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AUGUST 1936

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Volume VI
Number 5

BILL BARNES AIR TRAILS

AUGUST
1936

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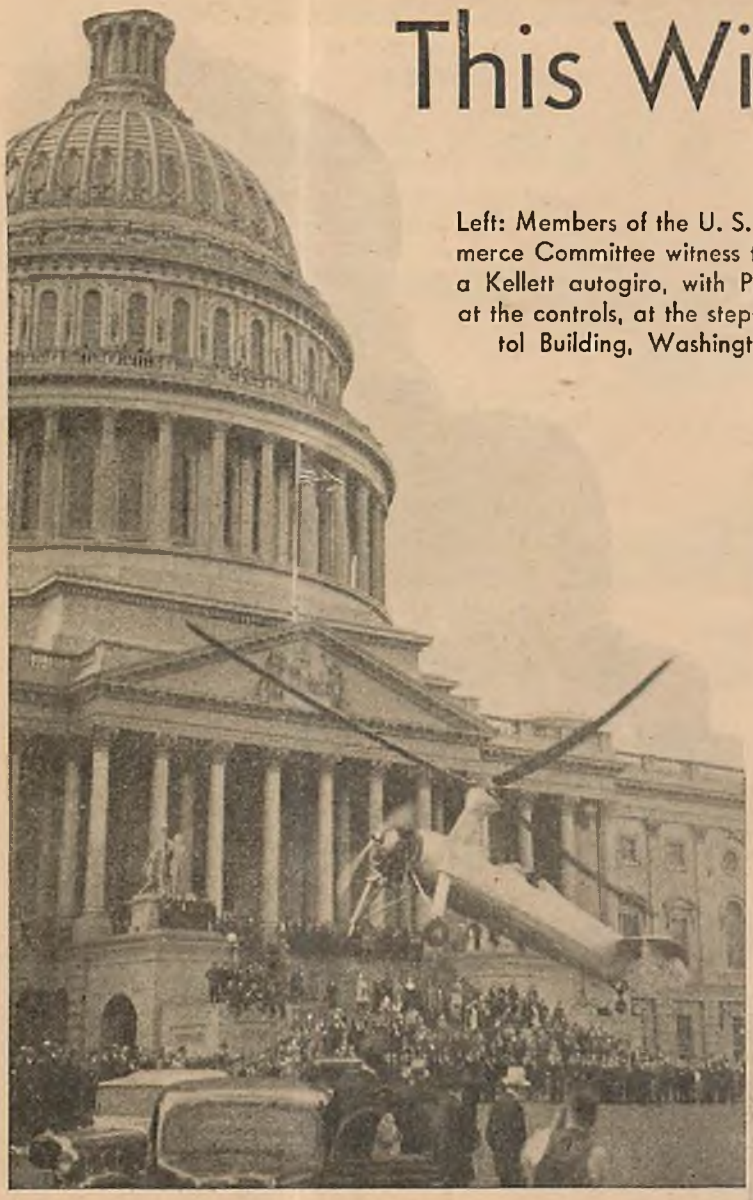
This Winged World



Left: Members of the U. S. Senate Commerce Committee witness the landing of a Kellett autogiro, with Pilot Lou Levy at the controls, at the steps of the Capitol Building, Washington, D. C.

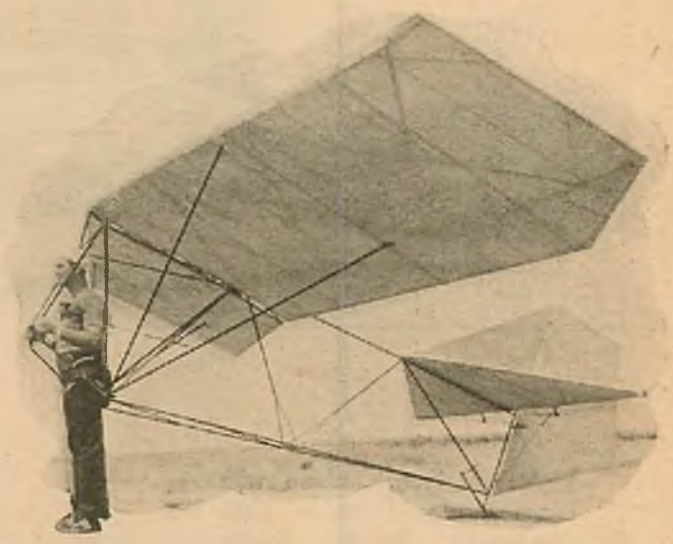
Above: Blind flying will lose another hazard with the perfection of this new altimeter by Ralph Lucas of Albany, N. Y. It records the height of the plane above the earth surface instead of the height above sea level.

Above: A gust of wind ripped a hole in a cellophane stratosphere balloon at Swarthmore, Pa., and spoiled an attempt to gain new knowledge of the mysterious rays which bombard the earth from outer space. An ingenious attachment carried a cosmic ray recording device, connected to a radio transmitter.

Left: Adjusting the microphone cover on the headgear of a British pilot before he takes off from Northol Aerodrome in England.

Above: The Flying Flea reaches Japan. Navy Minister Admiral Osami Nagano examines the tiny importation from France, during a tour of inspection.

Below: Bob Moore, of Redondo, Calif., at the controls of his new hang-glider, which weighs only 90 pounds but has a wing surface of 107 square feet. The glider has a take-off speed of 15 m.p.h., a landing speed of 12 m.p.h.; but maintains a speed of 22 miles while in the air. The pilot's legs operate as landing gear. The elevator and rudder controls are cables attached to his body.

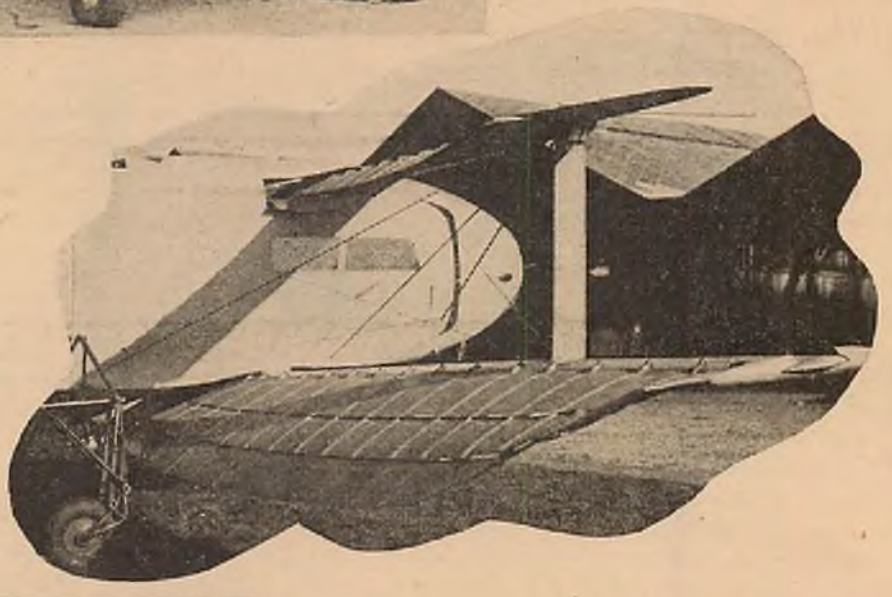


Above: A Russian-built fighter photographed during tests outside of Moscow. Conventional in design, it resembles our navy Boeing F4 B-4.

Below: An interesting picture of members of the Royal Flying Corps anchoring their planes to the ground during a sandstorm in Egypt. Every open part of the planes had to be covered with the tarpaulins to keep out the sand.

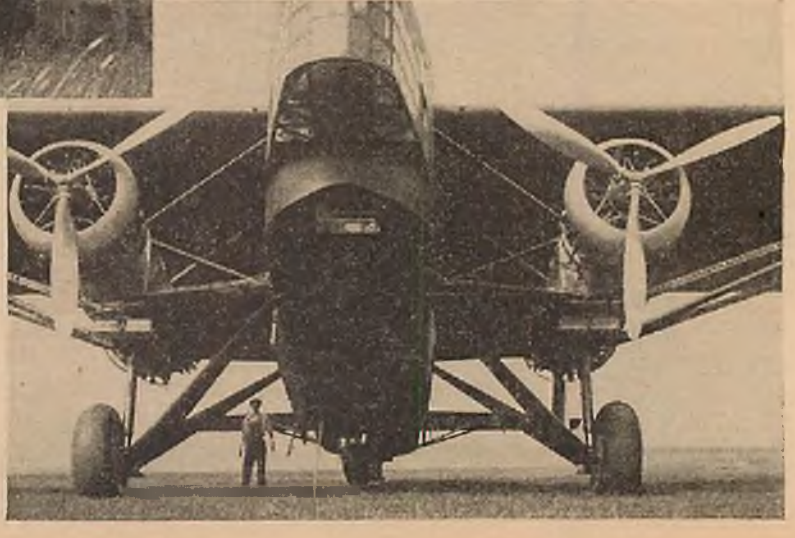
Left: The new cross-type antenna on this experimental Boeing has brought the air liner down safely and unerringly in 250 automatic landings, with no pilot at the controls.

Left: A new type helicopter is undergoing rigorous tests at Fairchild Field, L. I. The "Vertiplane" has an upper wing which is rigid at the take-off, but which revolves while in the air. It is expected to literally hover in the air.

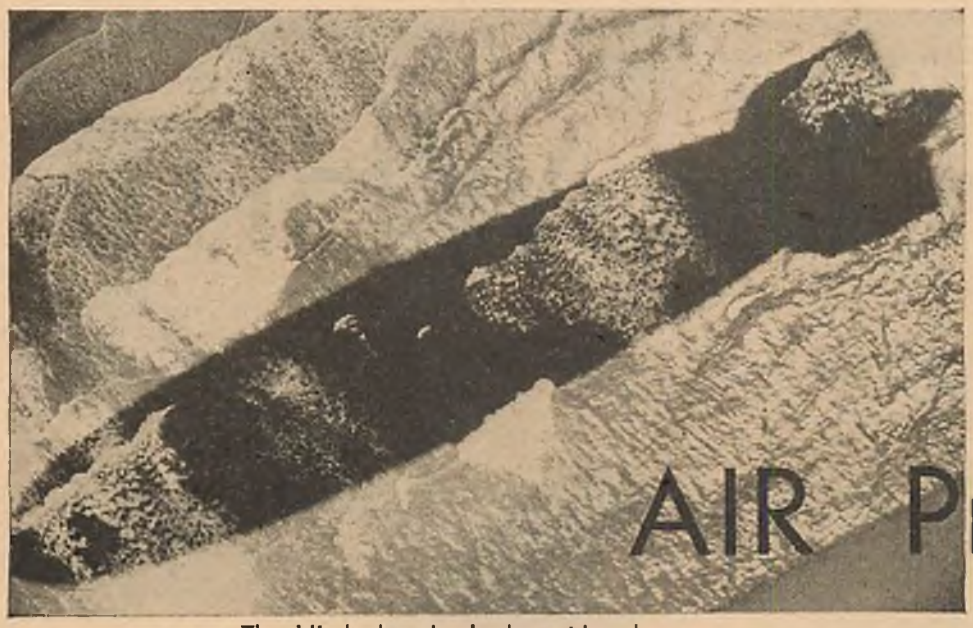


Right: A French plane with wings made of rubber cloth that can be rolled up on a drum in the fuselage to reduce air resistance, is the last experiment in retraction. The main structure of the wings is only a foot wide, but Inventor Guerrin thinks that is enough to carry the plane at high speeds.

Below: This gigantic, transparent forward housing is standard equipment on the new French Farman 221. The ship carries 4 motors, rates a speed of 218 m.p.h. and weighs 18,700 kg. The propellers are of the three-bladed type. The motors are located in pairs, directly above the landing wheels. It looks like a formidable bomber.



Above: Loading a Beechcraft aboard the Dirigible "Hindenburg," to be carried as freight on the return flight to Germany from Lakehurst, N. J. Jimmie Haizlip aboard the airship carried the plane for use on a flying tour of Europe.



A summary of aviation news

AIR Progress

The Hindenburg's shadow rides the waves.

Transatlantic

"That Zeppelin Is Back Again" was the way one New York newspaper headed a brief account of the *Hindenburg's* second flight arrival. The big dirigible's hops from Europe have ceased to be news, although aeronautically they are still outstanding. The second trip from Frankfurt-am-Main to Lakehurst, slowed by headwinds, took 78 hours 26 minutes, compared to the first flight's 61 hours 38 minutes; the return voyage starting May 20, the same day as her arrival, ended after 48 hours 7 minutes, or about 20 minutes faster than the first. Then she flew to South America and back, and was due to start her third visit here on June 17th.

Experimental airplane mail service between Berlin and New York, planned for August, has advanced a step with a successful trial launching and flight of a new Dornier Do. 18 flying boat from the specially built catapult ship *Ostmark*, to be stationed in mid-ocean.

In the Pacific

Rumors of early exploration of a southern air-route extension from Hawaii to Australia have been strengthened with the return of Pan American's supply ship *North Haven* from Manila to San Francisco. It is reported that she will leave to sail the route in August.

Future security of the Philippines, and thereby the Pan American air service, is promised in the announcement that the Philippine government, when it becomes an independent republic in 1945, will maintain a military and naval force that will include 250 fighting planes.

Performance

Arriving back in England from Capetown, South Africa, Amy Mollison set new records in her Percival Gull for southward, northward, and round-trip time. Flying time round-trip was 7 days 22 hours 42 minutes. Her flight has heightened interest in the £10,000 England-South Africa air race planned for fall or early winter.

Howard Hughes again flashed into the headlines with a lunch-to-dinner hop of 8 hours 10 minutes 25 seconds from Chicago to Los Angeles in his Wright-powered Northrop, following the transport route regularly covered in 12¾ hours by TWA's *Sky Chief*.

The National Air Races will be moved this year from Cleveland, where the Municipal Airport is being altered and improved, to Los Angeles. Dates are September 4th to 7th.

Science

The National Advisory Committee for Aeronautics demonstrated to engineers and manufacturers assembled at Langley Field, Virginia, for its annual conference the work done during the last year in aerodynamics and engine research. The prize attraction was the new 500 m.p.h.-wind-speed tunnel. The N.A.C.A., asking Congress for an increased budget, warned that our present lead in air knowledge is being reduced rapidly by advancing European scientists.

Shadows of hot air swirling over poorly smoothed surfaces have been photographed in England in measuring the serious skin friction drag of high speeds. . . . Cellophane instead of rubber in small balloons is expected to extend weather research.

Engines

Surpassing the Pratt & Whitney 1,000 h.p. 14-cylinder Twin Wasp announced last month is a new French Gnôme-Rhône 18-cylinder twin-row radial yielding an allowable maximum of 1,320 h.p. for sea-level take-offs and 1,325 h.p. at 7,700 feet. Total possible power at sea level is 1,580; at weight of 1,612 pounds, this figures to 1,015 pounds for h.p., against the Wasp's corresponding figure of 1.09. The Twin Wasp's frontal area, however, is considerably less than that of the Gnôme-Rhône. Incidentally, the statement in "Air Progress" last month that the Martin 130 Clippers have Wright Cyclone engines was in error; they are powered with Twin Wasps.

Standard Oil announces a gasoline that may enable present single-row engines to compete with the advancing twins. An inexpensive ingredient, isopropyl ether, is blended with the gasoline and tetraethyl lead to produce a fuel with octane rating of 100, compared to present commercial fuels of up to 87 rating. The increased power resulting can extend flight range or carry bigger loads.

by George L. Eaton

The WHITE

THE CIRCUS had been in the Kansas town of Plainville three days when "Prince Pedro" murdered the old woman.

He most certainly hadn't intended to strangle her—not then, anyway. It was the last thing he would have done had he retained his senses. But he had been goaded to a blind fury. His hands had shot out; his fingers had fastened around the scrawny neck and dug in. A red haze had danced before his eyes. He had choked her, shaken her, screamed: "Tell me his name! Tell me his name!"

She hadn't—couldn't answer. She had died then—from the garroting.

Prince Pedro had been with the Temple Bros. Circus thirty years when this happened. He had been left there at the age of five by some unknown. There was no record of his parents or kinfolk or what his real name was. To the management, to his fellow performers, to the gawking public, he was and always had been just Prince Pedro, the dwarf; Prince Pedro, a freak of nature; Prince Pedro, the doll-sized man. From the top of his oversized head to the soles of his tiny feet, he measured thirty-nine inches precisely—and tipped the scales at fifty-six pounds.

PYGMY

A Great Bill Barnes Air Adventure Novel

Ordinary men were giants to him, but none could face his demoniac flying skill—except Bill Barnes!

He was the main attraction of the circus and was widely publicized. Gaudy posters splashed his name and his picture over the countryside. Scientists came to examine and gravely discuss him. Famous specialists wrote articles about his case. He appeared in news reels and on the radio. He made special appearances at benefits. Society women, upon learning of the mystery of his origin, endeavored to adopt him. His fan mail became an avalanche, and with it came scores of matrimonial offers and letters from cranks and beggars.

His spectacular flying act was his own idea entirely. He not only learned to pilot an airplane, but became an expert. A midget biplane was specially designed for his diminutive body and, at afternoon performances, he put on sensational stunting exhibitions that packed the outdoor grand stands and took the circus far out of the red.

At every town where the Temple Bros. Circus began an engagement, crowds came in droves to see the famous Lilliputian, to marvel at him and, also, to laugh and sneer and make cruel comments.

Prince Pedro was used to the staring eyes and the snickers. He had long since learned to mask his emotions and be ever the showman. But the gibes were not forgotten. His miniature size had set him apart from normal men and, although nearly forty years of age, he found himself treated as a child.

He had no friends until a noted explorer, Hal Tuttle, brought a troupe of Belgian Congo Pygmies to the circus. The dwarfed brown natives were of Prince Pedro's own elfin stature and the one common misfortune erased all differences of color and creed.

Prince Pedro befriended and protected them, and the little men of the Itura Forest grew to worship the very ground the white dwarf walked on. He became their acknowledged leader and, for the first time in his existence, felt the intoxication of power over other men. He studiously learned their language, taught them a smattering of English, and taught them to hate normal men as much as he hated them.

Prince Pedro

He had nurtured the hatred from the moment when he had learned of his own abandonment at the age of five. It lay like a festering sore deep within him, and grew worse and worse. Every laugh, every pitying glance, added to it. And under the stimulation of the Pygmies' adulation, his twisted little brain began to evolve fantastic schemes of revenge.

Then came the night in Plainville——

FOR TWENTY YEARS he had doggedly searched for the woman and for her secret. He had long realized that his only clue, his only hope of not only establishing his identity but of learning who had cast him out as a child, was to find this woman.

His sole remembrance of the days prior to his advent with the circus had been the vivid picture of a woman's face—a face with a jagged scar across the right cheek. And, as the circus had crisscrossed the continent, year after year, he had closely watched the procession of people that streamed past him, ever searching for that scarred face.

And when, at last, he did find her, Fate had arranged a grotesque climax—as grotesque as the body with which nature had cursed him. He killed the woman with his own two hands—killed her while the most vital part of her secret remained unspoken.

The circus had pitched its tents on the Plainville fairgrounds down on the flats by the river. The infield of the quarter-mile race track had been turned into a flying field and the ramshackle grand stand, flanking one side of it, had been enlarged.

It was not until the third afternoon that the letter arrived.

Prince Pedro waited in his tent dressing room at the end of the field and listened to the master of ceremonies complete his flowery announcement to the packed grand stand. "—introducing Prince Pedro, the little flyin' fool!" The band crashed out a crescendo of noise.

The dwarf came to his feet. His cue. He started through the tent opening and almost collided with a messenger boy.

"For you, Prince." The boy thrust out a soiled envelope.

The dwarf took it, shot a hurried glance at the scrawled name and address and the underlined "important," and jammed the letter into his pocket. He hurried on to where his tiny biplane waited, waved his hands to the clapping multitude in the grand stand and climbed into the small cockpit. He took off immediately.

Once in the air he went methodically through the routine he knew by heart—a series of snap rolls and loops and then a precipitous power dive.

As he zoomed back to his former altitude, he took the envelope from his pocket, ripped it open and straightened out the piece of stationery. He read the shaky, penciled words rapidly:

> DEAR PRINCE PEDRO:
> I knew you once, long ago. I have much to tell you. Please come to see me. I am very sick. I must see you before I die. It is very important. Come to-night.

It was signed "Mrs. White," and a Plainville address was given.

The dwarf went through the remainder of his flying act automatically, but his eyes were gleaming.

He landed, went immediately to his tent and stayed there until dark. Two hours before he was to make his evening appearance under the big top, he slipped from the fairgrounds.

He had consulted a map of the town and, stealthily keeping to the shadows, finally located the house far out on the outskirts of Plainville. It was a hovel.

He knocked and opened the door when a weak voice bade him enter. He stepped into a room dimly illuminated by the flickering of an oil lamp. The room was small and filthy with dirt. On a metal bed he saw the emaciated figure of an old woman. She was raised up on her elbow, staring at him from feverish eyes.

"You came——"

Prince Pedro moved toward her. "What do you want with me?" he said gruffly. But he could scarcely keep the tremor of excitement out of his voice. The woman on the bed, in spite of the deathly pallor, the mass of wrinkles and the straggly white hair, was identical with the woman of his memory—and across the right cheek was a jagged scar.

The old woman said weakly: "I sent for you—to make a confession, to ask your forgiveness before I die. I haven't much longer. I did you a great wrong when you were a child."

The dwarf stood at the bedside and looked down at her, his stocky figure tense. "Who are you?"

"That doesn't matter. Have you ever learned who you are—what your real name is?"

"No."

"It's Leopold. Pedro Leopold. Your parents were Belgians. They came over to this country when you were just a baby. Your father made a fortune here."

Her voice rushed on, shrill and rasping. "Your parents both died suddenly, in an accident. You were left in care of your father's best friend. He became your

guardian—handled the fortune that had been left you. He wanted your money, but he didn't want you. You weren't normal; he thought you a monstrosity.

"He wanted to get rid of you, so he came to me, paid me to take you away so that he'd never see you again. I did; I left you with the circus."

She fell back, gasping for breath. "I've always regretted what I did. I was afraid to write you—until now."

The dwarf's eyes were on fire. "Does this man still live—my guardian?"

"Yes. He used your money, turned it into a vast fortune. He still lives, a multimillionaire——"

Prince Pedro's hands twitched. The veins on his neck stood out like cords.

The old woman spoke suddenly, brokenly: "You'll forgive me? Please. I know I did wrong but——"

The dwarf knocked her raised hands aside. His voice was venomous. "Who was my guardian?"

The woman saw his expression and was frightened. "I can't tell. I swore I'd never reveal——"

It was then that the madness engulfed Prince Pedro. His fingers were around the woman's throat. He was choking her and screaming: "Tell me his name! Tell me his name!"

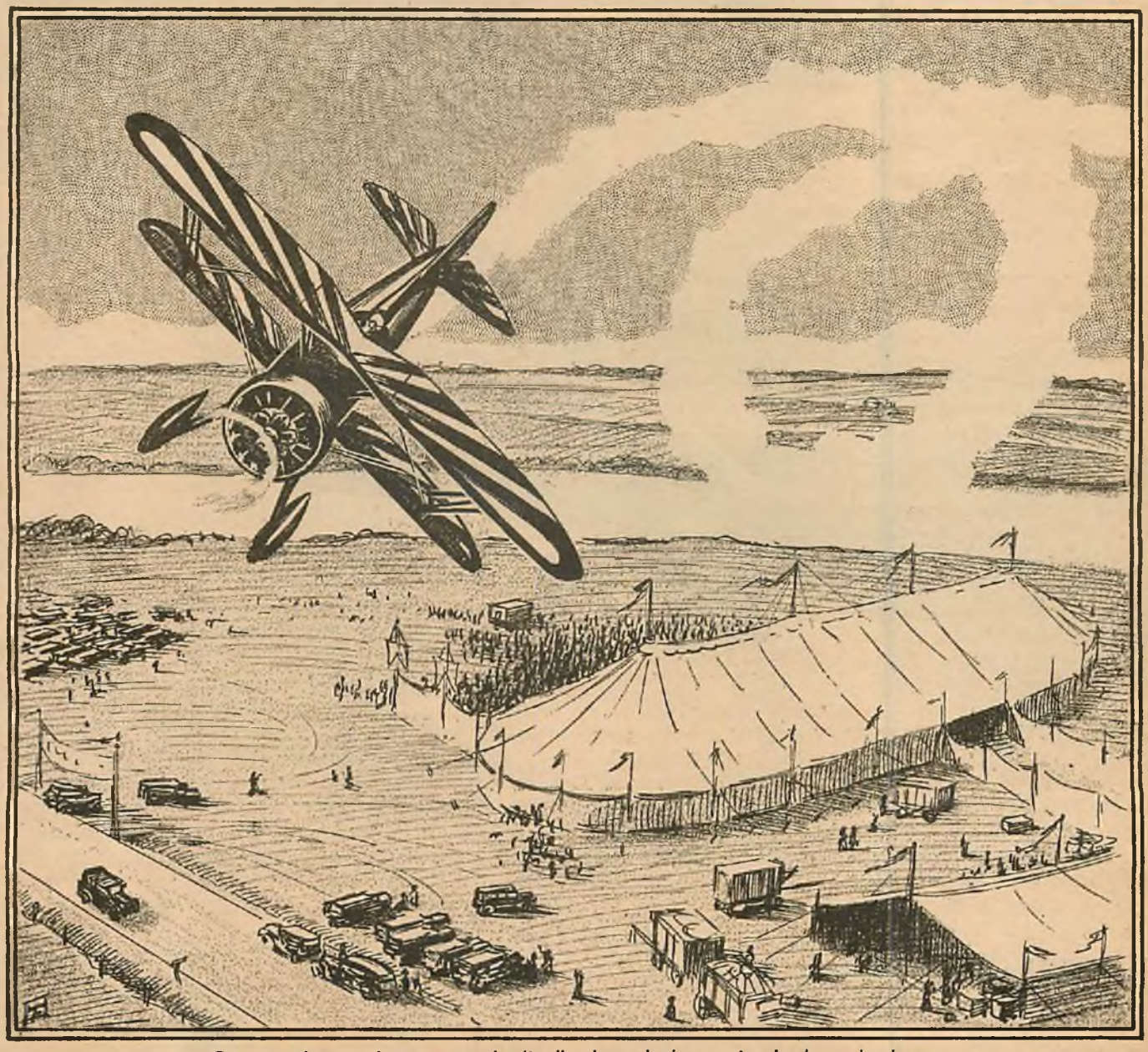
When the mists cleared away, he saw that she was dead.

He never remembered clearly what happened after that. Panic seized him. His one thought was to get away. He saw the smoking oil lamp, seized it, overturned it on the bed. As he ran from the house, flames ignited the bedclothes.

Terror gave him supercaution. He fled back to the fairgrounds by a long, circuitous route through open country, and gained the shelter of his tent undetected. The rigid control he had exercised over his emotions in the past stood him in good stead, and he was outwardly composed when, half an hour later, he made his appearance in the tented arena.

Later in the evening he heard reports of a disastrous fire in the northern part of town, where a house had burned to the ground. It was believed that an old woman had perished in the flames.

After the crowds had left and the circus had bedded down for the night, the dwarf sat on the edge of the bed in his darkened tent and stared into the blackness. The fear



Once in the air, he went methodically through the routine he knew by heart.

of detection and remorse over his deed had now dimmed, and in their place had come an all-consuming rage.

The words that the old woman had spoken were etched in his brain. His guardian—the unknown man who had cast him out as a child—had usurped his birthright and had grown fabulously rich on stolen money. His guardian! The search for the woman was ended but a greater search had begun.

All the pent-up hatred that had been engendered within him came to focus. The dwarf came to his feet, stood crouched there in the stillness. And from twisted lips he swore a savage oath:

"I will find him if it takes to my dying day. He will suffer as I have suffered. Upon him and his family will fall the curse of Prince Pedro."

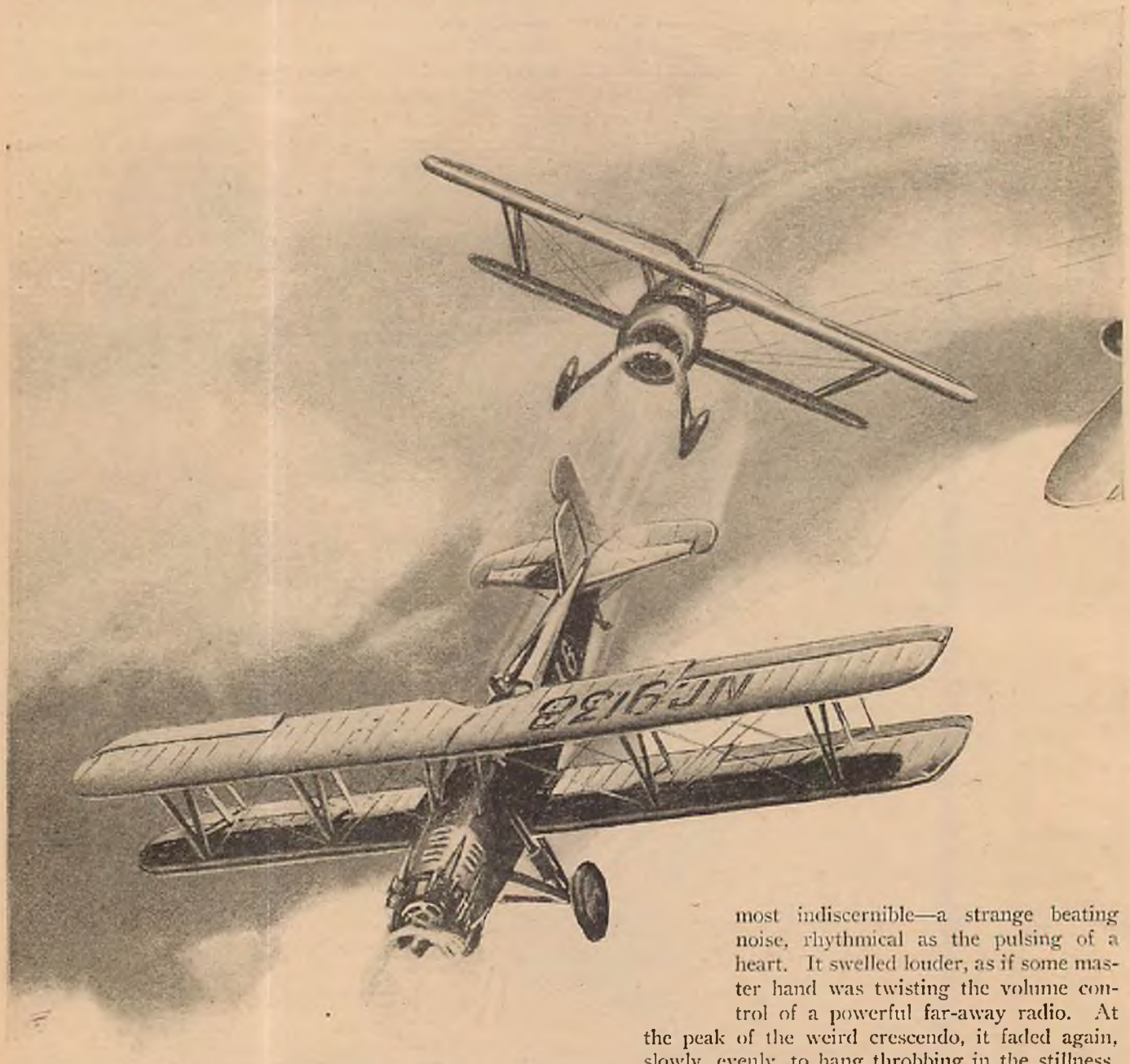
That was in 1924.

II—WAITING

JUNE 10TH, 1936.

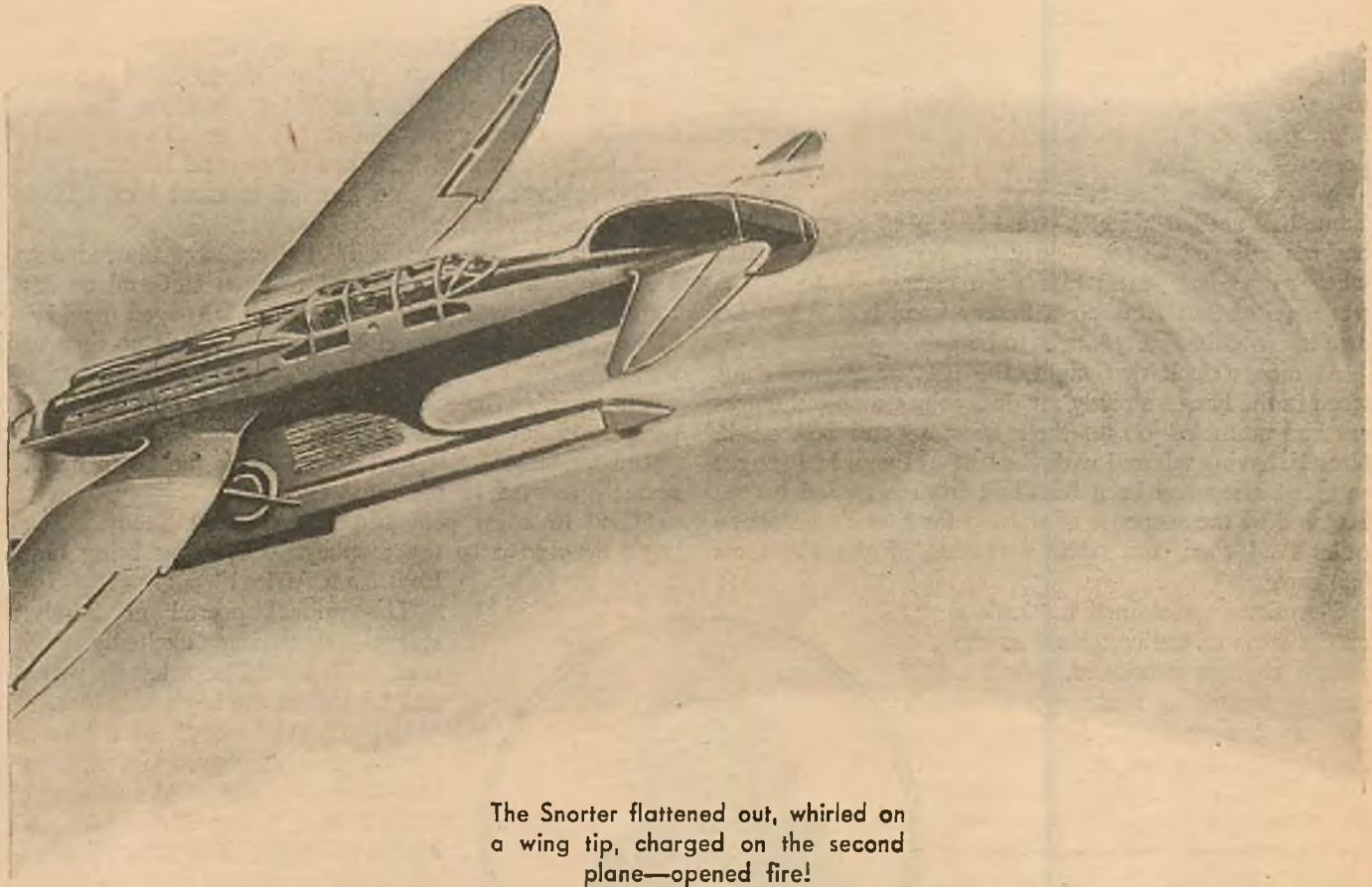
The moon stood over the expansive Barnes airport, a ball of sullen orange in a bluish-black sky. Midnight hushed the land. There was no breeze and the heat of the summer night lay like a smothering blanket over the hangars and field buildings. The airport's staff, save for the armed guards and the night radio operator, had retired early, worn out from a day of intensive work in the oppressive heat.

There was no sound, no movement, anywhere. It was as if nothing lived, nothing breathed. And then, it came—a whisper filtering through the night, faint, almost indiscernible—a strange beating noise, rhythmical as the pulsing of a heart. It swelled louder, as if some master hand was twisting the volume control of a powerful far-away radio. At the peak of the weird crescendo, it faded again, slowly, evenly, to hang throbbing in the stillness.



Bill Barnes heard it as he lay sleeplessly in the sweltering heat of his bedroom. He sat up, suddenly tense, and listened. The drumming grew in volume and again sank to a murmur, like the breaking of surf on a coral beach. The famous pilot swung bare feet to the floor and went outside to stand on the steps of his bungalow, his forehead furrowed.

For the last three nights the strange pulsing had come. Not only had it been heard at the airport, but for miles around. Complaints had been made to the police by Bill's nearest neighbors—the wealthy Dennisons, Kressels, Howes and the rest who maintained luxurious es-



The Snorter flattened out, whirled on a wing tip, charged on the second plane—opened fire!

tates in the rolling land between the airport and the distant town of Huntsville. The police had sent squads out every night after that, but nothing had been found, and the mysterious sound had still continued.

And there had been another baffling incident. The previous afternoon, Tony Lamport, the chief radio operator, had picked up an unidentified station on the short wave and heard the same weird pulsing. Bill and he had listened in, had tried to detect a code in the sound and had failed.

"It's identical with what we've been hearing at night," Bill had said thoughtfully. "There's only one thing that I can think of that makes a sound like that—the native tom-toms of Africa."

Tony had laughed. "Savage drums here on Long Island? Boloney! Doesn't make sense to me."

It hadn't made sense *then*, Bill had been forced to admit. But now, as he stood listening on the steps, his thoughts went back to what had occurred that very morning, and he knew that he had been right—that the sound vibrating through the night *was* from savage drums. And the radio? Had some one been broadcasting the secret telegraph of the Dark Continent—perhaps sending messages by means of the native tom-tom code, the code that had never been deciphered by white man?

Bill's heart beat faster. Tom-toms! Africa! And all that day the airport had hummed with feverish activity as the air fleet had been whipped into condition for a flight to that very continent!

IT HAD all begun that morning when, at ten minutes after eight, an amphibian—later to be identified as the plane attached to the ocean liner, *Emperor*—had circled the Long Island air field and landed. Its pilot had been brought into Bill's presence, and handed Bill an envelope heavily encrusted with sealing wax and then, tight-lipped, had returned to his refueled plane and taken off.

The letter had been from Bill's old friend, Gordon Stone, the noted explorer, and read:

DEAR BILL:

Am returning from the Congo aboard the *Emperor*. Vitally important that I see you upon arrival. Due to dock New York to-morrow morning, Thursday, at one o'clock. I didn't dare trust the radio, and chartered the *Emperor's* plane to deliver this.

Recent expedition disastrous. Cannot go into detail. Imperative that I reorganize and return to the Congo immediately. Human lives at stake. You and your men are my only hope. As much as I despise to do this, the emergency forces my hand and, unwillingly, I recall to your mind a statement you made years ago—that if I should ever need your help, I should feel free to call on you. I need that help now, Bill, desperately.

If you can and will accede to my wishes, I will need your entire flying force to proceed as soon as possible to the Belgian Congo. I can assure you, on behalf of my backer, who must remain unnamed, of a generous financial reimbursement.

In any case, please hold yourself in readiness to come to see me. Circumstances are such that the greatest secrecy and caution must be exercised. Burn this letter directly you have read it.

While in New York I will stay at the Claymore, Park Avenue. The penthouse apartment has been leased for me under the name of A. V. Brown. You will be notified by telephone as to when to come. Your caller will identify himself as Z and give the time of the appointment. Nothing more will be said.

I was placed aboard ship in a semiconscious condition from native poison and malaria. It is with great effort that I write this. But again I entreat you to stand by me, Bill.

Your old friend,

GORDON STONE.

Bill had reread the letter twice, then burned it. He had picked up the telephone and rapped out crisp orders for the Lancer, four Snorters and the carrier-transport to be readied for a transatlantic flight. All pilots and flight personnel had been instructed to hold themselves prepared for action.

Not a second had been lost in indecision. Gordon Stone had needed his help—that had been enough. Bill had remembered all too clearly the day, five years back, when Stone had saved him from certain death in the whirlpool of that Amazon tributary—and had risked his own life in doing so. A debt to be paid.

At nine o'clock that night, the fleet of Barnes ships stood in the hangars ready for duty; the exhausted workers had stumbled off to their quarters and bed. Bill, himself, having labored with the best of them, had sought rest, but sleep had been banished from his mind by the heat and by the suspense of waiting for Stone's telephone call. And then, the sinister rumble of the tom-toms had come.

The airman remained motionless on the steps of the bungalow as the savage rhythm continued. And a strange feeling of acute apprehension crept over him. In spite of the heat, he shivered.

Suddenly, from behind him came the creak of a board. He jumped involuntarily, whipped around to see "Sandy" Sanders, the boy pilot of the flying organization, standing in the open doorway. He was dressed in bright-green pajamas. His tawny hair was tousled and his eyes were heavy from sleep.

"What're you up to?" Bill said irritably.

Sandy came outside and down one step. "That noise again." His voice was low. "It gives me the creeps."

"Start creeping back to bed, then," said Bill. "You'll need all the shut-eye you can get. There's no telling when we'll——"

The sharp rasp of a telephone bell sounded from inside the bungalow. Bill left his sentence uncompleted and hurried into his bedroom. He picked up the telephone and said: "Bill Barnes speaking."

A voice came quietly to his ears: "This is Z. Come right away." There was a click as the caller disconnected.

The pilot lowered the receiver to the hook, his eyes bright. He hurriedly stripped off his pajamas and dressed. He saw Sandy in the doorway and made a quick decision. "Hey, kid, get some clothes on. You're driving with me to New York!"

It was two a. m. when they arrived at the Claymore.

III—HIGH MANHATTAN

GORDON STONE was waiting for them in the luxurious penthouse apartment on the top of the towering forty-story Park Avenue hotel. He was alone, save for an armed guard.

The guard had opened the door at Bill's knock, after their long elevator ascent, had hastily motioned the two pilots inside and slammed the bolts back into place with a muttered, "He's waitin' on you."

Alphonso

It was then that Bill saw the man advancing out of the shadows at the other end of the spacious living room and recognized him as Gordon Stone. But he had changed, shockingly. The stalwart six-footer Bill had once known was gone, and in his place was an emaciated, bent old man with sunken cheeks and burning eyes.

Bill said, "Stone!" and hurried to meet him. They shook hands warmly.

"I knew you'd come, Bill," the explorer blurted out. He was wearing a crushed white linen suit and on his right shoulder was perched a small, bright-eyed monkey. "I've got to talk to you right away. There's no time to waste!"

The man's whole body was trembling and beads of perspiration dotted his forehead.

Bill introduced Sandy. Stone shook the boy's hand, scarcely seemed to see him.

"Glad to know you, Mr. Stone," said Sandy. The boy's eyes went to the monkey. "Did you bring him back from Africa?"

The animal peered at Sandy, started chattering excitedly and then, with a wild leap, left its perch and landed on the boy's shoulder.

"That's Alphonso," said Stone. "A Colobus monkey. Got him in the Congo." The explorer seized Bill's arm. "Come on. There's a lot to tell you. You take care of Alphonso, youngster."

"You bet," said Sandy, delightedly. "We'll get along swell." His voice rose shrilly. "Hey, quit it, Alphonso!"—as the monkey began a frantic inspection of the boy's hair.

Bill grinned and followed Stone outside to an open-air terrace that flanked one side of the penthouse. The night air at the high altitude was cool and refreshing. Far beneath, the lights of Manhattan lay like myriad fragmented diamonds on a field of black velvet.

The explorer closed and locked the French doors into the living room, whirled toward Bill, and said feverishly: "Can you go? Will you help me?"

Bill nodded. "You needn't have ever worried on that score, Gord. My planes are all set to take off. Just say when."

Stone walked over to a wicker chair and sank into it. He was silent for a long minute, his eyes riveted on Bill's face. "I'll never be able to thank you for this," he said huskily. "I'm in an awful fix. I left a man there in the Congo—a prisoner of the Pygmies. I've got to go back and get him out. They'll do all sorts of things to him—torture and worse. If I don't get to him soon, it'll be too late."

Bill spoke gently: "You'd better tell me everything. But, get a grip on yourself, Gord." The pilot strolled to the low parapet that bordered the terrace, looked over and found himself staring down the sheer side of the skyscraper. He heard Stone's whispery voice.

"Yes. I'll tell you it all. I want to leave in twenty hours—as soon as Hal Tuttle gets into town. He's going with us. Having him and you with me—I can't fail."

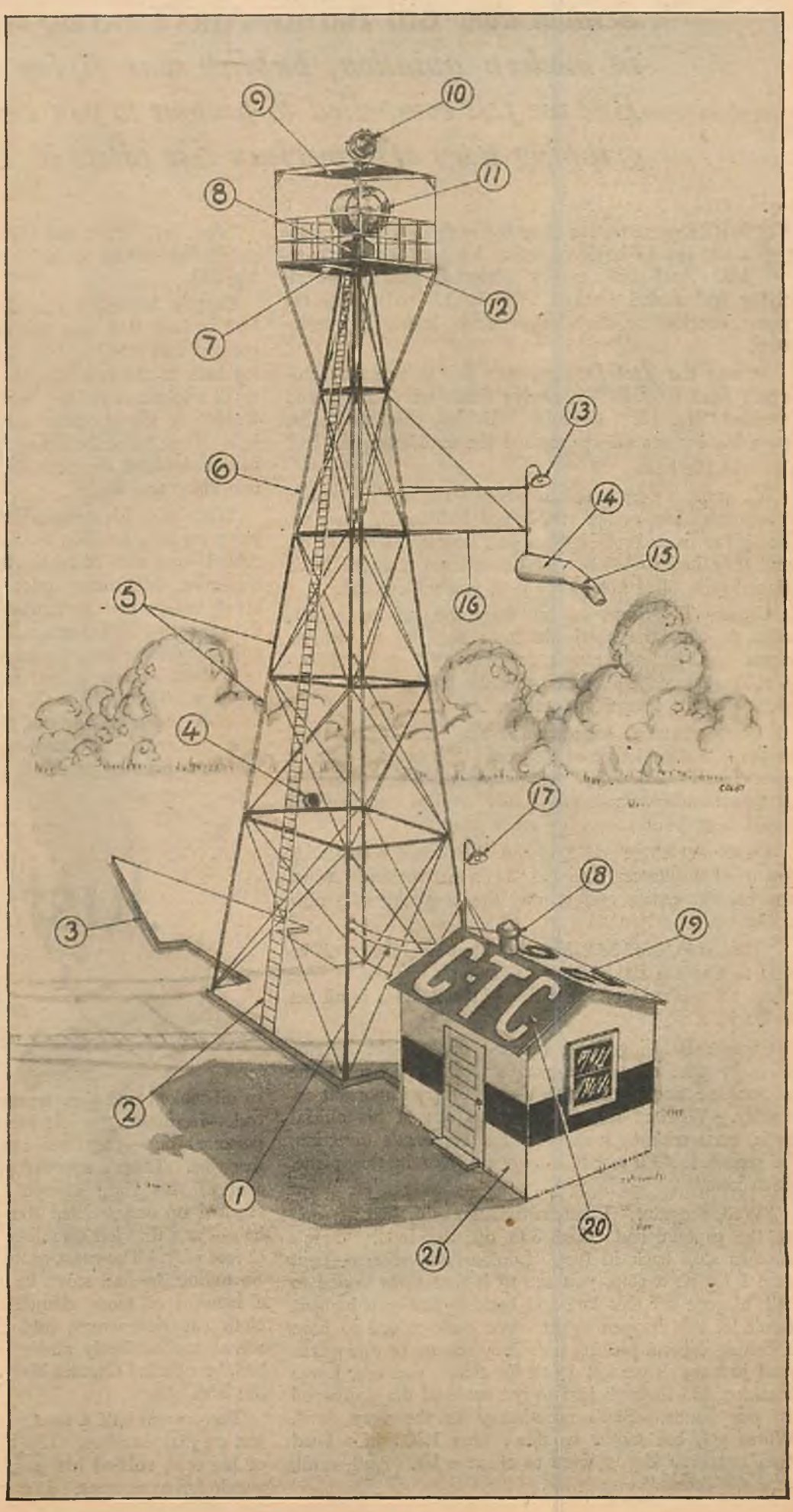
Bill went back and sat down opposite the explorer. He realized that Stone was a desperately sick man, going on nerve alone, and that he was rapidly *(Turn to page 62)*

THE FLIER'S DICTIONARY

The eleventh lesson in the technical terminology of the air. Save your files!

AIRWAY BEACON

1 POWER CABLES
2 INSPECTION LADDER
3 CEMENT DIRECTION ARROW
4 DIRECTION ARROW FLOODLIGHT
5 BLACK AND WHITE SECTIONS OF TOWER
6 BEACON TOWER
7 ENTRANCE TO TOWER PLATFORM
8 ROTATING UNIT OF BEACON
9 OBSTACLE LIGHT PLATFORM
10 OBSTACLE LIGHT
11 REVOLVING AIRWAY BEACON
12 INSPECTION PLATFORM
13 WIND SOCK FLOODLIGHT
14 WIND SOCK STIFFENER
15 WIND SOCK BODY
16 WIND SOCK OUTRIGGER
17 POWER HOUSE MARKING FLOODLIGHT
18 VENTILATOR
19 AIRWAY BEACON NUMBER (BLACK ON WHITE)
20 AIRWAY ROUTE NUMBER (WHITE ON RED)
21 POWER HOUSE



Seldom does Bill Barnes-AIR TRAILS, *believing in modern aviation, publish war flying stories. But we felt compelled to present to you this fine, gripping story of American test pilots in France.*

Just What

by Andrew

THERE were twelve busy flying fields where a pilot could get all kinds of action for his time and trouble. And there was a thirteenth field where all flying had ended forever. "Field 13" was atop the grade, overlooking the whole center. It was the cemetery.

It was the Test Department's job to see that students went through the twelve fields with safety, and avoided "No. 13." Captain Baldridge, chief test pilot, gave his endless efforts toward the avoidance of "13." He was the boss.

Many there were who considered Baldridge's demands too strict. He was a stiff-lipped individual, however. Being top man, he told them just how ships should be, and they had to listen. Test crews on a dozen fields cussed him. But not to his face, you understand.

Captain Baldridge, on his daily tour of the center, came in over the northside trees and put his wheels down on Field 8's rough acreage. When his Nieuport-27 had made its last bronclike buck, it was right in at the test hangar's deadline.

"Good morning, Lieutenant Duke," the captain said to the tester in charge of 8's line. "I'll make a *tour de piece* in this No. 333," he added, indicating the ship of that number which stood idly on the test line, "if you'll have your men give me a start."

Lieutenant Duke and Sergeant Rundt had been standing there discussing ship No. 244's airworthiness when the captain came; and it was the sergeant who now spoke up.

"That ship, No. 333, has just been O. K.d, sir," he said to Captain Baldridge. "That puts her out of test. She's all washed up. But this old cull, 244, is all set to do it, sir."

Captain Baldridge had reached 333's right inferior wing by that time. He was stooping to inspect the underside fitting bolts of the V-struts' very important assembly. Without taking the stoop out of his official back, even without looking in the sergeant's direction, he repeated: "I'll make a *tour de piece* in this plane, lieutenant."

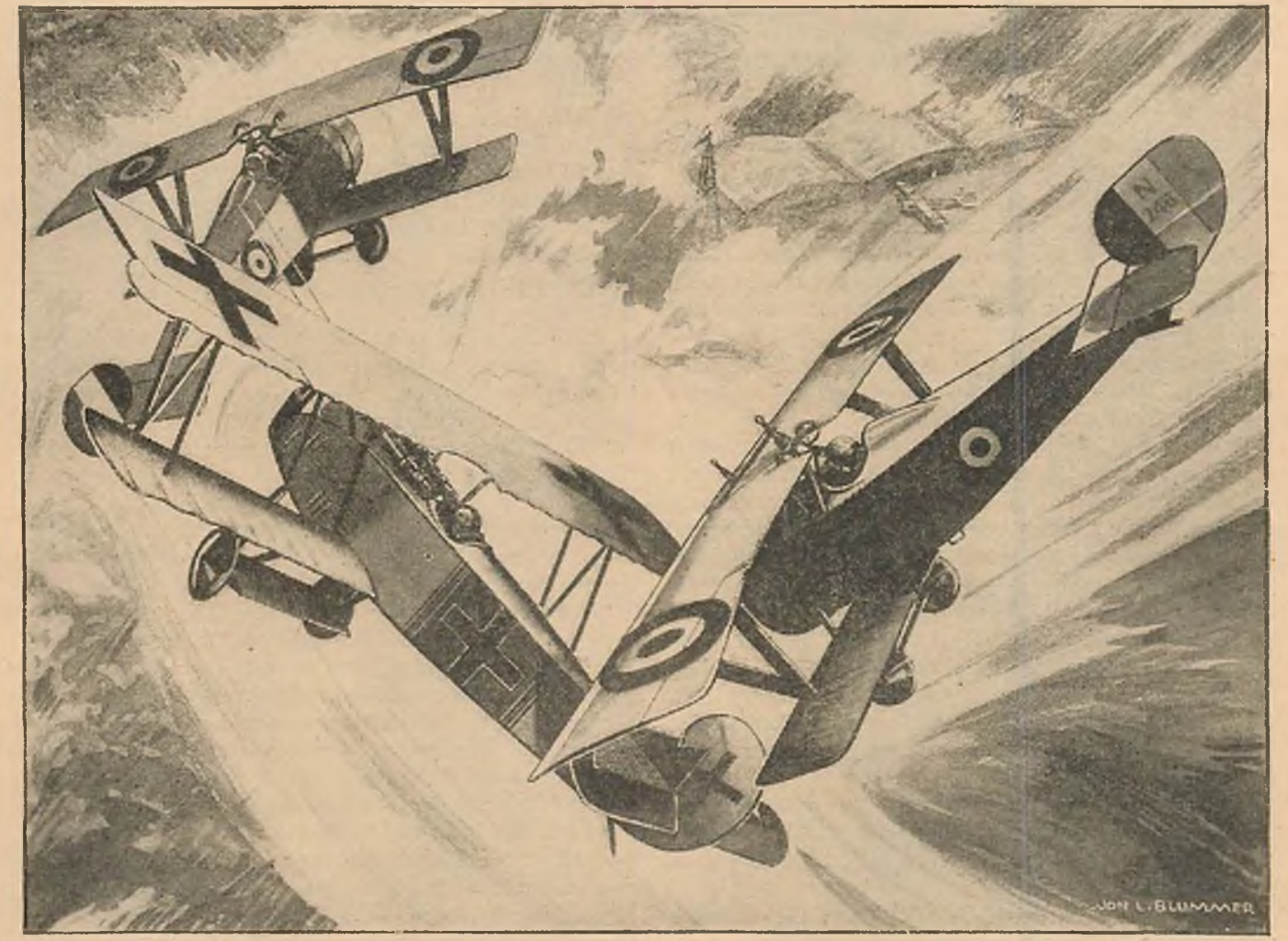
"Well, sergeant," Lieutenant Duke said, just as soon as the captain had lifted 333 off the field, "there's another ship back in test. Look-a-here, soldier—next time I O. K. a ship, you see to it that she's taxied to hell 'n' gone off this line and back to her own hangar. Don't let this happen again. We can't afford to have a visiting captain picking up sleepy money in this game. And just watch me get a call for this. You see, I was sneaking 333 through just to get some of the deadwood off our hands. She's nose-heavy as the very devil. Worse yet, her motor wouldn't turn 1,300 in a hard dive, not even if you were to cheat a bit. And—well, here she comes."

"Aw, hell. Him and his *tour de piece,*" was all Sergeant Rundt had to say. His eyes were on the landing 333.

Captain Baldridge landed with full power, trying his best to hold that nose out of the bloody blanket of red poppies that was Field 8's far east end. In time he taxied back to the test hangar. Still sitting there in 333's small cockpit, wordless for the time being, he slowly tossed off the shoulder straps of the four-way safety belt. Then he pushed his goggles upward from his eyes, next unbuckled the helmet's tight strap from his sensitive chin, and said:

"This ship, Lieutenant Duke, would be O. K. for use were we in a position to deliver it to a German flying school—and able to make them use it. Yes, as it handles now, one enemy pilot would be accounted for in short order; and that would be much more merciful than shooting him down. But"—and Captain Baldridge still managed to keep the edge off his tongue—"this craft falls short of our school requirements. It is dangerously nose-heavy. It is also right-wing-heavy. Its ailerons 'wash' above the trailing edges of the wings. The rudder bar is loose on its floor fitting. There's vibration on the propeller, and the motor boards are so oil-soaked that they weave on the longerons. That's bad. In flight, the left inferior wing blows up like a poisoned pup—the linen has torn loose from at least five ribs. There's a cotter pin missing from the rocker arm of this right aileron control tube"—the captain reached up and twisted the pinless castellated nut and bolt—"and that left chandelle has at least a full half inch of free play. The cross-brace wires must be very slack." So saying, he half stood in his pit, reached ahead, took a handful of those chandelle brace wires and pulled. Both superior wings, and the chandelle struts themselves, moved freely under his pull. "And that's very bad," concluded Captain Baldridge. His gaze went down the line.

There were half a dozen other Nieuports waiting for test on that deadline. The captain stood on the cushion of his seat, rubbed his jaw and then studied his wrist watch for a moment. Duke begged Heaven to compel



The Fokker luffed. That meant gun-sighting!

He Ordered

A. Caffrey

that wrist watch to remind the captain of some other pressing business; the prayer was answered.

Captain Baldridge said he had to hop over to Field 7, so Sergeant Rundt yelled for a starting crew. Two lazy macs, pulling a pair of chock blocks, came out to do the job. These two stood by, open-mouthed, and listened to the captain's last few words.

"Don't forget that ship I just flew, Lieutenant Duke," he was saying. "It's awful. . . . Should never have been O. K.'d. . . . Engineering Office calls for a perfect *ligne de vol* at 1,250 revolutions, you know."

Then the captain took off; and Duke sat there on his heels.

"A perfect *ligne de vol* at 1,250," he finally mused. "I guess we're pretty rotten, sergeant. And *were* we called!"

"Aw, the hell he tells! Old 333 can't be that bad," said Rundt.

Lieutenant Duke looked at 333 intently. "She's a pretty hard-looking piece of equipment, sergeant," he decided. "But lots of good ships, flown five periods a day, look hard. And we've never had a ship fly to pieces yet, not here at 8. And 8's the toughest field, too."

"Don't forget '13,'" said the sergeant. "That's a tough one."

"Right you are," agreed Duke. "Guess the captain is right, too."

Be Captain Baldridge right or wrong, Sergeant Rundt was sick of work, and he said so. His hangar had been overcrowded with work for months, and now the head tester was adding more by demanding exactness in a type of ship that could hardly be made to fly that way. "I'm sure sorry he called you for the mechanical condition of 333," he said to Duke. "That's all my fault. . . . But this perfect *ligne de vol* at 1,250 revs! What's a pilot supposed to do—take a nap during flights?"

Lieutenant Duke told his sergeant to forget it. Then he fell to a study of his wrist watch. "Here's a thought, though," he said. "He might fire me. After all, I'm top man here, and an officer of the captain's type wouldn't hit anything lower than the top. I know the man. That being the case, I'll tell you what we'll do. It's close to noon. I'll take 244 for a hop. I want to fly over here cross-country, about thirty kilometers. In the event that this might be my last day at 8, there's a bit of good-bying I want to say. And while I'm gone,

you and the boys put 333 through the work, eh? You see how it is: next time the captain drops in on us he'll surer'n the devil want to give that cull another hop. And we want to be all set. That is—you do. Maybe I won't be here. So wind up 244 for me."

After that, till it faded from view, Sergeant Rundt and his two starters sat on their heels and watched 244 fly into the west.

"There goes one hell of a fine flying gent," said the strongest back of the two starters, big "Tiny" Wenn. "And, say, sarg; what'n hell did that captain guy mean by lean—lean on the ball, or whatever it was he said —that French stuff, huh?"

"*Ligne de vol. Ligne de vol,* ignorant," corrected Rundt. "That's a high-class expression we educated guys use for line-of-flight. See?"

"Line-of-flight," Tiny repeated. "Well, why doesn't he call it that? Ain't American good enough for him?"

"Well, it's this way, low-gear," Sergeant Rundt went on to explain. "When you say 'a perfect *ligne de vol* at 1,250,' you say the whole thing. That is—and are ya following, hog-head?—you mean that a ship with its motor just turning 1,250 revs per minute, and headed into the wind, should fly with hands and feet off. And if she has a perfect *ligne de vol,* a bump can hit her, or she can drop through a soft spot in the air, then come right back to her line-of-flight again. And at that 1,250, her nose stays right smack on the horizon. She don't climb. And she don't pique."

Tiny Wenn's eyes were wide, for the great one was on the very threshold of enlightenment. "Y' mean to say this goof captain thinks one of these little frog ships should do that—fly itself?"

"That's the idea," said Rundt; "and the captain's right."

The captain's right!

There it was—Rundt, himself, saying "the captain's right." And way down in his belligerent, insubordinate heart, Sergeant Rundt knew the captain was right. No two ways about it, a wild student, handling a machine-gun against grounded silhouettes or a camera-gun against fellow students' craft, should have a ship in his hands that was perfect, a ship whose actual, physical handling could be left entirely to the subconscious while the flier in question gave his whole attention to the gunning job at hand. And that was the sole argument of Captain Baldridge and the better testers; and who'd be dumb enough to say they were wrong?

Snapping out of it, Sergeant Rundt said, "You two strong backs get out of here. Start for the hangar, and have 333 sticking to you when you get there. Come on."

They dragged 333 within. Rundt yelled for his two engine men. Then he singled out a few of his best plane men. And, forthwith, hard-looking 333 was back "in work."

"This old can's giving Air Service a hard name," Rundt explained to his crew. "We'll work her over from end to end."

"She ain't got no—no lean on the ball," Tiny Wenn made known. "And at 12,550 revs per——"

"Get back to your sleeping," said Rundt. "I'll yell for you when we want beef—not beefing."

During the noon hour a high wind swept the center. All the hangars lashed their doors tight, and flying was washed out. That wind held strong through the afternoon. Labor on 333 went right along; and did that cause Rundt & Co. to cuss! It sure did, for there were many reasons why Rundt and his boys should be elsewhere than in that swaying canvas hangar nursing old 333. With all flying washed out, unofficially work in the flight hangars would be washed out too, and there'd be a swell poker game down in the flying cadets' barracks, to say nothing of a big, kneeling circle down in the storage hangar where all and sundry gave 'em a fair shake and a long roll. And there were other things to do, so work was hard to take. And all on a captain's say-so!

With the wind came clouds and rain; and it was pretty close to quitting time before Lieutenant Duke, sneaking home under the low clouds, taxied up to the hangar and yelled for open doors.

"Whew! Some storm. An' some fun," he said. "But I've seen Paris, heard all about Mecca, and just now spent a swell afternoon with the little lady who counted a full thousand ships before mine came along —so I'm ready to die. . . . Has anybody been looking for me, sarg?"

"Not around here, lieutenant," Rundt answered. "But say—just take a peek at old 333 now. She's a new bus. Boy! Have we guys sweat over this old cull! Well, anyway, the motor end's been all cleaned and tightened. We pulled that bum left inferior and put on a brand-new wing. I've re-rigged the whole job—tight as a drum, too—and if she doesn't do it now, hands and feet off, at 1,250, I'll buy you a new hat." Sergeant Rundt moved to the front end of 333. "This is a new prop," he said. "She's got a new set of plugs. This here's a new casserole, too; the old one was beginning to crack. First thing in the a. m. we'll give the motor a run; then if there's any ceiling at all you can give her a hop. She'll be jake, too. It's a promise."

"She looks good," Duke agreed. "Free the slaves and call it a day, sarg. And say. Sometime when I'm not in a hurry, ask me about this afternoon. See you later."

There were low clouds next morning. They were sun-shot frisky clouds that tumbled and ballooned through what you might call a happy sky. They were right down among the trees, at times, and only now and then broke wide enough to give a clear view of the high sky above. That being the condition, there'd be no dangerous combat work at dangerous Field 8 until such time as that dangerous lack of safe visibility should end. So all student ships remained on the ground.

Right after breakfast, while Lieutenant Duke was putting his small room in order, an orderly arrived, advising the lieutenant that the commanding officer would see him—and toot-sweet.

"Morning, lieutenant," said the C. O. when Duke reported. "Hello and good-by, as 'twere." The C. O. fingered an official memo. "Here it is," he said. "You are relieved from duty at Field 8. You are to report to headquarters, Main Field, for further orders."

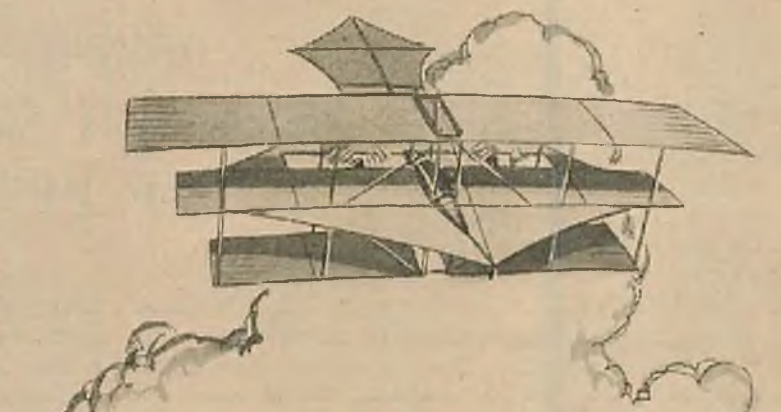
"Relieved—with black marks, sir?" Duke ventured.

"Black marks?" queried the C. O. "Why, no. Why black marks?"

"Well," said Duke, "I guessed that Captain Baldridge wasn't very strong for me, very strong for my work, sir."

(Turn to page 86)

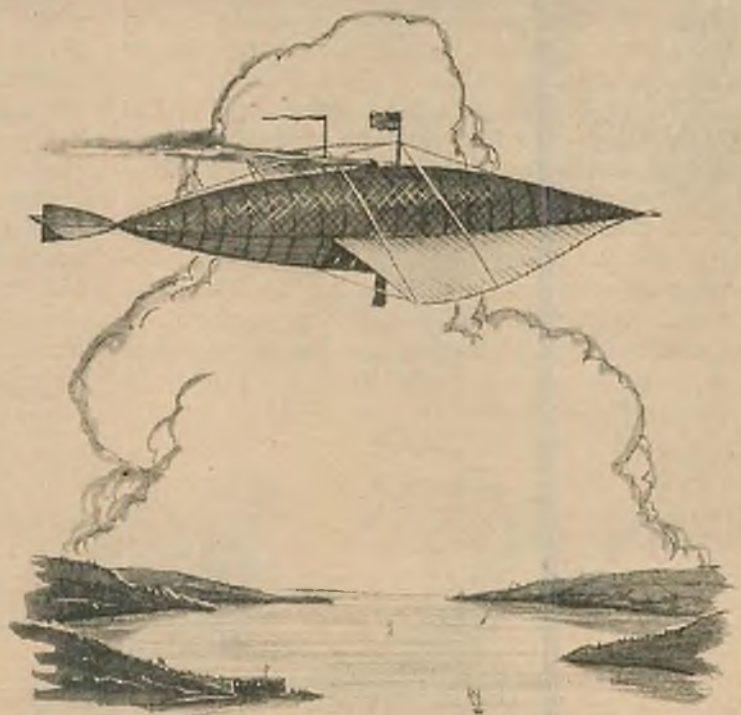
Pictorial History of Man in the Air



1868 - JOHN STRINGFELLOW BUILDS A STEAM DRIVEN TRIPLANE MODEL THAT FLIES ALONG A WIRE IN ITS TESTS

1866 - FRANCIS WENHAM, ENGLISHMAN, GRANTED FIRST PATENT ON A "FLYING DEVICE" WITH SUPERPOSED PLANES

1870 SIXTY-EIGHT WAR BALLOONS ESCAPE FROM THE SIEGE OF PARIS



1869 MARRIOTT BUILDS A STEAM DRIVEN BALLOON-PLANE "AVITOR"

COLBY

Hot AIR HEROES

by George Swift

No. 3:

Halstead H. Simms
(Hisso Hal)

HALSTEAD HAIR-TRIGGER SIMMS was the full name wished upon our No. 3 Hero of the Air by a proud father who was a great reader of Western stories.

Fortunately the matter was kept quiet.

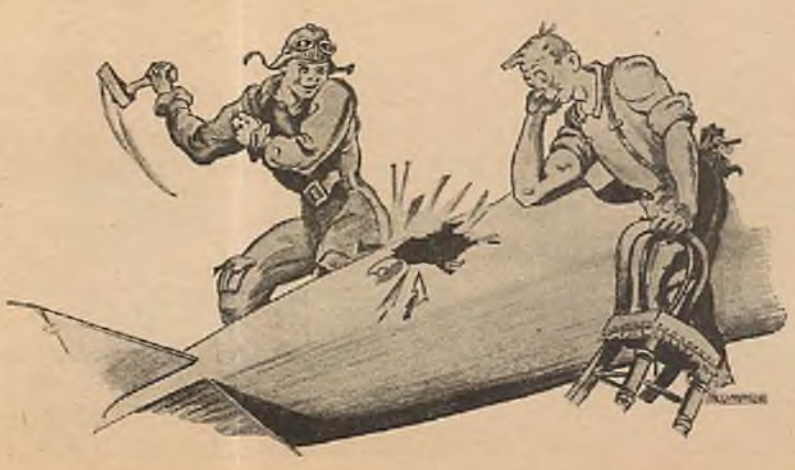
Halstead, or "Hal," as every one at first called him, started out to be a plumber, and at this profession he might have gone far. Old, experienced men often shook their heads in envy at the effortless way in which he could forget his tools, loaf on a job and excel in all such honored arts of plumbing. As a matter of cold fact, young Hal had been a full-fledged plumber no longer than one month when he set up an all-time record for getting in "time." This was on the occasion when he expended two hours and forty minutes in removing one lone nut which could have been unscrewed in thirty seconds by a six-year-old boy.

Yes, he might have gone down in history as a plumber extraordinary. But it was not to be. His name was to go down in history, true; but it was to be because of great deeds done in the sky rather than in the cellar.

One day he completed a plumbing job and presented his bill to the owner of the house, who took a look at the figures on the paper and promptly fainted. People often did this upon seeing one of Hal's bills.

After recovering, the gentleman signed over to Hal everything he possessed in payment of the bill. This included his house and a strange device called a Hispano-Suiza airplane engine.

Hal was fascinated by the Hispano. He ran it by the hour just for the sake of listening to the exhaust. He spent so much time with the Hisso that his friends began to call him "Hisso Hal." It did not occur to him to use the motor in an airplane for the simple reason that he had never seen a plane. In that era, aircrates were few and far between.



But the Hisso, and Hisso Hal, too, were soon to soar on wings into the sky.

Cries of "Airplane!" rang through the town one morning. The entire population ran out of doors and watched a Thomas Morse biplane come tearing down from the clouds. It swooped lower and lower, swiped the spire from the town house and made a fast landing on the village green.

Hal made the acquaintance of the plane's pilot. This worthy turned out to be an amateur flier by the name of Bill Bowler who had been engaged in a tour of the country. For some reason the mixture of bear's grease, vaseline and olive oil he had been using in the Thomas Morse had failed to lubricate it properly, and now the plane was grounded with a burned-out motor.

The acquaintance between Hisso Hal and Bill Bowler turned into close friendship when Bowler learned that Hal owned a perfectly good airplane engine. Within a short time they decided to consolidate forces and possessions. They proceeded to mount the Hispano-Suiza in the plane.

The Thomas Morse had never been intended for use with a Hisso power plant, but that was a minor point indeed to the two. And in those glad, mad days of aviation there were no prowling Department of Commerce inspectors to startle amateur fliers by asking leading questions about what kind of engine powered what kind of ship.

Once the motor was installed, the next step was to make the single-seater plane into a two-seater. This was accomplished by the simple expedient of cutting a hole in the fabric back of the regular cockpit, dropping a small chair inside, and wiring it to the fuselage members. A stick, rudder bar and throttle hooked up in the added cockpit gave them dual controls.

The revamped Thomas Morse, when test-hopped, proved to have some rather startling flying characteristics, including a burning desire to climb straight up when the throttle was opened and an equally burning desire to dive straight down when the throttle was closed.

Some re-rigging was in order, said Bill Bowler. Airplane rigging was a complete mystery to Hisso Hal, and, truth to tell, almost as completely a mystery to Bowler, but they set to work. After much shifting and adjusting of wings and tailpieces, the crate flew somewhat steadily.

Immediately they took off and flew away on one of the wildest barnstorming tours ever.

THERE were no dull moments in store for

the inhabitants of a town visited by the two air adventurers. They considered it their duty to make a spectacular entrance that would provide a few free thrills for the populace. And they were invariably successful in providing some thrills. Old gentlemen who had thought themselves crippled with rheumatism were wont to come galloping out of their homes when the Thomas Morse screamed down out of a clear sky and roared over the housetops, lopping off chimneys here and there.

Hisso Hal had now learned to fly and his favorite stunt was to roll his wheels on a town-hall roof. This trick was accomplished by flying toward the defenseless building at full speed and "touching" the plane's wheels on the sloping side of the roof. The usual result was a frightful-sounding crash that raised the townspeople's hair on end, sent shingles flying in all directions and bounced the plane high in the air, providing a great thrill for the two airmen.

It also made necessary frequent repairs on the landing gear.

Bill Bowler's favorite stunt was to go tearing down the main street, blowing away people's hats with his prop-wash. With this task completed he would power dive at the street until every person had been scared off it, then make a landing in front of the local post office. "Parking" the ship, he would stride nonchalantly into the P. O. and inquire for mail, just as though it were his usual custom to drop down out of the sky to get his letters. There was never any mail, but the stunt always attracted a crowd and tickets could be sold for joy hops from the nearest field.

One day, after pulling this stunt, Bill gunned the motor and swept down the street to a take-off. Fifteen feet off the pavement the motor began skipping. The plane politely but firmly declined to rise further.

Down the street they went at a terrific pace. The buildings on either side were a blur. And below, people swarmed into the street, making a landing impossible.

Bill swallowed deeply and pushed so hard on the throttle it broke from its moorings. The motor would not pick up. Bill was worried—and Hisso Hal was not exactly unworried.

What a situation! They could not lift the ship out of the street. They could not land. They could only wait for something to break.

Something did.

The street began to narrow. Bill Bowler observed

this in a flash and found time to think unpleasant thoughts about the street designers who had let this happen. Had they given no consideration to the possibility that the street might be used by aviators as a take-off runway?

Crash!

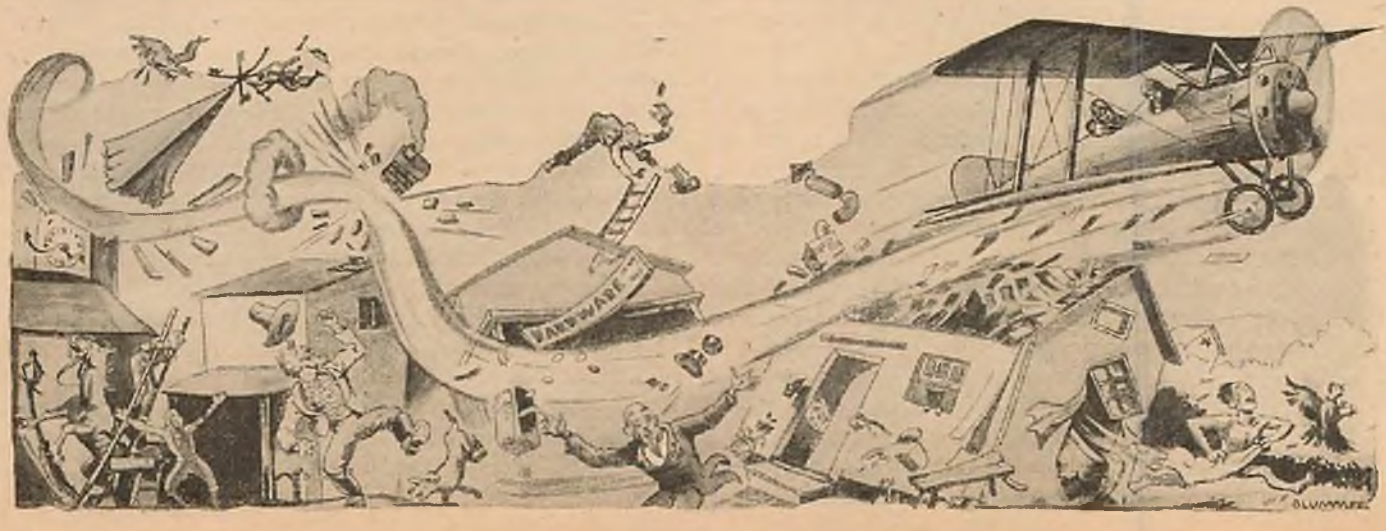
Both wing tips caught. The wings stripped from the plane as though yanked by giant hands. The fuselage dropped to the street and carried Hal and Bill through a store window.

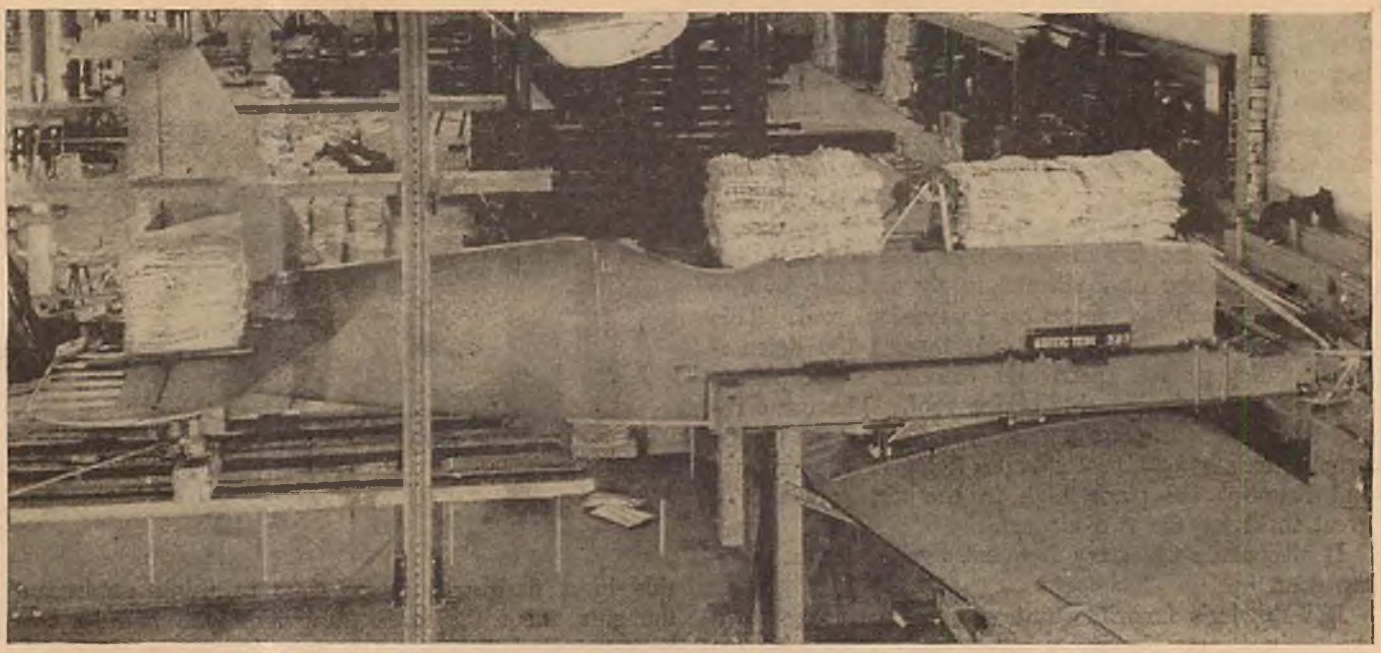
And for the next three weeks the population of that town was increased by two aviators who sat around and waited for new wings to arrive from the Thomas Morse factory.

BILL BOWLER, it must be related, believed himself to be something of a lady's man, and made it a point to get acquainted with every good-looking girl in every town visited. In one town he failed at this endeavor in the case of a certain girl.

This only spurred Bill on. After much thought, he decided to strike up an acquaintance in a quiet and unobtrusive manner by flying low past the girl's house with his motor thundering at full throttle. Hisso Hal decided to watch the show from the ground, so Bill started out alone.

Down out of the sky he came like a thunderbolt and roared past the front porch, so close he almost scraped paint from the porch posts. *(Turn to page 91)*





Air Corps static test of a fuselage to destruction by gradually adding lead weight.

How Strong?

IN the early days of the airplane, when Bleriot, the Wrights, Farman and Santos Dumont reigned supreme, aircraft construction was a more or less haphazard procedure. The principal requirement, regardless of other details which were considered of minor importance, was that the ship should fly. Airplanes were built "by guess and by God," or on the "cut and try" principle. Literally and figuratively, they were haywired and lashed together. Such terms as factor of safety, ceiling, payload and stress analysis were Greek to the constructors. Early pilots faced not only normal flying hazards, but those imposed by the engineers and mechanics, groping blindly through the haze of miscalculation, lacking in a great many cases a fundamental knowledge of aërodynamics or the principle of flight.

As soon as it was first established that a heavier-than-air unit would fly, engineers and mechanics sensed the possibility of sustained flight. Even with the assistance of the trained technical mind, many and weird were the contraptions presented to an awe-struck and doubtful public. However, this small group of pioneers, facing prejudice and skepticism on all sides, evolved a new and definite branch of engineering. It would be very interesting to discover the person who might be classified as the first "aëronautical" engineer.

Of necessity this phase of engineering developed rapidly. The World War added impetus to an already procreative science. Some of the developments were the result of painstaking application; others were pure accident.

As an illustration, we have in mind the discovery that the greater percentage of the lift was provided by the upper surface of the wing instead of the lower surface. A group of enthusiastic engineers was studying the action and reaction of a scale model suspended in a stream of air created by an electric fan. One of the group, endeavoring to get a head-on view of the model, crouched behind the fan. While studying the model, he inadvertently blew a puff of smoke into the air stream of the fan. The smoke carried around the model definitely established the fact that the contour of the airfoil created a vacuum on the upper surface of the wing. It was purely an accidental discovery.

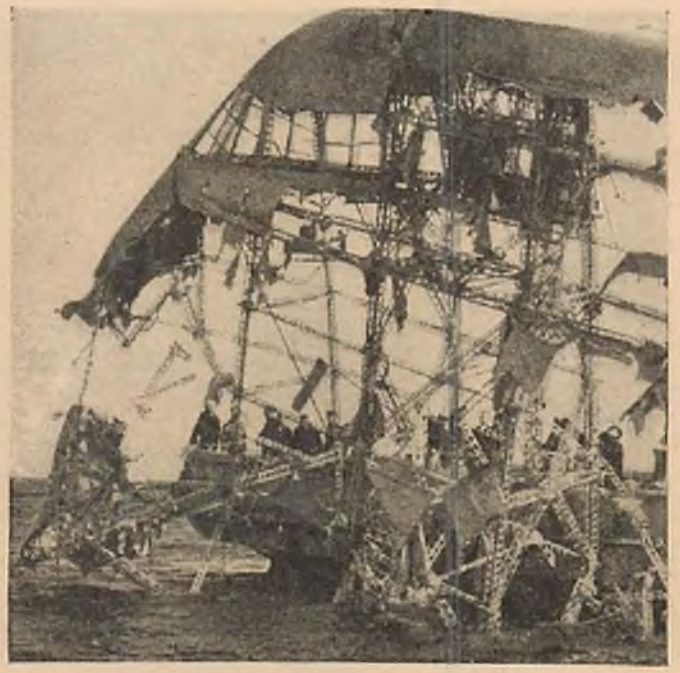
The electric fan was a forerunner of the wind tunnel; the wind tunnel opened up a new world to engineers and builders of aircraft. Soon vague reports of "factors of safety" and "stresses" were heard.

The first stress or load analysis was made on landing gears and structures. It was relatively simple to compute mathematically the stresses involved in landing a plane under known physical conditions such as definite weight and landing speed in a wind of known velocity. However, all landings were not made under ideal conditions. There were side winds, drift, down draft, variable air density and many other factors to be taken into consideration. As a consequence, stress analysis developed into a very involved and highly specialized branch of aëronautical engineering, requiring trained mathematicians.

Stress analysis of an airplane is merely the application of the principles of mechanics to the plane under various load conditions. Newton's first law is that "every body continues in a state of rest or uniform motion unless acted upon by external forces." The performance of an airplane depends upon many variables. Eliminating such features as design, materials and finish, it is mainly governed by the density and viscosity of the air through which it flies. The density and viscosity are in turn governed by temperature, barometric pressure and humidity, which vary considerably from day to day.

In order to facilitate analysis and to bring the variables under theoretical control, all calculations are based on an assumed air current, or, as it is known, "standard air." Standard air at sea level has the following characteristics: temperature 59 degrees F.; barometric pressure 29.92 inches; specific weight .07651 pounds per cubic foot.

That's the question that aeronautical engineers and mathematicians ask of their materials, of the air currents, of the many forces that act upon moving aircraft. The answer is the key to the vexing, all-important problem of stress analysis.

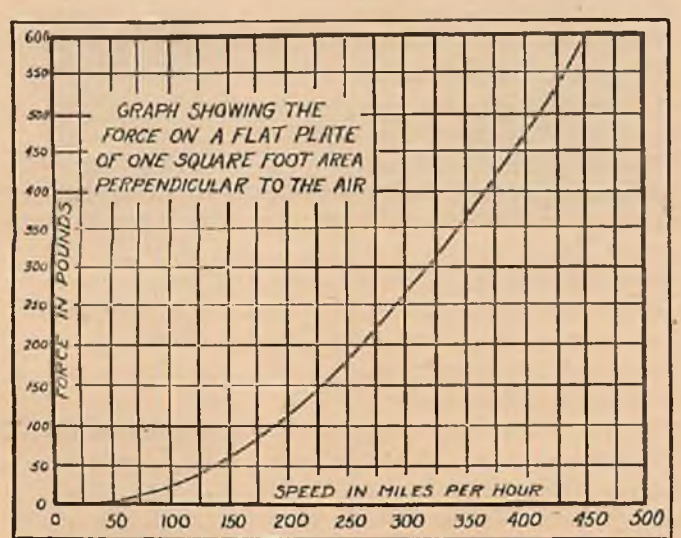


Wreckage of Navy dirigible "Akron" lifted from the sea shows the result of forces that defy calculation.

by Lt. Commander
George O. Noville

There are, however, other forces varying in direction and intensity that still make the analysis an involved problem. Some of these are air loads, weights, inertia forces and engine loads. Definite knowledge of these are necessary before it is possible to secure detailed calculations.

The Department of Commerce requirements for small and large commercial and private airplanes are very rigid. The department requires that a detailed and complete stress analysis be made by competent engineers and that two copies of the analysis and two copies of all drawings be submitted for check by department engineers. Materials for construction must be designated by the manufacturer. The question of materials is all-important, and places additional responsibility on the shoulders of the engineer. He must know all the physical characteristics of metals in various shapes and of the different woods. The properties of rivets, tie rods, and stranded wire cable figure in all his calculations. Where welding is necessary, he must know the probable strength of the weld.



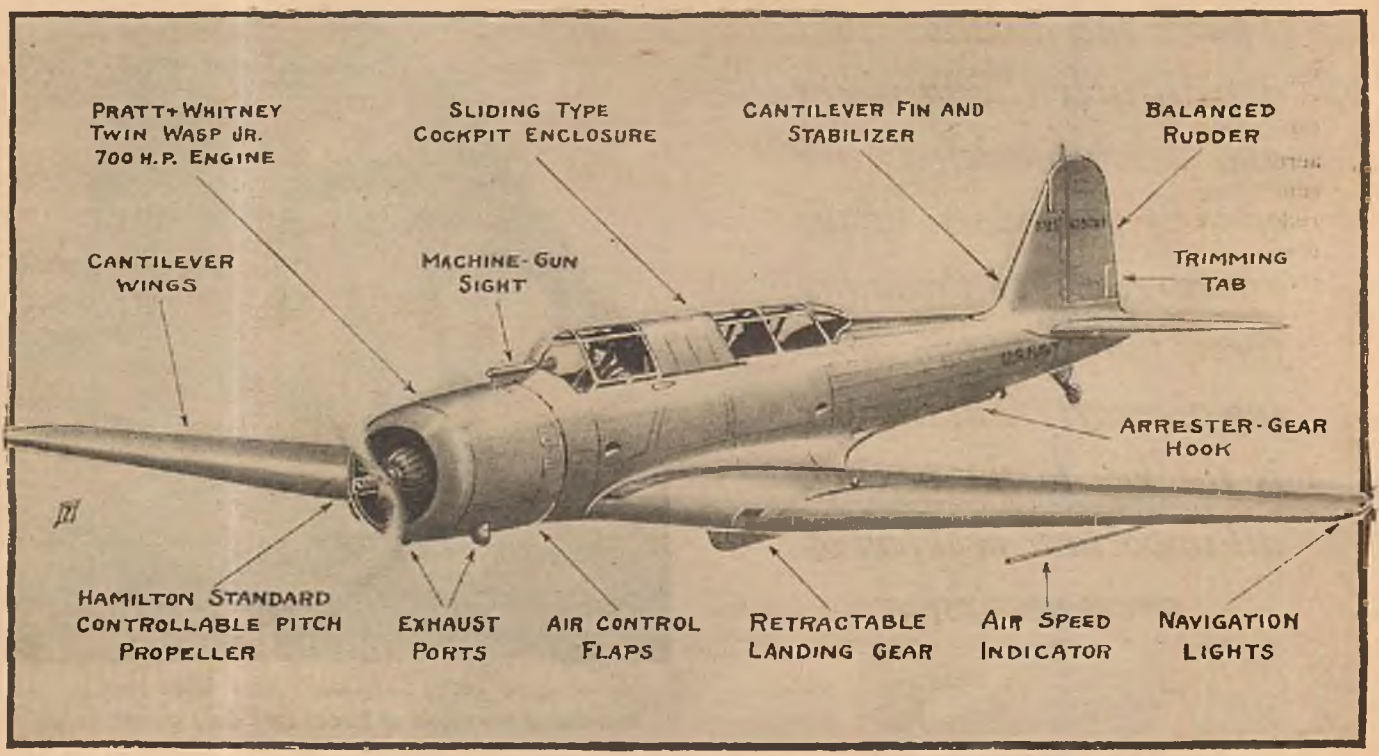
The foregoing applies to orthodox construction of orthodox craft, but what of the problems facing the engineer in the design and stress calculations on unorthodox equipment? What of the racing ships, capable of speeds in excess of 300 miles per hour? What of the tremendous structural and analytical difficulties encountered in the design and layout of the mammoth dirigibles?

We hear occasionally of bombers and attack planes, purely military in design, tearing off wings in dives and tearing motors out of their mounting rings, or dirigibles mysteriously collapsing in the air. Investigations subsequent to these crashes are practically valueless. Usually the condition of the wrecked structure precludes any possibility of being able to arrive at a definite conclusion. The stress calculations show an adequate factor of safety for the "assumed" condition. In that word, "assumed" we find part of the answer.

Nature has drawn a curtain across the skies and behind that curtain lie conditions that seem impossible of calculation.

How can we calculate the stresses in a structure traveling at a speed of 300 miles per hour through unstable and erratic air and meteorological conditions? How can we calculate the stresses involved when a dirigible gets caught in the jaws of two perpendicular columns of air, one ascending and one descending, when the force, density and weight of these columns is an unknown quantity? These are serious problems for the engineer.

The immediate answer seems to be an improvement in design and in materials. Some day, in the relatively near future, nature's curtain will no longer be a bugaboo. With the aid of improved design and construction materials of greater strength, we may be able not only to see behind the curtain, but to defy what we find there.



Low Wings for the Navy

About the new Vought XSB2U-1—the plane on the cover.

by Frank Tinsley

IT begins to look as if the aerial tars of Uncle Sam's navy have at last been converted to the cause of the monoplane. Not so long ago, an entering wedge was driven into the heretofore solidly "biplane" equipment of the flying fleet in the form of a sleek low-winged little Northrop fighter. Now there appears on the scene the beautifully streamlined "single-decker" shown on this month's cover; the XSB2U-1 scout-bomber.

And let me tell you something—when both the U. S. navy and the Vought Aircraft Company go "monoplane" at one and the same time, it's not only news, it's practically a double revolution! Especially when you stop to consider that from the date of his first governmental contract back in the spring of 1918, the late Chance Vought and the successor company that now bears his name had been steady and faithful adherents of the biplane form of construction.

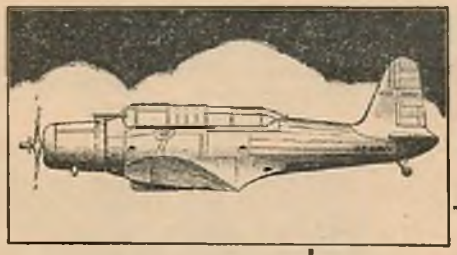
Linking the name of the well-known designer to that of the U. S. navy is no mere figure of speech, for it was Vought who in 1922 planned and built the first airplane to operate successfully from the deck of an aircraft carrier as well as the first plane to stand the strain of being launched from a warship's catapult. Following closely on the heels of these successes, he produced the O2U-1 and christened it the "Corsair." Little did he realize at the time that his new baby with the fancy name was destined to be the grand-daddy of one of the most famous lines of ships in the history of American aviation and the very backbone of our naval flying service. Vought Corsairs are doing the lion's share of all observation, scouting and light bombing duty with the fleet to-day and are credited with a record of over three million miles flown annually in the completion of such missions.

The ship pictured on the cover is the first single-wing production job turned out by the company. It is a low-wing, internally braced monoplane of exceptionally clean design, built around a 700 h.p. Pratt & Whitney Twin Wasp engine. This is a two-row, radial, air-cooled "ticker" geared to drive a Hamilton-Standard controllable-pitch propeller with two blades. The Twin Wasp is inclosed in an N. A. C. A. cowling of the latest type equipped with air-control flaps.

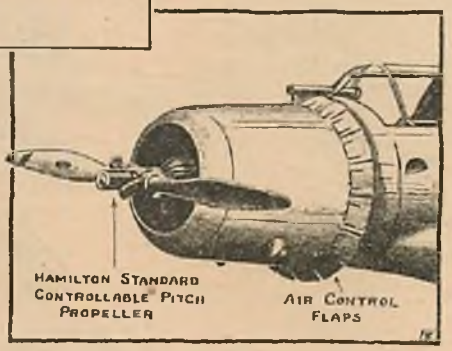
These flaps, recently developed by the technical staff of United Aircraft, are nothing more than a row of adjoining metal tabs hinged to the rear edge of the cowling. When closed, they cover the air passage between the rear of the cowling and the forward quarter of the fuselage. This action results in an increased top speed plus the maintenance of normal engine temperature when flying under sub-zero conditions. Opening the flaps permits a free circulation of air around the cylinders and enables the pilot to use full power on a climb without overheating the engine.

The fuselage of the new Vought is very similar in design to that of the SBU-1, a biplane model which preceded it. It is a metal structure covered with panels of

smooth dural plate as far back as the gunner's cockpit. The rear quarter is fabric covered, as are the aerodynamically balanced control surfaces. The rudder is provided with a trimming tab to compensate for engine torque.

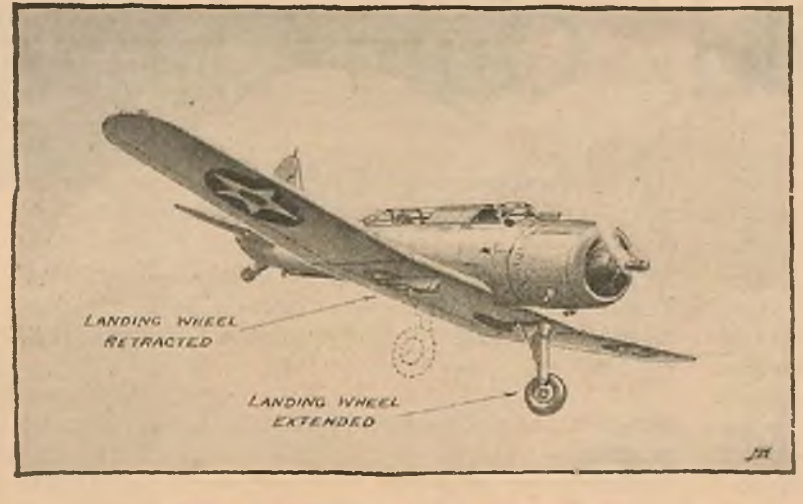


Side view, and nose close-up showing deep cowling and the cooling flaps devised by United Aircraft.



The twin cockpits are arranged in tandem and are completely inclosed by sliding, transparent hatches. The pilot's office is protected from the slipstream by a curved and streamlined windshield which has a machine-gun sight built into the base of its center member. The pit is equipped with the standard navy array of instruments and controls and is armed with a brace of fixed .30-caliber machine guns, synchronized to fire forward through the propeller arc. Under a metal center-section hatch, directly behind the pilot's seat, is a pyramidal structure of heavy steel tubing designed to protect the occupants of the plane against crushing in the event of a nose-over. Below it is placed a bomb bay provided with vertical racks in which the deadly cargo may be carried within the body of the plane. To the rear of this compartment is the after cockpit, also furnished with a full set of instruments and duplicate controls. The rear quarter of the inclosure folds forward under the hatch, which then slides forward to permit free play to the flexible .30-caliber machine gun with which the observer is armed.

The monoplane wing of the XSB2U-1 is a cantilever metal structure of tremendous strength, assembled in three sections. The center section consists of a faired-in wing root built integrally with the fuselage. Each stub contains a shallow, circular well into which the landing-wheels retract during flight. The spaces between these wells and the fuselage are fitted with twin fuel tanks. A pair of landing lights are recessed into the leading edge of the center section above the landing-gear housings. The outer wing panels are of similar construction, the leading edges being covered with a skin of smooth dural plate extending back as far as the forward spar. The rear surfaces of the wing are fabric-covered. Long, narrow ailerons of high aspect ratio are fitted along the entire trailing edge of the outer panels and the center section is equipped with an air-brake flap.



Here's how the landing gear operates.

In accordance with established navy policy, no technical or performance information relating to new aircraft may be released for publication until the ship in question has been in service for one year. The XSB2U-1 is of such recent design that quantity production of the monoplane has not yet begun, so you can readily understand why the actual performance data on the bus is still a deep military secret. There is, however, nothing to stop us from doing a little old-fashioned Yankee "cal-cu-latin'." Let's look first at the known figures on some other American fighting planes of similar design, size and power.

The army's Consolidated A-11 is a two-seater attack type powered with a chemically cooled Curtiss Conqueror engine developing 675 h.p. at 2,450 r.p.m. This ship, like the Vought, is a low-wing monoplane with retractable landing gear and inclosed cockpits. Both are equipped with flaps of approximately the same area. The Consolidated A-11 has a high speed of 227 m.p.h. cruises at 193 and lands (using flaps) at 67.5 m.p.h.

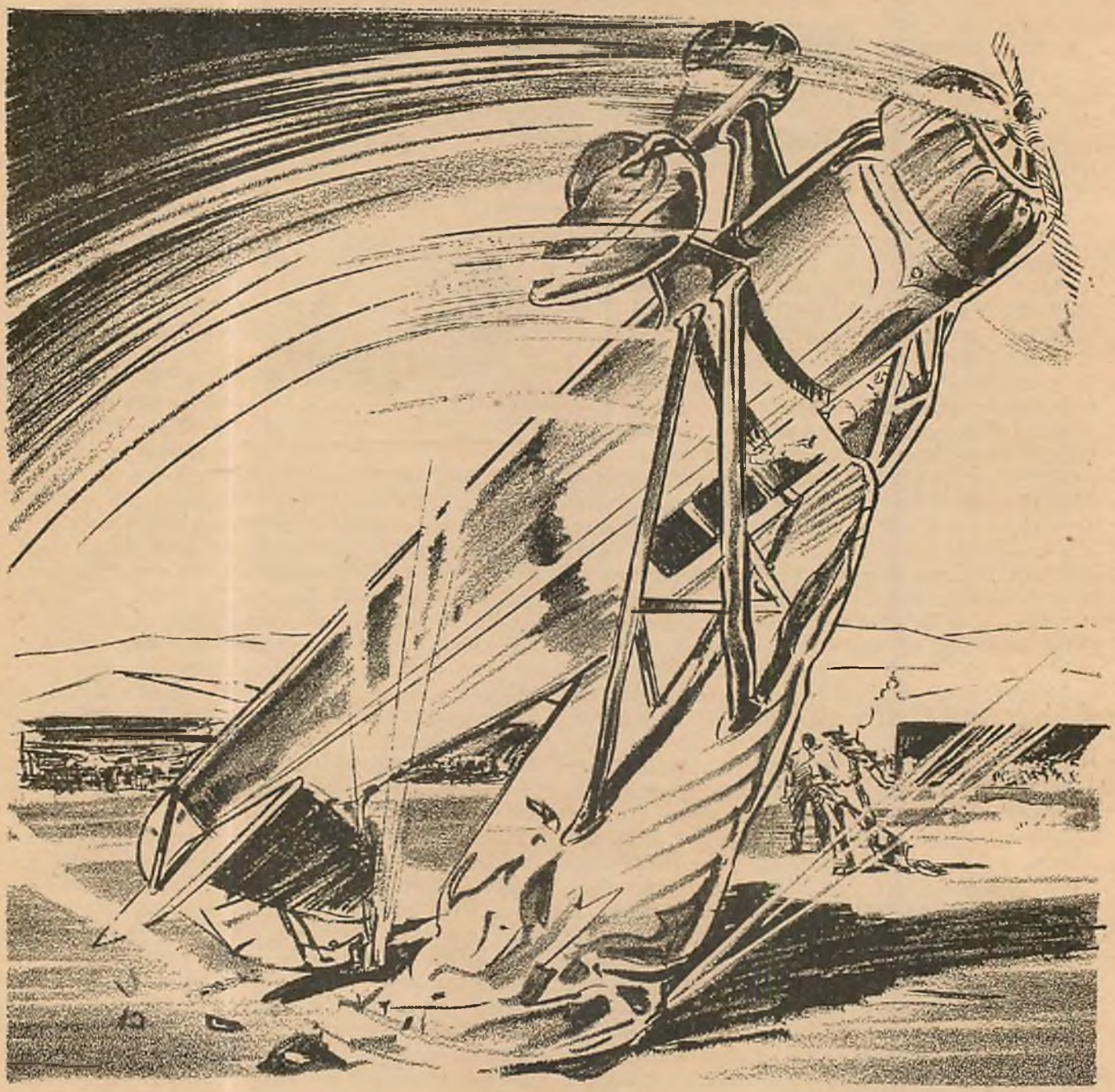
The Lockheed XP-9 resembles the Consolidated ship so closely that she could almost pass as a sister. The general design features of the two are practically identical. The Lockheed fighter, however, has 55 more horses under the hood and her performance figures improve correspondingly. Here they are: maximum speed, 243 m.p.h. at 6,000 feet; cruising and landing speeds not given. The Lockheed has about the same wing area as the Consolidated ship and is a thousand pounds lighter fully loaded, so her landing speed should be just that much lower and her cruising rate proportionately higher.

The Vultee outfit has recently brought out a new attack-bomber designated V-11, which closely approximates the Vought navy ship. The Vultee is an all-metal, low-wing monoplane powered with a Wright Cyclone air-cooled engine of 750 to 775 h.p. She also has fully retractable landing wheels, covered cockpits, and wing flaps. Her best performance (equipped as an attack ship) is as follows: high speed, 230 m.p.h. at 11,000 feet, cruising speed, up to 210 m.p.h., landing speed (using flaps), 65 m.p.h.

Let's arrange the figures on the foregoing planes in the form of a comparative table and see what we can deduce from them in regard to the probable performance of the Vought XSB2U-1.

Manufacturer	Type	Horse Power	Maximum Speed	Cruising Speed	Landing Speed
Consolidated	A-11	675	227 m.p.h.	193 m.p.h.	67.5
Lockheed	XP-9	730	243 m.p.h.	?	?
Vultee	V-11	775	230 m.p.h.	210 m.p.h.	65

Comparing this data, what are we to assume regarding the Vought? The A-11 has less power (25 horse) than the navy ship, the XP-9 has more (30 h.p.) and the V-11 exceeds the Vought by no less than 75 h.p. However, we find that the V-11 is almost *(Turn to page 92)*



Old Gum-Chew

by Morton J. O'Brien

"HOW ya gonna do it, Joe?" asked "Slugs" Martin.

"Make sure there's nobody outside listening, first," said Joe. He nodded over his shoulder. Slugs walked away softly and looked up and down outside, then into the offices and shops in the hangar. He returned with his face twisted in an ugly grin.

"O. K., Joe. Shoot," said Slugs, coming closer.

Joe leaned against the wing of his Stinson. With his forefinger he drew an imaginary line on the palm of his hand. "My ship's right next to Larry's on the deadline. When we land, I'll taxi close to him, and when I get near I'll open the throttle all the way and then I'll jump just before I crash into his ship. How's that? Good, eh?"

"Pretty good, Joe. Pretty good. But where do I come in on this?"

"You don't. You want him out of the way, don't you? You're paying for the job, ain't you? Well, you don't have to do a thing. Just leave it to me," said Joe. "I'll get him."

"HEY, Hank, c'mere!" yelled the starter from the deadline.

Hank came sauntering. He was dressed in slouchy dungarees, oil-stained shirt, and a grimy, battered old

A short-short story of the air races

hat. He looked completely disreputable, but he was a clever mechanic of long experience. In addition to his regular jobs, he hired out as general handy-man when the air races came annually to the field. But he never allowed anything to hurry him.

"What do ya want?" he asked, industriously chewing his huge wad of gum.

"Check the air in them tires. And hurry!"

Hank moved slowly down the row of planes that stood waiting, checking the "doughnuts" on all of them. Joe's took a little longer than the rest.

"All O. K.," announced Hank, coming back to the starter. Then he moved back a few paces to watch.

The starter raised his flag. Seven powerful motors roared, with throttles full open. Seven sleek, sparkling ships tugged at their chocks.

The flag dropped. Simultaneously, fourteen chocks were jerked from under fourteen wheels; seven ships hurtled across the field as one, each droning a challenge to the others as they took off.

The first pylon loomed. Larry sent his ship into a dizzying vertical bank. He swooped around the pylon with only inches to spare. Too close, maybe. Sweat began to ooze from his forehead and down under his goggles. He'd better watch himself. But he cast a sidelong glance at Joe's Stinson. It was dropping behind! Now to keep it there! He pushed his Waco with everything it had, streaking around the second pylon in a flash of gleaming white. Ah! Larry grinned. He had gained a whole length on Joe that time. He concentrated on pylon number three; whizzed past it, wings perpendicular, motor singing triumphantly. The field was his now; nobody else was in it! He'd shown 'em how to race! But no! Joe was still there, and gaining rapidly. He was only half a length behind. A quarter of a length! His nose caught up with Larry's tail, inched slowly, steadily forward. Larry broke into a fresh sweat. "Come on, baby, don't let him get away with that! Move!" There were only yards to go, and already Joe was ahead of him. He pushed on the throttle lever, although it could move no farther, and he beat on the cockpit coaming, trying to force his Waco ahead by sheer strength. As though suddenly aware of the situation, her drone somehow crept up to a higher-pitched wail. She leaped forward. Joe began to fall behind again. The checkered flag dropped! Larry grinned. "An inch is as good as a mile!" he exulted.

Hank

One by one they landed and drew up to the line; Larry next to last. He turned to watch the last ship before climbing out of his own. It was Joe who dropped swiftly in to a landing in center field. He sideslipped neatly and straightened out just before his wheels touched. They hit lightly and bounced a bit. They touched again. The ship settled.

Then everything happened at once. He ground-looped. The nose went over. The tail flew up. The ship landed on its back with a splintering crash, groaned, and settled in a cloud of dust.

The crash wagon darted out, siren howling. Joe was rocking on his feet and shaking his head dazedly when they got there.

Larry was the first to alight from the crash wagon. "Are you all right, Joe?" he asked anxiously.

"Yeah . . . yeah . . . I guess . . . so," he mumbled, feeling gingerly for broken bones.

The first-aid crew came up, Hank among them. They hurled questions at him: "How'd it happen, Joe? Are you hurt? What'd ya do——"

Larry raised his hand for silence. "Leave him alone, boys. Can't you see he's had a shock?" Then he spoke gently: "How'd it happen, Joe?"

"I don't know. I——"

"*I* c'n tell ya," interrupted Hank.

"*You* can?" asked Larry, raising his brows.

Hank spat in the dust. "Sure."

"Well, wise guy, how *did* it happen?" asked Larry, speaking in a sarcastic tone.

Undaunted, Hank stated casually: "He had a soft tire."

"How do you know?" asked Larry, staring.

"'Cause," responded Hank, "I softened it."

"*What?*" bellowed Larry. "Why, you crazy idiot! He might have been killed! What did you do that for?"

"Well, I'll tell ya," grinned Hank, shifting his gum. "Yesterday I hadda go up to the storeroom on the rafters o' hangar F for an aileron for my Aeronca. Well, I see this guy Slugs Martin an' Joe, here, actin' kinda funny. So I listens an' I hears them plottin' to crack into you on the deadline. So when I checks the air in the tires a while ago, I give one o' Joe's a slow leak. It's all right when he takes off, see?" He cast a mischievous glance at Larry. "Or am I goin' too fast for ya?"

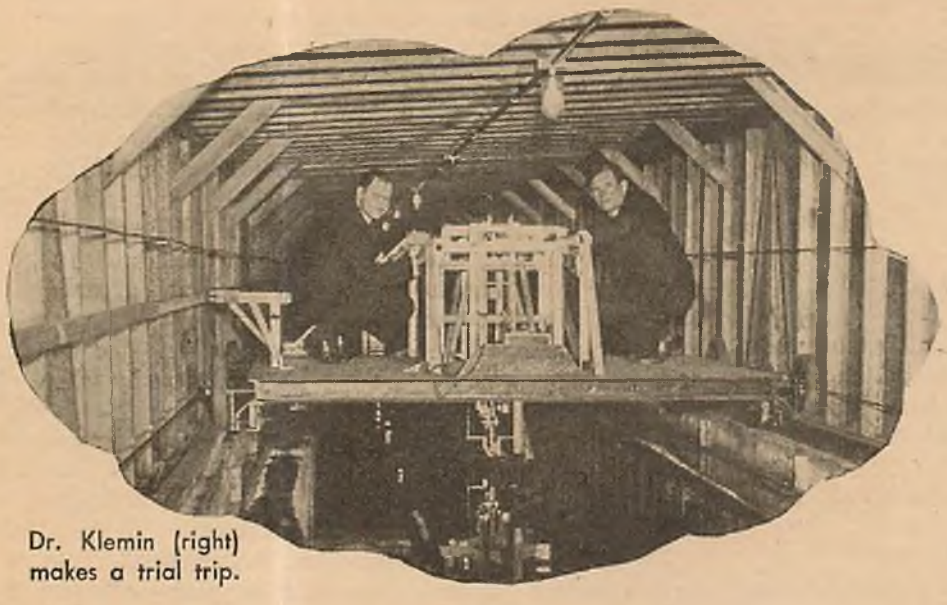
Larry grunted. "Go on."

"Well, while he's fightin' it out with you up there, it's gettin' softer an' softer, see. An' when he lands—bingo, ground loop!" Everybody turned accusing eyes toward Joe, but he had sneaked off, unnoticed.

Hank spat his gum out, drew a package from his pocket and stuck a new slice in his mouth. He grinned at Larry: "Have a stick o' gum?"

Larry grinned back as he accepted the gum. "Regular old 'gum-shoe,' ain't you?"

"Nope," answered Hank, grinning placidly. "'Gum-*chew*.'"



Dr. Klemin (right) makes a trial trip.

Testing Float Models

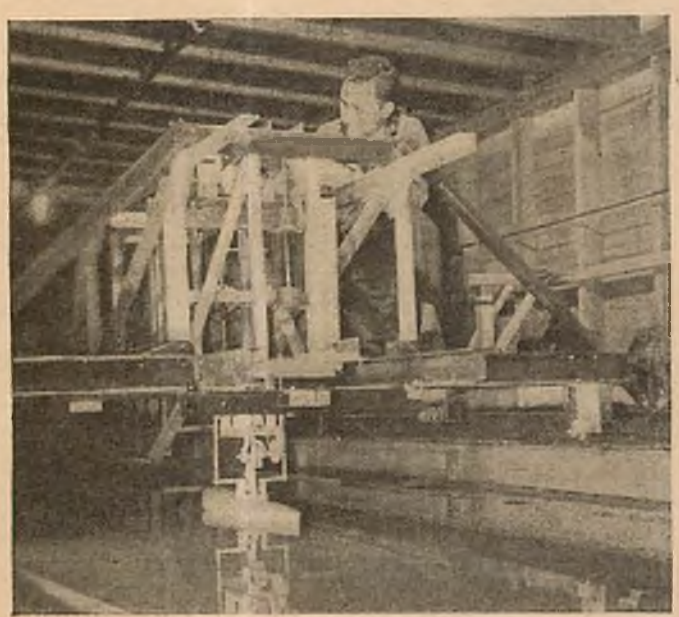
by Daniel Jordan

Photos courtesy of New York University.

THE Daniel Guggenheim School of Aeronautics at New York University has always been one of the foremost contributors to aviation development. The establishment of this school in 1922 with its wind tunnel and engine laboratory did much to put aviation on a scientific basis. Innumerable models have been tested in the wind tunnel. Many famous planes can trace their origin to models which were first tested at New York University.

It's only natural then that this school should be the first university to undertake the testing of seaplane float models and flying-boat hulls. For highest efficiency in take-off and landing, floats must be scientifically designed. The new towing basin just opened at New York University is to be used to study float designs with the object of increasing seaplane performance.

Work on the towing basin began in 1933, when plans were drawn up and approved. The site selected was on the University Heights campus of the university, where the aeronautical school is located. Actual work was begun in the spring of 1934 under the supervision of Dr. Alexander Klemin, director of the Guggenheim School of Aeronautics, and Assistant Professor Frederick K. Teichmann of the faculty. The tank is the second in the country designed for aeronautical work; it was preceded by the government's great 2,020-foot basin operated by the N.A.C.A. at Langley Field.



Ready for a ride that will yield accurate data.

The towing basin resembles a long, narrow swimming pool. It is 150 feet long, 8 feet wide and 4 feet deep. Some 36,000 gallons of water are required to fill the basin. Model floats as large as 2 feet wide and 12 feet long can be tested.

The float is mounted at the bottom of a carriage which moves back and forth along the basin. The carriage is pulled by cables which are geared to electric motors located in one end of the building. It is large enough to permit several observers to ride on it and watch the action of the model as it moves through the water.

In addition to watching the test, the observer has the benefit of automatic instruments which record the resistance of the model, the amount the model rises out of water during the run, the angle which the float assumes, and the carriage's acceleration and speed.

The difficulties of building and operating such a towing basin are not at first apparent, but the problems to be solved were many. One particularly annoying feature was the waves which were stirred up in the tank by models moving at high speed. These waves must be damped entirely before the next test run can be made, or the accuracy of the test will suffer.

Careful experiments in wave damping finally resulted in copper-wire screening being attached to the sides of the tank just below the surface of the water. This screen is about 9 inches wide, yet its damping action is so positive that the waves set up by towing large models will disappear completely in about 10 seconds. The cleverness of this method will be appreciated if you consider how long the waves and ripples on the surface of a swimming pool continue to move after the water has been disturbed.

Another problem to be solved was the acceleration and the stopping of the carriage. Since the tunnel is only 150 feet long, the carriage must be started from rest and accelerated rapidly. By gearing up electric motors, the movement of the carriage was speeded so

it reaches a maximum velocity in 30 feet. For the next 90 feet the carriage runs at constant speed. In the remaining distance of 30 feet it is brought to rest. Tests can be conducted at any speed from a fraction of a mile up to 20 miles per hour.

The towing basin is located in a narrow building with a low ceiling, and it's thrilling to see the heavy carriage start from a standstill and race along at a 20-mile-an-hour clip. The natural sensation is fearing the carriage will not stop when it approaches the end of the tank. But the braking mechanism is just as effective as the starting device, and the carriage pulls up to a sudden halt just as it reaches the end.

All quiet along the test basin.

It's important to keep a record of the velocity of the model throughout the entire test. An electric timing system does this accurately and simply. Metal plates are attached to the walls at intervals of several feet. When the carriage passes by a plate, an electric circuit is closed and a jumping spark makes a mark on a moving strip of paper which is part of the recording devices on the carriage. This strip is run at a constant rate of speed by a small motor. On the strip are noted quarter-of-a-second time units. The actual velocity of the float is determined by the distance along the strip between the marks made by the timer. If the marks are bunched together, it indicates the carriage traveled the tunnel's length in several seconds at a high speed.

On the same band of paper is recorded the resistance which the water offers to the forward progress of the float under test. From this record of the model's resistance, the actual force necessary to push a full-size float through the water can be calculated. This is important to know because it will determine whether the seaplane will be able to take off with a full load, and just how long a run will be needed to develop take-off speed.

But the water resistance of the float is not the only important factor. A float may slip through the water without much disturbance, but might still be unsuited for use. Floats of improper design perform the troublesome maneuver known as "porpoising." That is, they skim along the surface until they reach a fairly high speed and then, in porpoise fashion, they dive back into the water. This maneuver is particularly annoying since it usually occurs at just slightly below the speed when the airplane is ready to take off. Thus, when a float porpoises, the airplane's speed is slowed down to such an extent that a take-off is impossible, and the pilot must start his run all over again.

If the model float which is being tested tends to porpoise, the action is easily detected. The tendency of the float to dig into the water is measured by a system of balanced weights. A continuous record is made so that the experimenter can readily determine at what speed and to what extent the full-size float will porpoise.

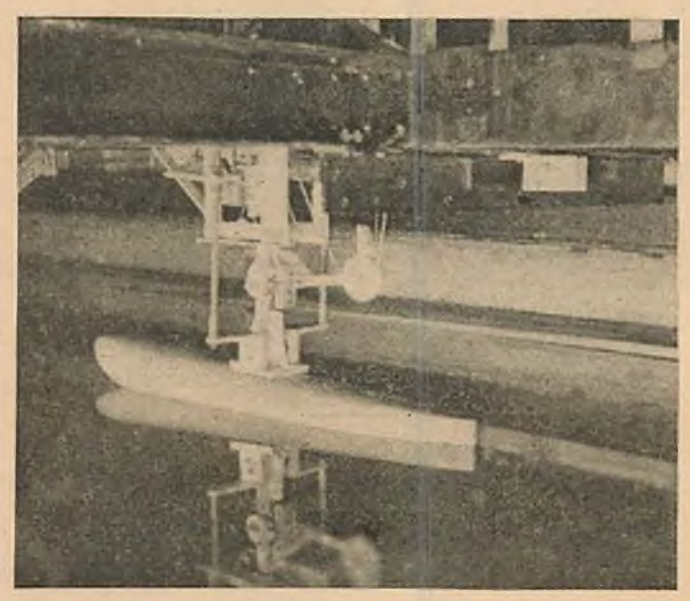
In addition to the automatically recorded characteristics of the float, the observer can watch the spray and the wake stirred up in the tank. A model float design which moves through the water without leaving much wake is almost certain to have very little water resistance. The spray set up by the moving float is also important. If the sidewise or rearward spray is excessive, it will damage the airplane structure and in addition will be disturbing to the pilot and passengers.

Since the designer of floats and flying boats is faced with a variety of difficult problems, experimentation with large-size floats of new design would be both costly and dangerous. The towing basin supplies the useful link between the drawing board and the finished product. A small solid-wood float can be built and tested in a short time and with little expense. Changes in design can be tested within a few minutes by merely changing the shape of the model.

The size of the model is governed by the size of the large float and the speed at which the test is conducted. In general, if tests are run at 20 miles per hour, the model float should be about 1/9 the size of the actual float. The readings taken during such a test would correspond to an actual take-off velocity of 60 miles per hour. By varying size and speed, floats of all dimensions may be tried out.

The towing basin is not restricted to use of model floats. Models of ships, yachts, etc., can be tested and the results used in the design of the full-sized vessel. This was the original use of test basins, dating far back before airplanes and flying water craft began to be considered within the realm of possibility.

New York University's towing basin is intended to serve the aeronautical industry in developing new airplanes. With the seaplane assuming increasing importance, much valuable work will be done in this basin. New designs can be tested in the wind tunnel for airworthiness and then tested in the basin for seaworthiness, thus making even more thorough the valuable work the Guggenheim School has long been giving to the airplane industry.



The complicated mechanism records every move.

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: What would be the order in which the six most important nations would be listed according to all-around air strength? J. R., Ashland, Ky.; similar questions also from G. B. J., Jr., Jefferson City, Mo., and others.

Answer: Judging the air strength of the nations these days can be hardly more than a guessing game for anybody except a few military experts in each country. For other interested people, the governments' secrecy makes any sort of accurate estimate impossible.

Air strength means more than just the quantity of service planes in action. It means also the number of reserve craft on hand, the number that can be manufactured in a hurry, the number of available pilots, mechanics, and other personnel and their relative skill, the number and safe location of airports, and other factors. Trying to strike a balance among these varying factors in order to fix a definite strength rating is a tough job, especially when each factor has to be weighed against the corresponding factors in neighboring nations' forces.

The airplane factor alone is difficult enough. You have to compare speeds, range, ceiling, armament and number of each type. Fifty modern fighters might be a match for a hundred obsolete enemy craft.

The best we can do is to quote available information and estimates on quantities of first-line machines—those in actual use—and on total planes on hand.

Russia has been credited by the New York *Times* writer with the largest number of first-line planes, somewhere around 2,500; France next with about 1,700; Britain, 1,200; Italy, 1,100; United States, 1,000; Germany, 700; Japan, 600.

First-line planes plus reserves of all degrees of obsolescence are totalled by the current *Aircraft Year Book* for the beginning of this year as follows: British Empire, 3,600; France, 3,400; Russia, 3,300; Italy, 2,800; United States, 1,900; Japan, 1,800; Germany 1,600.

These figures are merely estimates, remember. Few people know the true figures, and they won't tell.

Question: What does "Immelmann" mean? L. R. D., St. Mary's, Ontario; S. H., Jr., North Bedford, Mass.

Answer: This question has been answered here before, but I guess it's time it was cleared up again. An Immelmann is a flying maneuver named after its supposed inventor, a German war-time lieutenant. It consists of a half loop and half roll: climbing up and back until the plane is inverted, then turning it right side up, resulting in level flight in opposite direction from the start at slightly greater altitude.

Question: Which propeller makes a plane go faster —a wooden or a steel propeller? S. K., New York City.

Answer: Neither; the material, in itself, has nothing to do with speed. The shape of the prop and its rate and power of rotation are what determine speed capacity. Steel propellers are stronger and are therefore mostly used to-day on the faster planes.

Question: What is the factory name and address of the company that built Benny Howard's Mr. Mulligan, *and what is the factory price? J. J. B., Melville, Saskatchewan.*

Answer: Benny Howard and his friend Gordon Israel built *Mr. Mulligan* themselves; I don't think replicas of this record racer are for sale. As announced last month, however, Howard has started production on a commercial version known as the DGA8, powered with a 320 h.p. Wright; the price is $11,925 with complete instruments and radio, and the firm name, I believe, is Howard Aircraft Company, of Chicago, Ill.

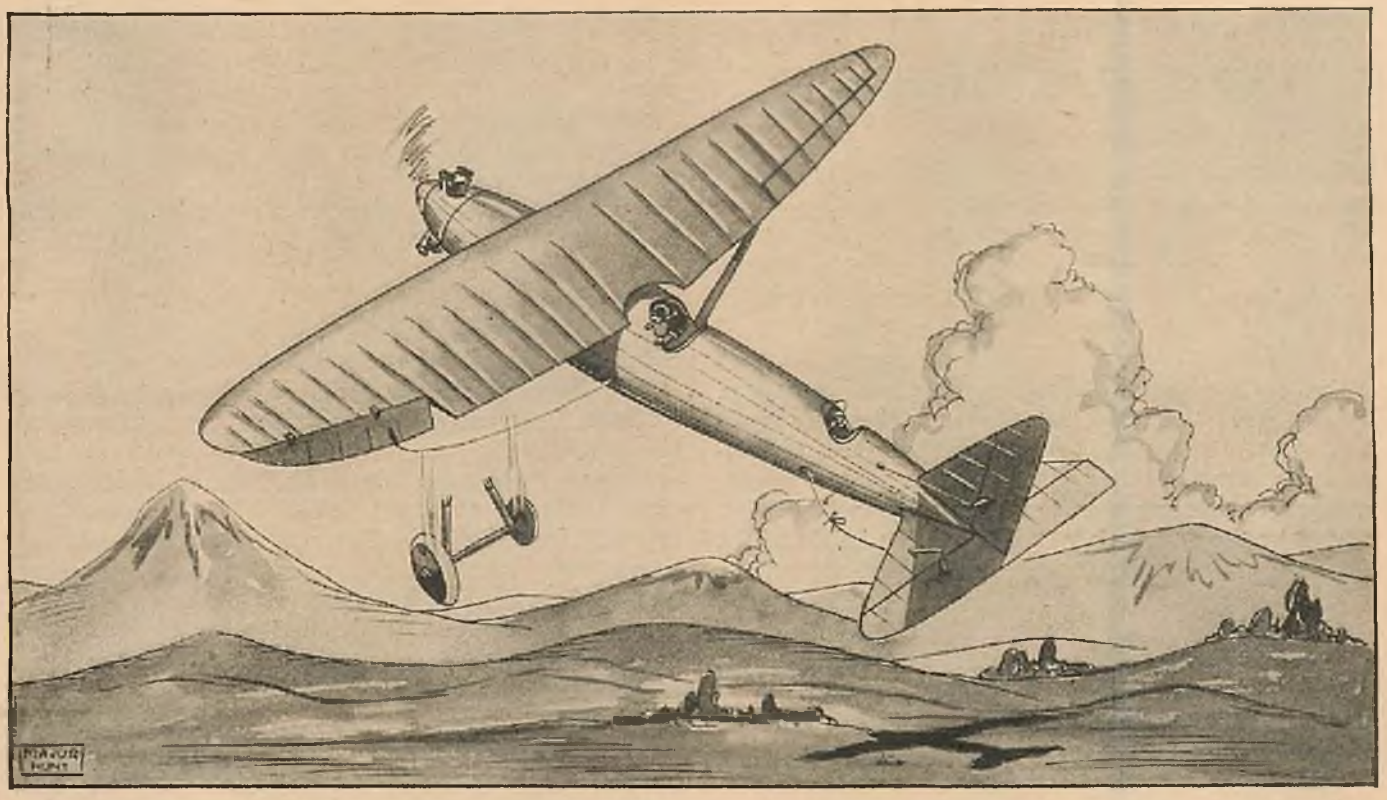
Question: Are two years of night college considered the same as two years of regular day college when applying for the army air corps? R. F., New York City.

Answer: The air corps' requirements state that an applicant must present a certified document from the registrar of a *recognized* college or university showing that he has completed satisfactorily one-half or more of the credits leading to a degree normally requiring four years' work, or must pass an examination which is the equivalent thereof. Whether the night college you have in mind is sufficient will probably depend on the air corps' interpretation of the word "recognized."

Maybe they'll be inclined to be lenient, for the army reports that air corps applications have fallen off lately, and that in the class starting March 1st, for instance, there were only 60 qualified men for a normal class of 150, leaving 90 openings.

It sounds as if now is a good time to apply. The army is definitely seeking fliers.

GULLIBLE'S TRAVELS—Major Hunt



AFTER the exciting take-off I told you about last month, I needed some relaxation to calm my nerves, so I settled down to lunch. As the single cockpit of my great biplane was completely outfitted for cooking, it was easy to prepare any food desired.

Below me the flat plains of New Hampshire, with her many trout streams, gave me an idea. Hastily rigging my fishing rod, I shouldered my creel and began trolling the nearest ones. Zigzagging back and forth just above the water, I managed to catch several nice trout. In fact, one was so big that, mistaking me possibly for some large insect, he leaped at me as I roared over, smacking his head against my landing gear.

I thought nothing of it at the time and continued my trolling, inventing some special new maneuvers. One in particular in which I pulled the stick hard back and then threw it over the side produced a snappy barrel roll, giving a lifelike action to the lure. Sort of a new "barrel troll," you might say.

Having caught my limit, I returned to a safe altitude of 50,000 feet to prepare my meal. Just as I had lighted the fire and put on the frying pan, I heard an ominous crack from beneath the fuselage! Glancing over the side, I saw the landing gear falling away, evidently loosened by the blow from the trout's head!

"Goodness me!" I cried, although not given to profanity, as I thought of making a landing without the wheels. Aha, a plan! I threw the stick to the right, putting the plane into a steep left bank, and dived after the falling wheels, unreeling my trolling outfit as I went. After about forty-five minutes I overtook it, and with a few deft casts put the hooks of the trout fly securely into one of the hard rubber tires.

I must say the landing gear put up a game but losing fight. Finally, after a last feeble flip of its spreader bar, I netted it and pulled it into the cockpit. Fitting new bolts and nuts to the ends of the struts was a matter of a few minutes, and then, holding the ship steady with one hand, I leaned over the side of the square fuselage and cemented the landing gear back into position.

I was now able to cook my meal and eat it with a feeling of security against having to land without landing gear, something that I was forced to do later on, but that is another story.

Prizes for Mistakes!

1—Each month Bill Barnes-AIR TRAILS will print one picture and story to test your knowledge of aviation conditions and aerodynamics.

2—PRIZES will be awarded for the eleven entries listing the highest number of errors and contradictions in the picture and the story of Gullible's Travels. The First Prize will be $5.00. There will be 5 prizes of $2.00 each; and 5 of $1.00 each. In the case of ties, duplicate prizes will be awarded.

3—List the errors you find in the picture. Then list the errors of fact contained in the story. Then check the story and picture for contradictions. A contradiction and an error on the same item may be counted separately.

4—This puzzle will serve as a game. It will be fun, but at the same time it will test the knowledge you have gained by reading Bill Barnes-AIR TRAILS.

5—All entries must be neatly written (or typed) on one side of the paper only, listing only one error on each line. Number your errors in the left-hand margin 1, 2, 3, etc.

6—Address your answer to the:
August Contest Editor
Bill Barnes-AIR TRAILS
79 Seventh Avenue, New York, N. Y.

7—The Editors will be the judges and their judgment will be final.

8—No entries will be returned.

9—All entries must be postmarked not later than midnight, August 15, 1936.

10—Prize checks will be mailed not later than September 15, 1936.

11—Every one is eligible to compete except employees of Street & Smith Publications, Inc., and their families.

Wash-Out

by Frank J. Davidson

THE plane was going to crash!

Bart Mason, standing in the doorway of his *oficina,* knew that as he watched the pilot sideslip in for a landing. Only a fool would attempt to land on that remote nitrate deposit in northern Chile.

For hundreds of miles around lay the great Talapaca Desert, a monstrous desolation of trackless wastes. Nothing lived out there, no insects, reptiles or vegetation, save for occasional spots of yellowish lichen, clinging to the decaying bones of some long-dead pack animal.

A cry of warning rose to Mason's lips as the pilot, blinded by the desert glare, misjudged the height of the *cliche* dumps, piles of nitrate ore clustered around the mouth of the *cata,* or shaft.

A wing tip sheared into a *cliche* pile. The plane slued around violently, nosed over, and crashed to a turtle landing in swirling clouds of nitrate dust.

Mason, followed by an excited group of *trabajores,* ran forward to the grounded plane. The body of the Chilean pilot had been thrown clear. He lay in a queer, twisted heap.

Moving with grim haste, Mason reached up into the cockpit and cut the switch. Willing hands disentangled the dangling figure in the forward cockpit and eased the passenger to the ground. Goggles and helmet removed, a twisted smile showed white teeth in a dust-covered face. He spoke sardonically:

"I'm glad to see you haven't forgotten how to cut a switch, Mr. Bart Mason."

Mason stared hard at the man's grimy face, faint recognition stirring within him. His body tensed, as if to withstand a shock. No one in this part of the world knew him as Bart Mason. To his natives, and the English company which had granted him this small concession, he was known simply as "Señor Jones."

By no possibility could any one know he had once been a crack transport pilot in the States. He said coldly:

"My name is Jones, mister. Who are you? Didn't your pilot have sense enough to know he couldn't land here?"

The injured man managed a whimsical smile.

"Yes, but I persuaded him to try it. I have urgent business with you. I'm Special Agent Harris of the U. S. Department of Justice. Remember? I've come to arrest you for air-mail robbery and—murder."

He made a weak, ineffectual movement toward a shoulder holster. His hand went limp and he sagged into unconsciousness.

HOURS later, Mason sat at a rough wooden table in his quarters and gazed steadily at the unconscious man in his bunk. Harris, he knew, was dying of a brain concussion. The Chilean authorities, probably acting on a special request from Washington, had assisted Harris to ferret out the man he had been assigned to bring in.

An examination of the plane had convinced Mason that it could be repaired. The pilot was dead of a broken neck. Nothing prevented Mason from patching up the plane and taking off to some distant seaport. Nothing, save the fact that Harris would surely die if left behind without proper medical attention.

Why should he worry about Harris? The F.B.I. man was bent upon hanging him. His only chance to escape this nemesis was to pull out as soon as possible. With Harris dead, he would be comparatively safe. At least, long enough to establish himself in another hide-out.

Even as he argued thus with himself, he knew he could not leave the man behind. No help could be expected from Slavonia, thirty miles to the north, for several days, when the nitrate train was due. Packing him by mule across the desert was unthinkable.

Out of hours of torturing indecision had come finally the resolve to fly Harris to Iquique, one hundred and fifty miles to the northwest. After that he would take his chances of escape.

He rose purposefully and strode out to see how the work of repairing the plane was progressing. His men had righted the ship and wheeled it to a small compound beyond the *cliche* dumps. Under his direction, the metal prop had been straightened and comparatively trued up in the forge shed.

Strips of canvas and lengths of baling wire had been used to repair wings and fuselage. The motor cleaned of clogging dust and sand, it stood now as ready for flight as their limited resources and unskilled labor could make it.

Mason eyed the battered plane critically, and breathed a fervent prayer that it would hold together as far as Iquique.

He turned at the touch of a hand on his arm. Enrique, his native foreman, stood at his elbow, looking deferentially up into his face. Mason asked:

"Qué es? What is it?"

The man pointed silently toward the south. Frowning, Mason narrowed his eyes against the constant, blinding glare of the desert. For a moment he saw nothing save an immense emptiness of arid earth and hard, blue sky.

Then, far to the south, he made out a dark mass of cloud, moving slowly above the far horizon. He turned a grim, bronzed face to his foreman.

A wash-out in the nitrate desert meant death. Yet a wash-out was the way an airman should die, if there wasn't much left to live for.

"Electric storm, Enriq'. We've got to take off before it gets here. *Cuanto tiempo?* How much time, do you think?"

The man shrugged thin shoulders.

"*Un o tres.* One, mebbe t'ree hour. *Quién sabe?*"

Mason moved with swift decision; barked orders in staccato Spanish. Chocking the wheels with gunny sacks of nitrate, he turned the prop a few times to prime the motor. Then, adjusting switch and throttle, he set himself to start the motor.

After long minutes of discouraging effort, the motor coughed and roared into life. He left it idling and strode toward his bunk house.

As he stepped through the door he encountered the quizzical gaze of Harris, lying in the bunk. The man spoke with weak sarcasm:

"You're not, by any chance, an aviator, are you—'Señor Jones'?"

Mason's firm mouth set in hard lines.

"I can fly, if that's what you mean."

"Running away again, eh? What's the use, Mason? Why go on being hounded by the law? Why endure the constant dread of capture? You can't get away with it. Sooner or later——"

Mason cut him off:

"Shut up; you're delirious. I'm not running away from anything. I'm taking you to Iquique. And my name is not Mason."

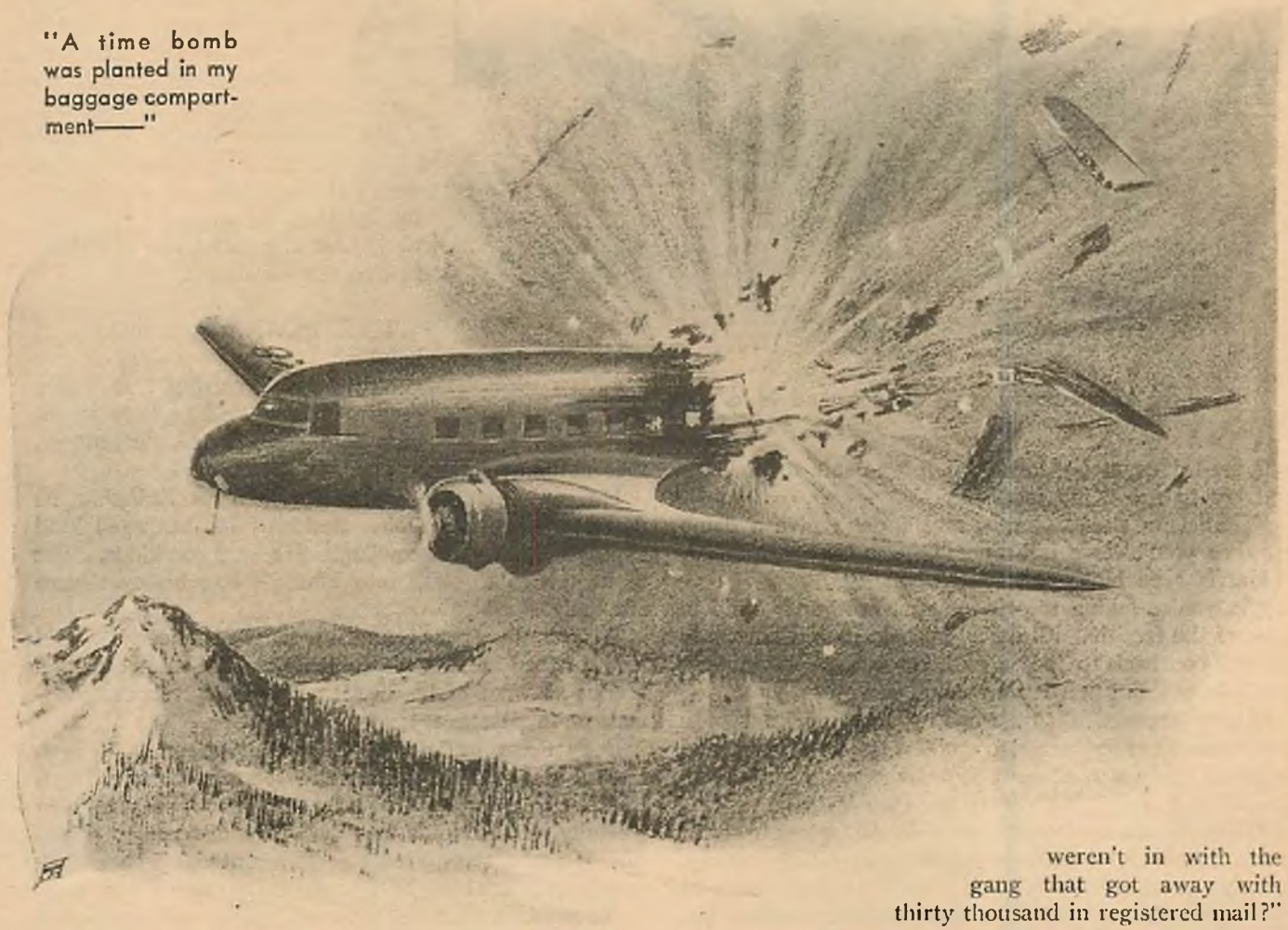
Harris studied that grim, bronzed face for several seconds.

"It's no use, old man. I know you are Mason. I've got your picture in my pocket. You gave yourself away when you admitted you could fly."

Mason paused in the act of gathering up his most prized possessions. He gazed across at Harris out of smoldering eyes. He seemed to arrive at a sudden decision.

"I suppose there's no use denying my identity. I am Bart Mason, yes. And I have lived in constant dread of arrest. But I swear I had nothing to do with that crime. I'm not going to be arrested for something I didn't do."

"Are you trying to tell me you didn't crack up that mail transport, killing your only passenger? You weren't in with the gang that got away with thirty thousand in registered mail?"



"A time bomb was planted in my baggage compartment——"

"I crashed, yes. But on purpose. A time bomb was planted in my baggage compartment. It blew my tail off. I tried to pull my passenger's ripcord and throw him out of the plane. He was scared stiff. He fought like the devil, socked me on the chin and pushed me off the ship.

"I 'chuted down into those Allegheny Mountains. My passenger crashed with the plane. When I came to I wandered around in a daze until some mountaineers picked me up. When I was able to leave the mountains and get my hands on a newspaper, I found myself charged with robbery and murder.

"Somebody timed the whole thing. The mail was removed from the plane after the crash. Somebody planted faked evidence in my locker at the base. I was the goat. After you'd chased me all over the country, I sneaked down here and bought into this concession.

The plane nosed over and crashed to a turtle landing.

I figured I could lay low until it was safe to go back and try to prove my innocence.

"That's my story, Harris, and I don't give a damn whether you believe it or not!"

Harris eyed him thoughtfully.

"So you're taking me to Iquique, are you? And in spite of the fact that I'll have you held until I am ready to take you back to face a murder charge. Why don't you just pull out and leave me? I can't stop you."

Mason growled. "Because I'm not that kind of a heel," and swung away to gather up pack, gun and canteen. A spasm of pain wiped the faint smile from Harris' dry lips. He closed his eyes wearily.

When Mason returned from a final inspection of the plane, Harris lay quietly in a torpor, breathing heavily. Concern creased Mason's brow as he looked down at the flushed face of the injured man. He couldn't last much longer.

Enrique appeared suddenly at the door, hat in hand. His thin, dark face betrayed excitement.

"Señor Jones! The storm! It comes, *aprisa!*"

Grim-faced, Mason gathered up the limp form of Harris in his arms and plodded through sifting sand to the idling plane. As he strapped him in, Harris' head rolled loosely on his shoulders. In his delirium, his lips mouthed incoherent phrases.

Mason climbed into the rear cockpit and signaled for a take-off. Previously instructed, his men swung the nose around into the rising wind from the south. In that direction the sky was like a monstrous blue-black bruise, shot with streaks of red and yellow, and rent with wicked tongues of lightning.

With a final wave, he opened the throttle. The ship moved sluggishly, gathering speed too slowly. He lifted it from the ground sooner than he would have liked. A *cliche* pile loomed up suddenly before his whirling prop.

He banked sharply. A wing tip grazed the ore dump with only inches to spare. The ship went into a near stall. He leveled off hair-raisingly close to a sand dune. But once in the air, the plane picked up speed quickly. He relaxed in his seat, sweat oozing from every pore.

He banked slowly to the north, climbing to two thousand feet. He would have to fly by dead reckoning. There had not been time to plot a course. He could fly northwest, directly across the open desert, or he could follow the narrow-gauge railway by way of Slavonia.

He decided on the former course as the shortest of the two, if all went well. If not—well, he was thankful for that big canteen. Without water, nothing could live out there in that terrible desert.

THE PLANE was difficult to handle. They had not done a very good job of repairing. It would require all his skill to keep it out of a spin. He hoped, desperately, that nothing would happen to the motor.

He could not see Harris. The man had slumped down low in the cockpit. Suddenly his bandaged head appeared above the cowling. He was conscious. But as he turned to stare into Mason's face his eyes were strangely bright.

His mouth opened and he laughed queerly. Cold fear clutched at Mason's chest as realization struck him. Harris was out of his head! He had a delirious madman for a passenger!

Body tense, he tried to divide his attention between Harris and the ship's controls. Harris raised a large, round object above his head and shook it, laughing gleefully into Mason's taut face. Sudden panic gripped Mason as he recognized it. The canteen! Their only supply of water!

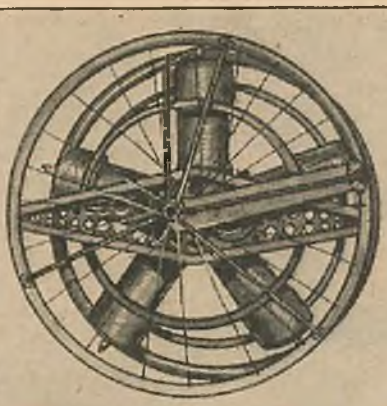
He yelled a furious command, but his voice was lost in the slip stream. Even if Harris could have heard him he would not have obeyed. With a groan, Mason saw the canteen go hurtling down to the desert below.

He swore fierce oaths and tried to reach Harris across the cowling. The plane wabbled dangerously. In the nick of time he pulled it out of a near spin. He sat back in helpless rage and watched the demented man throw out every movable object.

Over went his pack with all his worldly possessions. A spare can of gasoline followed. Then the container of food. He thanked his foresight in making sure the forward controls were disconnected. Harris, in his mad frenzy, could not interfere with the actual operation of the plane. He was securely strapped in. But if anything should happen to the motor now they were lost.

Below them stretched the great Talapaca Desert, where rain had not fallen for a century. *(Turn to page 90)*

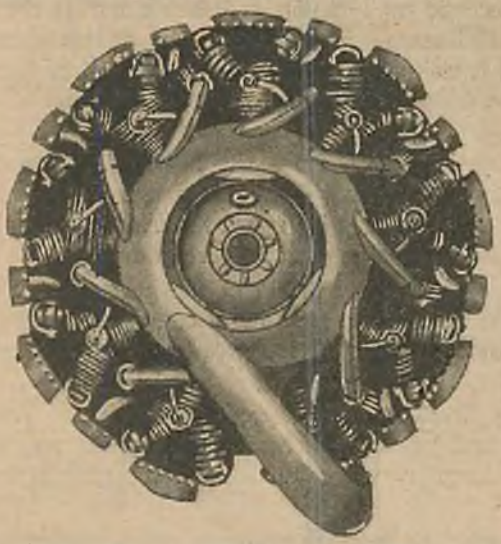
Engine Development



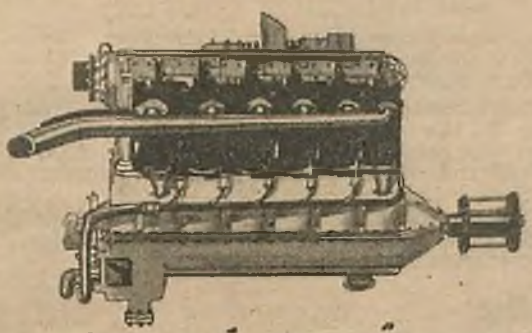
THE FIRST RADIAL ENGINE BUILT IN 1903 BY C.M. MANLY FOR LANGLEY'S AERODROME. IT WEIGHED 125 LBS. AND DEVELOPED OVER 52 H.P.

MONOSOUPAPE GNOME ROTARY ENGINE OF WAR TIME DEVELOPED 100 H.P. - ROTARIES NOW OBSOLETE.

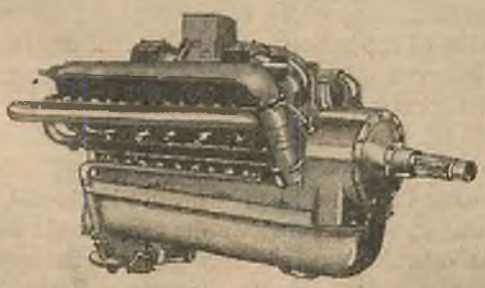
THE FAMOUS WRIGHT WHIRLWIND ENGINE OF 200 H.P. USED BY COL. LINDBERGH ON PARIS FLIGHT



A MODERN WRIGHT WHIRLWIND FULLY SUPERCHARGED RADIAL ENGINE DEVELOPS 440 H.P.



THE 400 H.P. "LIBERTY" OF 1917 WAS COPIED FROM FRENCH, ENGLISH, ITALIAN, GERMAN AND AMERICAN AERO-ENGINE DESIGNS



MODERN 600 H.P. GEARED CURTISS CONQUEROR: A LIQUID COOLED ENGINE.

COLBY

Endorsement

THANK you all, Air Adventurers, for the solid, enthusiastic support you gave last month to the first big Bill Barnes—Air Trails. We, at headquarters, knew that it was necessary to expand—but it took courage for the editor to take the step promptly and unhesitatingly.

Now he's smiling because the letters of congratulations have come flooding in like an avalanche. And the thousands upon thousands of you, Air Adventurers, have indorsed the expansion as if it were your plan.

We have been justly proud of the new table of contents in the magazine. It is more complete, more satisfying. And it seems to have caused new interest in our Club.

New applications for membership have been coming in larger and larger numbers. I have been very busy trying to keep up with the demand for pins and certificates.

I have tried to keep up with my correspondence, but unless I work evenings it piles up! Your loyalty makes me mighty proud.

You'd be proud, too, if you could see the membership list. It reaches into every city, town and village, into every corner of the nation. You may well feel that your Air Adventurers membership symbolizes a great power among the young people who will one day be flying. To-day, if we were to parade together, we would form a column four abreast, and fifteen miles long!

Think what this would be if we were in the air, in our own planes. It would comprise the greatest air force the world has ever known. It would equal the combined air forces of England, France, Germany, Italy, Russia, Japan, and the United States.

But the reason it would be great would not lie so much in its numbers as in the fact that deep in the heart of each pilot there is a creed—the time-honored Creed of the Air Adventurers.

The Air Adventurer has pledged himself to develop Self-Reliance, Courage, Initiative, Independence, Loyalty, Integrity and Obedience. That is why we have become great and strong.

If you are not already a member, but can honestly pledge yourself to live up to the creed, send in the application blank below. You'll be proud of your wings if your application is approved. You'll be proud to frame your certificate of membership and hang it where your friends will see it, because it stands for a solid body of young people who are working together for the advancement of aviation.

We are making our presence felt throughout the United States and Canada. And the more who join our ranks—the stronger our influence becomes.

Happy landings!

Your Flight Commander,

Albert J. Carlson

(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 .....

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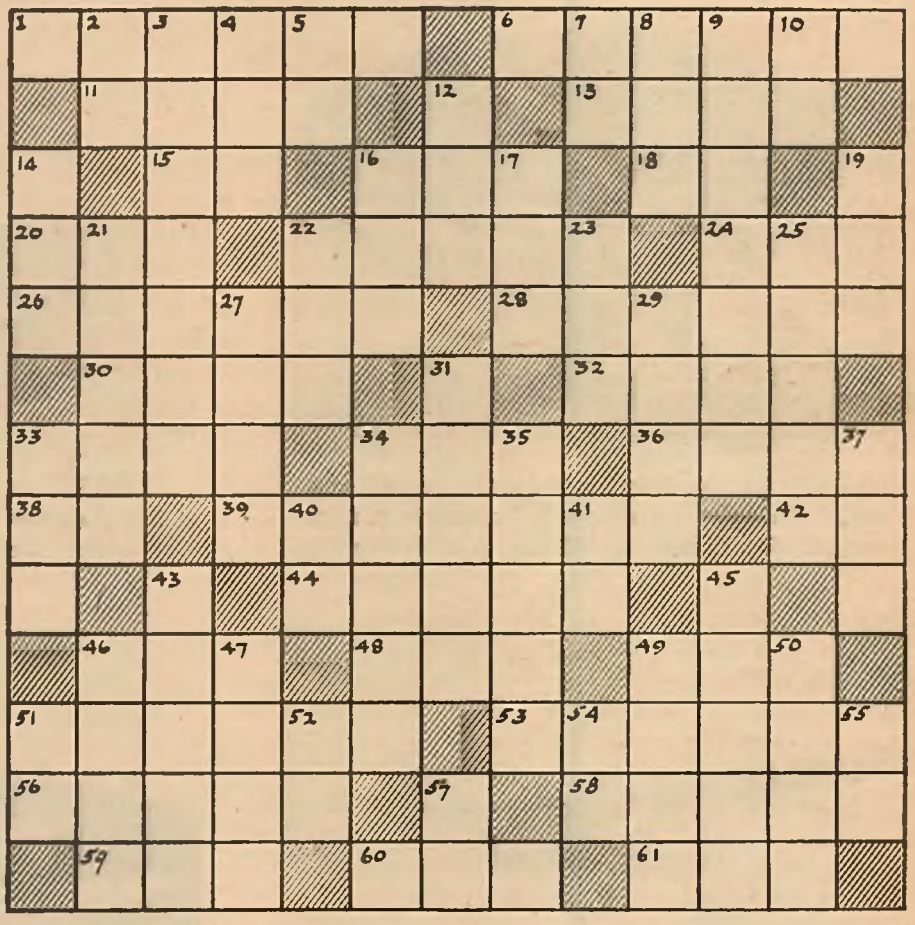
(This coupon may not be used after September 15, 1935.)

CROSS WINDS

Can you answer the aeronautical definitions in this puzzle?



Across

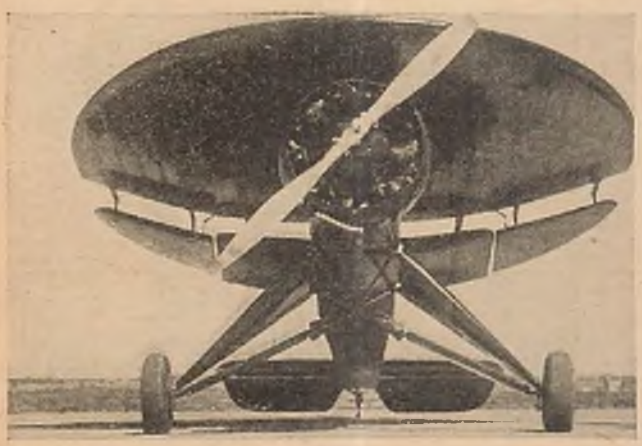
1—A model material
6—Curve in wing surface
11—Meridian
13—River duck
15—Famous Curtiss engine series
16—The ocean
18—Airplane registration letters
20—Thick black liquid
22—Cockpit covering
24—Moved swiftly
26—Shot at from concealment
28—In direction of
30—Congealed air moisture
32—Type of plum
33—Aircraft operation records
34—Screw-thread tool
36—American coin
38—Within
39—Aircraft naval weapon
42—Abbreviation for "Archy" guns
44—Dirt
46—Belonging to us
48—Airport wind indicator
49—Perch upon
51—Fly a plane, colloquially
53—Autogiro supporting surfaces
56—Simultaneous artillery discharges
58—Book leaf
59—Down-wind
60—Consumed
61—Food for invalids

Down

2—One
3—Anchoring of airship
4—Interplane strut type
5—Upon
7—Present
8—Human being
9—Type of captive balloon sustaining entangling nets
10—Beam shape
12—Balloon weight-supporting rigging
14—Neuter possessive
16—Mournful
17—Deed
19—Conclusion
21—Avro reconnaissance-bomber
22—To chop
23—Airship frame distortion due to drooping ends
25—Amphitheater
27—Round-the-world flier
29—Airplane made in Ohio
31—Kind of tree
33—Set aflame
34—Commonplace
35—Become exhausted
37—Auxiliary control surface
40—From
41—Short for British plane
43—Cunning
45—Musical instrument
46—Egg-shaped
47—Talk wildly
49—Cease
50—Journey
51—In the same manner
52—Toward
54—Concerning
55—Thus
57—That thing

AIR TRAILS GALLERY

A Picture Page of Modern Planes for the Collector

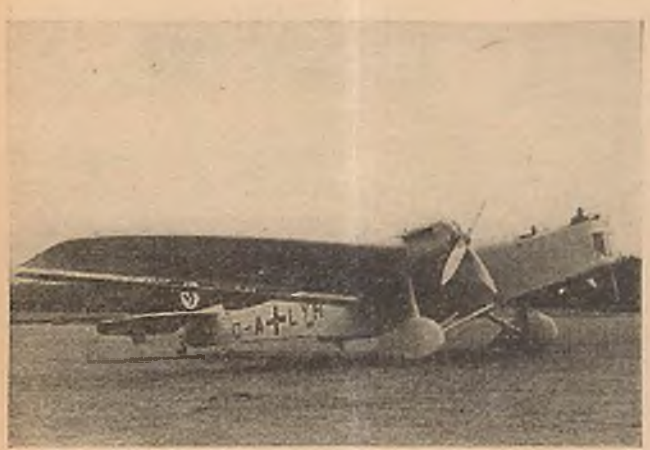


NEMUTH circular-wing monoplane, improved version, claims safety advantage in freedom from spins and sideslips. Engine is 110 h.p. Warner Scarab.

SEVERSKY army BT-8 all-metal basic trainer, 30 being delivered, has 176-mile speed and fighter action. Cockpit projection is nose-over guard.

S.F.A.N. 2-seater is new French light-plane version of British Drone powered glider. It mounts a 35 h.p. Mengin Poinsard 2-cylinder engine.

MAUBOUSSIN 40 Hemiptere, French light plane, uses tandem wing or lifting tail like Flea. Span is 23 feet, length 16½; engine, 40 h.p. Salmson.



DORNIER Do.23 bomber-transport for re-armed Germany does only 161 m.p.h., but has three gun turrets and carries a load of several tons.

FOKKER T-IV, shown in first test for Netherlands East Indies service, carries three guns and bombs within or torpedo beneath fuselage.

The MODEL WORK-SHOP

Conducted by Gordon S. Light

NOT long ago I was talking with several old-time model builders about the changes in models which have taken place during the last five years. We talked about the lightweight era, in its heyday about 1930. There were no restrictions of any sort and models were built with ample area and a minimum of weight. It took only the slightest updraft to take a model away for a flight that might last for hours. Then we discussed the advent of the weight restriction, about 1931, which put outdoor flying on a sounder basis and reduced the luck factor. Then there was microfilm, which revolutionized indoor flying and boosted indoor records. All these changes were important, but we agreed that the outstanding development in the last few years was the development of gasoline models.

At Dayton, Ohio, in 1931, the national contest produced only one gas-powered model. It was poorly built and showed little promise of flying. In its best attempt it gained a few feet of altitude and then fell off and dived. The resulting crash eliminated the builders from the contest.

Next year, at Atlantic City, results were slightly better. Maxwell Bassett was the only gasoline model entrant. After some bad attempts, he got his model off the ground for a flight of several miles. That was the beginning of gas-model popularity. The following year, at New York City, Bassett finally proved himself a real expert. He brought a fleet of contest ships, all equipped with small motors, and he took home with him four national outdoor trophies. This contest proved that rubber models were no match for gasoline-powered models. In 1934 a separate contest for gas models was held.

In the 1934 and 1935 contests there were about 40 to 50 gas models entered in each national contest. Many did not get their ships into the air, but even then they represented quite an increase over the lone entrant in 1932. Now, in 1936, gas models have hit a new peak in popularity. There are at least eight companies manufacturing motors. Thousands of them have been sold and there are still many unfilled orders.

Two important contests for gas models were held during May. The Kresge Model Club of Newark, N. J., conducted a meet on May 2nd, and the Eastern States Gas Model Contest took place May 9th, both at Hadley Field, near New Brunswick, N. J. Approximately 70 entrants were attracted to each contest. This is a remarkable gathering of gas models, when you consider that the entrants came from only three of the Eastern States. Many newcomers flying their first gas models turned in excellent flights.

The Kresge contest was won by Harold Denaci of Brooklyn, New York City. He is only 15 years old and this was his first gas model.

The Eastern States Contest was won by the old master gas-jobber, Maxwell Bassett of Philadelphia.

Despite the ruling limiting fuel *(Turn to page 94)*

The Contest Calendar

TEXAS CENTENNIAL EXPOSITION Model Contest, Dallas, July 27. Outdoor events include stick, fuselage, flying scale, freak designs, gas models. N. A. A. rules; no age restrictions. Trophies, airplane trips, etc. Col. J. C. Davis, contest director. Information: Golden Aircraft Corp., 1013 Elm St., Dallas, Tex.

JUNIOR BIRDMEN National Contest, Boston, first week in August. Winners of June elimination contests eligible. Information from Hearst newspapers in wing cities or from national office, 1834 Broadway, New York City.

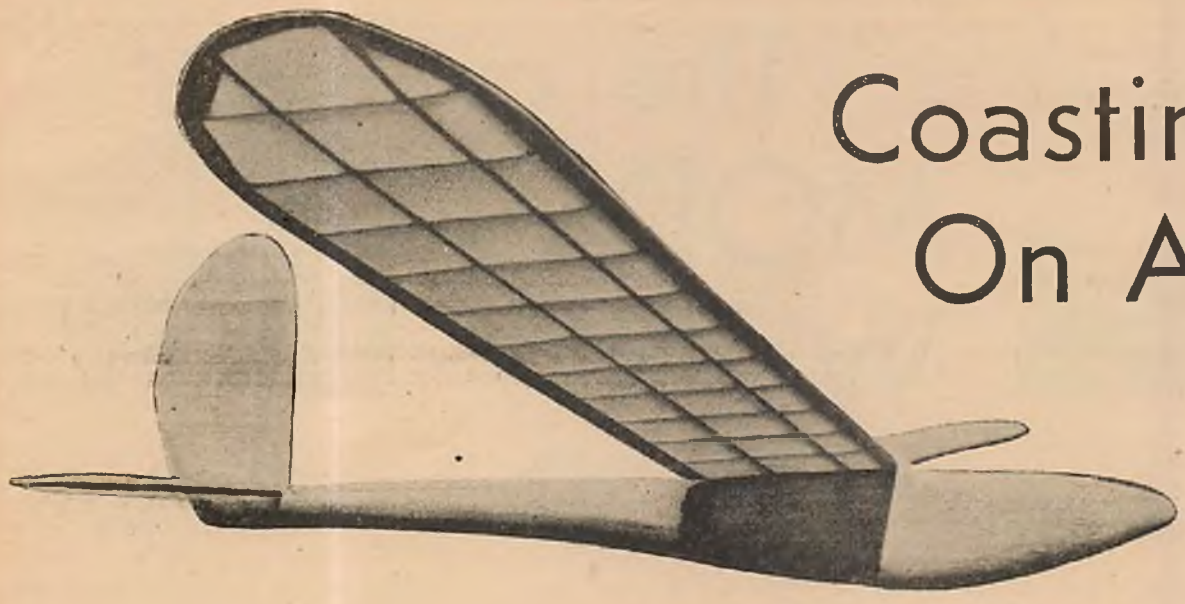
MISSISSIPPI VALLEY Model Airplane Tournament, St. Louis, Mo., Aug. 21-22. Annual event, with attractive prizes, open to all in this section. Information, entry blanks from sponsor: Stix, Baer & Fuller Model Airplane Club, St. Louis, Mo.

JUNIOR AVIATORS OF AMERICA National Junior Air Races, Cleveland, late August. Winners of elimination contest conducted July 6 are eligible. Information from Scripps-Howard newspapers in 19 wing cities or from national headquarters, Cleveland.

AMERICAN LEGION Fourth Annual National Model Airplane Contest, Indianapolis, Ind., Aug. 29-30. Full list of outdoor and indoor events. Rules, entry blanks: Director, Aeronautics Commission, 777 No. Meridian St., Indianapolis, Ind.

CANADIAN NATIONAL CONTEST, Toronto, Ont., Aug. 31-Sept. 2. Outdoor, indoor and gasoline events. United States modelers eligible. Information: Contest Director, Canadian National Exhibition, 705 Lumsden Building, Toronto, Ontario, Canada.

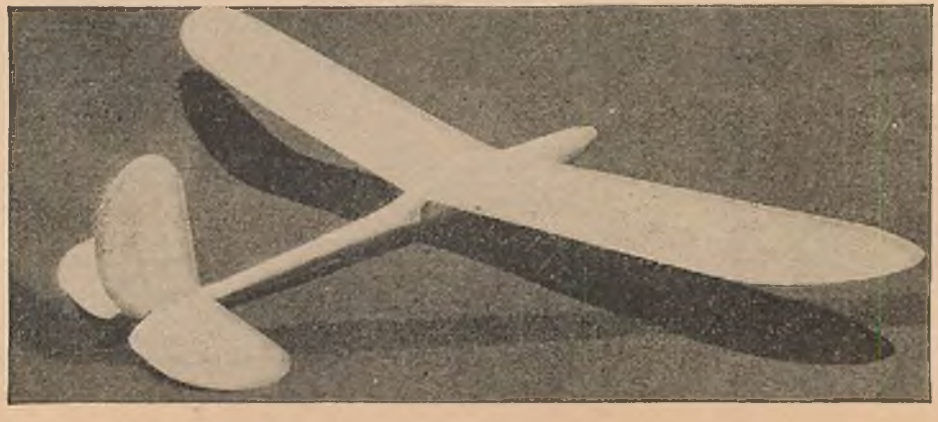
The Model Workshop asks the aid of readers and clubs in developing for their benefit a complete, detailed report of all model contests and exhibitions, large or small, everywhere. Listings should be received by The Contest Calendar, AIR TRAILS, 79 7th Ave., New York City, at least two months in advance; news of winners and results as soon as possible.



Coasting On Air

The SOARER

Throw it or tow it, and the distinguished, easy-to-build Soarer rides the air currents with the grace and beauty of a sky queen.



A GRACEFUL-LOOKING object almost always performs the task for which it is intended in an efficient manner. The soaring glider is the most graceful of all aircraft design, and it represents the ultimate in aerodynamic refinement and efficiency. Just as soon as the power plant is removed from an airplane—whether it is a model or a large-size ship—the designer fully realizes the shortcomings of his design. No longer is there the thrust of the propeller to pull the model out of embarrassing positions. Therefore, stability during flight and the ability to take advantage of every favorable air current must be built into the motorless glider.

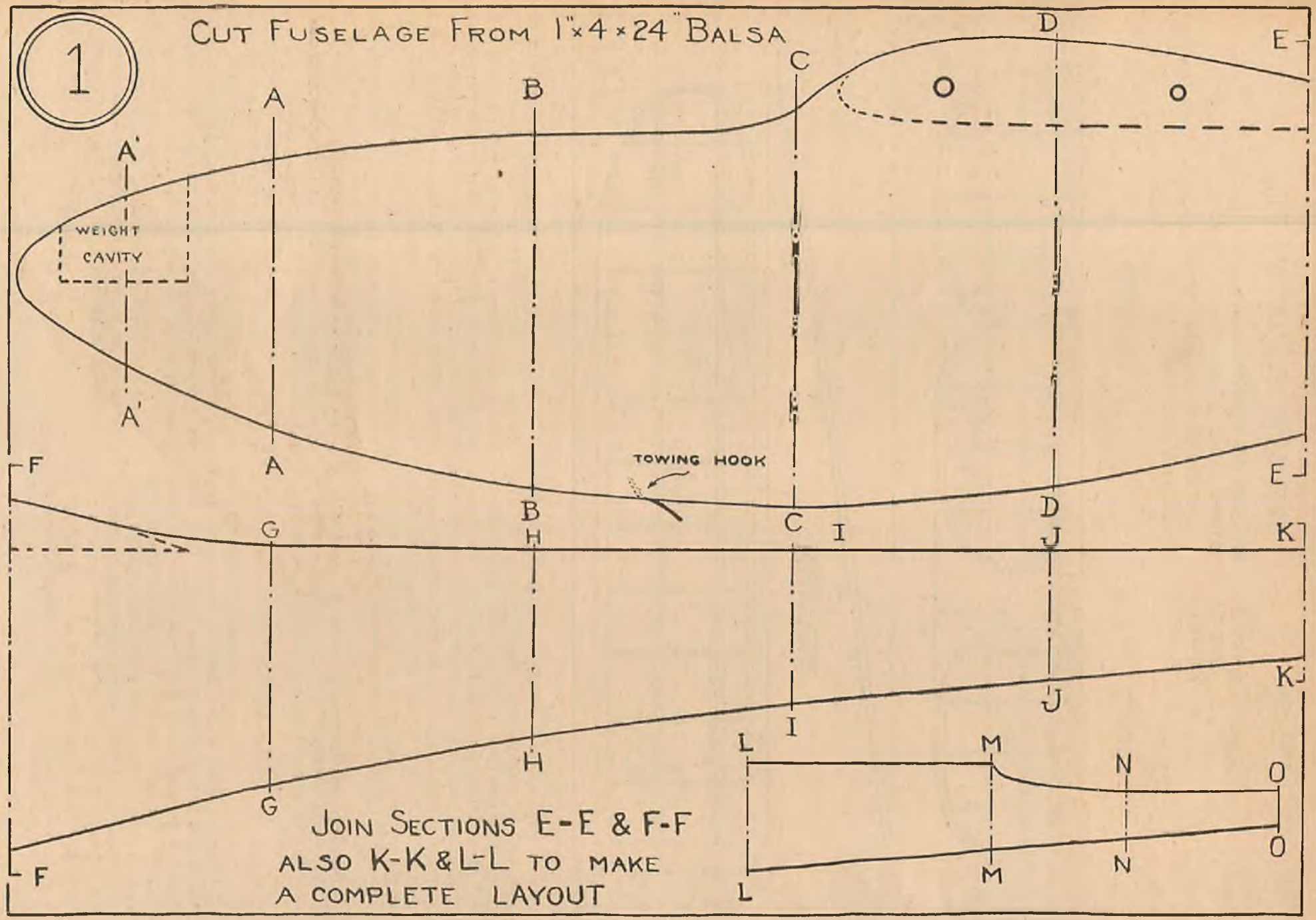
This month's Soarer model has all the necessary qualifications of a high-performing soarer. Parasite resistance is cut to a minimum. The fuselage is cleanly designed and there are no wires or struts exposed to the airstream. The wing is of high aspect ratio, about 10, an essential for reducing drag and boosting lift. The N-22 airfoil section used in the wing shows a high lift-to-drag ratio. And in the elevator and rudder a symmetrical airfoil section is used. It has little drag, yet performs the task of maintaining stable flight throughout all flying angles.

This ship can be flown hand-launched from any rise of ground or gliding slope. It can be flown from level ground by towing it with a 100-foot length of thread, jerking the thread loose when the model is directly overhead. A gliding ratio of 12 to 15 should be easily attainable in still air. If there are any rising air currents, the Soarer will gain altitude.

By carefully watching its flight, you'll see exactly what sort of terrain produces favorable air currents. Paved roads, tin roofs, gravel, and cinder paths all create their share of rising currents. The wind sweeping up a hill produces an updraft that is as pronounced in its effect as the disturbing downdraft on the leeward side of the hill. Apply this knowledge, and you'll get better flights.

The span of the Soarer is 48". The wing is built in two halves for convenience in handling. The total area is 225 square inches and the weight is 5.5 ounces, giving a wing loading of one ounce per 41 square inches, which brings it within the N. A. A. ruling of at least one ounce per 50 square inches. Construction is simple and the selling point of this model should be that no propeller is required. You can be assured of flights without being troubled by the irksome and difficult task of propeller-carving.

The materials for the Soarer cost about 75 cents. The biggest item in this expense will be the balsa block for the fuselage, which costs about 30 cents. This extra cost is warranted, however, since a solid balsa fuselage is desirable. It is easy to make and can be sanded smooth and given a highly polished finish. Construction is rugged, making this a model which can be flown in moderately strong winds. Hard wood of many kinds may be substituted for balsa throughout, if you want to


1
CUT FUSELAGE FROM 1"×4×24" BALSA
A
B
C
D
E
A'
WEIGHT CAVITY
TOWING HOOK
F
G
H
I
J
K
L
M
N
O
JOIN SECTIONS E-E & F-F
ALSO K-K & L-L TO MAKE
A COMPLETE LAYOUT

experiment, and should reduce only slightly the Soarer's flying ability.

FUSELAGE

Materials: 1 block of soft balsa 1x4x24"; 2 pieces ⅛"-diameter hardwood dowels cut to 10" lengths. (Rounded bamboo pieces can be used.)

In drawing #1 the entire fuselage layout is shown. Our page size necessitated drawing it in sections. By cutting out and joining the pieces you can make a full-sized pattern. The shape of the fuselage should be carefully traced on the balsa block. A small jigsaw is a valuable aid in cutting it out. Rounding the fuselage to the shapes shown in drawing #2 is done with a sharp knife, razor blade or small plane. The fuselage cross-sections are given for every 2" space along the length. Careful attention to duplicating this shape will give you a nicely modeled fuselage which is both attractive and efficient.

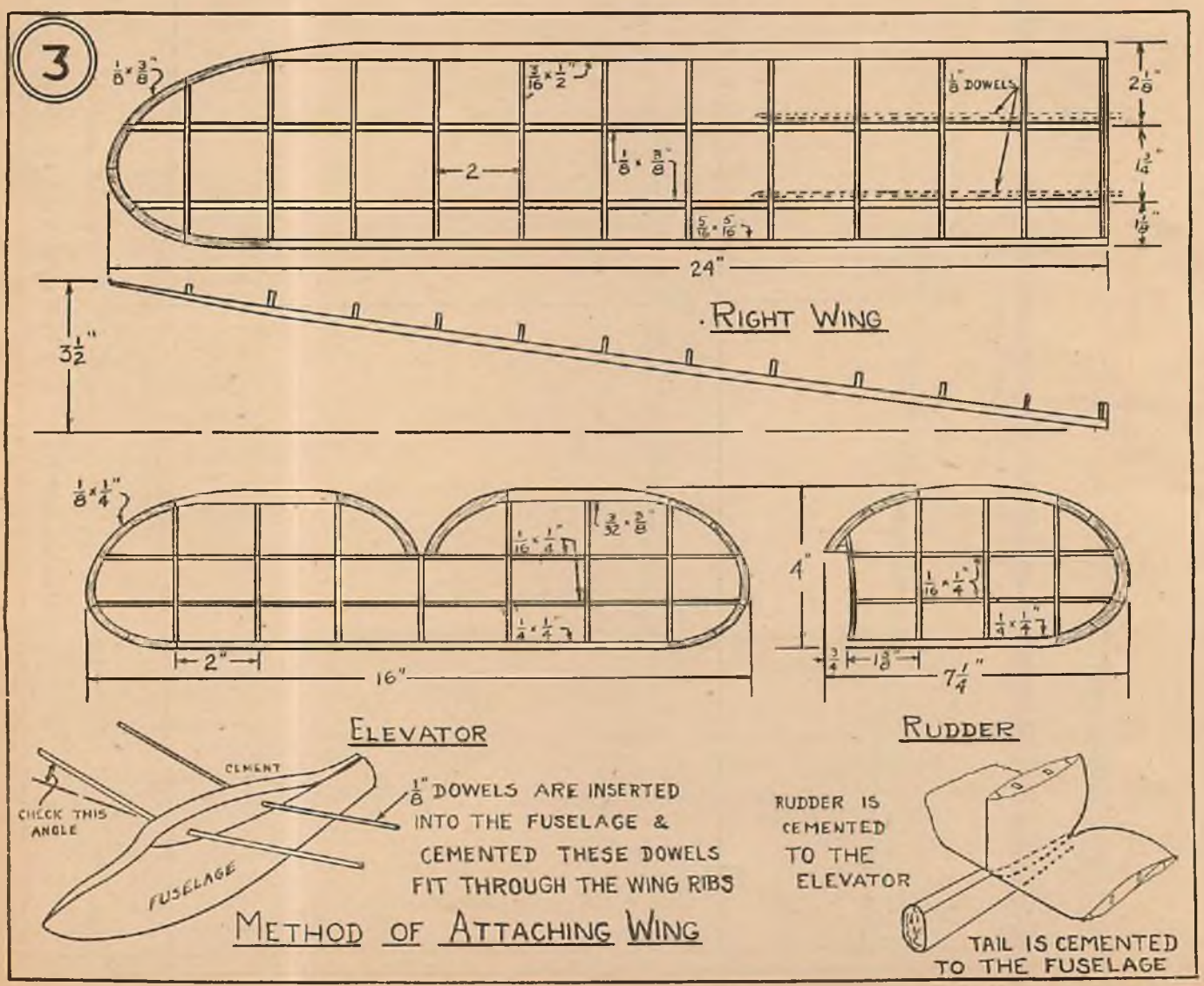
Using the tip of your knife or a very narrow-bladed wood gouge, cut a hole in the front of the fuselage. This hole is identified on drawing #1 as the weight cavity and is used for storing the weight that is necessary to balance the model. The cavity should be of ample size to store about 1½ ounces of lead. Concealing the weight inside the nosing is more attractive than merely cementing it to the front of the model.

Another part of the fuselage that should be carefully checked is the place where the wings are attached. The top of the fuselage should be curved at this point so it blends with the curve of the wing top. The small circles shown on the fuselage layout mark the position for the ⅛"-diameter hardwood dowels inserted into the fuselage. These pieces support the wing. Don't cement them in place until the wing has been built, since they must be placed at an angle which will raise the tip of each wing about 3½". The fuselage should be sanded smooth and given several coats of dope, with a sandpaper rubdown, until the surface is smooth.

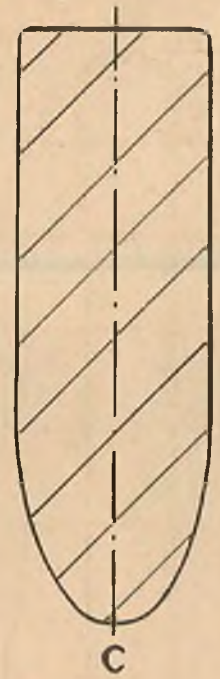
WING CONSTRUCTION

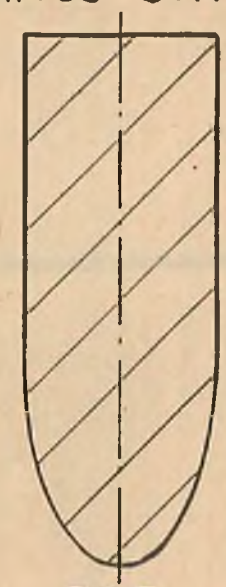
Materials: 2 leading edges 5/16x5/16x24"; 2 trailing edges 3/16x½x24"; 2 spars ⅛x⅜x24"; 1 piece of ⅛x⅜x24" for tips; 2 pieces 1/16x2x24" for ribs.

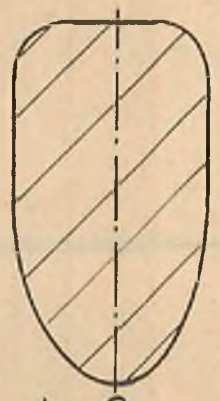
The 4-foot span requires ample strength in the construction. A wing built from the above material will be strong and durable. Cut out the ribs first. Make a cardboard pattern and use it to slice out the ribs. Make sure the pattern is an exact reproduction of the shape in the drawing. If it is not exact, all the ribs you cut will be inaccurately shaped and the wing will be different from the intended design. Careful attention should be paid to shaping the leading and trailing edges so they

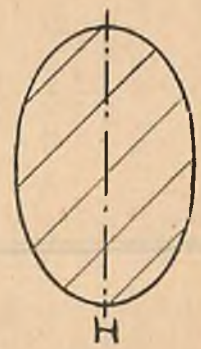


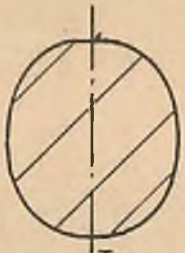
Fuselage Cross-Sections At Various Stations

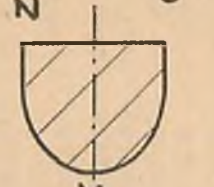




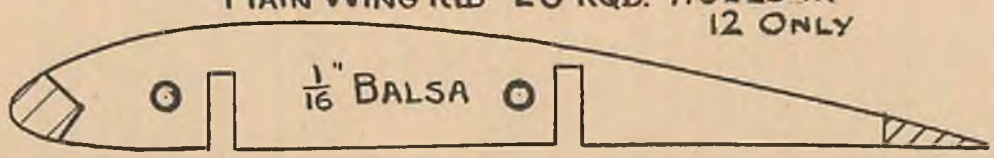


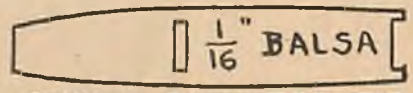






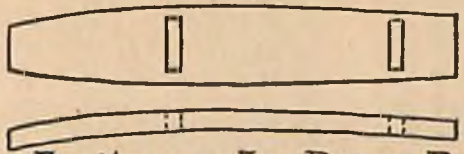
Main Wing Rib 26 Rqd. Holes in 12 Only



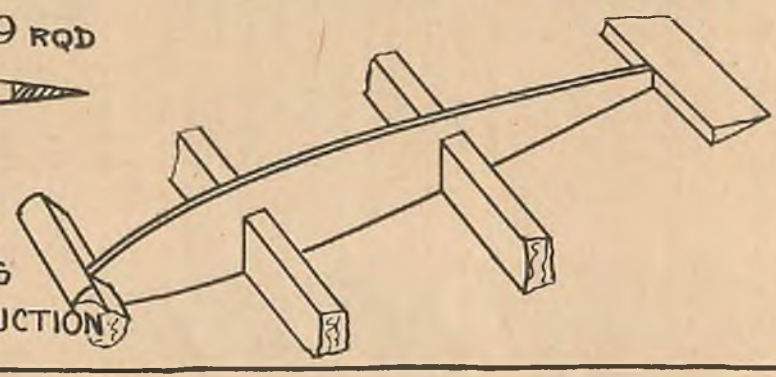


Center Elevator Rib

Elevator & Rudder Rib 9 Rqd



Two Views of End Rudder-Rib



Wing Construction

2

fit the ribs flush and accurately complete the rib shape. The rear of the trailing edge should be tapered to razor-edge thinness.

The end rib of each half of the wing is made of two ribs cemented together. This is necessary to absorb the added strain to which the end rib is exposed.

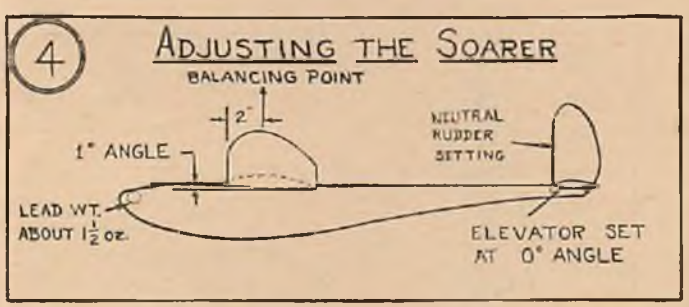
The wing is attached by slipping the ⅛" dowels through holes punched in the inner wing ribs. The holes should be a snug but not tight fit; no other fastening is necessary. These holes should be located so the wing will fill the space outlined on the fuselage layout in drawing #1.

Another important thing to watch during wing assembly is mounting the ⅛" dowels in the fuselage at such an angle that the tips of the wing are raised 3½". Try slipping the wing onto the dowels. After a little practice you can do it without any trouble. When the wing is attached to the fuselage, the slanted end rib should fit up flat against the fuselage.

ELEVATOR AND RUDDER

Materials: (balsa) 2 leading edges ¼x¼x18"; 2 spars 1/16x¼x24"; 1 trailing edge 3/32x⅜x12"; 1 piece ⅛x¼x24" for tips; 1 piece 1/16x1x12" for ribs.

The elevator is made in one piece and is left perfectly flat throughout its length. That is, no dihedral is built into it. The rudder is practically half the elevator. It is cemented permanently to the top center of the elevator. A good method of procedure when assembling the elevator is to first mark off the positions for the ribs on the spars. Use a soft pencil to avoid damaging the balsa with a sharp point. Next cement the ribs to the spars and add the leading and trailing edges, which can be cut to shape either before or after cementing to the ribs. The trailing edge should taper to a thin edge at the rear, just as in the wing.



The elevator and rudder tips are made from ⅛x¼" balsa pieces joined with cement so the grain runs lengthwise. First draw a full-sized outline of the tip. Then cut the pieces of balsa to fit this shape. Cement the pieces together and after drying, cement the tip to the ends of the ribs. Carve the tips to exact shape, tapering from ⅛" inside thickness to a knife-edge outside thickness.

COVERING

Materials: 2 sheets of superfine tissue; banana oil; dope.

White superfine tissue was used on the original model. The superfine tissue is really smoother and tougher than ordinary tissue. If you can't identify superfine by its quality or texture, look at the price. It's about 8 cents a sheet as compared to the cheaper prices for other varieties.

Run the grain of the tissue lengthwise along the wing and tail. Ironing out all wrinkles before beginning to cover will make your work easier and in addition assure you a better covering job. The top covering of tissue is attached by banana oil to the end ribs and the leading and trailing edges. Don't attach it to the top of each rib. However, the tissue must be fastened to the bottom of every rib to preserve the bottom camber of the airfoil.

The irregular shape of the wing and tail tips may necessitate covering them with small sections of tissue. This is preferable to the "bagginess" that usually follows an attempt to cover the wing tip with a single piece.

The wing and tail should be sprayed with water and pinned to a flat surface to prevent warping during drying. The water spray should be followed by a coat of dope. The consistency of the dope should be slightly lighter than banana oil. Brush the dope carefully when applying. Avoid getting it on too thickly in spots, which makes a blotchy wing. Doping when the air is very damp such as during a wet, drizzly day will cause the dope to turn white or to "blush," as this process has been called.

ASSEMBLY

Since the wing attachment has already been checked, the only operation necessary is sliding the two wing halves onto the hardwood pieces. The rudder is cemented rigidly to the top of the elevator. The elevator in turn is cemented to the top rear of the fuselage. In the fuselage pattern you'll see the small groove has been cut away to receive the tail.

The tail should be set at no angle of incidence. This means the center line of the rib should be parallel to the flat top of the fuselage back of the wing. The wing itself is raised slightly more than 1/16" at the leading edge.

FLYING

Balance the model at a point 2" back from the leading edge of the wing. Use soft solder wire or lead from a fishing sinker to add the necessary weight to the nose. From the performance of the model during a hand-launched glide, you can tell if it needs more weight. When adjusted, you can fix the weight in place with a few drops of cement and provide a flush surface over the hole with thin sheet balsa or tape.

If your model glides a short distance, then turns sharply to the right and dives to the ground, the following changes are necessary. Warp up the leading edge of the right wing a trifle by gently twisting it and breathing over it at the same time. Then gently twist the rudder to the left. Make these changes moderately, as the model is very sensitive to such adjustments.

Sometimes the model gives the impression of being unstable and badly adjusted simply because it is still a trifle tail-heavy. This fault is identified by a nosing upward when the model flies into the wind. After nosing up, the model will dive a few feet to regain flying speed and then immediately go into another climb. A little more weight in the nose should correct this trouble.

The tow-line method of launching is done with a piece of thread about 100 feet long. Tie a loop in one end of the thread and slip it on the launching hook set in the bottom of the fuselage. The loop should be loose so it will fall off the hook just as soon as the tension is removed from the thread.

Now stretch out the thread and start running slowly. The glider will shoot into the air and before you've run many steps it will be flying almost directly above you.

Now give the thread a jerk. It will *(Turn to page 95)*

Official Model Records

Approved by the Contest Board of the N. A. A. through May 30, 1936

(Age divisions: Junior, to 16 years; Senior, 16 to 21; Open, over 21)

INDOORS

Stick Models, Hand-launched

Class B

Junior:	Roy Carlson	Springfield, Mass.	16m 45.6s
Senior:	Wilbur Tyler	Boston, Mass.	20m 50.1s
Open:	William Latour	Philadelphia, Pa.	15m 17.8s

Class C

Junior:	John S. Stokes, Jr.	Huntington Valley, Pa.	20m 53s
Senior:	Mayhew Webster	Philadelphia, Pa.	23m 12.2s
Open:	Carl Goldberg	Chicago, Ill.	23m 29.3s

Stick Models, R.O.G.

Class A

Junior:	Wlliam Wert	Philadelphia, Pa.	10m 26.4s
Senior:	Merril Malley	Atlantic City, N. J.	10m 56.4s
Open:	Joseph Mutulis	Chicago, Ill.	9m 59s

Class B

Junior:	Bruce Mackler	Atlantic City, N. J.	10m 22s
Senior:	Mayhew Webster	Philadelphia, Pa.	16m 33s
Open:	William Latour	Philadelphia, Pa.	14m 02.8s

Stick Models, R.O.W.

Class A

Junior:	William Wert	Philadelphia, Pa.	7m 19.4s
Senior:	Bruno Marchi	Medford, Mass.	6m 22s
Open:	Beorgevin Becksted	Chicago, Ill.	5m 38.2s

Class B

Junior:	William Wert	Philadelphia, Pa.	7m 27.6s
Senior:	Mayhew Webster	Philadelphia, Pa.	11m 55s
Open:	Wlliam Latour	Philadelphia, Pa.	13m 15s

Gliders, Hand-launched

Class A

Junior:	M. Hugelot	Chicago, Ill.	34.6s
Senior:	Wallace Simmers	New Lenox, Ill.	43.6s
Open:	Joseph Matulis	Chicago, Ill.	38.8s

Class B

Junior:	Robert Gelbard	Chicago, Ill.	49.2s
Senior:	Wallace Simmers	New Lenox, Ill.	58.4s
Open:	Carl Goldberg	Chicago, Ill.	47.5s

Autogiros

Junior:	Raymond Steinbacher	Ridgefield, N. J.	57.2s
Senior:	Alton DuFlon, Jr.	Ridgefield, N. J.	2m 01.2s

Fuselage Models, R.O.G.

Class B

Junior:	Robert Jacobson	Philadelphia, Pa.	10m 44s
Senior:	Charles Heintz	Philadelphia, Pa.	13m 12.2s
Open:	Beorgevin Becksted	Chicago, Ill.	11m 26s

Class C

Junior:	John S. Stokes, Jr.	Huntington Valley, Pa.	15m 05.6s
Senior:	John Haw	Philadelphia, Pa.	17m 14.8s
Open:	William Latour	Philadelphia, Pa.	12m 31.8s

Fuselage Models, R.O.W.

Class B

Junior:	John S. Stokes, Jr.	Huntington Valley, Pa.	3m 23s
Senior:	Sidney Axelrod	Chicago, Ill.	6m 32.2s
Open:	William Latour	Philadelphia, Pa.	5m 42s

(Indoor classifications: Class A, wing area up to 30 sq. in.; B, 30-100; C, 100-150)

OUTDOORS

Stick Models, Hand-launched

Class C

Junior:	Junior Dague	Tulsa, Okla.	21m 04s
Senior:	Harry Cornish	Denver, Colo.	61m 09s
Open:	Joseph Frady	Tulsa, Okla.	27m 07s

Class D

Junior:	Fred Skafec	Akron, O.	8m 21.6s
Senior:	Daniel Clini	Springfield, Mass.	38m 50s
Open:	C. M. Miller	Akron, O.	11m 20.5s

Gliders, Hand-launched

Class B

Junior:	Walter Weitner	New York, N. Y.	46.5s
Senior:	Walter Farynyk	New York, N. Y.	1m 02s

Class C

Junior:	Marx Brook	New York, N. Y.	19.5s
Senior:	Henry Struck	New York, N. Y.	2m 13.5s
Open:	James McPheat, Jr.	New York, N. Y.	31.5s

Gliders, Tow-launched

Class C

Junior:	Marx Brook	New York, N. Y.	43.5s
Senior:	Robert File	Columbus, O.	23m 13s

Class D

Junior:	Paul Durup	Boston, Mass.	57.8s
Senior:	Dick Everett	Elm Grove, W. Va.	2m 38s
Open:	Roland Buhrig	Canastota, N. Y.	1m 18s

Class E

Senior:	Jack Smith	Dayton, O.	1m 23.4s

Autogiros

Senior:	Ralph Kummer	St. Louis, Mo.	2m 06s

Fuselage Models, R.O.G.

Class C

Junior:	Fred Smith	Denver, Colo.	27m 40s
Senior:	Robert Cahill	Indianapolis, Ind.	33m 00s
Open:	Beorgevin Becksted	Chicago, Ill.	39m 30s

Class D

Junior:	Alan Starr	Atlantic City, N. J.	5m 41s
Senior:	William Ying	New York, N. Y.	41m 19s
Open:	William Atwood	Glendale, Calif.	13m 14s

Class E (gasoline-powered models)

Senior:	Joe Kovel	New York, N. Y.	64m 40s
Open:	C. M. Miller	Akron, O.	29m 11s

(Outdoor classifications: Class B, wing area, 30-100 sq. in.; C, 100-150; D, 150-200; E, over 200)

Flying Auto

A government plane for the aerial motorist in a flying scale model.

by Alan D. Booton

THERE are several unusual features of the Fahlin Aircraft Company's Plymacoupe that should make this plane interesting to model builders.

It was built for the Department of Commerce as one of the new light planes that are being sought to encourage private flying. To reduce engine cost—a major factor in keeping airplane prices high—it has a 6-cylinder 80 h.p. water-cooled Chrysler Plymouth automobile engine, geared down for aircraft use, which uses only 4 gallons of gas an hour. The front end of the circular cowling, housing the in-line engine instead of the usual radial type, holds the radiator. The gull-type wing, of distinctive shape, permits wide piloting vision. The ailerons extend all the way from wing tip to root section, serving also as air-brake flaps. The seating arrangement accommodates two persons side by side.

Top speed is 105, cruising 95, and landing with flaps 40. Some of this good performance carries over to our model, so don't be surprised at the angle of climb, stability, and endurance you'll get.

Better look at the drawings on the following pages before getting the listed materials ready. And here's an important suggestion: the first thing to do in the case of oval-sectioned fuselages such as the Plymacoupe's is to make up a sheet of plywood of two 1/32" balsa sheets, cemented together cross-grained. Place it under something heavy to keep it straight during the hour or two it takes to dry well. In the meantime, cut out the ribs, nose block, propeller, landing struts, and bend wire parts, etc.

PLYMACOUPE

FUSELAGE

There are seven formers to be cut in halves out of a 4"x6" sheet of plywood, and an additional former (B), making 15 pieces altogether. The best method in building the fuselage is to make half of it right on the side-view drawing, in order to obtain the true fuselage shape. After removing this half, which will be a left one, build the right side on to it. Do not forget to include the ⅛" sq. braces that support the landing gear, because the 1/32" sheet covering at these points will not be strong enough. The rear hook must be cemented in place as former H is being made whole.

WING PANELS

The gull design of the wing will make you think harder while assembling it, but there will be no need for tracings this time. Just draw a straight line on your board or paper. Mark off 24" for the span and make a mark for the center. Pin the wing beams along the line, slot edge up, and then place the slotted ribs in their respective slots in the beams. Slide a 1/16" square strip into the front slots of the ribs on each side and then pin the leading and trailing edges on. Line the ribs up carefully by sight and cement every joint. When dry, cement the tips on, and then the special ribs, which are marked 1x, 1y, and 1z.

Not a dying Plymacoupe or a nose-over landing; just a bottom view of our model.

TAIL SURFACES

The tail surfaces are of the thin, or flat, type, and are easily assembled by pinning the parts right on the drawing and cementing. Cover the tail surfaces according to your color scheme and lay them aside until the fuselage is covered.

LANDING GEAR

Cut the landing gear struts out of 3/32" sheet and sand them to a streamline shape. Note that the lower ends of the struts are jointed. To make a springy landing gear, two wire loops are employed on each wheel. The front loops extend to make the cross struts and down to make the axles. The rear loops are just long enough to be securely cemented. Make the tail wheel with a single wire strut. Use 1" hard-wood wheels on the main axles.

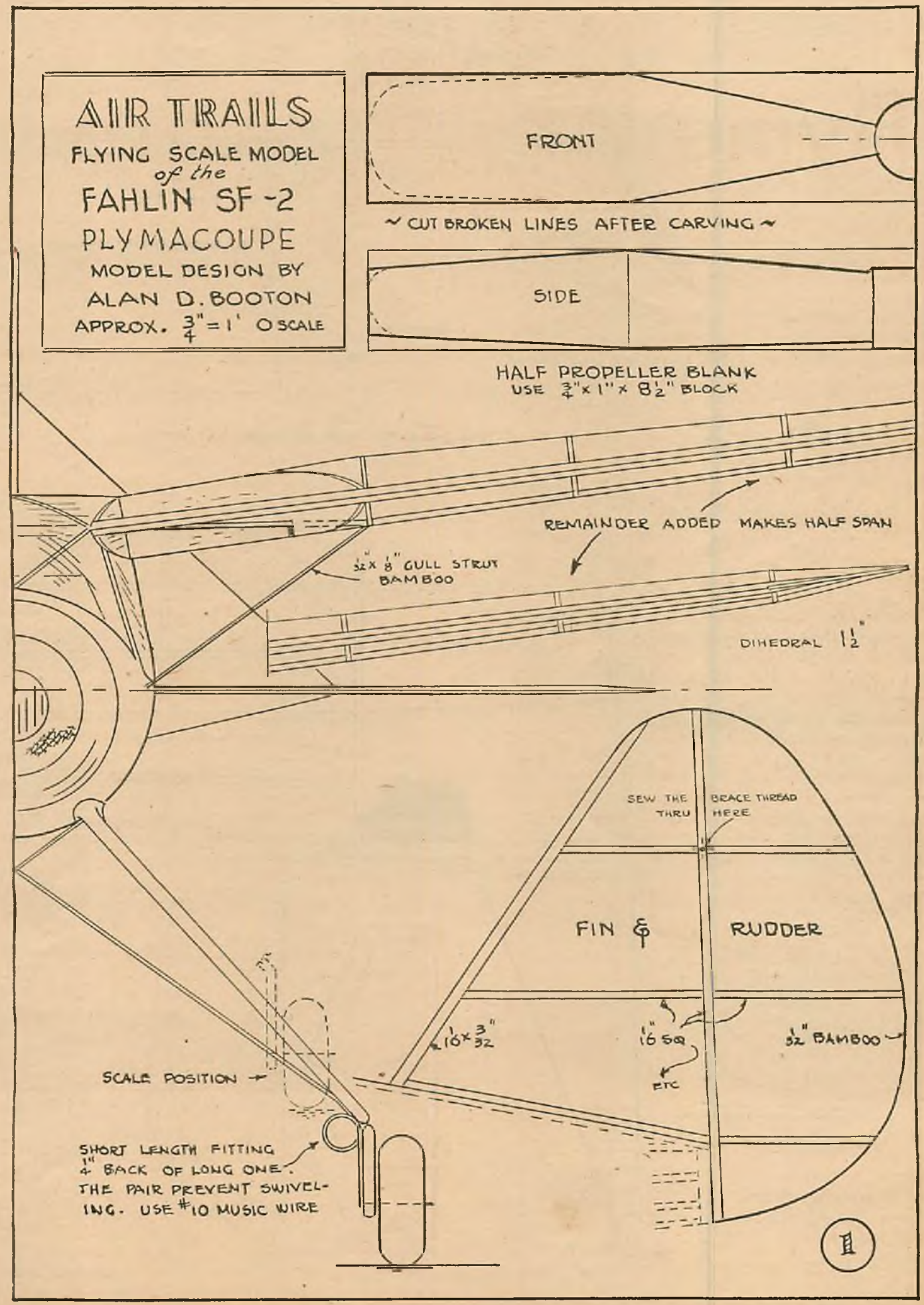
PROPELLER

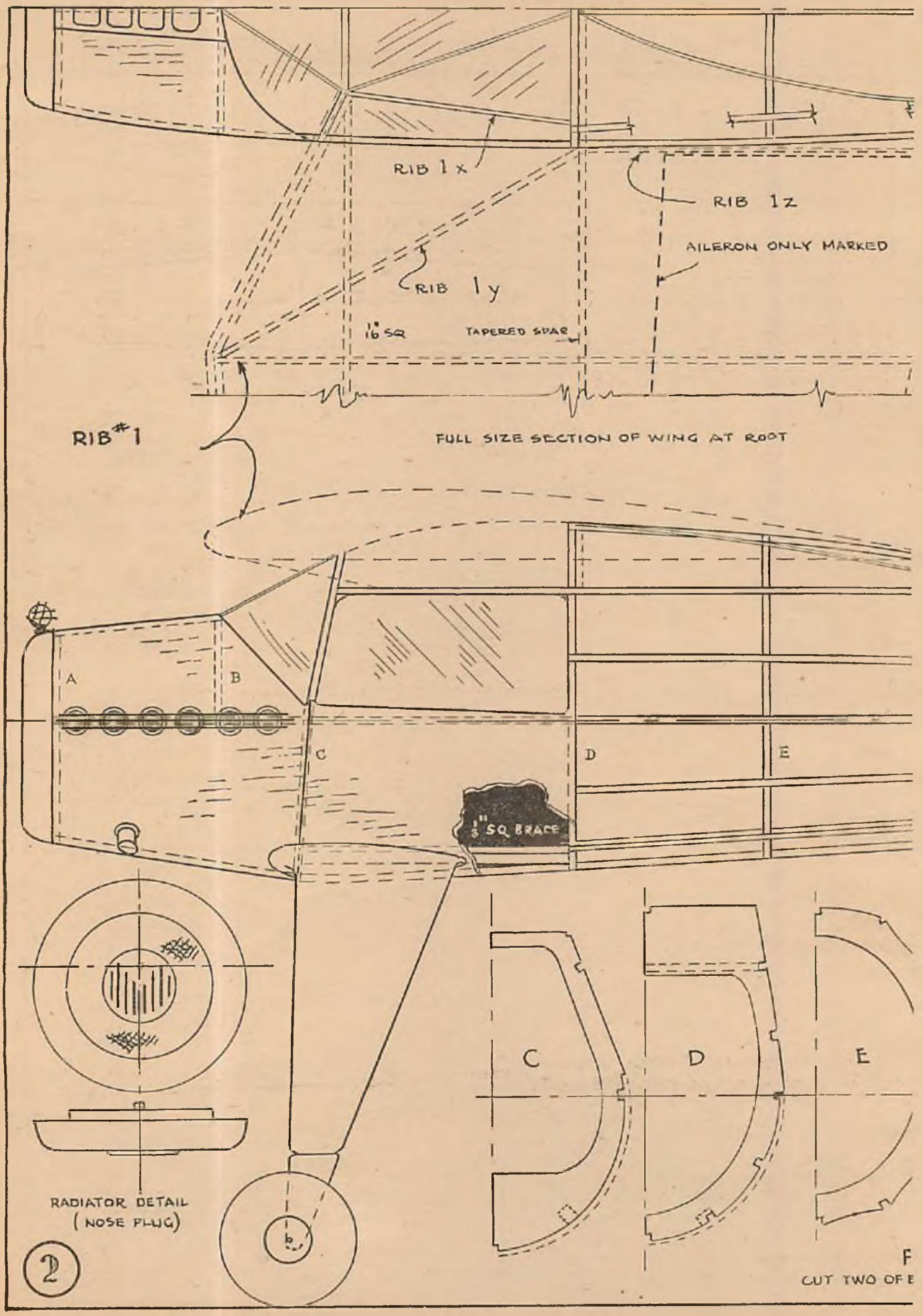
Blank out a ¾x⅛x½" block as shown on the drawing. Carve it carefully to the appearance of a wooden-type job, then sand and dope it several times. Insert the propeller shaft through the nose block (radiator), several washers, and then attach the prop in the usual way.

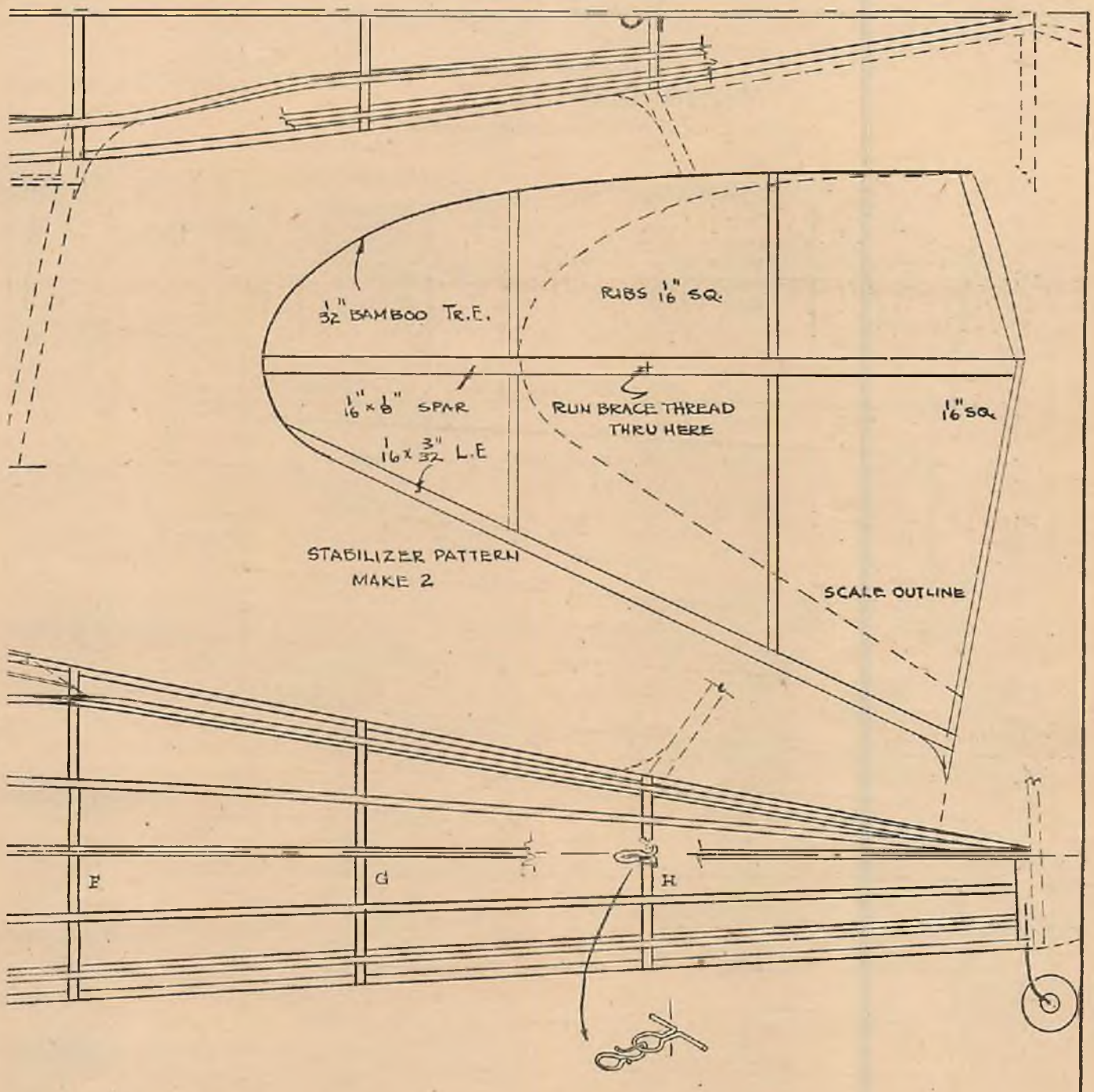
COVERING AND ASSEMBLING

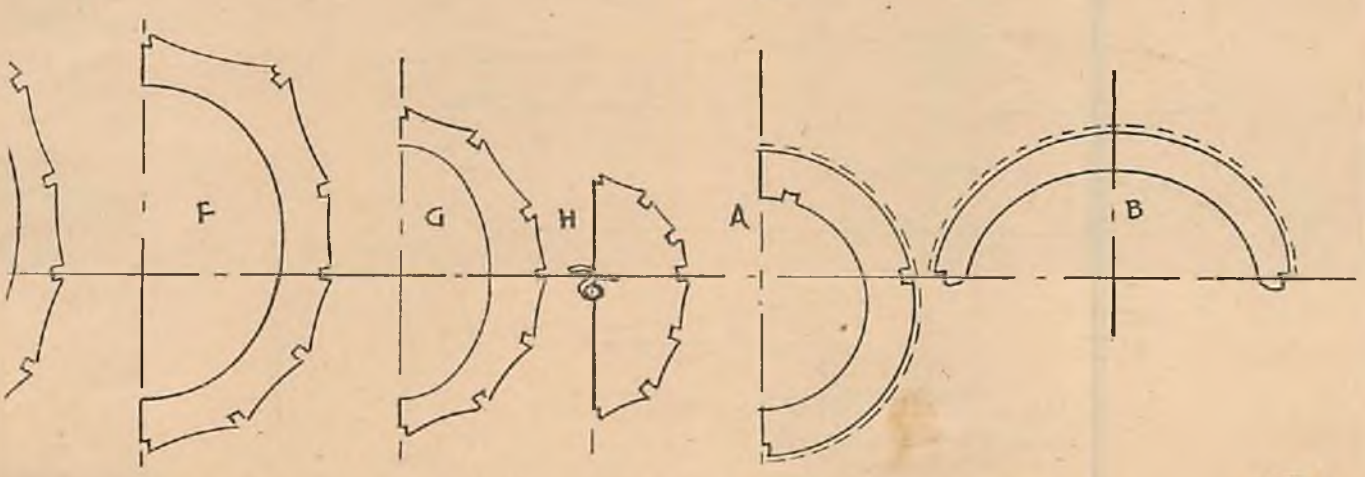
Start at the rear of the fuselage and cover the bottom between the former H and the tail post and up to the middle longerons, then the top portion, and continue forward a section at a time. To obtain a good covering job, a piece of tissue should be held on the space to be covered, and marked. Leave 1/16" border around the marks when cutting the pattern. Place this pattern back on the place it was

(Turn to page 94)


AIR TRAILS
FLYING SCALE MODEL
of the
FAHLIN SF-2
PLYMACOUPE
MODEL DESIGN BY
ALAN D. BOOTON
APPROX. 3/4" = 1' O SCALE
FRONT
~ CUT BROKEN LINES AFTER CARVING ~
SIDE
HALF PROPELLER BLANK
USE 3/4" x 1" x 8 1/2" BLOCK
REMAINDER ADDED MAKES HALF SPAN
1/32" x 1/8" GULL STRUT BAMBOO
DIHEDRAL 1 1/2"
SEW THE THRU
BRACE THREAD HERE
FIN & RUDDER
1/16" x 3/32"
1/16" SQ
1/32" BAMBOO
ETC
SCALE POSITION
SHORT LENGTH FITTING 1/4" BACK OF LONG ONE. THE PAIR PREVENT SWIVELING. USE #10 MUSIC WIRE
II


RIB 1x
RIB 1z
AILERON ONLY MARKED
RIB 1y
1/16 SQ
TAPERED SPAR
RIB #1
FULL SIZE SECTION OF WING AT ROOT
A
B
C
D
E
1/8" SQ BRACE
RADIATOR DETAIL
(NOSE PLUG)
C
D
E
F
CUT TWO OF E
2



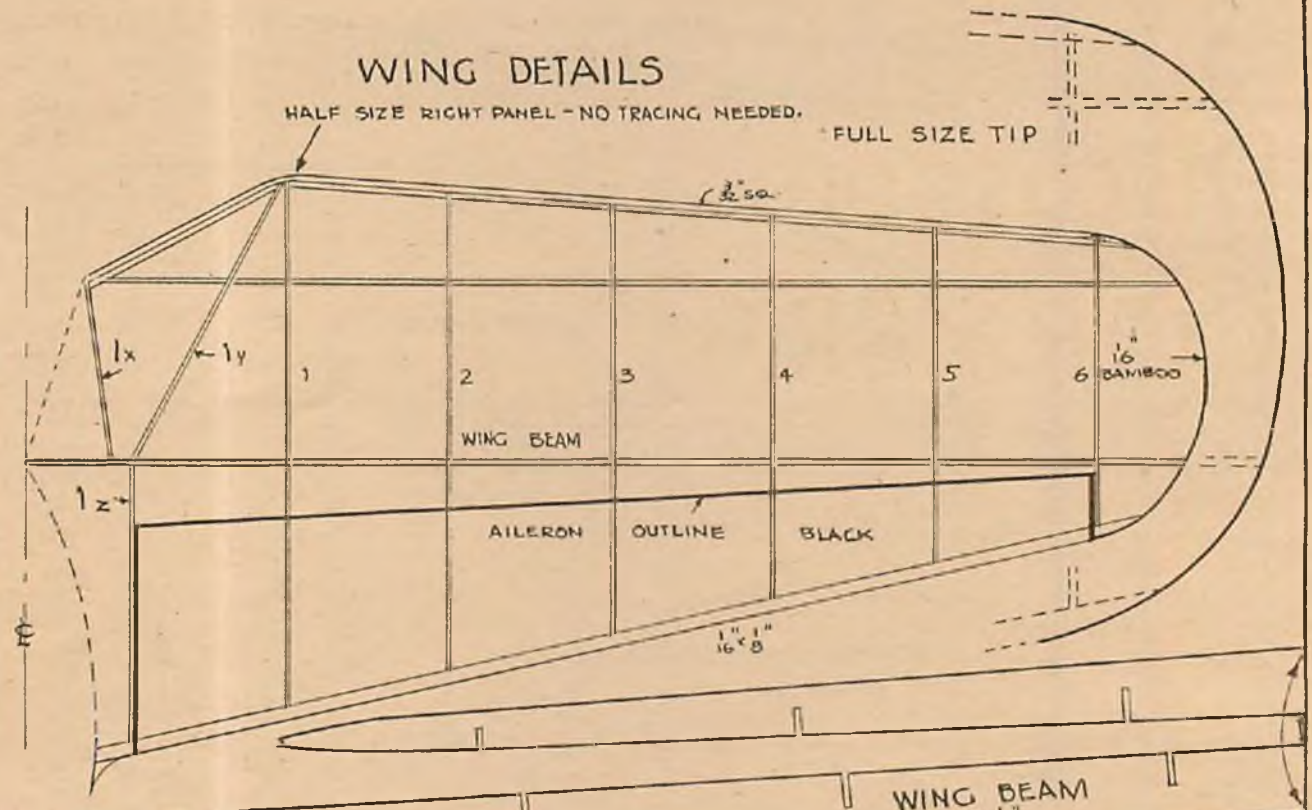


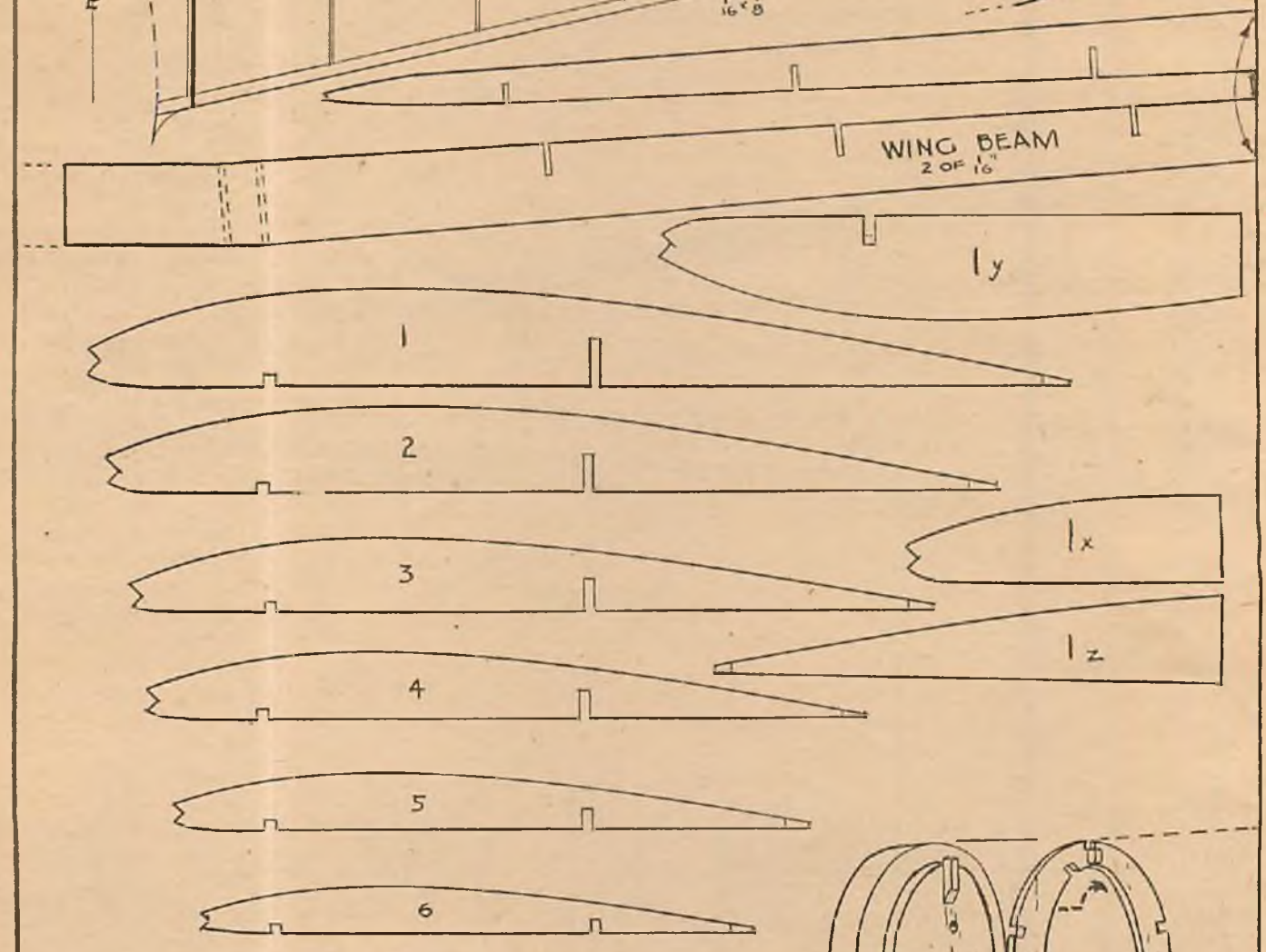
ORMERS
EACH FROM 1/16" 2 PLY

3

WING DETAILS

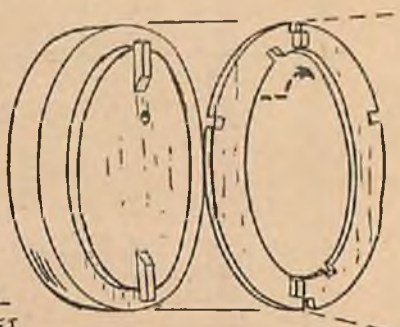
HALF SIZE RIGHT PANEL - NO TRACING NEEDED.





FULL SIZE RIBS

MAKE 2 OF EACH OF 1/32"



NOSE BLOCK LOCK DETAIL

INSERT BLOCK & TURN LEFT

4

The Discussion CORNER

The model art progresses through exchange of ideas. The Discussion Corner is a monthly sounding board for your opinions. This month we ask experts' ideas on lift tails. *For September we're publishing the best answers from readers on the first open subject,* airfoil sections. *Topics that will follow are listed below. Think about them, then write your opinion in 150 words or less and send it to The Discussion Corner.*

I BELIEVE it is a good thing to use a lifting tail, especially on a short fuselage model, because it shifts the C. G. forward, and thus the main wing must be moved forward. Thus a large moment arm is obtained, and results in a better glide. The use of the lifting tail also prevents the model from stalling; this is due to the tail set at a negative angle. When the main wing stalls or the angle of attack is high, the tail returns to a positive angle and starts to lift, thus lowering the nose and restoring the model to normal flight.

I don't think a model having a lift tail is much harder to fly or adjust. It does require a little more adjustment. From my experiments and experience, I have found out that a model with a lifting tail doesn't pull out from a dive fast enough, sometimes taking a long time to regain normal flight. Once properly adjusted, however, the model will fly well.

Regarding the types of models suitable for a lifting tail, I feel as though the fuselage model receives most benefit. ——William Ying, New York City, holder of Class D outdoor fuselage model record.

This Month's Topic

Do lifting tails improve a model's flight? Does such a tail make the model difficult to adjust? What type of model is best suited for a lifting tail?

In the present field of outdoor and indoor model aircraft, many model builders are using large propellers to gain greater length of flight time. Since large propellers cause greater torque, it is desirable to use an elevator with a large area. But a large flat elevator would cause drag, and the adjustments would be quite sensitive. With the use of lifting tails the area can be decreased about 15 per cent.

Another factor is that lifting tails would create a tail load, and it is best to set the angle at zero degrees in relation to the line of thrust. Almost all types of endurance models are best suited for lifting tails, with the exception of the speed type. To secure the greatest advantage out of such tails, we must make the surface as light as possible, which in turn would shift the center of gravity forward. This is highly recommended in the average fuselage type.——John Haw, Philadelphia, Pa.

It is claimed that a lifting tail adds to the stability and to the lift of a model. Both theoretically and from actual results, it is correct to assume that a lifting tail does add to the stability of a model. It is when the stabilizer begins to lift that the trouble sets in. This is the factor that makes it somewhat difficult to adjust models with lifting tails. If the stabilizer carries no load, no trouble is had in adjustment. When a stabilizer begins to lift, it begins to lose its stabilizing qualities. The more it lifts, the less stable it becomes. In order to regain this loss in stability, it is necessary to increase the area of the stabilizer, which adds greatly to the total resistance of the model.

The only time when a model really benefits from a lifting tail is when the tail is not too large (in order to cut down the resistance as much as possible), when it carries little or no load, and when no load is put on the wing by it.——Carl Schmaedig, New York City.

In regard to performance of a model with a lifting tail, I believe the performance would not be a distinct advantage over a streamlined section, providing, of course, that the model is properly adjusted. The lifting tail does allow the wing to be moved farther forward, which in the case of outdoor commercial models may give better stability. They are trickier to adjust, however. The lifting tail would probably be best for a slower flying model.——Robert File, Columbus, O., national tow-launched glider champion.

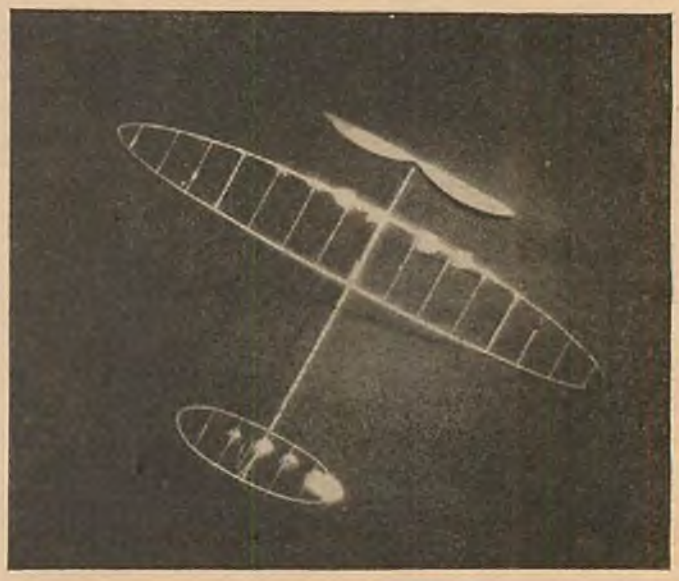
I believe that a lifting stabilizer is superior to flat surfaces in every respect. Probably the strength feature is the outstanding asset. Weight for weight, the curved surface is much stronger, not only in the air, but while it's being handled. Our indoor flying here is done in a building with a very low ceiling and numerous obstacles. We find that flat surfaces on striking girders are much more easily damaged than curved ones.

The greatest argument against lifting surfaces seems to be the question of stability. The impression has been created that lifting tails are very unstable and difficult to adjust. Personally, I have found the exact opposite to be true. On indoor ships, at least, there are no adjustment difficulties. In fact, several times I have considered using a lifting tail on *(Turn to page 95)*

Inside Stuff

Indoor flying is surging ahead in good weather and bad. This introductory article starts the Model Workshop's monthly series of expert hints and plans.

by Lawrence N. Smithline



TO many modelers a plane "oozing" around for fifteen or twenty minutes in the dusky shadows of a roof far overhead is a fascinating sight. There are still a few modelers, however, to whom indoor flying is literally a "pain in the neck." All we can say to them is that they don't know what they're missing. Indoor flying has grown steadily in recent years, and no modeler to-day can afford to pass up this fascinating sport if he wants to be up-to-date.

Indoor models are much different from outdoor planes. They are a great deal lighter, varying in weight from .012 to .12 of an ounce. They are much slower, flying at speeds ranging from one and a half to five feet per second. They have a fragile-looking beauty that is a pleasure to behold.

With indoor flying, too, the luck factor is cut down considerably. The duration of the plane's flight depends almost entirely on the ability of the flier and the merits of the ship itself. Wind and weather play no part.

Indoor flying has acquired a reputation as a winter flying sport, probably because it can be enjoyed when the cold, blustery winds render outdoor flying difficult and uncomfortable. It is interesting to note, however, that best results have always been obtained indoors in the summer, when the inside air is of even temperature and less troubled by drafts and currents.

Of the several kinds of indoor models, the most popular ones are the hand-launched stick model, generally known as a tractor; the fuselage, which of all the indoor models most resembles a real ship; the baby R.O.G., or small rise-off-ground stick model; and the indoor glider.

The tractor type is the favorite, the two larger classes being more generally built. The fuselage type, on the average, is heavier than the tractor because of the built-up body.

The N.A.A. fixes the area of the baby R.O.G. type of model as less than 30 square inches, so that this plane is not often larger than 15" in wing span and is therefore easily transported. Because of its size, it requires little effort to build. On an average, it seldom weighs more than two dimes.

When one sees a baby R.O.G. for the first time, one marvels at the size of the propeller in comparison to the wing. As a matter of fact, a 9" propeller on a model with a 12" wing is not a bit unusual.

Gliders are also divided into classes according to their wing area. They are made of solid wood and are built so that they will take the terrific strain of launching. You can imagine how much strain these models must take when you realize that some of the huskier builders sometimes throw their gliders to a height of 90 feet in order to get the duration required to win a contest.

At one time, any room about 60 feet square and 40 to 50 feet high was considered an ideal place to fly a plane, but as indoor models improved, it became necessary to have taller and taller buildings, for the planes insisted on going higher up. Three years ago, a building 90 feet high was an excellent place to fly

INDOOR MODEL RULES

Under 1936 N.A.A. rules, all indoor contest models are classified according to wing area. Area is measured as bounded by main wing outlines. Tail surfaces, not included, may be any size. On fuselage models, only the effective area—that portion not resting upon or in direct contact with the fuselage—is counted. Classifications are:

Class A—up to 30 square inches
Class B—30 to 100 square inches
Class C—100 to 150 square inches

Rise-off-ground models must have wheels that turn and landing gear that supports model on landing. Minimum wheel diameters: Class A, ½"; B, ¾"; C, 1". Floats on rise-off-water models must support model while at rest on water.

No limitations on rubber or motor-stick length; no restrictions on number or type of propellers; no weight restrictions.

TYPES

STICK—hand-launched or R.O.G. and R.O.W. Contests usually held for Class B and C hand-launched *tractors* and for Class A landing-gear type, known as *Baby R.O.G.*

FUSELAGE—R.O.G. and R.O.W. with fuselages in which maximum cross-section area must be equal to or greater than: fuselage length (without propeller) divided by 10, and result multiplied by itself, or (length÷10)². Contests usually for R.O.G. Class B and C.

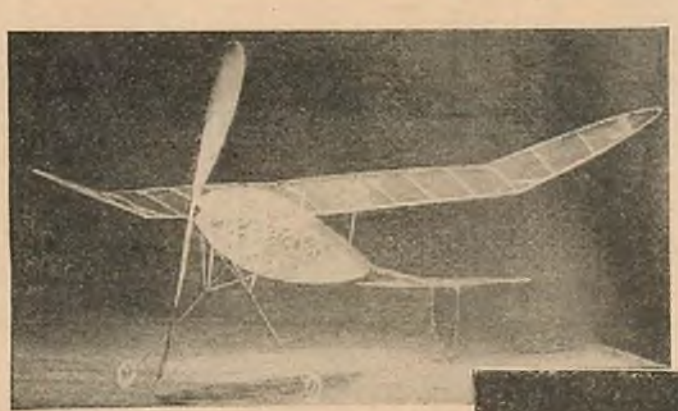
GLIDER—no restrictions; contests usually for Class A and B.

AUTOGIRO (must be supported by rotor), HELICOPTER, and ORNITHOPTER; seldom contested.

an indoor model. The 1933 National contests, at which 17 minutes was done, were held in a building of that height. The 1934 Nationals were held at Akron in the airship dock, which is close to 200 feet high, and in 1935 at St. Louis the building used was 135 feet high. Model builders complained that this building was too low in which to hold a national meet.

In spite of the fact that national contests are held in tall buildings, practically all practice flights are made in buildings from 35 to 50 feet high, in which as much as 15 minutes has been done. There are many such spaces available to modelers almost everywhere, such as school auditoriums, gymnasiums, armories, large barns, and so forth. Whereas model builders used to boast how tall their practice buildings were, they now boast of how low they are, as they have come to realize that duration is a function of the height of the building.

Duration also depends, of course, on the area of the model; the greater the area, the greater will be the time. But this holds only up to a certain point. The unofficial R.O.G. record is about 14 minutes; the unofficial tractor record is 24 minutes. Although the area of the tractor is five times the area of the R.O.G., the time done by the tractor is not even twice that of the smaller plane. This shows that time has little significance unless one also knows the area of the model and the height of the building in which the flight was made.

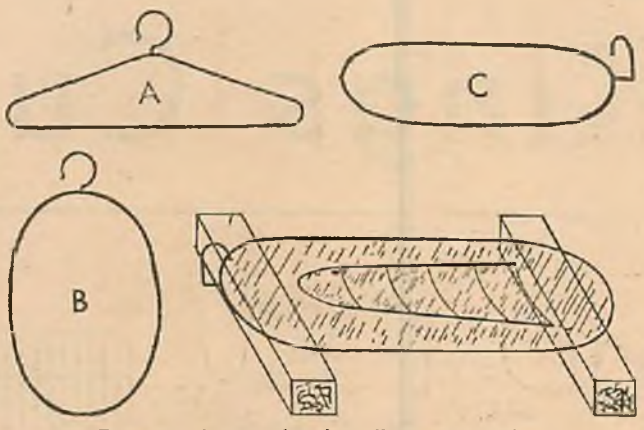


Three gleaming indoor models: left, tractor; above, fuselage with paper-strip bracing; right, baby R.O.G.

Indoor models nowadays are covered with "microfilm." In its liquid form it is a nitro-cellulose solution resembling clear dope. When poured on water it spreads over the surface, forming a thin film which is lifted off and used for wing covering.

There are several reasons for using microfilm. It is very light in weight. The thickness is much less than a human hair. Enough to cover a 150-square-inch tractor weighs .002 ounces. It is easier and faster to cover a plane with microfilm than to cover with tissue. Ships covered with film are easier to adjust and fly than a ship with tissue covering; consequently a microfilm "job" gives the beginner a better chance.

Two ounces of microfilm, enough to cover a dozen models, may be bought for about 25 cents from model companies handling indoor supplies. If you prefer to make your own solution, a good formula is as follows: 1 ounce of flexible collodion, .4 ounces of amyl acetate, .6 ounces of model cement. Add to this mixture as many drops of castor oil as needed for the degree of flexibility desired. Seven drops of castor oil mixed in 2 ounces of solution makes a good film. The solution should be kept in a light-tight bottle or can.



Forming hoops for handling microfilm.

In order to make microfilm you also need a big pan (your bathtub will do) and several hoops. These hoops can be formed from wire coat-hangers by bending the hangers into an oval or elliptical shape and curving the hook so that you can use it to lift the hoop from the water. See the steps A, B, and C in the accompanying drawing.

Fill the pan or bathtub 2 inches deep with cool water and lay the hoop on the bottom at one end. A stick fitting tightly into the width of the pan should be laid on the surface of the water just beyond the edge of the hoop. The thickness of the film can be regulated by moving the stick back and forth, increasing or decreasing the area of the water being used.

Now take a teaspoonful of solution and pour it onto the water in a steady stream, holding the spoon about a half inch above the surface. Do this carefully in order to avoid thick spots in the film, caused by the solution falling through the entire depth of the water, sticking to the bottom of the pan, and then later coming up to the surface when partly dry.

When the sheet is dry (this will take from 2 to 5 minutes and will be indicated by a slight wrinkling) it is ready to be taken off. Lift the hoop beneath the film until the wire is just above the surface of the water. Then move the hoop to one side of the pan so that the film extending beyond the hoop floats back under the wire about 1 inch. Then on that side only, allow the hoop to fall until the film edge which has gone under sticks to the sheet above. Follow this procedure until all four sides are similarly treated. Then bunch any excess to the sides of the hoop.

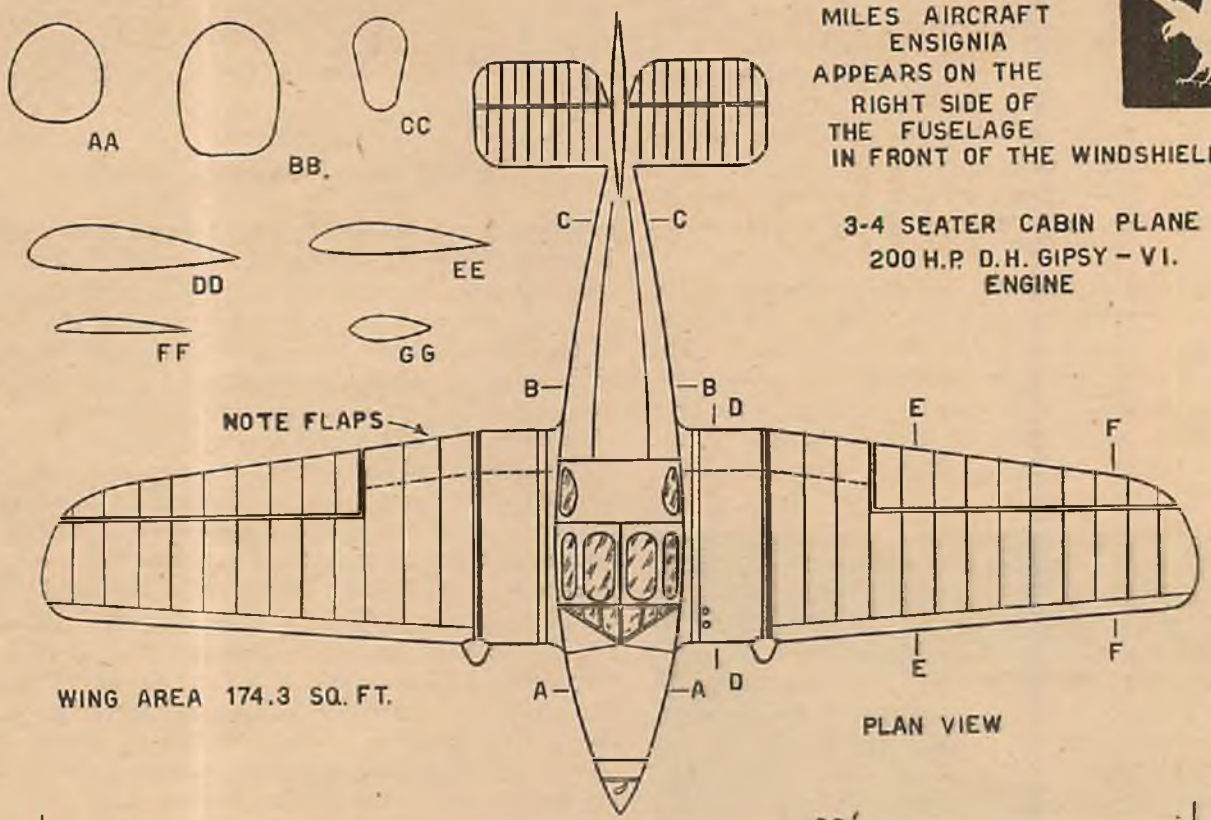
In order to lift the film off the water, raise one side of the hoop until it is perpendicular. The whole sheet will then be off the water. Set it aside until the water droplets have evaporated.

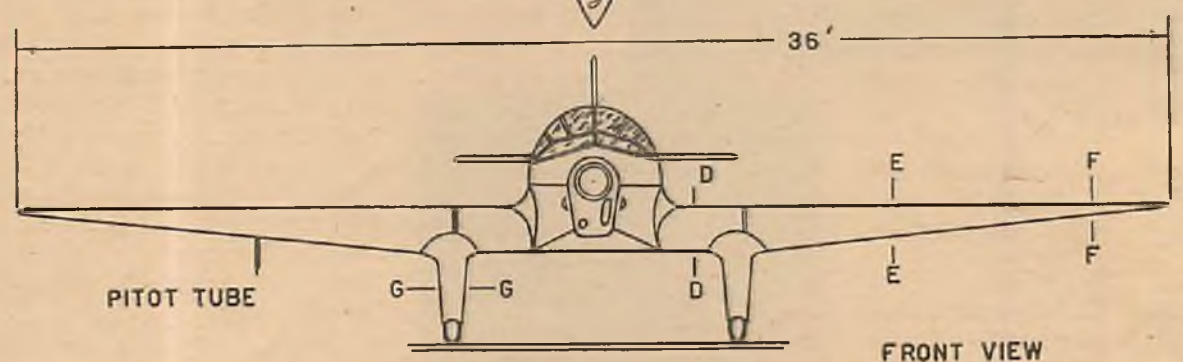
To cover with microfilm is exceedingly simple; in fact, much simpler than covering with paper. The wing is split into halves at the dihedral, and each half is covered separately by the following *(Turn to page 96)*

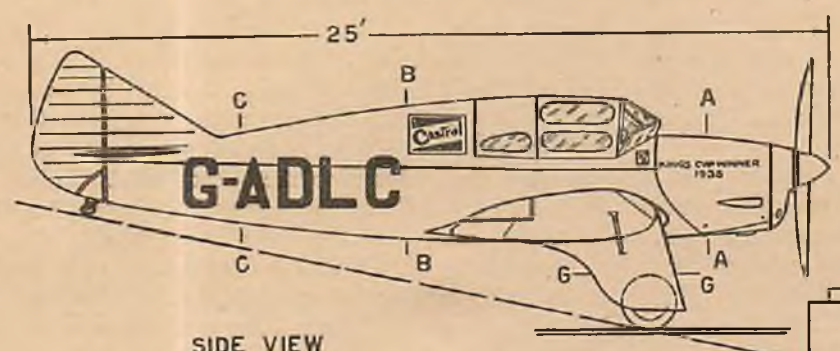
Kings Cup Winner

MILES AIRCRAFT ENSIGNIA APPEARS ON THE RIGHT SIDE OF THE FUSELAGE IN FRONT OF THE WINDSHIELD

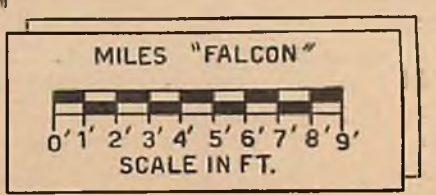
3-4 SEATER CABIN PLANE
200 H.P. D.H. GIPSY – VI. ENGINE



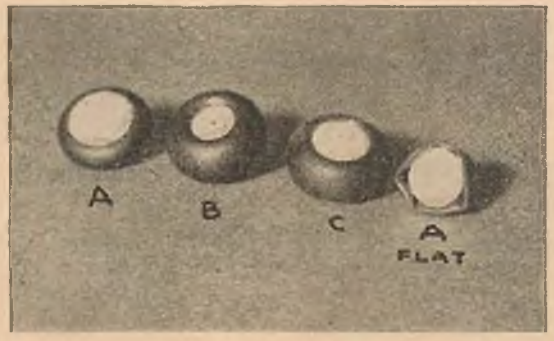




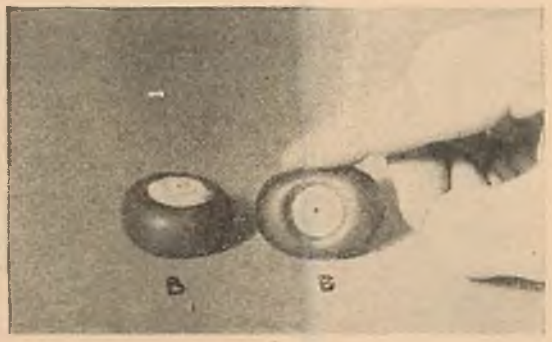
16
PLACED ON THE LEFT SIDE OF RUDDER



NICK LIMBER



Tires of three types for rubber-powered models line up like notes in a musical scale; the "A flat" at left and pressure at right prove their inflation.



Balloon Tires

Your model can wear lightweight pneumatic air wheels just like the big planes by this cheap, ingenious method.

by Alan D. Booton

SOME of you fellows like to make every part of your models, and there is the case of contest models on which you must produce all parts except the washers. What to do about tires? Well, for some years I have been making several types of air wheels for my rubber-powered models weighing up to 5 ounces, and for the heavy gas jobs, with increasing success. In this article I'll explain the procedure for turning out real pneumatic tires for rubber-powered planes.

Parts needed for these bouncing little wheels are easily obtained at any 10-cent store. They are a few penny balloons, a tube of rubber cement, and a sheet of sponge rubber. The other materials you'll find in your workshop.

There are three types of tires that you can make, although they look pretty much alike, as you can see in the photo. Here's how they're built:

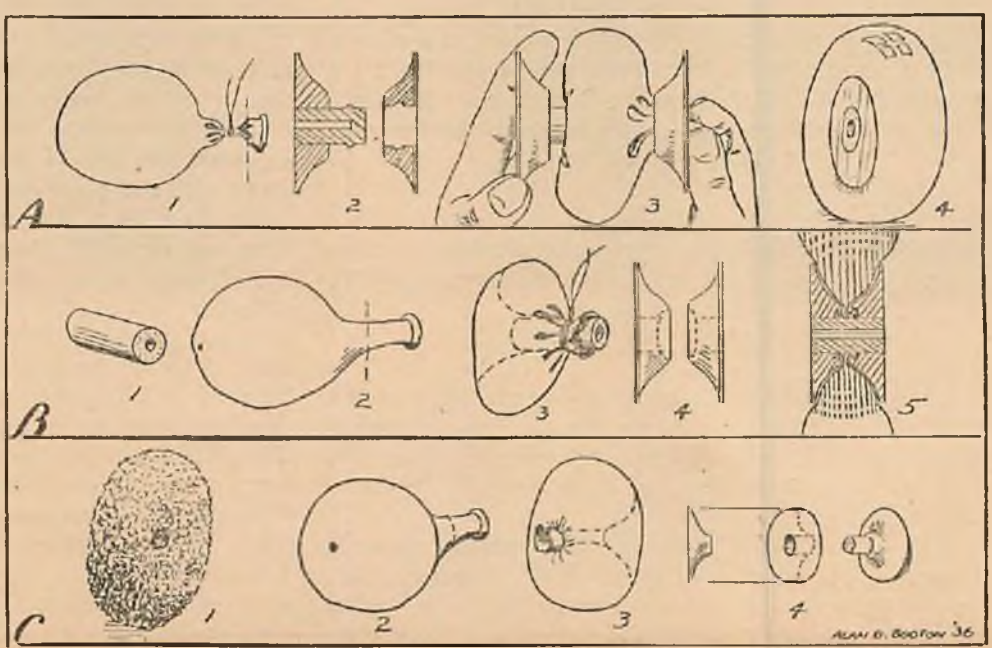
Beginning with type A in the diagram, Figure 1 is a toy balloon of approximately 1" diameter. Figure 2 shows the design of the wooden discs and hub. The hub for the 1" balloon is of ¼" diameter, with a 1/16" hole for the axle, but larger dimensions should be used with larger balloons. The discs' outer design will vary with the type of model you are building. In any case, one disc is cemented firmly on the hub, while the other is not. The hole in the "off" disc is sanded slightly larger than the hub.

Put a drop of rubber cement in the neck of the balloon and either tie a knot in the neck or wrap tightly with thread while the air in the balloon is just enough to keep the original shape. Cut the lip off the neck and insert the neck in the off disc as in Figure 3. Center the hub on the other side of the balloon and push it into the hole in the off disc. The balloon will thereupon take the shape of a tire.

It may take several tries to get the desired results. A thread cemented around the hub and a pencil furrow in the off disc hole will hold the disc on if you have trouble that way. Pluck the exposed balloon to even up the tread. Cement a hollow rounded piece lightly over the neck to achieve a finished appearance.

To prepare the axle to receive this wheel, put the proper length of tubing on it and place a drop of cement on the end of the axle. When dry, the wheel may be cemented on to the tube.

Air will stay in this type A wheel for weeks. The tire may be refilled many times before the "fit" becomes too loose. Caution should be used in selecting larger balloons for larger tires. *(Turn to page 96)*



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 the other readers. Replies by mail require return postage.

BAMBOO NOSE RING

Question: How do you fasten balsa or bamboo to the front of the fuselage longerons? D. I., Clanwilliam, Manitoba, Canada.

Answer: This question refers to the bamboo nose ring sometimes used on fuselage models. Cut notches in the ends of the longerons just large enough to receive the bamboo ring. Add a touch of cement and fasten the nosing in place by wrapping with thread. A neat job can be made by fastening the longerons inside the bamboo ring, cutting one-sided notches just large enough to bring the top of the bamboo flush with the outside edge of the balsa longerons.

GAS MODEL PLANS

Question: Where can I obtain plans for a gasoline-powered model? W. G., Adena, Ohio.

Answer: Many model companies carry plans for gas models. Kits containing all the necessary materials can usually be purchased from the company which prepares the plans. Advertisers in AIR TRAILS carry such plans and kits. Within a short time our Model Workshop will begin a series of articles on gas models which will include workable plans and instructions.

FINDING PROP FIGURES

Question: How can the propeller pitch and area be ascertained? E. B. K., Woodville, Ohio.

Answer: The pitch of a propeller is easily calculated from the dimensions of the block from which it is carved. Let's assume we intend to cut a propeller from a block 1½ x 1¾ x 12". In figuring the pitch, however, we must consider that this block will be tapered at the ends. That is, beginning 3" from each end of the block we will taper from 1½" thickness to ¾ at the tip. Now let's substitute the dimensions of our block in the formula:

$$\frac{\text{Thickness} \times 3.14 \times \text{diameter}}{\text{width}}$$

In this formula 3.14 is a constant, always having this same value. With our values substituted, the formula will be

$$\frac{\frac{3}{4} \times 3.14 \times 12}{1\frac{3}{4}}$$

which equals 16". This is the geometric pitch of the propeller, or the distance it would move forward during one revolution if it was 100 per cent efficient. However, there is about 20 per cent "slip," so the propeller actually moves forward about 13".

Pitch, as calculated from the above formula, amounts to usually 1½ times the diameter of the propeller. This has been found most efficient for models. The higher the pitch, the more slowly the propeller will revolve, and more strands of rubber will be needed to develop the necessary thrust. The area of a propeller can be calculated, but an easier way is to cut a paper pattern to the shape of the finished propeller and estimate the area by dividing the pattern into inch squares. Count the full squares, add to this the parts of incomplete squares, and the total will give you the blade area in square inches.

VALUE OF DOPE

Question: Are all models given a coat of dope, or can doping be omitted to save weight? J. A., Ottawa, Canada.

Answer: A coat of light dope does not add much weight to a model. Unless you are seeking extreme lightness, the added weight is negligible. Models can be flown satisfactorily without doped covering, but you'll find the tissue is sensitive to moisture. Flights when the air is moist, as in early morning or late evening, will be difficult with an undoped model. In warm, dry air, however, the undoped model will perform very efficiently.

BALANCE AND STABILITY

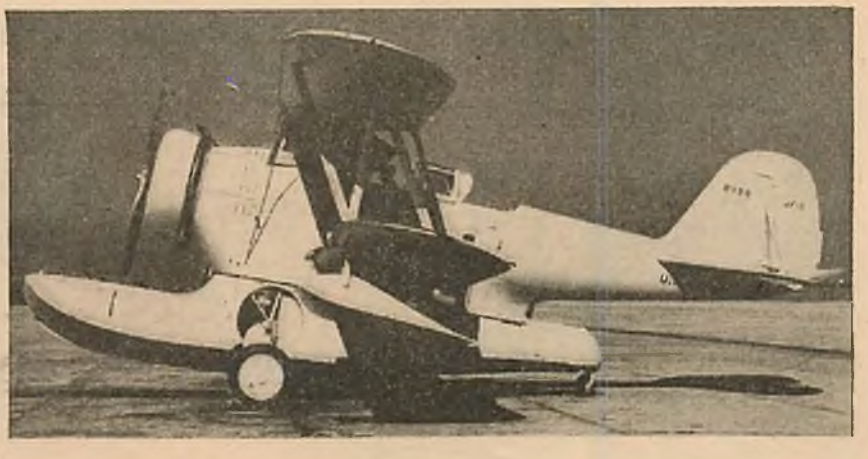
Question: How do you find the balance point of a model? In what ways can you give a model stability? J. M., Mystic, Connecticut.

Answer: A needle and thread are useful in finding the balancing point of a model. Insert the needle into the top of the fuselage, moving it back or forth until the model hangs level when suspended from the thread. This is one position of the balancing point or, in technical terms, the center of gravity. But we're interested in the up-and-down location of the balance point, in addition to its lengthwise location. To determine this location, insert the needle into the side of the fuselage and suspend the model. In this case move the needle up or down the side of the fuselage until the model balances with the wing vertical.

The location of the balance point with respect to the wing and propeller has an important bearing on stability. Usually it is placed slightly below the line of the propeller and at the center of the wing. Of course, with this set-up you'll need a tail of sufficient area. Stability in models as well as in large airplanes is the most puzzling of all problems confronting the designer. A detailed discussion is outside the scope of this answer. The best attack for this problem is for you to digest every scrap of technical information about stability. Try to analyze what takes place when your model performs some unusual maneuver. And above all, build models from reliable plans, so that you'll develop the correct sense of proportion until the time when you design your own models.

by
William
Winter

Navy Amphibian



Solid model plans for a high-performance land or sea plane.

THE navy's JF-3, latest of the Grumman amphibians, bears a striking resemblance to the old Loening "Duck." Modern design and methods, however, have made possible a highly efficient job that already has displayed a performance far above the ordinary.

The JF-3 construction, with the exception of the covering of the wings and tail control surfaces, is of aluminum alloy. The landing gear is retractable and the tail wheel is of the swiveling type. The upper wing is built in two sections joined at the center. A Hamilton Standard three-bladed propeller is used. The power plant is the Wright Cyclone developing 750 h.p. at 1700 r.p.m.

The high speed is 170 m.p.h., the rate of climb 1,400 ft. per minute, and the landing speed 63 m.p.h. The service ceiling is 20,000 ft.

The dimensions of the JF-3, noted also on the plan, are as follows: span 39 ft., length 33 ft., height 12 ft. 8 in., wing area 409 sq. ft.

The model plans are drawn to ¼" scale. When completed, it presents a striking appearance because of its somewhat unusual design and harmonious color scheme. Despite the fact that the fuselage seemingly is of intricate appearance, it is surprisingly easy to shape.

GRUMMAN JF-3

FUSELAGE

The combination fuselage and hull block is cut from one piece of soft balsa to its outside required block dimensions. Draw the outline on the side of the block and cut away the excess wood. When rounding the block in accordance with the top view of the plan, note that it is to be narrower at the top than at the bottom. To shape the block accurately, check the cross sections frequently with the templates provided for the purpose. The cut-out for the cockpits is slight, as shown on the side view. The cockpit enclosure framework consists of light wire pieces bent to shape. Sand your wooden parts as they are shaped and completed. The drag ring is cut from a separate piece of balsa 5/16" thick.

LANDING GEAR

The landing gear assembly is constructed of fine bamboo struts. The wheels are cut from sheet balsa if they are not available ready-made in the desired size and thickness. The tail wheel also is cut from sheet balsa; due to its small size, it is best mounted in an unmovable manner. In mounting the landing gear wheels, note that they "toe in."

TAIL SURFACES

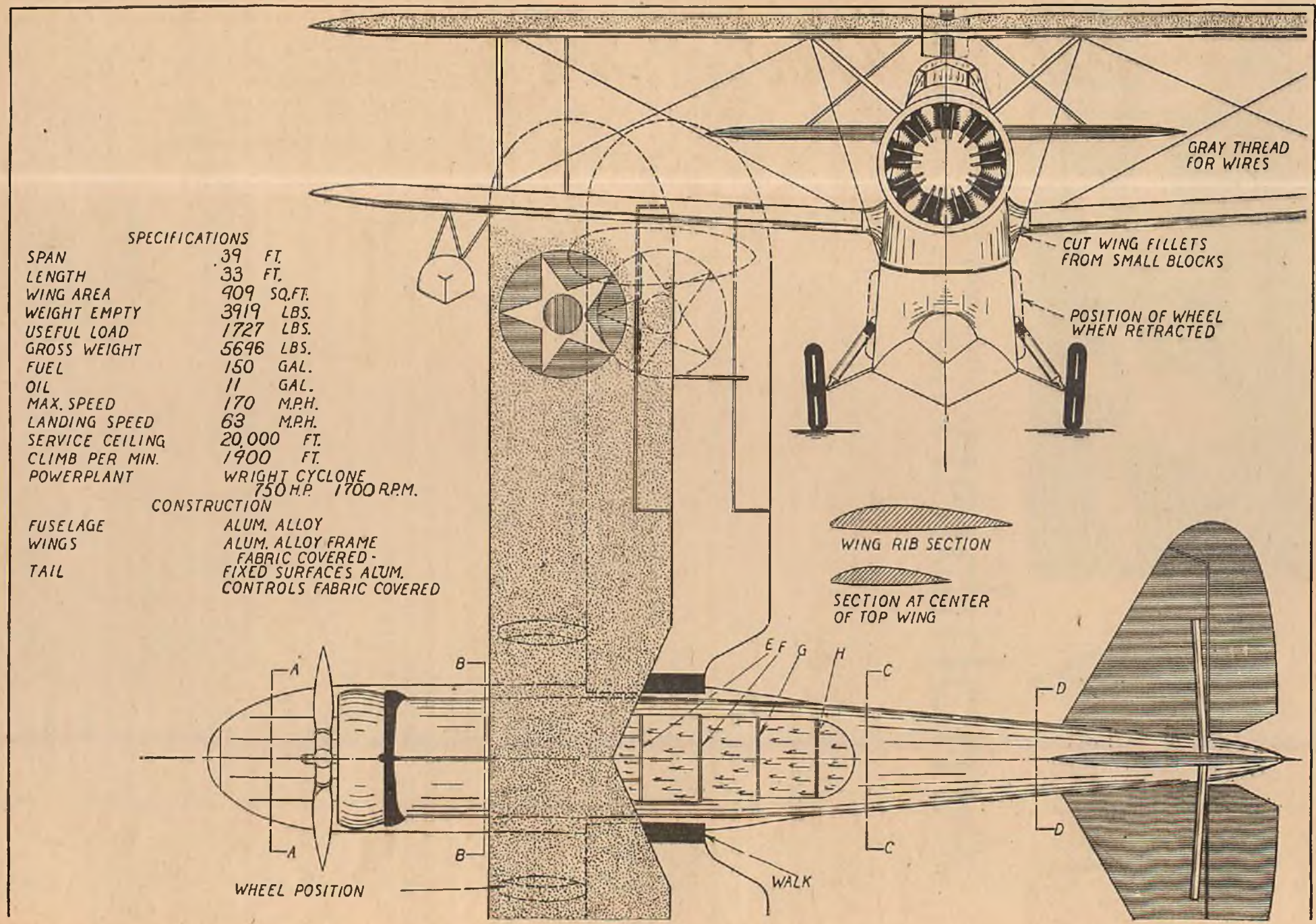
The tail surface units are all cut from 3/32" sheet balsa and shaped to a streamlined cross section. Cement the stabilizer halves and the rudder to the hull block at the positions noted. The tail bracing struts slant upward from the stabilizer to the rudder line as seen on the side view.

WINGS

The wings are cut to the required outline from 5/32" soft sheet balsa. Shape them in accordance with the wing cross section given. Near the tip, check the thickness from the front view. Note also that the top wing at the center-section cut-out is reduced in thickness. There is no dihedral in the top wing. The center-section struts as well as the remaining interplane struts are all cut and streamlined from 1/16" sheet. To assemble the wings to the model, mount the top one first by means of the center-section struts. To place the lower wing panels in position, invert the model. Using the end struts and a few thin straight pins, the operation will be simple. Check the amount of dihedral in the lower wings from the front view. The fillets necessary to the mounting of the lower wings are cut from small scrap blocks or heavy sheet, and are shaped to the required cross section by using a sliver of a double-edged razor blade. Shape the tip floats as shown and mount them in the proper finish on thin split-bamboo struts.

FINISHING

To permit a fine finish, it is desirable to coat the wood with clear varnish so that by filling the pores a smooth base will be provided for the paint. The painting is completed before any of the gray-thread wiring is installed. As stated on the plan, the main color of the ship is pearl gray. Silver will do, *(Turn to page 96)*

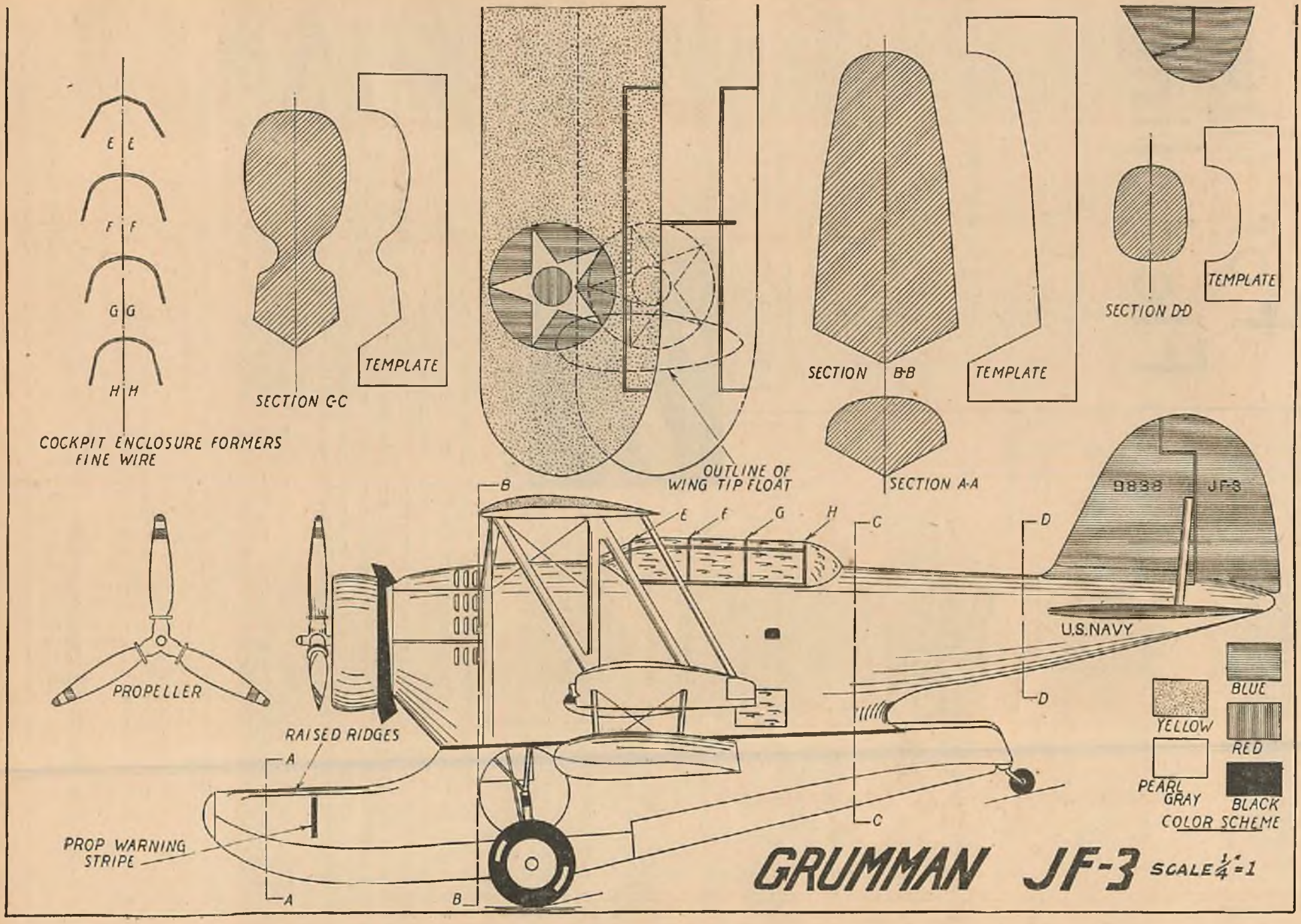


SPECIFICATIONS

SPAN	39 FT.
LENGTH	33 FT.
WING AREA	909 SQ.FT.
WEIGHT EMPTY	3919 LBS.
USEFUL LOAD	1727 LBS.
GROSS WEIGHT	5696 LBS.
FUEL	150 GAL.
OIL	11 GAL.
MAX. SPEED	170 M.P.H.
LANDING SPEED	63 M.P.H.
SERVICE CEILING	20,000 FT.
CLIMB PER MIN.	1900 FT.
POWERPLANT	WRIGHT CYCLONE 750 H.P. 1700 R.P.M.

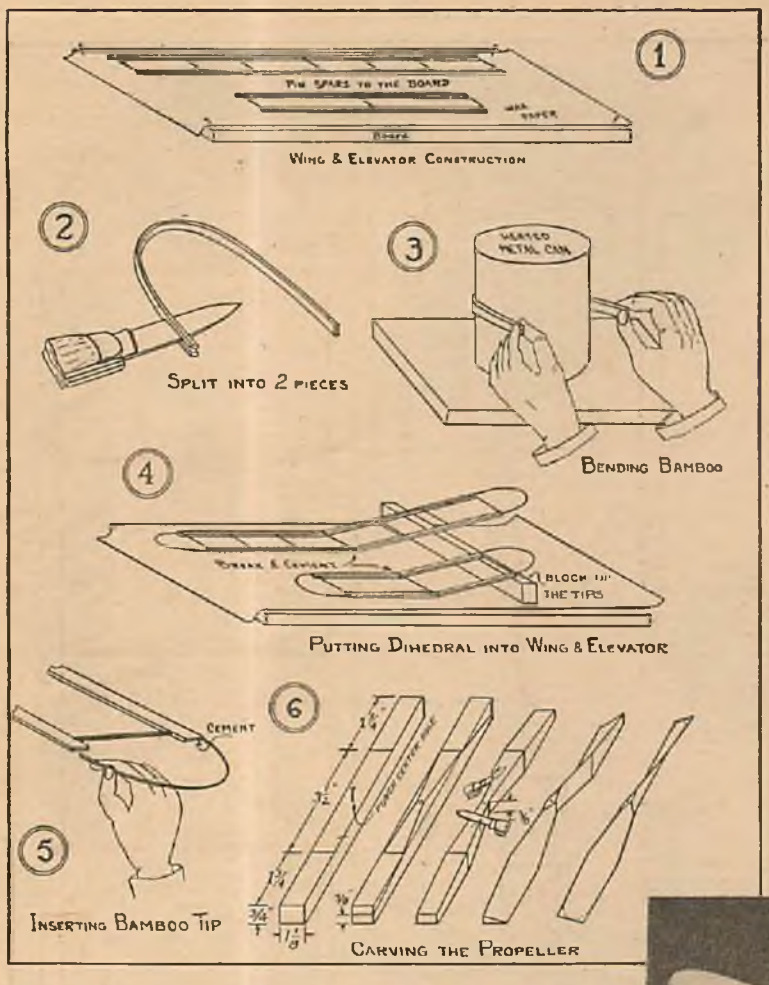
CONSTRUCTION

FUSELAGE	ALUM. ALLOY
WINGS	ALUM. ALLOY FRAME FABRIC COVERED -
TAIL	FIXED SURFACES ALUM. CONTROLS FABRIC COVERED


E E
F F
G G
H H
COCKPIT ENCLOSURE FORMERS
FINE WIRE
SECTION C-C
TEMPLATE
OUTLINE OF
WING TIP FLOAT
SECTION B-B
TEMPLATE
SECTION A-A
SECTION D-D
TEMPLATE
PROPELLER
RAISED RIDGES
PROP WARNING
STRIPE
U.S.NAVY
BLUE
YELLOW
RED
PEARL
GRAY
BLACK
COLOR SCHEME
GRUMMAN JF-3
SCALE 1/4=1

For the Fledgling

To you birds ready to take flight for the first time we recommend this staple item of model diet.



The BUG

A trim handful of flying fun.

DON'T bite off more than you can chew." You've probably heard that many times. Well, it's certainly true in model building. Don't start with intricate, complicated ships that will require a long time to build and will be difficult to get flying properly after they're finished. You're sure to become discouraged and lose patience with such a model.

The Bug is just the model to give you the right start in model airplane building. It's simple to build and just as easy to fly. Indoors or outdoors, the Bug will give you excellent flights. It doesn't look much like a real airplane, but since it flies on the same principles as its big brothers, it will teach you a great deal about aerodynamics. The experience gained from building and flying the Bug will prove to be a solid groundwork upon which to increase your model knowledge.

Suppose we start Bug-building. You'll need only a few tools: knife, sandpaper, pins, pliers, ruler, and pencil. The materials for the Bug can be obtained from any model shop, or mail-order company. Here is what you'll need: 2 balsa wing spars 1/16x¼x12"; 2 elevator spars 1/16x3/16x4"; 1 propeller block ¾x1⅛x7"; 2 fuselage pieces ⅛x⅜x15"; 1 small strip of bamboo; several inches of #12 piano wire; 1 small sheet of tissue; small bottles of banana oil and cement; and 4 feet of ⅛" flat rubber.

ELEVATOR AND WING CONSTRUCTION

This model is classified as a pusher. That is, the propeller is in the rear, pushing the model forward. The small wing or elevator flies to the front. Construction of the wing and the elevator are identical, so instructions given for one can be applied to the other.

Mark off 2" spaces on the elevator and wing spars. These are the positions for the bamboo ribs. Next pin the spars to a flat board as shown in drawing #1, remembering to cover the board with a sheet of wax paper to prevent cement from sticking to the board. The spars should be spaced 3¼" apart for the wing and 2¼" for the elevator.

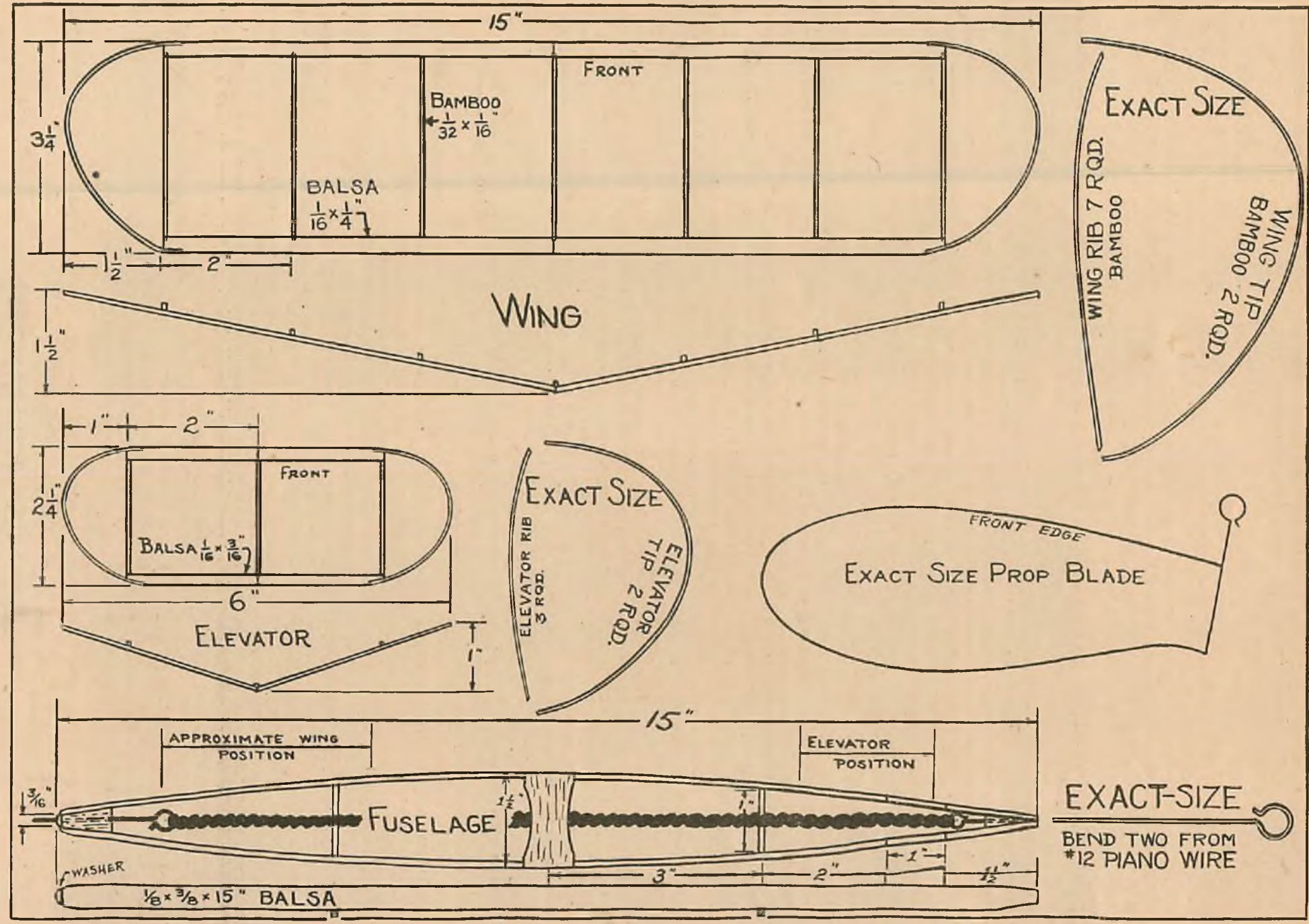
The ribs are bent to the shapes shown in the drawing. Cut a flat piece of bamboo ¼x1/16", bend it to shape, and split the 7 wing ribs from it. Bamboo can be bent by wrapping it around a heated metal can or a hot soldering iron. Likewise the elevator ribs are all split from one piece previously bent to the required shape.

Fasten the ribs to the spars by pointing the ends of the ribs with a razor and inserting them into the balsa spar, securing them with cement. Bamboo wing tips can be bent from bamboo 1/16x1/32". Split this piece into two tips when it has been bent to shape. Drawing #2 illustrates this operation. The tips are inserted into the spar ends as sketched in drawing #5.

The ends of the elevator and wing are raised 1" and 1½" respectively. Dent the elevator and wing spars with a knife or razor and then break them just enough to raise the wing tips to the required height. If you pin one side flat on the board, as shown in drawing #4, you can get practically the correct angle by blocking up the other end to twice the necessary height, or 2" for the elevator and 3" for the wing. Coat the break with cement and keep the wing in the correct position while drying.

COVERING THE WINGS

Cut a piece of tissue slightly larger than the wing. Iron out the wrinkles with a hot iron. *(Turn to page 94)*


15"
FRONT
BAMBOO
1/32 x 1/16"
BALSA
1/16 x 1/4"
3 1/4"
1/2"
2"
WING
1 1/2"
EXACT SIZE
WING RIB 7 RQD.
BAMBOO
WING TIP
BAMBOO 2 RQD.
1"
2"
FRONT
2 1/4"
BALSA 1/16 x 3/16"
6"
ELEVATOR
1"
EXACT SIZE
ELEVATOR RIB
3 RQD.
ELEVATOR
TIP 2 RQD.
FRONT EDGE
EXACT SIZE PROP BLADE
15"
APPROXIMATE WING
POSITION
ELEVATOR
POSITION
3/16"
FUSELAGE
1 1/2"
1"
WASHER
3"
2"
1"
1 1/2"
1/8 x 3/8 x 15" BALSA
EXACT-SIZE
BEND TWO FROM
#12 PIANO WIRE

THE WHITE PYGMY

(Continued from page 14)

approaching the breaking point. "Now take it easy. When you left here four months ago, you told me you were going to the Congo in hopes of finding the fabled burial ground of the elephants with its treasure of ivory."

"Yes—yes," said Stone eagerly. "But, that wasn't all. That was just part of it. I had a good tip that the ivory deposit was in the Pygmy country. I hoped to find it. But, that was only part of the job. My backer sent me over there to find and kill a man!"

Bill started. "Kill——"

"Yes." The explorer drew a deep breath. "What I'm going to tell you will sound incredible, but you'll have to believe it. It's true—I'll swear it's true. There's a madman over there in the Congo—an American by the name of Prince Pedro. He's a dwarf, not much more than three feet tall. He's made himself supreme ruler of the Itura Forest Pygmies, banded the tribes together. They almost worship him—do anything he says. He's got money—plenty of it. He's found the elephants' mortuary ground that men have been hunting for centuries. He's got a tremendous fortune in ivory. He's smuggling it out to the coast. The Belgian government's after him, too.

"He's a homicidal maniac. He's threatened my backer's life, killed his brother, has sworn to wipe out his family, because of something that happened years ago. I don't know much about that. I was commissioned to lead an expedition over there, to get this white dwarf.

"My backer's son went with me. His sole aim was to kill Prince Pedro. Heaven knows, I wish I hadn't taken him now. The Pygmies trapped us, killed all but two of my blacks, captured my backer's son. I was hit by a poisoned arrow; lost consciousness. Later, I got malaria. I don't remember much except that my two black boys carried me out to the coast.

"At Boma I was put aboard the *Emperor*. The ship's doctor worked over me; couldn't counteract the stupefying effects of the poison until days had passed. When I fully regained consciousness, I was halfway across the Atlantic.

"That's the story, Bill. I have to get back there and get there fast." Stone stood in front of Bill; breathing hard. "Hal Tuttle's due here to-day at noon, from Chicago. I wired him to go straight to your field. He knows the Congo and the Pygmies like a book. He once brought a troupe of them over to the Temple Bros. Circus. Met Prince Pedro, there in the same show."

Bill put up a hand. "You'd better sit down, Gord."

"No—no——" The explorer suddenly whipped around, his figure tense. "What's that?"

Bill said: "What?" and then he heard the far-away drone of an airplane engine. "A plane. Forget it; relax."

Stone leaned against the parapet, facing Bill. "I'm all shot. I'm afraid of my shadow. Africa does that to you. Bill, if anything should happen to me, will you go through with this thing—you and Tuttle?"

"Sure I will," said Bill soothingly. "But, nothing's going to happen to you. Say, I want to tell you something." He hitched his chair nearer Stone's and described the strange sounds that had been heard at the field and over the radio. He ended with: "Sounded like tom-toms to me. Think it ties in with this white dwarf?"

Stone looked grim. "It most certainly does. The radio business means only one thing: Prince Pedro is communicating from the Congo with his agents here by the tom-tom code. As to that drumming at night, I know about that. The dwarf's arranged for that to torment my backer—to keep him constantly aware that his life is in danger."

Bill's eyes thinned. "Then your backer must live out in my section of Long Island."

The explorer hesitated, then nodded. "Yes, he does. You'd know him if I told you his name. At that, I think I'd better tell you his name, even if I am violating a promise. You should know in case anything happens to me."

"If you think you should tell—O. K. But, perhaps you'd better wait."

And wait Gordon Stone did. For that name was never spoken——

In that second a shrill *twang* came from the north end of the terrace. Something streaked through the air. Stone gave a strangled cry, staggered back as an arrow slashed into his throat!

His legs hit the low parapet. His body arced backward, executed a gruesome somersault, seemed to hover on the very outside edge of the ledge.

Bill threw himself out of his chair, plunged wildly across the terrace, arms outstretched. He made a frantic grab just as the body slipped over the side. The tips of his fingers grazed Stone's suit—and missed.

The explorer's figure vanished. Bill leaned over the parapet, looked down. Stone's body was hurtling with the speed of a meteor toward the ground, forty stories below. And then—it was swallowed by the darkness.

IV—ATTACK

BILL straightened up, dazed. He half turned, detected something moving in the darkness at the end of the terrace. He jerked out his automatic, leveled it.

He saw a deeper shadow; saw it take form—the form of a small human. It was running away. He heard the pad of bare feet. He shot—once, twice.

There was a choking shriek. Bill heard it through the thunder of his bellowing gun. The small figure reached the end of the terrace, leaped up on the parapet. For a fleeting second the light from the living room fell across the dwarflike figure of a black-skinned man. He was crouched there, swaying on the ledge, his head twisted back. Bill saw a hideous, snarling face, receding forehead, two small cunning eyes. A Pygmy!

Then, the figure dropped over the side and out of sight. Bill fired again as the Pygmy vanished, reached the spot in a mad sprint. He saw that a slender rope had been looped around a metal brace on the side of the parapet and hung over the edge. The Pygmy was climbing down it, down the side of the building. Bill aimed his automatic, hesitated.

The small black man swayed drunkenly. He gripped the rope by one hand, pressed the other to his side. Blood was pouring from his body. He'd been hit—badly. His grip on the rope loosened; an animallike shriek came from his lips—and he fell. His body made three complete revolutions before it smashed into a step-out in the building ten stories below.

Bill watched, horrified. A roaring was in his ears—seemed to be growing stronger, deafening—not the echo from the blasts of his automatic, not the piercing screams of the dead men. No! An engine—an airplane engine!

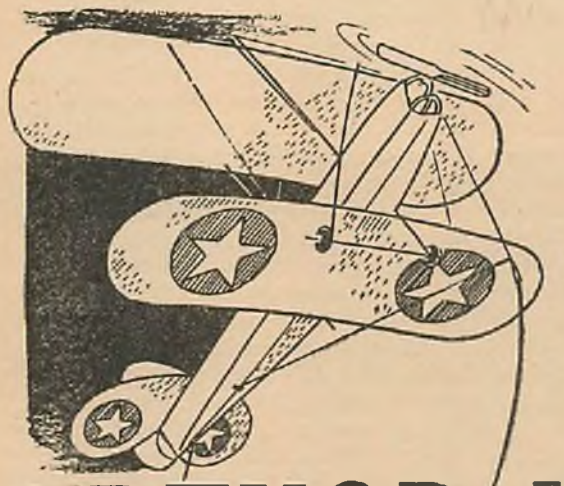
He spun around. The roar was closer, blasting. Then—he saw it. It was a biplane—hammering straight for the penthouse, dead on for the top of the building.

Ruby jets of flame stabbed from its nose. A yammering sounded above the roaring. Machine guns! Bill dived for the floor, landed with a breath-taking crash, rolled for the shelter of the parapet.

Bullets shrieked overhead. The clatter of breaking glass. The fiendish scream of the airplane engine.

Bill held his breath, waited for the plane to smash itself into the building. A hail of lead swept the penthouse. Something crashed across the pilot's forehead. His vision vanished into a whirlpool of crimson—and he knew no more.

WHEN HIS MIND began to probe back from the depths of unconsciousness, Bill again heard the sound of an engine. But it was softer, humming.



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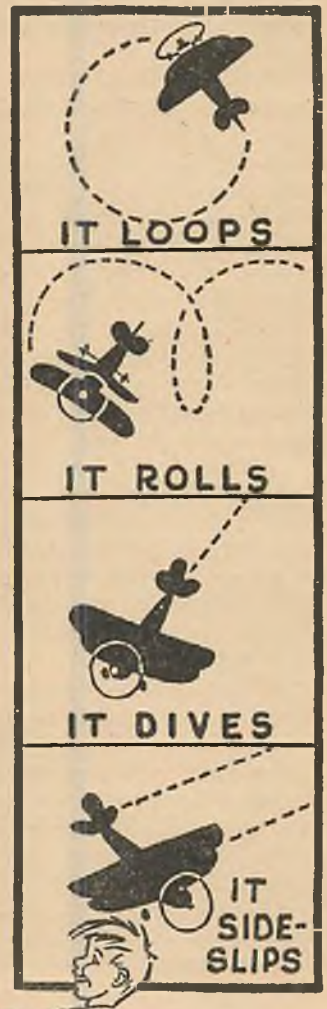

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He felt dimly that he was in motion. His eyes opened, came into focus. He was in a sitting position; some one was on either side of him. Then he saw that it was Sandy on his right, and at his left was the guard who had been in the penthouse. The guard's hands were on a steering wheel. Only then did Bill realize that he was in a rapidly moving automobile—his own roadster.

He spoke thickly: "What's this?"

Both Sandy and the guard looked at him sharply. Bill heard the guard say: "Coming out of it. Give him a whiff of that ammo, kid."

A small bottle appeared in Sandy's hand. He held it under Bill's nose. "Take a good whiff, Bill."

The flier did, and gasped. The powerful ammonia cut in, seemed to clear his aching head. He straightened up and said: "I'm all right."

The guard at the wheel said gruffly: "You're O. K., Mr. Barnes. You got a slug across the head. You've been out cold for a long time. We bandaged you up."

Bill's vision cleared. He saw that the roadster was streaking along a deserted highway. "What goes on?"

"You'd better tell us what happened out on the terrace first," said the guard.

Bill told them tersely about Stone's death; the destruction of the Pygmy assassin; the attack of the biplane. "That's all I know. How'd I get here?"

Sandy explained. The boy had happened to be looking out through the French doors at the moment when Stone had been killed by the arrow. He had tried to get out, had found the doors locked, had called the guard. They had heard the roar of Bill's automatic as they fought to batter down the door. But, before they could get out to the terrace, the biplane had come thundering in, machine guns blazing. They had barely escaped death by throwing themselves flat.

"We got outside," Sandy went on, "found you wounded in the head. Just got you inside when the plane came tearing back again, shooting. He"—the boy pointed to the guard—"said we had to get out. We carried you to the service elevator just as that ship returned.

"The apartment was a mess. We got down in the elevator to the basement. Everything was excitement—people racing around. They didn't notice us. We got you to the roadster and got going. He says we're going out to see Stone's backer."

The guard nodded. "That's the size of it, Mr. Barnes. My boss wants to see you. He detailed me to guard Mr. Stone." He shook his head ruefully. "A swell job I made of that. My boss'll fix things with the cops. I stopped and phoned him back a bit; told him what had happened. He said to bring you out. You know, that damn plane shot up the place four times before it beat it. Some one must've wanted to get you or Mr. Stone mighty bad."

Bill leaned back against the seat cushion. In retrospect, the furious burst of action seemed almost like a nightmare. He thought of Gordon Stone's tragic death. The explorer had been his friend. There wasn't any doubt who had engineered the killing—this dwarfed madman, this Prince Pedro. A cold light ignited in the famous pilot's steely blue eyes. He had promised Stone he'd go on with the job—and go on he would.

He said suddenly to the driver: "Who's your boss?"

The man shook his head. "Can't tell you. You'll have to wait. We'll be there in fifteen minutes."

Bill inspected the night-shrouded country that was streaking past and recognized landmarks. They were far out on Long Island, on the identical highway down which he and Sandy had driven earlier that night. They were heading back into the vicinity of the airport. Stone had admitted his backer lived in that region.

"I got Alphonso out safely, too," said Sandy. "The poor little guy's still scared to death. Look." He opened his coat to show Bill the Colobus monkey holding tightly to the boy, its head buried in Sandy's shirt.

Ten minutes later they passed through Huntsville, turned to the left and headed out in the direction of the exclusive Rosedale district with its millionaire estates.

Bill straightened up in his seat, his eyes alert. They zipped through open country, past the enormous grounds of the Howe estate, went on by Adam Dennison's.

Then, the roadster slowed. The driver swung right into a side road. The speed picked up again. Bill waited, peering ahead. A castlelike mansion was silhouetted against the sky. A high stone wall now flanked the road to left and right. The guard at the wheel swung the roadster into a pebbled driveway and stopped before two massive gates.

Bill recognized the estate. He said to the driver: "So it's Hans Kressel."

The driver said: "Yeah."

V—THE BACKER

IF, on the previous day, Bill had been asked what he knew about Hans Kressel, he would have said: "No one knows very much about that old guy. He's made a mystery of himself for the last eight years. Supposed to be worth millions. Made a fortune in Wall Street before the War and lived high, wide and handsome. He built a huge place over in Rosedale, and put himself on the front pages because of his wild parties. Then, eight or ten years ago, he suddenly gave up his business and retired to his estate.

"He's stayed there ever since; never comes out. No one's allowed to even see him. He built a high stone wall and hired an army of guards. Nobody seems to know why, and has given up trying to guess long ago. Probably a nut—or scared of something. He's a widower, has one son, Gustav, who was in the air force during the War. That's about the size of it."

Bill would have said *that* on the previous day. But *now*, as he sat in his roadster before the massive gates of the Kressel estate, his startled thoughts were: "Hans Kressel—Stone's backer! That means he's the one the White Pygmy's sworn to kill. And his son, Gustav Kressel, is the man who's held captive by the Pygmies! No wonder Kressel's been hiding in his estate. He's afraid of the dwarf. That's the reason for all the guards and the precautions."

The flier found his excitement mounting higher and higher. He saw two men, carrying submachine guns, come through a small door in one of the big gates and approach the roadster. The driver slipped from behind the wheel and went to meet them. They talked in low tones.

The driver came back. "Everything's O. K.," he said quietly to Bill.

The big gates opened slowly. The roadster purred forward, passed between them, swung up a curved driveway through well-kept grounds toward the house, and stopped under an ivy-covered porte-cochère. Immediately, a man stepped from the shadows and said in a hoarse whisper: "Mr. Barnes is to come inside. The other one is to remain in the car."

Bill slid past Sandy and stepped to the ground. His head began aching viciously. He said in an undertone to the boy: "I don't think I'll be long, kid. Stand by."

Sandy nodded. "O. K. I can't move, anyway. Alphonso's asleep."

Bill saw the man, who had come from the house, beckon. The flier followed him through a narrow entrance, down a long passage and up a flight of stairs, to enter a small, boxlike room.

The man nodded curtly. "Wait here. That door there will open." He pointed across the room. "When it does, go in. The master will speak to you."

The man left abruptly, and Bill waited, his eyes on the indicated door. He saw it slide noiselessly back, but no one appeared in the opening. He hesitated and then walked boldly through to find himself in a large windowless library. The door closed behind him as mysteriously as it had opened.

Bill looked around uneasily. The room was richly furnished. At one end was a large six-panel screen. He heard a movement behind it, and then a thin,


Bill dived for the door as bullets shrieked overhead. Then—the clatter of breaking glass, the fiendish scream of the airplane engine.

nervous voice said: "I am Hans Kressel. I wish to talk to you, Barnes."

Bill said: "How do you do, Mr. Kressel," and started in the direction of the screen.

He came to a startled halt when the voice blazed out angrily: "Stay where you are! Sit down there!"

The flier found a leather chair and seated himself, his eyes puzzled.

"I have been informed of what happened to Gordon Stone," said the voice. "Before his death he advised me that he was seeking your aid. Did you agree to go with him?"

"Yes."

"Are you still interested in the proposition?"

"Stone was my friend. I gave him my word I'd see it through, no matter what happened."

"Good. Will you please tell me how much Stone has revealed to you?"

Bill did.

There was a silence. Then: "You now know that my life has been threatened by this White Pygmy. Five years ago he caused the death of my only brother. Now he has my son in his power. He has sworn to annihilate every one bearing the name of Kressel because of a wrong he imagines I did him years ago. I have tried to stop him and failed. Are you prepared to leave for the Congo immediately?"

"My planes are ready to take off," Bill said. "I will leave as soon as Hal Tuttle arrives. It will be necessary to have him along. He knows the country and the natives."

"He is due this noon. As soon as he comes you will please leave. Speed is essential if my son's life is to be saved. I will pay you well, Barnes—seventy thousand and all expenses. In return, I want you to treat everything you have heard with the utmost confidence—and I want you to get my son back alive at all costs."

"I'll do my best." Bill stared at the screen and wondered why Kressel didn't show himself.

"This madman must be exterminated, Barnes. If it goes against your principles to kill him, bring him back here to face murder charges. That will——" The voice stopped abruptly as a bell tinkled.

Bill listened, heard the man lower his voice and say: "Hello." and knew he was speaking into a telephone.

The voice rose suddenly to a piercing shriek. "You say—she's *gone!*" Something crashed to the ground. The screen rocked violently and then tottered outward into the room.

Bill sprang to his feet as the screen fell flat. And then his staring eyes saw the man to whom he had been speaking. He was a dwarf!

VI—KIDNAPED

HE WAS A DWARF—a horrible travesty of a man. His head was large for his little body. His skin was drooped and wrinkled as if it fitted too loosely. He was staggering as if mortally shot. He fell to his knees.

Bill started for him, was halfway across the room when the dwarf's head came up. He saw Bill. His face became a savage mask. "Stop!" he shouted. His eyes were blazing.

The very fury in the man's voice brought Bill up short. He had thought he had been talking to Hans Kressel. But Kressel wasn't a dwarf. He remembered his photographs too well. Who was this man? Prince Pedro?

"Stay where you are!" the dwarf thundered. He was on his feet now, crouching. "You've seen me. Damn you! You've seen me!"

"Who are you?"

"I told you who I am, you fool," the dwarf spat out. "I'm Hans Kressel. Look at me and laugh! Laugh at my deformed body! I was once larger than you. Look at me and see what Pedro has done!"

"You, Hans Kressel?"

"Yes. Damn you, yes. Look! Strain your eyes. Yes, I'm Hans Kressel! Nine years ago I was six feet tall. Now look at me. Pedro did it. He made me a dwarf like himself!"

Bill's eyes were riveted on the little man's face. He suddenly saw the resemblance between the photographs of Kressel and the dwarf. It was true! The man crouched there before him was Hans Kressel—a dwarfed Hans Kressel! But, how? Why?

"I'll kill you if you ever tell any one, Barnes. You've discovered my secret. You're the only one who's seen me besides those fool doctors. I've been hiding from the world while the poison has done its awful work. Watching myself shrinking—shrinking. The doctors can't do a thing—can't stop this awful thing that Pedro injected into me."

The man sobered suddenly. The rage went from his voice. It was at once frightened, pleading. "The White Pygmy—Pedro—has struck again. He's kidnaped my granddaughter! She's the last of the Kressels. I just heard. That's what made me knock down the screen. I almost fainted."

"Kidnaped!" The emergency of the situation broke across Bill's dazed brain, brought him up, alert, anxious. "Quick! Tell me!" Everything else could wait.

Kressel pointed to the screen. "Please put it back. I can't bear to have you look at me."

Bill quickly lifted the heavy screen back into place, and the little man slipped behind it.

He began to talk immediately: "Betty is Gustav's only child. Her mother is dead. She was away at a school in the Berkshires under another name. I thought she'd be safer there. I haven't told her about what's happened to her father in Africa. Now she's gone. Pedro found out where she was. A telegram just came from him. He kidnaped her fifteen hours ago. The school officials won't miss her until morning. He's taking her back to the Congo. He boasted about everything in the telegram."

"Have you put out an alarm?"

"No use. He's well across the Atlantic now—flying. There's only one chance—and that lies with you. You have to get over to the Congo. Your job is doubly important now. You must save two lives!"

Bill's face was grim. He said: "What's Prince Pedro got against you? Tell me everything, Mr. Kressel. The more I know, the better chance I'll have."

"I suppose you're right." Kressel's voice was tired. "If I tell you, you must swear never to repeat it."

"All right."

"The White Pygmy's name is Pedro Leopold. His parents died when he was a baby. I was his father's best friend. The child was left in my care. I was to administer the fortune that had been left him. Pedro was deformed—unsightly. I wanted the money, but not the boy. I paid a woman to take him off my hands. She did—put him in a circus. He was a freak. I got control of his money, used it to make more and more. I never thought Pedro would find out. He did.

"He swore vengeance on me and all the Kressels. He managed to inoculate me with an African poison, unknown to the medical world. It produced a disease like Paget's disease, only worse. My bones softened, grew smaller. I called in the best medical minds in the country, paid them enormous fees for their services and their secrecy. They could do nothing. I stayed here. I saw no one—not even my son or my granddaughter. I watched myself grow smaller and smaller.

"I hired detectives to track Pedro down. All they could tell me was that he was in the Congo with the Pygmies. He sent me taunting notes, threatening the other members of my family. He signed himself 'White *Pygmy*.' My brother died a mysterious death. Then Gustav's wife was killed. Pedro boasted that he had murdered them. I hired Gordon Stone, sent him over to get this madman. Gustav went along, determined to himself annihilate the White Pygmy. He's gone—and now Betty.

"I know what you're thinking, Barnes: That I richly deserve this awful fate that has come over me. I *do* deserve it—but others do not. They're innocent of any wrongdoing. I'm doomed; I know it. I've done a great wrong, and I'm

paying for it. I'm asking you to go over there, not for me, but for my son, Gustav, and my eighteen-year-old granddaughter." Kressel's voice broke. "You'll still go through with it, Barnes? Even after what I've told you?"

Bill sat motionless. Hans Kressel deserved punishment for his despicable crime. But the others—— In the hands of the crazed White Pygny, Gustav and his young daughter would suffer horrible torture, mutilation and, ultimately, death. And they were innocent victims. Then, it had been an agent of the same dwarfed maniac who had murdered Gordon Stone. And that death had to be avenged.

Bill's face was grim. "I'll still go," he said.

Five minutes later he was back at the roadster, carrying a portfolio of maps and vital African information that Stone had forwarded to Kressel. The guard had vacated the steering wheel. Bill slipped behind it, started the engine, and with Sandy beside him, drove down the winding roadway. As the roadster nosed through the open gates, Bill suddenly stiffened as through the night came the eerie tom-tom of African drums.

VII—READY

AT TWELVE NOON the next day the pilots of Bill's gang were gathered together in the administration building. They sat in a semicircle around the famous flier—the tall, leathery-faced Texan, Cy Hawkins; the erudite Bostonian, Bev Bates; the carrot-topped "Red" Gleason; the youthful Sandy Sanders; the crew of the carrier-transport; the gunners of the Snorters—the whole personnel of the famous fighting squadron with the one exception of "Shorty" Hassfurther. The veteran pilot had flown to New York earlier to meet Hal Tuttle at Grand Central Station.

Bill had given out detailed flying orders, charts and maps. He had tersely explained the objective of the expedition, the necessity for speed, and the dangers involved.

"We'll leave the moment Shorty gets back with Tuttle. I want each one of you to be ready."

He looked around the circle of tense faces. His gaze jerked back to center on Sandy. The boy was wearing an immaculate white flying suit, but in the place of his flying headgear he had donned a large white pith helmet with the explanation that he'd need it in Africa. It was this helmet that held Bill's eyes. He would have sworn that he had seen it jiggle on the boy's head. He stared. The helmet rose and fell and then shook violently.

"What's wrong with you, kid?" Bill demanded. "You cold?"

The White Pygmy's biplanes.

Sandy's face was flushed. He blinked his eyes rapidly, licked his lips, and, holding his head strangely erect, said: "Yeah. I got a sort of chill, I guess. Feel sort of shaky."

The helmet again shimmied, heaved and slid over the boy's right ear. Sandy grinned weakly. "Got the hiccups now," he said. He lifted a hand and moved the helmet back into place.

Bill's eyes thinned. "If you're sick, you stay at home. You'd better go over to the doc and get checked up. You look pale. There's no telling what you might have caught from that monkey you've been dragging around. Did you phone the zoo to come and get that animal?"

Sandy shot an embarrassed glance around the room. All eyes were centered on him. "You mean Alphonso, Bill?"

"I mean Alphonso."

"Well, you—you see, the line was kinda busy. But, don't worry, I've got Alphonso in a safe place."

"See that you have," Bill said. "He did enough damage this morning, pouring the coffee into the electric fan."

Sandy's helmet began again to dance violently. It slipped from side to side, up and down, rocking and swaying.

"What——" Bill began.

Without warning, the pith helmet rose from the boy's head, arched through the air, landed on the floor, crossed it in three strange bounds and, with a prodigious leap, came to rest on Bill's desk.

A moan issued from Sandy.

Bill clamped both hands down on the helmet, then seizing the brim, lifted the hat.

Underneath was Alphonso, the monkey.

The animal had a tiny flying helmet of white cloth strapped around its head and a pair of miniature goggles over its eyes. It began to chatter wildly.

Sandy said miserably: "Good golly, he——"

Bill looked at him severely. "I suppose you thought you'd smuggle him aboard the plane and take him with you."

Sandy approached the desk and picked up his helmet. "Well, yeah. I fixed up the helmet and goggles so he wouldn't get airsick. Aw, let me take little ol' Alphonso along, Bill. He'll make a swell mascot. And, anyway, we really oughta take him to Africa. That's his real home. The little guy wouldn't be happy in an old zoo."

Bill was silent, his expression thoughtful. He said finally: "I guess you're right at that, kid. O. K., he can go along. But, remember, he's turned loose over there and doesn't come back."

"Sure." Sandy's eyes were shining. "You hear that, Alphonso?"

The monkey leaped to the boy's shoulder and, after a quick scrutiny of Sandy's hair, selected one strand and jerked it out by the roots.

Sandy's yelp of pain was drowned by Red Gleason's yell: "I never knew you had a brother, Sandy."

"It's obvious now," drawled Cy. "The resemblance is remarkable."

Bill tried to suppress a smile. "Clear out, all of you," he said gruffly.

BILL went to his bungalow, carefully dressed for the long flight, and then, carrying a small bag, strode toward the apron. Lined up on the concrete strip in front of the semicircle of hangars were the planes of the squadron, their lacquered surfaces shimmering under the hot noonday sun. The crews were standing by, ready and eager for the getaway signal.

Bill made a short inspection of the four low-winged Snorters; passed on to his own shining Silver Lancer. His eyes glowed with pride as they swept over the high-speed monoplane. He tossed his bag into the forward cockpit, called to Martin, the head mechanic, and when the man hurried up said: "You've personally checked every ship?"

"Yes, sir; three times. Everything's ready."

"Good. We take off as soon as Hassfurther and Tuttle get here." Bill walked on to the last plane in the line—the monster carrier-transport, the BT-4.

The crew, who had been lounging in the shadow of the widespread wing, sprang to their feet. Bill went up the gangway and through the port door in the fuselage.

In the capacious hangar which occupied the whole midship section of the fuselage, was Sandy's little fighting machine, the Eaglet. It hung suspended by its landing gear from an overhead girder, and was locked rigidly into place ready to be launched in mid-air.

Sandy came running down the narrow catwalk. "Hey, Bill," he said jubilantly. "Look. Alphonso's taken to the Eaglet already." He pointed.

In the dim light Bill made out the form of the monkey, hanging upside down, its tail wrapped around the hook-on apparatus in the Eaglet's gull wing. Alphonso was placidly devouring a banana.

Bill frowned. "You'd better keep him chained up, peewee. There's no telling what he might do."

Suddenly, from outside came the voice of some one shouting his name. Bill whipped around, started for the door, and saw Tony Lamport racing madly toward the transport.

The radio operator was excited. "Bill! Shorty's on the phone. Something's happened in town!"

Something *had* happened. Bill learned that after he had sprinted to the administration building and picked up the telephone. He heard Shorty blurt out: "Hal Tuttle wasn't on the train! I located his compartment. It was empty. The bed was saturated with blood, and half buried in the pillow was an arrow!"

VIII—ARRIVAL

BILL'S FINGERS tightened on the receiver. Gordon Stone—and now Hal Tuttle! The White Pygmy had struck again.

"You been able to learn *anything* about him?"

"No one saw him after he turned in last night." Shorty's voice hurried on. "He left word not to be awakened for breakfast."

"The police been notified?"

"Station master's calling them now."

"Get out of there and head back here—fast. There's nothing you can do. If you stay you'll be held by the cops for questioning. We have to leave."

"Right."

Bill hung up the receiver. The news

had been stunning. But no matter what had happened to the veteran explorer, the expedition had to go through. Time was vitally important. The odds against success had been great, but now they were increased a hundredfold. Bill had counted heavily on Tuttle's expert knowledge of the Itura Forest and the treacherous natives. It was now too late to find and enlist the services of another similarly experienced man.

Bill spent an anxious half hour pacing the radio room, waiting for Shorty's arrival. Contact was made with the veteran pilot constantly. He had managed to slip away from Grand Central Station undetected, get to his plane in the East River. And he was heading under full throttle for the home field.

"He'll be here in five minutes," Tony reported.

Bill said abruptly: "Get Martin. We take off in ten minutes."

Bill went outside. Every minute dragged. The nervous tension increased as he searched the distant sky for the first sight of Shorty's Snorter. The engines of the line-up planes were all roaring as white-jumpered mechanics scurried around, testing for the last time.

Bill saw a dot. Then, ten seconds later, another. They grew larger. They sprouted wings. Neither of them was the awaited Snorter. They were biplanes!

Bill ran to his Lancer, pulled on his flying helmet. He said to Martin: "Something's wrong."

The two planes were racing nearer. Martin had run for binoculars, came back, handed them to Bill. The flier jammed the glasses to his eyes, adjusted the set screw. The distant planes leaped into close-up perspective. The first ship was an old-type Benson trainer. It was being rapidly overtaken by the second—a small, fast streamlined biplane. At that moment, as Bill watched, white threads stabbed from the nose of the second biplane. It had opened fire!

Bill bellowed: "I'm taking off," tossed the glasses to Martin, threw himself up into the front cockpit of the Lancer.

The second plane was closing in. The first one was now diving wildly, heading for the field. Bill's hand froze on the throttle. He suddenly saw a third plane come diving out of a thin layer of clouds far above. He recognized the design instantly—a Snorter. Shorty!

The Snorter plunged past the other two, climbed abruptly back in a shrieking zoom. It flattened out, whirled on a wing tip, charged in on the second ship—and opened fire.

The first biplane continued its headlong dive. The second came steeply up on its nose, came over in a fast Immelmann. Shorty followed, his guns blasting.

The strange battle was over almost before it had begun. The Snorter was glued to the second biplane's tail. Its guns were yammering. A sheet of flame suddenly burst from the biplane. There was a dull explosion. The entire ship disintegrated in a giant puff of fire and black smoke.

Bill waited. The other biplane, the Benson, was close to the ground to the south of the field. It leveled off, came roaring across the far border of the airport, barely clearing the fence. Abruptly, its engine died. The plane's course was erratic. It dipped, leveled off. The wheels flicked to the ground. The Benson bounced, staggered, dropped down again. The left wing dipped. Its tip gouged into the earth. The Benson was slung around. There was a sharp, crackling sound. The tail section whipped skyward. The propeller dug into the ground—and the biplane turned turtle.

Bill bellowed: "Ambulance!" and leaped from his plane. Before his feet hit the concrete the white ambulance had spurted from its building and was racing across the field. Bill tore down the apron, leaped on the side of the crash car as it came out of the garage. They hurtled toward the wreckage, the fire engine following.

The crash car came to a shuddering stop. Bill leaped from the running

The gruesome message sped, without a pause, in swift relay——

board. He saw a red-bearded man scrambling out of the wreckage, swearing violently.

It was Hal Tuttle!

HAL TUTTLE had lived sixty-two years, forty-five of them following the danger trails of the world as an adventurer and explorer. His bright-red hair and red beard were known in the badlands of Australia, in the mountains of India, and in the steaming forests of equatorial Africa, as were his fiery temper, his explosive speech, and his evil-smelling cheroots. He had won for himself wealth and renown.

Early in 1936 he had retired to a small farm in the Middle West with the mistaken intention of spending his remaining years in peace and quiet. But, after three months of inactivity he had more than welcomed Gordon Stone's request.

Time and time again, in the past, his miraculous luck had saved him from death and injury. It was only that luck which enabled him to step out of his shattered Benson biplane unharmed.

He was still spluttering imprecations as Bill hurried him back to the administration building.

"We're all ready to leave," Bill said quickly. "You've heard about Stone's murder?" And, when he hadn't, Bill told him the bare details.

Tuttle's china-blue eyes stared at the flier. His mouth worked. He said quietly, in contrast to his former blustering: "They'll pay for that."

Bill plied him with questions. He learned that at six o'clock that morning two Pygmies had entered Tuttle's compartment on the train and attacked him. He had beaten them off, severely injuring one. The fight had continued outside, down the corridor to the vestibule at the end of the coach. The outside door had been open, and when the train had suddenly rounded a sharp turn, the three fighting men had been pitched out.

Tuttle had been knocked unconscious, hadn't come to his senses until eleven o'clock. He had found no trace of the Pygmies. He had then crossed open country, had come to a deserted airport. He had instantly commandeered a biplane and, using his meager amount of flying knowledge, had managed to get it into the air and headed for the Long Island field. He had been pursued by another plane, and then the attack had occurred. He swore that the attacker had been a small black man.

Shorty Hassfurther had corroborated this statement. It had been the sight of the black pilot that had determined Shorty to attack.

An extra hour sped by before Hal Tuttle was installed in the rear cockpit of the Lancer. Bill called his pilots together for last-minute instructions. All engines had been throttled down.

Bill's face was flushed. "All right, gang. We're off. Hold formation. Keep radio contact." He stopped suddenly, held up a hand.

Over the noise of the idling engines and the swish of the propellers came the now-familiar throbbing sound—the sound of African drums. But the rhythm was different. Bill listened intently, his fingers unconsciously tapping on the metallic surface of the Lancer's wing, keeping time to the savage drumming.

"Dash—dot—dot—dot—— Morse

code!" Shorty shouted. "It's Morse code! Listen!"

"Yes," whispered Bill.

The group stood silent, strained to catch the message that was shuddering through the hot skies:

DEATH IS WAITING IN THE ITURA FOREST—— DEATH IS WAITING IN THE ITURA FOREST.

IX—AFRICA

IN THE Itura Forest, far in the depths of the Belgian Congo, three Pygmies crouched in a thicket on the west bank of the coffee-colored Ataka River. The sun had dropped below the giant trees and the sky had turned saffron. In the tangle of lush vegetation that packed the banks of the river, the temperature hovered at one hundred and two degrees wet heat. A pall of silence lay over the matted wilderness, broken only by the distant barking of an infuriated baboon and the shrill screaming of monkeys.

The three little men crouched on their haunches without movement. Their skin was deep-brown; their arms were long, their legs short. Their foreheads receded and their noses were flat. They were of the Bambut Pygmy tribe and each was under four feet in height. Two of them were armed with poison-tipped elephant spears. The third gripped a small bow fitted with a heavily barbed arrow. The leader had a small wooden whistle slung around his neck by a leather thong. Except for brief loin cloths, they were entirely naked.

They had been waiting for eight hours when the leader suddenly raised a hand, the forefinger pointing toward the west. He moved forward to peer through the thick screen of interlaced vines. From the distance came a faint whisper of sound. It grew stronger. The Pygmy stared into the western sky over the tangle of greenery and finally discerned a formation of six birdlike shapes. He waited until there could be no mistake, then put his whistle to his lips and blew three shrill blasts.

The sound cut through the still air like a knife. It had scarcely faded when from the immediate vicinity came the high-pitched thudding of a native code drum. *Tum-tum-tumm-tummmm-tum-tum-tummmmm.*

The drumming blended into a thunderous roll and, suddenly, stopped. Then far, far up the Ataka River to the east came the sound of another drum, almost an echo. *Tum-tum-tumm-tummmm-tum-tum-tummmmm.*

The noise reached across the feverish jungle wastes, pulsed up the river. Another drum took it up. And another, and another. *Tum-tum-tumm-tummmm-tum-tum-tummmmm.*

The message sped in swift relay, without a pause. It followed the course of the winding river, racing from drummer to drummer. It swept along the high banks, passed the foaming rapids; it sounded above the roar of Devil Falls where the Ataka River throws its waters over a hundred feet of perpendicular rock.

It cut through the mist-laden air, probed northward, vibrated over a high barricade of sharpened tree trunks surrounding a native village, crossed a clearing where groups of Pygmies were squatted, filtered past beehive huts and entered a low, palatial house.

Tum-tum-tumm-tummmm-tum-tum-tummmmm. It passed down a corridor, thrummed across a lavishly furnished room to the far end—and it reached the ears of a white dwarf who was seated on a solid ivory throne.

Prince Pedro was dressed in a tailored sky-blue tunic of light drill with enormous silver wings embroidered over his left breast pocket. His breeches were of sky-blue whipcord and his short legs were incased in knee-high black boots. Amber-tinted goggles were pushed back over a lightweight flying helmet on his head.

He was half drunk on native banana beer. He held a gold-incrusted goblet on the arm of his throne and listened to the drumming. *Tum-tum-tumm-tummmm-tum-tum-tummmmm.*

"The American airman has arrived," he said. "You hear that, Tambu? You hear? The American airman has come to meet death in the Itura Forest."

On the steps of the dais below the throne was an old Bambut Pygmy. He was dressed in a Belgian officer's tunic with a Sam Browne belt. He wore khaki shorts and his legs and feet were bare. His intelligent face was heavily wrinkled and his head was shaved perfectly bald, with the scalp greased to a shining surface. Around his neck, held by a chain of interlocked safety pins, was a small greasy bag containing magic charms. He was Tambu, the chief medicine man.

He looked up at the white dwarf gravely. "I hear, O chief," he said quietly in English. "It is bad news."

Far below stretched the steaming jungle.

Pedro scoffed. "What can this mighty Barnes do? Nothing! Others have tried and died. They'll never guess where we are hidden, Tambu. They cannot see it from the air and if they come within miles of us through the forest they will be massacred. I'll let Barnes expend his energies and then I will capture and kill him. He deserves to die. He is working for a Kressel."

"But, chief, they may see you flying your great bird. They may watch and see where it alights—and then they will know."

The white dwarf reached down, picked up a crockery jug and filled his goblet to the top with foaming beer. He drank deeply, wiped the froth from his lips and said: "The damn Belgians have had planes out for weeks searching for me—and yet didn't I fly my bird this very afternoon? Didn't I make a long flight up to Lake Lemar where the transatlantic airplane awaited with the girl aboard? Didn't I have her placed in my bird and bring her back here? No one saw me—and no one will see me.

"The Itura Forest is a big place, Tambu, and it is a blanket of greenery from the air. It is hard to see a small airplane painted so that it blends with the forest, especially if it flies low. And it is difficult to hear the muffled engine of my plane. I take great care that I shall not be seen or heard, Tambu."

Pedro emptied the goblet in one greedy gulp and filled it again.

The medicine man was worried. "It is what the Belgians are doing that disturbs me, O chief. They have been dropping bombs in the forest, terrifying our people. They have been shouting warnings from their birds with great voices. Our people are afraid. It is causing unrest——"

The white dwarf, with a quick movement, threw the contents of his beer goblet into the old man's face. "That is treason, Tambu," he said savagely. "You'll die a million deaths if you plot against me."

The medicine man cringed down on the steps. "I but warn you, O chief. I am medicine man. I learn what the people are thinking. I do my best to quiet them. I tell you these things only because of my loyalty. It is these white people you hold captive who are causing the trouble. Why do you not release them—or kill them quickly and take their bodies to the outside? Then, perhaps, our enemies will leave us alone."

Pedro hunched forward on the throne. "I now have the last of the hated Kressels in my power. I cannot turn them loose. Neither can I have them speedily killed. They must suffer and die slowly.

I want to watch their sufferings. It will be a recompense for the great wrong that was done me."

His eyes glowed with a red light. "You, Tambu, will go forth and inform all the tribesmen that the hated big men are coming. Tell them to be ready for a blood feast. Tell them that they soon will have victims to torture. Tell them that the day of triumph for the little people approaches. All they want is a taste of blood—and they will have plenty when the Barnes expedition heads out from Durbat on Lake Albert."

The medicine man bowed his head. "I will carry out your orders, O chief. I will remind them of your great magic and I will stir up the hate of the big men. But there is one tribe, the Kola, far to the south. It is there where the restlessness is most serious. They have seen the other great birds in the air and they wonder why their white wizard fails to send his bird to drive them away. Bombs have been dropped and have killed many people. To-morrow they celebrate the feast of the sun god. You have in the past always flown over their gathering. They look for your coming. If you fail to fly your bird above them, there will be a revolt."

"Revolt!" The dwarf went white with rage. "The fools! Don't they realize that I have saved them from slavery and death at the hands of the big men—that they are again a free people to live as they want to live. I am all powerful! I rule the Itura Forest!" He leaned back in his throne. His voice grew calmer. "Very well, Tambu. See that the Belgian airman we hold prisoner here is taken to the Kola tribe for their human sacrifice. Tell them that their white wizard will, as always, come in his great bird and fly over their feast."

"But, if the enemy sees your bird—what then?"

"They will not see. I'll make sure of that. Until then we will remain quietly here and await word from my spies in Durbat. They will report the movements of the big men there. Bill Barnes will never find our secret headquarters, Tambu—until he is brought here a prisoner, to be killed."

The white dwarf stood up. "Come with me. I will show you our latest captive. She is pretty and young. She will last long under my slow torture, Tambu. She is the last of the Kressels. My work is almost completed. Her young body is pulsing with the blood of that accursed family. And that blood will flow and flow until it runs dry. Then, will I rest—— Come, Tambu."

X—LANDING

LAKE ALBERT was shadowed with rapidly approaching night when the Barnes fleet came to rest in the harbor of Durbat after a fast, uneventful flight. Sandy's Eaglet had been released in mid-air from its berth aboard the transport and lay anchored alongside the sleek Silver Lancer.

Belgian officials, informed by radio, were on hand to greet the American airmen and immediately escorted Bill and Hal Tuttle into the district commissioner's office for a hurried conference.

During the long hours of the ocean flight, Bill had discussed the situation in detail with the grizzled old explorer who had ridden with him in the Lancer. Bill had been worried then, but now, as he gazed around the table at the six grave faces of the Belgian officials and heard the district commissioner's account, his worries increased.

"It's growing worse daily," the district commissioner said. "Prince Pedro has united all the Pygmy tribes under his iron rule. He is absolute dictator and has set up an independent state. Our officials at outlying posts have been slaughtered and their residences looted and burned. Missionaries have been murdered. The white dwarf has bred in the Pygmies an intense hatred of all

other people. It is now almost certain death to venture even into the fringe of the Itura Forest. I have ordered all big-game expeditions stopped at the border.

"Directly we learned of the disaster befalling the Stone expedition and the capture of the American, we made an attempt to rescue him. But not one of our men returned. I am afraid any hope for him is now gone.

"I have been trying to make the home office see the seriousness of the situation here, but red tape prohibits any fast action. I have had only three planes at my command. They have been constantly in the air in search of the white dwarf. We know he has a plane. It has been seen a number of times but always eludes pursuit and vanishes into the wilderness. We cannot determine where he lands or where he hides his ship. There are few, if any, landing places in the forest. I have been trying to stir up the natives against him. Bombs have been dropped. My pilots have broadcasted in the native tongue through amplifiers telling the Pygmies of disaster if the allegiance to this madman continues."

The commissioner's shoulders dropped. "That's what we are facing, Barnes. I now have two planes left. One of the ships cracked up in the forest. The two airmen were captured. Later, we found one. He had been tied to a stake, covered with native honey and left for the ants to devour. They had picked his bones clean. As to the fate of the other pilot, we can only guess.

"Your arrival with your famed squadron and with Monsieur Tuttle has raised my hopes. But, even so, I am frankly pessimistic. I am afraid there is little chance for recovering either of the captives alive, unless you can get to them within the next few days."

Bill said: "Can you describe the dwarf's plane to me?

"Not very completely," the commissioner said. "The few times it has been seen, the distances have been great. It is apparently an exceptionally small biplane—and fast. That is about all we know."

A map had been unrolled on the table. Hal Tuttle and the Belgians studied it, and finally the explorer drew a penciled circle around a portion of the Itura Forest.

"The dwarf's headquarters is probably somewhere in that circle, Bill," said Tuttle. "That's the nearest we can guess. Somewhere in the vicinity of Devil Falls. There's only one possible landing place nearer than here and that's up here." He indicated a tributary of the Ataka River, far above the falls.

"One or two planes could possibly land at this point. I propose that we organize two expeditions and fly them to the mouth of this Yoko River. Then, the two parties could start out from this point and work their way overland toward Devil Falls. It would save at least ten days of hard going."

Bill agreed. "I can carry a big load in my transport. Make any number of necessary trips." He frowned. "But Prince Pedro must hide his plane somewhere. If we could only find the place."

"Precisely," said the commissioner dryly. "If we could only find it."

The men hovered over the map again discussing the details of the proposed expeditions. Bill's face was haggard and lined from the long, exhausting flight. He had ordered the rest of his men to retire and get a good night's sleep. The situation confronting him seemed hopeless. Yet, somehow, he had to find Prince Pedro. Somehow he had to get to Gustav and Betty Kressel. He thought of his promise to his friend, the murdered Gordon Stone, and his jaw muscles tightened.

"I'll establish a constant patrol of the forest during the daylight hours, beginning at dawn to-morrow. I'll make my base here until we get established at the Yoko River. Perhaps we will find some clue as to the whereabouts of the dwarf's landing place."

Tuttle nodded. "Good. When the expeditions leave the Yoko River they'll carry radio equipment and keep in communication with your planes." He stood up. "I suggest, gentlemen, that we get a little rest now and begin intensive work in the morning."

The meeting broke up. Bill was taken to the commissioner's residence, where he was to be quartered. He entered his bedroom, sat down heavily in a chair before an open window. As he bent down to unlace a boot, something hissed past his shoulder. He looked up, startled, and saw an arrow buried in the upholstery of the chair.

He jerked it free. Around the shaft was bound a slip of paper. Bill unwound it and read the bold handwriting:

> You were warned once. This is the second time. There will be no third. Remember Gordon Stone's destruction. Death is waiting in the Itura Forest.
>
> The White Pygmy.

XI—PATROL

DAWN was showing in the east when the first of the three detonations shook the port of Durbat. The concussion brought Sandy bolt upright in his bed, his senses still drugged from sleep. The noise came again like a smothered thunderclap. The building trembled; the window glass rattled.

Alphonso, the monkey, who had been curled up at the foot of the bed, let out a shrill cry, threw the covers over his head and lay whimpering.

Sandy dressed quickly. A third muffled boom sounded.

As the boy ran for the door, Alphonso leaped from the bed, landed on Sandy's shoulder and hung on. The streets were filling with people when Sandy emerged. Wild-eyed blacks ran moaning in terror. Others were shouting "Earthquake!" and dragging belongings from houses. A whistle from a ship down at the water front emitted a piercing blast.

Sandy fought his way through the crowd to where Bill was standing on the steps of the commissioner's house.

"What was it?" the boy asked. "Earthquake?"

"Sounded like dynamite to me, kid," Bill said, slowly. He turned to the commissioner. "What do you think?"

"I agree—dynamite. Must have been somewhere far in the interior. Sound travels amazing distances here. I don't know what on earth could have caused it—unless that damned dwarf is up to something."

There were no recurrences of the disturbance. The town quieted down; a squad of native troops was patrolling the streets. Bill sent word for all his men to come to the commissioner's office at once.

Dawn had definitely arrived when the entire personnel of the squadron jammed its way into the small room. Bill, accompanied by the commissioner, Hal Tuttle and two Belgian pilots came in. The famous flier stood on a chair at the end of the room and retailed curt orders.

The patrolling of the skies was to start immediately, with Red Gleason, Sandy and one of the Belgian pilots on the first relay. They were to remain in the air three hours, then to be relieved by Cy Hawkins, Bev Bates, and the other Belgian pilot. Detailed maps were handed out.

"Keep a sharp lookout for a strange plane," Bill said. "If you spot it, radio immediately, then follow it. Keep to your indicated territory, and don't overlap. See that your ships are in perfect condition before leaving. A forced landing means——" He drew a finger across his throat. "The rest of you will place yourself under command of the commissioner. An expedition has to be quickly organized and equipped. When ready, it will be flown inland to the Yoko River. Until then, our base will be here. Mr. Tuttle and I are leaving immediately on a reconnaissance flight over the Itura Forest and to inspect the landing possibilities at the Yoko River. Now get going!"

Sandy hurried back to his quarters, pulled on flying gear. He adjusted the tiny helmet and goggles around the monkey's head. "We're going places, Alphonso," he said. "Boy, you'll get a kick out of this. You'll be able to spit

on all your aunts and uncles down in the forest."

The monkey seemed to consider the idea of extraordinary merit. He jumped away from the boy, picked up a tube of tooth paste and, squeezing it, began to make intricate patterns across the rug.

Sandy grabbed him. "If you're going to act that way, I'll leave you home. Come on, we've got to beat it."

The airplanes of the fleet looked like great inanimate birds as they floated on the calm water of the harbor. Engines had been started and their thunder rolled over the dead quiet of the jungle. Sandy saw that the Eaglet had been moored alongside a float beside the dock. Its engine was booming and two mechanics from the transport were hastily inspecting the trim little ship.

Shorty stood at the top of the steps leading down to the float. He had a large banana in one hand and was peeling it. "You taking your brother with you, Sandy?" he asked.

"Alphonso? Say, what do you mean, 'brother.' Anyway, he's got a lot more brains than *some* people I've seen."

"You mean the person you see when you look in the mirror, don't you?" Shorty bit away a portion of banana.

Alphonso eyed the banana greedily. He shot out a tiny hand, clutched the fruit and jerked it from Shorty's grasp.

"Hey, you little——"

Sandy raced down the steps to the float, howling with glee. "Nice going, Alphonso," he said.

Shorty was still shouting, but his words were drowned by the roar from the Eaglet's engine. The two mechanics who had been inspecting the ship swung themselves to the float. "Everything's O. K., Sanders," one of them said.

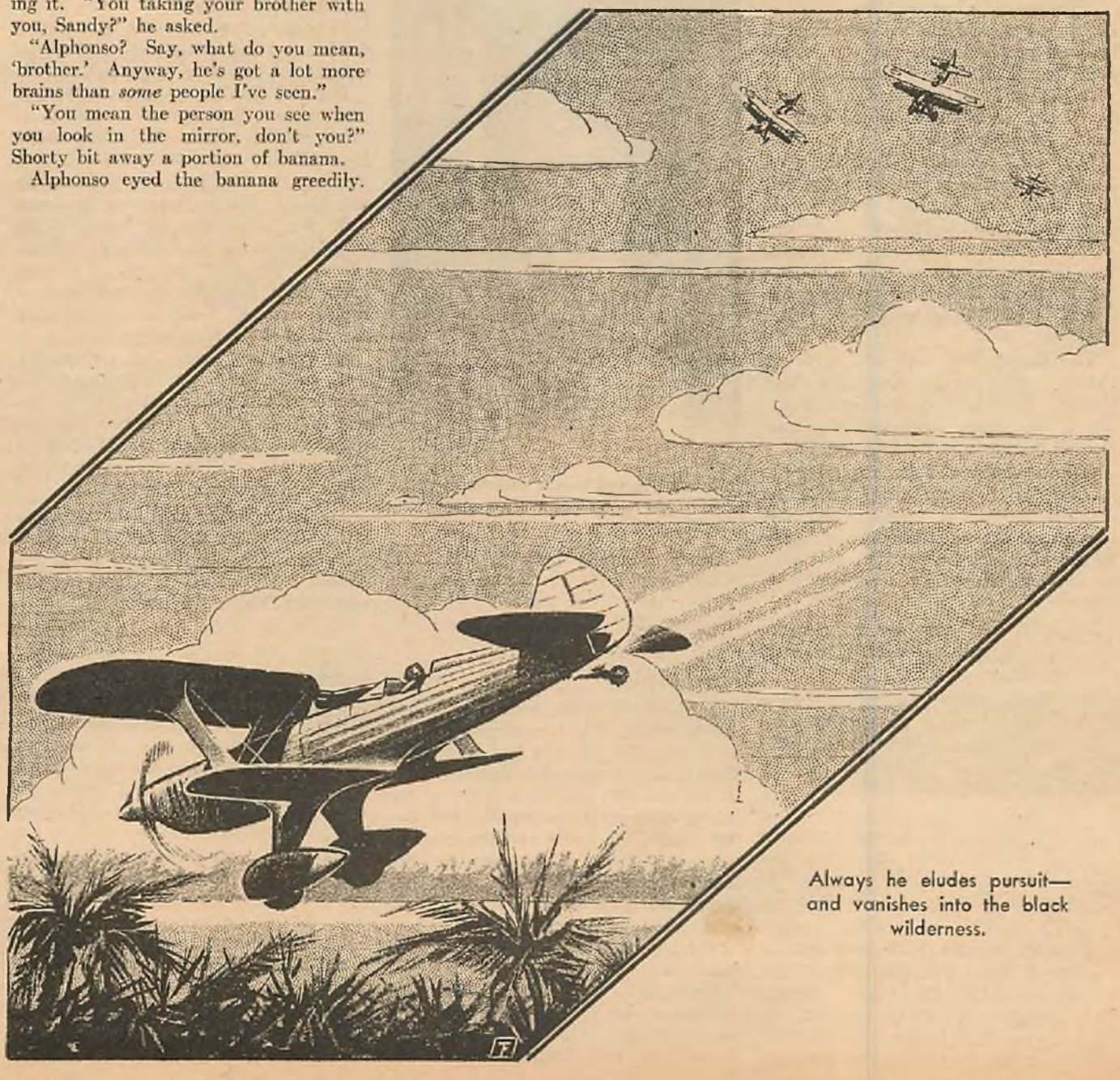
The boy stepped to a pontoon and swung himself into the cockpit, lowering Alphonso to the seat beside him. "Now get this straight, Alphonso," he said. "You watch your step. You're liable to fall out, see?"

The monkey blinked its eyes and devoured the last of the banana. Sandy bent down, took a length of line from the locker, tied it securely around Alphonso's middle and attached the other end to his safety belt. "That's in case you forget," he said

The boy plugged in his helmet wires and reported to the radio operator aboard the transport. Orders came for him to take off. Red Gleason's Snorter was already in the air, as was the Belgian's plane, when Sandy swung his machine out into the harbor and blasted it into the sky.

He climbed to the predetermined height of five thousand feet and compared his map with the earth below. The Belgian ship and the Snorter were angling away to the west ahead of him. The Eaglet was to patrol the center section.

The boy put his machine on its course and began to familiarize himself with the terrain below. It presented a never-ending blanket of greenery. Occasionally, he caught the gleam of water cours-



Always he eludes pursuit—and vanishes into the black wilderness.

ing through the forest. Far away to the right was a ball of puffy whiteness, and, after consulting his map, he identified it as the mists arising from Devil Falls on the Ataka River.

The boy looked back and suddenly saw the Silver Lancer racing far below him, its pointed nose aimed in the direction of the falls.

Bill's voice came presently over the radio: "Everything O. K.?"

"O. K.," said Sandy into the microphone. "But I haven't seen any Pygmies yet."

He heard Bill chuckle and then say: "They're too small and you're too high. See you later, peewee."

The Lancer streaked away.

Sandy reached the end of his run, banked around and droned back, his eyes constantly watching the green forest below—and the skies. The sun was rising higher and higher in all its tropical fury; the boy's eyes ached.

Alphonso, who had remained crouched down on the seat, climbed onto Sandy's lap and peered intently at the instrument board. He poked a hand gingerly at a yellow knob at the right side of the board. His fingers closed over it. Sandy jerked him back.

"Lay off," he said. "That thing releases the smoke screen from the left wing tip. You wouldn't want to do that, would you, Alphonso?"

The monkey chattered and leaped onto the control column. He wound his tail around it and hung upside down. Sandy laughed delightedly, and pulled him free.

The Eaglet flew back and forth on the set course, the boy keeping a sharp lookout. But the earth and the sky presented the same monotonous picture that he had seen on his initial circuit.

Alphonso spent the time exploring the interior of the cockpit. Twice he climbed up on the coaming and was blown over the side. Each time Sandy hauled him back by the rope and gave him a long lecture on the perils of such maneuvers.

Then, at last, came the radio order from the transport. "Return to base. Relief taking over runs."

The Eaglet whirled around on a wing tip and headed back. As the little machine raced within sight of Durbat, the Lancer thundered alongside. Sandy looked over and waved. Bill's answering gesture was curt.

At that second, Sandy saw a column of grayish-white smoke spew from the outlet in the Eaglet's left wing tip. It billowed out, forming a great cloud behind the Eaglet.

The boy whirled back and spotted Alphonso's hand still clamped to the yellow smoke-control knob. Sandy pulled him roughly away, snapped the knob closed. But, in the brief moment, a giant funnel of smoke had been released. Bill's anxious voice sounded in the boy's ear phones. Sandy winced.

"Anything wrong, Sandy?"

"No—— No—— Everything's O. K.——"

"What's the idea of the smoke screen?"

Sandy licked his lips and directed a murderous look at the monkey who was jumping up and down on the seat. "Alphonso—I mean—I turned it on by mistake. I just——"

"You got that ape with you?" Bill's voice was angry now.

Before Sandy could reply Alphonso sprang into his lap, tilted his head, and chattered wildly into the microphone.

Bill cut in with: "I'll see you when you get down," and disconnected.

In the fourth cell was a seventeen-year-old girl—Betty Kressel!

Sandy slumped back in his seat. "Golly, you little idiot, Alphonso," he said weakly. "Now you got us both in the soup. Bill sounded plenty mad."

XII—STRATEGY

BILL WAS MAD, boiling mad, but not at Sandy. The boy learned that, to his great relief, after he had landed the Eaglet, hastily smuggled Alphonso back to his quarters and then gone to the transport to make his report. Bill was there with Hal Tuttle and the commissioner. He was talking angrily: "We found the Yoko River all right, but there's no place to land a ship there *now*. Nothing but mud flats!"

The commissioner stared. "Mud flats?"

Tuttle said: "We found where that blasting occurred. A quarter of a mile up the Yoko. The dwarf must have learned of our landing plans. He blasted the river into a new course. It now flows through the jungle. Its former mouth is just mud."

"What!"

"That's the size of it," said Bill. "We flew over the place, inspected it thoroughly. The river now flows through the forest. Not a hope of landing. A ship would sink out of sight in that mud." He hammered a fist down on a table top. "That little devil must have spies here in town."

"Spies—yes," the commissioner said. "It's almost impossible to keep anything secret in these parts. But what will we do now—start the expedition from here?"

"The only thing to do," said Bill furiously. "We went over that forest hunting for another landing place—and there isn't one. Not one!" He caught sight of Sandy and Red in the corridor outside the cabin and gestured them inside. "Either of you see anything?"

"Nothing," Red said.

"The same," Sandy said, and waited for Bill to bring up the subject of smoke screens and monkeys in general.

But Bill didn't. He came to his feet and walked heavily across the floor. "He's got us licked. He's sure to lie low while our ships are in the air. But we *have* to find him—we *have* to do something! We can't just sit here and wait for something to break." He whipped around, his expression furious. "O. K. We start the expedition from here. It'll fight its way overland as rapidly as possible. In the meantime the air patrol keeps functioning."

Orders were given for preparatory work on the expedition to go ahead with greater speed. Sandy labored with the rest of them until it was time for him to take his second patrol. He hurried back to his quarters, opened the door and stood aghast at what he saw.

The room looked as if a blizzard had struck it. The floor lay thick with feathers and in the center of it all was Alphonso in the act of disgorging the contents of the last pillow.

Sandy closed the door hurriedly and slumped back against it. "Good golly!" he said. "This trick just about finishes you, Alphonso. After all I've done, you pull this on me."

Alphonso failed to take the situation seriously and executed a series of dives into the feathers, scattering them into the air. Sandy pulled on his flying gear, his face pale.

"My pal!" He looked undecided at the monkey. "If I leave you here, you'll probably set the whole town on fire. And if I take you with me, Bill's liable to catch me at it. Come here, you ape. I'll just have to risk smuggling you aboard."

Minutes later, with Alphonso tucked securely down inside his white flying suit, Sandy furtively left the building

and ran, half bent over, to conceal the bulk of the monkey lying against his stomach. He passed one of the crew of the transport. The man looked at him curiously. "You sick, Sanders?"

Sandy didn't stop. "Got a pain—indigestion," he said over his shoulder. Alphonso gave him a playful bite in the stomach. "Ouch!" bellowed the boy, and ran faster. He arrived at the Eaglet out of breath but jubilant. No one else had stopped or questioned him.

He climbed quickly into the cockpit, tied the rope around the monkey, and gunned his plane away from the wharf. He was late. Red and the Belgian had long since taken off and the planes they were to relieve were already circling the harbor. Sandy was scheduled to take over Cy Hawkins's run and he knew the big Texan would be waiting in the air, raging mad.

The Eaglet thundered into the sky just as Cy's bellow came over the radio. "Where's Sandy? I've seen enough of this damn forest."

"I'm coming, Cy," the boy said into the microphone. "Keep your pants on."

Ten minutes later, he sighted Cy's circling Snorter. "O. K.," he called into the microphone. "You can beat it, Cy."

He watched the Snorter straighten out and head in the direction of Durbat. "It's about time you showed up," he heard Cy say over the ear phones. "I'm hungry."

"See anything exciting?" Sandy asked.

The Snorter had passed the Eaglet and was dwindling rapidly. "Oh, sure," came the reply. "A lot of trees and a lot of sky."

"Unhappy landings," Sandy said, and disconnected the radio.

The Eaglet roared on across the never-ending forest. Sandy caught sight of Red's plane and that of the Belgian's, mere specks, miles away to his left and right. They had completed their first run and were on their way back.

"We're plenty late, Alphonso," Sandy muttered. "Red and the other guy are a whole lap ahead. We'd better step on it."

The monkey sat on the floor of the cockpit, busily inspecting its own furry coat as the Eaglet streaked on under full throttle. The sky was clear of clouds, and the sun had become a blasting furnace. Sandy sat forward in the seat, his eyes ever probing downward. He recalled how desperate Bill had looked and how discouraged his words had been. The White Pygmy had blocked every move and was, probably, at that moment laughing at their futile efforts. Sandy scowled at the tangled jungle. What a hope of finding any one in that!

The tree-packed slopes of Manunta Mountain, which marked the end of the Eaglet's run, showed ahead and raced nearer. Sandy swung the ship around in a sharp bank. With the plane canted over on one wing he looked down—and stiffened. A dark shadow was moving across the sun-bathed foliage. It was the shape of an airplane. Was it the shadow of his own machine?

No! It was coming from another airplane. He saw it now. A biplane!

The White Pygmy!

XIII—PURSUIT

THE WHITE PYGMY! It had to be!

Sandy threw the stick forward, dived the Eaglet and bellowed into the microphone: "A plane! I see a plane! Quick! Get Bill!"

The Eaglet was hurtling down. Sandy's eyes were riveted on the biplane. It was small—smaller than the Eaglet, open, single cockpit. It was painted a mottled green, blended in perfectly with the forest foliage. If it hadn't have been for the shadow Sandy would never have seen it.

The radio operator's voice from back at the transport was hammering in his ear. "Follow it! Stick on its tail! Don't let it get away! Broadcasting general alarm! Bill's taking off!"

Sandy's fingers tightened around the control column. His eyes drilled down the gun sight, aimed dead on for the biplane. It suddenly changed direction. He was now near enough to see the white of the pilot's face as he looked up. The biplane whirled on a wing tip and headed back in the direction from which it had come.

The Eaglet's altimeter blurred as the needle skidded around the dial. Sandy eased the angle of his dive, headed after the now fleeing ship. He was coming closer and closer. He saw the details of the plane's construction; saw the pilot whip around again and look back.

Sandy talked wildly into the microphone. "On his tail. Heading north from Manunta Mountain."

Red Gleason's voice suddenly broke in. "Stick to it, kid. Coming."

Then, right after that, Bill spoke. "Taken off in the Lancer. Don't let him get away, Sandy. Follow him! Don't open fire! Follow him!"

The Eaglet raced nearer, leveled off. Both ships were streaking barely fifty feet above the treetops. Sandy reduced the throttle—and then it happened.

Without warning, the biplane suddenly zoomed straight up, whirled over and came tearing down at the Eaglet.

The sudden maneuver caught Sandy by surprise. He wrenched his ship to the right, shot an agonized look at the biplane and saw white streamers stabbing from its nose. Tracers!

A burst of lead smashed across the Eaglet's mid-section, thudded into the side of the fuselage, splintered the in-

Twice Alphonso climbed over the coaming—and was blown off—to have Sandy haul him in.

strument board. Then Sandy was out of the range of fire. He heard a squeal from Alphonso, caught a glimpse of the monkey falling from the seat to land on the floor of the cockpit and lie still.

The biplane had dived past and was pelting headlong across the forest. And Sandy went after it, furiously. His fingers slid down to touch the firing trips on the control column. Rage burned in his eyes. Alphonso had been hit. He was lying motionless!

The biplane had increased its lead and was clinging desperately to it. The thunder from the engines of the two midget ships blasted across the matted wilderness. Sandy crouched over the controls, wild-eyed. The throttle was jammed to the limit, yet he wasn't gaining an inch on the other ship. Every instinct was shrieking at him to open fire. But Bill's instructions had been to follow—to find the enemy's landing place.

The two planes hurtled on in their crazed race. Far ahead was the white plume of spray coming from Devil Falls. Sandy jerked the microphone to his lips, not knowing that the radio had been smashed in the brief burst of fire and was definitely out of commission. "Biplane heading in direction of Devil Falls! You get that?" And when there was no answer he shouted again. "Bill! Red! You hear me? Biplane heading for Devil Falls. Come on!"

The cloud of mist that forever hung over the waterfall was growing larger. They were now over the sunken Ataka River, racing up it toward the giant cataract. The Pygmy's ship held rigidly to its course. The Eaglet was now gaining ground. The space between was slowly closing. Sandy shot another look down at the inanimate ball of fur on the floor and saw a trickle of blood coming from it. Alphonso!

Sandy forgot to wonder why no replies came over the radio—forgot everything in a frenzied desire to blast the biplane into atoms. Alphonso had been hit, was perhaps dying. And the pilot of the plane ahead was responsible.

They were almost at the waterfall. The water in the gorge below was a boiling fury. The air was choked with the heavy mist, almost obliterating Devil Falls itself. But the biplane kept on, streaking like an arrow—straight into that cloud of spray—straight for the waterfall.

Instinctively Sandy again seized the dead microphone; again shouted into it: "At Devil Falls. He's heading through the spray. The falls is straight ahead. He's going straight into them!"

The swirling mist swept in between the two pounding machines. The enemy ship was speeding for the giant streams of water crashing down over the precipice. Its upper wing was level with the brink of the falls.

"Bill! Heading dead into the falls. I'm following. I'm following!" Sandy's voice was a hoarse bellow. Fear came up to choke him. Every split second was an eternity. Surely the biplane would zoom suddenly, would hurtle that terrifying obstacle!

But it didn't. And then the fog was so thick that Sandy could barely see it. The biplane was right at the falls—would crash dead into them. Sandy breathed a prayer and followed.

XIV—DEVIL FALLS

DEVIL FALLS occurs where the Ataka River, after following a narrow, winding course, suddenly widens out and hurls itself over a hundred-foot precipice of sheer basaltic rock. The water crashes down to the gorge far below to become a foaming, churning caldron. An ever-present curtain of spray hangs over the falls, through which the sun weaves a rainbow of iridescent brilliance and beauty. The column of mist can be seen for miles around, hanging high in the air. The forest booms with the never-ceasing thunder of the mighty cataract.

At the very brink of the falls is an island, acting as a wedge in the river and splitting the Ataka into two waterfalls. The island itself is crowded with lush greenery and the foliage creeps over the sides. The two streams of water, crashing past on either side, intermingle halfway down the sheer drop and the spray sweeps up over the island.

The biplane was hurtling straight through the spray—straight at the island lying at the very top of the falls. And Sandy, terror gripping him, guided the Eaglet in pursuit. Bill's last instructions burned across his brains: "Follow him! Follow him!"

The enemy plane was blurred by the swirling vapor. Sandy saw it strike straight at the island—and then, as the mist cleared momentarily, he glimpsed an opening in the heavy foliage of the island, a veritable tunnel that seemed to bore straight through the greenery.

The biplane arrowed into that opening and disappeared!

FOR ONE crazy second panic lent Sandy a hundred eyes, a hundred

brains. He knew that the biplane was landing; knew that he had discovered the Pygmy's secret hiding place. He knew that he had come too far, that now there was no turning back, that he had to follow, that he was trapped.

These thoughts pelted through his brain in a flash. He closed the throttle, lowered the landing gear, opened the wing flaps—and the Eaglet bulleted for the opening through which the biplane had vanished.

Everything happened in a flash. The white, wet spray streaked past Sandy. The thunder of the falls blasted in his eardrums. The island came pelting at him. The tunnel opening swelled into a giant, black hole. The Eaglet was in it!

Sandy received a split-second impression; saw a rounded ceiling, sleek, steel-like walls, a smooth floor. He saw the enemy biplane at the far end; saw little black men pushing it frantically to the right.

The Eaglet's speed was cut down. Instinct alone controlled Sandy's movements. The wheels in the pontoons touched the flooring evenly. The little amphibian was down and streaking headlong along that strange tunnel.

Sandy applied the brakes, evenly, slowly. The speed decreased. The Eaglet was three quarters of the way down the tunnel. At the other end was a solid wall. Sandy pressed the brakes harder—harder. The flooring was wet. The amphibian slowed, skidded, half slued around and came to a shuddering stop.

Sandy, shaken by the terrifying ordeal, immediately grabbed the dead microphone and shouted into it, shouted words that were destined never to reach Bill. "Tunnel in the island at the head of the falls! I've landed there. Too small for other planes. You hear me, Bill? You——"

He broke off as a swarm of little black men came racing down the tunnel toward the Eaglet. Sandy ripped out his automatic, unfastened his safety belt, stood up. He directed one swift look at the still form of the monkey lying at his feet, and whirled around.

Too late he caught a glimpse of another group of Pygmies coming from the other direction. One of them had reached the side of the fuselage. A club in his hand was swishing down. Sandy fired once—then the club smashed across the side of his head. He reeled and jackknifed over the coaming.

XV—SEARCH

BILL had been in the commander's cabin of the transport when Sandy's first radio message had come through. The electrifying news had been relayed to him promptly. He had bellowed out an order to get every ship into the air, then raced for his Silver Lancer.

He reached it, threw himself into the forward cockpit. The Diesels thundered. The double propellers whirled. The sleek amphibian raced out into the harbor, swung around to head into the wind, and arrowed into the sky.

Bill shouted into the microphone to Sandy and jammed the throttle wide open. The Lancer became a silver streak across the brilliant blue heavens. The famous pilot's face was flushed. His eyes glittered. The break had come at last. The Pygmy plane had been sighted. If Sandy could only keep on its trail, run it down to its secret lair.

Bill heard Red Gleason shout over the radio to Sandy that he was coming. Bill spoke to Red right after that: "You see him? You see Sandy?"

"Not yet, Bill," Red replied.

Bill leaned forward in the cockpit, guided his pelting machine with one hand and with the other trained binoculars on the sky ahead. But he was still too far distant to see anything. Again he bellowed into the microphone: "Sandy! Keep after him, kid. Keep after him!"

There was no reply. Bill repeated his message. "You hear that, Sandy?" And again there was no reply.

Minutes swirled past. Bill held the glasses to his eyes, saw a dot ahead, identified it as a Snorter—Red Gleason. Red's voice came blasting into Bill's ears. "See them now. Miles away. Heading across the forest. Sandy on biplane's tail. Heading toward Devil Falls."

The Lancer's speed had swelled past three hundred and fifty miles an hour, and was increasing. Bill angled his ship around to head in the direction of Devil Falls. Far behind him, in one quick glimpse, he saw the other Snorters following.

The Lancer was gaining on Red's Snorter. Bill tried frantically to spot the Eaglet and its quarry and again yelled into the radio at Sandy. And still no reply.

"Red. The kid doesn't answer. You hear anything?"

"Nothing, Bill—— See both ships distinctly now. Right near the falls. Sandy sticking to his tail. Something may have happened to his radio."

The Lancer was arrowing ahead, faster and faster. Mile after mile of the matted jungle swept underneath in a blurred, green procession. Suddenly Bill gave a shout. He saw them—saw them through the glasses; could make out the silhouette of the Eaglet; could see that the other plane was a biplane. Beyond them showed the white plume of spray from Devil Falls.

Red's voice crackled into his ear phones. "Bill, they're right at the falls. You see them?"

"Yes—yes——" Bill's eyes burned through the glasses. He held the microphone to his lips. "Sandy! You hear me, kid? Sandy!"

No reply.

His binoculars were held rigidly on the Eaglet and the enemy plane. He saw them—and then they were gone—swallowed up in the mists over the falls.

Red's voice blared: "They're gone, Bill. Right into that cloud of mist."

The Lancer overtook Red's Snorter, whistled past it like a crazed meteor. Bill shouted into the microphone at Sandy—repeated and repeated. The boy never replied.

The Ataka River and Devil Falls were coming closer. Bill held his binoculars trained on the column of spray and waited for the Eaglet and the other ship to streak out of it. But they didn't.

Then the Lancer was at the falls, was over the mighty cataract. The air was filled with mist. Bill leaned over the side, peered down. He received a blurred impression of the mammoth sheet of falling water and his ship pelted out of the spray to the other side. He raised his glasses again, swept the area—and saw no sign of the two ships.

Fear choked him. He circled back, saw Red's Snorter pass across the Ataka above the falls.

"Bill! You see them?" came Red's anxious voice.

"No, nothing," Bill replied.

"I saw them head straight into the cloud of spray," Red said.

Bill's brusque words masked his fear. "Pygmy plane probably headed into its hiding place. Sandy may have followed. Keep your eyes peeled."

The other Snorters from Durbat roared into view. Bill called all planes, gave terse instructions. "Spread out. Search everywhere in vicinity. They must be around here somewhere."

He pushed the stick forward, dived the Lancer through the spray and down into the gorge below the falls. The canyonlike walls rose steeply on either side. The water in the river was seething and boiling. Bill's eyes probed into those angry waters; he continued a few miles down the river, then, zooming steeply, came back. He drove his plane over the mighty streams of falling water, passed close to the island at the lip of the cataract, searching, searching.

The other ships were flying low over the forest on either side of the river. The same discouraging reports came back from each pilot. They saw nothing—nothing——

XVI—CAPTURED

PRINCE PEDRO stood in a doorway at the side of the tunnel and watched Sandy being knocked unconscious. "Bring him in here." He had to yell to make his shrill voice heard over the booming of the waterfall. He

turned, went down a short passage and into a small circular room that had been hewn from the rocky formation. The air was damp and chill.

The dwarf's walk became a swagger as he crossed to a chair behind a small desk and seated himself. In the opposite rock wall four cell-like rooms had been cut. Rusted iron bars crisscrossed the openings. Two of the cells were empty. The third held Gustav Kressel. He was lying on a cot, a skeleton-like man, his sunken cheeks covered with dirty beard. He lay still, his eyes closed.

In the fourth cell was his daughter, Betty Kressel. The seventeen-year-old girl was standing, her hands clenching the bars. Her face was tear-stained. Her blond hair was matted and disarrayed. The sport suit she wore was wrinkled and dirty. She stared wildly across the room at the dwarf.

"When are you going to release us? You can't keep us here! You can't!" Her words ended in a sob.

Prince Pedro held up his hand. "I have a surprise for you. Another guest to keep you company." He twisted his head toward the door. "Bring him in here. Put him on the floor. Three of you guard him. The rest get out."

Six black Pygmies entered the room, carrying the limp body of Sandy. They lowered him to the floor in front of Pedro's desk. Three of them bowed low to the white dwarf and went out, closing the door. The others squatted on their haunches. In their hands were small barbed darts.

The white dwarf raised his voice. "Mr. Kressel! You'd better wake up. I want you to see this."

Gustav Kressel moved weakly on his cot, sat up and finally came to his feet. His once massive body was shrunken and he clutched at the iron bars to brace himself.

"Sorry to disturb you," said Pedro, "but this young gentleman just dropped in. He'll occupy Cell Three."

Sandy stirred; his eyes opened and a low moan came from his parted lips. The three Pygmies around him stiffened, raised their darts.

Sandy half sat up and looked wildly around him. "What——"

The dwarf laughed. "I am Prince Pedro. That man over there behind those bars is one of the delightful Kressel family—Gustav Kressel. At present, he's suffering rather badly as his body has shrunken considerably since he's been with me. In the next cell is his charming daughter, Betty. She has yet to feel the reducing torture." Pedro rocked back in his chair. "Undoubtedly you came to see these two people—and there they are."

Betty Kressel said: "Who are you? How did you get here?"

Sandy started to his feet, heard a growl from his guards and sank back to his former position. "I'm Sandy Sanders—one of Bill Barnes's pilots. I came to——"

Pedro interrupted him. "The American flier, Bill Barnes, brought his entire famous air squadron over here to rescue you two. But he won't succeed."

Pedro turned to Sandy. "You were very brave to follow me. If your plane had been a trifle larger, you would never have made it. And let me assure you of one thing: When I opened fire on you over the forest, I demolished your radio. I've had your plane inspected. So, if you endeavored to broadcast to your friends—they never heard you."

Sandy drew in his breath sharply. "They saw where I went. You haven't a chance of getting away with this."

The white dwarf slid a section of the desk top away to reveal a square glass. "A periscope device. I can observe what is happening above." He paused and looked into the glass. "Your friends are circling above, searching for miles around. They probably saw you vanish in this general vicinity, but they'll never think of the island."

A small square of light at the edge of the desk winked three times. Pedro leaned forward, pressed a button. A section of the stone floor to his right slid noiselessly back, revealing an opening. An iron ladder led down. The head and shoulders of Tambu, the medicine man, came through. He climbed into the room.

The medicine man's eyes were wide with fear. He stared from Prince Pedro to Sandy, and back again.

"He rode the other bird?" he asked, pointing to Sandy.

Pedro nodded. "He spotted me before I got down to the Kolas' feast. I turned back and he followed me in here. Don't be alarmed. Nothing has gone wrong. I've just captured another bird—and another victim."

Tambu came closer to the desk and his voice lowered. "I am alarmed, O chief. The drums are sounding through the forest. They tell that the Kolas are rising in revolt. They say the white god's bird failed to come. They say the white god is afraid."

Pedro's eyes blazed. "I'll wipe out those fools."

"But, chief, the drums tell of our other tribes. They, too, are seething with unrest. They are drunken and arming. The blood lust is upon them."

The white dwarf kicked back his chair, leaned over the desk. The fury in his face died and was replaced by cunning. He said to Tambu: "You told me that the unrest is caused by these prisoners here."

"True, O chief. Our people believe that the evil spirits of these whites have caused the great explosions. They want them killed."

Prince Pedro nodded slowly. "Very well. This day these three prisoners will be taken out to the village. There they will be tied to stakes and slowly burned to death. Go now, Tambu. Beat the tribal drums. Send word out to all the tribes to hasten to the village for the great sacrifice."

Tambu's eyes were shining. "It is a wise move, O chief. Our people will forget their unrest. I go."

The medicine man disappeared down the ladder.

Prince Pedro's eyes were inflamed. He said: "My revenge will come to an end this afternoon. Sanders, you and the Kressels will expire—tied to the stake. A slow fire will be built under each one of you. The flames will lick your feet, will curl up your bodies. You will writhe in agony. You will shriek for a quick death. And then you will remember what was done to me by Hans Kressel!"

WHEN the Pygmies had dragged Sandy from the Eaglet, they had not seen the little ball of fur on the floor of the cockpit. For a long time Alphonso lay motionless, then, slowly, he opened his beady eyes. He blinked them rapidly and sobbed from pain. His chest was drenched with blood and he twisted his neck so that his tongue could lick the gash that the bullet had torn in his flesh. He sat up on his haunches and patiently cleaned the wound.

The end of the rope tied around his middle had slipped free from the unfastened safety belt. The monkey stood up on its hind legs, wabbled uncertainly, then climbed weakly up to the cockpit seat and looked curiously around for its former occupant.

He blinked his eyes, chattered, listened, then leaned forward and began to make an inspection of the glass-dialed instrument board. His eyes fastened on the yellow knob that had previously fascinated him, he reached out a hand, touched it, hastily drew back. He peered cautiously around the cockpit. Again his hand darted out. He hit the yellow knob, played his fingers over its shining yellow surface. His fingers tightened on it. The knob turned suddenly. There was a sharp hiss.

Alphonso jumped back, startled, leaped to the cockpit coaming and chattered excitedly. A stream of grayish-white smoke was spewing from the outlet in the left wing tip. It was expanding rapidly, making great billowing clouds. The heavy, white smoke rolled across the tunnel.

Alphonso coughed, shook his little head. His eyes were watering. He leaped from the coaming to the wet floor and lay crouched down beside the right pontoon.

The tunnel was filled with smoke. It

rolled down toward the outlet at the far end and gushed out.

XVII—THE PLAN

BILL roared his Lancer back across the Ataka River above the falls for the tenth time; he shook his head grimly. There was no earthly sign of where the Eaglet and the biplane had vanished. He pulled the microphone to his lips, was about to make his monotonous check-up of the pilots when a bellow crashed through his ear phones.

"Bill! It's Cy. Quick! There's smoke coming up from the island at the edge of the falls. Look!"

The Lancer whipped around, raced over the waterfall. "Smoke? Where? Where?" Bill shouted into the microphone.

"Coming from the island. See it? *See it?*"

Bill saw it. Saw a stream of grayish-white smoke pouring out of the end of the island to mingle with the cloud of spray. Smoke! Grayish-white smoke! The peculiar color of the heavy vapor used in laying down smoke screens.

Bill's mind leaped to a quick conclusion—the only conclusion. Sandy's Eaglet was equipped with flasks of the liquid smoke-screen gas. That very morning he, Bill, had reprimanded the boy for turning on his smoke screen!

Sandy was sending a signal! He was down there in that island!

Bill shouted into the microphone. "All planes keep clear. I'm going close to the island. Keep clear."

He reduced the throttle, shot the Lancer down the river below the falls and then banked around and came back. He shoved the stick forward. The ship dived lower. When he was level with the top of the falls, he straightened out and headed his ship toward the island, which he could only dimly see through the swirling mists.

He roared nearer. He could see the island clearly now, the heavy tropical vegetation that covered it. Then he saw the swirling, grayish-white smoke pouring out from the end. He held the controls in a grip of iron and guided his thundering plane nearer and nearer.

Right under him was the roaring cataract with its tons of falling water. But Bill's eyes were fastened on that bit of green land—on that circular hole out of which the smoke was pouring.

The White Pygmy's secret lair! Sandy was in there. Had to be.

The Lancer hurtled straight at the island. And then, at the last possible second, when it seemed that the sleek amphibian would drive itself straight into that smoke-filled hole, Bill tugged the stick into the pit of his stomach. The powerful Lancer zoomed straight up and away from certain destruction. It pelted high over the falls, leveled off.

Bill's thoughts raced through his brain in white-hot confusion. Sandy was on the island, at the very brink of Devil Falls—but how could they get to him? The opening into that strange tunnel was too small for the Lancer or the Snorters. Bill had seen that in his close inspection. And nowhere in the vicinity was there a clearing large enough to permit a landing. The Ataka River flowed too swiftly to think of putting planes down on it.

He spoke quickly into the microphone. "Tunnellike opening in island. Must be Pygmy's base. Sandy must be down there—must have followed the enemy's ship inside. Opening too small for our ships."

Bill scarcely heard the replies that came back. He circled his Lancer lower over the forest, his eyes searching for some place where a plane could be landed—a place that he knew, from previous exhaustive efforts, didn't exist.

And then he saw a small opening in the forest, near the left bank of the river, directly opposite the falls—a small dime-sized opening from his height. He dived lower, until the tops of the trees were almost scraping the belly of his ship. He circled. There was a hole there in the matted jungle growth. A

small hole—and below it a small clearing, too small for a plane to land.

Bill whipped his ship around, came back. He stared down. The clearing below was masked in heavy shadow. He pulled up his glasses, swung back over it again, trained them on the place. He saw beehive-shaped huts far back in the shadow of the trees. A native village.

And then a plan burst across his brain—the only plan—their only chance!

Savagely, he jerked his plane up on its nose and shot it for the heavens. The microphone had been pulled to his lips; he was bellowing into it.

"Calling all planes! Calling all planes! Shorty—Red—Cy—return immediately to base. Bev, remain on duty over falls."

The four pilots confirmed the orders in rapid succession and without question.

Bill held the microphone tightly to his mouth. "Calling BT-4. Calling BT-4."

There was a wait. Then the voice of the radio operator aboard the transport back at Durbat answered. "BT-4 answering. Go ahead."

"Prepare transport for immediate flight. Am heading back." That was all.

Shorty, Red and Cy had already started streaking back across the forest, bound for the port of Durbat. Bill wrenched the Lancer around and went after them.

He said again into the microphone. "I've got a plan. It's the only thing to do. Listen: I found a small clearing. Too small to land in, a native village below. We are going to get aboard the transport, fly back there—and jump into that clearing in 'chutes!"

XVIII—ALARM

SANDY sat on the floor, his body tense, his thoughts racing. Black despair swept him. The news of the destruction of the Eaglet's radio had come as a bitter blow. Up to that minute he had clung to the hope that Bill had heard his words, had heard where he had gone. But now Bill wouldn't have a chance of knowing where the Eaglet had landed. And Prince Pedro was planning a swift end to his prisoners. Something had to be done—something!

He shot a look at the three black Pygmies squatted around him, saw their alert eyes, their cunning faces and the barbed darts in their hands. Escape would be impossible. Anger suddenly took possession of the boy as his thoughts went back to the white dwarf's aërial attack and the consequent wounding of Alphonso. Poor little Alphonso! He had last seen the monkey lying in the cockpit, his body unmoving. Had he died?

The dwarf suddenly came to his feet and said: "Throw him in the cell."

The Pygmies gestured for Sandy to stand up. The boy slowly obeyed. There was nothing else to do. They led him across the room, unlocked one of the cell doors and pushed him roughly inside. The door had just clanged shut when Sandy heard some one shouting wildly. He whipped around in time to see a wild-eyed Pygmy dash into the room through a door; with him came a great billowing cloud of grayish-white smoke.

The man was shouting in his native language: "*Pampui! Pampui!*"

The white dwarf bellowed: "Fire!" and raced out through the smoke-filled doorway. The Pygmy guards followed.

The room was filling with billowing heavy white smoke. Sandy saw the grayish-white color, smelled the biting, acrid fumes. The smoke could only be coming from one place—the Eaglet's smoke screen!

He leaped to the front of his cell, gripped the bars with both hands and jerked with all his strength. But they held, unyielding.

The smoke had completely filled the room, obliterating everything. Sandy tugged furiously at the bars. The smoke screen from his own plane! How had it been turned on? Alphonso!

Had the little monkey come to life? Had he turned the yellow knob at the side of the instrument board—the knob that he had twisted earlier that morning?

Sandy heard Betty Kressel calling: "What is it? What is it?"

"Smoke screen from my plane. It'll show above the island. Bill may see it. He'll know I'm down here. He'll come after us!"

And then came the stunning realization. Even if Bill *did* see the smoke and recognize it as coming from the Eaglet—what could he do? The Lancer's and the Snorters' wing spans were too wide to make a landing possible in the tunnel. And the tree-packed forest for miles around offered no place for the planes to get down.

Shouts were rising above the thunder of the cataract. Minutes passed. Then the smoke began to thin. Sandy heard Gustav Kressel's weak voice: "Get my daughter out of here, Sanders. Leave me. I'm dying. But get her out!"

"Dad! You're all right," said Betty Kressel. "We'll get you out, too."

The man groaned. "No, it's useless. I haven't much longer to live. I don't want to live—like this."

Sandy suddenly heard a shrill chattering close at hand—recognized it. He stared through the thinning smoke and then saw a small furry body jump into his cell between two bars.

"Alphonso!"

The monkey leaped for the boy's shoulder, threw its tiny arms around the boy's neck and held tightly to him. A sobbing cry came from the animal.

Sandy gripped him, his throat suddenly full. He swallowed hard and then said: "Good old Alphonso! You turned on that smoke screen, huh? You——"

The boy looked up and saw Prince Pedro striding into the room through the door. Sandy turned around, jerked open the front of his flying suit, pushed Alphonso inside, and pulled the zipper closed. He could feel the monkey clinging to him.

The white dwarf's eyes were glittering as the boy turned back. "A very smart trick, Sanders. You'll pay dearly for it. I don't know how you managed to switch on that smoke screen—but rest assured it'll do you no good."

Sandy said: "I didn't turn it on. I couldn't. One of your own men must have twisted the release knob."

The dwarf went back to his desk and sat down. He shouted at the Pygmies who were crowding in the doorway. "Get Tambu—quick!"

One of the little men raced to the trapdoor and dropped down through the opening.

Prince Pedro leaned across the desk, his face twisted with anger. "Your brave leader saw the smoke, Sanders. He brought his plane down for an inspection. He came close to the tunnel mouth and went away. He knows where you are, all right. If I know anything about the dauntless Mr. Barnes, he'll come back and attempt to make a landing. If he does—he'll kill himself."

Sandy drew in his breath sharply. Would Bill try the impossible? Would he attempt to force the Lancer into the tunnel? What the dwarf said was true. Bill would be beside himself with anxiety over the fate of the Eaglet and its occupant. He was liable to dare anything—anything!

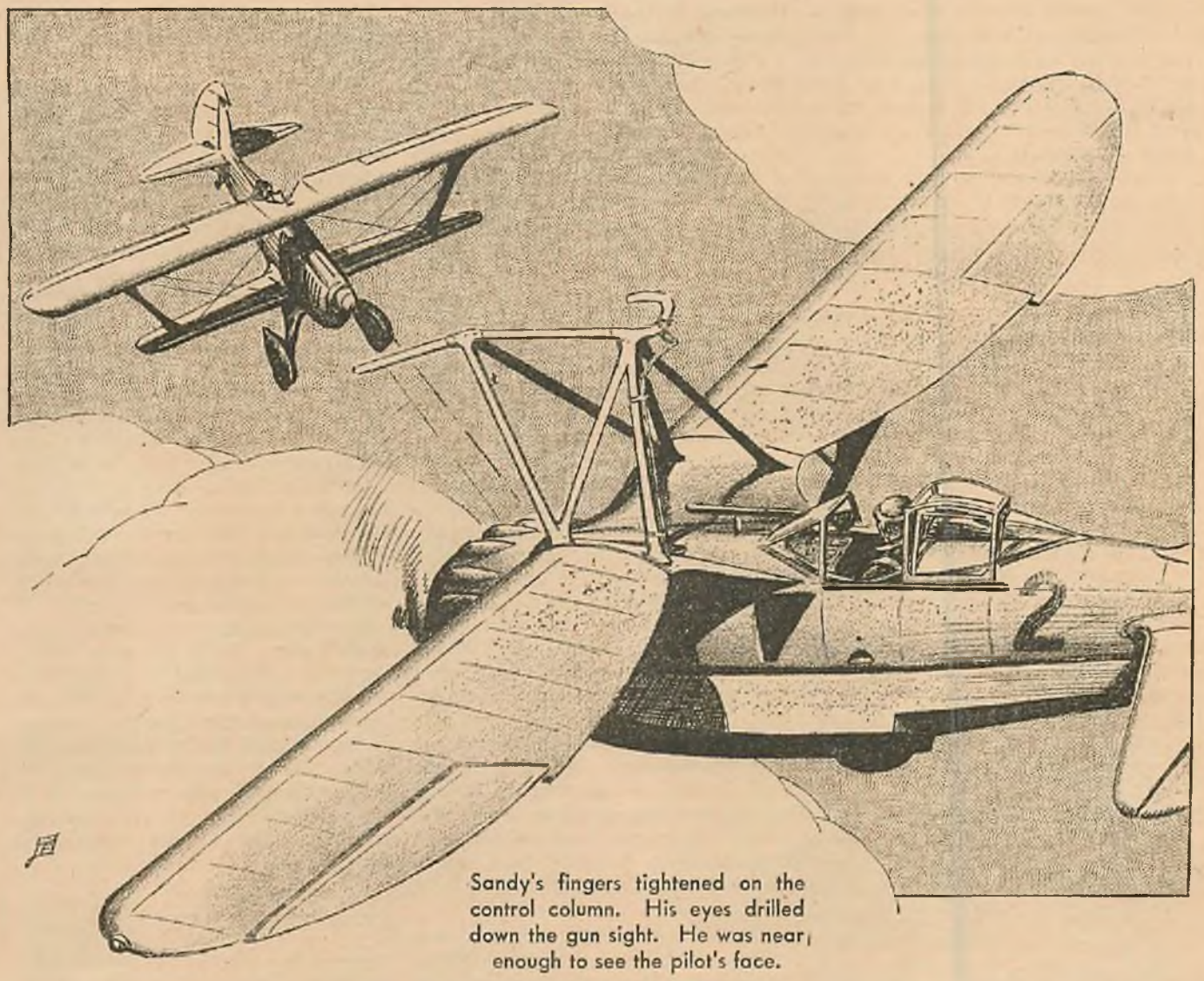
Tambu, the medicine man, came climbing into view through the opening in the floor. His black face was painted with white clay. He wore a long armet made from a leopard skin. His appearance was weird, terrifying. In his hand he clutched a spike-studded club.

"I saw the smoke, O chief," he said excitedly. "The people in the village are alarmed."

Pedro motioned him to the desk. "Tell them that the god of the falls is demanding that the white prisoners die immediately. Go back to the village quickly, Tambu. Prepare for the blood feast. Bid the tribes hasten with all speed. Gather firewood. Erect the stakes. The prisoners die—now!"

XIX—THE TUNNEL

WHEN Tambu had left, the dwarf said: "Your friends may have discovered my hiding place, Sanders—but they can never get near it. This very morn-



Sandy's fingers tightened on the control column. His eyes drilled down the gun sight. He was near enough to see the pilot's face.

ing I changed the course of the Yoko River. There is now no place to land planes for a hundred miles. But"—he paused and his voice lowered—"I will take no chances. You are now going to be taken to the village and put to death immediately."

He rapped out a curt order in the native tongue. A dozen Pygmies hurried into the room. The doors of the three cells were opened and the occupants dragged out. Sandy held one arm over the bulge that Alphonso made in his suit.

"Escape will be impossible," Prince Pedro said. "You will be surrounded by my men. They are armed with poisoned darts. To make one false move is to die. Now proceed. Take him first." He pointed to Gustav Kressel.

The wizened little man was dragged across the floor to the opening and forced through. Four Pygmies went with him.

Betty Kressel was taken next. The white dwarf turned. "Bind this one's arms to his side and bring him along."

One of the Pygmies unwrapped a length of twisted vines from around his waist and expertly wound it around Sandy's body. His arms were laced rigidly to his side and he prayed that Alphonso would remain unnoticed. The work was quickly completed and the boy was pushed toward the opening. His feet found the iron rungs of the ladder and he descended with difficulty. Pygmies went before him. Others followed. Sandy looked back and saw the white dwarf coming down the ladder.

They were in a gloom-shrouded passageway. Ahead, the two Kressels were being forced along. The passageway angled down. Sandy felt an uneven rock formation under his feet. The place was vibrating with a thunderous roar.

Prince Pedro came alongside and shouted in his ear. "This is a tunnel that leads under the river to the village. I have kept my headquarters secret for years. But my work is almost finished. With the death of the Kressels I am released from my sworn oath. I will go away from here and take my wealth with me. I will never come back."

Sandy strained his ears to catch the man's words. The prisoners were being hurried along at a fast trot. The boy could scarcely see the Kressels with their guards ahead. He felt Alphonso moving uneasily inside his flying suit.

The march continued. It was a death march. Sandy thought frantically of Bill and the gang. If they could only get there—— He knew it was impossible, but desperately he clung to the forlorn hope. He was too young to die. Somehow Bill would come—somehow Bill would save him.

And then he thought of Alphonso. He could feel the warmth from the little monkey's body. If death came, he would have to somehow loosen Alphonso—allow him to go back to the forest where he belonged. The monkey had been a faithful friend—he had to escape.

The passageway was angling up and up. Their progress was slowed. Sandy saw a beam of light cut down through the darkness, saw another metal ladder reaching upward. Gustav was being forced up the ladder. He disappeared above. Betty Kressel followed.

Pedro said to the boy: "We're on the mainland. You won't have much longer to wait."

Sandy was pushed up the ladder. He scrambled through an opening and found himself in a large dimly illuminated room. He looked around. An ornate throne on a dais stood at one end.

They crossed the room to a doorway, went through it and into the open. Sandy saw a small clearing in the dense forest. Conical-shaped grass huts bordered it. But the house from which they had come was made of wood and was of European design.

The clearing was swarming with natives. Some rushed to and fro, loaded down with great stacks of brushwood. Others were erecting posts at the base of which the firewood was being dumped.

Natives were hammering on drums. The throbbing vibrated in the air, rose above the roar of the waterfall. Pygmies, their bodies dabbed with strange war paint, were leaping and dancing. The whole clearing was in wild confusion. A sudden cry went up when the prisoners appeared. The Pygmies rushed, shouting and screaming, around them. Spears were raised on high. A weird chant swelled over the gathering, grew louder and louder.

Sandy watched, horror-stricken. The stakes had been driven securely into the ground. A great mass of firewood had been piled under each one. The three prisoners were forced into the center of the clearing. The natives whirled into a frenzied dance around the outer edge. The awful chanting grew louder and louder.

Gustav Kressel had collapsed and was lying on the ground. Betty dropped down beside him. The guards forced Sandy back when he tried to join them.

"You like it?" said the white dwarf to Sandy. "That is the blood song they're singing. It whips them up to fever heat. All they want is blood and death."

Sandy tried to fight back the awful fear that had now taken possession of him. Bill would come—would have to come! But would he get there in time? He clung desperately to the hope. But it was dwindling rapidly. How *could* Bill get there?

Icy sweat broke out over Sandy as the awful truth came stabbing in on him. He was going to die—to die. There wasn't any hope. He looked frantically up at the small circle of sky overhead.

The white dwarf laughed. "You're doomed, Sanders. Your friends can't possibly get here. All but one plane has left the vicinity. It's circling high over the falls, watching the island." He laughed and peered intently at the boy's blanched face. "You showed your bravery when you followed me into the tunnel. But now you are afraid. I can read it in your face. The death will be awful, Sanders. It will be prolonged—hideous."

Tambu, the medicine man, came over. His eyes were distended. He was shaking his great club and keeping time with the weird chant. "The fire is ready for its victims, O chief. The people are clamoring for the death. Bring the victims—bring them to the stakes."

The white dwarf gestured to the guards. Gustav Kressel was jerked to his feet, was forced roughly across the clearing to the nearest post. The Pygmy guards pushed him up on the heavy pile of brushwood. His back was forced to the post. Heavy strands of vines were quickly bound around him, lacing him tightly to the wooden pillar. The man's body was slumped.

Sandy lurched forward. "No—no!"

Tambu whirled on him, his painted face ferocious. His club was raised. He shouted orders. Pygmies seized Sandy, held him powerless. The boy's body was shaking. He was afraid—horribly afraid. He couldn't hide it.

And now they had taken the pretty young girl. She was screaming, trying to fight them off. But they were forcing her back against the second post. She was being tied securely. Her screams cut through the chanting.

Sandy writhed in agony. Again he struggled to get free. Those two people couldn't die. He couldn't die. This was all an impossible nightmare. He would soon wake up and laugh at his imaginings.

But it was true—too true! Death was only minutes away. His guards were now forcing him forward. He was pushed past the other two bound prisoners. Their eyes were on him. He heard Gustav Kressel's weak voice. "Keep your chin up, youngsters," he said.

The girl was sobbing; her head was sunken down on her chest. Broken words came from her trembling lips. "Dad! Oh, dad! This can't happen—it can't——"

Sandy's teeth bit into his lower lip. The words that had come from Gustav Kressel steadied him. In a daze he saw himself being pushed up on the pile of firewood; felt the firm wooden pillar at his back; felt the strong ropes of vines tugged tightly around his body. It would soon be over.

More natives had poured into the clearing, joined the frenzied dance. Sandy watched the pack of sweating, painted bodies swirl past. Then Tambu, the medicine man, leaped into the cleared space in front of the three victims. He raised his club aloft.

The dancing stopped. The natives fell back, sat down at the edge of the clearing. The hammering of the drums grew louder, faster. Tambu whirled into a savage dance. He raced around the three stakes, swinging his club and shouting.

Sandy felt Alphonso stirring down inside his flying suit. He called softly to him. "Come out, Alphonso. Come out." He was powerless to unfasten the garment. He felt the little monkey pushing upward; in a minute he had squeezed out through the collar opening and climbed free. He sat on Sandy's shoulder.

Sandy said desperately: "Beat it, Alphonso. There's no sense you dying."

Some one had seen the monkey. An arrow whizzed past Sandy's head, narrowly missing Alphonso. The monkey yelped, jumped to the ground, and made a flying leap for the low-hanging branch of a tree. He landed on it, held tight and disappeared in the foliage.

Sandy was relieved. At least Alphonso had escaped.

The medicine man's dance continued, faster and faster. The awful tempo of the drums was hammering into Sandy's brain. He looked across the clearing and saw Prince Pedro standing at the outer edge, a crooked smile on his face.

Suddenly Tambu stopped his dance. He raised his club in the direction of Prince Pedro, then swung it to point at the sun showing through the small hole in the forest overhead. He screamed out three native words.

Then from out of the crowd came a single Pygmy. In his hand was a flaming torch. He handed it to Tambu.

Sandy took a deep breath. This was the end. He looked over at Betty and Gustav Kressel and managed a weak smile. The girl's tear-filled eyes looked back at him; her chin went up.

Tambu walked slowly past the three prisoners. He stopped in front of Sandy.

XX—THE TRANSPORT

BILL had blasted the Lancer in a screaming flight back to the port of Durbat, far outdistancing the three Snorters. And by the time the trio of low-winged fighting ships had landed, he had packed an hour's work into five minutes.

Four volunteers had been selected from the squadron's gunners and mechanics and were aboard the transport; hand grenades had been loaded into haversacks; machine guns had been knocked down and tied to parachutes; Timmins, at the controls of the transport, had started both engines.

Directly Shorty, Red and Cy scrambled aboard the big ship. Bill gave orders to take off.

The transport wallowed out into the harbor, swung into the wind. Both engines boomed. The ship lurched forward and raced into a take-off.

Bill went into the commander's cabin and stopped suddenly. Hal Tuttle was seated in a chair placidly smoking one of his evil-smelling cheroots.

"What're you doing here?" Bill demanded. He had left the veteran explorer in the district commissioner's office after vetoing his offer to accompany the daring mission.

"I'm going with you," the man said calmly.

Bill saw that Tuttle was wearing parachute harness and that a sack of grenades was strapped to his body. "You are not going!" Bill said.

The explorer shrugged. "I'm not too old, Bill," he said quietly. "Anyway, I've taken a shine to that youngster, Sandy. He's spunky. I'm not going to sit idly waiting around. I know all too well what those little black devils will do to him." He paused and added: "That's why I'm going."

Bill's eyes locked with his. "O. K. I guess I know how you feel. Sandy is——" He shook his head and turned away.

"There's a chance of getting to him before it's too late, Bill," Tuttle said.

"A chance—yes. I'll take any chance—any chance to save that kid."

The transport was climbing steeply, its engines howling. Bill went forward to the pilot's compartment, stood behind the man at the controls. The forest was streaming past, far below. The speed was increasing, yet to Bill the transport was standing still.

Every minute was an eternity. They had to get there. There was no telling what had happened to Sandy. Bill whipped binoculars to his eyes, focused them across the packed wilderness. He picked out the white plume of spray from Devil Falls straight ahead.

"Give her all you've got," he said to Timmins. "You know what to do when we get there?"

The man nodded, his eyes trained straight ahead, his hands tightly locked on the controls.

Bill paced back to the deck of the hangar that the Eaglet had occupied. Red, Shorty and the others were waiting there. Hal Tuttle stood with them, fingering the metal ring of his parachute. A strange gleam was in his eye, and his body was erect and vigorous.

Bill spoke to the men. "When we get there, I'm going first. The rest of you follow in the order in which you're now standing. Cy, you'd better come last. Before you jump, drop those 'chutes with the machine guns overboard." He paused, looked at the tense faces of the eight men. "This is a suicide job, fellows. It's not too late to change your minds."

No one spoke.

"Thanks," Bill said. "Now remember. That hole in the forest is small. You'll have to go through it or you're finished. Timmins will swing the ship around for each man. At his signal—jump. There's little wind. You'll drop straight. We'll probably be peppered with arrows on the way down, so hold your grenades ready."

He left them then and hurried back to the pilot's compartment. Now the white plume of spray was visible to the naked eye—was growing larger and larger.

The ship's radio operator contacted Bev Bates, who was circling his Snorter over the falls and the island. Bill spoke hurriedly to him. "Anything happen?"

"Nothing, Bill. The smoke's stopped long ago. I've been sticking right above the island."

"Good. Stay there. Watch for the Pygmy's plane. We're almost there."

Bill went back to where the other men waited. He strapped two bags of hand grenades around his body. "Almost there, fellows." He rammed an automatic into his right leg pocket. Again he went back to Timmins. He shot a look out the window. They were there—right over the falls. Bev's Snorter was circling near by.

"Over there," Bill shouted to Timmins. "See that small clearing?"

The transport swung around, passed over the river. Timmins crowded close to the glass. His voice sharpened with excitement as he pointed. "There, you mean?"

"Yes. Get lower."

The transport dipped down, barely missing the top of the foliage. It reached the clearing, banked steeply. Bill had a long moment to peer down that leafy hole, and what he saw sent his heart thudding into his throat. A split-second impression was etched into his brain. He saw the circle of natives, saw the three stakes, with humans tied to them. That was enough. He whirled back at Timmins.

"Get higher. We have to get down there. There isn't a second to waste. They're holding a sacrifice. Three people. Sandy must be one of them."

The transport zoomed higher, banked around again. "I'm going back. Signal for each jumper."

Timmins nodded. "Yes, sir."

Bill raced down the companionway. The other jumpers were crowded around the port door. Shorty had tugged it open. The wind was screaming in. Bill moved close to the open door, held tightly to the framework.

"You see what was happening down there?" he shouted back at Shorty.

The veteran ace nodded, his face stony.

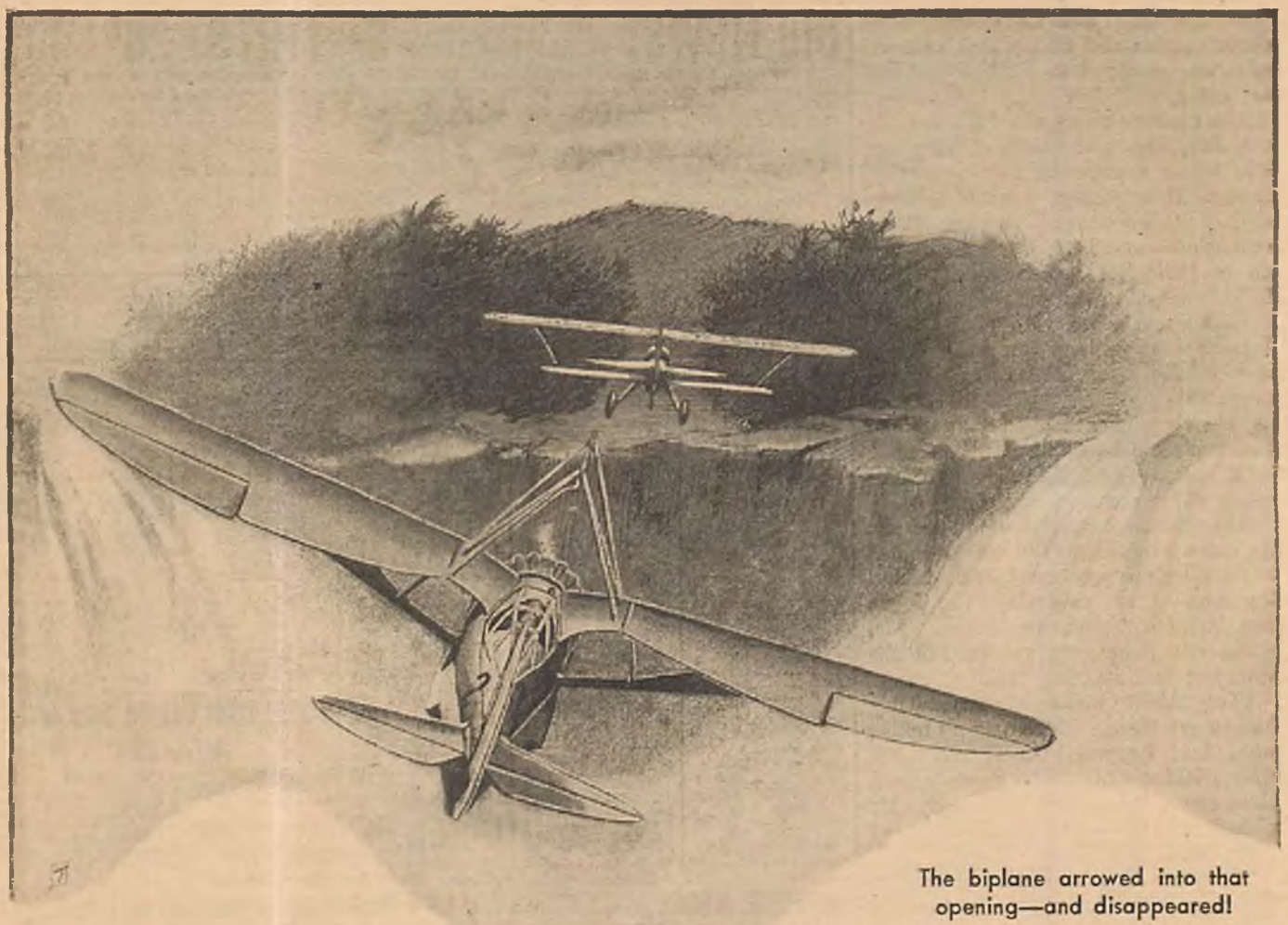
The transport was coming around in a flat turn. Bill peered down. He saw the packed forest—and then the buzzer sounded.

His signal to jump.

He took a deep breath—and dived headlong!

XXI—FROM THE SKIES

SANDY saw the torch in the hands of the medicine man move toward the brushwood under him. He closed his eyes and prayed. And then, as if in answer to his prayer, he heard a thunderous roaring. It sounded above the



The biplane arrowed into that opening—and disappeared!

waterfall, above the weird chanting. He opened his eyes.

He saw Tambu looking up. Sandy twisted his head back. And even before he saw the plane, he knew that it was Bill!

And then Sandy caught a glimpse of the sleek shape of the transport directly overhead. In that flashing second he saw a black object fall away from the fuselage and come tearing down. He thought of a bomb—and then he saw that it was a man—a man falling!

Then there was a sharp report. A circle of white billowed above the falling man. A parachute. He was very close now, descending into the clearing.

The Pygmy throngs had leaped to their feet, were shouting wildly. Prince Pedro pushed his way through the mass of blacks, shouted at Tambu.

"Light those fires, you fool!" he said savagely.

The medicine man held the torch out of the dwarf's reach. "No. This is strange magic. A man is falling from the skies. The gods are displeased."

Pedro cursed him. "Give me that torch!" He whirled around and shouted at the Pygmies. "Shoot at him. He's an evil spirit. Shoot!"

Sandy looked up again. It was Bill! He could see him now. And far above, the transport was recircling. Another parachuted figure was in the air—and another, and another.

Sandy heard the twang of bows, saw arrows streaking up at Bill floating down under that great umbrella of white silk. He heard Prince Pedro shouting, saw him wrench the torch from Tambu's hand. The white dwarf darted to the pile of wood under Sandy, held the flaming torch to it. The wood ignited, leaped up into flames. The boy felt the sudden heat.

The dwarf ran to where the girl was tied, dipped the torch down. The kindling took fire. She shrieked.

Sandy shot an agonized look up at Bill. He was floating closer. Sandy saw his right hand dip into a bag strapped to his body, saw him take out a cylindrical object and hurl it. A grenade! It landed at the side of the clearing, exploded with a deafening report.

The natives broke wildly.

Bill threw another grenade. Again there was a deafening detonation.

Sandy was struggling furiously to free himself from the stake. The flames were leaping higher. He shot a frenzied glance down at the other victims and saw that Prince Pedro had set fire to the wood under Gustav Kressel.

The Pygmies were stampeding across the clearing, fleeing pell-mell into the forest. Tambu, the medicine man, was lying flat on the ground, his face buried in the sod. His body was shaking with great convulsions.

The flames were creeping higher around Sandy. He fought like mad. The heat was growing worse. Bill had almost reached the ground; Sandy shouted wildly to him: "Bill! Get us free! Hurry!"

His eyes were riveted on the man in the parachute harness. Bill's feet hit the ground, slid along it. The billowing mass of silk collapsed. Bill was struggling out of the harness. As he leaped free a spear whistled across the clearing to bury its steely point in the mass of white silk. Bill jerked out a grenade, pulled the pin, threw the missile. It landed well back under the trees. There was a violent explosion.

The flames were reaching up around Sandy. The leather of his shoes was scorching. He saw a shadow fall across the sun-bathed clearing, shot a look up as another parachuted figure settled down below the level of the trees. And above it, fifty feet up, was another figure.

Sandy saw Bill running toward Gustav Kressel, a knife in his hand. The blade shimmered as it slashed through the man's bonds. The frightful ordeal had seemed to imbue Gustav with new

vigor, and he scrambled down to the ground unaided, shouting: "I'm all right. Get the others!"

Bill ran to the girl. She had fainted. Bill was cutting her free when Sandy caught a glimpse of a small animal leaping across the clearing. It was Alphonso!

The monkey jumped over the blazing firewood in one wild leap and landed against Sandy's chest, his hands clawing for a hold. His arms went around the boy's neck tightly; he was whimpering.

Sandy forgot the advancing flames and his peril as he felt the tight, affectionate squeeze of those little hairy arms. He said: "Alphonso! You came back! You wouldn't leave me."

The monkey whimpered and snuggled closer to him.

The boy's thoughts were jerked back to his own predicament. The fire was welling higher. The fumes went down his lungs, searing and choking. He shouted at Bill to hurry.

The pilot had pulled Betty's limp body free from the flames, and then he reached Sandy, was kicking the blazing wood away. His knife was cutting through the entwined vines.

"Bill—Bill——" A strange faint feeling swept over Sandy. Bill jerked him away from the stake and caught him as he almost fell to the ground. Another quick slash of the knife severed the rope that laced his arms to his sides.

Alphonso had climbed to Sandy's shoulder and was emitting sharp, excited cries.

A series of reports thundered in Sandy's ear. He saw that Shorty had dropped into the clearing, was firing wildly into the forest. And then, beyond him, Sandy caught sight of Prince Pedro running into the house through which they had reached the clearing. Gustav Kressel was stumbling after him.

"Bill! The dwarf—he's getting away. Look!" Sandy started forward, Alphonso clinging to him. "Come on! He's going back to his plane. Gustav Kressel's after him."

Bill and Sandy sprinted across the clearing as Hal Tuttle descended in his parachute. Bill shouted over his shoulder: "Going after Pedro! Get control over the mob here!"

They reached the house, pelted through the throne room, reached the *trapdoor* at the other end. The monkey was screeching excitedly. Sandy bent down, yanked the door open, hurried down the iron ladder. "This way, Bill," he panted. "Tunnel over to the island. Hurry! He'll get away!"

They heard running footsteps ahead of them and raced faster. The passageway seemed miles long. They finally tore up the slope and reached the ladder at the other end. Sandy scrambled up the rungs, heaved the trapdoor open, fell sprawling into the room where he had been held prisoner.

A thunderous roaring was blasting through the place.

"Engines!" Bill yelled.

Sandy threw himself across the room to the door. Bill followed. They raced into the tunnel beyond, were just in time to see the White Pygmy's plane hurtle out through the opening. And right behind it was streaking the Eaglet, with Gustav Kressel in the pilot's seat.

They were destined never to know how the desperately sick Gustav had forced his weakened body to pursue the dwarf from the village; how he had had strength enough to reach the Eaglet and start the engine. But he was there, in Sandy's small plane! And the Eaglet was racing down the tunnel, racing faster and faster. Then, with a snarl of its blasting engine, the Eaglet hurtled out through the opening.

Bill and Sandy tore down the tunnel, arrived at the end, stared out.

The Pygmy plane was zooming wildly up through the swirling mists. Behind it rocketed the Eaglet. And then, in that terrible second as they watched, spellbound, the Eaglet caught up with the other ship, smashed straight into it!

There was a crashing report! The two planes seemed to melt into one! A sheet of flame whipped up, encircled the whole tangled mass. The interlocked planes sped downward through the mist, sped down to the boiling waters of the gorge far below—and disappeared.

XXII—RETURN

IT WAS six weeks later to the day, when the weary body of men trekked into the port of Durbat after an exhausting struggle through the matted wilderness of the Itura Forest. Tambu, the medicine man, had accompanied them, and under the leadership of the experienced explorer, Hal Tuttle, they had proceeded unmolested by the Pygmy tribes. The port of Durbat greeted them joyously.

A few hours later Betty Kressel was put aboard a Belgian plane and flown to Mombasa on the Indian Ocean, to catch a liner for the United States.

That evening, the banquet hall of the district commissioner's residence was the scene of a gala occasion. A long table extended down the full length of the great room. Seated at it were the Belgian officials and the personnel of the Barnes squadron.

Beyond the great windows that bordered one side of the room was the harbor wharf with the Barnes planes riding silently at their moorings. The sun was setting, and a blazing red blanket was over the world.

The district commissioner had spoken glowing words of praise and had presented a check of a staggering amount of money to Bill on behalf of his government in grateful appreciation of ridding the Congo of the White Pygmy.

Bill came to his feet, thanked him quietly, and then looked down the table at the rows of men.

"I have an announcement to make. I have just received a cable from New York, telling of the death of Hans Kressel. I am only grateful that before he died he knew of the great sacrifice his son had made and knew that his granddaughter, Betty Kressel, was safe." He paused and then went on: "I, personally, want to thank every one of you men for your splendid cooperation and courage. Particularly—Sandy Sanders."

There was a roar of handclapping.

"And that other hero—Alphonso." Bill gestured toward the high chair beside Sandy and suddenly frowned. The monkey who had occupied the chair had disappeared.

Sandy said: "He left before the speeches started. He's modest."

A roar of laughter went up.

"Anyway, I now officially adopt Alphonso as the mascot of the Barnes squadron," Bill said. "He saved a desperate situation by turning on that smoke screen."

Sandy grinned his appreciation.

Shorty winked at Bill and said: "That ape's not so smart, if you ask me. Nobody knows if he really turned on that smoke screen. We're just taking Sandy's word for it."

Sandy's face went red from sudden anger. As he turned belligerently toward Shorty, he caught a glimpse of the harbor through the windows. His anger died abruptly. He grinned and said: "You don't think he turned on that smoke screen? Well—look!" He pointed out the window.

All eyes followed the direction of his finger. From the left wing tips of every one of the anchored Barnes planes columns of grayish-white smoke were gushing out.

"Fire!" the commissioner shouted.

"Smoke screen!" Red Gleason yelled.

"Alphonso!" Shorty gasped.

"My pal!" Sandy said—and Bill laughed.

JUST WHAT HE ORDERED

(Continued from page 18)

"Nonsense," said the C. O. "Captain Baldridge has always spoken highly of you and your test work. Two weeks ago, when you put in your bid for relief from 8, with your request for the front, the captain talked it over with me. He's not the man to keep any of you boys back here against your will. However, he made the point that good testers—*good* testers, lieutenant—are few. Therefore, said Captain Baldridge, he'd hold you a bit longer. Truth is, the captain told me he'd hold you till you showed the first sign of being fed up.

"Yesterday afternoon," continued the C. O., "I ran into the captain over at Main Field. He said, 'I'll be sending a new test pilot over to 8. I'm finally O. K.-ing Lieutenant Duke's request for transfer. And, sir, if it isn't going over your head, I'm commending the lieutenant, officially for the record, and recommending a two weeks' free period in Paris.'

"So, lieutenant," concluded the C. O., "if them there's black marks, I'd like a few more of them there—for the record—for myself."

Duke went away from that office walking on air. That Captain Baldridge—the swell son—giving his bid an O. K.—and with through-channel commendations and that recommendation for two weeks in the Promised Land, Paris! Whew! he'd best take the thing slowly, for maybe it was only a dream.

Dreaming or not, Duke next dropped in at flying office, there to tell 'em he was fired, and request that they get an official O. K. on his separation, and figure up and O. K. his flying time for the weeks spent at 8. A man must have his air hours correct—no matter what else happens—or how's he to show the gang just who's who in the air?

Just as Duke was about to quit the flying office, a Main Field courier slued his motor-bike to a stop outside. Here was the morning's morning in the line of dope, orders, etc. Duke waited.

"Here's something for you, Lieutenant Duke," said Sergeant Jack Smith, one of the powers in that office. "No. 333's in test, isn't it?"

Duke smiled as he reached for the bit of paper that had something to do with old 333. And smile he might, for 333 would never worry him again.

"Well, I'll be damned!" Duke said, upon reading. "Ho! ho! ho! and haw! haw! haw! Oh, wait till Sergeant Rundt sees this. Ho! ho!"

On the way down to the test hangar, Duke's laugh gave way to a smile, and before he had arrived, that smile had given way to a sort of a thin, humorless frown. As though a man might want to laugh, but should not.

"Morning, lieutenant," Sergeant Rundt said; then, noticing that strange look on his superior's face—"What's new? Something——"

"'Boots and Saddles' has done gone and blowed for me, sarg," Duke said. "I'm as good as packed up, all bets are paid, and you draw a new boss here on the test line."

"You mean"—and that danged cocky little runt of a Rundt had a catch in his voice and a tear in his eye—"us guys here in test've sold you down the river? Aw, hell—don't tell me we got you canned."

"Ah, forget it. Wrong idea," said Duke, and there was a bit of a frog in his throat, too, for you don't cut service ties with a wild song in your heart, no matter how wild you might be. "You recall I told you, a few weeks back, about putting in a bid for a trip up front? Well, I'm on my way. Captain Baldridge O. K.'d the bid; and he put a commendation and a recommendation, through channels, for me. I draw down a two weeks' stop in Paris, if I want it."

Rundt was still a bit starry-eyed. "M'gosh, I'm glad you get a break," he said. "You'll do things up there. Get a few for me. And as for Cap Baldridge—that guy's white. From now out, this here hangar's on the ball for him. He's an all-right——"

"Ah-ah," warned Duke. "Hold that a moment. Take a peek at this official memo, with the captain's name attached, that just came over from Main Field."

Sergeant Rundt took and read the memo. He went rigid. He was wordless. Then, regaining his self-control, he was no longer in the wordless class. He yelled. He cussed. His test-hangar gang, to a man, quit work and looked in the direction of all that noise. The memo that Rundt held in hand, that official bit of Main Field paper, was a Condemned-for-Salvage order covering one Nieuport-27, No. 333.

"Condemned! After all that condemned work!" he yelled. "She goes to salvage; 333 goes to salvage, after we guys sweat blood for five-six bloody hours, while every other dumb-john goldbrick on the so-and-so reservation was having a good time. I'll be condemned if I ain't sore enough to take a captain apart. An' if I had ten francs, could get outa camp and to town, then miss the such-and-which M. P.'s, I'll be doubly condemned if I wouldn't get myself all drunked up."

Lieutenant Duke pulled an officer's wad of queer French money. "I guess you've got ten francs coming, sarg," he said, "so here's a fifty-franc plaster. Too bad, though, there's so many other little things standing between you and that drunk."

"With the jack in hand," Rundt promised, "I'll overcome all them other obstacles. Thanks, and I'll hoist a few to you."

"But before you go to the bad," Duke said, "I'll tell you what I'll do. I'm supposed to report at Main Field for orders; so if the boys'll wind her up, I'll hop old 333 over to salvage. And if I can locate Captain Baldridge, I'll see what can be done about having the old crate hopped for just one more test. If she's as good as you claim, perhaps the captain will want to tear up this condemnation order and return the ship to service. After all, Nieuports cost Uncle Sam lots of money, and ships are few enough here at this center."

"Wish you'd do that, lieutenant," Rundt enthused. "I'd like to show the captain that we 8 guys can turn out a job of work. And as for 333 being good—I'll bet you fifty francs she's perfect. Now look"—Sergeant Rundt wet a finger and held it aloft, then checked the finding on the wind sock atop his hangar—"the wind's right out of the northwest, right from the Main Field to here. You put old 333 on the course, then take off hands and feet. And with her throttled to 1,250, I'll bet she'll take you right over Main Field. Talk about your old perfect *ligne de vol*—she's got it."

"Damned tootin', lieutenant," put in Tiny Wenn, who'd been standing by, open mawed, "and 'Field 13' is right beyond Main Field, and if——"

"Listen, ape," wailed Rundt, "if you don't pipe down and suck air, I'll tear you down to my own size. . . . You an' your '13'!"

Those frisky, sun-shot low clouds were still tumbling through the tops of 8's roadside trees when Duke hit 333 with full power, zoomed into a chandelle, loafed with it on its back for a few seconds, then dropped—taken entirely by the clouds—from view, down wind. A minute later, seeing as how 333 was the only ship aloft at 8, Rundt and his men heard it coming back. Ghosting through the clouds, at not more than two hundred feet elevation, 333 had her drilling nose dead into the northwest wind. And as she churned across the test line, Duke waved down with each free hand. Both of his feet, hanging one over either side of the cockpit, dangled in air. There was your perfect *ligne de vol*, a hands-and-feet-off job, proving up on its inherent stability, at 1,250 revs to the clocked minute. And more to the point: that flying job was doing its stuff in a puffy sky.

"Good's what I calls it," enthused one of the riggers.

"Good be damned, soldier," said Rundt. "That's perfect."

So Duke went into the northwest, toward Main Field.

And at about the time Duke was quitting 8, something came out of the east to 8, and to the whole center. It was a delayed alert. That alert warned that an enemy aircraft, type unknown, had crossed the front, above solid clouds in a French sector, and carried on deep into the rear.

An alert? Air raid? Well, this center had had one other such alert. That had been at night: and the thing had failed to come off. Still and all, an air raid wasn't out of the question. The center was only a hundred and fifteen miles behind the front; and what would that distance amount to if the enemy had finally satisfied itself that it had some sort of a new and efficient daylight bomber? Moreover, the sky was just right for such a try. Clouds, low clouds, and plenty of 'em. No rain and, perhaps, plenty of clear sky at a reasonable, reachable altitude above the low clouds. Anyway, Field 8's staff believed in the alert possibilities. The bugler sounded assembly. Then the post C. O. told all hands just what was what, concluding, "—so scatter. Go out and hide in the low grass and high wheat. Don't come in till assembly is sounded. That's all."

Main Field, like 8, was doing no student work that morning. Long lines of ready ships waited on the deadlines, and pilots and macs were goldbricking all over the reservation when assembly sounded there. They, too, heard the news, then scattered. Air raid? Here's hoping the enemy keeps his promise this time. A little noise in the S. O. S.—fine!

A mile down the line from Main Field was Field 3, really all one big drome. Up from Field 3, doing a test hop on one of that field's ships, Captain Baldridge was in the air at the time of alert. Getting down over Main Field, he noticed that his oil pulsation gauge wasn't pulsating. He shot a landing afront Main Field's headquarters hangar, intending to get a little motor service there. Just then Duke came in over the water tower, shot his landing, and rolled 333 to a stop beside the captain's Field 3 ship.

"Good morning, lieutenant," said the captain. "Seems as though the war is over, with everybody gone home. I've been here three or four minutes and haven't sighted a single American."

Duke, exchanging greeting, laughed. "Perhaps the command is standing muster, sir. Or listening to the periodical reading of the Articles of War," he advanced.

"Oh-o!" said Captain Baldridge, noticing 333 for the first time. "Lieutenant Duke, you know as well as I when and how pilots die. They die when they have no right to be flying: with their traveling orders in their pocket. Why take chances now, and especially with such a wreck as 333?"

Duke explained 333, bearing down heavily upon the labor put out, and the pride of mechanics at stake. "She's a fine ship now, sir," he promised, "and within ten revs of 1,950. Won't you hop her, sir?"

"Anything to please," the captain laughed. "But if 333's still salvage, I'll land her at Field 3, closest spot to the salvage hangar, eh? . . . I'll tell you what, I'll land there anyhow. And you can hop this 246 ship back to Field 3's line. I'll be glad to have you give her a test. Just make a *tour de piece* and see what you think of her handling. Lieutenant Page, my new tester at 3, and I have been trying to agree on this 246 for nearly a week. He says she flies one way, and I hold that she handles thus and so. So you see if it's one way or thus and so."

Captain Baldridge got off the ground, went to about three hundred feet, then swung down wind into the southeast, back toward 8. Duke zoomed 246 into that vacant sky, knowing that nothing would be in his way. He, too, turned down wind, all the while climbing for a bit more altitude than, as he judged, the captain would be using. Now and then, here and there over the half dozen open-country kilometers covered, each pilot caught a fleeting glimpse of the other. Finally, at a time when views were mutual, both turned, headed into the wind and went to test. Captain Baldridge was at three hundred feet. Duke was in much thinner clouds, at a thousand elevation. And then, for a

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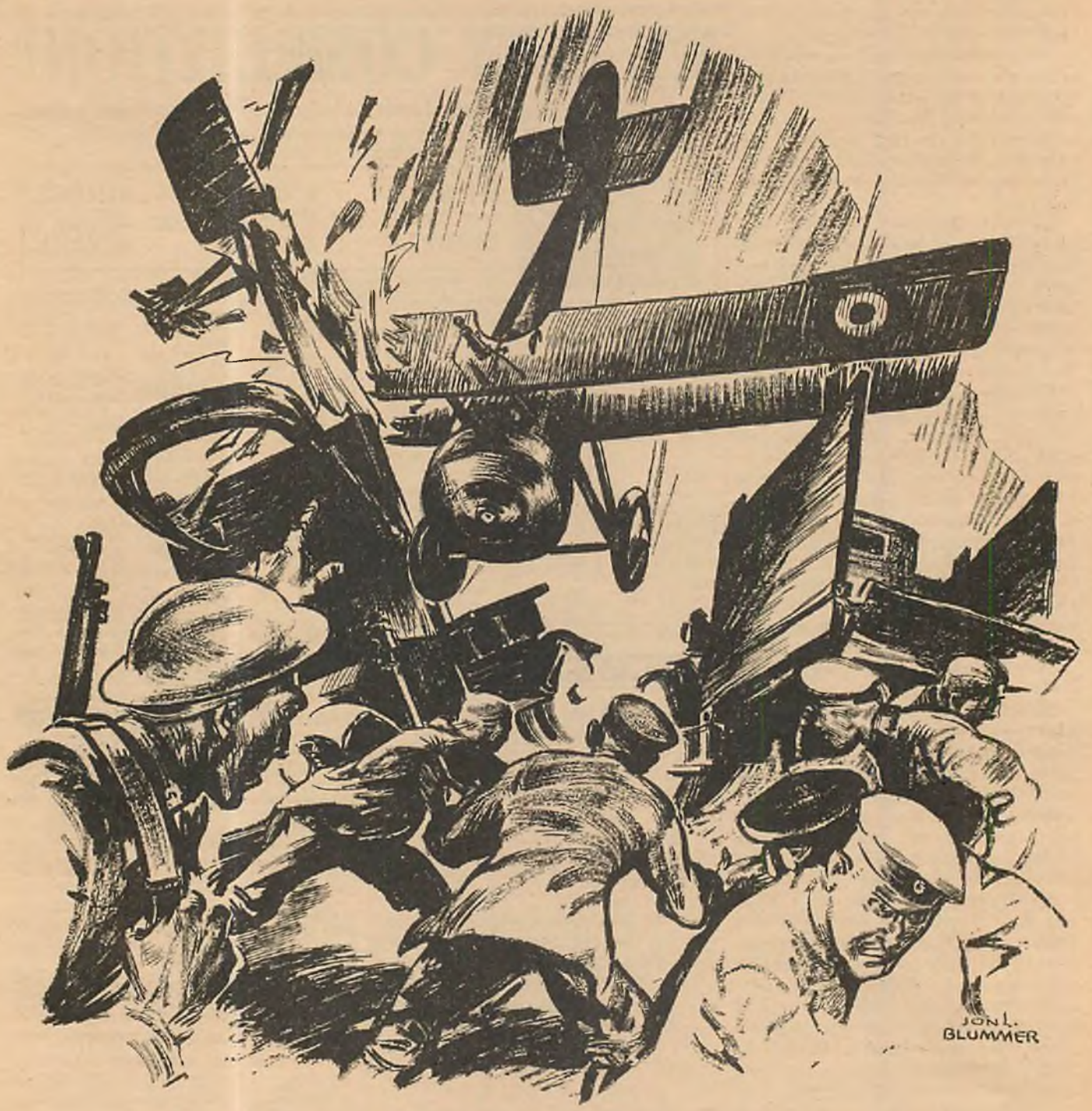


It was the salvage dump! Free-and-easy old 246 tried to pass between two trucks.

few minutes, now seeing and now losing each other, the two ships churned ahead. Then Main Field came under. Just ahead was dreaded "13." Also, the salvage hangar and its piles of junk. Then Duke lost sight of 333. But Field 3 was just ahead. And here's 333 again! It's directly below Duke. He gazes down. He sees that the captain's hands and feet are off the controls. Ah, there's a ship with a perfect *ligne de vol!*

Duke's heart dropped a few beats! Something else was coming into the picture—a ship churning through those clouds behind 333. It had black crosses on its surface. An enemy ship!

Duke had no guns aboard. But he knew that he must not lose sight of this German. It was a single-seater Fokker, a *chasse* job. No doubt, thought Duke, here's a pilot lost in the clouds. A German pilot whose fuel must be very low by now. But a pilot who had decided to get this lone Nieuport—333—before that lack of fuel forced a landing.

Duke was sideslipping. Away went five hundred feet. Then he judged that he had but a few hundred feet of space wherein to act. By then the Fokker was very close to 333. For a split second, Duke looked ahead to 333; and something told him that Captain Baldridge had been in those German sights before—back there a few seconds ago. The man in 333 wasn't flying test, wasn't glorying in a perfect *ligne de vol.* He was "out." But the *ligne de vol* was there.

Duke's ability to fly was his only weapon. He knew that the weapon was good even before he tried it. Even before the last hundred feet of sideslip had been spent, his mind had been made up to shoot the works. He flattened his ship out of that slip. His motor took full gun again. His nose was on the line—for that Fokker's tail. And the Fokker, just then, luffed. Duke knew what that meant. He knew what that slight change of direction spelled—gun-sighting! Last-second sighting! Old 333 was being framed in a small circle atop a German cowl, between two German guns. And those guns, once that

picture was framed, couldn't possibly miss—not this time.

Weapon in hand—buzz saw in hand! —Duke closed the gap, that small space that stood between his propeller—the buzz saw—and the Fokker's tail. That tail was Duke's quickly chosen objective, for the tail of a ship is its vulnerable spot, the Achilles heel of heavier-than-air flight.

No. 246, Duke had realized from his take-off, had an exceptional motor. It could turn 1,400 revs, very fast for a rotary engine. And 246's good power unit was turning that now—now, as Duke closed that last gap and swept, for just an instant, ahead of the Fokker's empennage. Then, just as he saw the first spreading burst of tracers spout from the enemy's guns, Duke, flying a flat turn, swung that howling buzz saw propeller across the small section of the Fokker fuselage, cutting afront of the stabilizer's leading edge.

Duke's wooden propeller shattered. Of course it shattered. The air was filled with flying, whistling pieces of wood. The vibration on his still-running rotary was ship-destroying, hellish, lethal. But he held that buzz saw to the job, thumping those stout, whirling, blunt propeller stubs through the last remaining shreds of twisted, broken Fokker fuselage pipes—pipes that couldn't take a beating like that! For nothing in air could take that. Even Duke's 246 would kick itself to pieces.

Duke saw the front end of that wreckage first shove its nose high in the sky, guns still spreading their bursts, and a German pilot turning to look backward at his tail—and at this unexpected thing that was tangled in that tail. Then the Fokker's howling power pulled that nose down; and the entire foreign entanglement fell away from Duke's lashing, thumping, vibrating bow. One of those low, tumbling clouds had blanked the under ground at the same time, and it had to be a very low cloud to get in below those parting ships. Duke knew that all too well, for you don't tangle with and then break away from another craft in flight without giving away some altitude. And there had been none too much altitude at the beginning.

Duke, with the parting of ships, had cut his switch. Clouds, for the moment, had him blanked. Motorless, then, he made his guess and put his 246 into what he supposed was a glide. Except for the dim swish of his own surfaces and wires, it was a mighty quiet world. Then a sickening crunch came to ear. It came from a bit to the rear, and not far below. That Fokker had piled up. Duke hoped the guy wasn't in the red—burning. The Yank held to his well-judged glide and hoped against hope that those clouds would open, just for a shake, before the ground came up to slap him.

Well, a wartime tester, as a rule, was a man who came amply fitted with the old stiff upper lip. He expected just about anything to happen, at any ungiven spot in the day's work, and he was all set to move in any one of forty directions when that thing did happen. So Lieutenant Duke, gliding through that uncannily hushed mess of clouds, wasn't at all surprised—just thankful—when the stuff began to come off his blunt bow a little thinner, more wisp-like. Now a bright slash of sunshine! Soon, with any kind of a break, he'd see his ground! And there it is—just scant feet below—and Oh! Oh!—it's the salvage dump!

In the next second the wheels hit. They'd reached earth on a small open spot between two lines of piled-up crates. From that moment on the detail was out of Duke's hands. He drew down into the office, got both feet to the same side of the joy stick, covered his head and face with his forearms. Then the world went crazy. That free-and-easy old 246 left all four wings, equally divided, when it tried to pass between two five-ton trucks upon which a score or more German prisoners of war were loading and unloading junk. A score or more of PG's went white, then went away from there. So did 246. She went right through the salvage hangar. What was left of her came to a stop out near the deadline afront the salvage layout.

"Just a minute—just a minute!" the sergeant in charge of that ex-ship department was yelling as he ran out to where Duke was coming up for air. "You can't fly wingless ships off this line. Damned if you can even *land* wingless crates here. I won't stand for it."

"Man! That was a landing!" Duke enthused.

"Yep," the salvage sergeant agreed, "a landing is anything a pilot can crawl out of and walk away from."

Not far away, though, there was a pilot who wasn't going to get credit for an official landing—the Fokker man. He never walked away from his tailless pile of wreckage. Truth is, that lone enemy ship landed so close to "Field 13" that its right wheel, snapping off, bounced and rolled fully two hundred feet, taking down a long row of little white markers. And the gang from the morgue, at Main Field, said it'd been a lot easier to bring up a box, nail the guy in, then lower him into any one of the six open holes instead of going to all that old official blah about lugging him back to their Main Field shop, there to make the thing official for the records. Anyway, "Field 13" had won a man.

It was Lieutenant Duke who, within half an hour of his salvage landing, led a flock of some thirty willing, hedge-hopping ships northwestward in search of 333—and whatever of bad news 333's cockpit might be holding. Duke was strong in the belief that 333, with her perfect *ligne de vol*, would carry on, pilotless, until her fuel supply ended. That would mean two hours' flight, from the time 333 had quit the line back at Field 8. Even against a wind, two hours' flight is a mighty far distance; and you might wear out a whole flock of good ships, all to no avail, combing such a far distance in search of something small on the ground. And a camouflaged Nieuport-27 could be small, too.

Lieutenant Duke and his many followers did not find 333.

But late that afternoon, sitting pretty atop a wine cask, Captain Baldridge came down the road from the back-country on a slow-moving, lazily swaying farm wagon. His head was bandaged.

The captain had no idea what had happened. He had come for a distance of fifteen kilometers on that cart. Old 333, with a hole in her fuel tank, and more holes in her fuselage, tail service and wings, was back there in a wheat field, and entirely O. K. except for those many queer holes. The captain guessed —yes, he was sure—that the hole in his fuel tank had sent 333 down. Not sent him down. No, he didn't have anything to do with it. Truth is, his last flight memory was when he looked down and watched Main Field's hangars going past. Then, according to him, something nice seemed to happen. His world went pink, and he rode ahead—and his subconscious told him he was still riding—on wings of glory. And in a ship —that same subconscious told him—that had a perfect *ligne de vol*. He

He awaked among wondering countryfolk.

sort of guessed that the whole thing was just a dream, just well-earned rest, after weeks and months wherein he had done little else than yell for ships with a perfect *ligne de vol*. And the captain, cruising in that pink shell of helplessness, knew that it must end, that he must awake.

He did awake. There were a dozen or more French countryfolk standing around the ship, each speculating as to just why this *aviateur* should land here to sleep so soundly. Captain Baldridge, still sitting there in his pit, had run a hand over his face, and that hand had found something. It was a bump on the left temple. What was that?

Wondering what that bump could be, the captain had looked up for a peek in his rear-vision mirror. That heavy, five-inch, convex mirror wasn't on its fitting. Its fitting was right at the top of the V chandelles, right where the upper wing butted together. In flight, for an average man, that mirror was not more than a foot above and in front of his face. And that mirror, for some reason or other, had come back and slapped Captain Baldridge for the long row—and why?

Still a bit dizzy, the captain had slid to the ground. It was then that he found all the holes. He tried to put 2 and 3 together, but it made more than 4—much more. So he gave it up, arranged for a ride down the road, and there he was back at Main Field, in the hospital for a going-over, and not a single shot in his person.

After a camp-wide search, they found the captain's rear-vision mirror. It was in one of Main Field's drainage ditches, but it took a whole lot of telling when they tried to tell the captain that a lone German had shot that mirror off its fitting. And that mirror, his own ship's mirror, had then swept back and konked him for a long count.

"Well," he said, especially to Duke, among those present, "that's the advantage of being a captain: you lieutenants have to take yourselves to the front; but, being a captain, *they* bring the front to *me*."

WASH-OUT

(Continued from page 34)

More formidable than the famed Sahara. Ugly gorges, offshoots of the ancient Cordillera foothills, yawned like cruel jaws of giant traps. Sand dunes rolled in endless billows to far horizons. A scene of utter and terrible desolation. A forced landing now meant certain death.

Then the motor conked!

Mason cast a swift glance back over his shoulder. The hair rose at the nape of his neck. A monstrous black cloud, borne on the swift wings of a gale, was almost on top of them. Thunder, like distant aerial cannonading, came distinctly to his ears.

He knew then, with a terrible certainty, that they would never make it. To remain in the air meant swift, hurtling death in the grip of the tremendous storm. To go down meant cracking up in a dry, rocky gorge or against the slope of a giant dune.

A whitish ring around taut lips, his face strangely pale, he put the ship into a steep glide. He ignored the ravings of the madman in the forward cockpit. Harris, screaming wildly, struggled insanely against the restraining straps. His violent movements threatened to send the motorless plane out of control.

Mason fought and nursed the controls with grim determination. A deep sense of utter hopelessness surged over him, followed by a wave of bitter hatred for Harris. Damn him! Why did he have to come along and wreck his last bid for regeneration? The desert had been a safe haven, if a cruel one. Here he could have worked out a future for himself. Now everything was lost.

And yet it was not entirely Harris' fault. He owed most of his present misery to his own quixotic chivalry; his innate sense of decency. Now they would both die. That was inevitable.

Oddly, he sensed a queer peace. If he must die, this was the way he wanted to go. Wash-out in an element he loved. They would crash, yes, but he would know one brief moment of bitter-sweet satisfaction. This was the way an airman should die.

Down, down they swept, with ever-increasing speed. Gaping mouths of rocky gorges rushed up to engulf them. By sheer flying skill he overshot them; searched desperately for a tiny level spot among the dunes.

He lengthened the glide to lessen speed. The instinct to live strong within him, he grimly resolved to attempt a pancake landing. Ten feet above the sloping side of a sand dune, he pulled the stick back as far as it would go—and prayed.

The tail skid struck and bounced off. The plane bounded forward, the undercarriage sank deeply into the sand. The plane stood on its nose and came to a jolting halt amid the rending crackle of framework and wing structure. Thrown clear, Mason landed with a sliding thud. The darkness of oblivion engulfed him.

SLOWLY returning consciousness brought with it a sense of soreness, and fantastic visions. He imagined he was lying in the bunk house at Slavonia, and that Robinson, the English supervisor, was bending over him. And what was that strange drumming sound on the corrugated roof? If he didn't know better, he'd think it was rain.

A voice he recognized as Robinson's said:

"Glad to see you coming out of it, old fellow. You're not seriously hurt. Just a bit of a bang on the head and a few bruises. How do you feel?"

Mason opened his eyes wide and was instantly fully conscious. This was no dream. This was real. He was at Slavonia. And that was Harris lying over there in the other bunk, grinning at him weakly. He didn't look crazy now.

And that strange drumming sound? By heavens! It *was* rain! He could see it through the small window, slanting down in steady torrents. But it couldn't be! Rain never fell in the Talapaca Desert. Maybe he was crazy now. He looked questioningly up into Robinson's smooth, pink face.

The Englishman smiled cheerily.

"You're all right, Jones, old boy. Top hole, in fact. Your friend is banged up a bit, but he'll pull through. Some of my men were prospecting that area you suggested, ten miles west of here. They saw you fall and packed you in."

A light of bewilderment grew in his light blue eyes.

"And, bless me, can you believe it, man? It's raining! For the first time in a century! A bloody freak, I call it."

A look of commiseration crossed his sunburned face.

"Sorry, old chap, it looks as if that concession of yours down south will be washed out completely. This rain has been falling for hours. It will do tremendous damage to even the largest nitrate deposits."

Mason rolled his head on the pillow and met Harris' quizzical gaze. He spoke musingly:

"Then there's no use my going back there. Anyway, I've got more important business back in the States. I'm not afraid of anything now. I'm going home with Mr. Harris. There's something back there I want to—wash out."

HOT AIR HEROES

(Continued from page 21)

Up into the sky he went and dived again, shrieking past the porch and dismantling a fence in his flight.

Inside the house an animated conversation took place.

"Good heavens!" yelled Father, leaping back and falling over a chair as the Thomas Morse seemed about to fly in through the window at express-train speed. At the last moment Bill backsticked and pulled up over the house with an ear-shattering clamor from the Hisso.

"What on earth is that young idiot trying to do!" shouted the Man of the House, picking himself up.

"I think," his daughter said demurely, only too thrilled at such attention from an Aviator, "he wants me to go out on the porch and wave to him."

"Then go and do it!" her father shrieked. "Wave to him before he knocks down the house on our heads!"

Obediently the girl went out on the porch and waved to her flying admirer.

Bill saw her, pulled the plane into a grand zoom and waved back. He was so busy waving he forgot to level out at the top of the zoom, with the result that it was a case of stall—fall—*crash!* In a cloud of dust the Thomas Morse cracked up in the middle of the road.

It was not a bad crash, as Bill hastened to point out to Hisso Hal while they inspected the crumpled ship. Except for the motor being moved into the front cockpit, nothing but the prop had been damaged. Hal absent-mindedly agreed with his partner and idly wondered what he (Hal) would look like about now had he been riding in the front cockpit.

Once again the two aviators sat around. This time they waited for a new fuselage and propeller to arrive from the Thomas Morse factory.

IT WAS at about this time that Hisso Hal's flying luck began to attract attention.

Of course it had been Bill Bowler who cracked up the Thomas Morse on the first two occasions. But this detail had passed almost unheeded. With unassumed modesty, Bill contended that these beautiful wash-outs while accomplished by himself had not meant anything.

"It was just the breaks," he said to Hal. "First thing you know you'll crack the ship yourself and have something to write home about."

But Hisso Hal, sad to relate, never had any crashes to write home about. Accidents the air adventurers had in plenty. Here they knocked off the tail skid in a bad landing. There they turned the plane over on its back and destroyed top wing and rudder. But in all the crashes one fact stood out. Bill Bowler was at the controls.

Hisso Hal, it was now apparent, was possessed of phenomenal luck in flying. Never, when he was piloting, was the ship so much as scratched.

It grew monotonous. Hal did not want to be an oddity among fliers. Why could he not crack up planes like other pilots?

He tried hard. Sometimes he cut the motor on a take-off, hoping for a stall, or at least that in landing he would damage the ship to some extent. No go.

Again he made a landing blindfolded, hoping to hit something with a good solid smack. Invariably the plane would go down to a perfect three-point landing, avoiding any and all obstacles with uncanny precision.

Finally he grew desperate. Going up alone one day to the highest altitude the Thomas Morse could reach, he went into a spin. Down came the ship, winding tighter and tighter, and dropping plenty fast. Observing the whirling earth rising to meet him with sickening speed, Hal abruptly changed his mind about cracking up that day and tried to come out of the spin.

But the Thomas Morse wasn't having any. It was buckling right down to the job, and seemed to be enjoying itself. Hisso Hal almost wrenched the controls from their fastenings, but he could not stop the spin.

Down—down—down—and *crash!* But in crashing, the plane hit not the ground, but the top of the largest haystack in the State.

The ship bounced off the haystack and lighted on the ground in perfect condition, without a scratch.

Hal gave it up. It seemed no harm could come to a plane he was flying. Also, he was not so sure now that he did not have something real good. And in the years that followed it was pleasant to note that he was becoming famous. His name spread far and wide among the country's fliers. Pilots came from great distances to get a button from his clothes, or even a piece of his shirt or trousers, the idea being that the clothes worn by the Luckiest Flier Alive might be possessed in some way of the amazing luck of their owner.

All this was very nice, except that Hisso Hal began to run up a staggering tailor's bill.

Bill Bowler, still Hal's flying partner after all these years, had always been just a bit skeptical of all this luck talk. But he was due to receive proof in one large gob.

They had been flying a Waco at a seacoast town. Both Hal and Bill were native Middle Westerners, and had never seen an ocean before, so at the first opportunity they set off for a flight over the water.

Ten miles out, with Hisso Hal at the

Literal Lemuel

"You said to lighten it, so I let out some gas!"

controls, the motor began to make a strangling sound as though it had swallowed something the wrong way. It shook and shuddered violently, almost tearing loose from the mountings. Suddenly a cylinder shot into the air, described a graceful arc and fell into the sea.

The motor died.

Bill swallowed dryly.

"You know," he said in a conversational tone of voice. "I wish I knew how to swim."

Hisso Hal looked overside as the ship fell swiftly.

"I wish I did, too," he said, just to keep the conversation going.

Both looked down and eyed the ocean. It was very rough. Green waves leaped high and frothily. In all that expanse of water, not a craft of any kind was to be seen. There was nothing down there but a patch of fog.

"This ship won't stay afloat five minutes," Bill asserted.

"Nearer three," Hal corrected tersely.

The Waco was now almost down to the sea.

"So long, Hal," Bill Bowler said slowly. "We've had a great time together. But this is the end. Your luck can't save us now."

They shook hands.

And there emerged from the patch of fog off to their right the broad snout of——

"An aircraft carrier!" Hisso Hal yelled.

He ruddered carefully, and the Waco glided onto the landing deck of the navy craft.

Thankfully they stepped out on the firm deck.

Bill Bowler stood there beside the plane and looked dazedly out at the sea and then at Hisso Hal.

"Migosh," he said in an awed tone. "Migosh. And to think I doubted your luck."

Hisso Hal, too was staggered by his colossal luck. But a new thought struck him.

"This can't last forever," he said. "Some day my luck is going to change. And when it does, I'll bet it changes with a bang."

Never were truer words spoken.

ONLY a month later, Hisso Hal was engaged to pilot a plane in an attempt to break the world's non-refueling endurance record.

On the auspicious day of the start he blasted the huge ship, loaded with gas, down a long runway and into the air. Bill Bowler occupied the co-pilot's seat.

Slowly, very slowly, the heavily laden plane gained altitude. The motor pounded at full throttle, giving its last ounce of power.

Bill looked down.

"I'll be glad when we get upstairs. If our motor should quit right now—well, I'd hate to make a forced landing in this flying gas tank, even with you and all your luck at the controls."

Then he went on, with a view to brightening the conversation.

"What a blaze this bus would make if it crashed and all the gas caught fire!"

Just then the motor cut out.

Hisso Hal worked desperately to restart it. He was not successful.

He turned to Bowler as the big ship banked drunkenly and started down.

"Bill," he said slowly and impressively, "I have an idea that right here is where my luck runs out."

That gentleman only gulped and idly snapped and unsnapped his safety belt. With fascinated gaze he was watching the steady, rapid advance of the ground below.

Down came the huge plane, gathering speed at an unpleasant rate. Fortunately there were many large fields below, all good for landing. All except one were free from obstructions.

And now it became apparent to even the most casual eye that Hisso Hal's luck had indeed changed. For at this crucial moment the rudder control failed.

The big ship fell into a sideslip. Hal hauled it out. But he was forced to land in the only field with an obstruction. The obstruction was a balloon—a half-inflated hydrogen balloon around which khaki-clad figures stood waving frantically.

The plane touched the ground at high speed, rolled straight for the balloon. The khaki-clad figures began to run. With the rudder out of commission Hal could do nothing. At the same instant both pilots dived from the speeding plane together, rolled over on the grass and sprang up to watch the ship continue on down the field and rip into the balloon.

BOOM!

A tremendous explosion blew the plane to bits and sent a 500-foot geyser of burning gasoline into the air.

Hisso Hal's prophecy was fulfilled. His luck had changed—with a bang.

AFTER THAT it was just one crash after another. Hal crashed ships on take-offs, on landings, in spins, in dives. It seemed he could not fly a plane without something happening. He experienced cracking struts, breaking props, folding landing gear, collapsing wings. But somehow he preserved his health.

Shortly after his twenty-fourth crash, Hisso Hal sat moodily in front of an airport hangar. Bill Bowler, faithful to the last, sat beside him.

"My flying days are over," Hal said mournfully. "No one will trust me with a ship again."

Bill said nothing. Inwardly he was forced to agree.

A bustling Big Businessman appeared on the scene.

"Mr. Simms," he said, "or shall I call you Hisso Hal? My name is Safon. I want to hire you as chief test pilot for my company, the Safon Safetyplane Company."

Hisso Hal looked up in amazement, and Bill Bowler almost swallowed his cigar.

"You don't mean—you don't want me ——" Hal began.

"I do," snapped Safon. "You're just the man I want. You see, my company aims to build the safest of airplanes. And with you to test the ships we can do it. When we build ships that can be flown safely by you, we'll have the safest planes in the world. You may not know it, but your genius for making ordinary ships fall to pieces is going to make you the most famous of test pilots."

And so it turned out.

To-day Hal is retained by all the large airplane manufacturers to test their planes. And fliers have a saying, "When Hisso Hal brings a ship down in one piece, nothing can make that ship come apart but a tap from a pile-driver."

LOW WINGS FOR THE NAVY

(Continued from page 25)

double the loaded weight of the Lockheed ship and in all probability is also much heavier than the Vought monoplane. That item takes care of the disparity in power. My guess, therefore, is that the performance figures for the plane on the cover are about as follows:

Manufacturer	Type	Horse Power	Maximum Speed	Cruising Speed	Landing Speed
Vought	XSB2U-1	700	235 m.p.h.	215 m.p.h.	65 m.p.h.

What do you think?

In winding up this rather "guessy" article, let's consider the biplane versus monoplane in relation to the practical difficulties of operating an air force under all kinds of weather conditions on the high seas.

Big as an aircraft carrier looks to the landlubber, she presents a pretty small and unstable landing field to the naval aviator who tries to bring his high-speed

fighter safely to rest on the heaving deck. That means that a low landing speed is essential in shipboard-based aircraft and is one of the reasons why the U. S. navy has so persistently clung to the biplane's large wing areas. Also, space is at a premium aboard the big floating hangars and the shorter wingspread of the biplane permits closer packing both below and on the flight deck. Furthermore, handling the crates is that much less wearing on the muscles and morale of the service crews.

On the other hand, the bureau of Naval Aeronautics realizes that the primary purpose in sending airplanes to sea is to have them fight and win. They are therefore perfectly aware that while convenience in servicing is to be desired, the really important characteristic to be sought for in naval aircraft is high fighting performance in the air. That is why clean, well-designed monoplanes of the type of the Vought XSB2U-1 shown on this month's cover are gradually making their appearance on the flying decks of Uncle Sam's fleet.

Photo Courtesy of Aero Digest

About Clyde Pangborn's New Flying Wing

Last month we announced that an article was being prepared by Clyde Pangborn for this issue about his plans for a non-stop flight aimed at a new world distance record. Wing Commander Pangborn tells us that developments in altering the special plane which he has acquired for the flight caused an unavoidable delay that made necessary temporary postponement of his article. In the meantime, we're able to present this photo of the plane he will use. It's the Vance Flying Wing, built originally for the Bendix Trophy and similar in design principle to the Burnelli transport. Watch the newspapers for further developments of the flight and Bill Barnes-AIR TRAILS for Wing Commander Pangborn's own story.

THE MODEL WORKSHOP

(Continued from page 39)

to 1/16 of an ounce for every pound of weight of the model, the winning times were 26 and 25 minutes, the models disappearing in the clouds at the end of that time.

Continuing our musings about gas-model progress, some one brought up the point that gas models are really too good at flying. No field is large enough to hold a contest. In every event many models fly away. Some are recovered, but many are lost. In several minutes of good flying, a gas model will pass out of sight of the field and the remaining part of the flight is a mad chase by the judges and timers trying to keep the plane in sight.

Some way to limit the flights of gas models must be found. We can't think offhand of any possibility except radio control from the ground. But no successful radio control has yet been demonstrated. And even then radio equipment would be too expensive to make it compulsory equipment for contest models.

Some other means should be found to cut down the flights of gas models effectively. The gas supply has been reduced, but it is still sufficient to take the model a few hundred feet into the air, where the excellent soaring ability of the average gas model enables it to ride the rising air currents even after the motor is dead.

So the model world is faced with a peculiar problem. The gas model—the ship that wouldn't fly back in 1931—now flies too well for the land-bound builders who try to keep after them.

In last month's calendar we erroneously reported the location of the national contest as Akron. Akron had fully intended to sponsor this year's contest, and most of the plans had been made. But at the last minute they were compelled to yield their sponsorship and the contest was held in Detroit, June 30th to July 2nd. Detroit is a model-minded city—it was host to modelers during 1929 and 1930—so look forward to reading model history in the next issue, when we'll carry a complete summary of the contest.

Boston's active Junior Aviation League announced its annual flying scale model contest winners. Seniors, building the Fairchild 24, were Frank Barrett, Jr., first, and Sidney Wallerstein, second. Juniors, with the Stinson Reliant, finished in this order: Paul Durup, Ralph Brown, Morris Sulkin, Arthur Sampson, Ted Alexander.

The seventh New England Championship Model Airplane Contest was coming up as this is written. We'll try to have detailed results next month.

FLYING AUTO

(Continued from page 46)

marked for and dope the edges with a small brush while the pattern is held in place.

Cover the wing panels from the first ribs to the tip ribs, except the portions between ribs 1x and 1y, which, like the tips, must be covered with separate pieces.

Cement model celluloid on the spaces indicated on the drawing and then cement the wings on. The wing beams fit to the back of the former D, which is the main support. The leading edges are cemented to the top corners of former C and the trailing edges to F. Finish covering the space left between the wing panels and the fuselage.

Cement the tail surfaces on and sew the brace thread through the places indicated on the drawings.

Cement the landing gear to the fuselage with the aid of short wire or bamboo pegs to hold the struts while drying. Don't forget the tail wheel.

Spray the model lightly with water to tighten the tissue and then apply a coat of clear model dope. If you consider what color scheme you prefer before covering, the only colored dope necessary is for the cowl and landing gear.

FLYING

With two loops of ⅛" rubber, the model should weigh about an ounce. To get the rubber in, fasten an "S" hook on the rubber and tie the strands together with a thin rubber band, then drop the rear end of the rubber into the fuselage and "fish" for the rear hook.

Glide the model and make adjustments to suit the trouble, if any. Try the model under increasing numbers of turns until it is found the model acts well in the air. And by the time you get to the full winds, somebody will be tired from retrieving!

LIST OF MATERIALS

1 ¾x1x8½" prop block
1 ¼x1⅝" sq. nose block
6 sheets 1/32x2x18"
1 sheet 1/16x2x18"
1 " 6x6 celluloid
1 pc. 3/32x2x4½"
18 pcs. 1/16 sq. x18"
2 " 3/32 sq. x18"
1 pc. ⅛ sq. x5"
4" #10 music wire
18" #8 " "
2 sheets colored tissue
1 pr. 1" hard-wood wheels
1 oz. model (clear) dope
1 tube cement
Several washers
1 pc. 1/16x¼x15" bamboo
Plenty of patience.

FOR THE FLEDGLING

(Continued from page 60)

Give the wing a coat of banana oil, allow several minutes to dry, and then give it another coat. Put the paper in place and smooth out all wrinkles. Trim the excess with a razor blade.

If the tissue is loose, stretch it by moistening it with steam. When the tissue dries the wrinkles will disappear. Don't moisten it too much or the shrinking paper will twist the framework out of shape when it dries. For the same reason, do not treat the wings of the Bug with any airplane "dope."

MAKING THE BOW-FRAME

The frame is bowed at the center, since this permits a better attachment for the wings and the rubber. The drawing should clear up the details of its construction. Cross bars are cemented where indicated. The rubber runs through the center of the frame. A brass washer cemented to the rear end serves as a propeller bearing. Small slanting balsa blocks about ⅛" high, indicated in the side view, are cemented to the bow-frame about 1½" from the front. These blocks raise the front edge of the elevator, setting it at an angle to the air and thus adding climb to the model.

PROPELLER CARVING

Carving the propeller is the most difficult and yet the most important part of the entire construction procedure. The success with which you follow the directions will determine whether or not your Bug will be a good flier. Look at drawing #6 until you can visualize every step.

First mark off the propeller block with pencil and ruler. Punch a center hole with a needle. Then cut away the excess wood forming the propeller blank. Next cut the blades, shaving away the sides of the blank at an angle. The propeller blades should be just thin enough to allow the light to be seen through the wood. Sandpaper the propeller smooth and then round the tips. Bend a propeller shaft to the shape in the other drawing. Insert this through the bearing washer, slip on several small washers or beads to cut down friction, then insert the shaft through the propeller. Bend the end of the shaft into a U-shape and pull it back into the propeller, fastening it with cement.

ASSEMBLY

The wing and the elevator are attached to the fuselage with ordinary rubber bands. First slip the rubber band under the fuselage, then up and over the wing or elevator and down under the fuselage again. Be sure to place the front edge of the elevator on the incidence blocks. Tie a loop in each end of a 4-foot length of 1/8" rubber. Slip one end on the propeller shaft and loop the rubber back and forth to make a three-strand motor.

FLYING

Don't forget the Bug flies with the elevator forward. Try gliding the model first. When it settles to the ground in a smooth glide, you're ready for the first flight. To wind the rubber, hold the fuselage in your left hand and turn the propeller with the forefinger of your right hand. Turn the propeller clockwise, looking at the model from the rear.

If your model dives without trying to climb, move the wing forward toward the elevator. If this does not remedy the diving, raise the front of the elevator a trifle. If the model stalls; that is, tries to climb and then falls back, move the wing toward the propeller and lower the front edge of the elevator.

Fly the Bug outdoors on calm days. But be careful, since this model has a tendency to ride the rising currents of air high into the sky. Flights as long as ten minutes have been turned in by the Bug.

By breathing over the wing and twisting it at the same time, you can warp the wing so the model will circle in a 15-foot room. Launch the model near the floor so you'll get the benefit of every foot of height. The Bug will leave your hand, point its elevator toward the ceiling and spiral upward, bumping against the ceiling as it tries to get higher. As the power is exhausted, the model will come gliding in for a landing.

DATA

Total weight ready-to-fly .43 ounces
Turns in rubber (by hand) .....600 turns
Turns in rubber (with winder) ....900 "
Average flight, hand-wound .....35 seconds

——G. S. L.

THE DISCUSSION CORNER

(Continued from page 51)

indoor class R.O.G. models to see if I couldn't give them more stability. And then, of course, the extra lift is something that is required by any model and certainly can't be ignored.——John I. Dilly, Galt, Ontario.

NOW let's hear what *you* have to say about these topics:

For October—*Do you prefer to attach the propeller and rubber to a demountable motor stick, or to fasten the motor directly to the fuselage?*

Answers must reach us by August 1st.

For November—*What step in building a flying model gives you the most trouble? What is your chief difficulty in getting a good flight? Have you any suggestions for overcoming these obstacles?*

Answers must reach us by September 1st.

Keep your answers within 150 words. Every modeler's opinion is welcome.

COASTING ON AIR

(Continued from page 44)

fall loose. From then on the model will be gliding free. A well-adjusted glider will be able to stretch the 100 feet of altitude into a 1,000-foot glide without depending on air currents.

The record for gliders launched with 100 feet of tow line is 23 minutes 13 seconds. It was established at the Akron contest in 1934 by Robert File of Columbus, Ohio. This is really splendid time for a glider starting out with 100 feet of altitude. It proves that we can actually do good work in this country with model gliders. German model builders are far ahead of the rest of the world in model gliding, but if we devote more of our time to this activity we can match the progress we've made with rubber-powered models with correspondingly good glider flights.

SPECIFICATIONS

Wing area.....225 sq. inches
Elevator area..... 55 " "
Rudder area..... 26 " "
Total weight R. T. F.. 5.50 ounces

——G. S. L.

BALLOON TIRES

(Continued from page 55)

Now for type B. This type has the hole completely through the hub, and therefore calls for a hole in the balloon. Figure 1 shows the ¼" hub with the desired hole. The same size balloon as in type A is used for an example in Figure 2. Cut part of the neck off and nip a 1/16" hole on the opposite side. Push the hub through this hole (sure, it'll stretch) and on through the neck until the beginning of the neck is centered on the hub. Peel back the neck a little way and apply rubber cement between the two layers. Roll the neck back in place and bind with thread or a small rubber band as shown in Figure 3.

The disc shapes for type B depend on your particular needs. The inner edges are hollowed enough to cover the binding.

To get air into the balloon in this type, flatten the end of a 1/16" tube and insert between the layers of the balloon when the first wrap of the binding is being made. Blow in the desired amount and complete the binding. Now cement the two discs on and place the wheel in a vise or between blocks until set. Trim away the extra hub, if any.

If rubber is used for the binding, the tire may be refilled by removing one disc and blowing air into the balloon by inserting the flattened tube as before. Type B may not hold air as well as type A, but it makes a nice job, just the same.

Type C is filled with a sponge rubber disc, and while it is not exactly a pneumatic tire, you can forget about the air. This tire is made by simply stuffing a prepared oversize tire-shaped disc of sponge rubber into the balloon and following the final steps of type B.

I'll tell you how to make good, sturdy tires for your heavy gas-engined model in another article next month.

INSIDE STUFF

(Continued from page 53)

manner. Take the hoop and support it levelly at two ends, as shown in the drawing. Wet the wing spars and ribs with saliva (run your tongue over the framework) and just put it on the sheet of film. If the spars have a tendency to come off the film, press them down with your fingers until they stick. Let the wing dry in this manner for half an hour.

The wing may be removed in either one of two ways. The excess film may be dissolved off with acetone, or applied on a splinter of wood or other pointed object, or a hot wire may be run along about one-eighth of an inch from the edges of the wing.

When both halves of the wing are covered, they may be joined together with cement. Be careful when you apply the cement, as it dissolves the microfilm.

Next month you'll have a chance to try out your microfilm technique. We'll tell you how to build a simple but fine indoor flying tractor model. This tractor is called a Class B tractor, according to the N.A.A. rules, because its area falls between 30 and 100 square inches. It will give you an excellent start at indoor flying.

NAVY AMPHIBIAN

(Continued from page 57)

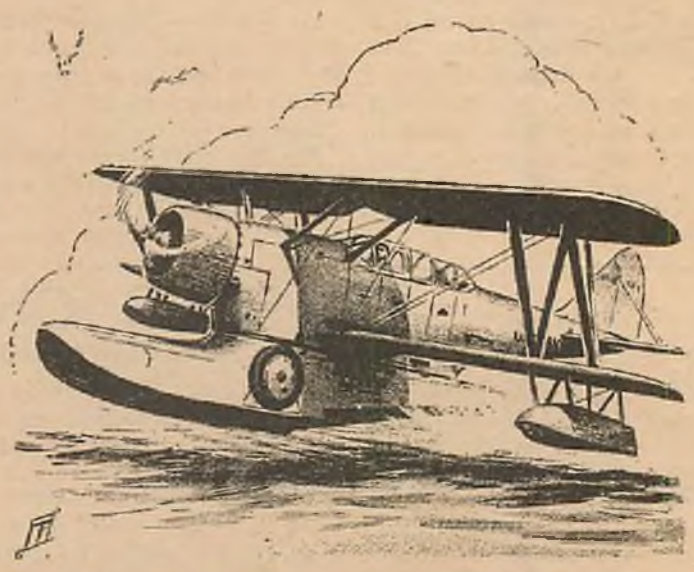
if necessary. The entire tail surfaces are blue. The upper surface of the top wing is bright yellow. Trimming and lettering are shown in the drawings. Regulation star insignia are pasted on the upper surface of the top wing and on the lower surface of the bottom wing.

The propeller blades are cut from scraps of sheet balsa. Pin them temporarily to the work bench until the cement has hardened. Silver the prop and trim the blade tips with red, white, and blue stripes as specified. The finished prop is installed on a pin so that it is free to revolve.

Place all the wiring in position. If you are possessed of a steady hand, outline the control hinge lines in black. All other trimming is likewise done in black.

MATERIALS

Hull block—1 block 7¾x2¼x1⅛"
Drag ring—1 block 5/16x1" sq.
Tip floats—1 3"x½" sq.
Tail surfaces—1 sheet 3/32x2x6"
Wings—1 sheet 5/32x20x1½"
Struts—1 sheet 1/16x1x6", and scrap bamboo
Prop blades—1 scrap ⅛" sheet
Wing fillets—1 scrap 3/16" sheet
½-oz. cement.
Pearl gray, blue, yellow, red and black paints
Gray thread
1 pr. appx. ¾" wheels
1 scrap cellophane
1 scrap .014 music wire
2 sets star insignia (1")



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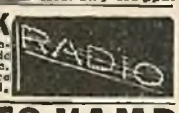

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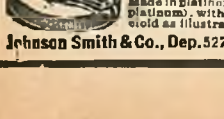

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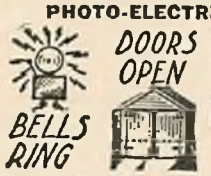

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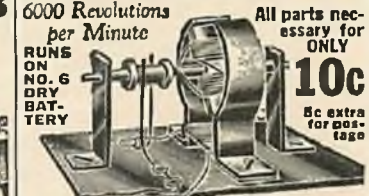

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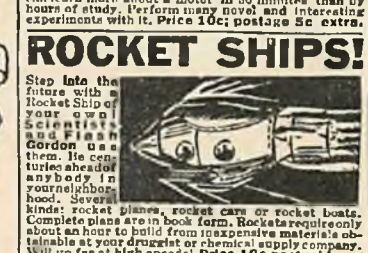

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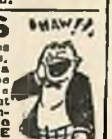

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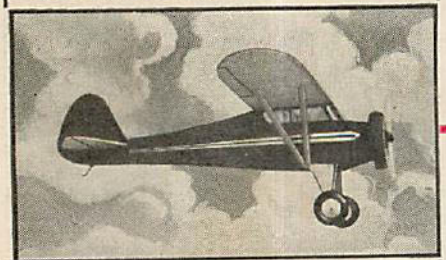

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