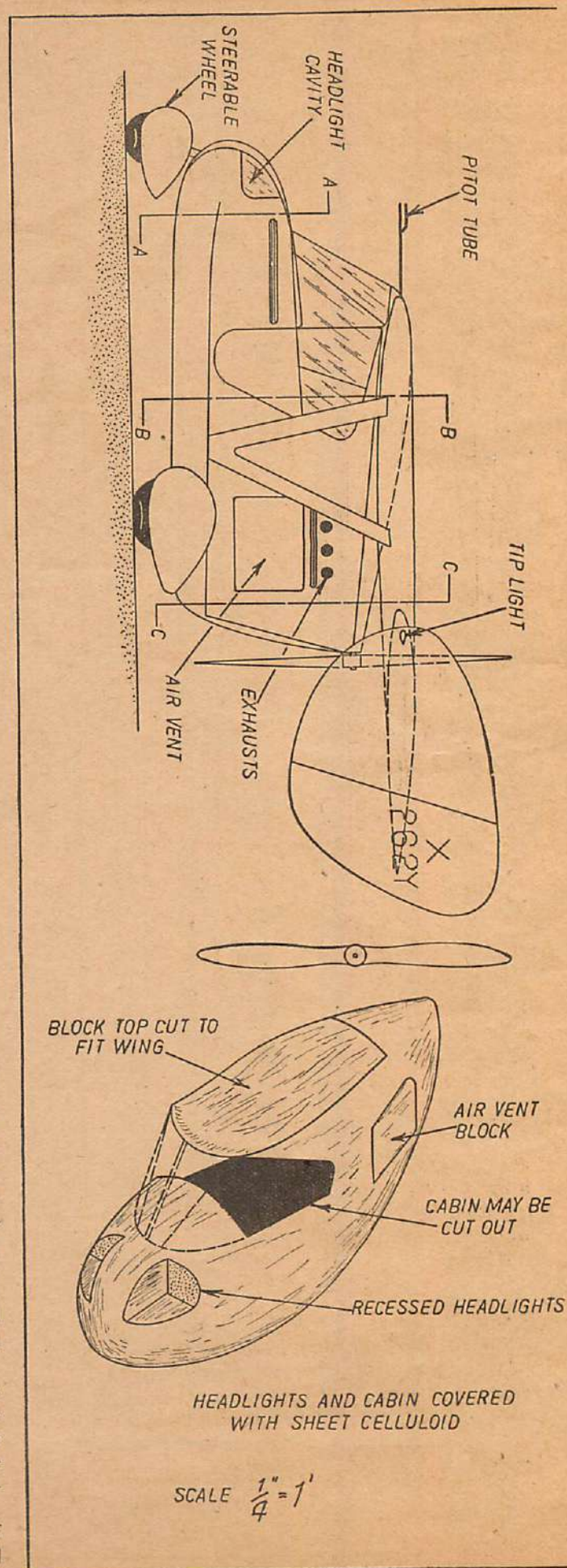
Draw the profile of the fuselage on the widest side of a soft balsa block of the required rectilinear dimensions and trim away the excess balsa. Mark and cut the block to agree with the top outlines on the plan. Round the fuselage in accordance with the given cross sections. Cut out the cabin at this stage, if desired; windows are usually painted white and trimmed in black. The headlight cavities are cut out to agree with the detail, using a sliver of a double-edged razor blade.

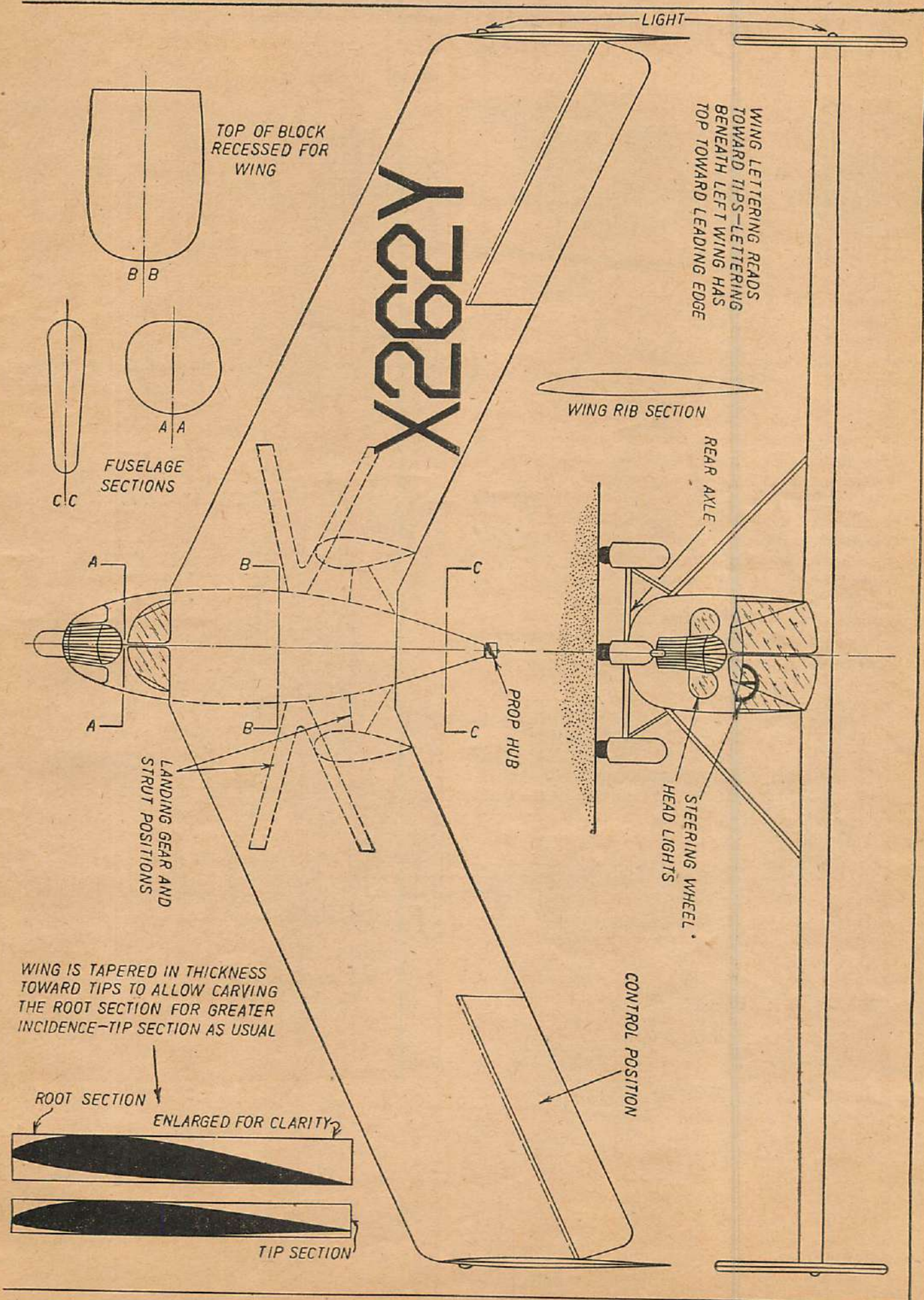
Cut the wing panels, one left and one right, from $\frac{1}{4}$ " sheet balsa, tapering the tips in thickness to approximately $\frac{3}{16}$ ". This is to permit carving the wing for the increased incidence at the center. Join the panels, after shaping to the required rib section, with thickened cement, reinforcing the joint with internal bamboo pegs; the assembled unit is sanded to a satin finish.

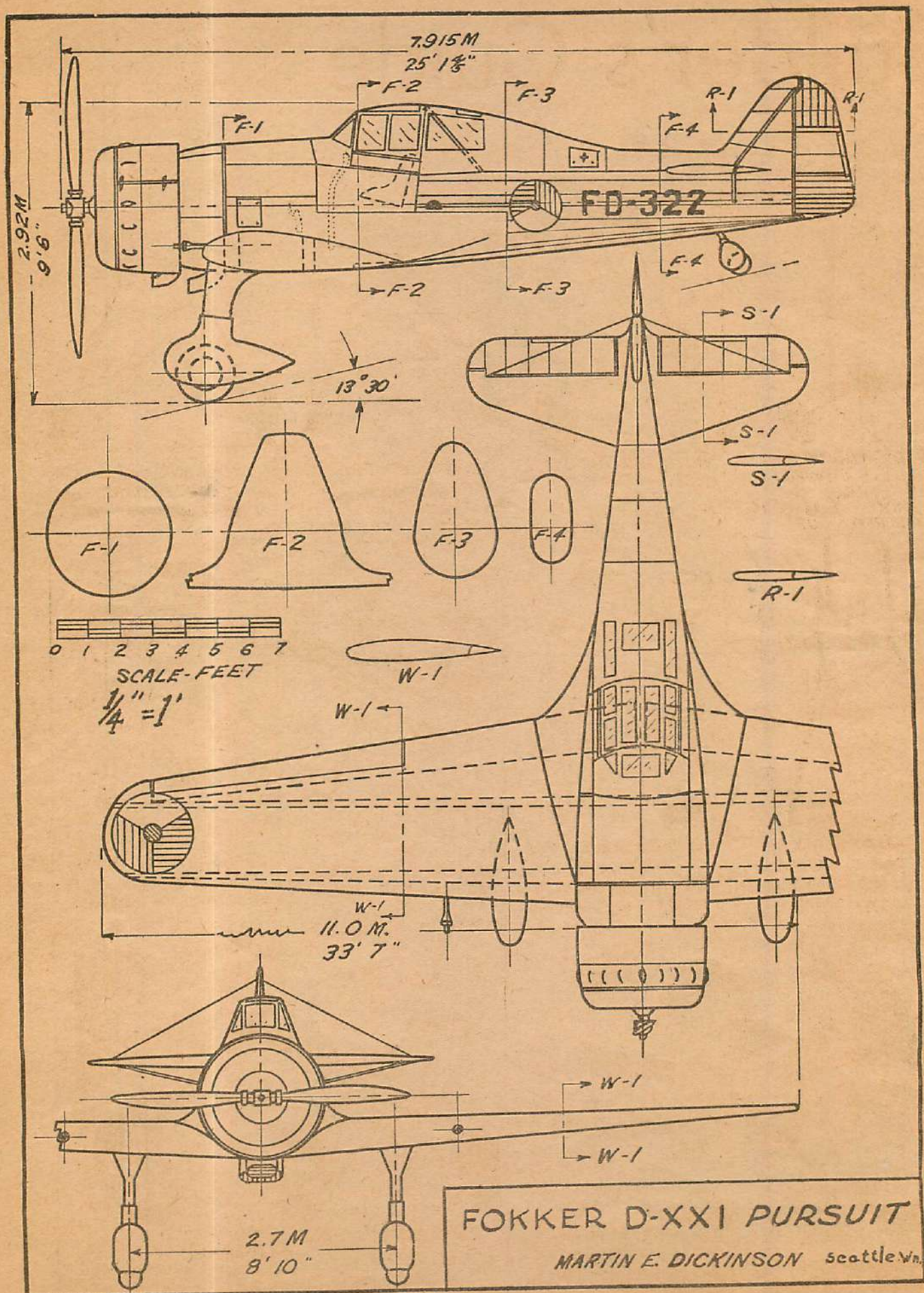
Curve the fuselage top to match the camber of the wing and cement the wing to the fuselage, using pins to hold the work firmly in position. Cut the wing-tip rudders from $\frac{1}{16}$ " sheet balsa. Cut to a streamline shape and sand smooth. Fit each in its proper position, carefully checking the alignment.

The landing-gear parts and wing struts are made of scraps, although pointed bamboo for struts are optional with the builder.

(Turn to page 95)

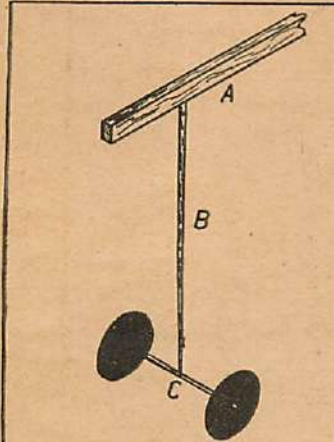




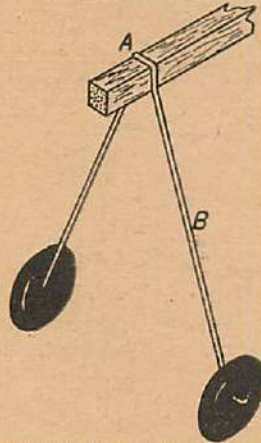


Builder's Guide

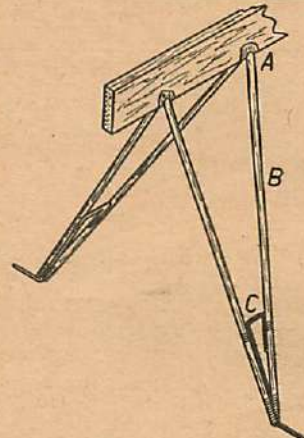
Landing Gear
by William Winter



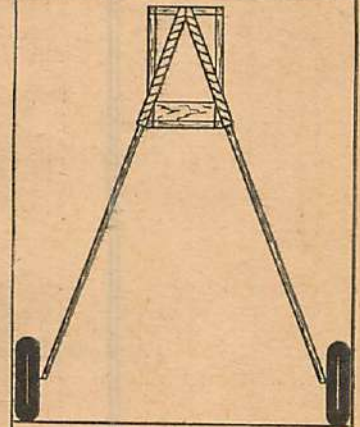
INDOOR R.O.G. TYPE HAS
INVERTED T BAMBOO
FRAME
A-STICK C-AXLE-STRUT
B-TAPERED STRUT



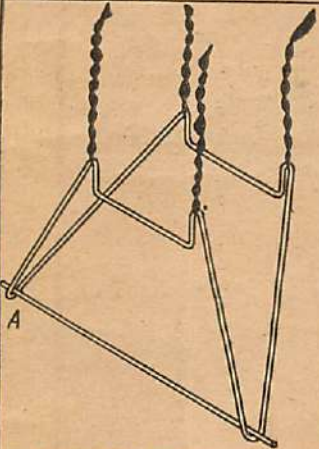
UTILITY R.O.G. HAS ONE
PIECE WIRE LANDING
GEAR
A-STICK U JOINT
B-WIRE CHASSIS



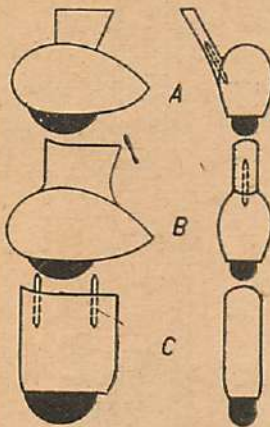
LIGHT UTILITY R.O.G. HAS
POINTED BAMBOO STRUTS
A-CEMENTED JOINT
B-STRUT C-WIRE AXLE



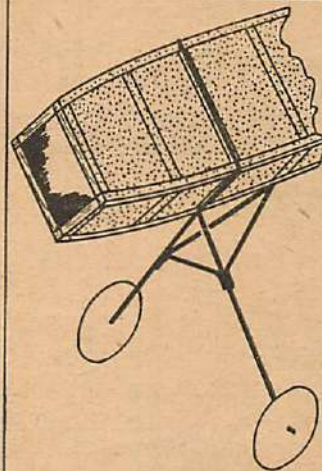
OUTDOOR TYPE HAS DETACH-
ABLE BAMBOO STRUTS SET
IN PAPER-WRAPPED TUBES



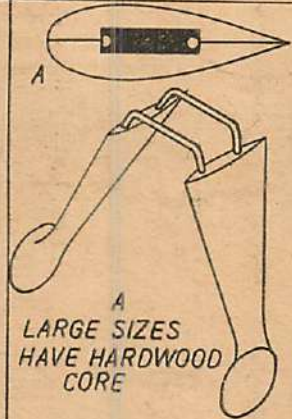
WIRE GEAR FOR BALSA
FUSELAGE IS SADDLELIKE
AND ATTACHED BY RUBBER
A-RUBBER BOUND



VARIOUS SCALE TYPES
OF LANDING LEGS THAT
REQUIRE INTERNAL PEG
OR WIRE REINFORCING

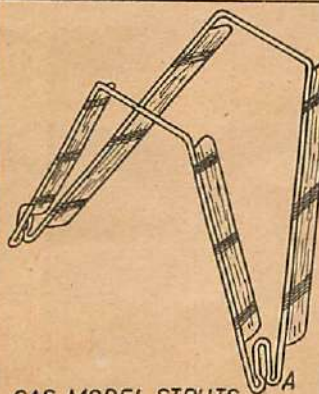


OUTDOOR DIAMOND TYPE
HAS WIRE BENT AROUND
FUSELAGE



LARGE SIZES
HAVE HARDWOOD
CORE

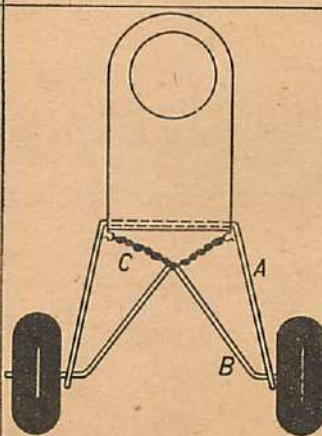
LANDING LEGS HAVE WIRE
ATTACHMENT PIECES RUN-
NING THROUGH FUSELAGE



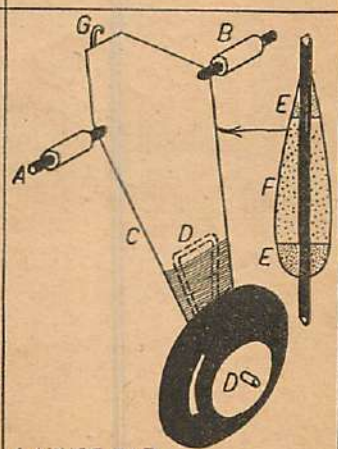
GAS MODEL STRUTS
STREAMLINED WITH
BALSA AND BOUND
A-SHOCK JOINT FOR CROSS
AXLE-RUBBER BOUND



GAS MODEL TYPE HAS
DRILLED HARDWOOD AT-
TACHMENT PIECES(A)
B-RUBBER-BOUND JOINT



SHOCK ABSORBING GEAR
A-WIRE STRUTS
B-WIRE AXLE
C- RUBBER



A-HINGE BAR
B-BEARINGS E-BALSA
C-STRUT F-HARDWOOD
D-AXLE G-RUBBER SHOCK
HOOK

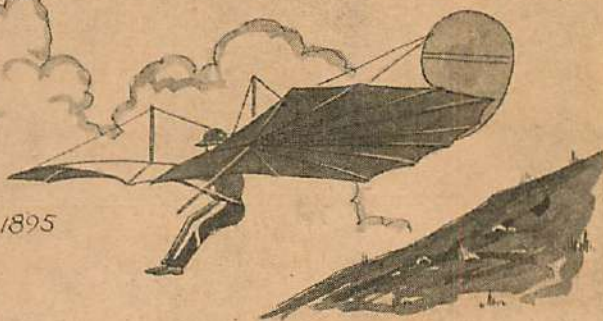
Name	Wiley Post	Mercury	Heath*	McGafey	Welch	American Eagle
Model	A	Chic T-2	Experimental	Gr-2	OW	Eagle B-32
Manufacturer	Wiley Post Aircraft Corp.	Mercury Aircraft, Inc.	Heath Aviation Company	McGafey Airplane Dev. Corp.	ATC 474	American Eagle-Lincoln
Factory	Oklahoma City, Oklahoma	Hammondsport, N. Y.	Benton Harbor, Michigan	L. W. monophane	South Bend, Indiana	Kansas City, Missouri
Type	Open	Parasol	Parasol	Enclosed	Enclosed	Parasol
Cockpit	2 side by side	Open	Open	2	2 side by side	Open
Seats	2 tandem	2 tandem	1	2	2 tandem	2 tandem
Price (factory)	\$1,438			\$1,650	\$1,195	\$1,575
Finance Terms					\$398 down, balance monthly	
Manufacturer	Ford (converted)	LeBlond Aircraft Engine Corp.	Heath	Ford (converted)	Welch	Aviation Holding Co.
Model	A	90	B-4	Y-8	0-2	Skelety
Total Rated h.p.	40	90 @ 2,125 r.p.m.	25 @ 2,800 r.p.m.	100 @ 4,000 r.p.m.	45 DC or manufacturer ?	45 @ 1,750 r.p.m.
Fuel Consumption		.015 lbs./hour (cruising)		3 gal./hour (cruising)		3 gallons per hour
Oil Consumption		28 gallons		16 gallons		10.5 gallons
Fuel Capacity	7 gallons	4 gallons			10 gallons	
Oil Capacity					1 gallon	
Propeller	Wooden	Hartzell wooden		90"	Flottorp wooden	76" wooden
Maximum Speed	82 m.p.h.	115 m.p.h.	73 m.p.h.	115 m.p.h.	93 m.p.h.	90 m.p.h.
Cruising Speed	70 m.p.h.	90 m.p.h.	62 m.p.h.	100 m.p.h.	85 m.p.h.	75 m.p.h.
Landing Speed	25 m.p.h.	40 m.p.h.	32 m.p.h.	35 m.p.h.	29 m.p.h.	25 m.p.h.
Initial Climb	600 ft./min.	900 ft./min.	500 ft./min.	500 ft./min.	450 ft./min.	700 ft./min.
Service Ceiling	10,000 ft.	18,000 ft.	13,000 (absolute)	12,000 ft.	11,000 ft.	14,500 ft.
Cruising Range	140 miles	375 miles	330 miles	500 miles	200 miles	250 miles
Wing Span	28 ft. 6 in.	35 ft. 8 in.	31 ft.	34 ft.	24 ft. 4 in.	34 ft. 4 in.
Length o.a.	19 ft. 8 1/2 in.	23 ft.	17 ft. 3 in.	23 ft. 9 in.	21 ft.	21 ft. 7 1/4 in.
Height o.a.	7 ft. 8 3/8 in.	8 ft. 7 in.	6 ft.	7 ft. 4 in.	5 ft. 8 in.	8 ft.
Wings (inc. ails.)	206 sq. ft.	192 sq. ft.	135 sq. ft.	196 sq. ft.	136 sq. ft.	164.4 sq. ft.
Areas				15 sq. ft.		17.84 sq. ft.
Fln				8.2 sq. ft.		4.35 sq. ft.
Rudder				8.1 sq. ft.		6.62 sq. ft.
Stabilizer				17.2 sq. ft.		12.96 sq. ft.
Elevators (total)				7 sq. ft.		12.07 sq. ft.
Weights						
Useful Load	581 pounds	935-950 pounds	450 pounds	1,130 pounds	540 pounds	509 pounds
Wing Load	411 pounds	378 pounds	250 pounds	394 pounds	394 pounds	413 pounds
Weight (gross)	992 pounds	366 pounds	700 pounds	1,750 pounds	170 pounds	922 pounds
Wing Loading	4.8 lbs./sq. ft.	1,528 pounds	28 lbs./sq. ft.	9 lbs./sq. ft.	6.6 lbs./sq. ft.	3.65 lbs./sq. ft.
Power Loading	25 lbs./sq. ft.		28 lbs./h.p.	17.5 lbs./h.p.	26 lbs./h.p.	20.5 lbs./h.p.
Spars	Spruce	Steel tubing	Solid spruce	Wood	2 ply spruce web	Solid spruce
Ribs	Plywood	Steel tubing	Plywood	Plywood	Bass wood	Spruce
Covering	Fabric	Fabric	Fabric	Aluminum	Fabric	Fabric
Frame	Welded steel tubing	Welded steel tubing	Welded steel tubing	Aluminum	Welded steel tubing	Welded steel tubing
Covering	Fabric	Fabric	Fabric	Aluminum	Fabric	Fabric
Frame	Welded steel tubing	Welded steel tubing	Welded steel tubing	Aluminum	Welded steel tubing	Welded steel tubing
Covering	Fabric	Fabric	Fabric	Aluminum	Fabric	Fabric
Type	Divided	Fixed, split type	Split	Individual	Fixed, divided	Fixed, split
Wheels		Kelsey-Hayes	Yes	Autofan	Air wheels	Air wheels
Brakes		Yes	Shock absorbing rings	Autofan	Yes	Yes
Springs		Rubber cord	Spring leaf type	Oil (Autofan)	Spring leaf type	Shock cord
Tail Skid	Yes	Leaf spring	Yes		Yes	
Tachometer		Yes	Yes		Yes	
Oil Pressure Gauge		Yes	Yes		Yes	
Oil Temperature Gauge		Yes	Yes		Yes	
Fuel Gauge		Yes	Yes		Yes	
Ammeter		Yes	Yes		Yes	
Throttle		Yes	Yes		Yes	
Water Temperature Gauge		Yes	Yes		Yes	
Compass		Yes	Yes		Yes	
Altimeter		Yes	Yes		Yes	
Airspeed Indicator		Yes	Yes		Yes	
Turn and Bank Indicator		Yes	Yes		Yes	
Controls		Dual stick			Wheel type	
Upolstery		Yes			Mechanical	
Fire Extinguisher		Yes				
First-aid Equipment		Yes				
Navigation Lights		Yes				
Landing Lights		Yes				
Instrument Panel Lights		Yes				
Engine Starter		Yes				

* The Parasol is also powered by the Continental A-40 40 h.p. engine. The Heath monophane, using component parasol parts, is fitted with either the Heath or the Continental engine—specifications and performance as follows: span 26 ft. 10 in., length 16 ft. 6 in., wing area 140 sq. ft., empty weight 937 lbs., maximum gross weight 1,528 lbs., landing 38 m.p.h., climb 500 ft./min., range 330 miles and absolute ceiling 15,000 ft.

Launching Development

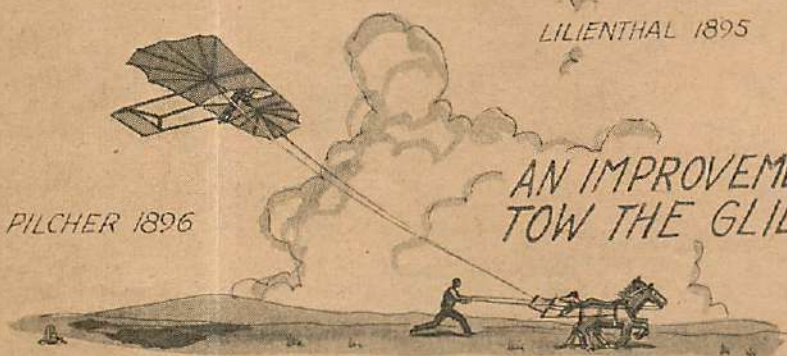
EARLY GLIDERS WERE LAUNCHED BY RUNNING DOWN HILL AND THEN LIFTING UP THE FEET.

LILIENTHAL 1895



PILCHER 1896

AN IMPROVEMENT UPON THIS WAS TO TOW THE GLIDER ALOFT WITH HORSES.



LATER THEY WERE CUT LOOSE FROM HOT AIR BALLOONS THOUSANDS OF FEET IN THE AIR.

MONTGOMERY 1905



A FALLING WEIGHT STARTED THE FIRST POWERED PLANES ALONG A MONORAIL TAKE-OFF TRACK.

WRIGHTS 1908

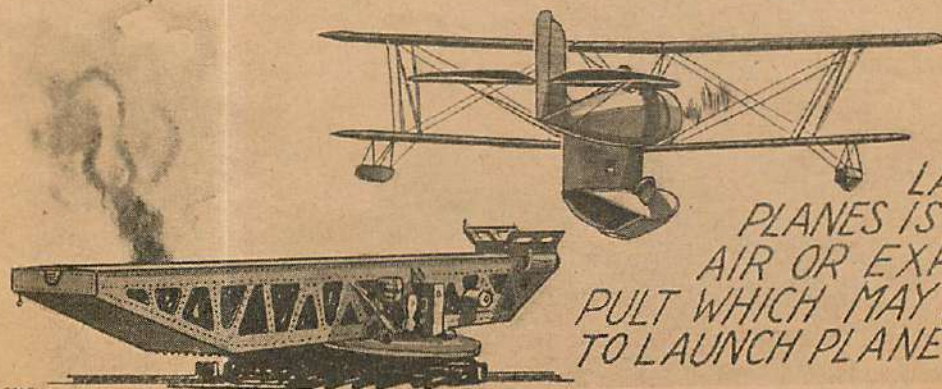


SEAPLANES WERE LAUNCHED SUCCESSFULLY INTO THE AIR BY SENDING THEM DOWN A TIGHT WIRE

ELLYSON 1911



THE MODERN DEVICE FOR LAUNCHING AIRPLANES IS A COMPRESSED AIR OR EXPLOSIVE CATA-PULT WHICH MAY BE REVOLVED TO LAUNCH PLANE INTO THE WIND.



THE LANCER'S READY

(Continued from page 22)

It was a diver coming up from the deep on an errand of death.

He clung to the buoy and waited. Bill did not see him. Then, as the pilot completed his work and began wriggling back to the boat, the diver raised his right hand. In it was clutched a heavy revolver. He held the gun poised for a fleeting minute. Then, taking sure aim, he brought the barrel crashing down across the back of Bill Barnes' head.

V—SEARCH

THE WALL CLOCK in the radio room of Barnes Airport showed five o'clock in the morning. Shorty Hass-further gave it a despairing glance and resumed his ceaseless pacing. He had had no sleep since Bill left with the ransom money, and his rugged face was haggard, his eyes strained and bloodshot.

Bill had said, "Wait until dawn. If I haven't radioed by then, you can start looking."

Now, in a little over an hour, it would be dawn, and still no word had come from Bill. At one end of the room, lying full length on a bench, was Sandy Sanders. The boy had been determined to share the night's vigil with Shorty and Tony, but fatigue had finally overcome him and he was now fast asleep. Alphonso, the monkey mascot, was curled up close to his young master, his eyes closed.

Tony Lamport, the radio operator, sat slumped before his equipment, an ash tray overflowing with cigarette butts at his side. His eyes stared dully at the radio's instrument panel.

A dead silence was over the room, broken only by the steady tramping of Shorty's feet as he continued his tireless patrol—back and forth, back and forth.

Tony turned around. "Take it easy, will you, Shorty?" he said irritably. "You're driving me nuts. Nothing has happened to Bill. He can look after himself."

"Yeah," Shorty said.

"Hell, we'll hear from him!" Tony went on, as if trying to convince himself. "Anyway, what could happen to him? That snatcher's certainly not going to get tough. All he'll want is the dough."

Shorty stopped walking and said quietly, "There's a lot of stuff you don't know, fella."

Yes, a lot of stuff, and Shorty almost wished he didn't know it, either. About Eddie Walker's connection with Karl Schrenk and the new fuel. About that murder warning to Bill. Didn't it all tie together? Wasn't the fuel at the bottom of the whole thing? Wasn't it more than coincidence that Eddie should

be kidnaped just at the time when he was heading for the secret laboratory?

"Aw, you're just imagining trouble, Shorty," Tony said. "I bet we'll get a call in the next five minutes."

Shorty said, "No bet."

A call did come through within that space of time—not by radio but by telephone. And it wasn't from Bill but from the harassed Marcus Walker.

Shorty talked to him. "We've heard nothing, Mr. Walker," he said in reply to the other's question. "We're still—waiting."

"No word here," Walker said, his voice tight with emotion. "No word of Eddie—of Barnes. Can't you do something? You have planes. Can't you go looking?"

Shorty said, "Our orders are to stand by until daylight. We couldn't do much good until then, anyway."

But after he'd hung up Shorty's worries increased, until he couldn't abide the thought of inactivity any longer. He said to Tony, as if in anger, "I'm taking off. I'll hear Bill's message in the Snorter's radio—if there is a message. If there isn't, I'll start looking that much sooner."

Tony said, "But, hey—Bill said to wait until dawn."

Shorty walked past the slumbering Sandy and opened the door. He said over his shoulder, "I'm going to meet it."

He met the dawn forty-five minutes later, as he guided his Snorter high over the New Jersey coast. And, keeping the ship to a great, circling course, he watched the glow in the east gradually heighten until the sky above and below him had bleached out. He could vaguely discern the calm surface of the Atlantic below. But mainly he watched the radio panel and waited for the message that did not come.

And now it was dawn. Shorty calculated his position with the marked

chart showing the exact location of the buoy, then pushed the stick forward. The Snorter howled down through a gray sky. At a thousand feet Shorty eased the angle of the dive and finally leveled off at fifty feet above the ocean. The wind had died down and scarcely a ripple marred the black waters.

The sliding hatchway was thrown back; the seat raised; Shorty leaned over the cockpit coaming and searched for the buoy. Then, when he thought he'd gone too far south and was about to bank around, he saw it. And moored to the buoy was a rowboat.

The next second the Snorter had pelted past overhead. But in that brief interval Shorty had had a quick glimpse of the interior of the boat. Lying full length on the bottom of the craft had been what looked like a human body.

Hastily, he spun the amphibian around and came back, the throttle reduced, the flaps down. Now he had a longer look. Yes, a man was in the boat—lying dead still.

Shorty landed with reckless haste and taxied toward the buoy. Fear crawled over him. He closed the throttle and allowed the amphibian to drift. Then, climbing down to the single pontoon, he waited until the rowboat came under the plane's low wing and grasped it by the stern.

He looked inside. The man was lying face upward. One leg was hooked under a thwart. His eyes were closed.

The man wasn't Bill! He was—Eddie Walker!

Eddie Walker—unconscious but alive! But where was Bill?

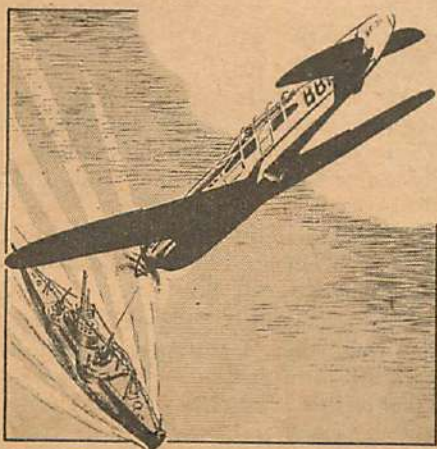
The question pounded across Shorty's brain as he loaded the unconscious Walker into the Snorter and flew him rapidly to New York. Nor did the answer come when the doctors finally brought Eddie out of his drugged state.

All Eddie Walker could say was, "I've no idea where I've been or what happened. I haven't seen Barnes. I only remember when my car was forced off the road and the men knocked me out. That's all—"

A week passed without any answer, without any clue. Bill, together with eight hundred thousand dollars in ransom money, had utterly vanished.

Shorty called in Stephen Drake, the special agent of the department of justice. Eddie Walker told him everything pertaining to the new fuel and Karl Schrenk. Then later, when Walker was able, Shorty flew him to the secret laboratory at Cay Blanco. There they found the laboratory a burned ruin and the guards and Karl Schrenk gone.

When he got back to the field, Shorty spoke to the assembled pilots of Bill's



The Lancer's nose was pointed directly on the conning tower—

squadron. He went over the entire case and the details of the search and ended up with, "We've done everything possible. We haven't found one lead. But we can't give up hope. Bill must be alive!"

VI—TO THE SOUTH

BILL BARNES gripped the metal bars of his prison room and stared at the hunchbacked man in the cell across the corridor. "Aziz Pasha is alive?" Bill said. "You are sure, Mr. Schrenk?"

Karl Schrenk said, "I am positive, Herr Barnes. He himself told me of how he escaped your bombs. You are now his prisoner and he boasts that he will kill you."

The famous chemist pulled a stool close to the bars of his cell and sat down. He was a gnomelike man with a large, closely cropped head which seemed to sink into his humped back. His eyes were small and bright.

Bill said in utter bewilderment, "But where am I? How did I get here? The last thing I remember I was at the buoy."

Schrenk lowered his voice, "I have been held prisoner here a long time. I have overheard many things. You were captured, Herr Barnes, in a very clever way. Aziz Pasha's submarine lay at the bottom of the ocean directly under the buoy. A diver left the submarine and climbed the buoy's anchor chain. He waited just below the water for you. He had little difficulty in knocking you unconscious."

"And then?"

"The submarine came to the surface. You and the money were transferred to it. They had previously taken Edward Walker aboard. He was placed in the rowboat and left. You were heavily drugged and brought on the submarine to Calibar Island."

"Calibar!" Bill said. "But that's where Aziz had his headquarters before. He couldn't use the place again. The Turkish government searched it and destroyed all the buildings."

"That is true," Schrenk said. "But the Turkish government failed to discover Aziz's submarine base. Under Calibar Island is a great natural cavern and a large lake. A subterranean tunnel connects the lake with the Caribbean Sea. The submarine uses it to come and go undetected from above."

Bill's grip tightened on the bars. For a long time he was silent. Then he said, "I can't believe it. It's too—" He looked up suddenly. "But you? What about you?"

Karl Schrenk shook his head. "Somehow Aziz Pasha heard about the fuel I had invented. That is why he captured Walker. They forced him to reveal where I was working by injecting him with a truth serum. They came to the laboratory in the submarine. My two

guards and I had no chance. They were murdered. I was brought here. And now Aziz Pasha has the formula."

"You told him the formula?" Bill asked incredulously.

Schrenk's mouth twisted. "I was injected with the same truth serum. The formula had never been written down but was only up here." He tapped his head. "I apparently told it to Aziz Pasha while under the drug. I have no memory of doing so. But Aziz is now making the fuel. I am being kept alive until they are sure it will work."

The chemist came abruptly to his feet and quickly motioned to Bill. "Some one is coming. It may be Aziz Pasha."

It was. A heavy door at the end of the corridor was thrown open and the fat Turkish criminal swaggered inside. Accompanying him were two armed Turks. Aziz stopped between the cells and looked from Schrenk to Bill.

"I am glad you two have become acquainted. I consider you both my greatest friends. Mr. Schrenk brings me an invention that will make me not only ruler of the united Moslem empire but of Asia and Europe as well. And Mr. Barnes brings me almost a million dollars—besides giving me the utmost pleasure of slitting his treacherous throat."

Bill said, "So it is Aziz Pasha. I thought I killed you once. The next time, I'll make damn sure."

"There will be no next time. Once you blocked my plans. But Fate has ordained me for even a greater rôle. My organization has been reestablished. My agents are everywhere. I have a fast-growing fleet of airplanes hidden away in Mexico. When this new fuel has been manufactured and tested thoroughly, it will be used in my airplanes. And my triumph will be at hand."

Bill saw the savage light in Aziz's eyes and he said, "You are a madman."

The Turk laughed. "All great leaders have been called insane." He paused and came closer to Bill. "The money which you brought me is not quite enough for my needs. I am going to ask five hundred thousand dollars for your return, Mr. Barnes."

Bill said, "For me?"

"Yes. I am quite convinced that your men will be able to raise the money. When they do, you will be returned. But you will know nothing of that. You will be dead."

Bill said steadily, "My men will never pay. You'll never be able to convince them that I'm still alive."

Aziz Pasha smiled. "They will be more than convinced. I am going to have a motion picture made of you while suffering torture. Subtitles will convey my ransom demands. The finished reel of film will be carried by one of my planes and dropped on your field." He rubbed his fat hands. "Your men will rush the

ransom money to me when they witness what is happening to you."

He spoke to the guards. "Bring Barnes along now."

The cell door was unlocked. The two guards seized Bill by either arm and pulled him outside. They followed Aziz down the narrow corridor and through the open doorway.

Bill heard Karl Schrenk say, "Be brave."

His voice was shut off as they made a sharp right turn into another passage. Through an opening in the rock wall Bill had a brief glimpse of a great domed cavern beyond. Bands of sunlight struck down from high overhead. In the half light he saw the cigar shape of a giant submarine floating on a lake at the bottom of the cavern. Men were working over the craft and the hatches stood open.

Aziz Pasha had turned around, "You will see more of that later, Barnes. The studio is awaiting the star performer."

The studio consisted of a large cave with rough, slimy rock sides. A powerful searchlight was focused on one wall, from which four iron rings protruded.

Aziz said, "Your pose for these pictures will be rather confining, Barnes. You will be spread-eagled, your wrists and ankles locked in those rings." He turned to the guards. "Get him ready."

There were six other men in the room. A small, portable motion-picture camera was being set up on a tripod and focused.

Aziz called to one of the men. "Bacoub, hasten to Dr. Kara and summon him here. He will enjoy witnessing this."

Bacoub looked uneasy. "Dr. Kara has retired to his quarters, master. He does not feel well."

Aziz's eyes grew hard. "The fool has drugged himself into a stupor again," he said. "He will not be normal for many hours. I must stop his indulgence in the future. I may be in need of his brilliant mind."

Aziz lighted a cigarette and calmly watched as Bill was backed against the stone wall and his arms spread far apart. The open metal bands were snapped over his wrists and his ankles locked in the other pair of rings.

"Bare him to the waist," Aziz ordered. "And bind his mouth with cloth, so that he will be unable to say anything that a lip reader could translate."

A heavily muscled Turk, holding a long whip, approached Aziz.

Aziz said to him, "Put on your mask. Your face must not be seen in the film. While the camera is operating, you will lash Barnes across his bare torso."

Bill, held motionless in the iron rings, stared out into the room, as his shirt was ripped from his body and a gag forced into his mouth. His gaze centered on the gloating Aziz Pasha.

crophone in Arabic, "Calling Pilot 14! Calling Pilot 14! Urgent! Headquarters calling Pilot 14—"

VIII—FROM THE SKY

IT LACKED a few minutes of six p. m. when Sandy Sanders saw the biplane pass high over the Long Island airport. The kid ace was seated on the concrete apron in front of Hangar 4, his back against the closed hangar doors. Alphonso, the monkey, was scampering around in front of him.

Sandy watched the high-flying plane with little interest. His usual cheery, freckled face was gloomy and the corners of his mouth were turned down. Alphonso, with a lithe bound, landed on the boy's shoulder, put hairy arms around his master's neck and gently bit his ear.

Sandy winced and shook off the monkey. "Hey, quit it, Alphonso!" he said peevishly. "This is no time to start kidding around. It'd be different if Bill were here."

He suddenly sat up straight, his gaze still on the biplane. The ship, having passed over the field, had now abruptly banked around and was diving. The noise from its engine rose from a drone to a roar.

Sandy jumped to his feet, took another quick look, then started for the administration building. He cupped his hands and yelled, "Hey, Shorty! Red! Cy!"

Shorty's voice came from a window. "What's up, kid?"

"Look! A ship diving on the field. Get out here."

Shorty came on the double, and with him "Red" Gleason and Bev Bates. By the time they arrived the biplane was down to two thousand feet. The angle of its dive had lessened.

Martin, the head mechanic, had come out of a hangar and Shorty bellowed to him. "Run my ship out—fast!"

"Yes, sir!" Martin disappeared.

The biplane was now overhead. It leveled off. The pilot's right arm suddenly appeared over the side of the cockpit and a small object dropped from his hand.

Sandy yelled, "A bomb!"

Before the words had left his lips he saw that it wasn't a bomb, that a small, white parachute had blossomed out. Something small and round was tied to the end of the shroud lines.

The biplane was now zooming steeply and heading away into the south.

"Maybe it's a message from Bill!" Sandy said. "It's going to land in the center of the field. C'mon!" He started running.

The wind was blowing the parachute farther and farther across the field, as it gently descended.

Shorty shouted, "Hold it, kid. He's coming back."

Sandy stopped, looked around. The biplane, after tearing away from the field, had whirled and was now over the group of startled watchers. It hurtled on across the field. Suddenly, it zoomed straight up at the descending parachute. The right wing tip barely missed the billowing silk as it zipped past. The machine whipped around. Again it charged the small parachute.

Sandy said excitedly, "He's trying to pick it up. Look! There he goes again!"

The pilot of the biplane was making desperate efforts to retrieve the dropped parachute. Suddenly, he dived straight at it and the men on the ground heard the rattle of gunfire. The hail of bullets from the ship's guns slashed through the silken umbrella, riddling it. The parachute dropped faster—was almost on the ground.

The doors of a hangar were slammed back and mechanics hastily ran out a Snorter amphibian. Shorty raced to the machine, vaulted into the front cockpit. The Diesels boomed into life.

Red Gleason joined Sandy. "Let's get the thing," he shouted.

But Sandy was already on his way. He saw the parachute hit the ground and collapse. The biplane was now over the far end of the field. It banked steeply and came roaring toward the fallen parachute, the plane's wheels almost flicking the turf. Then, once again its guns opened fire and bullets slashed across the ground where the parachute lay.

The line of fire lifted as the plane swept over its target. Red bellowed, "Down!"

Sandy hit the field flat. He heard the scream of bullets close overhead and hugged the ground closer.

The biplane thundered over Red and Sandy, the belly of its fuselage seeming to miss their prone bodies by inches.

Shorty's Snorter was now tearing down a runway for a take-off. And the biplane, like a thing gone mad, whirled and dived on the amphibian. Again its guns yammered. A torrent of slugs slashed across the Snorter's left wing. Then Shorty blasted his ship into the air.

The biplane didn't wait. With its engine screaming power, it arrowed high into the sky, heading toward a distant, heavy cloud bank.

Sandy leaped to his feet. He caught a glimpse of Shorty gunning the Snorter in hot pursuit of the other plane; then the boy broke into a wild sprint. Red and Bev and three mechanics were close on his heels.

Sandy reached the parachute, picked up the object fastened to the shroud lines. It was round and flat, like a drum for a Lewis gun.

Bev said in alarm, "Leave it alone!"

But Sandy had already forced off the lid. He looked inside, and said: "A

movie film. Jimmy! I wonder what it is?"

AZIZ PASHA clenched his hands and muttered through his teeth, "The fool! The fool!"

From a loud-speaker in the radio room Pilot 14's excited voice was shrilling out, "I cannot get it. It is too late. A plane is coming after me."

Aziz Pasha said to the radio operator, "Tell him to flee."

The message was relayed.

Dr. Kara turned to Aziz. A twisted smile was on his face. "Excellent, O great and powerful master," he said mockingly. "The film has been delivered as you planned. Barnes' men will now see their leader in horrible torture. And they will also read the message. What are you going to do now, O great one?"

Aziz Pasha's fingers curled into the soft palms of his hands. "The message is most obscure. They may not detect it."

"But if they do, they will come down here," Dr. Kara said. "We will have to leave, master."

Aziz Pasha scowled. "Leave? Not yet. I will direct my New York agents to—"

The radio operator cut in. "Pilot 14 reports gaining cover of heavy clouds. Believes he has effected escape from Barnes plane."

"Very well. Instruct him to report to Base 10." Aziz Pasha turned and walked from the room. Dr. Kara went with him.

Aziz Pasha said, "I will send my agents in New York to raid Barnes' field. They will recover the film before the others have a chance to detect the message."

"Easy to say," Kara remarked. "But, more than once we have inspected the plans of that airport and found the place impregnable. Your agents haven't a chance of getting inside."

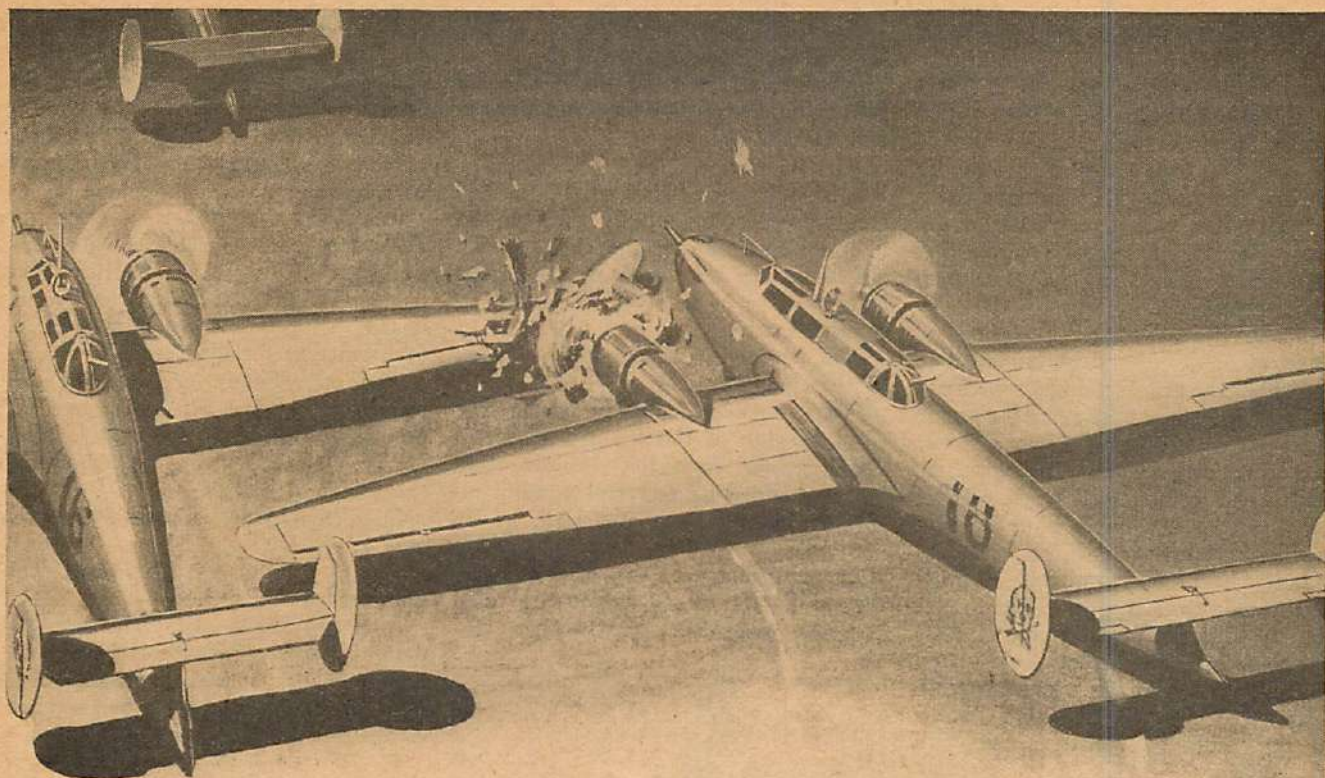
Aziz Pasha's eyes were thin. "Barnes is still under the influence of the truth serum. I will ask him how to gain access to his field. He will tell me."

IX—THE FILM

AT eight o'clock that night the mess hall at the Barnes Airport was in total darkness save for a V of intense white light coming from Sandy's motion-picture projector. The widening track of light passed over the heads of the assembled pilots and ended on a square screen.

Sandy stood behind the projector and watched the film click through for the fourth time. The repeated sight of Bill being whipped by the masked man sent cold shudders through him and hot tears stung his eyes. If only they knew where Bill was.

The film reached the end of the run



The propeller of his port engine slashed through the trailing edge of the other plane's wing—obliterating the aileron—ripping the metal covering of the wing section into a jagged wreck—

and the screen was bathed in blinding light. Sandy turned off the machine and groped his way through the darkness to the near-by wall, where the small red glass of a fire-alarm button gleamed brightly. Directly above it was the mess-hall light switch. He pressed the switch and the chandeliers overhead blazed on, illuminating the large room.

Shorty stood up and faced the other pilots. "We'll run it through once again. Fix it up, kid," he said to Sandy. Then to the others, "Bev's out at the main gate, waiting for Steve Drake and his G-men to arrive. They should be here soon. Maybe they'll find something that we've overlooked. Bill must have given us some clue."

Red Gleason shook his head wearily. "I think we're looking for something that isn't there, Shorty."

The veteran pilot scowled. "Nuts on that. Listen. That film was made so we'd be sure to send the five hundred gees. The guy drops it on the field. Then, suddenly, he changes his mind and tries to recover it. When he sees he hasn't a chance, he opens fire, probably hoping to wreck the reel." Shorty paused and looked around. "Why the sudden change in tactics? Doesn't it sound logical that they discovered there was something in the film we shouldn't see? And what could that be? A message. Of course, Bill would try to send one. Anyhow, we'll keep looking."

Cy Hawkins slid a hunk of chewing gum into one cheek and drawled, "Adds up pretty straight to me, fella. I wish to hell you'd have knocked down the guy that brought it."

Shorty grunted. "Don't I? But he got away, so that's that. All set, Sandy?"

"Just a second."

Shorty said, "Now watch Bill's every move, you guys. Don't miss a thing."

Sandy said, "O. K. Kill the lights, Red."

As the lights of the mess hall winked off, the track of illuminosity stabbed out from the projector. Once again the scene that was etched on the minds of every man there lived before their eyes. And once again Sandy saw Bill pinned helplessly to the stone wall.

He watched Bill's face contort as the whip lash curled around his body. He watched Bill's eyes blink spasmodically. He blinked twice rapidly, twice slowly. Sandy saw that same blinking repeated, again and again.

He shouted, his shrill voice blasting across the silent room, "Shorty! Look! Bill's eyes! He's blinking in code. He's sending two dots and two dashes. International Code. He's sent 'Signals' three times."

There was a brief, complete silence. Then Shorty bellowed, "Yes, I see. 'Signals.' Bill's getting our attention. Watch. He'll start his message. There

it is! Dash . . . dot . . . dash . . . dot. The letter 'C'!"

With intense excitement gripping every pilot, they watched the tortured face of their leader. His eyes winked out a dot and a dash.

"The letter 'A'!" Shorty said. "He's sent 'CA——' Here's the next letter. Dot . . . dash . . . dot——"

Then, without a trace of warning, the screen went black as the light from the projector suddenly snapped off. The double doors of the mess hall crashed open. Indistinct shapes poured through. An object arced through the blackness, hit the floor and exploded with a dull thud. Biting fumes swept the room.

"Tear gas!"

Instantly, Sandy knew that some one was after the film. He didn't pause to reason how and why. He acted. With one sweep of his right arm, he wrenched the projector off its stand and, hugging it to him, dived headlong under the long mess-hall table. The fumes were biting into his eyes, into his throat.

No sooner had he gained his temporary hiding place than the mess-hall lights came on. Sandy looked out from under the table. Through the moisture in his eyes he had a blurred impression of five masked men dressed in khaki overalls. Two held submachine guns nestled in their arms. The others had automatics.

Shorty, Red, and Cy had staggered to their feet and were pawing at their eyes,

as the tear-gas fumes swirled around them.

One of the masked men said, "You will all raise your hands."

Sandy lay motionless, hidden for the moment. The long mess-hall table under which he covered had been pushed back. An open window was near by and the breeze from it swept the suffocating fumes away from the boy. His eyes cleared rapidly.

Somehow, these masked men had gained access to the field, undetected. They had thrown the building's main light switch. They were after the movie film.

As if echoing his own thoughts, he heard a curt command, "Where is that motion-picture machine? Find it. Get the film. Destroy it. Quick!"

Sandy held the projector tightly. They couldn't destroy the film. Not now. Not when the beginning of Bill's message had just been discovered. And then, to Sandy came an agonizing realization. The chances were that Shorty and Red and Cy weren't armed. He most certainly wasn't. In the hitherto safety of the field, such a thing had never been necessary.

Shorty and the other two were powerless to help. That left it all up to him. Momentarily, he had escaped detection, but not for long. Somehow, he had to summon aid.

The table had been pushed within a yard of the wall near the open window. Sandy's eyes went to the window. For one mad second, he contemplated throwing the projector outside and diving after it. But, cool reasoning told him that he would be shot down before he could succeed.

Then, his gaze fastened on the gleaming red circle of the fire-alarm signal attached to the wall behind the table. That was the solution. Somehow he had to press that button, to ring the alarm and—

Not only would the fire truck respond, but every man on the field would come on the run.

The button was high above where he was crouching. He wouldn't be able to reach it undetected. With his heart galloping in his side, Sandy released his hold on the projector and slowly crawled out from under the far side of the table. He stood up, leaned against the wall and feigned to be suffering from the gas. He wiped at his eyes with his left hand while, concealed behind his back, his right hand was frantically feeling the plaster wall behind him.

He heard a harsh commanding voice say, "Another one! Put up your hands. You, boy!"

Sandy pretended not to hear, as he hunted madly for the alarm button. Then his finger tips contacted its smooth surface. He pressed once, twice, three times.

No sound came from the alarm button itself, but Sandy knew that strident gongs were crashing out within the fire house, the control building, and the administration building.

"Get up your hands!"

Sandy obeyed. Three of the masked men were moving rapidly through the hall, searching under the chairs, while the other two stood with machine guns leveled. One of the men was hurrying toward Sandy.

The leader said urgently, "Quick! Find it!"

From outside, suddenly, came the shrill keening of the fire truck's siren. Another siren from the administration building added its powerful voice.

"An alarm!" the masked leader shouted.

At that moment, the man heading toward Sandy looked under the table and saw the projector on the floor. He



A plume of greasy smoke blew from the motor cowlings of the stricken biplane—

yelled, "It is here. I have it." He bent down.

The leader said, "Destroy the film. Strike a match. Then run for your lives."

The fire engine was nearer. Sandy heard the sound of running feet. The man had lifted the projector and placed it on the end of the table directly in front of Sandy. The gunman took a match box from his pocket and opened it.

Sandy didn't wait. He quickly sidestepped from behind the table, seized a chair, and, with a lightninglike motion, brought it crashing down on the man's head.

Some one fired. The bullet zinged past Sandy's head as he dived for the floor. He had a fleeting glimpse of Shorty, Red, and Cy plunging for cover behind furniture. The blast of the gun would warn the others outside of danger.

Sandy landed on his stomach and rolled over. The man he had hit had been knocked back. He was now fighting to get to his feet, dazed by the blow, a torrent of foreign words coming from his lips.

The masked leader shouted wildly. Another shot crashed out. Then the double doors to the room again smashed open. Sandy caught a snap view of Stephen Drake and three of his G-men rushing inside, shooting. Bev Bates was with them.

The stream of fire from their guns slashed across the raiders before they could turn. Three of them were cut down. The masked leader tried to shoot it out. But before his automatic had fired twice he dropped in his tracks.

The man Sandy had attacked had leaped to his feet and, with one wild plunge, had reached the open window. He dived straight through it, followed by a fusillade of bullets.

Stephen Drake bellowed, "Get that man alive!"

But they didn't get him alive. They didn't get him at all.

Stephen Drake, who had so providentially arrived at the right moment, directed the search. But no trace of the man could be found. He had somehow escaped—the sole survivor of the raiders.

It was during the search that Shorty learned how the enemy had gained access to the field. Back in the mess hall he told Drake, "We found a specially constructed ladder down by the southeast corner of the field. It was like a large stepladder. That's how they scaled the electrified fence and overpowered the one guard without sending in an alarm." Shorty shook his head. "It's damn funny that they'd pick the only place in the whole field where such a thing could be possible. Bill has said any number of times that he'd have to do something about that section. Strange that they should know exactly where to go."

But to Sandy nothing mattered now except that the film had been saved. He passed off his prominent part in the fracas with a shrug and worked frantically over his damaged projector, so that the rest of the film could be shown and Bill's message learned.

Then, under the watchful eyes of Stephen Drake and the others, the reel was again run off. With mounting excitement, the silent message was received and decoded:

CALIBAR AZIZ SUB

Shorty had the three words written down on a pad. He gazed at them thunderstruck. "Aziz! That must mean Aziz Pasha! But he's dead! Bill killed him months ago!"

Sandy said excitedly, "Calibar is the island where Aziz had his headquarters. I was held prisoner there. I know all about it. And, listen. That word 'Sub'—Aziz had a submarine. He was in it when Bill bombed him. Maybe—maybe he got away!"

"He must have," Stephen Drake said. The government agent's grizzled face

was grim. "There's no time to figure out how or why, Shorty. Bill's words are enough. Aziz Pasha must have kidnapped Eddie Walker. He must be holding Bill down at Calibar—perhaps aboard the submarine."

"But—but—it seems impossible," Shorty said. "Aziz Pasha alive! But if he is—if he has Bill—he'll kill him. Bill wrecked all his plans."

Bev Bates cut in. "Say, do you think Aziz Pasha has captured Karl Schrenk, too?"

Shorty swore softly. "Karl Schrenk! If he has Schrenk—he has the new fuel. And that means— Aziz had a scheme of uniting the Moslem countries. Bill wrecked that. If Aziz has the new fuel, he'll try to put over that wild plan again. This time he might succeed. It would mean a world war."

There was a silence as the full meaning of Shorty's words became clear to every man.

Drake turned to Shorty and said quietly, "Aziz Pasha is asking five hundred thousand dollars in ransom for Bill's return. Are you going to open up negotiations with him?"

"Negotiations? With that murderer?" Shorty lunged to his feet, kicking his chair back. His voice became a hoarse shout. "Prepare every plane for flight! We're taking off! We're heading for Calibar! We're going after Bill!"

X—PLANS

BILL savagely paced the confines of his small cell. "I told Aziz how to get into my field!" he said violently.

Across the narrow aisle stood Karl Schrenk, holding to the bars of his prison room. "Do not take it too hard, Herr Barnes," he said quietly. "Every one is powerless under that devilish truth serum. You can imagine how I felt when I learned I had revealed the formula for the fuel—the formula on which I had worked for years."

"Yes. But Aziz's men may have stolen the film before my pilots could read the message. They may have killed some of my gang!"

Schrenk's voice dropped lower. "I don't believe Aziz's agents recovered the film, Herr Barnes. Something is happening outside. There is much excitement. I have heard men running and shouting orders. Listen."

Bill did. Muffled sounds of activity came from beyond the stout door at the end of the passageway. He looked over at Schrenk. "Yes, I hear," he said eagerly. "If my pilots got the message, they'd head for here pronto."

"Yes," Schrenk said. "And Aziz may be preparing to leave in his submarine. Somehow we must stop him."

"But how?" Bill asked hopelessly.

"We must find a way. If he leaves, he will kill us before he goes. Not that I am worried over losing my life. I have

FREE

SPRAY
for Your
MODELS

or
1 DZ. SHEETS
JAP. TISSUE

or
PLANS

20 IN. MODEL

(Choice of 3)
CURTISS-WRIGHT
COUPE, HEATH
PARASOL, U. S.
BOEING P-12C
FIGHTER
DRIGGS SKY-
LARK
BELLANCA SKY
ROCKET

with

ORDERS
OF \$1.00 OR
MORE

TAKE ADVANTAGE

of this special FREE offer now! Experience what a real pleasure it is to do business with a model airplane supply house that keeps promises! Every order is shipped same day received! All materials are of highest quality! Prove this to yourself! Learn why so many builders, dealers and clubs deal with SKYWAY! Dealers! Send for prices.

Wholesale Prices for Retail Buyers

18" Balsa Sheets 1/32x2 .5 for 5c 1/16x2 .5 for 5c 3/32x2 .4 for 5c 1/2x2 .2 for 5c 3/16x2 .2 for 5c 1/4x2 .2 for 5c For 3" Sheets, double above prices.	18" Balsa Strips 1/16x1/16 100 for 5c 1/16x1/8 35 for 5c 1/16x1/4 30 for 5c 1/16x3/16 20 for 5c 1/16x1/2 15 for 5c 3/32x3/32 30 for 5c 1/4x1/4 .12 for 5c 1/2x1/2 .6 for 5c 1/2x1/2 .3 for 5c	NOSE PLUGS. large .10c doz. small .5c doz. Clear Dope 1 oz. .25c 1/2 pt. .125c Miscellaneous Washers, 1/4, 1/8 Doz. .1c Sandpaper, 1/2 pkg. 5c Colored Dope 1 oz. .5c 1/2 pt. .30c Clear Cement 1 oz. .25c 1/2 pt. .125c 1 pt. .45c Wood Veneer 20x30" 1 for 9c 2 for .17c	Celluloid Wheels 3/4" .1 pair 5c 1" .1 pair 7c 1 1/2" .1 pair 9c 2" .1 pair 15c Balsa Balloon Wheels 1/2" .1 pair 2c 3/4" .1 pair 3c 1" .1 pair 4c 1 1/2" .1 pair 5c 2" .1 pair 8c 3" .1 pair 14c PROP. SHAFTS 2 for .1c PAUL-O-WINE JAP PROPS (Add 5c per inch for props up to 10".) Machine Props 3/4" .1 pair 4c 1" .1 pair 5c 1 1/2" .1 pair 7c 2" .1 pair 10c Rubber Motors 1/16 sq. 20 ft. 5c 1/8 sq. 20 ft. 5c 1/4 flat 20 ft. 5c	Model Pins pkg. 5c Brushes No. 6 5c INSIGNIAS— French, American, English, German 1/4" .4 for 3c 2" .1c 1 sheet of 24, 5c Dummy Radial Engines 1 1/2" Diam. .14c 2" Diam. .18c 3" Diam. .23c DOWELS, 1/6x12 10c per doz. SPOT WELDED HOLLOW ALUMINUM WHEELS 1" .1 pair 6c 1 1/2" .1 pair 7c 2" .1 pair 10c Sheet Aluminum .003 .sq. ft. 10c Alum. Tubing 1/16", 3/16", 1/4" .10c ft. Thrust Bearings .1c Bushings, doz. 3c
---	--	--	--	---

ORDERS 75c or under 15c postage. Postage prepaid on orders over 75c. West of Mississippi add 10c extra. Canada: add 15c extra on orders under \$1.00. On orders over \$1.00 add 15%.

SKYWAY MODEL AIRCRAFT SUPPLY CO.

383 Seventh Ave.
Dept. B.
Brooklyn, N. Y.

not told you before, but I have an incurable heart disease. My days are numbered anyway. But if Aziz escapes from here he will take the formula with him. He will use the new fuel to wage war, to kill. The fuel that I invented to promote world peace. We have to stop him, Barnes, we—"

Bill put up a hand for silence. From the door at the end of the passage came the sound of a key sliding into the lock.

Bill had a sudden plan. He whispered hastily across to Schrenk. "The guard. If he's come to take me out, I'll stumble against him. Knock him against your cell. You put your hands between the bars—grab his throat—"

The door swung open and Bill stopped talking. He received a quick nod of agreement from Schrenk.

It was the guard—a tall burly Turk wearing a soiled white military tunic and shorts. His legs and feet were bare. On his head he wore a large purple fez. He held a Luger in his right hand and a key ring in the other.

He stopped in front of Bill's cell and said, "The master wants you. Come."

The man selected a key from the ring and unlocked the cell door. Bill waited tensely for the chance to put his reckless plan into operation.

But the chance didn't come. The guard, after opening the door, backed away toward the passage. Bill walked outside the prison room. He saw the disappointment on Schrenk's face.

The guard said, "Hurry, *effendi*," and gestured with the Luger.

Bill went past him down the corridor and through the open door at the end. The guard quickly followed and held the muzzle of his gun against Bill's spine.

The route through intersecting narrow passages was familiar to Bill from his previous visits to Aziz, but now he

walked with every sense alert. They reached the pathway that was cut into the side of the cavern wall and went along it. Directly below was the long, oval-shaped lake. The submarine lay motionless, moored to the rocky side. A gang of men were working around her. Bill saw that refueling was going on, that supplies were being hastily carried aboard.

Karl Schrenk had been right. Aziz was planning to leave. The activity was not only around the submarine. A procession of men was climbing the path that spiraled up into the gloom-shrouded cavern dome above. The path, Bill knew, led to the top of the island.

The pressure of the gun in his back forced Bill on. Halfway down the side of the lake they reached one of the numerous openings and the guard said, "Enter here, *effendi*."

Bill saw that he wasn't being taken to Aziz's office. That lay farther along. They passed through the opening and stopped before a wooden door. From behind it Bill heard Aziz's voice saying angrily, "You take the narcotics again, you fool—at a time when everything is at stake."

Then Dr. Kara's voice sounded, low and mocking. "I am useless, master, in the face of genius such as yours. Do not tell me that your latest plans have gone wrong."

The guard stepped beside Bill and rapped sharply. The conversation inside the room broke off. Aziz's voice said, "Enter."

The guard pulled the door open and pushed Bill through into a small cave. It was crudely furnished with a camp cot, a table, folding chairs, and a metal lamp. Dr. Kara was lying on the cot, his clothes disheveled. He was unshaven and his face looked like white wax under

the heavy, black stubble. His eyes were half closed and Bill realized that Kara had once again surrendered to the seduction of the drugs.

Aziz Pasha was seated beside the table. He took an automatic from a holster and said to the guard, "Leave Barnes here. Wait outside."

The guard salaamed. "Yes, master." He left.

Aziz's little eyes fixed on Bill with burning intensity. His voice was deceptively mild and polished when he spoke. "I have called you in for a last talk, Barnes. Your message has been received by your men, despite my efforts. I have been advised that all your airplanes have left your field and are flying for this island. Unfortunately, I won't be here to greet them, but I have arranged an ingenious reception. More about that later.

"My own personal air squadron is coming here from Mexico and, within the next half hour, will land on the field above, under cover of darkness. They will be loaded with the new fuel and will take off immediately. You think, perhaps, Barnes, that I send them against your planes, yes?"

Bill stood silent, his face expressionless.

Aziz went on. "No. I have a much better scheme. My planes will carefully avoid contact with your fleet and will fly straight to your New York airport—now quite defenseless. Their load of bombs will be released. Your airport and your ground force will be blasted out of existence. After that my planes will head straight for Turkey without stopping—thanks to Mr. Schrenk and his miraculous long-range fuel."

A flush of anger colored Bill's face. His fingers knotted into fists at his side. He cast a look around the room. Dr. Kara had closed his eyes and was apparently sleeping. Near by on the table Bill saw a large hypodermic needle—the one with which he had received the truth serum.

Aziz said sharply, "You wonder why I do this, Barnes? I will tell you. I hate you and everything that belongs to you. Once you defeated me. This time you tried to trick me. But I will have the last laugh. Listen to me, you wise one.

"When my planes leave Calibar, Dr. Kara and I and all the remaining men on this island will board my submarine. We will leave this place. We will head straight across the ocean to Turkey."

He stopped suddenly and raised a hand. "I must correct myself. Every man will leave this island except two: Karl Schrenk and you, Barnes. Both of you will remain, locked in your cells.

"Your planes will land here unmolested. Then an ingenious secret device will detonate a charge of high explosives. Calibar Island will be lifted from its foundation. It will disappear in a flash.

And with it will go you and your fleet and all your men. You hear me, Barnes?"

Yes, Bill heard him, heard him too distinctly. Now, more than ever, Karl Schrenk and he had to escape. With an effort he made his voice calm and said, "And how will you time the detonation of the explosive?"

The criminal laughed. His bloated body shook and a crazy note was in his voice. Bill saw Dr. Kara stir, try to sit up. He reached out a hand for the hypodermic needle and said stupidly, "Give him some of the serum, master. That will make him talk, eh?"

Aziz Pasha said, "Go back to your dreams, you drugged dog." Then he looked at Bill. "So you wish to know about my detonating device? I will never tell you. Just Kara and I know. Once before I talked too much. No, you will never know. You will sweat here in your prison cell. You will hear your planes land. You will shout and scream out warnings. And even if they hear you it will be too late."

He called the guard. When the man entered, Aziz said, "Lock Barnes in his cell. Then report to Mustapha and assist in carrying the flasks of fuel up to the landing field."

"Yes, master," the guard said.

He nudged Bill with the Luger. Without a word, the pilot turned and went outside, the gunman closely following.

Night had come and darkness had settled over the cavern, broken only by the flickering glow of oil flares placed at irregular intervals along the pathways. A searchlight was bathing the submarine in glaring white light as the men worked.

The cavern echoed with shouted orders and the sound of hurrying feet. The guard jabbed Bill with the gun and growled, "Faster, *effendi*."

Bill obeyed and excitement mounted within him. Schrenk and he would now have to take a chance on overpowering the guard. There was no more time to lose.

The chance came. As Bill entered the narrow aisle between the two cells he saw Schrenk standing at the bars of his cell, waiting. The pilot nodded imperceptibly to him.

When the burly Turk bent down to fit a key into the door of Bill's cell, the airman spun around. He grabbed the man's gun hand. With a terrific wrench he jerked the Luger free, then drove his knee savagely into the Turk's stomach.

The man was thrown against Schrenk's cell. The chemist was ready. In his hands he held a loop of sheeting twisted into a rope. He threw it over the Turk's head and jerked it tight around his neck.

The guard was yanked back, unable to yell. He clawed and fought like a madman. With cold deliberation, Bill raised the Luger and brought the butt

crashing down against the Turk's temple.

The man went limp.

XI—GAMBLE

BILL lowered him to the floor and gagged him with the rope of sheeting. "Quick! Aziz is leaving soon," the pilot whispered to Schrenk. He picked up the fallen key ring and unlocked the chemist's cell. "I have a plan. Get the clothes off this man. I'm going to wear them."

Schrenk bent over the unconscious Turk. "What is happening, Herr Barnes?" he asked. "Tell me."

Bill told him, in quick, staccato words, of Aziz's plan. And as he talked, the pilot stripped off his flying suit and donned the Turk's shorts and white tunic. He jammed the purple fez on his head. "If the explosives go off, we'll be killed—so will all my men. If Aziz's planes leave here loaded with the new fuel, my airport will be wiped out and they will next attack Turkey. If Aziz escapes in his submarine—"

Schrenk cut in, "*Ach Himmel!* If Aziz escapes knowing the formula, world chaos will follow. We must stop him, Herr Barnes."

"We must stop all three things," Bill said, and then added hopelessly: "Somehow."

The pilot tore his flying suit into long strips and bound the limp body of the guard hand and foot.

"You have a plan?" Schrenk asked anxiously.

Bill dragged the Turk into his own cell, rolled him under the cot and dropped the blanket down over the side. He hurried back. "Dr. Kara is stupefied with drugs. I'm going to his room. I'll give him a shot of his truth serum. I'll make him tell me what device Aziz is using to detonate the explosives, and where it is—how it works."

"*Donnerwetter!*" Schrenk exclaimed. "But you will be discovered."

"It's dark out. In these clothes I have a chance. It's our only hope." Suddenly he held up his hand for silence.

Footsteps were approaching the outer door. Bill waited in agonized suspense until the noise receded. He turned despairingly to Schrenk. "Even if I succeed and stop the explosion—there are still the other two things. Aziz's planes will leave. And he will escape in his submarine."

"Yes. That is bad. But wait!" Schrenk seized Bill by the arm. His eyes behind the thick glasses were dilated. "Herr Barnes, we can trap the submarine! We must find the mechanism that controls the steel net!"

"What? The steel net—"

"*Ja! Ja!* A net of steel mesh covers the outer mouth of the subterranean tunnel. A protection against any enemy *unterseeboot* entering. The net is raised

Then the entire universe seemed to unite in one terrific blinding burst of flame——



only when Aziz's submarine goes out or comes in. It is controlled from somewhere in the cavern."

"You mean if we could lower the net and——"

Schrenk went on hastily, "Aziz's submarine comes in here bow first. The lake is too narrow for her to turn around. She has to back out when she departs. If the net is dropped just after she starts, she will back into it, unsuspecting. *Ach!* She crashes into the net. Her propellers entangle in the mesh. She is caught—held tight. She cannot get free. Aziz and all aboard are trapped. They slowly suffocate in that iron coffin!"

Bill caught his breath. The idea was horrible, yet Aziz had long since con-

demned himself and his followers to death. But how would they ever find the mechanism that controlled the net?

Right on the heels of his question, the answer came to Bill. He said, "Kara will tell me where the controls are—The truth serum will make him——" Bill paused and swore softly. "We have a fighting chance to stop the explosion and trap Aziz. But what about his planes? Can we stop them?"

Schrenk said, "You say they come here soon? To use my fuel?"

"Yes. As soon as they land up there on the field, Aziz's men will start carrying up the flasks of fuel." Bill shook his head grimly. "Maybe I could go to the laboratory and do something to the fuel—something that would disable the

planes. Is there anything I could do, Schrenk?"

"Ja. Break all the gas flasks containing the concentrate."

"No. They would know we were loose then. They'd hunt us down. It would wreck our other plans. If I could only do something that would disable the planes *after* they take off."

Schrenk said, "I know of nothing, Herr Barnes—nothing that will do that." The old chemist bowed his head, his brow furrowed. For a long interval he was silent; then he looked up wildly. "Mein Gott! There *is* something—a simple thing! *Ja! Ja!*"

"Quick—tell me!" Bill said.

The excitement died on Schrenk's face. He became suddenly grave. He said, "Only I can do it. I know where the laboratory is. In fifteen minutes I can turn that fuel into a hell's brew. Aziz's planes will take off from here, Herr Barnes, but they will never reach your field."

"Tell me what to do," Bill said. "You stay here."

Schrenk's jaw was firmly set. "No. I invented the fuel. Now I destroy it. You go to Dr. Kara. I go to the laboratory."

And no argument could dissuade the old chemist. Already too much precious time had been used up. Bill said with misgivings, "O. K. But don't take too many chances. Get back as soon as you can. Stay in your cell. I'll meet you here."

While they had talked, Bill had rubbed his hands repeatedly over the slimy rock walls and smeared the accumulated grime over his face and legs. His skin was darkened almost to the degree of the unconscious Turk's.

Bill pressed the Luger into Schrenk's hand. And when he protested, said, "I am disguised. You aren't."

The pilot led the way down the short corridor to the outer door. He cautiously opened it and waited, listening. Then Bill whispered, "O. K. Can't hear any one coming. Let's go!"

The two men gripped hands in silence. Then they parted—Schrenk slipping noiselessly away to the right, Bill to the left.

XII—THE SERUM

BILL reached the entrance to the trail that skirted the lake. Beyond lay the great cavern, drowned in dead blackness, through which the sparsely placed oil flares glowed feebly. There was no other light save the single white beam of the searchlight blazing down on the submarine.

Bill took a deep breath, then swung boldly along the path. From now on every foot of the way would be alive with danger.

He had not gone far when a file of men hurried past, laden with supplies,

their bodies glistening with sweat. No one gave him a glance. Every man seemed intent on his own work.

And Bill, taking his cue from the others, increased his speed until he was almost running. When the guard had taken him to Kara's room, the trip had seemed short. But now, with suspense mounting, an eternity seemed to have passed before Bill reached the doctor's door.

So far he had been lucky. He had passed straight through the scene of activity and not been detected. But would his luck hold? Would Kara still be in his room? Would he be alone?

The doctor was alone. Bill saw that the instant he gently pushed open the door and slipped inside the room. Kara was lying full length on the couch, his eyes closed. An oil lamp was burning with a smoky flame. On the table, where Bill had last seen it, was the hypodermic needle.

The pilot crossed the room, picked up the shiny instrument. One glance told him that it was filled.

Kara was breathing noisily, his chest rising and falling in slow irregularity. Bill crept over to the cot. He put his hand over Kara's mouth to smother any outcry, then inserted the needle in the man's bare arm and pushed the plunger down.

Kara moved sluggishly. A faint moan came from his mouth. Bill jerked the needle out and put the instrument back on the table. How long it took for the stuff to work, he had no idea. He crouched beside the bed and waited, straining his ears for the first sound of danger from outside. But only the muffled noises from the workers in the cavern reached him.

Then, when he could wait no longer, he bent close to Kara's ear and said, "Do you hear me, doctor?"

The Turk's body moved and an unintelligible mumble came from his lips.

Bill said again, "You hear me, doctor?" He asked the question rapidly, eagerly.

Kara's voice was stronger when he spoke again. But he was answering in Arabic!

Dismayed, Bill saw all his hopes of saving his air fleet, of trapping Aziz, crumbling. He said, desperately, "Speak English. Do you hear me, doctor?"

The Turk muttered, this time in accented English, "I hear you."

Excitement jabbed through Bill. He asked quickly, "Do you know of Aziz's plan to blow up the island?"

"Yes."

"When will the explosion occur?"

"When Barnes' planes land on the field above."

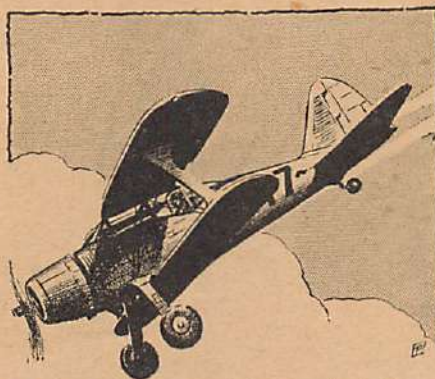
"How will the charge be detonated?"

"By a selenium cell."

Bill frowned. Selenium was a chemical element that reacted to light or heat.

He asked tersely, "How will the selenium cell time the detonation?"

"Aziz is placing the cell on the landing field. Barnes' planes will arrive before daybreak. They will drop landing flares. When a certain degree of luminosity strikes the cell it will detonate the explosive charge."



A biplane fighter of the Pascha's fleet.

Bill winced. Aziz had reasoned cleverly. "The cell hasn't yet been placed on the landing field?"

"No."

"When will it be?"

"Not until after Aziz's airplanes have taken off."

"Do you know exactly where it will be placed?"

"No. Only Aziz knows."

"Where has the explosive been stored?"

"I do not know. Somewhere in the cavern."

"How large is the selenium cell?"

"The size of a human eye."

Bill's fingers dug into the palms of his hands. Aziz held all the cards. To try to find the cell after it had been placed would be like hunting for a needle in a haystack. To find it before would be almost impossible. He was blocked at every turn. His planes, by the very act of coming to his rescue, would bring about their own finish.

And now, conscious of every passing minute, Bill abruptly changed his line of questions. He asked suddenly, "Do you know how the steel net over the tunnel is controlled?"

"Yes."

"How?"

"By a switch in Aziz's office."

"Tell me the exact location of the switch."

"It is on the wall directly back of Aziz's desk."

Bill's eyes glowed. Yes. He remembered seeing a switch there. It would be easy to find. And now—

Suddenly he straightened, listening. Muffled, from far away, came a deep-throated drone. Airplane engines!

Aziz's air squadron was arriving!

XIII—THE FIELD

THEY would be landing at any minute now. That meant that Aziz's men

would begin carrying the fuel from the laboratory to the field above. Then—what of Karl Schrenk? Was the old chemist still in the laboratory? Had he completed his mysterious sabotage? Would he take warning and flee?

But perhaps he wouldn't hear the planes?

Bill shot a quick look at the drugged Kara. There was no need to remain here. He had all the information he could hope for. Schrenk had to be warned! Maybe he could get to the laboratory in time.

But Bill didn't get there. His concern over the old chemist's safety smothered his caution. He ran from the room and down the corridor. And then, as he rounded the turn into the main pathway, he almost collided with a man in the darkness.

The sudden surprise sent Bill's heart pounding into his throat. He stepped back, his hands instinctively knotting. Behind the man he saw the vague shapes of a long line of others.

The man he had almost crashed into, muttered something in Arabic, roughly shouldered past Bill and strode on along the trail. The others moved after him.

The pilot, realizing his narrow escape, cautiously retreated along the corridor and away from the passing line of men. It was then that his luck deserted him.

Another man, the eighth in line, abruptly stepped from the procession and confronted Bill. He jabbered Arabic words in a harsh, commanding voice and thrust two objects at the pilot. Bill instinctively took them and found himself gripping two glass flasks.

The man repeated the foreign words as if asking a question. Aghast at the sudden turn of events, Bill remained silent. The darkness cloaked his face from detection but if he talked, discovery would come instantly.

Then the man spoke in sudden anger, seized Bill by the shoulder and pushed him into the line of men. And scarcely before the pilot could realize what had happened, he was marching along the pathway with men before and behind him.

An explanation flashed through his mind. The man who had given him the flasks had been some one in authority. He had assumed Bill was one of Aziz's men and had pressed him into service. And now all Bill could do was go along with the others and watch for an opportunity to get away.

And these glass flasks that he and the others were carrying must contain the new, concentrated fuel! Then Aziz's men had already been to the laboratory, were now carrying the fuel to the landing field!

It was too late to warn Schrenk. Perhaps he had completed his work and escaped back to his cell before the men

had come. Bill clung to the hope desperately.

The long file of men was following the narrow path that wound upward around the sides of the cavern in a great spiral. Hope of immediate escape for Bill was out of the question. The path was a ledge only wide enough for one man. On one side was the solid rock wall, on the other a sheer drop to the lake below.

Bitter anger goaded Bill. He was free and yet he was a prisoner. What chance had he now of trapping Aziz—of saving the lives of his loyal gang who were speeding to rescue him?

In the darkness there was no way to estimate how many men were in the line. He could hear snatches of conversation in a variety of languages. Some were speaking French, others German, the majority Arabic. But directly behind Bill two men were talking in the unmistakable jargon of the New York crook. The wolves of all nationalities had gathered under the banner of Aziz Pasha.

The pace up the slippery trail was steady and exhausting. Bill felt perspiration dripping down his body and his hands were wet. He took a tighter grip on the glass flasks and his thoughts jabbed back to Karl Schrenk.

During the hours the old chemist and he had spent in their prison cells Bill had learned some of the details of the new fuel and how it operated. And then, from behind him, as if echoing his very thoughts, he heard the two New York criminals discussing the fuel.

"Sure I know how this junk works, Tony," one of them said. "Yuh fill the plane's tanks almost full of water. Then yuh valve in a shot of the stuff in the flasks. It mixes with the water—and yuh got the fuel."

"Yeah," the other said. "But how yuh gonna fly clear around the world without refuelin', like they sez yuh can?"

"Easy, punk. The old rooster, Schrenk, is smart. He dopes out a way to catch the water from the engine's exhaust and run it back to another tank. When the tank fills up, yuh just shoot in another squirt of this bottled stuff—and yuh got another batch of fuel. Goes on like that, usin' the same water over again. That's why yuh can go so far, see?"

Bill listened. The man had it just about right. The reclaiming of the water gave a plane an enormous flying range. But the vital secret lay in the composition of the concentrated liquid—a liquid so potent that a few drops added to a tankful of water turned it into engine-driving fuel.

But had Schrenk been successful down in the laboratory? Had he been able to transform the concentrate in the flasks into a plane-wrecking liquid as he had planned? If the old chemist had failed,

Bill knew that his Long Island airport was as good as gone.

A constant roaring of engines was coming from overhead as Bill toiled upward. More and more of Aziz's planes were coming in. By now, the majority of the murder fleet must be assembled. The Turkish criminal's plans were rapidly nearing completion.

And somewhere to the north, Bill's own planes were speeding, under full throttle, toward Calabar. In them were riding his pilots, his loyal friends—Shorty and Sandy and the others—riding to certain destruction unless he could warn them or block the deadly trap that Aziz had laid.

The line of men had climbed far up the great dome of the cavern. And from somewhere ahead Bill felt a cool blast of air sweep over him. He knew that they must be nearing the top.

They were. In the next few minutes, Bill passed through a small opening between two rocks and stepped unexpectedly out on the level stretch of the flying field at the top of Calabar Island.

XIV—ACCIDENT

THE SIGHT before him was stupendous. Rows of flares lined the level field and in their flickering illumination Bill saw line after line of large, two-motored attack bombers—sleek, low-winged jobs, streamlined and formidable-looking.

There was not an idle man on the field. The pilots and gunners were working over their planes, fitting the glass flasks of the fuel into the cockpits, tuning up the engines.

Bill went with the line of men as they skirted the field and headed toward a temporary rack where the flasks were being deposited. The line moved slowly and the pilot, conscious of the ever-present danger of detection, watched the activities with nervous intensity.

More and more planes were arriving, sweeping down from the black sky for quick landings, coming in two and three abreast. The procedure to Bill was extremely hazardous and he half expected the accident when it occurred.

An attack bomber had just settled on the field and was taxiing toward the line as a second ship came in right behind. The pilot of the following plane must have misjudged his distance or been dazzled by the lights.

At the last minute he apparently saw that he was going to ram the ship in front. He pancaked his plane and tried to turn the ship around to avoid hitting the other. He almost succeeded. Then the propeller of his port engine hit the trailing edge of the first plane's wing.

LOCKHEED P23A NAVY FIGHTER



Send 5c coin for illustrated catalog showing other models, gas motors, etc.

32" Span; Length, 22"; Weight, 3½ oz. This is a combination land and seaplane set. Set contains all parts printed on balsam, silver paint, glue, turned 3/32" motor front, large scale drawing and all parts. Set. Post-paid, \$2.95.

MINIATURE AIRCRAFT CO.

83 Low Terrace, New Brighton, New York



MEN GET THEIR MAN!

So do the Monties, all are Jia Jia Experts, get illustrated course on 13 KNOCKOUT BLOWS without use of fists. 15c By the world's foremost Police Jia Jia Instructor, Get Your Man! S. J. JOHNSON, 331 Marine Building, Seattle, Washington

MAKE EXTRA MONEY! We put you in business—representing our company—among your friends and acquaintances in your Camp-School-Community Center-Club-Group-Local-ity, etc. Merely show our model airplane supplies and kits—sporting goods—games—and hobbies, and take orders. You can make up to \$15 a week. We supply sales helps—samples—and show you how to develop your earnings. Rush your request for information and exclusive territory NOW!

DIAMOND MODEL AIRPLANE CO., Dept. B-7
915 Saratoga Ave., Brooklyn, N. Y.



AVIATION APPRENTICES

Ambitious, air-minded young men, interested in entering the well paid field of Aviation, write immediately, enclosing stamp, to

Mechanix Universal Aviation Service

Incorporated
Strathmore Station Dept. T Detroit, Mich.

CLASSIFIED DIRECTORY

An opportunity to contact a large field on a small lineage. Rate 10c per word (Minimum 20 words). Cash with order. Address:

AIR TRAILS CLASSIFIED ADVERTISING

79 Seventh Avenue, New York City

FREE AIRPLANE with motor purchase only \$134.95. terms. Modern Engine Propellers 98c. Sensational values. Information 25c. Universal Aircraft, Ft. Worth, Texas.

ABOUT JOHN HAW

Lindbergh's flight to Paris in 1927 stimulated model building just as it did aviation in general. The upswing in aviation interest swept John Haw into modeling, and that year he built his first model—an R. O. G. which didn't fly. Probably that was the only model of John's which never flew.

The turning point in his model career came in 1931, when he took up indoor building.

The next year, at the Nationals in Atlantic City, he won a medal in the Stout indoor contest. He placed high in the next 2 national meets. In 1935 he set an indoor fuselage-model record, only to have it broken a few months later. But by the end of the year he had the record again, after a flight of 17 mins. 14.8 secs. Then, he won the Stout Indoor Trophy in Detroit last June.

John is an American-born Chinese. He's 21 years old. The 2 years preceding the start of his model career were spent studying in China. The remainder of his schooling has been in this country. This year he's finishing his college work.

See page 92

READY BUILT SOLID SCALE MODELS

Finished models complete in all details, with wire rigging, insignias, RUBBER Tired Wheels and MOVABLE CONTROLS (not from the cockpit). All orders sent postpaid and insured. Send 3c stamp for price list.

STATE MODEL COMPANY,

Post Office Box 138,

Morgantown, West Virginia

7½" Boeing F4B-4	\$2.05	7½" Albatross	\$1.80
8½" Boeing P-26A	2.05	7½" Fokker D.7	1.80
7" Grumman	2.05	6½" Spad	1.80
8½" Beechcraft	2.25	6½" S. E. 5	1.80
10" Monocoupe	7.50	11" Camel	7.50

It slashed through, obliterating the aileron, ripping the metallic covering of the wing section into a jagged wreck.

A serious accident had been averted. Yet Bill could see that the first ship had been definitely disabled.

His conviction was borne out minutes later when he overheard one of the New York crooks speak to the other. He was apparently translating the belabored orders of a fiery officious Turk who had rushed to the scene of the accident.

"Lord, she must be cracked up bad. They've ordered her run into the woods and abandoned. No time to fix her. I betcha Aziz gives that pilot plenty of hell."

But Bill wasn't worrying about the pilot. His interest was centered on the disabled plane. Already mechanics were wheeling her out of the way of incoming ships.

Aziz was abandoning the plane! The ship had been damaged, was useless for a long flight. But, perhaps—perhaps it was still airworthy enough to get off the ground and carry two passengers away from the island!

It was a chance—the chance he'd been looking for. Now, more than ever, he had to get to Schrenk and warn him to be ready. They'd wait until Aziz was trapped in the submarine by the steel net—then they'd climb up here and take off in the damaged attack bomber.

But even then, how could he contact his men and warn them away from the island? Somehow he'd have to find a way to detonate the charge, to blow Calibar Island sky high, after Schrenk and he had left and before the others could arrive.

It was a wild, crazy plan, with but one chance in a million of succeeding.

The men ahead of Bill were now placing their flasks in the racks and moving on. Other workers were picking up the fuel containers and rushing them to the waiting planes. Bill put down his glass flasks, then moved quickly away, keeping his face averted from the light.

Gradually, he edged farther and farther into the black shadows beyond. The men with whom he had come were standing in a group, awaiting orders.

Bill's gaze whipped to the entrance through which he had reached the field. No one was coming through it.

With fear pin-pricking his scalp, he strode boldly toward the opening between the rocks. At any second he expected to hear a command behind him. But none came.

Then, with a gasp of relief, he reached the opening and ducked through. He looked down the winding trail. In the faint light from the flares, the path appeared to be empty.

With a recklessness born of desperation, Bill headed down that narrow, winding ledge, down toward the lake

far below. In the descent the rocks seemed even more slippery than before. Time and again he barely checked himself from sliding over the edge. One misstep and he would go hurtling to a sure death.

He had gone more than halfway when he heard some of Aziz's men come through the opening above and start down. But they were far behind and he stood in little danger of being overtaken at the speed he was making.

And then, when he had almost got to the bottom, his anxiety to reach Schrenk proved to be his undoing once again. He rounded a bend in the trail too quickly. His feet slipped out from under him. He tried frantically to claw for a hold. But his fingers slid over the slimy rocks.

He felt himself whip over the edge of the trail, felt himself falling. Then, the whole cavern seemed to collapse upon him. And he knew no more.

TONY LAMPORT walked out of the radio room of Barnes' Long Island airport to the steps of the administration building. He stood there, nervously puffing at his cigarette. His eyes were on the black skies to the south and a worried frown creased his forehead.

The airport lay under the hot summer night in dead silence, with all but the emergency lights extinguished.

Tony looked at his wrist watch. The glowing hands showed three thirty in the morning. Suddenly, he shivered.

He went back into the radio room and said to his assistant, "Something bad is happening. I can feel it. Something to Bill or to the gang—I'd better contact Shorty."

Shorty Hassfurter, crouched down in the forward cockpit of his Snorter, heard Tony's radio call and answered quickly. "Everything's O. K. here, fella," he said. "Making good time. Just passed Jacksonville, Florida. Be at Calibar in two hours if we can hold the pace."

Then he signed off. Tony's voice had been anxious. But who wasn't anxious?

Shorty's gaze swept through the night. To right and left he saw the riding lights of the other ships of the squadron in tight formation, streaking at top speed for the island where Bill was being held prisoner.

He radioed a routine check-up, calling Sandy and Red and Cy and Bev and the transport. Every one answered.

"That tail wind's boosted up our speed," Shorty told his pilots. "If Aziz has been tipped off about us and has figured when we'll arrive—we're going to surprise him. Now get this straight, all of you. As soon as we reach Calibar, Bev, Cy, and Red are to dive pronto and drop flares. The rest of us are to land as fast as we can. You get that?"

The replies came back. And Shorty settled down in the bucket seat. Every-

thing seemed O. K. But the veteran ace, too, was feeling a strange, nervous tension.

Would they ever reach Calibar in time? Was Bill still alive? And no answer came to him but the blasting of his pounding Diesels and the screaming of the wind.

On and on, cleaving the black night like a giant arrowhead, plummeted those mighty ships of the invincible Barnes squadron.

XV—PREPARATIONS

HOW MUCH LATER it was when Bill opened his eyes, he never knew. He found himself lying in a cradlelike depression in the rocky wall but five feet below the ledge from which he had fallen. Pain was knifing through his head and he felt sick.

He sat up, dazed. His body, although stiff and sore, seemed to have no broken bones. But when his fingers touched the side of his head he felt a large bump and he winced with pain.

Gradually, he realized what had happened. His fall had been broken almost before it had begun. His head had hit against a rock and he had been knocked out. And there he had lain in the darkness, unseen.

But for how long? Minutes or hours?

The night-blackened cavern with its sprinkling of oil flares was strangely quiet. The thunderous roaring of airplane engines from the field overhead was now gone.

Had Aziz's air fleet already taken off? Had that much time elapsed?

Bill heard a subdued mumble of voices and a steady, throbbing sound. He looked down and gasped.

There, lying in a brilliant pool of light, was the submarine. But now her engines were running. Men were gathered in a group on the shore. Others were filing up the gangway and climbing through open hatches.

Aziz and his men were boarding the submarine! They were preparing to leave! Then, the air fleet must have taken off long ago—while Bill had been unconscious!

The appalling situation jolted his senses clear. He looked wildly around him. If he climbed to the ledge above, he might be able to get back to the cells undetected in the darkness—back to Karl Schrenk. He and the chemist would wait until the submarine submerged, then race to Aziz's office and pull the lever controlling the steel net.

There wasn't a second to lose. Aziz's murderous plans were rapidly nearing completion. And there was no telling when the speedy planes of Bill's own fleet would reach the island and drop their explosive-detonating landing flares.

Bill stood up, hugging the rocky wall, and found that he could reach the ledge with his upraised hands. He dug the

toe of his left foot into a crevice; then, in one quick motion, he hauled himself back onto the ledge.

In a brief look down he saw Dr. Kara being carried to the submarine and lowered through the conning tower hatchway. Others were following rapidly. Now only a few men remained on the land. And there, standing by the conning tower, with his arms folded, was the fat figure of Aziz Pasha.

The sight of the Turk goaded Bill. The criminal couldn't escape. With the formula in his possession he would become a menace to the whole world. He was a madman—a killer!

Without a backward glance, Bill started down the trail, hunched over to avoid detection. Some of the oil flares had burned out. Others gave but weak, flickering flames. Bill forgot about the dull pain in his head, about his bruised body, in his feverish desire to reach Karl Schrenk. And as he progressed farther away from the submarine he quickened his pace to a run.

It seemed hours later—and was minutes—when Bill finally reached the door leading to the two cells. So far he had been unobserved.

He threw open the door, darted down the aisle. His eyes jabbed into Karl Schrenk's cell and, for a moment, he thought it was empty. Then he saw the old chemist lying on his cot.

Bill said urgently, "Schrenk! It's Bill Barnes! Come on!"

But Schrenk didn't move.

Bill called again, jerked the cell door open and rushed inside. "Schrenk! Wake up! Schrenk!"

There was no response.

Bill reached the cot, looked down. Karl Schrenk's upturned face was gray. His eyes were open and stared at the ceiling. The eyelids didn't move. *Karl Schrenk was dead!*

XVI—SHOCK

BILL stared in stunned unbelief. He put out his hand and touched the chemist's face. The flesh was cold.

It was then that Bill saw the piece of paper clutched in Schrenk's right hand. The pilot reached for it, forcing back the tenacious grip of the stiff, dead fingers.

The paper had been torn from a small pad. Written in pencil, in an almost undecipherable scrawl, was:

HERR BARNES:

I write this in haste, for I will die very soon. I have told you about my bad heart. Now I have had two severe heart attacks. I know the next one will mean the end.

I was able to fix most of the fuel in the flasks before Aziz's men came to the laboratory. Then I had to come back here. I added only a small amount of chemical to the flasks, but the reaction will turn the liquid into a metal-eating acid. It will slowly cut through the fuel lines of the airplane using it. The airplane will be disabled. The fumes

arising are deadly and will kill the pilot.

But I was not able to fix all the flasks, Herr Barnes. Some of the planes may get through to your field. But most of them will be destroyed.

The excitement and the work has proved too much for my heart. I also inhaled much of the acid's fumes. I fear that something has happened to you, for you do not return. But if you do, and you read this, I make one dying request.

Only Aziz Pasha and I know the formula. I made the fuel to bring peace to the world. I realize now that only harm can come from it. I willingly die to destroy that which I invented. But if Aziz Pasha lives, my sacrifice will be in vain. I, therefore, charge you to destroy him.

Please regard my body as cold clay and leave it where it lies.

auf Wiedersehen,

KARL SCHRENK.

The writing at the last had trailed off the paper.

Bill lowered the letter and his eyes fell again on the dead face. Yes, Schrenk had told him of his heart disease. And now, as Bill recalled the old chemist's grave expression when he had decided to go to the laboratory, he realized that Schrenk had known then that the task would be his last. Yet he had gone.

And now his dying wish—destroy Aziz Pasha.

Bill saw the Luger he had given



Once again he tried to get up, then fell back, exhausted—

Schrenk lying on the floor of the cell. He picked it up. Then, with bowed head, the pilot backed through the cell door, his gaze still centered on the set face of the man he had come to regard as a friend.

Bill stumbled back across the aisle and jolted against the bars of the cell he had formerly occupied. Then, when he was about to turn toward the outer door, it happened.

Without a trace of warning, steellike fingers fastened around Bill's throat. The wrist of his gun hand was seized in a viselike grip and a voice said, "Give me that gun, O infidel!"

XVII—TO THE DEATH

TOO LATE. Bill remembered the Turkish guard he had left bound in the cell. Somehow, the man had broken loose. He had come stealthily from his hiding place beneath the cot. He had caught Bill unaware.

The fingers dug into the pilot's throat until his breath was cut off. Bill felt the Luger being twisted from his hand. He let it go without a struggle. A shot fired now would warn Aziz. He would send his men to investigate.

The man behind Bill said, "I now have your gun. You will unlock this cell."

The fingers around Bill's throat loosened. The pilot stepped away, his head ringing from the garroting. He turned and saw the burly Turk crouched in the cell. His great, muscular body was nude except for a loin cloth. His eyes blazed and he held the Luger aimed at the pilot.

"Hasten to unlock this door, infidel," the man said. "Where are the keys?"

The ring of keys was lying in a dark corner near Schrenk's cell, where Bill had placed them hours before.

Bill said, as a quick plan flashed through his mind, "They're over there," and pointed.

The Turk grunted. "Get them. One false move and I shoot. Hurry!"

Bill picked up the keys. The Turk was leaning heavily against the bars of his cell door, watching the pilot intently. Bill came back, inserted a key in the lock. He turned it quickly, and at the same time jerked the door outward with all his strength.

The Turk was propelled through the opening. He stumbled across the aisle, trying to regain his balance, and crashed against the bars of Schrenk's cell.

Bill dived at him, his hands grasping for the Luger. His fingers fastened on it, tried to tear it from the Turk.

The man let out a bellow of rage. He threw his left arm around Bill's neck in a strangle hold. The two men locked together, rolled across the floor, fighting savagely.

Bill felt his fingers slide over the cool metal of the gun. He tightened his hold.

A terrific crash blasted in his ears as the gun went off. He felt something slash across his leg.

He had been shot!

The sudden pain gave him super strength. With both hands, he twisted the Turk's wrist. The Luger leaped free, skidded across the floor.

Bill saw it. He wrenched himself from the Turk's grip and dived for the gun. He seized it, whirled.

He saw the guard lunging at him. Bill's finger found the trigger. He pulled it. The weapon exploded again.

The bullet smashed into the Turk just under the chin. He crashed down as Bill rolled out of the way.

The pilot staggered to one knee. The guard was lying on his face. Blood was gushing from his neck. He had died almost instantly.

Bill gripped the bars of Schrenk's cell and pulled himself up. One glance at his leg showed him that the bullet had only grazed the flesh. But had Aziz heard the shooting? Or had the submarine already left?

Bill took one last look at the dead body of the old chemist. Then he ran down to the outside door, jerked it open and sprinted along the corridor to the main pathway.

He looked out across the lake. There was nothing floating on the surface of the black waters. *The submarine had gone!*

He was too late. Aziz had escaped!

Horried, Bill's eyes again swept over the lake. Then he saw it—a black rod sticking out of the water far down toward the end—the submarine's periscope!

No. He wasn't too late. He still had a chance to trap the submarine. The craft had submerged, was now heading for the subterranean passageway.

Bill sprinted down the trail for Aziz's office. He reached the door. In a quick look back he saw that the periscope had dropped out of sight.

The submarine was entering the tunnel—would be through it in no time.

Bill lunged into the office. He saw the switch on the wall. He reached it. His fingers closed over the handle.

For just one second he hesitated, as a vivid picture of the impending catastrophe flashed across his mind. A picture of the submarine caught relentlessly in the steel net by her snarled propellers; of the panic aboard that great metal tube; of the men trampling each other in a wild desire to get free; of their slow death as the air became poisoned by the fumes from the battery room.

He saw all that. Compassion? No. He could have no mercy. Aziz Pasha

and all his men were murderers; they had long since been sentenced to death.

He jerked the switch down.

XVIII—THE TRAIL

BILL left the office. As he stood on the pathway outside he heard a loud crash, followed by a shrill whining. He knew what had happened.

A surge of water came bubbling up at the end of the lake. Bill watched the turbulent waters and shook his head grimly. Now Karl Schrenk could rest in peace.

But there could be no rest for Bill—not yet—not while his own planes were up there in the night, streaking nearer and nearer to Calibar Island and death.

Bill looked once more across the lake, then turned and made for the winding trail that led upward to the landing field. Aziz Pasha was through, but his lethal plan was not.

Concealed somewhere on the landing field lay the selenium cell, waiting for the first flash of light to bring disaster.

And Bill, as he rushed up that slippery path, knew that the lives of all his loyal pilots depended on him. Somehow he had to save them.

Escape? Yes, he might escape in the disabled attack bomber. But that wouldn't save his fleet. There was but one chance in a million that he could contact them in the dark and signal them to turn back.

No. The explosive charge had to be detonated before his men reached the island. If he could also escape with his own life in so doing, so much the better. If not—

Fifteen minutes later, when Bill reached the landing field and raced across it toward the disabled attack bomber, he found the one thing that might enable him to do both. In a small shed built of rough boards was a stack of gasoline drums, and in a corner was a heap of oil-soaked cotton waste. One quick glance was enough. He knew what he had to do—if there was time.

Then the pilot ran to the plane, his ears straining for the first drone of oncoming engines. But the tropical night, bright with moon and stars, was utterly still.

A hurried inspection of the damaged right wing of the attack bomber showed him that it was in bad shape. The aileron was gone. The metallic skin was ripped and torn—but the leading edge of the wing was still intact. With luck, he might be able to get off the ground and keep her in the air.

Bill swung into the pilot's seat. And his next worry was instantly wiped aside. There was a small amount of fuel left in the tanks—enough for his purpose.

He worked the starters. In the warm

air the port engine boomed into life. Its companion in the other nacelle followed.

Bill taxied the big ship to the end of the landing field, swung her around to head into the wind. Then, leaving the engines idling, he leaped to the ground and ran back to the shelter where the gasoline drums lay.

The rumble of the idling engines cut off any chance of hearing approaching planes. Bill's gaze whipped into the north, searching for the gleam of navigation lights and praying that he wouldn't see them. He didn't.

He worked with desperate haste, conscious of every passing minute. Jerking the stoppers from two of the drums, he upended the cylinders. A flood of gasoline gushed out, spilling on the floor, until a great puddle had formed.

Bill gathered up the heap of oil-soaked cotton waste, saturated it in the gasoline. Then, he backed from the shed, pulling the waste out in great, long strips and laying them on the ground. His fingers trembled as he tried to work faster. Finally, a long trail of the cotton led away from the building.

He reached in his pocket for a match. The trail of cotton would act as a fuse. As soon as the end was ignited, the fire would run along it until it reached the gasoline-drenched shed. The spilled gasoline would ignite. The shed would start to burn and then the fire would reach the other drums of gasoline.

A wild column of flame would spurt up, lighting the entire landing field. The illumination would fall upon the selenium cell wherever it was. The explosive charge would be detonated and Calibar Island would erupt.

But long before that time Bill would have to reach the attack bomber and take off. It was a wild gamble, but the only hope of saving the gang.

He struck a match, held it to the end of the cotton fuse. The fire caught. The gasoline-drenched waste ate the flame greedily. The tongue of scarlet ran along it—ran back along the trail toward the shed.

Bill turned and pelted wildly across the landing field to the plane. Just minutes were left before the whole shed would go up in a burst of fire.

But before Bill had covered half the distance to the attack bomber he stopped dead in his tracks.

From the edge of the field back of the plane, a man had appeared!

He, too, was running toward the bomber. In the moonlight Bill could see him plainly, see his fat figure. His clothes were wet; clamped to his chest was a flat, metal container and dangling from it was a rubberized mask.

Bill couldn't believe his eyes. But it was—there could be no mistake—Aziz Pasha!

XIX—FIRE

AZIZ PASHA! But the man was trapped in the submarine down there in the tunnel! He couldn't be alive! He couldn't be here, racing nearer and nearer to the plane.

But he was. Somehow he had again escaped death.

Suddenly, Bill recognized the apparatus strapped to the Turk's chest. It was a Mommson lung—the emergency device carried by some submarines to enable a man to exist for a short time under water.

That was how Aziz escaped.

Bill plunged across the field.

Aziz must have seen the trail of fire—must know when the shed went up, the burst of flame would react on the selenium cell—that his only chance of life was in getting to the plane and taking off before Bill.

The Turk saw Bill coming. He whipped up a gun. He fired wildly, without aim. Bullets shrieked past Bill. He ran harder.

The trail of fire was speeding along the fuse toward the shack now. Aziz was near the plane—and passed the tail section. He was swinging up into the cockpit.

Bill raised the Luger. He took swift aim. He pulled the trigger. The weapon bucked in his hand.

Aziz had one leg inside the cockpit. Suddenly, he straightened up. His body seemed to hang motionless in the air. Then, with his hands clawing, he fell backward. He crashed to the ground.

Bill reached the plane. He saw that his shot had pumped into Aziz's back. The man was dead!

Bill gave him but one swift glance. The fire had spurted down the fuse—had almost reached the shed. He could hear the crackle of the flames.

The pilot threw himself into the cockpit. He released the brakes. Flames had reached the shed and were now gushing over it.

Would he ever get away in time? Would he ever make it?

Bill threw the throttles open. The engines thundered. The attack bomber lurched into action.

Down that rough landing field the big plane raced—faster and faster. The shed was a mass of roaring crimson—the ground bright with the illumination.

And Bill, clinging desperately to the control stick, shot an agonized look at the right wing. Would it ever stand the strain?

At any second the gasoline drums would explode. A tongue of flame would knife into the heavens. The light would fall on the selenium cell. The charge of explosives would be detonated. The whole of Calibar Island would go up in one deafening eruption.

AL WILLIAMS' "famous" **Gulphawk**



MEGOW'S latest . . . a MODEL of the Gulf Refining Company's colorful GRUMMAN now touring the Country. Every live-wire fan will want one. Choice of "Flying Model" or "Detail" kit.

Send 5c for profusely illustrated catalog showing scores of boat and airplane models.

MEGOW'S Dept. AT., Howard & Oxford Sts., Philadelphia, Pa.

or Dept. AT., 217 N. Desplains St., Chicago



SCROLL SAW

This Balsa wood cutting saw will make your models neater, finishing them in one-fourth the time. Finest detail work easily done. Cuts out parts all at once, without the use of dangerous razors or knives. Runs easily by hand or small motor. Safe, efficient, easy to use. Do better work with a Craftsman's Scroll Saw.

Electric Model
\$2.00
Complete with Motor

CRAFTSMEN, INC.
Dept. AT2
4303 Cottage Grove Ave.,
Chicago, Ill.

Hand Model
\$1.00
Complete

FREE GIFT

with every Balsa Stripper purchased 25c (coin) postpaid. Why buy balsa strips when you can cut your own and save money. Full instructions enclosed.

LITWIN BROS., 474 EAST 98th ST., BROOKLYN, N. Y.

COLT

45 CAL. Frontier Model

Basswood construction kit with working plans and all necessary hardware. Barrel and cylinder are machined.

\$1.45

COLT 45 CAL. "FRONTIER" model kit, 5 1/2" barrel . . . \$1.55
COLT 45 CAL. "FRONTIER" model kit, 7" barrel, 1.70
COLT 45 Automatic Pistol Kit, . . . 1.00
COLT 25 Cal. automatic pistol kit,50
THOMPSON SUB MACHINE GUN model kit, . . . 3.00
Savage Cal. 32 automatic pistol kit,75
LUGER 9 M/M auto. pistol kit w/6" barrel, . . . 1.75
LUGER 9 M/M auto. pistol kit w/6" barrel, . . . 1.90
All kits make beautiful full scale models. Postpaid in U. S. A.
GUN MODEL CO., Dept. W27, 2908 N. Nordica Ave., Chicago, Ill.

FINISHED FLYING SCALE MODELS

Our 22" Douglas Fighters and DeLuxe Monocoupees are completely finished and painted. Price each: \$1.25 postpaid. Supply limited. **BRADLEY MODELS, ARMSTEAD, MONT.**

FREE CATALOG WILL SHOW YOU HOW

to Get America's Finest

FIREWORKS

at 50% Saving and MORE

Big \$4.00 Assortment Special \$1.95
including repeater pistol and caps Only F.O.B. Chicago

SPECIAL Junior Assortment \$1.50

especially selected for younger children
Before you buy any fireworks, get our NEW LOW PRICES and BIG NEW catalog displaying America's finest FIREWORKS. Assortments—individual pieces—everything you want—daytime noise-makers, NEW novelties, night thrillers—for children, grownups and whole family. HIGHEST QUALITY. LOWEST PRICES. Write for FREE circular now.

**MODERNE SALES CO., Dept. B-129
2806 Tribune Tower, Chicago, Ill.**

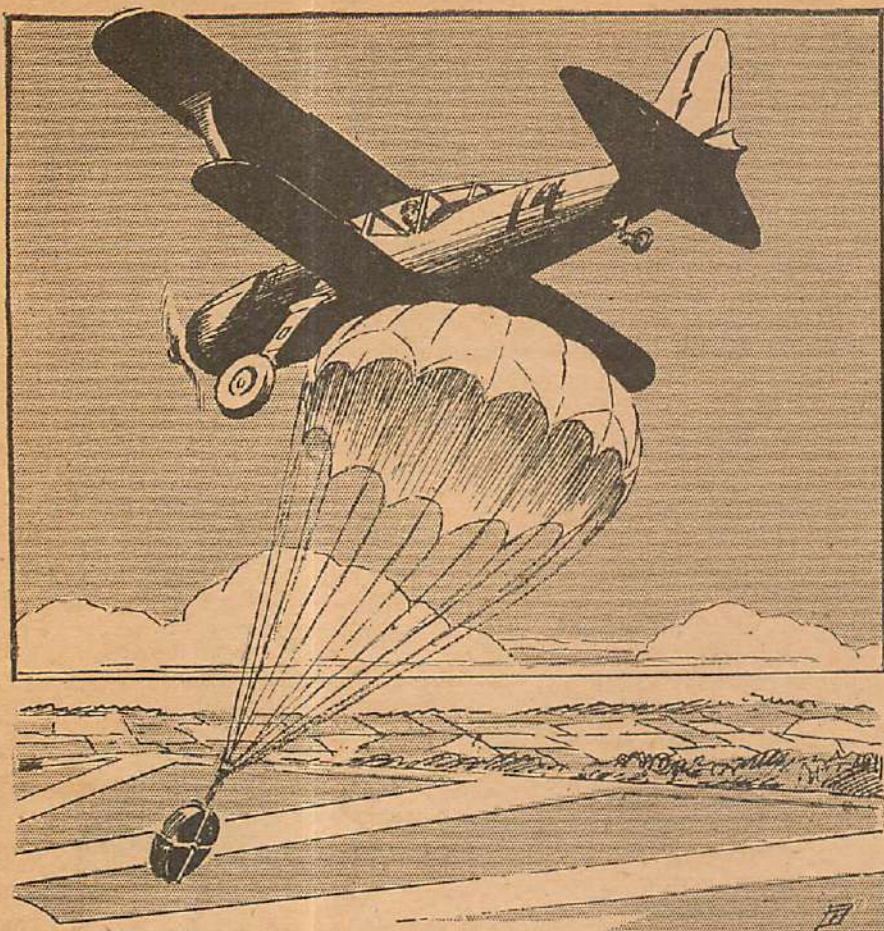
MODERNE SALES CO., Dept. B-129
2806 Tribune Tower, Chicago, Ill.

Rush me your big FREE Fireworks Catalog with SPECIAL OFFER and NEW LOW PRICES.

Name

Address

City..... State.....



A small white parachute blossomed out— Something small and round was tied to the end—

The speed of the attack bomber increased. It was nearing the end of the field. Bill tugged the stick back. His heart was pounding in his throat.

The big machine reacted. She came away from the ground. The wing was taking the strain.

Then, like a bullet of steel burnished red by the light from the fire, the plane pelted high into the heavens.

Back at the field a gasoline drum exploded. Another and another. The flames leaped high.

Bill crouched over the controls. His body was soaking wet. Would he ever get far enough away?

The attack bomber arrowed up. In tortured agony, Bill waited—waited for the final explosion. Suddenly, he looked at the sky ahead. He saw pin points of red and green light. Navigation lights. His planes! His own squadron!

Then—the entire universe seemed to unite in one terrific, blinding burst of flame.

The attack bomber was lifted bodily and thrown across the heavens. Bill's head grazed the instrument board. Half stunned, he hung to the controls. He had a blurred impression of the whole of Calibar Island erupting, of a giant pillar of flame standing motionless in the sky.

XX—THE AIRPORT

LATE the next afternoon, the Barnes airport was crowded with newspaper men and photographers.

Bill sat beside Shorty on a bench in front of one of the hangars and patiently repeated the whole story to Sam Cooper of the *New York Star*. He ended with: "—I managed to keep control of the ship until the wing was about to come off. Then I sat her down on the water and fired an S O S with the ship's Very pistol. Shorty came down and pulled me off. That's all."

"But, hey," Cooper said. "What about Aziz's planes?"

Bill went on, "We chased up north fast, overtook Aziz's planes about two hundred miles south of here—what there was left of 'em. Schrenk's doctored fuel had wrecked about three quarters of the fleet."

"And you got the rest," Cooper said.

"Yes," Bill said grimly.

The hangar doors behind Shorty and Bill had been run back part way. Sandy Sanders suddenly appeared in the opening. He held a small jar of honey in one hand and Alphonso by the other.

The boy bent down, placed the jar of honey in the monkey's hands. Then he pointed to Shorty's helmet, which lay on the bench back of the veteran pilot.

"Go on, Alphonso," Sandy whispered.

The monkey crept steadily to the bench. Undetected, he tipped the jar of honey over Shorty's flying helmet and allowed the golden, sticky mass to pour into it. Then, his beady eyes blinking, he scampered back to his master.

A motion-picture operator approached Bill. "Let's have a shot of you and Mr. Hassfurth," he said.

"O. K.," Bill said obligingly. "Come on, Shorty."

The two men stood up.

The camera man said, "Look. We want to give the public all the trimmings. How about putting on your helmet, Mr. Hassfurth?"

Shorty said, "Sure." Without looking, he reached behind him, seized his helmet and slapped it on his head.

But Sandy and Alphonso didn't see any more. They were running hard.

LIGHT PLANES OF 1937

(Continued from page 9)

motor-car fuel; they have proved long-lived and dependable in service and can be replaced for a fraction of the cost of an aviation-engine top overhaul.

One of the newer experimental jobs, the Waterman "Arrowbile," boasts the further advantage of "roadability." This ingenious air-and-ground craft is a Studebaker-powered, tailless plane which sheds its wings upon alighting and is transformed into a streamlined, rear-engine car in which to drive home. The

idea sounds screwy at first, but a careful examination convinces me that Waldo Waterman's newest model is a long step forward in the direction of a convenient, low-cost airplane for popular use. The only other American craft having this feature is the Pitcairn Roadable Giro. Unfortunately, the development work on this interesting little autogiro seems to have come to a standstill.

There you are, boys and girls. You have a picture of what is available right

now in the way of wings for the private flier. If you have studied your lessons properly, you should know who makes it, what it will do in the way of performance and how much it costs. The rest is up to you. As little Alfie, the Limey grease monkey would say, "Yer pays yer money and yer tikes yer chice." Only when you do "tikes yer chice" up into the big blue sky, for Pete's sake, keep up your flying speed and always land into the wind!

WHAT'S YOUR QUESTION?

(Continued from page 36)

Question: Can a wingless auto-gyro make a loop? N. D., Vineland, N. J.

Answer: The auto-gyro was originally designed for safety and particularly to eliminate the chance of stalling. I would not care to attempt to loop one; and as far as I know, no loop has ever been performed in an auto-gyro, but I would not go so far as to say that an auto-gyro couldn't be looped.

Question: When did Colonel Lindbergh make his famous flight across the Atlantic, and how long did it actually take him? S. M., Plenty, Saskatchewan.

Answer: Colonel Lindbergh's transatlantic flight was carried out on May 20-21, 1927. He started from Roosevelt Field, New York, and flew to Le Bourget outside Paris in 33 hrs. 31 mins. The distance was about 3,600 miles.

Question: Why are not more planes designed along the teardrop idea, particularly those used for racing? D. J., Denver, Col.

Answer: Designers do not always work from a shape formula. They first have to consider the power plant they are to use. The big 2-row radial is, of course, best suited for the teardrop design, but the in-line works in better with the cigar or bullet idea. In this country most racing planes have been built by young enthusiasts who have been keen on speed but shy on cash, and they have not been able to do better than the lighter inverted in-line jobs.

Abroad, the big companies have built racing planes mainly for publicity purposes, and they have usually taken the best engines they have, such as water-cooled Vee or in-line jobs. A modern 1,000 h.p. radial costs plenty of money, and racing enthusiasts cannot afford such an outlay. Theoretically, the teardrop design is the best for streamlining, but it does not always fit in with the builder's purse.

Question: Which service has the faster planes, the army or the navy? T. M., Hammond, Ind.

Answer: You must first understand that the conditions faced by both services are entirely different. Navy planes, for instance, have certain duties to perform. They must carry a very comprehensive equipment. They must be built stronger for catapulting or deck landings, and for that reason are usually heavier. For this reason, generally speaking, army planes are faster than those used by the navy.

Question: What is the greatest height reached in an airplane by a pilot using oxygen? Without the use of oxygen? H. H. P., Jacksonville, Fla.

Answer: The world's altitude record is 49,967 ft. by Squadron Leader F. R. D. Swain of the R. A. F. in a special Bristol monoplane. There are no official records of any altitude flight attempted without the use of oxygen. That would only indicate the ability of a pilot to withstand certain physical strain.

Question: Please explain what a demolition bomb is. C. R., Fort Wayne, Ind.

Answer: A demolition bomb is a bomb designed for the demolishing of enemy strong points. It is usually built with a heavy casing and a fuse with a delay action, so that after falling it will pierce the target for a certain distance before exploding. A fragmentation bomb, on the other hand, is fitted with a light shell casing, loaded with shrapnel and a graze or impact fuse, so that it explodes on contact and discharges its shell fragments or shrapnel over an area near the ground, to stop ground troops.

Question: Please give me the address of the best technical aeronautical school in or near New York City. C. D. A., Yonkers, N. Y.

Answer: The course offered by New York University is probably the best aeronautical course given in this section. But there are several other private schools which advertise in the aviation technical magazines.

Question: How does the catapult on a battleship work? E. D., Bridgeport, Conn.

Answer: There are two general types of catapults to-day. They both use the same double track and cradle system, but one is powered with compressed air and the other uses a special cartridge much like that used in a gun. The plane to be catapulted is placed on the cradle, which is free to run along the two tracks. When the catapulting sequence begins, the tracks are swung around into the wind; the motor of the plane is warmed and all signals are given that indicate that the pilot and the operator are ready. On the signal "Release!" the deck officer pulls a lever which either fires the explosive cartridge or releases the compressed-air cylinder. This force carries the cradle and plane down the runways at high speed and allows the plane to take off.

Question: Is a four-year term at West Point sufficient to get an appointment

to the air corps as a cadet? E. J., West Allis, Wis.

Answer: I have attempted to answer all these questions in the series of articles run recently in Air Trails. You should know by now that graduates from West Point are among the preferred candidates for the air corps.

Question: Where can I obtain plans for building a glider? W. C., Jerseyville, Ill.

Answer: I suggest that you get in touch with the secretary of the Soaring Society of America, Delaware Avenue, Wilmington, Delaware, for any up-to-date information on gliders and gliding.

Question: Is it true that Japan has a Fokker seaplane that is capable of 340 m.p.h.? My uncle is positive they do. F. B., Jersey City, N. J.

Answer: I have no way of knowing what real speeds the Japanese air-service ships are capable of, but I certainly question whether any service seaplane, anywhere in the world, is capable of 340 m.p.h. I would be interested in learning where your uncle got this interesting information.

Question: What is meant by a "dead-stick" landing? B. C., Newton, B. C.

Answer: A dead-stick landing is one carried out with a completely dead engine. That is to say, once you start in, there can be no taking off again in case of misjudgment of distance. Actually, the "dead" refers to your power.

Question: Can you tell me something about De Havilland and Short, the British aircraft designers? J. H. E., Victoria, Australia.

Answer: Captain Geoffrey De Havilland was a young officer in the R. F. C. who was allowed to join the firm of the Aircraft Manufacturing Co., makers of the Airco planes of those days. Later De Havilland designed the D. H. 4 after the D. H. 2, which was a fine single-seater. This established him as a designer. He is now chairman and director of design for the De Havilland Aircraft Co., which was founded in 1920.

The Short brothers, Eustace and Oswald, organized their firm as far back as 1898, when they first made balloons. They started building planes in 1906, and their planes won many European races. They devised a folding wing, and in 1911 went in for seaplane design. Their products during the War were considered the best of their class, and were widely used by the British royal naval air service. They first took a torpedo into the air. To-day the firm is one of the leading manufacturers of giant seaplanes.

GLIDING AND SOARING

(Continued from page 25)

The Rockaway Gliding and Soaring Club, at Inwood, Long Island, is joining the new movement by renewing its activity after a lapse of several years. This club has purchased a Cessna Primary, and the members are at work on the construction of an Albatross sailplane. Al Berwick, long an enthusiast of air-yachting, is the organizer.

The Newark Gliding Club in New Jersey, one of the few endowed groups in the United States, remodeled its towing winch and made it more suitable for transportation over rough ground. The nacelled Waco Primary, used for instruction, is being kept busy on their field at Lyons, New Jersey. The Bowlus sailplane has been completed and is ready for the national meets.

The Associated Glider Clubs of New Jersey are looking forward to the most successful of their annual Labor Day meets on the field of the Aero Club at Basking Ridge, N. J. The Aero Club Albatross maintains its own field and hangar, a secondary, and a Waco Primary glider. Gus Scheurer, the founder, is the developer of the tow winch used to launch gliders where the ground is too rough, or the straightaway too short for auto towing.

The Y Flying Club maintains its headquarters across the road from the Aero Club Albatross. This club also maintains its own field, and is equipped with a hangar built by the members. It owns

a Waco Primary, a secondary glider, *The Nimbus*, converted from a Waco Primary, and has just completed a Kestrel sailplane built from English plans.

The converted *Nimbus* rivals the best of the factory-built utilities in the excellence of its performance, and in the soundness of its construction.

The North Jersey Soaring Association is not a club, for each member owns his own individual ship. The association has no dues or meetings. The seven members went to school together, and two of them started flying with hang-gliders.

The total equipment of the association is probably the finest of any group in the country, for it includes Chet Decker's Albatross in which he won the National Soaring Championship. There are two Franklins, one of which is equipped with special long wings, and a two-place Sesquiplane glider.

In winter the frozen surface of Greenwood Lake is used for take-offs, and the hilly shores for soaring. At a recent expedition to Mt. Peters, near Warwick, N. Y., two of the boys set fifty-minute records aloft in their Franklins.

Ellery Clark, of the Clark Glider School, Hartford, Connecticut, has redesigned his Mead C-3 Utility and is back in the air, in step with the new movement.

The Case Aero Club, of Case School, Cleveland, Ohio, has streamlined its

Waco Primary with excellent results. The members have experienced a new thrill in ease of take-offs and have been able to reach greater altitudes and to stay up in the air longer since the change was made.

The Toledo Gliding Club, Toledo, Ohio, holds a new altitude record for flights launched by auto tow. Emerson Melhouse, one of America's outstanding glider pilots, flying the club's two-place Funk Glider, was towed up to an altitude of two thousand six hundred feet! For a runway the members used the frozen Maumee River.

The Wyandotte Gliding Club, of Wyandotte, Michigan, has built a redesigned Funk two-place glider. If the tests prove as successful as appears probable, the new ship will be entered in the National Soaring Contest at Elmira, N. Y.

Fifty other clubs throughout the country are either building new equipment or rebuilding old. New records are going to be set, and set again and again as this great movement reaches toward new peaks of interest. This department will reflect that interest, will give you the news concerning old clubs come to life and new clubs in the making. Be sure to mail YOUR news to the Gliding and Soaring Editor of Air Trails every month. This department is devoted to your interests. It is the nerve center of gliding and soaring in America.

LET THE KIDS FLY THE AIRWAYS

(Continued from page 28)

yourself to these new developments if you're going to keep on flying, Moose."

Old Moose gazed at his son out of the corners of his eyes. What in the world did the kid mean by "if you're going to keep on flying"? What else would he do? He'd been flying now for over twenty years, and, taking everything into consideration, he had done pretty well.

Suddenly, a thought struck him that nearly bowled him over. He blinked his eyes, gulped, and mentally reached out and yanked the thought back to him.

Did the kid mean that he thought Moose ought to stop flying? That he ought to make way for younger men who knew how? The thought appalled him at first, then fascinated him.

"Why did you wallop that student on the jaw, kid?" he asked suddenly.

"He annoyed me like the devil," Young Moose said. "He talked too much."

"Criticized my flying, eh?" Old Moose asked. "Called me an old fool who ought to cut out the flashy stuff?"

"Yeah," Young Moose confessed. "That was the idea. These young fliers

have different ideas than you old-timers, Moose."

"Yeah, I know," Old Moose said. And he knew that in spite of the fact that Young Moose had hit the student on the jaw he believed the student was right! He had hit him because he couldn't stand hearing him tell the truth, or what he thought was the truth, about his father!

For the first time in his life Old Moose saw himself as something besides a daring, romantic figure in the eyes of other people. He was so used to believing other people thought of him in that way he couldn't countenance the idea. For an instant he was angry. His handsome face flushed and his gray-blue eyes gleamed brightly. Then, he got hold of himself.

"You mustn't mind that stuff, kid," he said. "Every one has a right to their own opinion. When are you going to start actual experiments with these gadgets?"

"I've already started," Young Moose said, relieved. "We've spent a lot of money on beams and equipment. My

own ship is a regular flying laboratory. The first night we get ideal weather—I mean, lousy weather, the worst we can get—I'll make a test flight from here to Oakland."

"I'm going over to say good-by to Steve Halliday," Old Moose said. "Then, I'll come back and we'll have some lunch, eh?"

"O. K., Moose," his son said, grinning. "I'm proud of you, kid," Old Moose said, as he went out the door. A wave of affection swept Young Moose, as his father's voice boomed back to him.

At noon that day the meteorologist on the field reported to Young Moose that to-night might be the kind of night he had been waiting for.

"There is a low moving down from Alberta that may be just what the doctor ordered," the meteorologist said. "Snow, no visibility, no ceiling, and a forty-mile head wind."

"Head wind?"

"It'll smack you on your starboard quarter if you stick your nose on Oakland."

"Good!" Young Moose said. "It

sounds ideal. Keep me informed, will you, Hank?"

"O. K., suicide." Hank chuckled and hung up.

Old Moose looked anxiously out the window as Young Moose told him his plans while they ate their luncheon. Large, wet flakes of snow were already beginning to drift to earth, fanned by a light breeze.

"This is going to be no kind of a night for flying, according to my ideas," Old Moose said. "You'll get a lot of snow and ice on your wings, lose altitude and stick your nose into the side of a mountain."

"Defrosters take care of that," Young Moose said. "And a new electrically shielded ring antenna eliminates snow and rain interference on the radio beams and phones. Before long we'll be going through any kind of weather, right on schedule, like a train."

"Trains still get stuck in snowdrifts," Old Moose growled.

"That's one thing we don't have to worry about. I've never seen a snow-drift above the ground."

"You take it easy, kid."

"Be careful like my father, you mean?" Young Moose laughed.

At five o'clock that evening Young Moose had definitely decided that this was the night he had long been waiting for. It was the worst possible kind of a night for flying. The snow was three inches deep on the field when they rolled his two-place, flying laboratory out of the hangar and a swarm of grease monkeys went to work on the outside, while staff technicians checked and rechecked his instruments.

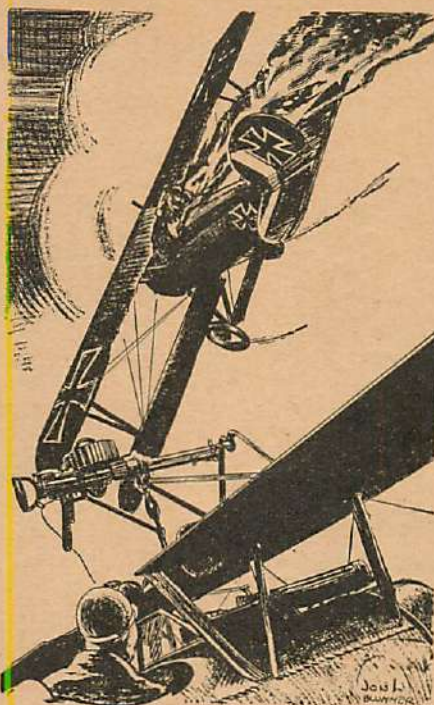
Old Moose Lamb stood inside the administration building, talking to Steve Halliday. His eyes were more than anxious as he studied the storm that whipped up eddies of snow against the corrugated iron hangars.

"You're not going to let the kid go through on a night like this?" he said to Steve.

"He says it's just the kind of a night he has been waiting for," Steve said, doubtfully. "Personally, I don't like it. But we're old-timers, Moose. These kids can get through things that would have sent us old-timers back to the fireplace. There is no denying they have guts. If they stick their nose in the side of a hill and get burned to a cinder, it's all in the interests of science."

"It's poppy-cock!" Old Moose thundered. "I'm not going to have my son a martyr to his own damn foolishness! An angel with a message from Garcia couldn't get through a night like this!"

Old Moose opened the door and a swirl of cold, damp snow slapped him in the face. He stuck his head down and started toward that dim little group of men around the sturdy biplane on the apron.



He got his twelfth after he was twenty—

"Hey!" Steve Halliday shouted after him. But Old Moose didn't hear him, as Steve's words were blown back into his own mouth. He closed the door. A worried frown creased his forehead. He remembered why Richard L. Lamb, Senior had been nicknamed Moose in his younger days. It had been because he dared to go where angels feared to tread. He had been noted for sticking his head down and roaring through, instead of around, obstacles.

"Listen, kid!" Old Moose roared at his son. "You're not going to take that ship out on a night like this. You'll never get over the mountains. You have no visibility, no ceiling, no nothing!"

Young Moose laughed. His white teeth and eyes flashed in the frame made by his fur-lined helmet. He was a young man on the eve of his great adventure. He slapped his father on the back and said, "This is the night the doctor ordered."

"I forbid your taking a ship out!" Old Moose shouted above the whistle of the wind. "No man could take a plane through such a storm."

"She's ready to go," Young Moose said, and his face was grave now. "You never let any one tell you when to take a ship into the air. Wish me luck, Old Moose." He put out his hand.

But Old Moose hardly saw the outstretched hand. Dimly, he heard a voice call that the power plant in the biplane was turning over 1,800 r.p.m.s. For the first time in his life Old Moose was really afraid. This, he thought, is my fault. The kid would never have been like this if it hadn't been for me. His mother gave her life for him. She—

Twenty years dropped off the shoulders of Old Moose Lamb, as his right fist came up in a short, sharp arc. It landed on the side of his son's padded jaw and sat him down in the snow. A dozen hands grabbed at Old Moose as he dived for the cabin door of the biplane. He crashed through them in a manner befitting his name. The door slapped shut behind him as he dropped into the port seat and snapped the catch.

He pushed the throttle open and poured soup into the mighty power plant as he released the wheel brakes. He made out the dim outline of the illuminated wind sock, as he blasted the tail around and stuck the nose into the storm. The powerful little ship waddled through the snow for a moment, then gained momentum.

Old Moose whipped it into the air with a fury that was matched only by the storm that came racing to meet him. He eased the stick back gently and tapped his rudder. As the little ship came around and dipped a wing the lights of the field below were a dim, blurred mass. He eased off and came back into the wind with his engine screaming. Up and up he climbed, until his sensitized altimeter told him he had five thousand feet between him and what had been a dim mass of lights. He studied his drift and air-speed indicators and stuck the nose of the blind ship on a true course above Hornell.

As he switched off his landing lights the world became a huge black void and the storm seemed to race at him like some huge, destroying monster. He clenched his teeth and cursed, as his compass needles began to dance. For the first time he realized what he had done. The thought left him weak and a little sick. He knew that he had acted like a man without reasoning powers. He had stuck his head down and tried to go through the line without interference. He was like an enraged bull charging heedlessly.

He saw a vision of Young Moose's startled face as he sat down in the snow. It all came to him with sickening clearness now. He saw Young Moose as a chip off the old block—with the benefit of his mother's common sense and logic. He was doing the same things, he, Old Moose had done as a youth. Only he was approaching them in a scientific manner. Young Moose had studied and plotted with the same careful thoroughness Lindbergh had used in 1927. That was the difference between the old and the young. He groaned and plugged in the ear-phone connections that dangled behind him and reached for the round, black microphone on the spring reel in front of him.

"Moose Lamb calling Palmero," he said into the mike. "Moose Lamb calling Palmero." The sound of his own voice was drowned out by the scream

of the storm. He fumbled for the key on the radio switch and threw it. A million banshees wailed in his ear. Then a faint, familiar voice cut through the night air.

At the same instant the ship dropped with sickening speed and he had to use all his powers of concentration to regain balance, his worried eyes roaming across his instrument panel. As his left wing dropped away he leaned the stick to the right and peered downward, trying to pick up a beacon. He could barely see the end of his wing tips and his running lights.

"Palmero calling Moose Lamb. Palermo calling Moose Lamb," beat in his ears. "Palmero calling Moose Lamb. . . . Can you give us your position. . . . Can you give us your position?" "Moose Lamb speaking," he gulped into the mike, as he nosed down to see if he could pick up the beacons at Hornell. "Moose Lamb speaking. Calling Palermo. . . . Calling Palermo."

He had recognized the voice of Young Moose over the radio-phone and the thought of making contact with him sickened Old Moose. How could he ever explain to the kid what he had done? Suppose he smashed up the thousands of dollars' worth of equipment the kid had worked so hard to put in the plane?

"Just a moment, Moose," Young Moose's voice came back. "I'll give you your position. Take it easy. Throw the little brown switch at the top of your radio panel and see if the radio beacon comes in. Do you get me?" Young Moose repeated his instructions.

"I don't get the beacon," Old Moose said in a moment. "I'm sorry—"

"Hold that, now," Young Moose said sharply. "Here's your present position." Old Moose checked it on his chart. "Give me your drift, your course, and your altitude."

"You ought to be over Ralston in a moment," Young Moose said in a few minutes. "You missed Hornell entirely.

I'll give you your true course." His voice faded away and was gone.

Old Moose nosed down cautiously and tried to pick up the floodlights at Ralston. He checked his bearings as Young Moose had given them to him, while he fought to keep control of his ship. He finally decided he didn't know where he was and he didn't give a damn. He was cold through and through. His feet and hands were stiff in the light gloves and shoes he was wearing. He had his overcoat wrapped around him as tightly as possible, but a clammy, nasty cold had crept in next to his skin.

He felt his way cautiously, carefully, using every sense, relying on his natural touch and perception and instinct. He was crouched down in the cockpit and his shoulders ached from being banged against the cowlings, as the plane bumped through the air at a hundred and fifty miles an hour.

He tried to make contact with the ground again, but no voice came back to him. Suddenly, it seemed that a giant hand came out of the air and slapped him earthward. He worked with all his skill to regain the three hundred feet the descending current of air had cost him. He eased the stick back while he talked to the ship, imploring and cursing in turn.

Then a voice came over the radio-phone again. It was indistinct and Old Moose had to draw the words out of the air with the sheer power of his will.

"Ralston calling Moose Lamb," a voice said. "Ralston calling Moose Lamb."

Old Moose acknowledged with his name. He was so cold now that he could hardly speak.

"Listen, you old fool!" a voice came back to him. "This is Bill Harkins speaking from Ralston. Do you get it? Bill Harkins speaking from Ralston. Circle back and let your Sperry-gyro bring you in. When you pick us up ride the runway and landing beacon down. Do you get our localizer beam?"

"I get it now," Old Moose said. "But

I don't know how to work the Sperry-gyro and the other dials. I—"

"What the hell are you doing up there on a night like this?" Bill Harkins roared back at him. "Keep circling lower. You're O. K. We have your position. All our floodlights are on."

For one awful moment fear seized Old Moose. He knew what it meant to go into a field blind. And he would be going in blind, unable to make a blind landing.

Then the night was split in half by powerful floodlights. He gazed downward at them in half-mad wonder. He circled low, cut his gun and rolled in toward the hangars.

Men came running. They stopped and stared at him. They stared at him as though he was something from another world.

"Moose Lamb!" came from one of the upturned faces.

"Moose Lamb," Old Moose repeated, as he stepped through the door and collapsed on the ground. He began to babble incoherently, until some one slapped him on the face and he looked up into the eyes of Bill Harkins, another old-timer.

Harkins helped him to his feet, stuck a cigarette in his mouth and lighted it for him after the wind had blown out three matches.

"Up to your old tricks, you fool!" Bill said.

Moose nodded weakly. "Have you talked with my kid?" he asked eagerly, in a moment.

"Yeah. And he's been worried as hell," Bill said. "He said it was no night for an old man like you to be in the air."

"He's right," Moose said. "You got a ground job you can give me, Bill?"

"I have," Bill said. "And you'll need it after to-night. You'll lose your license for this, Moose."

"I won't need it," Old Moose said. "The place for an old fool like me is on the ground. Let the kids fly the airways! I'm through."

GETTING INTO AVIATION

(Continued from page 32)

AIRPLANE FACTORY WORK

From the above you can see that if the present trend keeps up there are going to be even greater demands in manufacturing than at present, for men with the proper training. But a young man picking an occupation should take a long view of the matter and remember that the airplane industry, like the automobile industry, produces largely for a luxury market, and for that reason is extremely hard hit by bad business conditions.

Of course, military construction doesn't suffer so much from depressions, but only one third of the 1936 airplanes not exported were military planes. And mili-

tary appropriations are likely to vary drastically. Exports, too, may drop if foreign countries cut down on their military-plane programs. If they don't fight, they will probably cut down. If they do fight, we make no guesses—except that there will be lots of jobs in airplane factories.

But even if we avoid war, another depression in this country is practically sure, unless a lot of things are changed. That's what some government officials and a lot of economists say that experience proves that the best jobs to have in depressions are those in industries which provide goods and services for which there is the most constant

demand—such as electric-power service, telephone service, local-transportation service, Federal, State, and local government service, food, tobacco, and wearing apparel, especially shoes. But the only real safeguard against losing a job in a depression is to be better than the two guys next to you.

"The aeronautical industry," says the sales manager of the Waco Aircraft Co., "is a widely fluctuating one at the present time and questions answered in December could be completely contradicted in June, particularly in the commercial industry. This does not apply so much to the military field, but the same thing would apply from one year to the next.

Many of the factories go a year without any work, then have more than they can take care of the next year.

"Certainly, as a general statement, there is no reason to believe that the young man does not have a better chance in aviation and better prospects in aviation than in any other trade today. On the other hand, the exceptional man, skilled or trained for any trade, will make his mark and do his earning no matter how crowded that particular industry may be when he enters it. Aviation is a baby industry at the present time, just scratching its possibilities, and there is no doubt that as these possibilities develop, as they will, that the man who is worthwhile and a producer will find plenty of opportunity to advance himself in this business."

With present prospects indicating an increasing demand for airplane factory workers in general, what particular kind of men are most in demand at present to fill shortages? The answer is: skilled sheet-metal workers; installation assemblers able to work from blue prints; machinists; and tool makers, especially jig builders. At present the factories are making a greater effort than usual to train unskilled helpers for the better jobs. One of the biggest factories says that a helper of average ability can hope to get out of the helper classification in from three to six months; if he has exceptional aptitude, in from one to two months. After that, he works on up into the higher-paid foremen's and inspectors' jobs, as his superiority over his competitors warrants.

What about pay in airplane manufacturing? A recent report by the United States Bureau of Labor Statistics showed that out of 93 different industries listed, the average weekly earnings of 73 were lower than the aircraft industry, and 19 higher. Among those higher, newspaper and periodical printing was highest of all, at \$36.32; automobile next at \$32.27; railroad repair shops, \$30.78; tires and tubes, \$31.82; beverages, \$30.65; petroleum refining, \$30.43; machine tools, \$29.28; steel works, \$29.13. For explosives the figure was \$28.43, and for chemicals, \$27.38. For airplane factory workers, the average weekly earnings were \$26.93. Salaried workers are not included in these figures.

There are several reasons why aircraft workers, though among the most highly skilled of all, get less than workers in these other industries. It has been found that in industries where the use of machines is highly developed the workers, though perhaps less skilled, get higher pay for the simple reason that by using machines they produce more goods which sell for more money. This explains high wages in the automobile, steel, and several other industries in the group above airplanes. In newspaper printing, railroad repair shops and some

others, there are very strong labor unions. And in the case of newspaper printing there is also especially highly developed machinery.

The aircraft manufacturers, due to the comparatively large amount of handwork and to the high engineering cost (because so few airplanes of a model are made before a new model is designed) have relatively high total labor costs despite the fact that the amount to each man is low considering the high skill required.

Another reason why pay isn't higher is the weakness of labor unionism in the aircraft industry. A large proportion of all aircraft workers in the country are employed in southern California, and sit-down strikes and union movements fare badly in that section of the country. You probably read in the papers how the sit-down strikers in the huge Douglas plant were hauled off to jail at the point of machine guns, and were glad to go back to work for a 5-cent-an-hour raise in pay, instead of the 15 to 25 cents they had demanded.

Besides the Douglas plant, which recently was employing about 5,600 people, there are 4 or 5 other fairly large factories in southern California, which means that the outstanding aircraft-factory area in the United States is not very likely to see any strikingly successful efforts by employees to force higher wage rates. The open shop prevails elsewhere in the industry, and it seems reasonable to suppose that the real hope for higher wages rests on the further development of the worker's productivity through greater use of machinery and mass-production methods.

But less machinery means less routine repetition of mechanical movements hour after hour. A lot of aircraft factory jobs are better jobs than many other higher paid ones—for the man who can't enjoy his work unless he uses his head as well as his hands, and for the man who likes to see what he has made and be proud of it. And there are those 73 lower-paid industries. Pity the poor cottonseed oil and meal workers, who average 53 hours a week for \$11.20.

A great many airplane factory workers get a lot more than \$26 a week. The shortages are in the higher-paid classes, and a smart fellow can go gunning for a well-paid job with good hope of success. Wages vary in different factories and different areas, but we'll give you our own estimate of what is probably fairly close to present pay rates for some of the most important classifications. Factories making airplanes for the government are now required by law to observe the 40-hour week. Some other factories run on the 48-hour week and weekly earnings in some of them may run a little higher than the rough estimates we give.

Apprentices, 18 to 19 years old, are

paid about \$14 to \$16 a week where they are used. Some of the largest factories have a limited number.

Helpers for the most part may expect to earn from \$16 to \$20 a week. Some make up to \$25, but very few as much as \$30.

Riveters make ordinarily from \$20 to \$25 a week.

Fitters and bench hands, and assemblers: probably about a third of them make from \$24 to \$28 a week; about a third from \$28 to \$32; some make less than \$24 and a few more than \$32.

Steel fuselage builders: almost a third of them get about \$24 to \$28; close to a fourth get from \$28 to \$32; about a fourth between \$32 and \$40; a very few over \$40.

Sheet-metal workers and welders: about a third get from \$28 to \$32; about a fourth of them from \$32 to \$36; and a good many get more than \$36, on up to a high of about \$45 to \$50 a week.

Machinists and tool makers: it is probable that a large proportion make between \$28 and \$36 a week in the aircraft industry, with the rest more or less evenly divided above and below these figures. Some make as high as \$45 to \$50 a week, and in a very few cases even more.

Inspectors: there are many kinds of inspectors and about half of them make probably between \$28 and \$36 a week; perhaps a third make from \$36 to \$50, and a small number make up to \$60 a week.

Foremen make ordinarily between \$40 and \$60 a week, with \$50 a fair average in the big factories.

A list of all airplane manufacturers may be obtained from the Bureau of Air Commerce, Washington, D. C. Because of the relatively large number of untrained people trying to get jobs in airplane factories, it is not wise, if you are inexperienced, to go any great distance to ask for a job, unless you know beforehand that you have a good chance. If a factory is looking for intelligent but untrained young men, it is probable that an employment manager would answer a letter of inquiry—if it showed intelligence and stated clearly the applicant's age, general education, and experience. And a stamped, self-addressed envelope would make reply easier.

CIVIL-SERVICE JOBS

The army air corps maintains large "air depots" where army planes are periodically overhauled and rebuilt. They are under the direction of air corps personnel, but the work is done by employees drawn from the lists of the United States Civil Service Commission. The four big depots are the San Antonio Air Depot, Duncan Field, San Antonio, Texas; the Fairfield Air Depot, Patterson Field, Fairfield, Ohio; the Middletown Air Depot, Middletown, Pa.; and

a fourth at Rockwell Field, Coronado, Calif. Rockwell Field has been turned over to the navy, but the air corps continues to occupy shops there pending completion of a new air depot near Sacramento. There are also air corps establishments which employ civil-service and mechanical workers in Hawaii and a few other places, including the Matériel Division at Wright Field, Dayton, Ohio.

About 4,500 persons are employed in the air depots at present. Due to the fact that the pay, in general, is a little lower than in privately operated factories and maintenance bases, air depot employees are leaving government service at present "like flies," as an official in Washington put it. That means that jobs in government service are easier to get than they have been for a long time. If the number of army planes is increased considerably, as seems likely, the number of men needed to overhaul them will naturally increase, also.

In order to get on the civil-service list of eligibles for jobs in the air depots it is, in most cases, not necessary to pass any written examination. When vacancies exist an "unassembled" examination is announced. Applicants do not assemble anywhere for an examination, but merely secure the necessary blanks, fill them out, and send them in. If the applicant's qualifications fill the requirements, and if investigation of his references back up his statements, he is put on the list. Appointment to jobs is generally made from among those living closest to the place where vacancies exist, though consideration is also given to superior experience and recommendations.

If you are interested in an air-depot job, you should write for information in regard to pending examinations, and blanks, to one of the following:

For jobs at the San Antonio depot, to the Manager, Tenth U. S. Civil Service District, New Orleans, La.

For jobs at the Middletown depot, to the Manager, Third U. S. Civil Service District, Philadelphia, Pa.

For jobs at the Fairfield depot and at Wright Field, to the Manager, Sixth U. S. Civil Service District, Cincinnati, Ohio.

For jobs at Rockwell Field and in Hawaii, to the Manager, Twelfth U. S. Civil Service District, San Francisco, Calif.

Employees at the air depots include aircraft mechanics, aircraft-engine mechanics, aircraft-instrument mechanics, aircraft electricians, aircraft woodworkers, aircraft welders, aircraft sheet-metal workers, machinists, and various others. Each occupation is divided, with reference to experience and ability, into helpers, juniors, journeymen, and seniors.

The minimum age for helpers is 18 years; for all others 21. The maximum allowable ages for new appointees varies

with different occupations from about 44 to 49. Age limitations are waived on account of previous military service.

Experience required for appointment is, for helpers, six months; for juniors, generally two years; for journeymen, generally four years; for seniors, generally five or six years. All of the helpers' experience must be on aircraft work of the kind his prospective job involves. In the case of engine mechanics, all the experience must be on aircraft engines; for sheet-metal workers, welders and woodworkers, 3 out of 4 or 1 out of 2 years must be on aircraft work. 3 and 5 years' experience, all on airplane maintenance, are required of prospective junior and journeyman aircraft mechanics. Junior aircraft-instrument mechanics must have had 3 years' experience on aircraft or similar instruments, such as speedometers, including at least 6 months on aircraft gyroscopic instruments; journeymen must have had 5 years, with 1 year on gyroscopic instruments.

All applicants must be citizens of the United States and in reasonably good health.

The pay of helpers is \$1,200 a year; juniors generally from \$1,620 to \$1,680; journeymen from \$1,680 to \$1,860; seniors about \$2,100.

Foremen in the various occupations are men promoted from the ranks. Their salaries are from about \$2,300 up to around \$3,300.

A good many inspectors are men promoted within the service to those positions, but some vacancies are filled from outside applicants. As an example of the qualifications and pay, an "inspector, aircraft overhaul and repair" must have had 5 years' experience in the inspection or supervision of aircraft building, overhaul or assembly in an airplane factory, an air-transport maintenance shop, or a major overhaul military-maintenance base. Experience as a mechanic in such an establishment may be substituted for as much as 2 years of the supervisory or inspection experience, at the rate of 1 year for 6 months. Experience with barnstorming, privately operated, or short-hop planes doesn't count. Inspectors are paid \$2,000 a year.

"Senior inspectors" must have the above qualifications, plus 2 extra years of inspection or supervisory experience. Their pay is \$2,600 a year.

Qualifications and pay are essentially the same, in the same grade, for the various kinds of inspectors. Applicants for positions as inspectors of aeronautical materials may substitute college work in engineering courses at the rate of 1 year for 6 months, and also mechanic's experience at the same rate, but the minimum of 2 years' actual inspection or supervisory experience is required. The maximum age for new appointees is 52. Applications for inspectors' jobs are

handled out of the Washington, D. C., Civil Service Office.

In addition to the above jobs, for which no written examination is required, there are occasional appointments of apprentices, aged 16 to 21 or 24, for training in aeronautical trades. In the last few years, few have been appointed, but it is possible that with so many men leaving the air depots the air corps may be forced to train more apprentices. Applicants are "assembled" for an examination and are required to pass "mental tests" and "mechanical aptitude tests." They must have at least 20/30 vision, measure at least 56 inches in stocking feet, and weigh at least 95 pounds. The pay, while undergoing training, is \$600 a year. If interested, write for information to the manager of the civil-service district where an air depot is located. Preference in appointment is given to boys who live near the depot.

Navy planes are overhauled for the most part by naval personnel in bases at Norfolk, Va., San Diego, Calif., and in Hawaii and the Canal Zone. But the navy also has an airplane factory at Philadelphia, which is at present manufacturing training planes. In 1934, the Vinson-Trammel "treaty navy" act, which authorized 1910 navy planes by 1940-42, also provided that the navy should build at least 10 per cent of its planes in a government factory.

Actual production began at the Naval Aircraft Factory last year, and the first of a production order of 85 training planes was delivered last June. When the new naval-appropriation bill was before Congress this past March, a provision was inserted forbidding the navy to manufacture any except training planes, and one congressman called the navy-built planes "fakes" and declared that "the only way we can get planes at reasonable prices is through private manufacture."

The future of the Naval Aircraft Factory doesn't look very certain, but it apparently will continue to manufacture training planes. Most of the employees of the factory are drawn from the civil-service lists. If interested, write for information to the Secretary of the Labor Board, Naval Aircraft Factory, Philadelphia, Pa.

The bureau of air commerce employs a considerable force of persons drawn from the civil-service lists. These include clerical workers, draftsmen, civil and radio engineers, radio operators and electricians, airways mechanics and keepers, and others. Inquiry in regard to pending examinations should be made to the Civil Service Commission, Washington, D. C.

Civil engineers are employed in connection with airway construction and maintenance. Only college-trained civil engineers are able to get jobs. Radio

engineers must also have had college training, in electrical engineering, specializing in radio. They direct construction and maintenance of airways radio stations. Civil and radio engineers in government service are ordinarily paid from about \$2,000 on up to about \$4,000 a year.

Radio operators on the airways must do radio work and also make and report weather observations. They must be qualified for first-class radio-operator licenses, be able to take and send code messages at 30 per minute, and to type 40 words a minute. Most radio operators are promoted from the ranks of airways keepers, but some are appointed from the civil-service register of eligibles for the grade of junior radio operator. Such appointees must have had one year's actual experience as commercial, army, or navy radio operator, and be able, among other things, to climb poles and steel towers. Operators are paid from \$1,600 to \$2,400 a year.

Airway keepers are the hardy fellows who are in charge of the communication stations at intermediate landing fields along the airways. They have to do, or be ready to do, everything from making weather observations and handling radio and teletype communication, to giving first aid to unfortunate aviators and keeping the field in good shape. They are paid \$1,500 a year.

Most of the keepers are selected from among the assistant keepers, 2 of whom help the keeper in charge at each station. Each man stands a 12-hour shift 272 days out of each year. Assistant keepers must be husky fellows with some mechanical ability and third-class or amateur radio-operator licenses. (Get information in regard to radio licenses from the Federal Communications Commission, Washington, D. C.)

Airways mechanics are assigned to maintenance work along civil airways, each one having about 250 miles. They travel in small motor trucks furnished by the bureau, and keep beacons, electrical installations, and so on, in order, and supervise the work of caretakers. They must have had at least 2 years' experience as an aviation engine mechanic, or 3 years as factory assembler or tester of internal-combustion engines, or 3 years' experience in maintenance of internal-combustion, engine-driven generator units. In any case, experience on generators is necessary. They are paid \$2,000 a year.

Other higher-paid bureau-of-air-commerce positions we will discuss later with engineering work.

AIR-LINE MAINTENANCE JOBS

With air-line traffic increasing, maintenance supervisors are looking for trained men and even taking on some who aren't so well trained. Men who have had even a little training on air-

plane engines have a good chance for jobs at present, but there is little demand for airplane-only mechanics. Radio and instrument mechanics are also in demand. Though it is very likely that more inexperienced men are being hired by the air lines now than ever before, such men should remember that many other untrained men are trying to get jobs. What we said about that in regard to factory work holds good here, too. Addresses of air-line operators may be had from the bureau of air commerce.

The pay of air-line maintenance workers is in general a little higher than that of factory workers, and they usually work longer hours. Pay naturally varies from one company and one locality to another, and at present wages are generally unsettled. But we'll give you the best estimate we are able to make from available information, covering some of the most important classifications, and also the higher-paid jobs, holders of which are proportionately more numerous than in factory work.

Mechanics' helpers, not licensed: about a third of them earn from \$18 to \$22 a week, with the rest more or less evenly divided below and above those figures.

Mechanics' helpers, with either airplane or airplane-engine mechanic's license: \$25 a week is close to the average.

Mechanics licensed for airplanes, engines, or both: the average is not far from \$35 a week; a small percentage make about \$25; something less than a third around \$30; about a third fairly close to \$35; something less than a fourth close to \$40; six or eight out of a hundred make up to \$45; and a very few on up to a high of about \$60.

Crew chiefs: perhaps a fourth make from \$25 to \$35; a fourth around \$40; and about half from \$40 to \$55.

Inspectors: a little higher; less than a fourth from \$25 to \$35; about half from \$35 to \$45; and about a third from \$45 to a high of around \$65.

Chief (or boss) mechanics: about a third make between \$30 and \$45; at least half between \$45 and \$55; and a few from \$55 on up to \$90.

A few higher maintenance supervisors, of course, make more. And there are also a few maintenance engineers who get salaries varying with their experience, the size of the company, and so on.

In air-line communications there are a good many radio mechanics, but a great many more men who act chiefly as radio operators and in addition do most of the repair work on their own equipment.

Radio mechanics make from as little as \$20 for beginners on up to an average of around \$35 a week. A few make more and some foremen, not many, up to \$50 or more a week.

Radio operators usually get a little more than mechanics, but the increasing

use of radiophone and elimination of code makes licenses easier to get, brings more applicants, and tends to force pay down. Most operators earn about \$35 a week. A good many assistants get less, of course, but chief operators up to about \$45, and in some cases more.

The big aviation schools include communications training in their mechanics and air-line operations courses. Several schools offer special radio courses, ranging from very sketchy to quite thorough courses requiring 6 months to a year. For most air-line operator's jobs, the applicant is required to hold a radio-telephone, second-class license, though some jobs as assistant may be held by men with third-class licenses. Certain jobs with a few lines are open only to holders of third- and second-class radio-telegraph operator's licenses. A 6 months' course at one of the best schools, qualifying for second-class radio-telephone and third-class radio-telegraph licenses, costs \$240 (no living expenses included). Other courses of various kinds range in tuition from \$35 to \$400.

One large air line has informed us that there is a demand for additional radio operators. Another, asked about a possible shortage of operators to handle communications on new ocean air routes, said they knew of no difficulty in getting all the operators needed.

ENGINEERING WORK IN AVIATION

The recent graduates from college aeronautical-engineering courses are finding a warmer welcome this year than at any time since the spring of 1929. If the present expansion continues, the supply of qualified engineers will probably not surpass the demand. But young men thinking of studying aeronautical engineering, due to the fact that such a long time will be required to complete the training, should be especially mindful of the fact that the industry is not yet among the really big ones.

An aeronautical engineer may look for work either in government service or in privately operated factories. Several government agencies employ them in considerable numbers.

The bureau of air commerce uses aeronautical engineers to examine stress analyses and drawings submitted by manufacturers of airplanes, engines, and propellers, in order to see that they conform with the requirements for licenses.

Aeronautical inspectors of the bureau must be expert pilots with 2,000 or more solo hours, and in many cases they must also have engineering training and experience. They not only examine pilots and mechanics and enforce the regulations, but also test and inspect aircraft, for first licensing and relicensing; keep an eagle eye on air-transport operations; investigate accidents, and perform many other duties. They are selected on their individual merit by the bureau, without

competitive examination, though the civil-service commission passes on their applications. The same is true of aeronautical engineers. Inspectors are paid from \$2,800 to \$4,000, and engineers ordinarily from \$2,000 to \$3,800.

The bureau of aeronautics of the navy uses civilian engineers at the Naval Aircraft Factory and also at the experimental station at Anacostia, D. C.

The air corps maintains a staff of civilian engineers who do research and development work at the Matériel Division at Wright Field.

And the National Advisory Committee for Aeronautics, which maintains its famous laboratories at Langley Field, Va., also employs engineers from the register of eligibles of the civil-service commission.

A separate list of eligibles is maintained for each of 4 branches of work: airplane design, aerodynamic research, aeronautical power plants, and structural research. And there is a fifth list for other specialized branches of aeronautical engineering. When vacancies exist,

applicants are not given written examinations, but are sent blanks to be filled out and returned, together with photographs, copies of any published articles, proofs of citizenship, and so on. Those qualified are listed as eligible for appointment in the grade of assistant aeronautical engineer, salary \$2,600; associate aeronautical engineer, \$3,200; aeronautical engineer, \$3,800; or senior aeronautical engineer, \$4,600 (salaries given in the last announcement).

All successful applicants must have completed 4 years of college engineering (though certain practical experience may be substituted for 2 years). In addition, assistants must have had 2 years of professional experience; associates, 3 years; aeronautical engineers, 5 years; senior aeronautical engineers, 6 years (with various requirements as to the kind of work). Certain post-graduate work up to 3 years may be substituted for practical experience.

For men of especial engineering ability the government service offers great opportunity for promotion and per-

formance of important work in advancing the progress of aviation.

It seems most likely that the biggest opportunities for engineers will be in private manufacturing. The achievement of mass production of an airplane for thousands and perhaps millions of people remains to challenge the engineers.

Recently we asked an official of the bureau of air commerce what he thought was holding back the mass-production airplane. He replied in effect: "The lack of a man, a genius to put together the strands of knowledge and experience we now have and to put the thing over to the public."

A fledgling aeronautical engineer is practically sure at present of a beginning job, most likely as a draftsman, at \$35 a week. After that, the heights he may reach and the speed of his progress, barring personal misfortune and economic or political catastrophe (which might ruin his chances and leave the achievement for others), seems to be limited only by his own energy and ability.

THE END.

Canada's Transcontinental Airway Ready

(Continued from page 15)

railway section hands, and prospectors. A myriad of lakes cover the area, and the land is rocky, covered with bush. Lumber camps and gold mines exist.

To insure safe flying with bulk mail and passengers on this northern Ontario stretch it was necessary to overcome the difficulty of autumn freeze-up and spring thaw. Most planes in Canada use pontoons in summer, skis in winter. They are laid up from three to six weeks each season, when neither landing gear can be safely used. This cannot happen when a daily, scheduled transcontinental service is operated, and so landing fields other than lakes had to be made.

An army of single, unemployed men, somewhat similar to the CCC in the United States, was employed for the past three years to clear bush, fill in muskeg swamps, dynamite stumps, level ground, build runways, sow binding grasses in an area which would otherwise be quickly overrun with bush, string telephone lines, and generally prepare nearly fifty intermediate landing fields in the northern section of Ontario and adjacent stretches of Manitoba and Quebec. Now these air fields, at twenty-five and thirty-mile intervals, make for safe flying even in this "wilderness" leg of the route, since the planes which will fly the airway will have sufficient glide angle to make one of the fields if forced down.

Besides these fields on the most isolated section of the airway, additional forty-five such fields have been built on the rest of the route, half the total on the western leg through the Rocky Mountains. No chances have been taken by the Canadian government that

planes should crash against the ten-thousand-foot-high peaks of the Pacific coast, and landing fields have been built so that planes flying this route in daylight, as at present planned, will have airports continually in sight.

Radio beacons of Canadian design and make will be used on the entire airway. In the mountain sector they will be more numerous than elsewhere, to overcome a radio echo caused by the directional waves being recast by the towering mountainsides. In all, more than twenty-five radio-beam stations will be installed when the airway opens, with more being added where necessary, as experience will dictate.

These radio-beam stations give directions on four sectors of the compass. They are not necessarily opposite directions, such as north and south or east and west, but may deviate any number of degrees in a quarter of the compass, depending on the direction of airports to which the radio beam is the guide. Thus a pilot flying in a fog from Montreal to Winnipeg may come near that latter city to be piloted in by the radio beam. Another pilot is coming in from Churchill

in the north, and he also will be guided by the beam. The radio beacon on its third direction may be pointed southward to Fargo, North Dakota, where American mail lines converge for Canada. Churchill and Fargo are not opposite points from Winnipeg, yet both pilots will have a beam to come in on, while a pilot flying east to Winnipeg will have a fourth beam to guide him along.

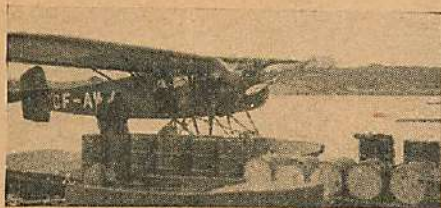
Radio equipment on the planes will be for two-way voice and code work, while antenna and radio compass will be the latest designed in the United States, where most of the planes will come from. The pilot flying the trans-Canada airway will follow the radio beam entirely, night and day, and must take his own bearings, no arrangements being made at present for the use of ground triangulation stations. There will be marker radio beacons flashing code signals at every intermediate landing field, thus enabling him to check his position about every eight minutes.

The route from Montreal to Lethbridge is being thoroughly lighted with every type of night-lighting device, from boundary lights to revolving floodlights. Signal lights will flash skyward through the bush area as well as at main terminals. From Halifax to Montreal will be lighted when the route is flown at night, present plans calling for this to be a daylight run, as is the western leg from Lethbridge to Vancouver.

Weather stations have been lined up to give frequent reports to pilots flying the route. Radio stations at more than twenty-five strategic points will flash the



Hangars of the Royal Canadian Air Force at Trenton, Ontario.



A typical transport taking on a cargo of oil drums bound for the interior.

weather bulletins, while teletype will bring the reports to the radio stations. The Canadian meteorological service has in the past few years developed an airway division which serves not only the route of the trans-Canada airway, but also the many airways which travel into the Canadian northland, and the western half of the trans-Atlantic air service when it is in operation. Internationally, the Canadian service supplies United States weather bureau with bulletins.

The actual set-up of the Canadian airway has not yet been decided. The ground services, including radio, lighting and weather, will be operated by the Do-

minion's department of transport, in conjunction with the royal Canadian corps of signals and the royal Canadian air force. The operating company will be partly government-owned, with the two Canadian railroads heavily interested.

The airway will carry only mail and express for the first year, with passengers on limited sections. Canada expects, with this airway, to obtain the bulk of the British Empire mail bound from Europe to Asia and vice versa. The planes of the airway will meet the incoming and outgoing steamers at Vancouver and Halifax taking aboard first-class mail for transcontinental transport as well as domestic delivery. Within the British Empire a three-cent-per-half-ounce air-mail rate goes into effect this year, and mail will automatically switch from surface travel to air lines, with Canada's airway being the bridge between Europe and Asia.

This service will be enlarged to cover transcontinental mail throughout the year. The Dominion is banking on "Via Canada" mail from Europe and Asia to pay a large slice of the operating

costs of the Airway. With the opening of a transatlantic flying-boat service from England this summer, mails will fly all the way from England to Vancouver.

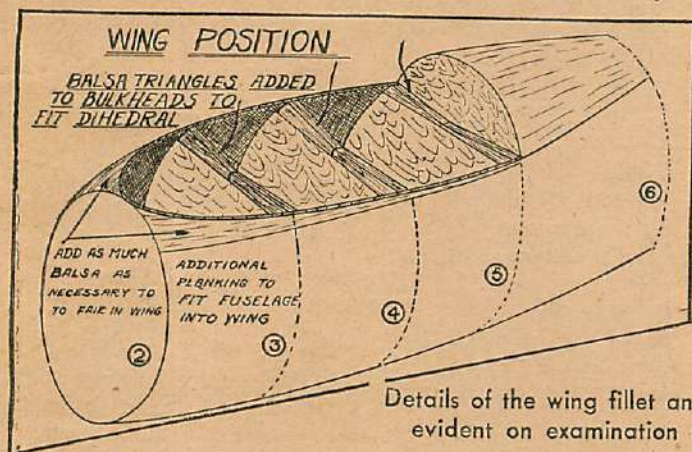
Planes for the service are understood to be the latest-type Douglas transports, ordered by the government for summer delivery.

Canadian aviation authorities do not look for any special difficulties in winter operation, since Canada's pilots have had much experience in flying the Northland, in temperatures often down to fifty below zero, and travel in thirty below zero on schedule is an everyday winter occurrence. Ice formations on wings are not expected to any extent, since, once winter sets in, it stays. There is little of the freezing-point temperature on the route.

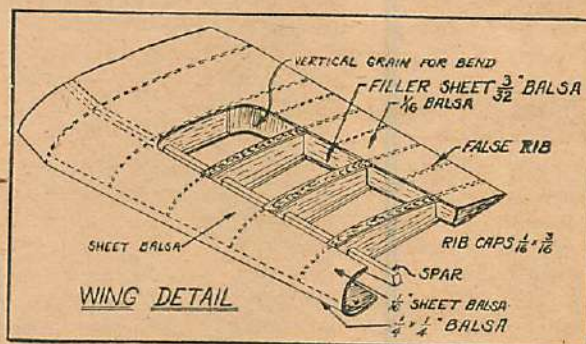
It is this hovering of temperature around freezing point which makes for ice conditions. Experience has shown Canadian pilots that in the coldest weather engines can be warmed up before starting by using a "nose hangar" with a portable stove inside.

1936 CHAMPIONSHIP GAS MODEL

(Continued from page 43)



Details of the wing fillet and mounting are evident on examination of the detail.



The wing structure is simple but strong.

ing by laying the pattern over the surface; the amount to be cut away can be outlined.

COVERING

Before covering, sand the wing and tail frames until they are entirely free of bumps or roughness.

Reënforce the trailing edge of the wing with .005 sheet aluminium, as shown on the plan, to prevent damage by the attachment of rubber bands.

Before silking, cover the tips and center section with bamboo paper and resand. The actual covering is not unduly difficult, but requires neatness and patience.

At the center section cement the chordwise edge of one top panel of silk, stretching it as tight as possible, and not overlapping the wood more than 1". When dry, pull the silk evenly toward

the tip and cement the outer edge down, keeping sufficient tension on the silk to eliminate wrinkles. The front and rear edges are now glued in place. Covering of the lower and the remaining top panel is accomplished in the same manner. However, the lower surface, since it has undercamber, requires more care. After the edges of each lower panel have been cemented down, place small weights between the ribs while the wing is in inverted position. This will depress the covering to touch the cambered sections. Dope each rib through the silk, rubbing until perfect contact is made. Be sure that drops do not fall on the silk between the ribs, as uneven pulling will result.

On the Texaco winner the sheet-covered portion was painted, while the silk was simply doped for transparency. This scheme was found to present the great-

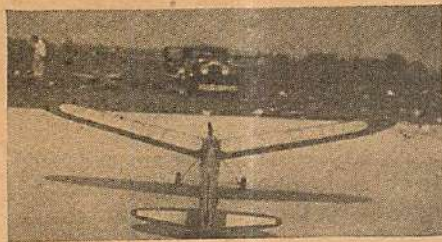
est visibility when the ship was high in the air.

Before doping, dilute the dope with thinner until it has the consistency of water. The first coat is brushed on with light, fast strokes to fill the pores. Use as little dope as possible, as a surplus will drip through the fabric to the opposite surface and ruin the appearance. After 3 of these preliminary coats, thicken the dope gradually, until at the end of 20 coats full strength is being used.

The tail is covered in the same manner as the wing; the rudder and stabilizer units are assembled to the upper tail block when finished. The filleting is done with wood filler and sheet balsa.

PAINTING

The silk-covered wood portions will require filler coats to completely close



The completed model is a thing of beauty, capable of great durations.

the pores. Purchase the filler at an automobile-supply store and use thinner to dilute it to an easily brushed consistency. After 2 coats rub the surface down with waterproof sandpaper. Use medium paper for the first sanding, which, although removing much of the filler, should not penetrate to the silk. Inspect the surface for cracks, using full-strength filler to fill any found.

Give the entire surface another filler coat and a final sanding before spraying the top coats. Enamel dope should not be used, due to its weight. Since this type dope is the usual product of the supply houses, be specific in ordering pigmented dope.

Spray 3 coats of the desired color; the

first 2 are rubbed down with waterproof sandpaper and the third with a rubbing compound. The finished surfacing is now waxed.

TESTING

The May Air Trails contained a detailed article on testing; refer to it if possible.

By using negative thrust in the motor and negative incidence in the wing, the plane can be held to the ground in trial runs. Gradually alter the incidence and then the thrust, until the ship makes short jumps off the ground when running. By this gradual alteration in rigging, the model can be brought to the flight stage, where measured fuel will allow a short flight.

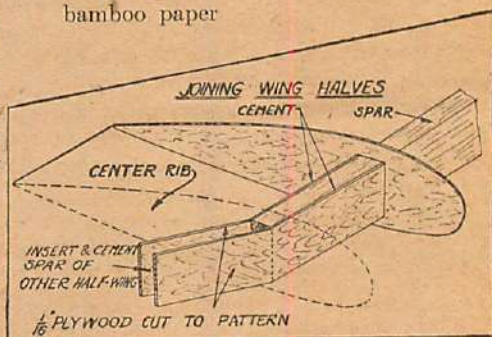
Study the flight carefully, so that the minor adjustments can be made.

The easiest method of altering the incidence is by using small blocks under the trailing edge; small washers under the rear holes of the motor base will tilt the engine.

BILL OF MATERIALS

- 2 $\frac{1}{4} \times \frac{1}{2} \times 36$ " hard balsa strips
- 1 $\frac{1}{8} \times \frac{1}{2} \times 12$ " " " "
- 2 $\frac{1}{8}$ sq. $x 24$ " " " "

- 3 $\frac{1}{16} \times \frac{5}{16} \times 36$ " hard balsa strips
- 5 $\frac{1}{4}$ sq. $x 36$ " " " "
- 2 $\frac{1}{4} \times 3 \times 36$ " sheet balsa (medium)
- 3 $\frac{3}{32} \times 2 \times 36$ " sheet balsa (quarter-grained)
- 8 $\frac{1}{8} \times 3 \times 36$ " sheet balsa (quarter-grained)
- 12 $\frac{1}{16} \times 3 \times 36$ " sheet balsa (quarter-grained)
- 3 $\frac{3}{16} \times 2 \times 36$ " sheet balsa (medium)
- 1 $10 \frac{1}{2} \times 4 \times 3$ " soft balsa block
- 1 $10 \times 2 \frac{1}{2} \times 3$ " " " "
- 1 $10 \times 3 \times 2$ " " " "
- 3 sq. yds. silk
- wood filler
- pigmented dope
- $\frac{1}{16}$ " plywood
- cement
- clear dope
- bamboo paper



CHAMPIONSHIP INDOOR MODEL

(Continued from page 58)

The tips are made by bending strips of soft balsa $\frac{1}{32}$ " square around a cardboard template and holding them (while still on the template) over a stove to dry. After they are dry they should be fitted to the ends of the tips with angled joints.

The wing is now ready to be covered. After the three sections are covered, cement the tips to the center section with $2\frac{3}{4}$ " dihedral under each tip. After the cement has dried the curved dihedral in the center section should be put in. This is done as follows: Wet the front and rear spars of the center section and lay the wing over 2 pieces of wood $\frac{3}{8}$ " high and 17" apart. Weigh the centers of the spars down with weights and let

the water dry out of the spars. When dry the center section will be found to have an even curve. Cement the clips in place. The front clip is $\frac{1}{16} \times \frac{3}{32} \times 2$ " and the rear clip $\frac{1}{16} \times \frac{1}{8} \times 1\frac{1}{8}$ ". The long axis is, of course, parallel to the wind. Then cement the wire clips in place.

The last job on the wing is to put on the silk braces. Cement the thread on the spars at the dihedral points first. Then, working with either the front or rear spar, draw both threads to the lowest section of the clip and put a drop of cement at the junction of the two pieces of thread and the balsa. Do the same for the other spar, after the first has dried. In this operation be ex-

tremely careful not to draw the threads too tightly, as this will distort the wing.

TAIL AND RUDDER

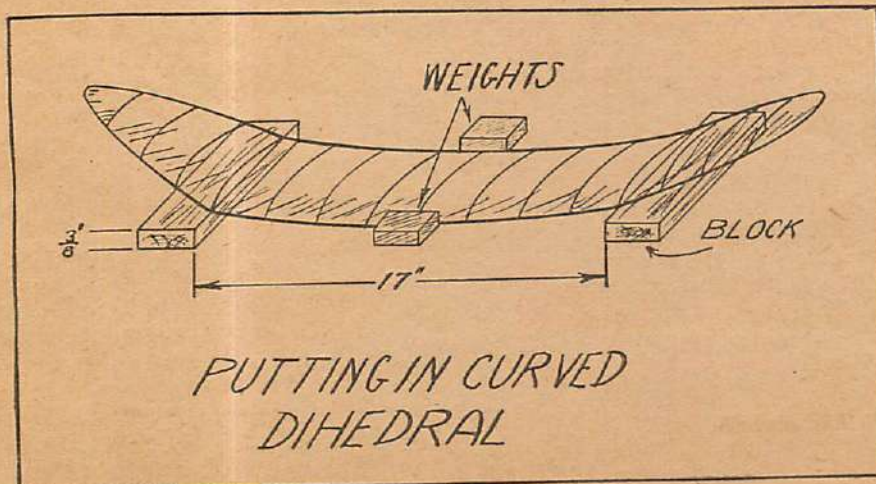
The tail and rudder are of straight taper in plan form and built as simply as possible.

Draw both tail and rudder full-size. Round all the spars, which are made of soft balsa, $\frac{3}{64}$ " square tapered to $\frac{1}{32}$ " at the ends. The ribs of the tail are cut from the same template as the wing ribs and are cemented in place. The rib of the rudder, which connects the rudder and tail assembly to the boom, is flat, as is the other rudder rib. A template, made and used as the wing template, should be made for the tail and rudder tips. Cement the tips in place and cover the parts.

After covering, a "stilt" of balsa $\frac{1}{32}$ " sq. by $\frac{1}{4}$ " should be cemented to the upper rib (note, of course, that the rudder is on the bottom) in order to give the proper negative angle to the tail. Then cement the tail in place. That part of the upper rudder rib that fits into the tail boom should be wet before inserting, in order that it fit snugly.

MOTOR STICK AND BOOM

The motor stick and boom are made in the conventional way. The motor stick (bent from a blank $\frac{1}{64}$ " thick, $1\frac{1}{8}$ " at the center tapered to $\frac{7}{8}$ " at the ends and 15" long) is formed around a hardwood former 15" long $\frac{3}{8} \times \frac{5}{32}$ "



at the center tapered to $\frac{1}{4} \times \frac{1}{8}$ ". Wet the blank, bind it with ribbon, and allow it to dry. After it has dried, cement the seams and caps in place. The boom is bent around a former $\frac{3}{16} \times \frac{1}{4}$ " at the larger edge tapered to $\frac{1}{16}$ " sq. and 8" long. It is built in the same way as the motor stick. Both boom and motor stick should be polished with fine emery paper. Cement the rear hook, thrust bearing, and boom in place. The boom is perfectly straight and the negative angle in the thrust bearing is determined by flight testing.

PROPELLER

The propeller design used by John was different from ordinary indoor practice. It was designed so that the blade angle at 40 per cent of the blade length from the hub was at a pitch of 20 per cent of the tip pitch. The revolutions per second of this type are very nearly the same as a correspondingly true-pitched propeller of the same blade area and length. However, the foot ounces of thrust is reputedly 10 per cent greater than the true pitched propeller. The efficiency is

stepped up by reducing the resistance of the hub section.

The weight of wood used is $3\frac{3}{4}$ lbs. per cubic foot and it is carved from a block $17 \times 1 \times 1\frac{1}{2}$ " cut as shown in the drawing. Cement the 2 triangular blocks together with $\frac{1}{2}$ " overlap and allow it to dry. Carve the concave sides of both blades $\frac{1}{8}$ " deep and completely finish them before starting the convex sides. The convex sides should be carved down to a thickness of $\frac{3}{32}$ " at the hub and $\frac{1}{32}$ " at the tips. Then sand the thickness down to $\frac{1}{16}$ " at the hub and $\frac{1}{100}$ " at the tips. Make a template of the blade shape from the drawing and cut the blades to that shape. Insert the shaft and cement it in place to finish up the propeller.

FLYING

Insert the propeller in the thrust bearing and put a loop of $40 \times \frac{3}{32} \times \frac{1}{30}$ " brown rubber in place. Put the 40 per cent point of the wing chord over the balance point and then glide it. Any diving or stalling tendency should be removed by moving the wing either forward or backward to counteract it. Then

wind the model about 400 turns. The ship should fly in about 40-foot circles. Stalling tendency under power can be counteracted with negative thrust and by warping the tail and rudder. Careful study of the model in flight should be made in order to observe any faults. Remember, long flights are obtained by smooth flying. Erratic tendencies should be corrected before any official flights are tried.

SPECIFICATIONS

Wing Span	34"
Wing Area	146.5 sq. ins.
Tail Span	13"
Tail Area	39.6 sq. ins.
Wing Incidence	$\frac{1}{8}$ "
Tail Incidence	$\frac{1}{4}$ "
Rudder Area	10.2 sq. ins.

WEIGHTS

Wing	.022 ounces
Propeller	.018 "
Motor Stick	.016 "
Tail	.008 "
Motor	.059 "
	.123 ounces

"DEAR HARRY—"

(Continued from page 13)

Ugly-looking clouds are coming up, hiding the sun. A storm is approaching, but I don't worry, figuring to get back to land ahead of it.

I begin leapfrogging over the foaming waves. What a thrill! Tearing along, up and down, up and down, clearing the combers by inches. Spray drenches the plane, wets my face and goggles. I pull off the goggles to see better.

Thud!

In the second or two it takes me to remove the goggles the ship dips and hits a high wave. Sea water is thrown back and into the cockpit. My heart leaps. I crack on the gun and pull back the stick. The plane rises and I breathe a deep sigh of relief.

The motor misses!

It has been wet thoroughly. Water has probably seeped into some part of the ignition. I jazz the throttle, do everything possible to keep the cylinders firing.

The motor goes dead—and the next instant the plane drops into the sea.

The shock is terrific. I release the safety belt in a desperate hurry and climb onto the top of the wing. The ship settles slowly, then ceases sinking and sluggishly rides the waves.

It occurs to me to be thankful that I have washed out a comparatively inexpensive light plane rather than an expensive big ship. In the event that the crate is not covered by insurance, at least it will not take me so long to earn enough money to pay for it. But right now the washing out of the plane is the least of my worries.

There is not a boat in sight. Land is barely in view. The wind is rising. It is late in the afternoon, and darkness is falling, hastened by the coming storm.

Time passes. I cling to the wing surface, soaked through, continually sweeping the ocean with my eyes. Oh for a vessel of any kind! But not a one do I see—and soon it is too dark to see any distance.

The wind is blowing harder now. Fortunately indeed the plane is staying afloat, but it is lower in the water, washed over constantly. Darkness now falls completely, and I cannot see twenty feet away.

Above the roar of the ocean I think for a minute that I hear a motor drone. It fades away, and I conclude that it was only imagination.

I hear it again. A glaring white light breaks out in the blackness overhead, descends slowly, lighting the surface of the sea. A parachute flare—from a plane that is searching for me!

I wave my arms wildly as the ship circles overhead. Has the pilot seen me? No. The drone of his motor lessens in volume and he drops his flares farther and farther away.

For the next fifteen minutes my feelings are indescribable. One—two—three—four planes I hear high overhead. One passes far to the side, flares lighting empty ocean; another flies directly over me, letting fall a flare farther on that only dimly illuminates my section of the sea. The other two cruise by at a hopeless distance.

Then all are gone.

My plane is ready for its last dive. It is almost entirely submerged. When it goes—

The familiar roar of an airplane motor close at hand! Norwood's plane—I know at once—and flying low. A flare bursts in blinding brilliance. Reckless of consequences, I stand up on the rolling wing and signal frantically.

The ship is circling above. Norwood has sighted me! Eyes now accustomed to the light of the flare, I can see him banking, wings buffeted by the wind. His ship has been fitted with floats.

Down come more flares. Every foaming wave stands out in sharp relief. Norwood's biplane is dropping to the sea! I watch, holding my breath. A safe landing on such rough water I know to be almost impossible. But, seeing my desperate plight, he is taking the risk.

The blue biplane hits the water in a shower of spray, not twenty feet away. Simultaneously I am in the water and striking out for its side. I climb aboard, scramble into the forward cockpit as the motor thunders out at full throttle. The pontoons plow through the water. We gather speed.

Follows the greatest exhibition of flying skill I have ever seen. Holding the plane on its course despite blowing wind and breaking wave, Norwood drives straight ahead. We lift. The curling crest of a wave smashes down on us and we drop to the water. We rise again, stagger into the air, relying almost solely on the pull of the powerful motor. Another wave hits the ship. The stick is nearly torn from Norwood's grasp. We

fall, but not into the water, rise again into the teeth of the wind and are away—but not to a safe altitude.

The faithful motor is running raggedly. Saturated with water as it is, no more could be expected. Norwood grimly fights to hold the plane in the air. We roar along, skimming the waves, rising to escape one, dipping to gain speed to top another. It occurs to me that not so long ago I was flying in the same manner, risking my life foolishly. Now Norwood is flying thus in an endeavor to save my life and his own. And so we go on for hours, centuries, or so it seems to me. Then lights appear

ahead. We fly over calmer water, land in a sheltered basin under floodlights.

For a few minutes after the motor has been shut off, Norwood sits in his cockpit resting; relaxing from the terrific strain. Then he looks up at me. And I have something to say.

"Norwood," I announce resolutely, "I'm through with wild flying and reckless stunts. Your risking your life to save mine, after I had nearly thrown it away, has taught me a lesson I'll never forget."

"In that case," Norwood returns, "I'm glad all this happened. Shake hands on it, Sterling."

Well, here I am in my room, writing this letter. From my window I can see a brand-new cabin plane warming on the line, the ship in which I am to sail away into the sky—who knows?—perhaps to new adventures. The businessman who owns it has hired me as his pilot, largely on Norwood's recommendation that I am now, if I was not before, a safe and sane pilot. The boss has granted me permission to stop off at the old home town when we fly East. Sometime after you receive this letter you'll see me gliding down from the clouds. So keep an eye on the sky. Yours, STEVE.

AIR PROGRESS

(Continued from page 7)

The Douglas company is working overtime filling orders for new equipment. T. W. A. has ordered thirteen new DC-3 monoplanes. Five will be equipped as twenty-one-passenger day planes and the rest will be combination aerial Pullman-chair ships, with eight berths and nine divan seats. Pan American has also ordered seven twenty-one-passenger models for their air lines. They will be used in Central America, Mexico, and trans-Andean routes. Braniff Airways has ordered five DC-2 Douglasses for its Great Lakes-to-the-Gulf line.

AIR FORCES

A new type of fighting plane designed for the stratosphere is about to be tested by army officials. It was built by the Lockheed company at Burbank, California. The pilots will be seated in air-tight cabins, wear electrically heated suits, and use oxygen. Few other details are available.

The Norwegian government is making great plans to intercept a mysterious military plane which has been paying nightly visits over the west coast of Norway. Navy pilots have been sent up in shifts to spot it, and surface ships have been ordered to look for a foreign airplane carrier which has been reported in the vicinity.

Loyalist troops in Spain are getting up-to-date equipment from Russia and France.

Great Britain is now thoroughly overhauling her aerial machine-gun system. It is believed that the Lewis guns, in use since the War, will be replaced with American Brownings. The British government has obtained manufacturing rights to several types of the Browning guns, and with the announcement that the Vickers gun has been greatly improved, it is reasonable to assume that the Brownings will be used as movable guns.

The Dutch navy has ordered fifteen six-cylindered Menasco motors for use in their new navy training planes. This is the first military order for foreign use the Menasco firm has received.

Frank Hawks' new speed plane *Time Flies* did at least three hundred m.p.h., according to the noted racing pilot. The recent accident in which *Time Flies* was badly damaged, occurred when Hawks landed at Newark after round-trip speed dash to Miami from Hartford, Conn., and did not indicate a fault in the plane, landing conditions in the twilight having caused the mishap.

Colonel Ernst Udet, the noted German Wartime ace, had been conducting experimental contacts with the airship *Hindenburg*, using a Focke Wulf Steiglitz biplane. He had been launched from and returned to the large airship several times.

The British Hawker company has designed a new light bomber, low-wing monoplane, using the Rolls-Royce Mer-

lin engine. It has retracting wheels, a variable-pitch air screw and a deep belly for stowage of bombs.

The air service of the Irish Free State is purchasing many machines from British manufacturers. Their latest order included several Avro Ansons for coastal reconnaissance work.

WINGED WORDS

Mrs. Crystal Mowry, an American woman pilot, was recently credited with four new air records by the International Aeronautic Federation. Mrs. Mowry's records were set on a Class C light seaplane and included altitude, 6,069.54 feet; speed over a 100-kilometer course, 79.13 m.p.h.; altitude under third category of the C Class, 5,830.04 feet, and speed, 69.01 miles per hour. Alexander Seversky was also credited with a speed record of 209.45 m.p.h. in a Class C amphibian.

The word "aeroplane," still in use abroad by countries of the British Empire, seems to be losing its place to the American word "airplane." H. E. Wimperis, president of the Royal Aeronautical Society, plans to use the word "airplane" in all of his future lectures and addresses before the society.

The Japanese newspaper, *Asahi*, recently sponsored a successful flight in a Japanese plane, called *Divine Wind*, from Tokyo to London. The route of nine thousand five hundred miles took in Indo-China, India, Greece, and Italy.

MONOCOQUE SAILPLANE

(Continued from page 54)

sinkers or solder wire) or nails. Sufficient weight should be added to bring the leading edge of the wing up to Section A, indicated on the drawing. More delicate adjustment can be made after the model is assembled by moving the wing backward or forward along the top of the fuselage.

The wire hook for attaching the thread towline is cemented to the bot-

tom of the fuselage. It is bent from medium wire.

WING

The shape of the wing is known as a distorted ellipse. That is, the shape of the ellipse has been modified to give a straight center of pressure line. The construction can be reduced to a minimum of work if you follow the directions as outlined. First cut a cardboard pattern

to the shape of half the wing. This pattern is used for cutting the 2 pieces of sheet balsa which are used for the top of the wing. It is necessary to make the sheet balsa of sufficient width to allow for the curvature of the ribs. The actual width of the balsa pattern is given in the drawing.

Using the cardboard pattern, cut 2 duplicates from $\frac{1}{8}$ " balsa. (Join the edges

of 2"-wide sheet balsa to form a 6"-wide sheet.) Sand the surface of the balsa and add either dope or glider polish to fill the pores. Finish with additional sanding. Surfacing the balsa while it is still flat is considerably easier than after it has been bent to the shape of the wing.

Now cement the $\frac{1}{8} \times \frac{1}{8}$ " balsa leading edge and the triangular-shaped trailing edge ($\frac{3}{32} \times \frac{1}{4}$ ") to the bottom edges of the sheet balsa. Curve these pieces to fit the edges of the balsa pattern. The edges of the leading and trailing edges should fit flush with the edges of the balsa pattern. After the cement has dried, bend the sheet-balsa wing panel over the ribs, cementing the balsa to the ribs. Note that all ribs are $\frac{1}{16}$ " balsa except ribs (A) which are $\frac{1}{4}$ " stock. The leading edge should be fitted into the notches which have been cut in the front of the ribs. The trailing edge should be butt-jointed to the rear edges of the wing. With sandpaper, round off the leading edge of the wing. Also sand the extreme rear of the trailing edge to knife-edge thickness.

JOINING THE TWO WING HALVES

The 2 halves are joined by cementing together the center ribs (A) of the 2

wing halves. They should fit together at such an angle that the tips are raised 5 inches. Special care should be given to making a snug joint at the top of the wing. A band of tape or silk should be cemented across the top of the wing to strengthen the joint.

A balsa saddle should be cemented to the bottom of the wing for mounting to the fuselage. This saddle is dimensioned in the drawing. It should fit flat across the top of the fuselage. The wing is attached by rubber bands which fit around the fuselage.

The bottom of the wing is covered with tissue, which is given a coat of dope. The front of the wing, which extends over the fuselage, is faired with a small piece of balsa cemented to the leading edge.

ELEVATOR

The method of construction follows that used in the wing. However, no leading or trailing edge is used. The elevator is made in one piece. And, just as was done with the wing, the balsa is polished before assembly. The top and bottom of the elevator are both made of $\frac{1}{16}$ " sheet balsa. Draw a full-size pattern on cardboard and use it in cutting out the 2 balsa pieces. Cement these

pieces to the ribs and, with your fingers, shape the wood to fit the curve of the ribs.

RUDDER

The rudder is built directly to the fuselage. 2 ribs are used to help shape the $\frac{1}{16}$ " sheet balsa. The part of the rudder which extends below the fuselage is made flat. In attaching the elevator, cut a notch in the rudder. The trailing edge should be raised about $\frac{1}{16}$ " above the leading edge. All joints between the fuselage and the rudder should be faired with a mixture of talcum powder and dope and later sanded to shape.

FLYING

First glide by hand to determine the correct wing setting. Add enough weight to bring the wing well forward on the fuselage. Turn can be put into the model by warping the wing tips.

A strong, lightweight grade of thread makes the best towline.

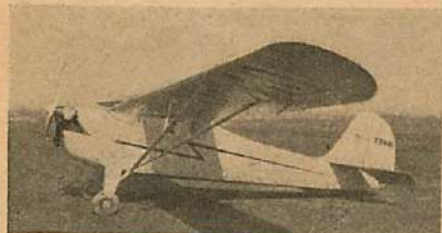
WEIGHTS

Wing	1.70 ounces
Elevator45 "
Rudder25 "
Fuselage plus weight	2.50 "

Total RTF 4.90

Light Cabinplane

(Continued from page 48)



The real Aeronca is one of the foremost American sport planes.

- 1 $\frac{1}{16} \times \frac{1}{4} \times 12$ " bamboo
- 12" #14 music wire
- $\frac{1}{2}$ oz. cement
- $\frac{1}{2}$ oz. paper cement (half clear dope, half cement)
- 1 sheet yellow tissue
- 1x10" black tissue
- 2 cleaned photo negatives
- 1 pr. 1" "airwheels"
- 40" of $\frac{1}{8}$ " flat rubber for motor.

ARROWBIBLE

(Continued from page 60)

Give the entire model a coat of white shellac or clear varnish to fill the pores. The control outlines may be scored with a semisharpened point. After sanding this light foundation coat, paint silver as mentioned, using aluminum paint or silver bronzing powder and liquid for the purpose.

Cut the propeller from a scrap and mount on a pin, free to turn.

Only one member flew in the fuselage R. O. G. category:

Dan Clin 1:52

Edwin Oatos reports that the club has been bitten rather severely by the gas-model bug, several models being under construction and the lads reporting splendid progress—so the Springfield Model Airplane Club can expect plenty of gas-model competition this summer.

Boston Gas Contest

The Boston Gas Model Society, New England's largest gas-model organization, held its first contest of 1937 at Boston Metropolitan Airport in Canton, Massachusetts, Sunday morning, April 11th. Contestants were limited to 1/25 of an ounce of fuel per pound weight. Weather conditions did not measure up to the enthusiasm displayed by the spec-

tators and the entrants. Durations were low. Following are the winners:

1st Harold Thompson	2:59
2nd John Jorgensen	2:32.8
3rd Frederick Rooke	1:35

Harold Thompson was awarded the Rogers-Post Memorial Trophy. Officers of the Boston Gas Model Society are Bruno Marchi, president; Mary Fowler, vice president; and Albert Lewis, secretary-treasurer.

Keystone Contest

The Flying Keystone Model Airplane Club, of Allentown, Pennsylvania, held a championship scale-model contest on March 23rd. The results are:

	Points
1st Charles Wieder (Ryan NYP)	83
2nd Russell Fahringer (Martin Bomber)	75
3rd John Campbell (Hughes Racer)	69
4th Elwood Matten (Douglas O-25C)	67
5th Richard Waidelich (Nieuport XVII)	61

On March 24th, George J. Micott of the club competed in the senior division of the Philadelphia Model Airplane Association Meet and set a Class A, R. O. W. record of 8:54.

June 19th has been set as the date for the indoor-championship meet, to determine the club's indoor champions.

Jacksonville Club

Jacksonville Model Club contest for outdoor models was held April 11th at Paxton Field, near Jacksonville, Florida. The competition was conducted under the direction of William I. Timpone of

BILL OF MATERIALS

- 1 $3\frac{1}{2} \times 1 \times 1\frac{3}{4}$ " block balsa
- 1 $1\frac{1}{4} \times 2 \times 12$ " sheet balsa
- 1 $\frac{1}{16} \times 2 \times 6$ " " "
- 1 $\frac{3}{8}$ " wheel
- 1 pair $\frac{1}{2}$ " wheels
- 1 scrap celluloid
- 1 vial of cement
- small quantity of white shellac or clear varnish
- fine sandpaper
- straight pins
- paint as required

the N. A. A. Roy Marquardt of Burlington, Iowa, flew his tractor-pusher stick model out of sight after 7:5. Following are the contest results:

Hand gliders, Class B: Ed. L. Smith, first; Lawrence Raley, second; Roy Marquardt, third.

Hand gliders, Class C: Roy Marquardt, first; Ed. L. Smith, second; Herbert Weeks, third. Hand gliders, Class D: Ed. L. Smith, first place.

Flying scale models: Lawrence Raley, first; Herbert Weeks, second; Horace Smith, third.

Stick models, Class C, seniors: Lawrence Raley, first; William McMinn, second; Milton Myers, third. Juniors: John Williams, first; Lester Bodden, second; Edward Herrmann, third.

Stick models, Class D: Roy Marquardt, first; Milton Myers, second; Edward L. Smith, third.

Tow gliders, Class C: Don L. Six, first; Lawrence Raley, second; John Aitken, third. Tow gliders, Class D: Herbert Weeks, first; John Aitken, second. Tow gliders, Class E: John Aitken, first.

Fuselage models, Class C, seniors: Arnold Booth, first; Lawrence Raley, second; Gus Mangos, third. Juniors: Richard Paulis, first; Frank Waterhouse, second; Bill McElroy, third.

Fuselage models, Class D, seniors: Milton Myers, first; Theo. Everett, sec-

ond; Salvatore De Grand, third. Juniors: Bruce McElroy, first.

Racing models: Herbert Weeks, first; Lawrence Raley, second; Edward Herrmann, third.

Gas-model division: Elmer Wassman, first; Michael L. Smith, second; Roy Marquardt, third; Milton Myers, fourth; Lucius Herrmann, fifth; Theo. Everett, sixth; David Smith, seventh; Chester Derr, eighth; Ed. L. Smith, ninth; Bill Walters, tenth; Herbert Odell, eleventh.

Judges and timers for the meet were Michael F. Smith, William Spung, Theo. Weeks, Ernest Downs, John Williams, Arthur Maggi, and A. Weeks.

In addition to the regular membership of the Jacksonville Club, Director Timpone has organized a junior division of boys of 9 to 13 years. This active group invites any interested modelers to join them any Wednesday afternoon at 3:15 p. m., at 2048 Rosselle Street, Jacksonville, Florida.

Pittsburgh Scale Contest

Works Progress Administration Scale Model Contest was held at the Boys' Club of Pittsburgh, Pennsylvania, on March 27th. There were 40 entrants in this event. Two one-year subscriptions of AIR TRAILS were among the prizes awarded to the winners. Tabulation of the results is as follows: Senior division: Joseph Issurro, first; Walter Flynn, sec-

ond. Junior division: Harry Gray, first; William Furlick, second; William Devine, third; Pete Yakich, fourth; Frank Hillsdon, fifth; John Costa, sixth.

Rockford Meet

The Aviation Committee of the Rockford Chamber of Commerce, in conjunction with the Kiwanis Club of Rockford, Illinois, had scheduled an outdoor meet for Sunday, June 6th, at the Rockford Airport. Trophies and medals were to be given to the winners of the stick, fuselage, and gas-model contests. N. A. A. rules were to be used. Address the Contest Director, Rockford Chamber of Commerce, Rockford, Illinois.

Boston Scale Results

The winners of the Junior Aviation League's annual Flying and Nonflying Scale Model Contest are as follows:

Senior

1st Wallerstein (Douglas)
2nd Woodman (Waco)
3rd Sampson (Waco)

Junior

1st Whalen (Hawk)
2nd Smith (Ryan)
3rd O'Day (Fairechild)

The silver trophies will be presented to the winners at the banquet of the New England Championship Meet.

There will be no awards below third place in either event.

AIR ADVENTURERS HONOR ROLL FOR JULY

FLIGHT LIEUTENANT

Bill Armstrong, 7 Belsize Drive, Toronto, Ont., Can.
William Botting, Marigold P. O., Victoria, B. C., Can.
Lucille Buck, 6039 Woodlawn Avenue, Chicago, Ill.
Joe D. Buerdell, 210 Regent Avenue, Providence, R. I.
William Conroy, 4047 N. Lawler Avenue, Chicago, Ill.
Tony DeLorenzo, 206 Shrewsbury Avenue, Red Bank, N. J.
Edward Domohowski, 32 Summer Street, Hyde Park, Boston, Mass.
Robert Forrest, RFD 4, East Hartford, Conn.
Richard H. Graham, 11 Irving Road, Waban, Mass.
Charles Hanna, 82 East 121st Street, New York City.
Ralph L. Marohn, 1049 West 11th Avenue, Spokane, Wash.
King Newell, 88 Victoria North, Woodstock, Ont., Can.
John Pavlantonio, 119 Haverhill Street, Lawrence, Mass.
Allan Phillips, 82 Abbott Avenue, Toronto, Ont., Can.
Bob Rose, 132 Berrydale Avenue East, St. Vital, Winnipeg, Man., Can.
Emil E. Sabuda, 415 S. Kosciusko Street, South Bend, Ind.
Douglas Shaw, 34 Lake Crescent, Mimico, Ont., Can.
Allan Trotter, 226 Kent Street West, Lindsay, Ont., Can.
Wilson Wetz, 707-124th Street S. E., Roanoke, Va.

George Thomas Reed, 317 Chillicothe Avenue, Knoxville, Tenn.
Murray Dobier, 271 First Avenue, Ottawa, Ont., Can.
Alfred Bresso, 125 Andover Street, San Francisco, Cal.
James R. Cowdery, 1309 Bunker Hill, Ashtabula, Ohio.
Earle Dugan, 5407 Sierra Vista, Los Angeles, Cal.
Stephen Malloy, 174-24-128th Avenue, St. Albans, N. Y.
Bill Pruitt, 124 W. Cliveden Avenue, Philadelphia, Pa.
Craig Sharp, 535 Fourth Street, Crescent City, Cal.

ENGINE MECHANIC

Arlo Koontz, 202 East 5th St., Onawa, Iowa.
William Langshaw, 4546 11th Avenue, N. E., Seattle, Wash.
Roman Malenck, P. O. Box 221, Mass, Mich.
Laurence R. Ray, 277, Route 4, Oregon City, Ore.
Kenneth Rusch, 825 South 15th Street, Manitowoc, Wis.
Branon Sell, Dallas, Ga.
Michael Serduck, P. O. Box 617, Thomaston, Conn.
John Vopat, Jr., 13307 Alvin Avenue, Garfield Hts., Ohio.
Charlotte Northcote, 139-22-87th Avenue, Jamaica, N. Y.

TOPOGRAPHY

Wilson Maclin, Wilson's Cafe, Shelton, Wash.

Dana Roy Cunningham, 36 Veazie Street, Old Town, Me.

PHOTOGRAPHER

Billy Laycock, 6164 Norwaldo, Indianapolis, Ind.
Jack Loughheed, 19210 Warrington Dr., Detroit, Mich.
Alfred Perry, 40 Summer Street, Somerville, Mass.
Wm. R. Feist, 521 Sixth Street, South Boston, Mass.
Gindo Bianchi, 67 Church Street, Somerville, Mass.

AIRPLANE MECHANIC

Murray Dober, 271 First Avenue, Ottawa, Ont., Can.
Melvin DuPont, Main Street, Rutland, Mass.
Oldrich Foucek, 13 Jarvis Street, Binghamton, N. Y.
Wendell Armour, 142 LaBelle Street, Pittsburgh, Pa.
William H. Rodney, D. O., Sullivan, Mo.
George Wilber, So. Lancaster, Mass.

OBSERVER

Walter Goff, 500 Fullerton Parkway, Chicago, Ill.
Walter McCabe, Jr., 285 Bonner Place, Bronx, N. Y.
William J. Karges, 73½ Zane Street, Wheeling, W. Va.
Murray Donovan, 235 City Road, St. John, N. B., Can.

Air Adventurers—If you want to qualify for a craftsman award, or lieutenant or captain, write to Commander Carlson and he will forward the list of requirements to you by return mail.

New Thrills for all who Build and Fly! Model Airplanes!



WHEN you want all the authentic news and information about Model Aviation, read

MODEL AIRPLANE NEWS

"The Only Magazine Devoted Exclusively to Model Aviation"

Contains every month all the latest inside information on this wonderful sport; plans for all types of models, including the newest gas jobs; up-to-the minute news on the activities of model builders everywhere; reports of coming events and contests, and snappy, timely information on the latest developments in Model Aviation—all presented to please and fascinate live-wire enthusiasts and illustrated with hundreds of action photographs of Models and Model Builders from all parts of the World, and all brought to you every month in this big, lively magazine for Model Aviators of every age. Start to read it now! Get in on this

SPECIAL SUMMER SUBSCRIPTION SALE

FREE Flying Model and 12 Big Magazines

Kit to build this fine WACO CABIN "C" Flying Model given FREE to all who subscribe now on this Special Sale. Complete Kit including many finished parts such as wheels, propellers, wire fittings, nose plug; also full size plans, printed balsa, etc. Made specially for us by a well known manufacturer. A really "fool-proof" model that will give much pleasure building and hours of enjoyment in the air.

(A New Magazine
Every Month for
One Whole Year)

^{\$}
for
only **1.**

Only in MODEL AIRPLANE NEWS

will you get these Features
Every Month! 64 Pages of:—

News of New Models. Information on Contests. Photographs from Everywhere. Facts about Aeronautics. Plans of Model Planes. Gas Model News. I.G.M.A.A. Authentic Notes.

Instructive Articles by Authorities. These, and hundreds of other important subjects, will give you the latest information and keep you up to date on what is happening in Model Aviation.

Regular Newsstand Price is 20¢ a copy. Subscribe now and save \$1.40—and get this dandy Flying Model Airplane FREE! Model Builders everywhere depend upon MODEL AIRPLANE NEWS for the reliable news of what is happening in Modeldom, written to please boys and adult fans. No fantastic fiction, no imaginary feats of the air, no blood-curdling aerial combat stories—but instead 64 pages every month of clean, authentic, timely news of Model Aviation and reports on the latest advances in Aeronautics. To keep up with Model Aviation you'll want MODEL AIRPLANE NEWS every month. Send your subscription now and save \$1.40.

This offer good in the United States and its possessions; also Cuba, Canada, Mexico and Panama.



MODEL AIRPLANE NEWS
Dept. 72, 551 Fifth Avenue, New York, N. Y.

Enclosed find \$1.00 for which you are to send me MODEL AIRPLANE NEWS each month for one year, and also the Waco Cabin "C" Flying Model Kit.

This offer expires
Aug. 9th, 1937

Name

Address

City

Send for this magazine to get the news of this magazine. Just send this coupon on a separate sheet of paper, with your name and address, and return it to me.