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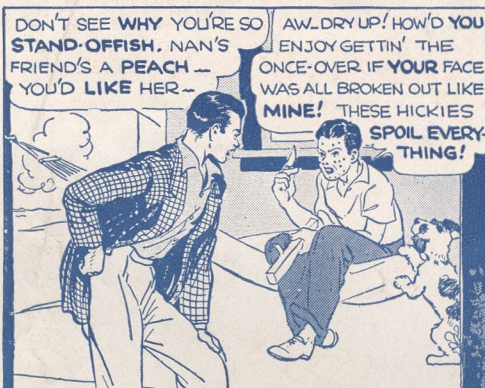


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WHEN OUR TRANSPORTS SAY "AH!"--FEATURE ON AIR BATTLE TACTICS
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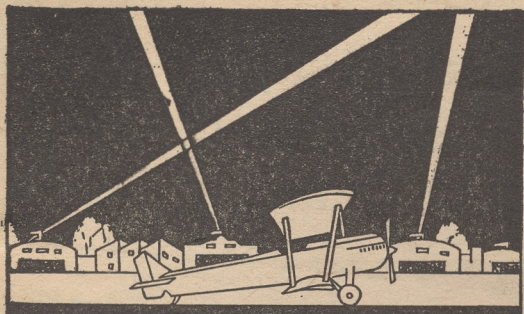
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A. A. WYN, *Editor*

VOLUME XXIV

HERB POWELL, *Managing Editor*

AUGUST, 1936

NUMBER 1

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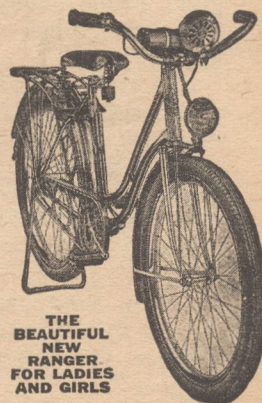
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The Dead Don't Fly

Spandau death hurled by the greatest sky fighters of the Fatherland had failed to faze those intrepid pilots of the 93rd. But when their own dead comrades returned from the grave itself to predict to the minute the slaughter of their fellow flyers, those Yank airmen quavered, their spirits were shattered. Only one man in the squadron scorned that fearful scourge. He was Rex Dene, bold C.O. But for all his scoffing, the grim clock of Fate continued to tick off the lives of his men . . . inevitably . . .

one by one . . .

CHAPTER I

SCREAMS IN THE NIGHT

ALTHOUGH it was nearly midnight, Hangar 2 of the 93rd Pursuit was a hive of industry. Riggers crawled over the doped wings of the lean, deadly Spads. Greaseballs tore at the entrails of twin-banked Hispano Suizas. A new strut here, a patch there, a new bearing, a repaired cam shaft. Every man worked with high speed and efficiency.

There was a reason for all this—a reason six feet two inches in height and a yard broad at the shoulders. In short, a man. His face was bronzed, his eyes gray and pugnacious, his chin as stubborn as a battleship prow. He strode up and down, commending here, lashing there, driving these men with all the vigor of a tremendous, dominating personality. His name was Rex Dene, and he was skipper of the 93rd.

He seemed everywhere at once. "Okay, Steamer, I want that motor revving sixteen hundred by dawn. Come on, McCarthy, get the lead out of your tail. Young Carney is going to fight that crate tomorrow afternoon on the dusk patrol." And then: "Get the rag out, Peters, we can use those guns on S-2688."

It was night work; hard, unrelenting, slaving labor. But the men did not resent it. As the lean, blonde young giant strode among them, hurling his orders, they gave him a grin, a bob of the head, a cheery "Yes sir. Comin' up, sir."

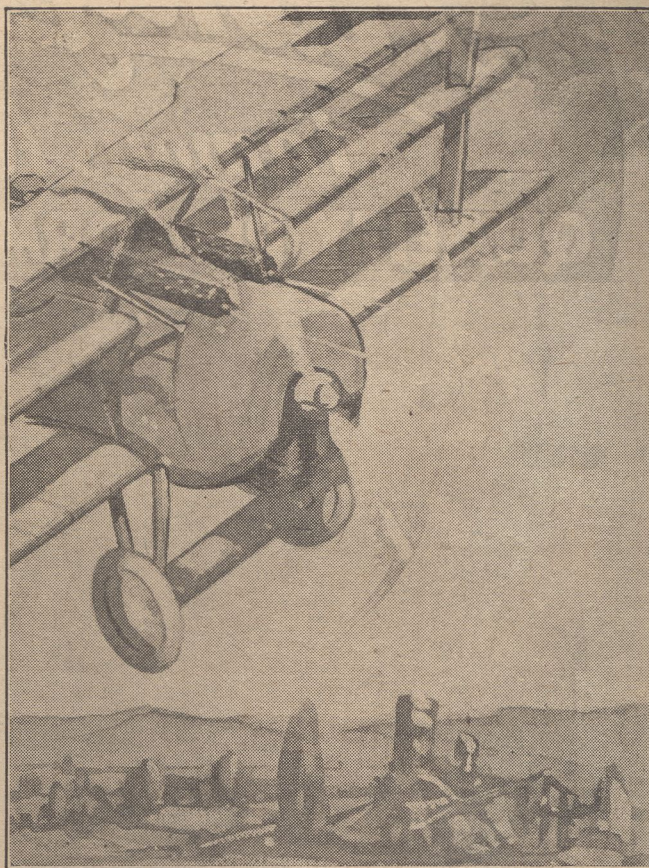
One old timer, a wizard on internal combustion engines, spat a yard of tobacco juice, and said deliberately, "Skipper, you want this engine mounted on S-50? Okay, she'll be mounted. Go prod the rear of them other guys, and leave me to my work."

His eyes twinkled as he spoke. Young Rex Dene grinned: "Tellin' the old man off, eh, Pop? All right, I'm putting it up to you. This outfit is going to stage a squadron show over Fismettes at five-ten o'clock if I have to work you guys to the marrow."

Came the chorused assurances: "We'll be there, Skipper."

Rex Dene felt a great flood of pride surge over him. These men liked him. They showed it in everything they did, the way they worked. It was nice to be liked. When he had come to the 93rd, a month before there wasn't any morale; everybody was getting drunk, crates were cracking up because of sloppy mechanics and lousy flying.

All that was changed now. The hottest squadron on the Marne salient was the 93rd, and no kidding.



Illustrated by Eugene M. Frandzen

Rex Dene could have gone to bed; these men would go on stimulated by his personality. But he didn't. If these birds had to stay up and work he'd stay up and work with them. They knew that; that's why they adored him.

He walked about, inspecting the guts of this engine, watching the patching of a bullet-torn wing, the replacement of a shattered strut.

Across the beaten ground an orderly-sentry came on the trot.

"They's a Lieut. Jerry Trevor in the orderly room, sir. Wants to see you right away."

"A Jerry Trevor—" Rex Dene paused, "Oh—the replacement from Colombey. Okay, Laird. I'll be along directly. Tell him a bottle's in the right drawer and cigarettes in the left."

He paused long enough to inspect an interrupter on twin, prop-synchronized Vickers machine guns destined for his own crate, and then strode, long-legged, impatient, across the night-blackened tarmac to the operations room.

It was exactly six minutes to midnight, a fact he was to remember later.

A young man nearly as tall and broad as himself reposed with one leg hooked over the edge of Rex's desk, blowing the ashes from a cigarette. Where Dene was blonde and fair, and rather rough-cut like a shaggy Airedale, this young man was smooth, keen-eyed, dark and trim.

Though Rex Dene had captain's bars to his shoulder straps and this man only a single yellow bar of a second looey, he did not snap to attention. Instead he straightened negligently, self-assured.

A WEIRD TALE OF WESTERN FRONT SKIES

By Frederick C. Painton

Author of "Slaughter of the Dead," "Duel of Dishonor," etc.



Into Tom Brock's face there suddenly flashed a look of utter bewilderment. He flung aside his safety belt, slowly rose in the pit of his hurtling Spad, his left hand clutching his breast, his right clawing at the air . . .

"Captain Dene?" he asked in a low quiet voice.

"Right," snapped Dene. He held out his hand. "Glad to have you with us, Lieutenant. You'll be in 'C' Flight under—"

Lieutenant Jerry Trevor's face was grave. "I'm not so sure you'll be glad to have me, captain, I'm a har-binger of bad news."

Rex Dene laughed gruffly. "Yes? Well, what, for instance?"

But even as he spoke he felt a sudden chill settle over the office as if a black blizzard had suddenly fallen in summer time.

"Do you believe in ghosts, captain?" Jerry Trevor asked gravely.

"No."

"You may change your mind," Trevor said dryly. He

drew from his pocket a thin sheaf of papers. "For your information only, captain, I'm Captain Trevor of G-2-AD, Army Air Intelligence. This is my authority to take charge."

"Take charge of what?"

"The investigation of the strangest case that ever drove intelligence men mad with worry." He paused. Then, keenly, "Have any ghost rumors reached you here, captain?"

Rex Dene reflected.

"Why, there were a lot of silly stories around Dormans to the effect that the 92nd Pursuit was jinxed, that men were dying for no reason after—"

But whatever he intended to add to that sentence was never finished.

Though he had not looked, his wrist watch indicated precisely midnight. And at that juncture a shrill yell of utter terror tore across the darkened tarmac. Two revolver shots blasted the silence.

For a space there was a deep, terrible silence. Then a sentry shouted, "Corporal of the Guard, post number three."

Rex Dene growled deep in his throat. He snatched a six-gun from a holster and raced to the door. Behind him, holding a blue, ugly automatic, Jerry Trevor ran.

"I'm afraid," he panted, as they tore through the darkness, "that I'm slightly tardy."

Rex Dene did not answer. Flashlights blazed like in-

sane fireflies as sentries from the anti-aircraft and motor repair sections convened before the row of galvanized iron huts where the pilots of the Ninety-third had their being. One flashlight played on a young, small-boned pilot who, clad only in shirt and drawers, stood on the threshold of his cubicle, shaking so that the gun in his right hand jittered against his leg.

Rex Dene ran up to him and the young pilot almost sobbed in relief as he saw the brawny skipper.

Dene clapped him on the back. "What the devil happened, Tom?"

The young man's face was pale as ashes; his eyes were bulging, and his breath clicked with terror in his throat.

"A ghost, sir," he whispered, "I've seen a ghost."

At his words the night seemed to close in more blackly; the dark trees that fenced the tarmac were

peopled with hidden evils. The sougning of the night wind became eerie as if the dead were rustling their wings. Not a man but whose heart pinched, whose breath stuck in his throat, who did not cast a backward glance over his shoulder. A sense of terror, the fear of the unknown, the supernatural, settled over them.

Rex Dene shook his head like a goaded bull.

"Come, Tom," he forced his voice to be bright, "you had too much cognac at Dormans."

Tom Brock, as good a pilot as the outfit boasted, with two accredited victories, shook his head. The color had been restored somewhat to his cheeks, but he was still under the spell.

"I wasn't drunk," he said grimly, "and I wasn't dreaming."

Rex Dene became aware of the gaping mouths and uneasy appearance of the enlisted men. This wouldn't do at all; morale was built on too delicate a foundation to have rumors spread among the men.

"Get a coat," he ordered abruptly, "come on to my office. Now!"

With a curt order he sent the sentries about their business. While he waited he said to Jerry Trevor who had been quietly observing, "Is this what you meant?"

"Yes," assented the G-2 officer. "The damned thing has hit your squadron. If it follows its usual course, every pilot you've got will be dead in eight days."

"Nonsense!" growled Rex Dene, but he could not shake off a black despond that the warning aroused. A moment or so later Lieut. Tom Brock emerged and in silence the three returned to Rex Dene's office. Still in silence Rex poured a stiff three fingers of brandy and handed it to Brock.

The latter, never much of a drinking man, tossed it off with scarcely a cough.

"All right," said Dene, lighting a cigarette, "what actually happened?"

Brock put down the glass. "You know me, Skipper. I'm not suffering from nerves, and I'm not yellow. There wasn't any subconscious suggestion. I was just as awake and sane then as I am now. I got in from Dormans on the last truck. I'd been to an *estaminet* with Germaine D'Arcy, one of the girls over there, and I'd had but two drinks. I said goodnight to the gang, got undressed, and went to bed. Since Parkley was transferred I've been bunking alone. I propped my head up, drew the chair close with the ash tray and lit a good night cigarette. The room was dark except for my cigarette."

Rex Dene nodded, but offered no comment.

"I was staring at the wall, thinking about nothing much when suddenly there was a light there. A grayish light that grew brighter. I wondered at first if a sentry making his rounds had a flashlight whose reflection was coming through the window. And even while I thought this a figure began to take shape."

His lips thinned in tense recollection of that moment.

"Suddenly it was a man. I knew who it was—Charley Coakley. He was my bunkie when I was in the 92nd.—before I transferred here. We were sort of buddies."

Rex Dene and the intelligence officer exchanged a quick glance.

"I thought I might be a victim of an optical delusion. I rubbed my eyes. I shut them, turned away, then looked back again. It was still there—Charley in his flying togs. And as I looked at him he spoke."

Rex Dene cleared his throat.

"What did he say?"

"He said, *Tom, tomorrow morning at six you're going to die.*"

Rex Dene stared incredulously.

"You heard those words?"

"I heard them," declared Brock tensely. "Not in my mind, either. That whisper came as distinctly as if Charley were alive there in the room." He paused, eyes staring, mouth trembling, "and yet Charley is dead—he was killed a week ago at Landres-St. George!"

Lieutenant Trevor spoke for the first time.

"That's right, captain. Coakley was next to the last of the 92nd. to be warned of his death. He was shot through the heart, and fell inside our lines below the Vesle."

The Intelligence officer looked abstractedly at the wall.

"He was the twenty-ninth pilot to be warned and to die as the warning had said."

Rex Dene shook his head impatiently. "It's foolishness, man. You were 'cut up' over Coakley's death and you've been brooding."

Tom Brock shook his head as impatiently as Dene had.

"That's not so, sir," he said sharply. "I'm no baby. I was 'cut up' over Charley's death, yes, but I know better than to brood—to let nerves get me

one day so a Kraut can do me in the next.

"I tell you he stood there, that wistful smile of his lifting his lips. He went on talking—

Tom, we die, men like you and me, and our spirits are chained to earth. For we are murderers—killers upon whom God looks with displeasure. Where there is friendship, I am permitted to come and warn you. Death will find you tomorrow—whether you fly or whether you stay home. I'll be waiting for you, Tom."

There was a deathly hush for a space.

"Then I guess I lost my head," Brock went on. "My gun was hanging from a nail. I grabbed it. I fired two shots squarely into the ghost. I gave a yell—of fright. Naturally, I was scared. The vision did not go away at once. It faded slowly, and its last words were, *Tomorrow, Tom, God have mercy on your soul.* And then, as I heard you come running, the vision whispered, *a quick merciful death, Tom, through the heart, like me.* And as the vision faded out all I could see was a breast dripping blood."

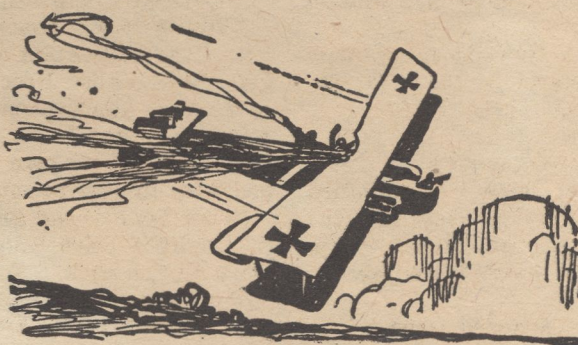
Tom Brock shuddered and reached for the cognac bottle. He drank, wiped his lips, put the bottle down.

"I don't want to fly tomorrow, Rex," he said simply.

A LITTLE quiver of pity twisted Rex Dene's firm mouth. He knew Brock had been through a terrific ordeal, and he felt sorry for him. But almost as soon as the quiver manifested itself, it disappeared into a flat grim line. Enlisted men had overheard much of what had transpired; by now the story would be all over the drome. If Rex Dene permitted Tom Brock to skip the dawn patrol the ghost rumor would be believed. Men would get nervous, scared—and such men are easy prey for sharp-shooting Fokkers.

Furthermore, in Dene's mind was a fragment of a letter from Corps: "The last and final offensive of von Ludendorff's drive on Paris is expected any time. They will attempt to control the air. At all costs our pursuit planes must engage the enemy at all times and keep them on their own side of the barbed lines. The Germans *must not* control the air."

Dene knew how vital this order was. If the Yank



army's "eyes" were blinded, then the German offensive could pick weak points and drive through, perhaps win the war, as Ludendorff hoped, before Christmas.

He clapped Brock gently on the back.

"Sorry, old timer," he said softly, "but you're taking off with 'A' Flight at dawn. You've had a tough experience, but that doesn't mean you won't be drinking damnation to the Boche at dinner tomorrow night."

Rebellion blazed in Brock's eyes. "You mean you want me to go out and get killed?"

"Steady, Tom," Dene said. "You won't get killed. We'll scotch this ghost yarn once and for all when you come back."

He pushed Brock to his feet. "Go in and cork off on the extra bunk in my quarters," he suggested. "I'll fly beside you tomorrow. You'll come through all right."

Faith in Rex Dene stilled Brock's fears. The touch of the bigger man comforted him.

He forced a smile. "Okay, Rex. Those are orders. Goodnight."

He vanished through the door to Rex's sleeping quarters. Dene's slender fingers drummed on the desk top. His head swiveled to face the Intelligence officer.

"Do you believe it?" he asked.

Captain Trevor shrugged, his eyes opaque.

"I don't know what I believe, Dene," he rejoined thoughtfully. "Twenty-nine men in the 91st. told the same story. They're all dead. It's gruesome, weird, damnable, if you like, but I for one haven't been able to figure out a way to stop it."

"But I don't believe in ghosts," snapped Dene.

"Neither do I," said Trevor, shrugging again, "and yet the bodies of two million men rot here in the hills of France. Who knows? Perhaps men's souls revolt against further bloodshed. Perhaps the dead have returned to stop the slaughter."

Rex Dene got up, paced the room. "It's uncanny," he said, "but I won't believe—not yet."

Trevor was whispering dreamily, "There was a Scot walking home across the moor one night in a driving rain. Suddenly some one was walking beside him. The newcomer said, 'terrible night, Jock. A good night for ghosts.' The Scot replied angrily, 'I don't believe in ghosts.' 'Ah,' said the newcomer, 'don't you'—and vanished."

"For Heaven's sake, shut up that talk," growled Rex Dene.

"Sorry," said Trevor rising. "I'll turn in if you don't mind. I'd like to be flying on the other side of Brock, if you're agreeable. We might get a clue."

He went out into the night leaving Rex Dene a prey to many burdening thoughts.

CHAPTER II

DAWN PATROL

PALE light streamed from the east and drove the night from the valleys. On the tarmac of the 93rd. the fire-cracker pop of warming Hissos growled from the dead-line. Pilots in leather coats and helmets with chin straps streaming, strode from the mess hall, coffee sloshing in their stomachs, eyes on the ceiling, speech on the weather.

There was an uneasiness among them; the story of last night's weird vision had spread. Mechanics swarmed over the planes, making last minute adjustments, and their remarks had to do with the haunted squadron.

As Tom Brock walked steadily enough toward his crate, eyes fastened to him. Would he die as foreordained, or would he return? Had he seen a ghost or had he suffered from an hallucination?

Captain Rex Dene, trying to be everywhere at once sensed this nervous attitude and scowled. He told himself Tom Brock would come back unharmed or else this squadron would be demoralized. Dene took no chances. He inspected each crate carefully, and Tom Brock's with especial keenness. From prop to tail assembly it was in perfect condition. There would be no fault here. Of this he was certain.

His own crate and the new S-55 for the intelligence officer ready, he summoned the pilots.

"High offensive patrol," he announced calmly: "No breaking of formation until signaled to do so. Rendezvous at four thousand over Nonsard. 'B' on the right, 'C' on the left, and 'D' as cover."

He stared at the men before him.

"You've heard rumors of some nonsense on this tarmac. Pay no attention to it. If you're nervous, the Kraut gets the best shot. Brock rides with me at the point, and so does the replacement, Lieutenant Trevor. That's all. Happy landings."

Passing to his own crate he found Brock standing pensively by the mounting stirrup.

"Feel better?" he grinned.

"Daylight helps some," said Brock. "I'll feel better when I come back."

Rex Dene gave him a bone-crushing grip. "You'll come back—with bells on. You know perfectly well that Coakley can't do you in. The dead don't fly!"

He got into his crate, tested the controls, fastened the safety belt. He looked across at the intelligence officer, Trevor. The latter nodded and Dene grinned. His own fist shot forward in a signal. The chocks were pulled and one by one the Spads followed him out, the roar of motors became an inferno of sound, and under the canopy of it the Spads streaked down the field, shot into the air in fast climbing turns.

At twelve thousand feet, streaming under cirrus clouds, the formation droned across the low Marne hills for the front.

Rex Dene watched Brock like a hawk. He crowded the youngster as if to give him the comfort of a reassuring presence. And when the Fokkers came like fly specks on the blue of the north Dene pulled in front in order that his own brawny body and crate might cover the youth.

Rex Dene offered combat; those were his orders. A signal spread his squadron from a stair-case echelon to a wide arrow-head "V." Throttles full out, guns warmed, and eyes alert the 93rd. stormed straight at the Fokker tripe formation. There was the momentary confusion of maneuver for position. The Fokkers zoomed, nosed down in screaming power dives. As they tilted, Rex Dene signalled a zoom, and the break in formation. Thus, for a split second, the two squadrons tore into each other. Ships parted erratically to avoid collision; some zoomed, others dived, some banked. But in less than ten seconds the whole fifty-one planes were tied inextricably in knots that gradually became a huge ball, as single planes dove on an adversary's tail and then zoomed to the top of the pile to dive again.

Dog-fight! Thin-winged checkered triplanes howling down behind the hot breath of Spandaus which laced the sky with thin veins of gray tracer bullet. Orange Spads



pivoting in a flash, spouting phosphorus bullets in torrents of deadly fury. Ships weaving incredibly without collisions. Youth riding dragons and ravens, offering their young lives that the crawling armies below might carry on their maneuvers without sky witnesses!

CAPTAIN REX DENE fought like one possessed. He seemed everywhere at once. He loved this greatest of all thrills—the carrying of his life in his two hands gripped to the joy stick and the Bowdoin stick triggers. No guns were more deadly than his; no shrieking dive or zoom carried more deadly menace for the twisting German crates that swept before him.

In this circus of death he found outlet for the repression of the night before; and the sight of his orange Spad with the blue streamers of command flowing from the tail assembly brought gray pallor to many a German that day.

Yet he was not unmindful for a second of his task. It seemed his guns surrounded young Tom Brock. Once it was a German *Staffel Meister* who came howling down from the heights, lean, thin eyes behind lean, thin guns. His first burst swept the left wing struts of Brock who went into a slip and faded from the burst with the German turning with him. Rex Dene's crate roared in front of the German, dragged him away as Brock zoomed. Two bursts caught Rex Dene, one ripping the leather on his left arm.

His wings flashed in a quick roll. A momentary stilling of his Hiss as the German shot by, trying desperately to turn. And then Dene was on him and the claws of his guns raked the German with tracer fire. A small eddy of smoke that grew into a long black streamer like the flow of a woman's hair. A small burst of fire that grew into the fury of a gasoline fire. The German's crate was swept by it, burned furiously.

The German took the easier way. His lean hands let go of the wing and his body plummeted downward to fade finally into the browns of the earth two miles below.

Two minutes later a German ship of peculiar markings, almost golden in its coloring, whipped twice in front of Brock. Trevor came racing up from the east but he would have been too late. Rex Dene, sparing nothing, dropped with wings bending at the pins and the fury of the Vickers blast he loosed caused the German to fade to the right and dive headlong into the press of planes.

Elsewhere the battle raged without let. And then it was suddenly over as the Germans, with glances at their gas gauges and the broken-backed ribbons of bullets leading to their guns, saw that both fuel and ammo were low. On signal they turned and ran for their own side of the lines.

The gold-colored Fokker was the last to wheel. Its position was south of the main press of planes due to a maneuver. Rex was signalling for his hell-cats to resume formation. Tom Brock was beside him. Then abruptly the German ship, a flash of gold in a bright sun, hurtled past. The German's guns spoke once—a short brief burst of not more than ten bullets.

Rex accepted it for what he thought it was—a last gesture of defiance. But as his head turned, he saw Tom Brock sling aside his safety belt, slowly rise in his pit. There was a look of utter bewilderment in Tom's face. His left hand was pressed against his breast, his right clawed at the air.

Dene's and Brock's planes were flying wing-to-fuselage. Brock's pain-distorted face was hardly twelve feet from Rex's. Clearly enough, Rex saw the crimson seep through Brock's tightly pressed hand, saw the gray of death mantle the youth's cheeks!

By then, the golden Fokker was a mile or so away, buried in the protection of his *Staffel* comrades.

Rex Dene stared incredulously. He could not believe what he had seen. With planes making a hundred miles an hour or better in flashing maneuvers executed at high speed, even the best of shots miss their targets. He himself had fired as many as ten long bursts at a German on whose tail he rode at thirty yards distance and failed to kill the man.

Yet here was a Fokker, firing from several hundred yards, firing an angular shot at a Spad coming toward him—and, with no more than six bullets, hitting his man squarely in the heart!

It was uncanny, weird, impossible—but it was true. Brock must have died almost instantly. His plane, under full gun, nosed down at terrific speed. The falling body angled against the stick which wrenched the high speed ship into what would have been a pivot turn. The Spad's wings tore off under the velocity. The fuselage with its dead cargo, knifed down like a falling coffin and with a speed of more than two hundred miles an hour smashed the ground just this side of the Vesle swamps. A tall, yellow flame burst up from the wreckage. And this was Tom Brock's funeral pyre.

All this Rex Dene watched with wide eyes, a shout of agony held pendant in his throat. As the flames burned furiously, he took his eyes away from the spot and looked at his wrist watch.

"Good God!" he muttered.

The hands of his wrist watch pointed exactly to six o'clock! The ghost of Charley Coakley had said, *Tom, you die at six!*

ALL that day a pall of gloom, of oppressing horror laid heavily upon the 93rd's airdrome. Rex Dene did his best to dispel it. He called the pilots together. He spoke scornfully of fear.

"A lucky burst caught Tom Brock after the scrap was over," he growled; "they'd sent their best against us and they failed. It took luck to do it. Such a thing won't happen again. This ghost stuff is bushwah!"

He searched their faces as he spoke—and perceived that they did not believe him. A ghost had warned Tom Brock of impending death, and he had died as prophesied and at the identical minute; that was all they knew or cared to know. Upon their faces was the gray of terror, of suspense, of wondering when *their* turn would come.

Rex Dene finally cursed under his breath.

"All right," he snapped, "pile into the Dodges and go to town. Get drunk, sing, call on your girls. Get back here by midnight—and forget this damned nonsense."

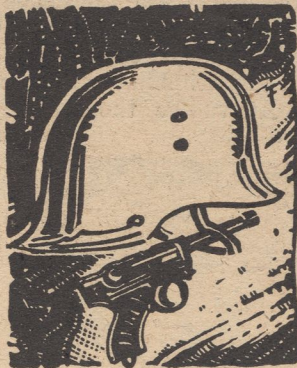
He sent them off, then resumed the nervous pacing of his office. Captain Trevor watched him silently. Both men knew the 93rd. was not alone involved. The fate of the 92nd.'s men, now transferred by some malign power to the 93rd., had passed all along the front like wild fire. Men, pilots who risked their lives five hours a day, every day, were asking themselves, "are we *all* doomed?"

G.H.Q. at Chaumont had sent peremptory word to Corps: "Take strict precautions to prevent these insane rumors from undermining pilot's morale. Find out what is behind this affair and destroy it."

Corps, as Corps always does, passed the buck to Intelligence. Intelligence already had a man on the job. Rex Dene also had his orders.

"But where do you start?" he snapped aloud out of his thoughts. "The thing has some natural explanation. It

(Continued on page 64)



Snapshots of the War



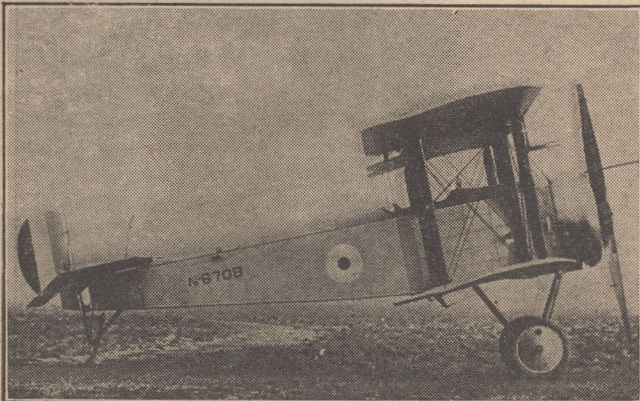
Left: Here's an unusually fine photo of a German pursuit ship line-up—four Fokker D-7's of Jagdstaffel No. 2 on the Western Front. For one thing, it indicates how much—or rather, how little—the Heinies actually dressed up their planes in garish colors and designs. You'll note that only the Fokker on the extreme left has anything unusual in the way of decoration, and even in this case it's only a band around the fuselage bearing the initials "R.K." Wonder if any of our readers can tell us the identity of "R.K." (Puglisi photo.)



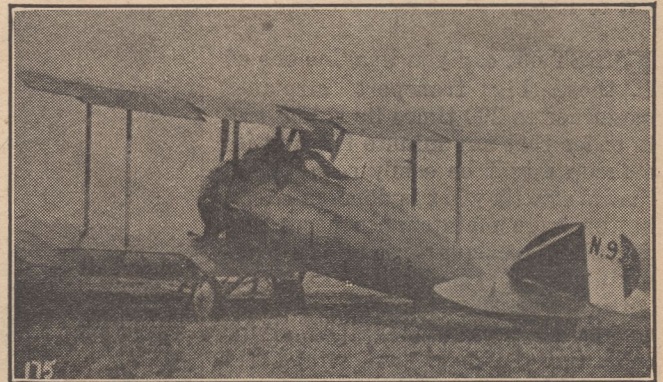
And now, here's a picture never published before. It shows Lieut. Joe Wehner, the American Ace from Everett, Mass., who was officially credited with shooting down five German balloons. Wehner, who was Frank Luke's great buddy, "went West" just a few days before the Arizona Balloon Buster took off on his last flight. This photo of the Massachusetts "Drachen" downer was snapped on the renowned field of the 27th which he and Luke made famous. Wehner was a modest man, but a determined fighter.



This fine group picture was clicked in front of the motor test block at the 2nd Production Center, U. S. Air Service, Romorantin, France. The photo was sent in by Kent Dawson, one of our readers in Elwood, Indiana. If you count this industrious-looking bunch of fellows, you'll note that there are just thirteen men facing the camera—which proves that they weren't a very superstitious lot. Or did they forget to count themselves? Anyhow, we wonder if any of our ex-service readers recognize any of these boys. We'll bet everyone of the thirteen could tell an interesting story of the War days.



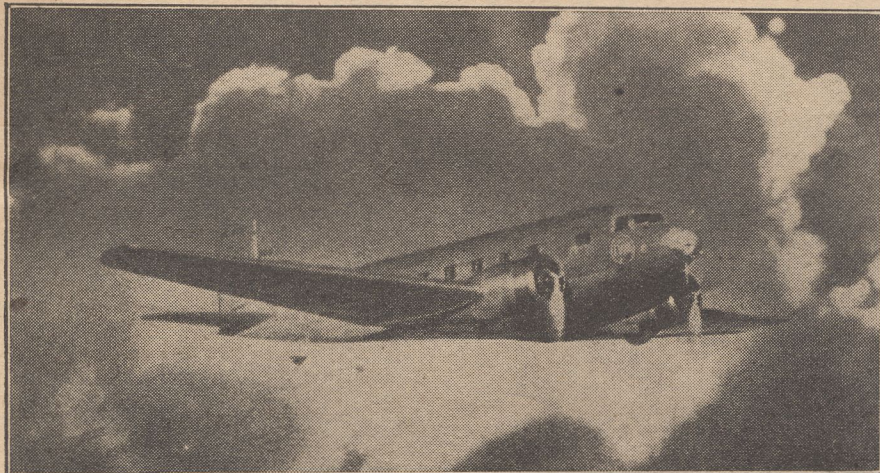
Presenting a little-known British single-seater designed for ship-board use. Over the number on the fuselage, you'll note one of the hoisting hook eyelets set in the upper longeron. The ship is the Beardmore SB-3D, equipped with the LeRhône engine and intended for Naval interceptor work over the North Sea. Few of them were actually turned out for service squadrons, however. (Puglisi photo.)



And here's another unusual wartime fighter. It's the Parnell Panther, a scout job designed to take off from a towed barge—all of which was quite an idea, if you ask us. The Panther had folding wings—note how short they are—and a unique flotation gear was built into the sides of the fuselage. As we understand it, a destroyer would pull the Panther's barge through the water until sufficient speed was attained to allow the plane to hop into the air. After the air action was over, the pilot was expected to land near the destroyer, open his flotation gear, and wait until he was picked up. (Puglisi photo.)

ZI-P-P-P! There goes one of TWA's giant Douglas Transports, hurtling through the clouds at well over 200 m.p.h. The passengers aboard her realize they're safe because every mechanical unit of the plane is working like a charm. But few of them ever realize that the secret of that charm lies in long hours of painstaking labor by an army of airplane "docs."

★ ★ ★



Jam on your wheel brakes here, fans, and read the absorbing story of a great transport-plane "clinic" where the huge airliners are kept "fit" for their daily work of hauling passengers and mail through the skies. Being an airplane "doctor" is one of the numerous important jobs in the aero industry, and many of you who are mechanically inclined may find your life work in this significant field.

★ ★ ★

When Our Transports Say, "Ah!"

PERHAPS the title of this article has you "stumped." Well, what we're driving at is that airplanes require periodical physical examinations by doctors just as do human beings. Of course, the medicos in this case are expert *mechanical* doctors.

Every one of us, I guess, has suffered that uncere- monious ritual in which our physician rams a wooden paddle into our mouth and asks us to say, "ah." Figura- tively speaking, our air transport doctors pull the same stunt with the huge airliners that traverse our skies. They, too, listen to the "ah's" for in both instances— human being or plane—the doc's aim is to keep his sub- ject "fit." So we're now going to tell you the dramatic story of the transport doctors.

We might also remind you that the job of pilot is only one of many im- portant positions that you may choose in the aviation industry. Maybe this article will set off the spark of am- bition in many of our mechanically- inclined readers—an ambition that may ultimately lead to one of the jobs I am about to describe. And now, let's get to it—

FIRST off, can you imagine one of those big transport airplanes magnified to 200 times its actual size in order that any minute flaws in its makeup might be easily seen? Well, that is exactly what is done, in effect, in the huge maintenance bases and operating headquarters of the lead- ing air lines.

Of course, the entire airplane can- not be so greatly magnified all at once. But the individual, vital parts —some 250 to 300 of them—are taken one at a time and placed under a powerful microscope of the same type used by bacteriologists in searching for microbes. Valves, wrist pins, pis- tons, gears, bearings, connecting rods

By David Levinson

—all the important parts which must function perfectly in the powerful motors—are placed, one at a time, under the microscope's "eye" and carefully examined for any defect that might not otherwise be apparent.

The propellers and the navigating instruments upon which the pilots place so much dependence are also sub- jected to this same microscopic examination. Control cables and the control surfaces on the wings and tail assembly, being of much larger dimensions, are not placed under the microscope; but these are nevertheless examined critically at the end of each flight by sharp- eyed inspectors.

It might be interesting to follow one of the huge transport planes of a leading transport company through



This mighty peaceful scene was snapped inside the comfortable cabin of a speeding transport. As for those passengers, you won't find a worried face in the whole lot. And there's no reason why you should, for the boys back at the airplane "clinic" tuned this ship to perfection.

the repair base at the company's general headquarters. The capacity of the particular maintenance base we will consider—the one of Transcontinental & Western Air, Inc., at Kansas City, is exceptional. With careful stowing it could undoubtedly house about twenty great passenger ships together with a dozen or so single motor planes used for the night mail flights.

In its greatest dimensions it exceeds 400 feet and is about 300 feet wide. It has been found economical to have the stock boys—who carry nuts, bolts, and small parts from the stock rooms to the men working on the different planes—equipped with roller skates. Amateur statisticians have already figured the resulting annual time saving in terms of months!

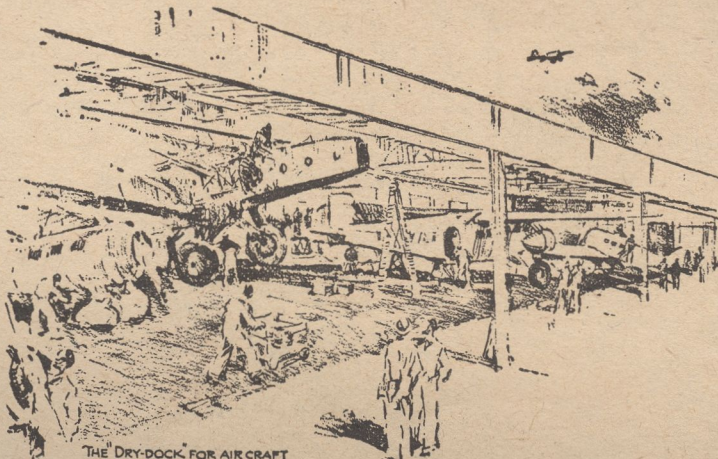
The greatest space in the hangar is, of course, given over to storage and to routine repairs, but approximately one-third is occupied by the very vital engine overhaul shops. The balance is in the sheet metal department, the propeller department, weather bureau and communications center, and the general offices. Indeed, an entire transport plane could be built in this huge plant!

Let's watch one of the large ships land at the airport. Passengers disembark, mail and express is unloaded. And now the plane taxis to the repair base. The 100-foot long doors swing open at the touch of an electric button and the plane is towed up to the inspection stand. The plane has flown about 25 hours and is due for a routine inspection.

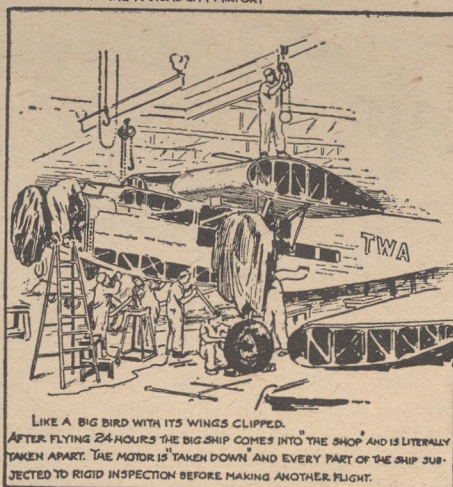
Routine inspection, in the language of the aeronautical "doctor," means that the plane will be docked at the inspection stand for eight hours and that six men will spend their entire time looking for any defects, interior and exterior. That's 48 man hours of inspection for each 25 hours of actual flying. These aero docs are a critical gang and go on the assumption that there must be something wrong with each plane brought in. Like all good physicians, they won't be satisfied until they prove themselves wrong. A flaw or structural defect that escapes their eyes simply is not a flaw in the first place—if you get what we mean.

Then after that 48-hour "clinic" there appears an-

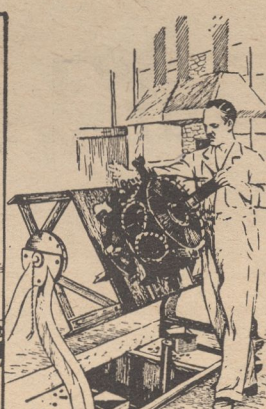
The "Doctors" in Action



THE DRY-DOCK FOR AIR CRAFT
OF THE TRANS-CONTINENTAL AND WESTERN AIR, INC.
AT THE KANSAS CITY AIRPORT



LIKE A BIG BIRD WITH ITS WINGS CLIPPED.
AFTER FLYING 24 HOURS THE BIG SHIP COMES INTO THE SHOP AND IS LITERALLY
TAKEN APART. THE MOTOR IS TAKEN DOWN AND EVERY PART OF THE SHIP SUB-
JECTED TO RIGID INSPECTION BEFORE MAKING ANOTHER FLIGHT.



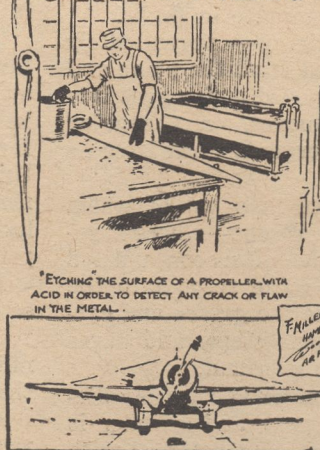
"TAKING DOWN A MOTOR."
AFTER 300 HOURS OF WORK IT IS TAKEN
APART. 1620 PIECES—CLEANED, SANDBLASTED,
INSPECTED BY MICROSCOPE AND REASSEMBLED
BEFORE IT IS READY TO FLY ANOTHER 300 HOURS.



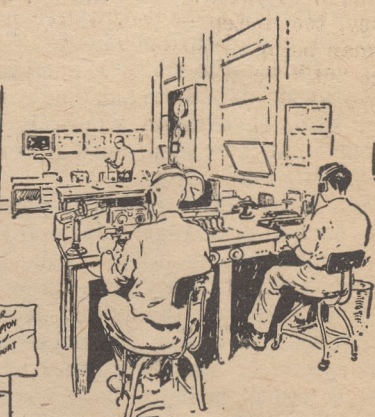
RIVETING ON A NEW PIECE OF CORRUGATED
STEEL SIDING ON AN ALL-METAL PLANE—



ALL PARTS OF THE ENGINE ARE EXAMINED
THROUGH A MICROSCOPE TO DETECT
ANY FLAW OR DEFECT



"ETCHING" THE SURFACE OF A PROPELLER WITH
ACID IN ORDER TO DETECT ANY CRACK OR FLAW
IN THE METAL.

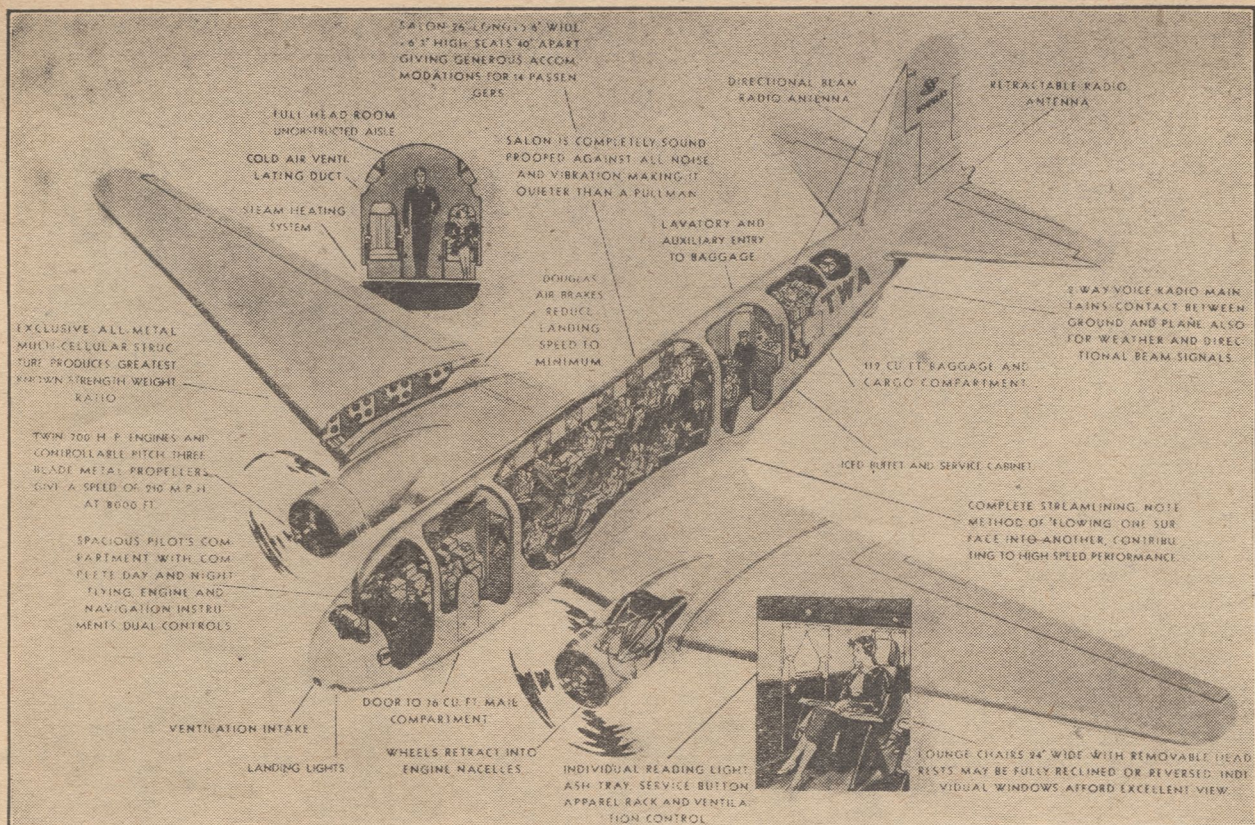


ENGINE
HAMPSON
AIRPORT

Now we visit TWA's great Kansas City maintenance base to observe the various specialists at their work. The inside story of an airplane physical exam is told in these fine sketches. They were drawn from life by F. Miller Hampton.

Courtesy Kansas City Star.

other suspicious gentleman. He is the inspector of the Department of Commerce—another master at this art of believing something must be wrong. He first looks at the work sheets which show what has been done to the plane before his arrival. Then he gives his suspicions full play and goes all over the plane again. Usually he completes his inspection with a sad look in his eye as if life is not worth living. No airplane of a commercial line is permitted to carry passengers or mail without the final approval of the Department of Commerce inspector—and it is no child's play to obtain that approval. The D. of C. deserves a big hand for its fine work of standardizing aircraft fitness throughout the country.



The experts have plenty to keep them busy once overhaul work begins on a mighty sky ship. This cut-away illustration of the Douglas will help you to visualize the many important units of a passenger transport which must be thoroughly tested and re-tested before a plane may be "discharged" as "fit."

SO much for the plane itself. But still further back of the scenes another gang of critical, sharp-eyed mechanics are at work on the motors. Giant, nine-cylindere, power plants they are, each one supplying many hundreds of horsepower to turn over the steel props at 1700 to 1800 times each minute in flight.

At the end of each 300 hours of flying—approximately 30,000 miles—the motor is removed from the plane and a spare engine is installed. The removed motor goes into the overhaul division where it moves, on a regular schedule, step by step, until it emerges a week later as a virtually-new motor.

First, the entire motor is placed in a vat of warm oil—a mixture of turpentine and kerosene—where it remains from about 5 o'clock in the afternoon until 8 o'clock next morning. The oil mixture seeps into the smallest corner of the motor, cleans the grease and carbon, makes it easier for subsequent steps, and saves approximately four hours on each overhaul.

Removed from its oil bath, the motor is carefully disassembled. Every nut, bolt, moving part, and cylinder is removed and displayed unit by unit. Not satisfied with its cleanliness, the individual parts are subject to a further bath, this time in acid compounds. They come from their second bath looking like newly manufactured parts. The cylinders are put through a still further cleaning process, first in an annealing furnace to remove as much of the paint as possible, then in a sand blast cage in which the every trace of paint is removed. Two reasons are given for this sand blast treatment. First, it exposes the base metal of the cylinder and its cooling flanges for inspection; second, when the new coat of paint is applied, the overhauled cylinder has the same weight and same cooling properties as before.

Large, wheeled trays stand by the motors as the overhaul begins. Piece by piece, the motor parts are placed on the tray. As it continues through the overhaul process each motor moves along on its tray and original parts are placed in the same motor when re-assembled.

Further, each part goes back into the re-assembled motor in the same place from which it was removed. Whether they are interchangeable or not, number 9 piston goes back into the number 9 cylinder and number 3 wrist pin likewise goes back into its former place within number 3 cylinder.

The first stop the dissected motor makes on its trip through overhaul is at the "ward" where the inspector awaits with his microscope trained. Piece by piece, he holds them on his inspection table. Just watch him for several hours. You'll see no change in his routine. Under the mike and back to the "finished" table go the many pieces. Then at very frequent intervals he pauses, looks more intently and perhaps marks a piece with a red pencil.

Examine it for yourself without the aid of the microscope. It certainly looks like a perfectly good connecting rod, gear, or "gadget." But examine it again under the mike. There it is, sure enough! A little bit of a crack that might some time cause trouble!

And what is done with that particular piece? Is it repaired? No, indeed. It's thrown away. It might easily be repaired and it *might* give good service for some time to come. But again it might not. And if a piece happens to be a wrist pin, or some other piece of which there are eight similar parts—one for each cylinder—all nine of them are taken from the motor. Not just *one* replaced—but all *nine* of them. This seems needless at first, but good motor overhaul requires each individual part have the same number of hours of active service. Just the old story of the chain and its weakest link.

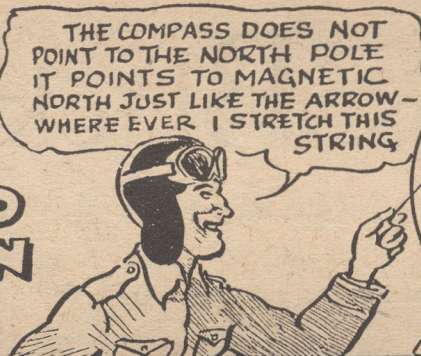
In a motor of the type used for coast-to-coast flying, there are 1,610 parts. Each one—nuts, bolts, valve springs, everything—is subjected to its own specific examination, and 250 to 300 of them go under the microscope.

Past this critical examination, the wheeled tray moves down the assembly line which is divided into some

(Continued on page 93)

ACE MCCOY

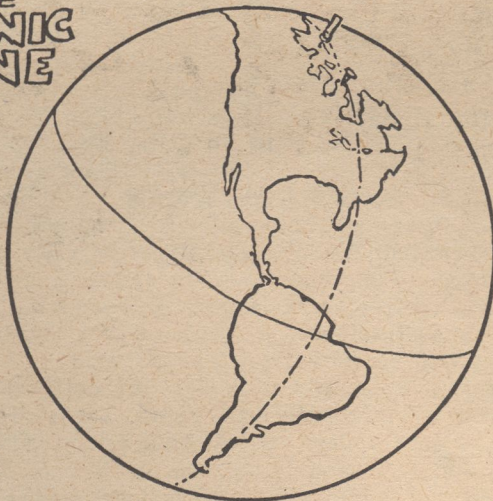
SIMPLIFIED AVIGATION



MAGNETIC NORTH

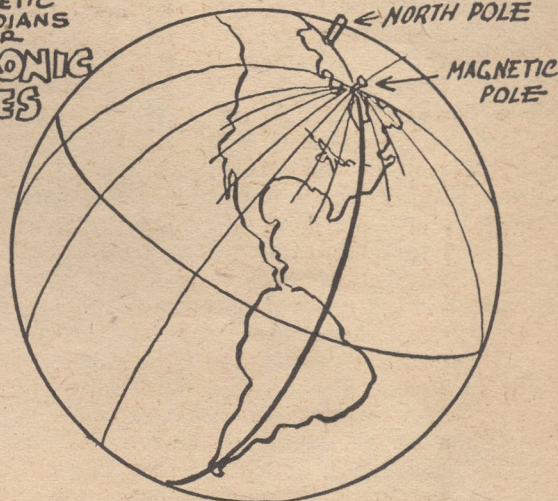
Left: On Boothia Peninsula, indicated by the peg in our globe, there is a large mineral deposit which attracts magnetic compasses from all parts of the earth. This point of attraction, lying at about 90 degrees West Longitude by 70 degrees North Latitude, is called "Magnetic North." Your compass needle always points toward there, whether you are in Oshkosh, Little America, Addis Ababa, or anywhere else on earth.

THE AGONIC LINE



B

MAGNETIC MERIDIANS OR ISOCONIC LINES



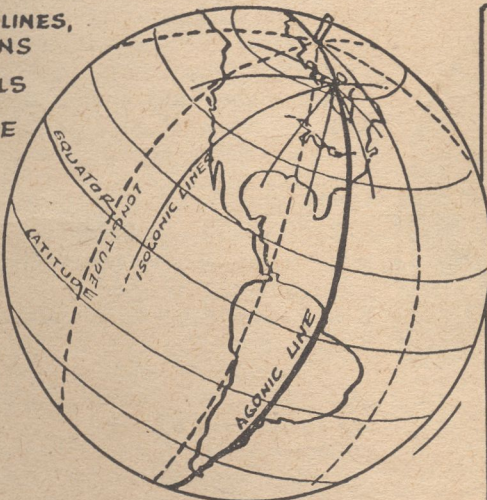
C

SINCE the North Magnetic Pole does not coincide with the North Pole proper, there will obviously be an error in the reading of your compass in different portions of the globe, the magnitude of the error depending on your location. You will find the necessary correction indicated on your airway maps; roughly, it is represented by the acute angle formed when lines drawn from the North Pole and the Magnetic North Pole intersect at the place of your reading. This acute angle represents the difference, or *Variation*, in degrees.

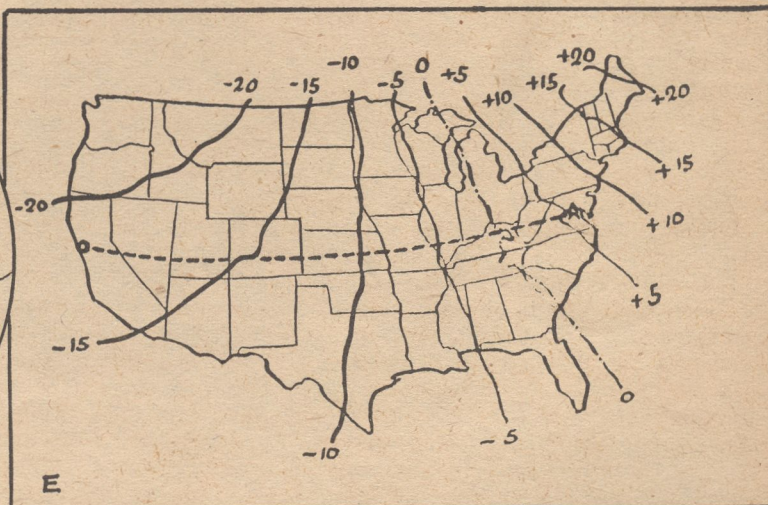
In the United States, all points on a line running through

Michigan, Indiana, Kentucky, Tennessee, and the Carolinas have *zero variation*. That is, no correction is required along this line; for this is the *Agonic Line* running directly through both the Magnetic North Pole and the North Pole Proper (see drawing "B" and line marked "O" in drawing "E.") Points east of this line have *Plus Variation*, while points west of it have *Minus Variation*. In other words, you must add or subtract the designated number of degrees to correct your compass. These *Magnetic Meridians* (see "C") other than the Agonic Line are called *Isogonic Lines*. All these lines connect points of equal variation,

ISOCONIC LINES, MERIDIANS AND PARALLELS OF LATITUDE



D



E

as indicated by the various degree-marked lines that we've superimposed on our map of the United States in drawing "E."

Now, when a pilot flies between Washington and San Francisco (see the dotted line in "E") he must add or subtract the degrees indicated as he crosses these lines in his flight. Actually, he is flying dead West, or 270 degrees, when he leaves Washington—but he must bring his compass to read 264 degrees when he takes off; for the variation is plus 6 degrees at the Capitol. Then, as he crosses each isogonic line, he must correct his compass the specified number of degrees until he crosses the Agonic line at

a point just south of Cincinnati. Here, as we've pointed out, there's no variation; for a compass on the agonic line tells the exact truth.

Then, as he continues westward, the pilot must add the indicated number of degrees at each isogonic line until he reaches San Francisco where some 19 degrees must be added to the 270, making 289 degrees. Thus, from Washington to San Francisco the compass varies gradually from 264 degrees to 289 degrees, a variation of 25 degrees. Note that when the map reads *minus* you must add, and when it reads *plus* you must subtract.

Next Month's SIMPLIFIED AVIGATION Lesson—CHART READING

Blois, Blois, Black Sheep

BOONETOWN'S BAMBOOZLER FINALLY GETS BUSTED!

IF anyone goes to a well too often and keeps bailing out the aqua pura, it is a cinch that the well is going to go dry sooner or later—mostly sooner. This aphorism applies to Lieutenant Phineas Pinkham, skullduggerian of the Ninth Pursuit Squadron, U. S. Air Force. He dipped at the well of patience of the Allied brass hats just once too often. Early spring of 1918 found Phineas therefore very much suspended in a sling. It seems that he challenged a certain bibulous Limey to a mule race from Thieblemont to Bar-Le-Duc one night. A lot of francs depended on the outcome.

Now the Limey had considered that the mule was worthy of its hire and had paid a Frog accordingly. But Lieutenant Pinkham's coffers were sadly depleted, so he borrowed a long-eared equine unbeknownst to its lord and master. Moreover, he put an electric buzzer under the blanket upon which he sat. The mule had never run so fast in its life so that halfway to Bar-Le-Duc Phineas was leading by four city blocks. Sad to relate, however, he chanced to round a curve and the mule had no brakes. A boiler carrying two colonels and a brigadier general had brakes of a sort but the driver forgot to use them. He just threw up his hands and held them over his glimmers. Result—one defunct mule; two brass hats

Phineas hadn't figured on a flight from the back of a mule instead of from the drome of the 9th. And the gallant Garrity hadn't figured on getting stuck when he put adhesive tape on his francs. Anyhow, they called out the guard. But what's the good of jailing a Jekyll if you haven't hamstrung the Hyde?

held over at a base hospital for an inventory of loose parts; a wrecked Yankee limousine; and two lumps on the Pinkham cranium as big as a pair of darning eggs. Last, but by no means least, a hurry-call for a court martial. Phineas ducked the scene, but in his hurry left a little book in the road called "The Wizard's Man-

ual." That proved to be his undoing.

Just forty-eight hours later Lieutenant Pinkham was being busted into pieces that spread high, wide, and handsome. Four charges were plastered against him, namely theft of a mule, criminal assault on superior officers, destruction of government property, and inebriation. Phineas flatly denied all the charges.

"It was somebody who stole my book," he argued. "I was with Babette all evening. I got these bumps walkin' into a door twice. She'll tell you! That's my alibi and I demand justice."

"Oh, you'll get it!" Garrity stormed. Then he sent Phineas out under guard while he and the other officers weighed matters.

"We've got to discipline that man," argued a choleric brigadier. "I know what you're thinking. He's a valuable asset to the Air Force in ways. With that new Kraut explosive being concocted back of the lines—

Pinkham's amazing ingeniousness at times with blocking Heinie moves—yes, I'm aware of it all. But he's been getting away with murder, Garrity. Got to teach him a lesson for the good of the force. Now—we—er—after all, he's not very well versed in military law, is he? Doubt if he knows anything about any kind of law and probably doesn't want to. But this girl—you say she denied he was there when you questioned her?"

"Right!" cracked Old Man Garrity. "That's where he slipped up. She found a letter he had dropped—from a dame back in the States. And is she sore! Man! Ever hear a Frog dame when she was on her ear? Ugh!"

"Why—er—no—that is—humph! Now as I was saying, Garrity, Pinkham is going to Blois! We'll take a chance that he doesn't know that you can't break an officer with a summary court, but that's what it will be in the records. We'll make him think he's busted—take his wings away and send him to Blois for, say, a week—to teach him a thing or two. Then we—er—will restore him to duty. Say we found extenuating circumstances—know that everyone will cooperate—"

"If you ask me," the Major said, "it sounds risky. But I don't want to see the man sent back to the States disgraced. Been quite a help to his country, sir, even though—"

"I understand, hmmm! No doubt of



Phineas chanced to round a curve—and his mule had no brakes!

ANOTHER SKY-HIGH "PHINEAS" MIRTHQUAKE

By Joe Archibald

Author of "Scratch-As-Scratch-Can," "Sky Finance," etc.

With Illustrations by the Author



this flyer's guilt, Garrity. Get him in here. We'll give him the works."

An orderly went on the double to get Lieutenant Pinkham. No sooner had he evacuated the Operations shack than the sound of a shot came to his ears. A second one punctuated a merger of wild shouts. Bang! Bang! Bang! Major Garrity and the rest of the court barged out into the sunlight. The C. O. spotted a squadron motorbike negotiating a sharp turn around the corner of a hangar, its sidecar lifted clear of the dirt.

"Shoot him!" a Colonel yelled. "The flap-eared—!"

"It looks like they tried hard," Major Rufus Garrity groaned, "but maybe they're wearin' the wrong glasses—them guys."

"I hit him, I know it," hollered a sentry.

Two soldiers got up from the ground, sneezing and pawing at their eyes which were running as freely as the proverbial babbling brook. When questioned, one of them snuffled: "We was tagin' hib across the fie'd whed he dossed the bebbber iddo our eyes. Thed he slugged uds. There was a modorzyle sta'din' there a'd—"

Major Garrity ground his teeth and it sounded like a cement mixer going to work. "Kid him about Blois, huh?" he yipped. "Like hell! Maybe we'll shoot him, or worse. C'mon, c'mon, get after him, somebody! Don't stand there like a lot of waxworks."

Meanwhile Phineas Pinkham, in high dudgeon, was giving the mechanical bug every ounce of goosing as he headed for Bar-Le-Duc. Three quarters of the distance there he slanted off the road, ditched his bus, and ran for an old root cellar with which he was well acquainted. In its gloomy depths, only too reminiscent of last year's crop of tubers, Phineas sat down to contemplate his drab future.

"Break me, huh? After all I've done for the democrats? Huh, I guess not! I'll git away to Parea. I—er—but I got to have argent as that is what talks in *la belle* France. I—uh huh, it's worth tryin'."

THAT night an American officer walked into Babette's domicile in Bar-Le-Duc. His hair was black and his lip was garnished by a mustache to match. Spectacles rode the bridge of his proboscis which was wiped free of freckles. His ears were laid back closer to his head thereby drawing the flesh from his temples and giving his eyes an almond shape.

"*Sacre!*" exclaimed Babette in high C. "*Qui etrez-vous?*"

"Oh, it's only the Fuller brush man," warbled Phineas' voice. "Bong swar, ma cherry dam'selle."

"*Vite—vous allez!*" screeched Babette inhospitably. "Nevair does I weesh for to see *vous* for ze hun'ed year. *Vous ete ze deux-timair. Oui, I tell him ze Majair, vous*

ete ze liair. *Regardez—chien—ze lettair!*" The Frog mam'selle plunked the letter right into the made-over Pinkham pan.

"Why, that—huh—" stammered the temporarily non-plussed Romeo, thinking fast. "Huh, that's from my sister. Why, to think you'd doubt me! This is too much."

"*Ah, mon Dieu,*" squealed Babette, "an' I have tell ze brass *chapeaux* zat *vous*—ah, Pheenyas, what ees eet Babette have do to *mon brav' soldat*? *Vous pauvre*—"

"Listen, cherry," yipped the masquerader, immediately seizing his advantage, "you can help me get some *argent*. Listen, veet—*vous* get it here *ce swar* an officer—somehow—*comprenez*? I don't care what kind as long as he looks flush. I'm desperate, as the Pinkham honor is at stake. The Pinkhams stop at nothing to keep out of Blois. Tell ze officer you have ze spy cornered or anything, nest paw?"

"*Oui, oui,* any'eeng *pour vous*, Pheenyas," Babette promised, shedding a tear or two. "Any'eeng for zat I help *mon brav' soldat*. Babette, she ess *beaucoup* sorree. *Votre soeur—ah mon*—"

"Adoo for a little while, then," said Phineas and he set forth.

In a cafe not far from Babette's he singled out a very tipsy Frog officer. The fellow had a black mustache and a lot of ivories that his mouth looked too small for. Phineas coaxed him to a room above the grog shop and got down to business. He found that the Frog was very much in need of legal tender, too, so right there and then the Yank had his guinea pig.

"*Vous* lend me ze unee-form for wan minoot," Phineas proposed right away. "I pay you ze francs when I get back, savvy voos?"

"*Oui—oui,*" agreed the Frog, very desirous of a nap. "She ees ze bargain, *mon ami*—hic—I wait *ici*—hic—"

Fifteen minutes later Lieutenant Phineas Pinkham was back at the domicile of his light of love. He asked for a nice cozy closet in which to hide. He got it. Babette then fixed herself up *tres chic*, donned her finest frock and sallied forth to the fleshpots of Bar-Le-Duc. It was close to midnight when she returned. From his hiding place Phineas heard a voice, a very familiar one.

"Sh-sh-sh-sh," he detected Babette's admonition. "Quiet *M'sieu*." Then silence, broken eventually by the tinkle of glass. "*Vous avez* ze leetle *dreenk, non?*" Babette cajoled her caller. "Ze spy he comes in ze minoot, *M'sieu* Majair. He does not know I know he ees ze spy—*non*."

"Good work, Mam'selle," was the gruff response and Phineas' knees buckled. More tinkling of glass. Babette coughed. Phineas drew a deep breath and strode out into the open. The door he had just opened swung violently on its hinges.

"So! Ze croquette you air, *non?*" he yipped, eyeing Major Rufus Garrity with baleful optics. "An' ze American, ze snake in ze grass, *non?* Hah, I have heem ze satisfaction. I mak' heem ze duel—tomorrow, *M'sieu*, at dawn—*pouf!* Peeg! *Chien! Vache!*"

"N-Now s-see here," Major Garrity stammered, his chin sagging until the wart on it brushed against the third button of his tunic. "I—er—there's a mistake—I—er—"

"Oh—oh, Jules, I do not know *vous* are *ici*—Jules!

Ah, mon brav' soldat, Jules—"

"I weel not leesten to ze lies, bah!" stormed Phineas. "At dawn in ze *matin*. Look, I heet you in ze face *avec* ze glove!" Smack!

"Why, y-you—" the Old Man exploded. "I—I'll—er—can't we settle this? I have a little money with me, Lieutenant. I—I—Ha! ha! If this gets out—my position—my honor—if a hundred francs—"

"N-non. I am inxult," Phineas choked. "But—mabbe I let you go—hah, I might keel *vous* as I am ze mos' good peestol shot in all France—*voila* toot! I tak' ze *argent*. B-But *encore* I see *vous avec mon Fifi*, hah, I cut ze piece from ze throat—!"

Major Garrity paid over the francs. Several of the squares of paper money had been torn and were patched up with adhesive tape. The Old Man bestowed a withering glance on Babette and then hurried out, his ears as red as a rooster's wattle.

JUST half an hour later a still bibulous Frog officer lumbered down the stairs in a certain cafe, stopped at the bar for a snort, then walked out of the *estaminet* thumbing a small bunch of paper francs. Major Rufus Garrity stood just outside the place, still befuddled by his experience nearby. He saw the Frog lieutenant and eyed the handful of *argent*. One bill, reinforced by adhesive tape, fluttered to the dirt from the Frog's fingers that seemed all thumbs. The Frog had a black mustache—a lot of teeth—it had been a bit dark in the mam'selle's place—

"Why you big crook!" howled Garrity, leaping into the air. "The badger game, huh? And in France?" Whack! His fist landed right on the Frog's chops and he went down. The Old Man of the Ninth was collecting the fluttering francs when three M. P.'s dashed up.

"Robbery—highway robbery, huh?" yelled one. "Hands up!"

"N-now see here," the Major tossed out, having an explanation to make

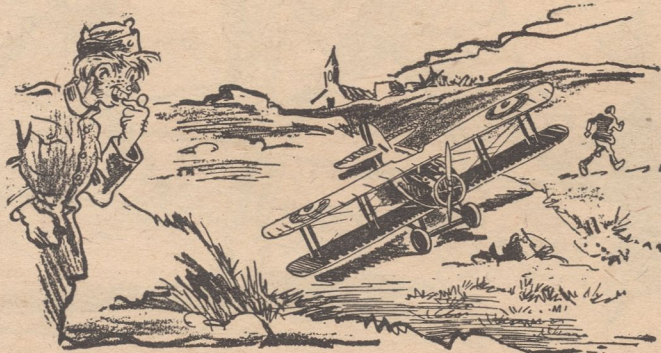
for the second time that night, "I can explain. It's my dough. I can prove it. I tore three of them by accident—I can prove—" Right then and there Major Garrity tumbled to the fact that only one man had actually seen him with the patched currency—Phineas Pinkham. And he had busted Phineas to a fare-thee-well—more-over Phineas had decamped. "Look here—don't you arrest me. I can explain—"

A Frog Colonel came running out of the cafe. "I see all of thees," he yelped excitedly. "Ze American officair he have punch ze lieutenant. He tak' heem ze *argent*. Arrest heem, *vite!*"

So it was that the Old Man went to the bastille. The Frog officer who had been walloped got up and reeled down the street. From a window of the cafe Phineas had been a delighted witness to it all.

"Huh, of all the officers in France, Babette has to pick Old Man Garrity. Haw-w-w-w-w! Well, I'm allezin' out of Barley Duck and if I can make it, I'll be in Africa in a week. Adoo, Heinies, you're gettin' a break! Pinkham must make himself scarce."

Major Garrity was released some time later, but the charge of assault and robbery was to be aired in court in due time. He went back to the drome convinced that he, too, was through with the big fuss if he could not produce Phineas Pinkham. Herr Pinkham was well



Near Dommartin he found a Spad and a pilot—and the pilot walked away.

Gunners From the Clouds!

THRILLING STORY BEHIND MR. MOREY'S COVER PAINTING

* * *

FOR years, certain self-styled military experts had been belittling the part played by flying men in warfare. They'd said that the Air Service was a much over-rated organization and that the Aces were simply the pets of the war correspondents. They'd argued that in spite of all the color and dash of the flying men, it was still the infantryman who actually captured the ground.

Well, we air fans have, in the past, had to admit that the infantryman is the last word when it comes to taking over captured territory; for while it was true during the Great War that the Air Services helped materially with their reconnaissance, photography, trench-strafting, and bombing, it was really the P.B.I. (Poor Bloody Infantry) that had to go over the top and bayonet their way to actual victory.

This point, of course, rankled in the airman's mind. He's had "to take" this from the men who served in the trenches, and he admits he's never had an answer—that is, a convincing answer. True, he can tell how he strafed the enemy lines, and he can point out that his bombing materially assisted the infantryman in capturing certain strong points that would have been impregnable without the aid from the air. But though the infantryman usually admits that, he always adds his inevitable dig: "Sure, but the gravel-crushers had to go over and *take it!*"

There seemed to be no answer to that.

But then a few years ago, both the U. S. Army and the British Army tried the idea of 'chuting men from speeding planes. These men—trained airmen and gunners—practiced parachuting to points as near to certain objectives as was humanly possible. And they proved to the General Staff that such aerial tactics were sound.

But like many other novel ideas, this scheme was dropped once someone had proved it could be done. Moreover, a drawback was pointed out—that a complete gun team usually consists of about seven men, hence it would take a pretty big plane to carry that number along with full military equipment, machine guns, ammunition boxes, and spare parts. The plane would also have to carry a pilot, a navigator, and at least two more gunners to man her own armament. In other words, the scheme required a ship capable of hauling about a dozen men, and at that time there were few planes in any service capable of that.

Thus, as we stated, the idea was virtually forgotten. The infantryman remained supreme.

Then there suddenly came the stories of the Soviet government's plans for improving on the flying infantryman idea. For one thing, the Reds had their new Maxim Gorky—an A.N.T.20 military plane capable of taking

63 passengers aloft. (It has carried nearly one hundred people!)

Here, then, was the answer to the airman's prayer!

At first the idea was tried out as something of a stunt. A dozen or so soldiers in full military kit leaped out, took to the silk, then lined up on the ground and performed pre-arranged ground maneuvers. Later on, 'chute machine-gun teams were formed and in one or two cases soldiers actually leaped out with a dismantled light field gun.

About this time, the Russians suddenly went parachute crazy. They leaped out of anything and everything that would fly. Industrial plants had parachute clubs, and Ivan, Serge, and Alexis (Tom, Dick, and Harry to you) found they didn't "rate" in the community unless they had leaped into space from something. The situation eventually reached the point where the government had to erect special towers from which beginners could learn to jump in perfect safety with the aid of already-open 'chutes.

The real story finally came out—the Russians were carefully organizing aero machine-gun corps! As many as fifty fully-equipped machine-gunners were dropped from great military cabin planes. With them went officers and others trained in this novel form of war tactics. They had new and lighter guns for this special air work. Their officers studied the "enemy" back areas and selected the most suitable spots for the attacks. In a few weeks they had ironed out most of the problems.

TODAY, then, Russia stands alone in this new form of warfare. Her airmen no longer have to take "backtalk" from the infantrymen, for while these parachuting gunners actually fight on the ground, they are first trained as airmen so that they are at ease both *above* and *behind* the enemy front.

The original Maxim Gorky was wrecked in May 1935 when a stunting scout plane smashed into it. Forty-nine were killed. But the Russians immediately ordered three more, and we have since learned that additional air giants will be built on money donated by public subscription.

When the Red infantry can't get through the enemy lines in the next war, the Soviet Air Service will simply send a number of mammoth planes over, drop machine gun corps in the enemy's backyard, and say: "Now let's see how you like it!"

Rumors have it that the Russians will be able to drop a whole armed regiment directly into the enemy's back country. And you don't have to force your imagination to realize the important military ramifications of that sort of thing.

aware of that fact, also, and it was quite clear to him that he had an out if he decided to return to the Ninth. He'd strike a bargain—a hard one. He was chuckling as he walked down a dark side street.

Garrity found his pilots all agog when he trudged into the French farmhouse. Captain Howell spoke first.

"They dropped a bomb on that bridge over by Lerouxville awhile ago—one

bomb—an' I bet most of the Meuse was spilled over. If they ever drop one of them things on us—I er—would you mind getting me a transfer, Major? I have asthma and the climate here—"

"Get out!" erupted the Old Man. "Let me alone—go to hell! I might want to commit suicide and I won't want you gapin' at me while I do it. Oh, if Pinkham was only here—" He slammed the door.

"Callin' for Phineas?" gasped Bump Gillis. "Like he was his long-lost prodigal son! An' after he busts him! Garrity's gone plain nuts."

Phineas did not return to the drome right away. Halfway down that dark street he had stopped short. He saw the empenage of a man, consisting of khaki pants, dirty puttees, and muddy boots, wriggling over the window sill

(Continued on page 83)

Tactics of Two-Seaters

ANOTHER DRAMATIC MODERN AERIAL COMBAT FEATURE

By David Martin

Author of "Tactics and Strategy of Modern Sky Fighting," "Talons of the American Eagle," etc.

AS far as we can learn, there are no text books on tactics and strategy for two-seater pilots and observers. There never were, even during the heat of the Great War when bookstores all over Europe were crowded with volumes on gunnery, drill, artillery movements, and some one hundred and one other subjects then being taught in the University of Mars. Today, after looking closely through the stack of war-time instruction books at my command, I find nothing that would give the two-seater airmen even an inkling of what they might do when they went into action.

In the war days, just as today, the pilot was generally taught his trade at one field. He advanced through the various types of planes until he reached the active service machine. Then he went through a short period of gunnery. He dived on ground targets and hammered away at air targets either towed by other machines or which trailed from captive balloons over the sea. In other words he got the same gunnery training as the average single-seater pilot.

While all this was going on, the man who was eventually to become his observer, was learning Morse code, L-type cameras, map-reading, artillery spotting, and a meager amount of gunnery on fixed ground targets.

During the World War, the only sky fighter that "batted .400" was the single-place job—the two-seaters figuratively "sat on the bench." But today the two-pit craft bid fair to become the most effective of winged weapons, and in this article, Mr. Martin lucidly describes the deadly tactics that make these present-day high-speed attack ships worthy rivals of the pursuits.

Later he was given a test with a camera gun just to make certain he knew just what "laying-off for direction, wind and speed" meant. Then he went out to France and joined up with the pilot aforementioned.

But once they were in the air, these fellows were on their own. They had been shown nothing of teamwork and two-seater tactics. Whenever they went into action, they just

hoped that the other would do the right thing, and if such an amazing occurrence took place, it was more through luck than skill.

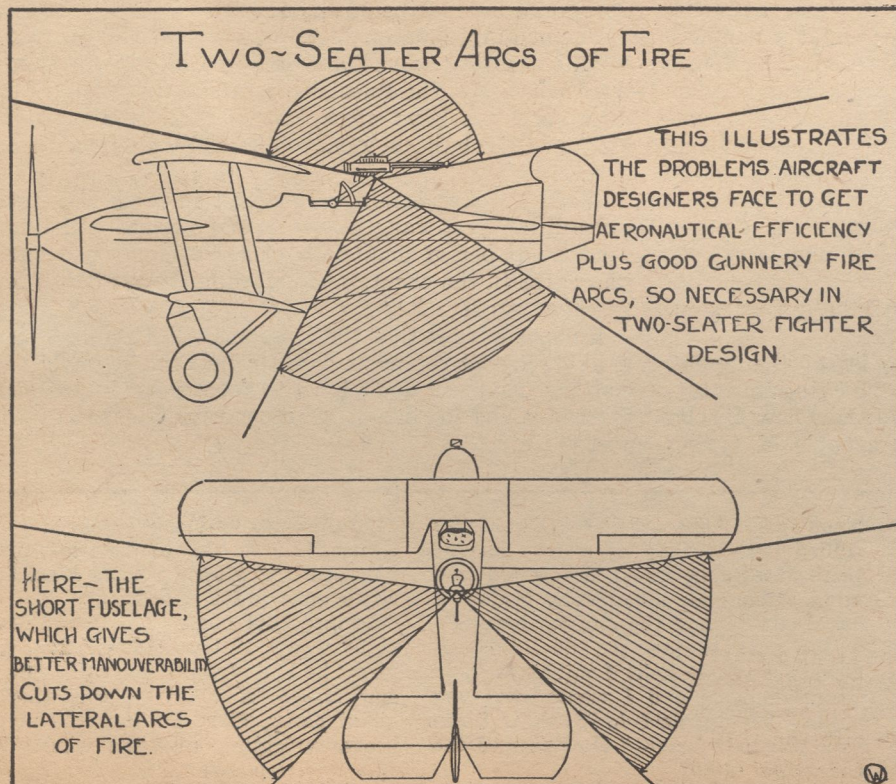
Today, eighteen or more years later, two-seater guys are still outcasts in most air services. But they are now beginning to gain a place in the sun. Slowly, yes—but surely.

The war-time single-seater pilots—who got all the glory and medals—have attempted in their own way, to put down on paper the tactics and maneuvers they used in their successful combats against the enemy. From these have been evolved the accepted roots of modern air-fighting practice, but these roots are only planted for the single-seater pilot. No observer or two-seater pilot ever seems to have attempted to outline suitable practices for those who have followed them.


What, then, can we offer as a representative system employed by two-seater fighting teams? For that matter, where do we get our authority to offer such a system?

Well, the answer to that is that we have spent considerable time checking the systems in vogue all over the world and we have had to come to the conclusion that the art of two-seater fighting has a certain relation to that used by the single-seater men, though a different type of teamwork must be evolved. Once this teamwork is established—and we mean both teamwork between pilot and observer and teamwork with the other planes—the two-seater immediately becomes the most effective weapon in the air. Without it, however, it is nothing more than a floundering bundle of steel, dural and fabric that is getting in the way and absorbing gun-power that might be more effectively used elsewhere.

DURING the World War, the two-seater was the orphan of the service. It never got far beyond the B.E. and R.E.8 stage for its



The Gunner is the Heart of the Two-Seater!


① ABOVE AND BEHIND 



A REAL OBSERVER LIKES THE SINGLE-SEATER TO COME DOWN LIKE THIS.

② BELOW AND BEHIND



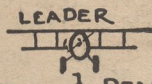
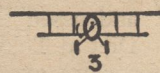
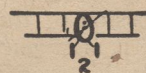
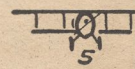
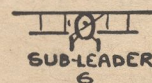
A LITTLE TOUGHER BUT HE CAN STILL BE HANDLED ~ TEAMWORK 

③ DEAD ASTERN!

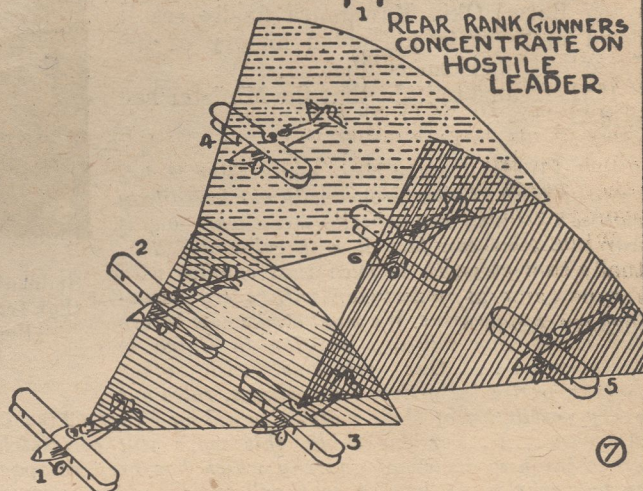


THIS IS THE DEADLIEST POSITION THE TWO-SEATER HAS TO FACE.

ON THE ATTACK TWO-SEATERS ADOPT THE REGULAR STEPPED-UP VEE FORMATION ~ LIKE THIS ⑤

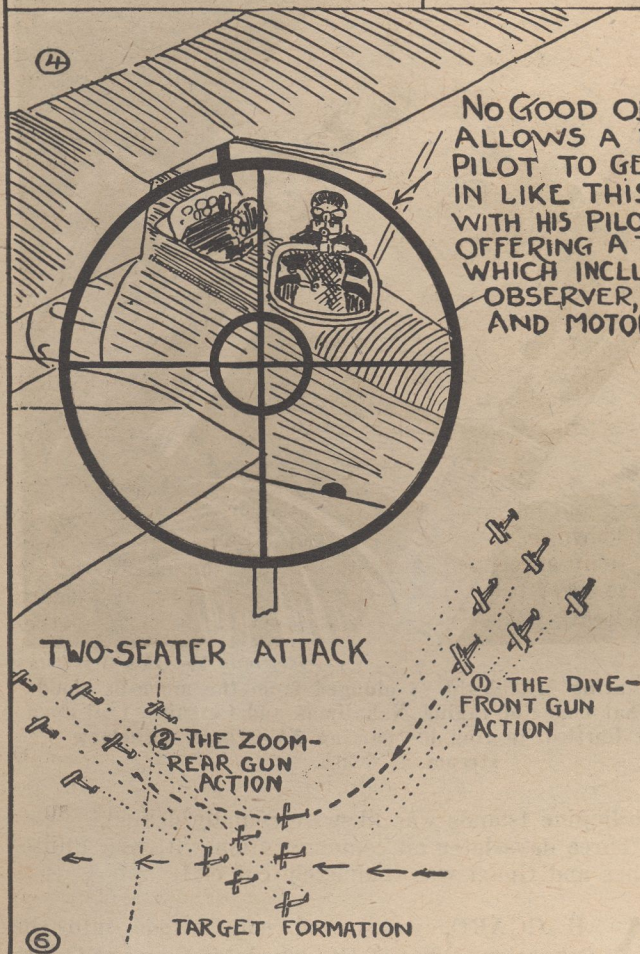


REAR RANK GUNNERS CONCENTRATE ON HOSTILE LEADER



TWO-SEATER FORMATION WHICH CANNOT BE BROKEN UP BY ANY EQUAL NUMBER OF SINGLE-SEATERS ~ AS LONG AS EACH SHIP STAYS IN ITS RELATIVE POSITION ~ EACH GUNNER COVERS A SPECIFIED AREA. ⑦

NO GOOD OBSERVER ALLOWS A PURSUIT PILOT TO GET A SHOT IN LIKE THIS ~ TEAMWORK WITH HIS PILOT PREVENTS OFFERING A TARGET WHICH INCLUDES PILOT, OBSERVER, GAS-TANK AND MOTOR



first two years because of the assumption that a two-seater was useful for nothing more than ordinary photography, artillery spotting and general observation work. It was the accepted theory that all two-seaters on normal duty required a flight of single-seaters to protect them.

Then came the D.H.4., a fighting reconnaissance type that proved several things. It had speed and maneuverability. It could fight and protect itself. And in addition it could do more jobs than the old B.E.'s, R.E.8's and early Martinsides.

But before the D.H.4. had been on the front a month, the pilots and observers learned one thing that all the designers and theorists had not learned in two years. They discovered that the greatest fault with the D.H.4. was the fact that the observer was too far away from

the pilot to maintain close cooperation during action in the air. Take a look at the old D.H. and you'll see that the observer was at least four feet away from the pilot with nothing but a very cumbersome and inefficient tube-telephone set for conversational contact.

Before anyone could do much about it, the Bristol Fighter appeared and they discovered that inadvertently the Bristol designers had overcome this error and had placed the observer up so close to the pilot he could lean over his shoulder and bellow in his ear—or he could handle his Lewis gun, or guns, with one hand and tap his pilot on the back with the other, thus to signal him which way to turn or twist while fighting an action over his tail. In the midst of a fight, a tap on the shoulder and a couple of gestures are quicker and more effective

(Continued on page 88)

Death Spans the Pacific

It was a quirk of Fate that brought "Buzz" Benson to take off for the North without first examining the rear cockpit of his Lockheed XP-9. If he had glanced into that tiny observer's "office," he would never have known that behind that withering flame of war that lit the skies of the Pacific there lay a deadly secret. He would never have learned that only one American held its key.

WHEN the Japanese Foreign Minister addressed that closed session of the Diet at Tokyo on July 27th, stringent measures were exercised to keep his words secret. In fact, so thorough were those measures that the world at large never learned the exact content of that speech until 1940 when Baron Okia Kawamura finally set it down in print in his noted history of the Japanese-American conflict.

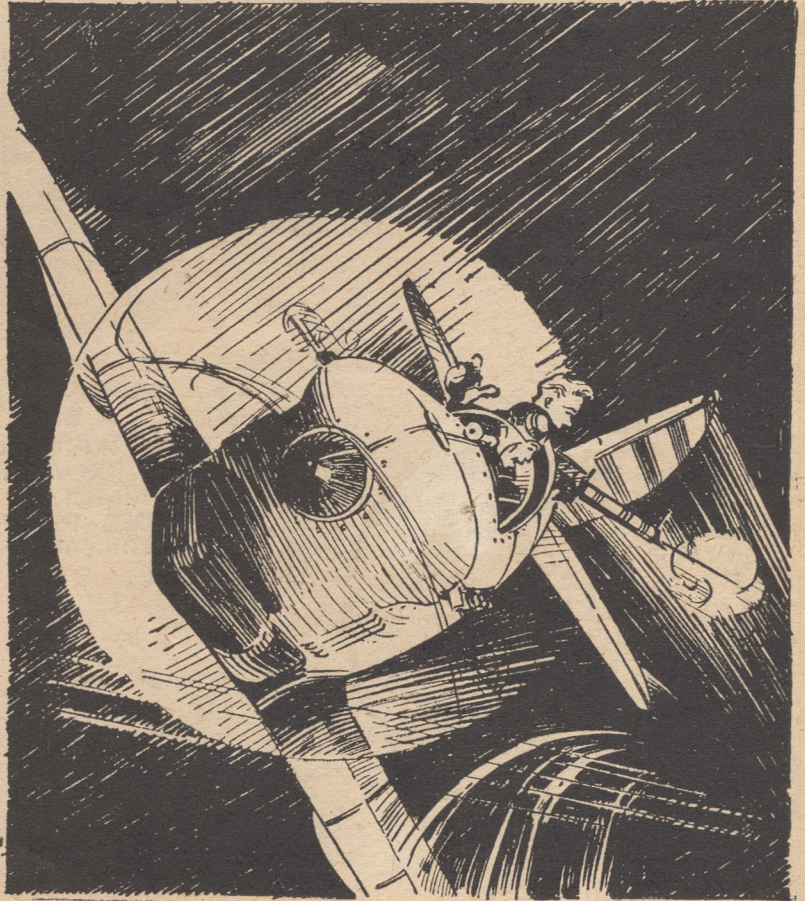
It then came to light that the Minister had said—

... We will make clear our resolve to tolerate no further interference with our hereditary rights. This may not actually mean war—but if war comes we can face it with calmness ... Our Naval strength is such that conflict with America can be undertaken with every assurance of a happy issue. We must strike now before our newly won military position in China is threatened ... Our relations with other powers, particularly European powers, rules out every possibility of their materially aiding either China or America ... For one thing, this move will completely erase the new demon of anarchy which has been rampant in our country of late. A war will purge our country of the baneful poison injected by foreign agitators; and what is more important, we can now set up impassable barriers against the flood of Western influences which have threatened to engulf our peoples ... For those of you who may fear that our military and Naval might is insufficient to engage America, I again point to our air strength. In the last two years, our sky forces have been increased ten-fold. Indeed, Japanese aircraft now have a radius of action twice that of any other power—for we figure only the outward distance. Our brave men never consider the return ...

But the people of America knew nothing of all this. To them, the whole thing began on July 28th when a noted radio commentator, speaking over a national hook-up, declared—

All United States Naval vessels in Atlantic waters have just received urgent orders to proceed at once through the Panama Canal and join the Pacific Fleet somewhere off Hawaii for a proposed cruise to the Philippines.

The Navy Department promptly denied such an order had been given. It did admit that a few vessels had been ordered into the Pacific, but only in line with ordinary routine. The report of a Naval cruise to the



Illustrated by Alden McWilliams

Suddenly, a roaring Mitsubishi 93 plunged from the moon-lit clouds that framed that melee of raging Nakajimas and Corsairs. Full upon Benson it hurtled, to ring his darting XP-9 in a withering stream of death.

Philippine Islands was likewise soundly denied.

Three days later all communication with the Philippines and Guam was completely cut off!

AHAGGARD, weary-eyed man strode into the Operations Office of the Army Air Corps at Crissy Field just as the late afternoon sun was throwing long shadows across the runways. He was greeted with unmistakable reserve by the Staff Colonel.

"I haven't much time to give you, Mr. Benson," the Colonel said. "We have been under trying times here at Crissy, and you must not expect too much attention. You will have to take things as they come. We have, however, got your ship ready."

"I know. I realize what you have been through, sir," Billy "Buzz" Benson replied crisply. "On the other hand, I want you to understand fully that this is not a job of my asking. I'd sooner be back in Los Angeles."

"You're a newspaperman, I understand."

"I am—when I'm not under the orders of Major Norton in Washington."

"It's all very irregular, of course," the Colonel sniffed. "A civilian on active duty—free-lancing all over the place in the best machines we can get our hands on."

"Irregular? It's a damn nuisance, sir," Benson agreed. "You say the word and I'll clear out."

"Oh, no! You don't understand. We need you, Mr. Benson," the Colonel stammered, "but you see—well,

"BUZZ" BENSON—AND THE WAR OF TOMORROW

By Arch Whitehouse

Author of "Sky Gun Snare," "Flight Deck Fury," etc.



there's no precedent for me to work from."

"What you are really trying to say, colonel," smirked Buzz, "is that you would like to have full control over my movements, bawl me out when you are upset and generally man-handle me."

"I can see that you are not that sort of man, Mr. Benson," the Colonel smiled wanly. "Let's get on with the business."

"Let's!" agreed Buzz. "Now first. What are the latest reports?"

"There are none. We know nothing—except that the

Japanese fleet has destroyed the American Asiatic Squadron in a battle off Lubang Island. Enemy vessels of the *Kongo* class engaged them at 24,000 yards and destroyed every vessel within forty-five minutes."

"That's bad."

"But it's much worse than that. A complete flotilla including two new aircraft carriers has been spotted off Queen Charlotte Island—that's near the coast of British Columbia. We are expecting news of a naval air engagement at any time."

"Have we any planes in that area?"

"Only a few two-place naval observation jobs—no match for what they are sending up against us."

"Where's the main body of the Pacific Fleet?"

"I'm not sure. But I believe they were drawn as far west as Hawaii before they were recalled. It will be days before they can get back."

"How's the Canal?"

"All right, so far. It is now closed to merchant shipping. Only Navy vessels allowed through."

"The Philippines and Guam have been taken?"

"As far as we know. We've had no news from either post in several days."

"You say you expect an aerial engagement somewhere south of British Columbia, colonel?" asked Buzz. "What naval vessels have we in that area?"

"All I can tell you is that we have three almost obsolete cruisers, each carrying four spotter seaplanes. That's twelve aircraft. I am not certain, but the new *Yorktown* may be in the area, too, and she can offer considerable help, if she is there."

"That's the new light aircraft carrier, isn't it?"

"You're right. But I can't be sure where she is."

"Then as things stand now, the Japs should have no trouble in getting through and bombing industrial areas around Seattle and perhaps even as far south as San Francisco?"

"I expect news of such an engagement any minute."

"Then the sooner I get into the air, the better."

"Your machine is waiting—at No. 4 hangar. Here's your special identity card. That's all I can do for you now."

"That's enough, thanks."

THE new Lockheed XP-9 stood in the lowering shadows of the No. 4 hangar when Buzz made his way through the wild flurry of tense activity that marked the concrete aprons in front of each shed. The machine was a new low-wing monoplane fitted with a supercharged Curtiss "Conqueror" engine which gave the two-place fighter a top speed of 226 m.p.h.

He studied the machine carefully for several minutes. Then he ordered the mechanic to stow the rear gun—a 7.5 m/m Browning fitted to a movable mounting—under the camel-hump cowl of the rear pit.

"Going alone?" the mech asked.

"Yes. I want to make time."

"You'll wish you had a gunner in back there, if you ever run into any of them Jap Nakajimas. They're hell on wings, they say."

"How do you know?" Buzz snapped.

"I seen 'em when we wuz in the Orient."

"How'd you like to come along?" asked Buzz with a wry smile.

"Not me, brother! I'm a monkey-wrench soldier. You ain't gettin' me up there to be shot at."

Buzz laughed aloud and went across the hangar and drew a new white coverall and a pack 'chute. He dressed carefully, buckled on a gun belt, and selected a few maps. The mechanic watched him with interest.

"Where you going, anyway?" he finally asked.

"Looking for trouble," replied Buzz.

"Anything else?"

"Nothing in particular."

"You ain't going to look for Cressford, are you?"

"Cressford? . . . Cressford? You mean the guy

who 'went West' a short time ago on a non-stop from Tokyo to Seattle?"

"That's the guy. He was flying a Lockheed, too."

"Right! I'd forgotten all about him. Wonder where he cracked up," Buzz said, frowning.

"I wonder *why* he cracked up," the thin-faced mech argued. "He could have flown all the way to New York with the bus he had."

"That's stretching it a bit, brother," Buzz smiled.

"Still, considering everything, he might have had one put over on him."

"You keep your eyes open if you get up around Charlotte or even further along. You might find the guy, yet."

"You sound interested," Buzz said.

"I am. Lauren Cressford was my brother and I could tell you something, only you wouldn't believe me. It sounds screwy."

"Say!" gasped Buzz. "No wonder you don't want to fly."

"It ain't that, exactly. Read this. It's part of a letter I got from him—mailed in Tokyo before he took off. It only got here a few days ago."

Buzz took the sheet of crumpled paper and read:

. . . . I should make it, but in case anything happens, I want you to take care of Lionel. I ought to be able to make it, but something tells me I'm going to be jobbed. I ran into something out here, that has me scared stiff, and the quicker I get to Washington and explain it, the better for all concerned

"Whew!" whistled Buzz. "Who's this Lionel?"

"That's his kid—a swell kid, too. I'm taking care of him at a place just outside the field. We really call him Lonny."

"I wonder what it was he found out."

"You can bet it was something to do with all this mess."

"You've got too much brains to be on this job," Buzz said, peering into the man's eyes. "Why not come along with me? I can use you. I can fix it with the Colonel."

"No If anything happened, who'd take care of the kid?"

"That's right. I'd forgotten. Well, wind her up. I'm getting away before it gets too dark."

They hoisted the Lockheed fighter up in a dolly and rolled her out. Buzz climbed in and set the throttle for starting. The little mechanic wound the starter and Buzz kicked her over. With a bellow, the motor caught and Buzz eased her down for the warm-up.

Cressford, the mechanic, climbed up on the wing, again barked into Benson's ear: "Where you going, anyway?"

"North, on a special job."

"Keep your eye open for that Lockheed, will you?"

"Sure will. Stick around, I may be back before midnight."

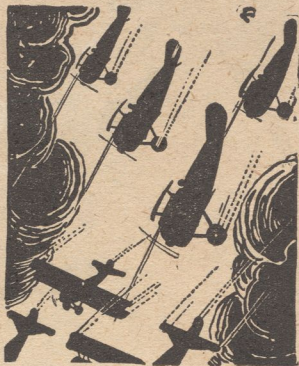
"You'd better. You only got about four hours in them tanks."

"I'll be seeing you," grinned Buzz, pulling back the sliding covers.

THE new Lockheed raced away through the moon-streaked sky and headed north. So many things had happened in the last twenty-four hours that Buzz was glad of the chance to sit back and relax while he went over the whole situation.

For one thing, the Japanese government had broken off diplomatic relations. The move had been timed perfectly and it had caught the United States flatfooted. Already the Asiatic Squadron had been wiped out and to all intents and purposes both Guam and the Philip-

(Continued on page 72)

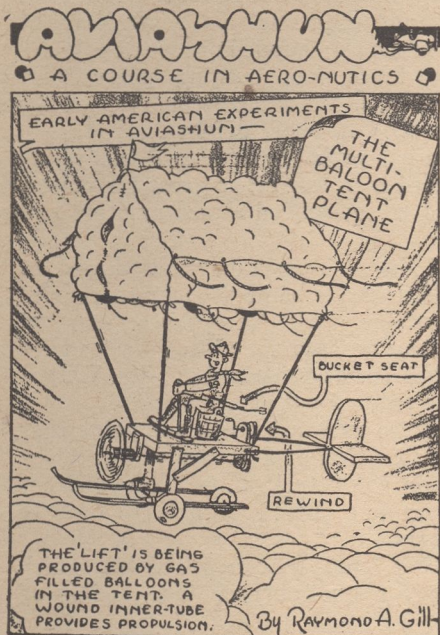




WISCRACK-UPS



Taxi in on this runway and pick up a plane load of laughs! In this department, we present a collection of jokes, cartoons, and humorous verse. For all original contributions which we can use here, FLYING ACES will pay \$1. Contributions will not be returned—except art work with stamped return envelope.



SLIP SCREAM

First stude: I took off perfectly, did two complete loops, went into a tail spin, then dived down and made a pancake landing—all in one second."

Second stude (puzzled): Gosh, how did you do it?

First stude: I slipped on a banana peel.

ANYHOW, they've finally written a theme song for parachute jumpers. You know the one we mean—"I'm Building Up to an Awful Let-Down."

PUT 'EM ALL TOGETHER
AND THEY SPELL—

F AIRCHILD
CONSO L IDATED
R YAN
ST I NSON
MO N OCOUPE
DOU G LAS

M ARTIN
LO C KHEED
BO E ING
SIKOR S KY

VOUGHT A BUM JOKE!

Aviator (to pretty girl): Come, Fairchild, would you like to take a ride?

P.G.: No thanks, I'd rather Waco.

HAY! HAY!

Two darkies had hopped off in a two-seater for a trip over the surrounding countryside. But when the ship returned to the airport, there was only one darky in the plane.

"Say, Snowball," said a mechanic who stood near by, "what happened to your friend?"

"Well, suh," the Negro replied, "back about six miles, he fell out. Fo'tunately, dere was a load of hay below him, but unfo'tunately dere was a pitchfork stickin' up out of de hay. Well, fo'tunately he missed de pitchwork — but unfo'tunately he missed de hay."

HARD PRESSED

Mechanic: Holy smoke! Is that all that's left of Bill Smith's new sport plane?

Pilot: Yeah. You see, Bill flew over New York City and tried to put creases in his wheel pants.

Mechanic: He tried to put creases in his wheel pants? What with?

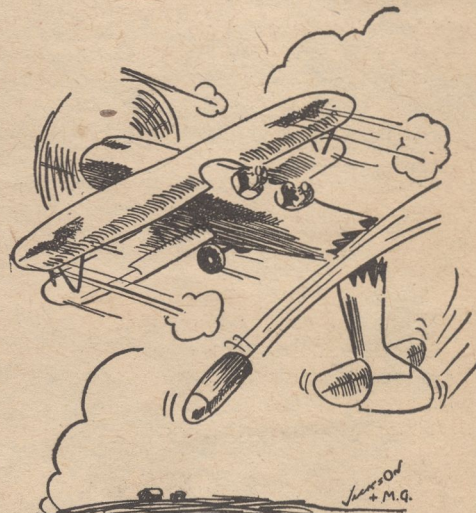
Pilot: The Flatiron Building.

Wow!

First flyer: Hey! What's the matter with our motor? It's making more noise than a boiler factory.

Second flyer: You'd better go out on the wing and see. It should be Okay. I had a mechanic working on it before we took off.

First flyer (coming back): Good lord! He's still working on it!



EGG-CELLENT IDEA

Flyer: In Scotland they train students to land smoothly with only one lesson.

Kiwi: That's marvelous! How do they do it?

Flyer: They make every stude buy a basket of eggs with his own money. Then they put the basket in the student's ship whenever he goes up.

HELP!

Pilot: I say, old chappy, did you ever hear that old wheeze about the escaped lunatic who flew a passenger in a stolen plane?

Fellow in rear cockpit: Why, yes.

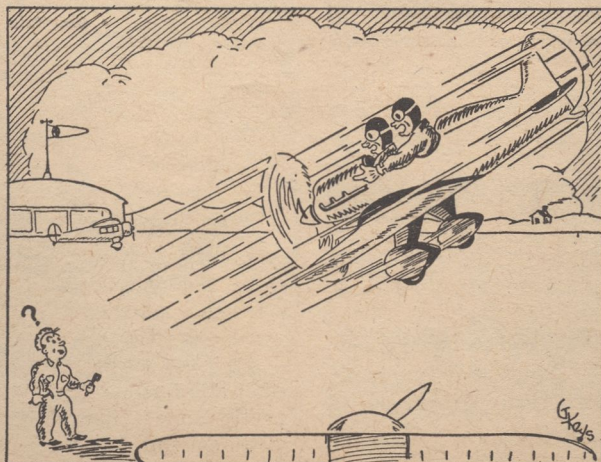
Pilot: Well, you're the passenger.

DUMB DORA thinks that the oleo strut is a new dance step.

IT'S ALL YOURS, MAJOR

Garrity (seeing a lighted cigarette on the floor near several gasoline drums): I say, Pinkham, is this yours?

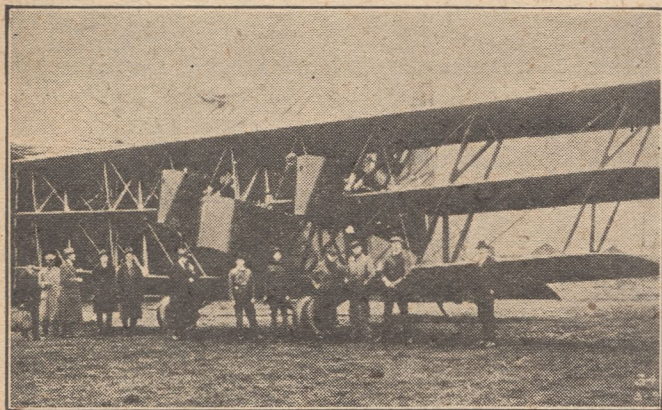
Phineas: Not at all, sir. You saw it first.



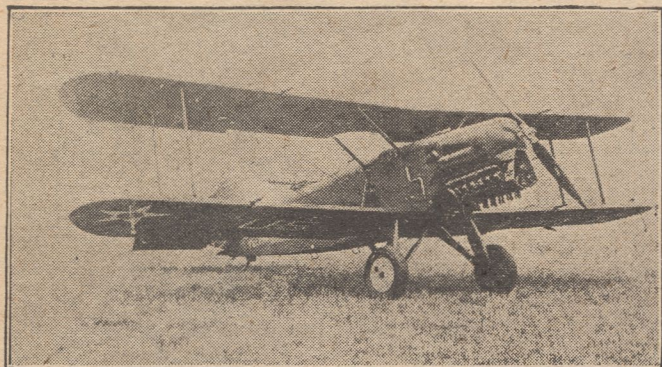
"Gadzooks! The blasted idiot put the prop on backwards!"

The Dramatic Story of

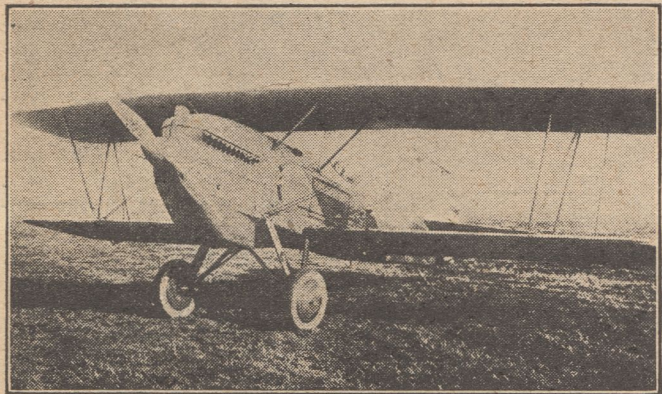
ILLUSTRATED WITH PHOTOGRAPHS
FROM THE ROBERTS COLLECTION



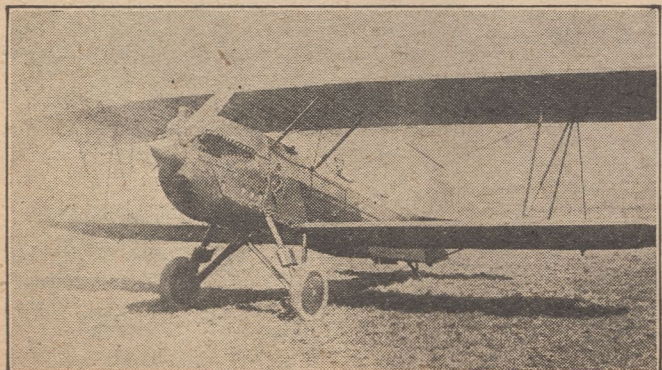
1—This 1921 plane—the Boeing GA-X—was the first out-and-out attack ship developed in the United States. It was an armored N-strutted triplane.



2—The Douglas Company decided in 1922 that an inverted Liberty, eight machine guns, and no armor at all was the real thing. This is their XA2 job.



3—Our first really successful American attack craft was this Curtiss A-3B Falcon. It's still a grand ship.



4—And here we see the Curtiss AX-5, a Prestone-cooled Conqueror job. Actually a re-designed XO-16 observation ship, it was said to do 165 m.p.h.

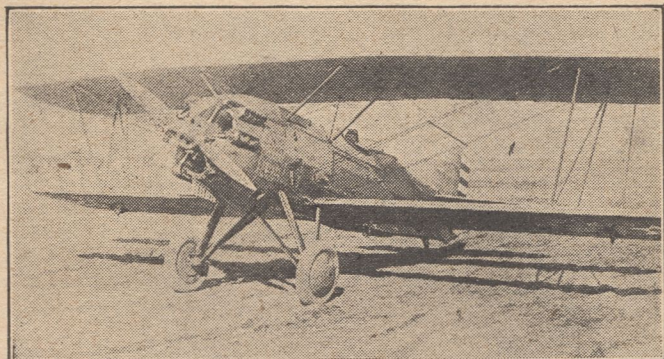
ATTACK aviation is that branch of military aeronautics which specializes in onslaughts on personnel, on certain material objectives, and on communication arteries by means of machine gun fire and light fragmentation or demolition bombs. In the old days it went under the war-minded phrase of *ground-strafting*, and while there was nothing particularly specialized about it then, it has since become one of the most important branches of aerial defense.

The United States has probably developed this phase of military flying more than any other great air power, and so today we lead in specialized attack aviation and in attack machines.

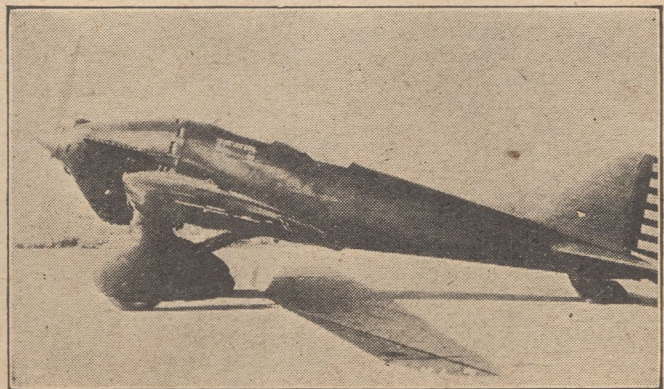
Only Holland and Soviet Russia have attempted to develop attack aviation in the same manner as carried out here. Other countries work under the assumption that light bombers may be used for attack work under certain conditions, but it has remained for the United States to produce the out-and-out attack ship.

The argument may be summed up in the point that the United States' conception of a future war involves 24-hr.-a-day programs for attack units. They are not only daytime workers but should be able to operate equally as well at night.

Abroad, on the other hand, they feel that the attack ship should be simply a dual-purpose job, capable of



5—Although it was one of the best-looking Falcons ever produced, this XA-6 went to the aviation bone-yard because they couldn't make its Chiefstain engine keep cool.



6—Here's the first U. S. Fokker attack craft—the XA-7. It started the rush of low-wing designs in this field back about 1931. They had good wheel pants even in those days!

Attack Plane Progress

long-distance light bombing and attack work should the occasion demand. It is really a question of military budgets, and where certain nations are limited in finances, it is easy to understand why they prefer the dual-purpose machine.

The first real attack machine was the German Junkers-Fokker all-metal Schlachtflugzeuge (attack airplane) which came out in 1917. This machine failed in its work, however, and later was superseded by the Hanoveraner and Halberstadt CL types armed with extra guns firing through the floor at an angle of 45 degrees toward the front of the ship. Later a new Junkers-Fokker, the CL-1 all-metal monoplane, came out actually armored in certain vital spots.

The Germans first used planned-attack maneuvers on September 6, 1917, against the British outside Peronne, and they managed to cover successfully the withdrawal of their own ground troops. The 24 Halberstadts used in this show were able to block out the advancing British at St. Christ and Brie long enough to allow their retreating divisions to consolidate their new positions.

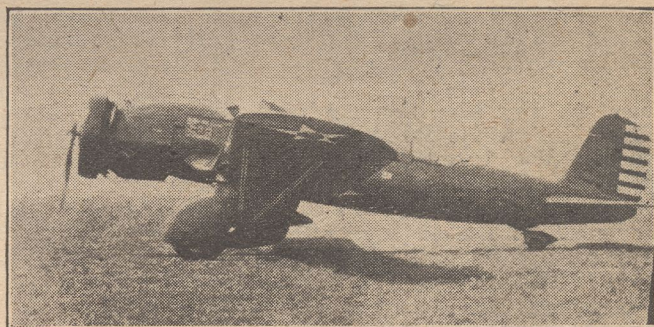
During the March offensive of 1918, 300 of the 1,000 planes available to the Germans on the Amiens front did attack work and almost succeeded in cutting the British lines, but in the meantime the British retaliated with Bristol Fighters, Sopwith Dolphins, and Salamanders, which by the way had six guns for trench-strafting work. Thus the Allies broke up the German attack. Later, on August 8, the British planned a special attack show against Ludendorff's German Army on the Amiens front. This resulted in the capture of 13,000 prisoners.

(Continued on page 91)

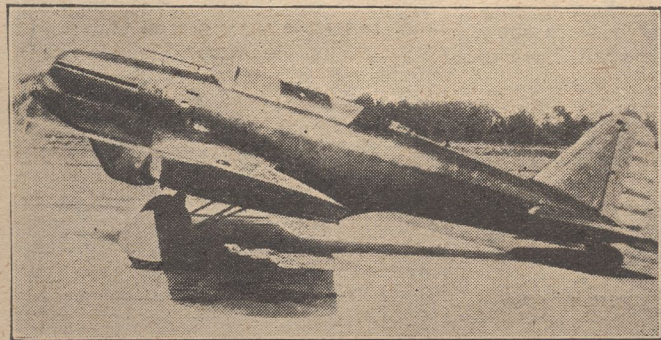
★ ★ ★

A lot of slip-stream has zipped past since the ground-strafting days of the World War. And in that period, no branch of our air service has chalked up a more remarkable record of achievement in aircraft design than has our attack department. To get a good outline of this striking story of progress through the years, first read the accompanying photo captions in sequence. Then read the article and you'll get the story behind the pictures.

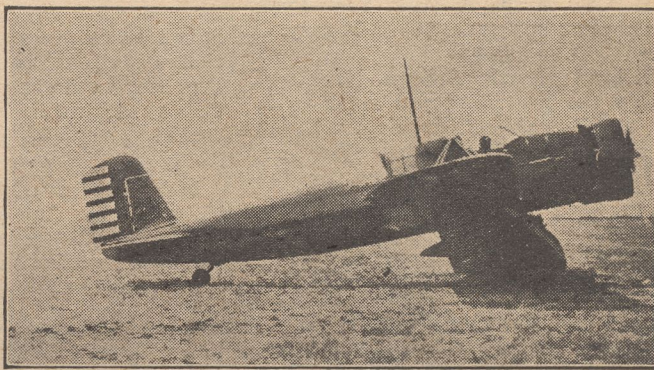
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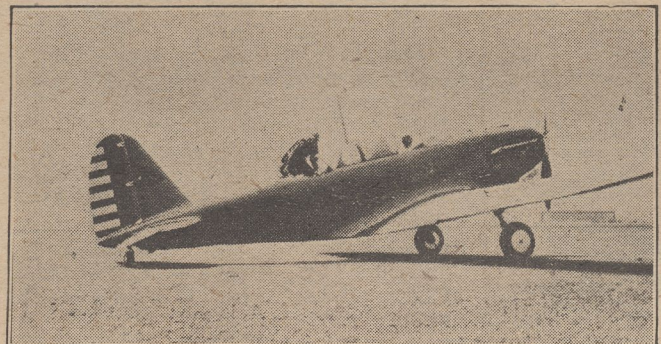
9—Next, the Curtiss Company went out for more speed with their Shrike. They tried this A-10 out with a Pratt & Whitney power plant, but somehow or other the design they doped out for cooling the engine didn't click. Note that bad break in the cowl just forward of the leading edge. That didn't help the streamline any.



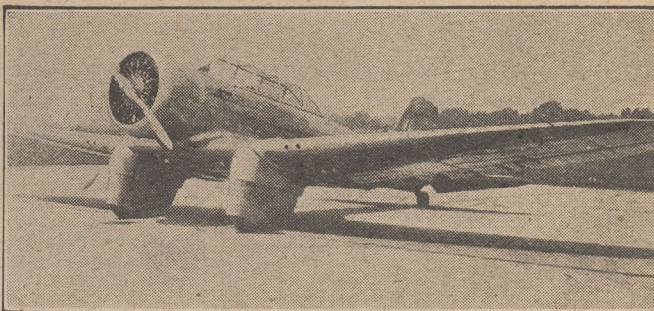
7—And here's that ill-fated Lockheed XA-9 that you've all heard about. It seemed to have everything—until they tried to test it. It crashed, killing the test pilot. But they are still trying with new models.



10—This modern attack ship—the Curtiss A-12—did click, however, when the Curtiss people put a 750 h.p. Cyclone in its nose. It's this kind of plane that forms the backbone of our attack service. Nine of these jobs can destroy a complete regiment on the march!



8—The Consolidated company's well-known effort in the attack line—the A-11—is presented above. It was probably the forerunner of the Consolidated P-30, the noted two-place fighter. They say that this A-11 did 235 m.p.h. But nevertheless, Uncle Sam didn't buy it—why, we don't know.



11—And now we conclude with a "shot" of the striking new Northrop A-13. This plane, however, is still believed to be undergoing tests at a secret field out on the West Coast. Who knows? Perhaps it's the attack plane of the coming years.

All Questions Answered

This section of FLYING ACES is at your service, F.A.C.'s. Send in your questions and requests for aereo information, and we'll be glad to answer them here in the order they are received.

Bill Coyne, Chicago:—I would suggest that you write to the Army Air Corps Headquarters in Washington and ask for the information you wish me to give you. But after you write the letter, buy a ticket for Mexico or Canada—and stay there until it all blows over. In other words, we cannot give out such information on service ships.

Marvin Grassman, Hollywood, Calif.:—Sorry, this is only a question and answer department and we cannot undertake to write your high school examinations for you. We could, of course, at so much a word.

James H. Alexander, Scotland Neck, N. C.:—I believe the P-26A (Boeing) fighter is the fastest commissioned plane in the U. S. Army Air Service. I believe it does 226 m.p.h., but I do not know for certain. The old German Gotha firm is back in business again and is making long-distance bombers for the new German air service. No, we do not have any pictures or details on these ships yet.

Login Potkanski, South River, N. J.:—A full list of American aircraft manufacturers would occupy too much space. Look it up in the Aircraft Year Book available at any good public library.

W. H. Walezick, Auburn, N. Y.:—I believe the magazine you refer to is either the *Pracownik Lotnictwa*, issued by the Union of Aeroplane Workers, Filtrowce 59, m.11., Warsaw, or the *Przeegląd Lotniczy*, the flying review devoted to Polish Army aviation, but I do not have the address of the latter organization. I presume it is a government outfit, but I feel sure that if you wrote to the Aeroclub Rzeczypospolitej Polskiej, Al Ujazdowskie, 32, Warsaw, c/o Lieut.-Col. Andrzej Chramiec, you would get the information you desire.

Harry F. Dushin, Pleasantville, N. Y.:—The rotary motor principle is very intricate to describe without a diagram. It is true that the ring of cylinders revolve around a master crankshaft which is built in such a manner that the main body of cylinders and cylinder assembly revolve about a common fixed crankshaft. A master connecting rod is set so that it shoves the top cylinder piston up on the compression or exhaust stroke and draws it back when the same cylinder reaches the bottom of the circle.

Nickey Ardan, Niagara Falls:—The March 1935 issue of FLYING ACES had a complete article on war-time and mod-

ern machine guns and we have since given out interesting facts on other guns. It would be impossible to include all that again.

Hal Cooper, Sacramento:—You would have done better by writing direct to the Pan American offices in San Francisco for the detailed information you desire on the trans-Pacific flight. I'm sorry but I do not have all that data.

Billy McGuire, Peoria:—You should read the article in question more closely. All your questions were answered there. I understand that such a plane can be brought back to its starting point.

Arthur Bower, Baldwin, L. I.:—Thanks for the pictures. We will hold them for future use. The Curtiss "Conqueror" engine is a Vee-12 liquid-cooled engine rated at about 650 h.p.

Richard Rudolph, Minneapolis:—The Henry Mangan you were attempting to contact is the son of an Army officer and can be reached at the present time at Fort Bragg, North Carolina.

E. Lindsay, Brisbane, Australia:—Your letter is very interesting, but it does not offer any more proof than we have already presented in the von Richthofen matter. We have tried to show both sides and our readers will have to decide for themselves. It's certainly tough!

Maurice Weaver, Gettysburg, Pa.:—I think you can buy a Consolidated P-30 if you have the money and can afford to run such a costly machine. It would not have military equipment, of course. Why

not write to the Consolidated company and ask them what such a ship would cost. An awful lot more than you think, I'll bet. A "flechette" is a metal dart thrown from, or dropped from, an airplane. You may take out a private pilot's license if you wear glasses, yes—but you must wear goggles with corrective lenses in them.

Bill Baumbach, Milwaukee:—It is hard to say which is the best aircraft machine gun to-day. The Vickers is still the most widely used, but the present day Colt-Browning .30 caliber gun is considered one of the best in the world. The Fantome did not pass all demands of the British R.A.F. but it was very fast—and landed very fast, which I believe was against its being accepted for active service conditions. It did over 300 m.p.h., though.

Melvin Kaplan, New York City:—Sorry, I do not know anything about the organization of cadets you mention.

Charles Brandelph, Brooklyn:—The only M.G. book I know of such as you seek is *The Book of the Machine Gun* by Longstaff and Atteridge, published in England by Hugh Rees, Limited. You might get a copy through Foyle's Book Agency, Regent Street, London, England, but it is very scarce and might cost considerable money. I advise you to inquire of Brentano's Book Store in New York.

Charles Maneri, New York City:—Outside of Kerry Keen's Black Bullet—which is pure fiction—I know of no sea-plane that has retractable undercarriage pontoons. However, the Consolidated XP3Y-1 flying boat (see your May FLYING ACES) has wing-pontoons that retract into the wing-tips.

A. Katowitz, New York City:—Thanks for your clippings. Sorry, but we cannot publish them. We must have the actual photographs.

Laurabelle McCain, Spokane, Wash.:—Our mistake, Laurabelle. It was Max Immelmann who was known as the Eagle of Lille, not Werner Voss. Voss was known as the Checkerboard Ace.

Frank Bidwell, U.S.S. Buchanan:—Sorry, I have never heard that story about the outside loop being originally "invented" by a French officer who tried to commit suicide in a D.H.4. It sounds swell, but I question whether it could be done. So you want to sell your World War Aviation photo album, eh. Well,

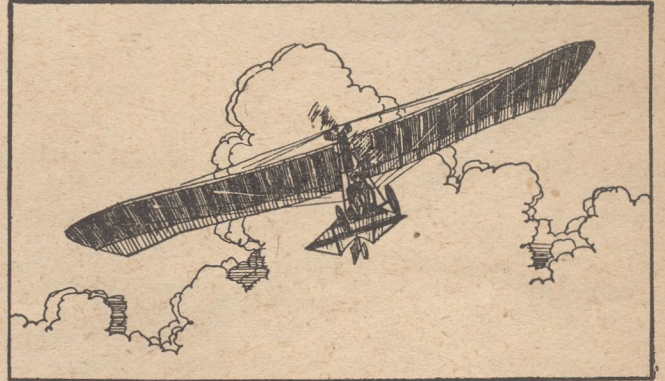
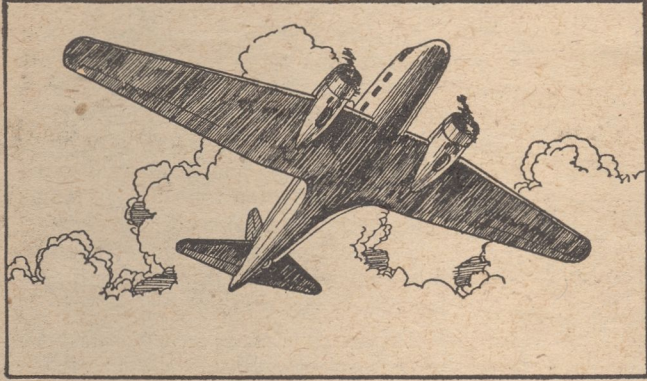
(Continued on page 63)

And Now We'll Ask You a Few

- 1—How many dirigibles named Akron have been built?
- 2—What is the Vought XSB2U-1?
- 3—What is the horsepower of the new Pratt and Whitney Twin-Wasp?
- 4—Where did Howard Hughes set his new land-plane speed record?
- 5—What is the Hawker Nimrod?
- 6—What plane was nicknamed "Old Charlie"?
- 7—When did Count Zeppelin complete his first dirigible?
- 8—What famous air trophy is Amelia Earhart sharing with Jean Batten this year?
- 9—What American light planes are becoming very popular in England?
- 10—How many women hold transport licenses in this country?

Answers on Page 96

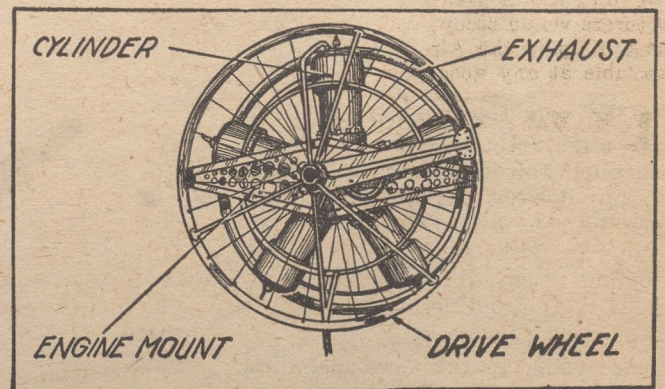
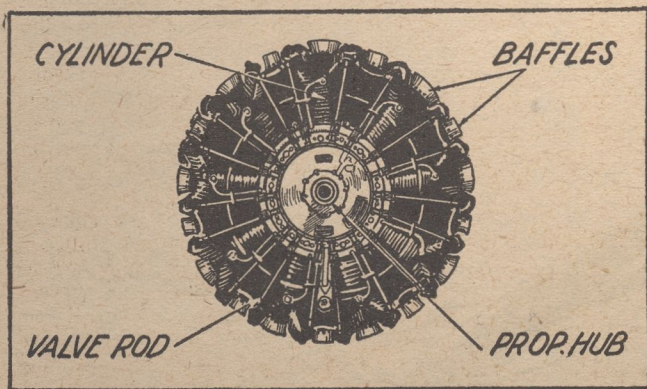
CompAIRisons *by Colby*



THE LATEST AIR MAIL CARRIER—AND THE FIRST

OUR modern mail (and passenger) transports of the Douglas DC-2 type, are capable of carrying more than three tons of weight at a speed of over two hundred miles per hour. Indeed, you will have to travel a long ways to find a more striking ship than the DC-2; for recently, this ship, powered with two Wright "Cyclone" motors, established nineteen American and World records for speed and load carrying over distances ranging from 1,000 to 5,000 kilometers (approximately 627 miles to 3,135 miles). These ships not only are fitted with the most up-to-date storage spaces for mail, but they also afford every possible luxury for passengers and are equipped with the most efficient types of aviation and safety devices.

Compare this great transport with the tiny "mail plane" shown on the right above. This was the first airplane to be honored with the distinction of carrying postal matter. It was a small monoplaner designed, built, and flown by one Hans Grade, of Germany, in 1909. In fact, this was the first power-driven airplane produced in the Fatherland. Of the parasol type, this craft incorporated several successful features of the famed Santos Dumont, Bleriot, and Antoinette machines. The pilot sat beneath the wings, directly over the wheels and under the small motor. The longest flight made by Grade that year was one of fifty-five minutes duration. It is interesting to note that both the latest and first mail planes were of the monoplane type.



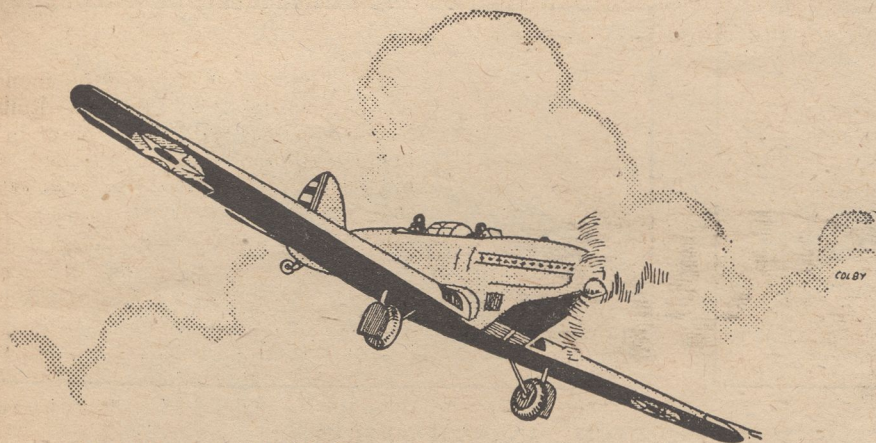
THE LATEST RADIAL ENGINE—AND THE FIRST

FOR our modern radial engine we've selected one that's certainly proved its worth—the power plant used in the Douglas Transport (discussed above) which set those nineteen American and World marks. This particular motor is one of the Wright series—the Type F-50 "Cyclone." This plant has higher power ratings at higher altitudes than any other motor of its type. Rated at 820 h.p. at take-off, it still develops 775 h.p. at 5,800 ft.—only a slight drop in power considering the altitude attained. Fitted with a supercharger, this engine gives even better performance. The F-50 "Cyclone" is a nine-cylinder radial weighing approximately 1,000 lbs., the exact weight depending upon accessories attached. The motor is equipped with automatic dynamic dampers (attached to the crankshaft) which smooth out the operation of the engine at all speeds and which decrease

vibration generally. These engines are used in U. S. military planes as well as in ships of our transport lines.

Consider now the grandfather of all radial engines—the one designed and constructed by Charles M. Manly, chief assistant to Dr. Samuel Langley, who built the famous Langley "Aerodrome" plane. This motor was turned out in an emergency when the contractor found that he could not deliver the engine originally called for. The power plant ordered was to have been a gasoline motor delivering 12 h.p. and specified not to weigh more than 100 lbs. Manly, however, did even better. He built the radial pictured above, a plant that delivered more than 52 h.p. at 950 r.p.m. and which weighed only 125 lbs.—truly a remarkable engine (even in the light of present standards) considering the fact that Manly had no precedent to aid him with his design.

Modern Planes Album



LOCKHEED XP-9

THE LOCKHEED XP-9 FIGHTER

WE'VE often wondered why the Lockheed firm didn't get into the military business on the ground floor. They seemed to have the stuff, as far as speed and trim lines were concerned, and the record of Lockheed ships in long-distance endeavors is one of the bright spots of American aviation.

Past history to the contrary, they have got in now. They've turned out a two-seater fighter that seems to

have everything! Strange to relate, little has been said about it—nothing much more than rumors, and very unreliable rumors at that.

We've learned a couple of things, however. For one thing, whereas most Lockheed commercial ships use an up-to-date radial engine the new XP-9, as it is known, mounts a 730 h.p. Curtiss Conqueror, which gives it a top speed of 226 m.p.h. At 6,000 feet it does 243 m.p.h. It has an initial rate of climb of 2,400 feet per minute and a service ceiling of 32,640

ft., which is a good height.

On the face of these figures, one realizes that while the XP-9 may not be the fastest machine of its type, it still has lots of commendable points. First off, it's a monoplane with a one-piece wing which is easily attached or detached for repairs. It has the regular Lockheed retractable wheels and a metal monocoque fuselage that presents few service problems.

The wing is made of wood covered with plywood, which, while not as efficient in some ways as an all-metal wing, is easy to repair. It certainly is much easier to handle than the all-metal, stressed-skin wing, and when we consider the problems of active service conditions, this is a point well worth consideration.

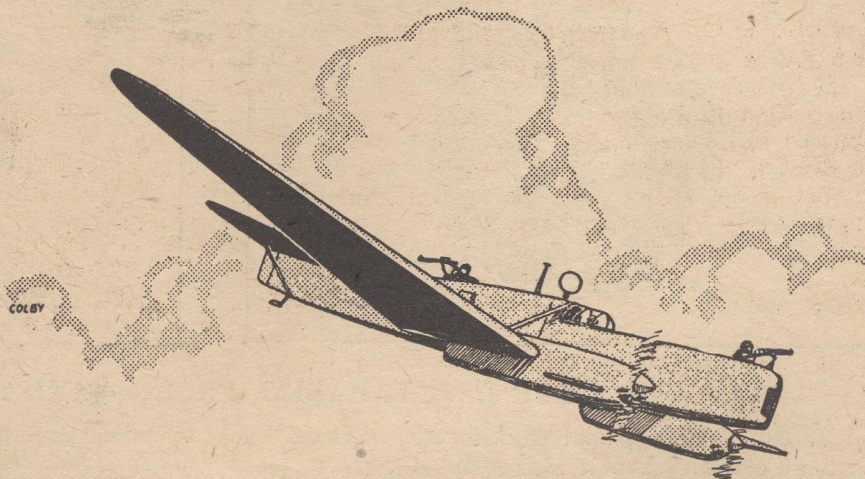
The two cockpits are set in tandem under a folding transparent cover. The observer has one 7.5 m/m gun on a flexible mounting and he also has access to the bomb releases. Light fragmentation bombs are carried in a special rack under the fuselage. The pilot has two guns synchronized to fire through the propeller. One is a 7.5 m/m weapon and the other is a 13 m/m gun.

FOCKE-WULF FW-58 TRAINER

THE new German Air Service is not wasting any time in training pilots for special duties. They've already devised a means of training men to handle high-speed, twin-engine jobs without all the trouble of sending them through the many multi-engine routines so prevalent in most military schools.

According to the Germans, these preliminaries are all eye-wash, and they now "shoot" their students into these new Focke-Wulf trainers just as soon as they get in a few solo hours. Here they can learn to handle the controls under competent supervision, get a good understanding of blind, or instrument, flying and at the same time provide air time for the training of gunners and bombers.

This new Focke-Wulf is a low-wing monoplane powered with two 240 h.p. Argus engines which give the ship a top speed of 153 m.p.h. One only has to figure what it would do if they equipped it with two 500 h.p. motors. There's no doubt that they're stressed well enough to take them. The Germans never leave any-



FOCKE-WULF FW-58

thing like that to Fate.

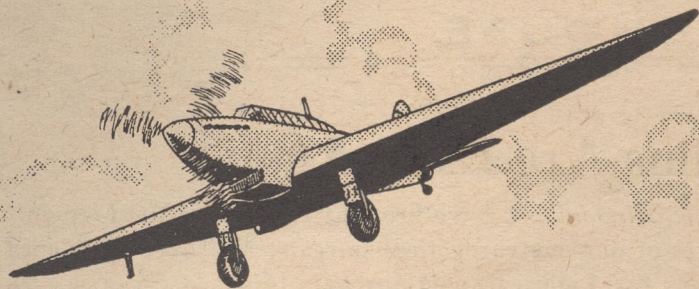
Besides complete dual flying equipment and controls for teaching instrument flying in two-motored planes, the FW-58 has a full outfit for teaching radio and suitable gunnery and bombing equipment for students in that branch of the service. Thus, while Herr Hopscotch is getting his time in as an instrument pilot or learning the trick of tuning

two throttles, Otto is firing his number of rounds to get in his gunnery time, Fritz is checking his lessons on the bomb sight, and more than likely Hugo is taking pictures of the "battlefield" below.

Here's a unique thing about this ship: They call it "Weihe," which means "inauguration" or "consecration." There's no secret what that means in the new German air service!

FOUR WINGED FURIES

Once again we present a striking batch of fighting craft—new planes from the military hangars of the United States, Germany, Great Britain, and Belgium. Here's the menu: Lockheed's little-publicized two-place fighter; the Nazis' latest trainer, and what's behind it; Britain's venture with monoplanes—the Fairey “Battle”; and Belgium's newest adoption, the Monofox.



FAIREY “BATTLE” BOMBER

BRTAIN has gone monoplane crazy all of a sudden. A short time ago, you had to get some sort of special dispensation to put a military monoplane across in England, but now they're turning out amazing one-wing ships. The latest is the new Fairey “Battle” monoplane bomber,

FAIREY “BATTLE”

one of the finest of military types.

They don't tell what speed it does, but the Air Ministry recently admitted that a Fairey “Battle” could leave the Fairey plant at Hayes and be over the South Coast within ten minutes. This would give the impression that it does at least 275 m.p.h., because that distance is a good 48 miles. Figure it out for yourself.

The “Battle” is a low-wing monoplane powered with the new Rolls-Royce Merlin engine. This plant is a twelve-cylinder affair designed to present a much smaller frontal area than the R.R. Kestrel. It carries the regulation Fairey three-bladed prop.

The military equipment has not been divulged, but everything seems to be tucked away inside in order to retain the fine aerodynamic lines. The bombs are carried in racks set inside the fuselage and the guns are under splinter-proof glass. The wheels, mounted on small cantilever legs, tuck up out of the way into the wing-roots. Only the tail-wheel seems to break the neat silhouette.

It has been said that the stressed-skin work on the “Battle” is the finest that has been seen anywhere; for no unsightly “waves” are to be noticed between the panels, and the wings are absolutely devoid of skin wrinkles. The wing itself had wide wing-root fillets, split trailing-edge flaps, and trimming tabs on elevators and rudder. We believe it is a two-seater machine.

THE FAIREY MONOFOX

MANY of our readers have written in to ask what happened to the Fairey Fantome, the much-advertised multi-gun fighter that was supposed to be used by the Belgian Air Service. All we know is that the original model crashed during the Belgian Army trials—or at least was supposed to have done so. Anyhow, nothing further seems to have been done about it.

Now we learn that the Fairey firm has developed a new single-seat fighter for the Belgian Air Service. This one appears to be the latest in general purpose work. Many have been ordered by Belgium, and while the firm name for it is the Monofox, the Belgians have already nicknamed it the “Kangaroo” because of the pouch-like radiator slung beneath the fuselage.

This ship, listed as a single seater, may be changed into a two-seat light bomber or reconnaissance-fighter within an hour. It is, of course, an improvement on the old Fairey Fox, formerly used by Belgium as a standard fighter.

The Monofox is powered with an 860 h.p. liquid-cooled and super-



FAIREY MONOFOX

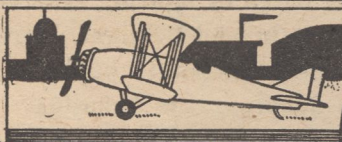
charged Hispano-Suiza “Y” motor, which gives it a top speed of 236 m.p.h. at 14,100 feet. It climbs to 19,690 feet in eight minutes and has a ceiling of 37,700 feet. As a single-seater, the Monofox carries four guns, one on each side of the motor cowl and two mounted high in the upper wing outside the propeller arc. As a two-seater, a fifth gun is carried on a swivel mounting in the observer's seat. If they'd only added an additional tail-turret she would have been sprouting guns like porcupine quills!

The cockpits are fitted with coupé tops. The single-seater type has a useful load of 1,225 lbs. and as a two-seater the ship carries 1,850 lbs., which is somewhat perplexing but true, nevertheless. We must then presume that the range of the two-seater is much less than that of the single place job.

The Monofox carries two-way radio, fuel for five hours of flight, and complete equipment for night flying and blind flying. The cockpit can be warmed for flying at high altitudes.

HAPPY LANDINGS

BY ARCH WHITEHOUSE



The Zeppelins Are Back Again!

Current successes with the huge new dirigible, *Hindenburg*, have brought the lighter-than-air enthusiasts out of their hiding places once more. Failures of our meteorological bureaus and over-confidence in our structural abilities may have been the reasons for America's past upsets in this field. So says Arch Whitehouse, who in this department is given free rein to express his personal views.

★ ★ ★

THEY inaugurated a ten-trip Zeppelin passenger service from Germany to the United States early in the month of May. By the time this appears in print, the dirigible *Hindenburg* should have made several more trips across the Atlantic. And successfully, we hope!

To go on and say that the Germans certainly do know their stuff when it comes to airships, would only be repeating what everyone has been saying since long before the World War. It would be mere repetition.

The United States Navy, bolstered again by the success of this new and apparently successful dirigible, is making another bid for something like \$5,000,000 for future airship experiments. Only recently, however, the Navy appropriations bill had a large slice cut out of it which had been intended for the construction of two small Navy-type airships.

You see, the *Shenandoah*, the *Akron*, and the *Macon* haven't been forgotten.

Commander C. E. Rosendahl, a gallant gentleman and probably one of the finest lighter-than-air experts in the world, is one who is insistently bidding for another attempt at the dirigible-building game in this country. We do not know anyone who has a better right to ask for more money for dirigibles. Commander Rosendahl was one of the cool-headed Navy men who escaped death in the *Shenandoah* disaster by free-ballooning down in a chunk of that ill-fated American-built airship. He since has seen active service at Lakehurst, and he was aboard the *Graf Zeppelin* on her world cruise. Moreover, he commanded the *Los Angeles* on several of her more important voyages.

If they do appropriate that five million dollars, we sincerely hope that they take it in one lump sum, hand it over to Commander Rosendahl, and tell him to go ahead and build himself a dirigible. We'd like it if he could select his material from anywhere he chose, build it anywhere he likes, and pick himself his crew from the thousands of airship men who would instinctively leap at his nod. There should be no strings tied to any of that five million, and all politicians found anywhere within five miles of it, should be shot on sight and no questions asked.

Perhaps he could get a real dirigible out of all that.

The only thing we'd worry about is whether he'd ever get any worth-while weather reports to work on; for from what we can make of it weather does seem to

have something to say in this lighter-than-air business.

A man who knows, told me the other day that "old Eckener can smell a storm 300 miles away—and he takes no chances with them. He'll go 400 miles out of his way to dodge anything which smells like weather trouble."

That's all very well, if you are an "old Eckener" who can smell storms 300 miles away, but what about the unfortunate airship commanders who have to rely on the weather reports sent out from the government bureaus?

The *Shenandoah* was wrecked in a line squall, which seemed to escape the notice of anyone until it was too late to do anything about it. Seventy-three lives were lost aboard the *Akron* off Barnegat because of a storm which seemed to come to someone's notice too late again. The *Macon* went to pieces off the Pacific coast when "a sharp gust of wind strained a structurally-weak frame." Only two died in that \$4,000,000 disaster.

The same trouble appears every so often in the heavier-than-air end of the business, for most of our major air line casualties can be traced to some "mistake" where the weather report is concerned. We don't know how they do these things in Germany, but we have had piles of fun keeping a day-by-day report of the forecasts of the weather bureau and comparing them with what *actually* turned up. Try it some time yourself. It's very funny—when you're on the ground.

Commander Rosendahl made a statement a short time ago that of the thirty or forty thousand people who have travelled in commercial airships in the last ten or twenty years, not one has suffered serious injury. When you read that off at first it is very impressive, and what's more it's actually true. But a lot of people don't realize that Commander Rosendahl slipped in that little word, "commercial"—which makes a lot of difference. And again we get back to the old fact that the Germans can certainly build Zeppelins and fly them all over the place, and that the United States and Great Britain both went haywire trying to build the world's largest airships in the face of the fact that neither country had had half the experience in such work as had Germany. Then we must remember that Britain and America tried to make a military weapon of the airship, while disarmed Germany went out and built them simply to carry passengers.

Of course, if war should break out tomorrow and Germany decides that the airship is still handy, they

will arm them and send them off again for some Limies or Frenchmen to shoot down. And *how* they come down, under those circumstances!

IT was not bad enough to take a lot of metal and attempt to build the world's largest, fastest, finest, biggest, most armed airship, in the face of the lesson the *Shenandoah* had offered, but they had to add guns, aerial hangars, and trick release-gadgets for airplanes which were carried inside. We might also add that in the case of one of the two aircraft-carrying dirigibles, they actually *cut it in half* and added a couple of more sections, just to make certain it would be the world's largest, longest, and biggest—or what have you. We'll bet ten bucks Commander Rosendahl squawked about that; for it was about that time that he was suddenly

shipped off for sea duty aboard a battleship.

How do you like that? The country's greatest airship expert planted on the bridge of a battlewagon when he should have been at the helm of the Akron trying to make something out of the weather reports being received!

It is evident that if the Germans can build safe commercial dirigibles, and use hydrogen to make it even tougher; there is no reason why Commander Rosendahl can't do the same thing. It would be still saner, of course, if some sort of an arrangement could be instituted whereby American engineers could sit in on the building of the next big Zep and see just what the trick is—if there is any trick to it.

Personally, we do not believe there is any magic in the German construction. Certainly there's nothing in the metal

they use—for most of the metal in the new *Hindenburg* was originally used in the luckless British R-100. They simply bought it up when the R-100 was scrapped, boiled it down again, and poured it into ribs and castings for the newest German dirigible.

This country has safe helium, all the aluminum we can use, and certainly a fair share of the world's technical skill. All right, what's left? Nothing, except that once it is built, it ought to be used for what it was intended—commercial aviation—and not as a play thing for the vote-seeking politicians who wouldn't go up in it, anyway. After they have satisfied everyone that airships can be successfully flown along commercial lines, then they can play around with guns and aerial hangars again.

(Continued on page 91)

* * *

Florida To Puerto Rico In a Cub

&

A Sergeant Builds His Own

* * *

On the Light Plane Tarmac

FLORIDA TO PUERTO RICO IN A CUB

LIGHT plane enthusiasts very frequently run up against the argument of usefulness. Among many fans, the goofy idea prevails that anything less than 200 miles per hour is just a waste of time.

Dennis Powelson, of Lake City, Florida, is one of the light plane flyers who've demonstrated that these diminutive craft can be utilized for more than airport

hops. Powelson recently flew his little Taylor Cub from Lake City to San Juan, Puerto Rico!

It all came about when Mr. Powelson learned of his appointment to the U.S. Forest Service in Puerto Rico. Immediately the notification was received, he installed an extra twenty-two gallon gas tank in the front seat of his Cub—and "took off."

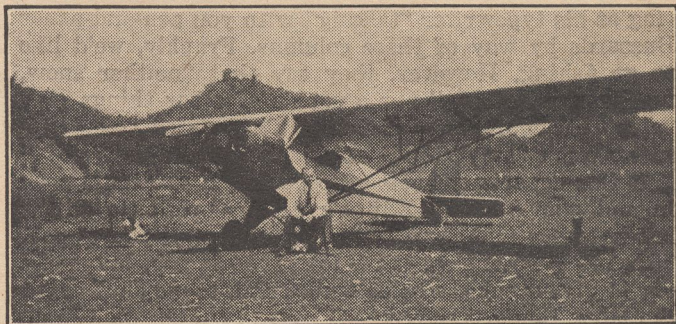
Aided by the extra gas capacity, Dennis flew from Lake City to Miami, some four hundred miles, non-stop. From Miami he continued along the chain of Florida keys—those last outposts of the United States mainland—to that dot on the ocean, Key West.

Next came the "stiff" ocean hope to Havana, Cuba; but Powelson completed it with ease and reported an uneventful trip across the Gulf Stream. He did not carry a life preserver feeling that the sharks would make short work of such a device.

"As a compromise," he stated in explanation, "I left my twenty-two gallon extra gas tank almost empty and put a pair of pliers in my pocket with which to jerk the feedline off in case I had to use the tank for a life boat. I was not overly optimistic as to how it would work, but I thought it would give me something to do while the Cub was sinking, if the Continental should choose one of those ninety miles to quit."

After getting his Okay from the Cuban

If you think light planes are restricted to airport hopping, you've got another think coming! Plenty of proof that they aren't is offered by Dennis Powelson, of Lake City, Florida, shown seated here in front of his Taylor Cub. Powelson flew this little ship all the way from Florida to Puerto Rico!



Sergeant Truman F. Taylor, of Luke Field, Hawaii, figured he'd get into the light plane game by building his own. Here we see him with the 20-ft. span, LeBlond powered ship he turned out in his basement workshop. It's a plenty neat job, and it only cost him half a "G" to make it!

authorities, Powelson started across Cuba. At Camaguey, where he landed for gas, he met a group of U.S. Marine Corps flyers. "These pilots expressed the usual sympathy for a poor guy making such a trip in a Cub," Dennis relates. "But I told them I would see them all in San Juan in a couple of days—and I did!"

The next leg of the trip was over the Cuban mountains to Santiago de Cuba. From Santiago de Cuba to Port au Prince, Haiti, Dennis' course took him across the famous Windward Passage,

where he was somewhat surprised at the persistence and velocity of the trade winds.

After crossing Haiti and the Dominican Republic, Powelson ran into his hardest flight—his jaunt across Mona Passage to Puerto Rico.

"Mona Passage is a tough crossing! You get your first taste of it as you swing around the lower end of Dominica when following the coast. The wind meets you with a rush that threatens to blow you back into the Caribbean Sea. As I rounded the point, the Cub

faltered, seemed to lose ground for a moment, then settled down to the battle with the wind.

"I was two hours on that short crossing, even though I flew 20 feet over the water to make more speed against the wind. I passed the time away by looking for the sharks and barracudas for which these waters are famous. I did not see any. After reaching the Puerto Rican coast I flew the remainder of the trip up the north side of the Island to San Juan.

(Continued on page 94)

The New Airmail Pals

AIRPLANES aren't the only things that fly—time, for instance, goes along at a pretty good clip, for it seems only yesterday that your old friend, the Right Honorable Pal Distributor, was sitting at his typewriter "talking" with you pen-and-paper Buzzards by way of these columns. Frankly, we'd like to go fishing. However, they say that "neither snow, nor rain, nor floods" nor a couple of other things ever "stay" the mail men from "their appointed rounds"—so we won't "stay" the Airmail Pal letters. Let's go!

Is this department getting popular? If you could peek in and glance at Ye Editor's desk, one glance at the letters we've just "exchanged" would cause you to say, "Oh, my gosh!" Yep, it's a lot of work, too, but we're out to give every scribbler a good Pal, so we don't mind the labor that's involved.

Most of you fellows and gals will remember that back in the June issue the R.H.P.D. made some mention of a scarcity of foreign Pals, concluding with, ". . . We certainly hope a lot of FLYING ACES readers in other lands see this and come through pronto with a pile of new pal letters." Our foreign friends (particularly those residing in Canada and England) saw it all right and are coming through now with flying colors! Honest, pen-pushers, our foreign letters outnumbered those from the good old U.S.A. two to one this month. Therefore, those of you who requested pals in England, Australia, and Canada won't be disappointed this trip. If this keeps up, we'll have to change the wording of the last paragraph in the accompanying box.

By the way, if you definitely want a correspondent in one of the foreign English-speaking countries and would prefer not to have one elsewhere, just say so and your letter will be "held out" until we can satisfy your desire. On the other hand, if you merely prefer a foreign Pen Pal, but would just as soon have one from your own country in event our current supply runs out, make this fact known to us and we will be governed accordingly.

Every mail contains extraordinary letters, and one such letter comes this month from Ernest A. Pring, of London, England. Aside from writing a mighty interesting letter, Ernest enclosed an excellent photo of one of his models, another of one of their fast British ships, plus five intriguing postcard photos of French battlefields. We'll send Ernest's letter to the first Pen Pal on this side of the "Pond" who sends along some interesting American photographs.

A short time ago Jack Cafarelli, Teaneck, N. J., wrote in asking for a Pal who would like to play chess by mail. The only "hitch" was Jack wanted a feminine player, and we just couldn't seem to locate one. But the other

day Don Ertel, of Williamsport, Penna., asked to be hooked up with a chess player by mail, so we've teamed Jack and Don. This, however, doesn't eliminate lady chess players. Ships are still welcome on the "Chess Tarmac" so we'll be keeping a weather eye for chess hounds of both sexes. Come one, come all!

Who in our midst would like to play host to a Canadian F.A.C. this summer? Ken Ross, of Montreal, writes that he'd like to be shown around the local aviation fields a little later on in the summer. If you'd like to meet up with Ken (and we assure you he's a "regular fellow") just write Ken, in care of this office and all letters will be shipped across the Canadian border pronto. And may the best man win!

Earlier in this article we mentioned that this department was becoming more and more popular as time buzzed on. Now, as we look over the mail, we find it "spreading" to other departments. Noticing Rita Goodger's picture in the Advertisers' Contact of the April issue, G. S. Campbellton, of Bedfordshire, England, a member of both the F.A.C., and the R. A. F., has just sent us a Pen Pal letter to be forwarded to her at Christchurch, New Zealand.

Cheerio, and we'll be seein' you next month, same time, same place. And in the meanwhile let's hear of your interesting Pen Pal experiences.

—THE RIGHT HONORABLE PAL DISTRIBUTOR.

HOW TO GET AN AIRMAIL PAL

FIRST, write a letter just as if you were writing to your new pal—the kind of letter which tells your age, particular interests in aviation, your hobbies, et cetera. (If you wish, you may include a separate sheet of paper telling us, in a general way, what kind of a pal you seek). Next, send this letter to Airmail Pals, care FLYING ACES, 67 West 44th St., New York City. And be sure to enclose a stamped, self-addressed envelope.

Now, when your letter arrives, we select a Pal for you from our batch of letters—the sort of Airmail Pal your letter indicates you want—and we mail his letter to you in the stamped envelope you send us, and we mail your letter to him. Then you're all set! Of course, if you want additional Pals, just write us again.

REGARDING FOREIGN PEN PALS

IN case you do not reside in the United States, write a pen pal letter as above—but do not enclose a stamped, self-addressed envelope or send any money for stamps. Your pal letter will be forwarded to an American correspondent, following which you need only wait for his reply.

If you are an American who wants a foreign pal do not write a pen pal letter. Simply send us a stamped, self-addressed envelope with a note telling your age and stating that you wish a foreign correspondent. A foreign writer's letter will be returned to you in the envelope you send us—whereupon you may begin writing to him direct from your own home. The foreign airmail pals are cared for in this fashion because foreign stamps sent in from other countries cannot be used in the United States to forward letters to Canada or across the seas.

Unfortunately, our supply of foreign pals is limited. Those of you who seek foreign pals will be given American correspondents whenever the supply is exhausted. Please note also that we cannot supply you with foreign pals in non-English speaking countries where FLYING ACES is not distributed.

JOIN THE FLYING ACES CLUB

Honorary Members

President and Mrs. Franklin D. Roosevelt

Vice Pres. John Nance Garner

Casey Jones	Rear-Admiral Byrd
Wallace Beery	Capt. Edward Rickenbacker
Al Williams	Colonel W. A. Bishop
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Lieut.-Col. Pinsard	General Balbo
G. M. Bellanca	melia Earhart Putnam
Capt. Boris Sergievsky	Frankie Thomas
Colonel Roscoe Turner	Josef Veltjens
Charles W. A. Scott	Tom Campbell Black
Richard C. DuPont	Eric Kingsford-Smith
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Lieut.-Col. Theodore Roosevelt

Official Charters

F.A.C. Flights and Squadrons are recognized only when they have been awarded Official Charters. These Charters are illustrated to depict the various steps of advancement in aviation, and the wording is in keeping with the high ideals and purposes of the Club. They are printed on a very fine grade of paper and the names of the Squadrons are hand-lettered. Charter applications must always be accompanied by a complete list of members with their addresses. For the Flight Charter send 25c, for the Squadron Charter 50c, to cover costs.

Volunteers for G-2

G-2, the Inner Circle of the F.A.C., is open to a restricted number of members who are qualified for Secret Service activities. Those who are chosen will have unusual opportunities to win the Club's Distinguished Service Medal. Those who are accepted will be given a secret number and identification card as well as the secret code. Assignments will be made by letter and code.

Save This Coupon for the
NEW CADET WINGS
of the Flying Aces Club



COUPON
No. 45

All members with Official Membership Cards are eligible for Cadet Wings. This coupon, with two others and 10c, entitles members to Cadet Wings. Do not send this coupon alone. Save it until you have three. Then send them in all together with a self-addressed envelope and 10c to cover cost of wrapping and mailing. Only one pair of Wings to a member. If you lose yours, send 25c for new ones.

Canadians send International Reply Coupon for 15c. British send one shilling in coin or International Reply Coupon for one shilling.

Do Your Full Share to Advance Aviation

No Dues—No Red Tape

How to Join and Form a Flight or a Squadron

TO advance the cause of aviation, over 50,000 men and women, boys and girls, have banded together to form the **FLYING ACES CLUB**.

It's the easiest thing in the world to join. Just clip out the application blank at the right, fill in, and mail, along with a stamped, self-addressed envelope, and you will receive your official membership card by return mail. After that you can quickly advance to earn **CADET WINGS, PILOT'S WINGS**, and other honors.

To organize a squadron, you must have 18 members, including yourself, holding cards. To organize a flight, you must have six members, including yourself. Send names and addresses to headquarters. To cover costs of the official squadron charter a charge of 50 cents is made, and 25 cents for the flight charter.

Meetings and activities are conducted among the squadrons and flights according to the wishes of the members. GHQ has established no rulings in this respect, nor are there any dues or red tape whatsoever. The entire idea of the Club is a common meeting ground in an international organization for the lovers of aviation in its various phases.

Many fine friendships have been formed through the Club. Many youths have found an incentive to fly, and aviation's makers of history have lent their names and given their advice and best wishes to the F.A.C.—the ever-growing legion of eager, actively air-minded men and women, boys and girls.

The simple rules of the F.A.C. are clearly put on this page. Learn them and read the F.A.C. news in the magazine. And remember—when you write, always send a self-addressed stamped envelope, for the Club receives thousands of letters each week.

THE HIGHEST AWARDS

After the membership card and Cadet and Pilot's Wings, comes the Ace's Star, awarded for obtaining five new F.A.C. members, using the application to the right. The **FLYING ACES CLUB DISTINGUISHED SERVICE MEDAL** is awarded to members whose work on behalf of the club is "beyond and above the call of duty." The best way of putting yourself in line for this coveted medal is through the medium of efficient G-2 work, and of course honorary memberships of prominent flyers, or persons otherwise engaged in the various phases of aviation, will bear weight when members are being considered for the D.S.M.

Attention, F. A. C's!

This Beautiful Aviator's Identification Bracelet



Now 25c!

Because we wish to place the beautifully designed F.A.C. AVIATOR'S IDENTIFICATION BRACELET within the reach of all members of the club, decision has been reached to cut, temporarily, the price in half. Remember—this offer will be in effect for a short while only, and we suggest that you send your quarter immediately, since this is a real bargain. In sending coins be sure to wrap them securely.



The
Beautiful
F. A. C.
Ring

The official F.A.C. club ring is a beauty and should be worn by all members. It is self-adjustable, to insure a perfect fit. It is finished in antique silver. Sent postpaid anywhere in the U. S. and possessions for only 50c. (A **STERLING SILVER** ring, of similar design, may be had for \$1.00)

August Membership Coupon

I, the undersigned, hereby make application for membership in the Flying Aces Club. I agree to live up to its rules and regulations; to foster the growth and development of aviation; and cooperate with all other members in the work of spreading aviation information, building up confidence in flying for national defence and transportation. I will aim to build up the Club and its membership, and do my best to win the honors that the Flying Aces Club offers.

My name is

Age

Street

City State

Mail this application, enclosing a self-addressed, stamped envelope. Canadians send International Reply Coupon worth 5c. British send a similar coupon worth sixpence.

Citations and Awards

Citations and awards, heretofore published on this page, will henceforth be found at the close of the Club News. Be sure to refer to those columns—YOUR name may be among the names to be found there.

F. A. C. Stationery and Official F. A. C. Pennants

Due to popular request, we have ordered a new supply of F.A.C. stationery and official F.A.C. (paper) pennants. The stationery is of high quality with the Flying Aces Club letterhead attractively hand-lettered, and the price is amazingly low—100 sheets, postpaid for 25c. The attractive pennants (with glue on the back) sell at the rate of 6 for 10c or 20 for 25c.

Save This Coupon for the
NEW PILOT'S WINGS
of the Flying Aces Club

COUPON
No. 42



All enrolled members who have won their Cadet Wings are eligible for Pilot's Wings. This coupon, with four others and 10c, entitles Cadets to Pilot's Wings. Do not send this coupon alone. Save it until you have five. Then send them all together with a self-addressed envelope and 10c to cover cost of wrapping and mailing. Only one pair of Wings to a member. If you lose yours, send 25c for new ones.

Canadians send International Reply Coupon for 15c. British send one shilling in coin or International Reply Coupon for one shilling.

FLYING ACES CLUB, 67 W. 44th St., New York

Flying Aces Club News

Welcome to the F.A.C. tarmac, Buzzards! We've got a lot of multi-motored news on tap for you here. It's all steaming on the platter, so dig in with a will. And this month we want all our radio fans to take the head table—for we're announcing a swell new contest for the wireless bugs.

SWOOSH! There goes the signal flag indicating that all's clear on the old Club tarmac, so three-point your way in, fellows, and we'll have another rousing session of the F.A.C. Wow! There are certainly a lot of you! Guess we need a couple of more runways.

Everybody in now? Okay, taxi your ships over here by the G.H.Q. hangar and we'll pile into this month's news. Here we go:

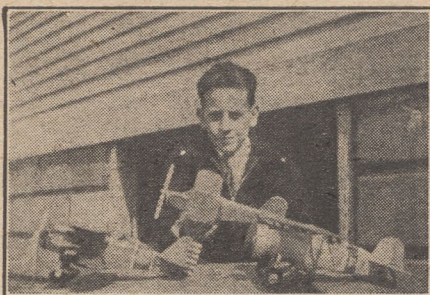
You've often heard it said that "the sun never sets on the British flag." Well, from the letters that have been pouring our way from the far corners of the globe we believe that we can rightfully boast that the sun never sets on our official Club magazine—FLYING ACES!

For instance, here's part of a letter received from D. Wharmby, residing in far off New Town, Tasmania:

".... I do not know whether I am taking liberties in addressing you before being enrolled as a member. If so please forgive me. It is seldom in Tasmania that one sees a copy of FLYING ACES magazine. Some months ago I procured a stray copy of it and was so impressed that I inquired after more copies. I discovered that to obtain it regularly I would have to order it from the mainland, and this I am doing, since I'm particularly interested in the Model Building section. I've already made some models from plans given there and assure you the ships not only look fine but fly perfectly"

That's indeed a swell letter and we've written friend Wharmby for a few photographs of his handiwork. If we get some good, clear prints, we'll pass 'em along to you through the medium of good old F.A. Watch for them in our With-the-Model-Builders page.

And here's one that will interest you—a letter from Daniel Canter, of Rehavia, Jerusalem, Palestine! Dan tells us that aviation activity is pretty



Meet Edward Ramanowski, of Grand Rapids, Mich. To pose for this "snap," Eddie stood on the bench on which these natty models were built and protruded from his cellar window (he calls it his "hangar window"). Eddie is a member of Carl Ulanowicz's crack unit. He built one of the planes shown here and Carl built the other two. All three are from FLYING ACES plans.

scarce in his part of the world, but he's strong for aeronautics and he's strong for FLYING ACES. Dan says he is going to build up an F.A.C. unit in Jerusalem if it's the last thing he does. Moreover, to show that our friend is not letting any grass grow under his feet he asked that we send him a diagram of the one-tube short wave receiver offered some while ago. We're sending it, and one of these days some of you members of the F.A.C. Radio Communications Corps may be startled with a call from your fellow member 'way out there in Rehavia!

While on the subject of radio, we wish to make official announcement of the appointment of the Dawn Patrol, Inc., 30 Essex St., Boston, Mass., as the executive station of the F.A.C. Present members of the F.A.C. Radio Communications Corps are requested to communicate immediately with Capt. Lionel K. Berig, Commanding officer of the Dawn Patrol, for the present regulations and orders of the department. All information regarding duties and authority may be acquired from this new office.

At Captain Berig's suggestion, the

R.C.C. is to conduct a contest which will be of interest to those F.A.C.'s interested in radio. The rules and regulations follow:

1—The contest is open to regular members of the F.A.C. (Those readers who are not members may join by merely sending the filled-out membership coupon to G.H.Q. You'll find it on the Club membership and awards page in each issue of FLYING ACES.)

2—Members wishing to compete in the contest shall be required to file their name, address, and amateur radio call (if assigned a call) with Capt. Lionel K. Berig, c/o The Dawn Patrol, Inc., 30 Essex St., Boston, Mass. This must be filed before Aug. 1st. Contestants are not required to own or operate a radio transmitter, but must have a short wave receiver.

3—Contestants shall be required to stand Watch at their radios each Friday night from 10 to 11 P.M. (Eastern Daylight Saving time) on 3,500 to 4,000 kilocycles (80 meters) and on 10 meters. During this Watch period a log shall be kept of all stations of the FLYING ACES Communications Corps heard. (Lists of these stations will be printed in FLYING ACES each month.) Furthermore, each contestant shall during the period of the contest list all receptions of emergency messages whether on land, sea, or in the air, and any cases in which the contestant gave assistance to the distressed.

4—All logs must be filed with Boston not later than October 15th. Mail postmarked later than midnight, October 15th, will not be accepted for the contest. The following facts will be taken into consideration in the selection of winners: (a)—Number of times contestants have been on Watch during the period required. (b)—Number of stations of the net logged during this Watch period. (c)—The number of times contestant rendered assistance in cases of distress, and the assistance rendered.

5—The judges will consist of a board comprising: Capt. Lionel K. Berig, of The Dawn Patrol; National Adjutant Douglas Allen; Managing Editor Herb Powell, of FLYING ACES, and Arch Whitehouse, Technical Editor of FLYING ACES. Decision of the judges shall be final and duplicate awards will be given in case of ties.

6—The following prizes will be awarded to winners:

First Prize—A yearly subscription to FLYING ACES and a surprise package.

Second Prize—A six months subscription to FLYING ACES and a surprise package.

Third Prize—A surprise package.

In addition, various other awards will

JOIN THE

"FLYING ACE'S CLUB"

and be Air Minded—

(Special Flying Rates for all members)

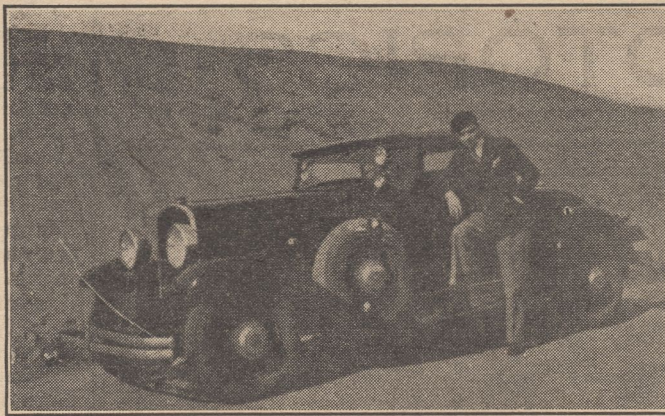
Construct Scale Models and learn all about Flying, Aero Engines, Lewis Guns, etc., from ex-Royal Air Force pilots. Join the Rifle Club, open to all members and go camping with your Squadron.

Full details on application to:—THE ADJUTANT, 1st Middlesex Wing, "The Flying Ace's Club," 29, Ruskin Avenue, Feltham, Middlesex. 'Phone: Feltham 2455

Here's a reproduction of the leaflet being distributed by the First F.A.C. Middlesex Wing, Feltham, Middlesex, England. It certainly is a swell way to advertise and advance the Club! We recommend it to F.A.C. units on this side of the big pond. The accompanying Club News columns tell you about other fine things the Middlesex bunch is doing.

be given runner-ups.

We know that all our FLYING ACES readers and members of the F.A.C. are not model builders, so here's an excellent chance for you radio bugs who are not in on the F.A.C. Transport Contest, to try your luck at winning a subscription to FLYING ACES, plus other prizes. Moreover, we still have on hand a number of diagrams of a one-tube short wave receiver, which we will be glad to send to all requesting same. These sets are not difficult to build and if you get busy pronto you still have time to build an outfit and enter the contest. If you're interested at all in short wave, climb aboard the band-wagon—you'll have loads of fun!



This is Emanuel Taylor, of San Francisco, one of our outstanding F.A.C.'s on the West Coast. He tells us to take a good look at that auto; for we won't be seeing much of it any more. You see, Emanuel is taking up flying and his future mechanical companion is going to be an airplane.

GETTING back across the seas, we're just in receipt of a most interesting letter from Bernard R. Thorne, in charge of the London Command of the F.A.C. Says Bernard: "... I think we can honestly compare in enthusiasm and progress with the cream of American F.A.C. units." He then goes to tell of their visit to the Cannock and Bishop Squadrons, 160 miles away. But, let's quote from Bernard's interesting letter:

"... We were met at Cannock by Major Mollye Poynton-Swarbrick and members of the Cannock and Bishop Squadrons. The weather unfortunately was terrible and a proposed picnic was completely washed out. We retired, however, to the Bishop Clubhouse where games and contests were played between the various Squadrons. An excellent tea was served by Mollye and her girls and the day continued with games and music. ... At 10 P. M. the London Command cars left for home with the cheers of a score of girl F.A.C.'s ringing in their ears. It was snowing hard: visibility 20 yards. The return journey took 5½ hours through blinding snow and hail, the members driving in relays. At 3:30 in the morning the cars arrived at Feltham, after a journey of 350 miles ..."

Above we have an excellent example of the close cooperation between the various English F.A.C. units. Frankly, we haven't heard of any of our crack American units visiting others 160 miles away. Moreover, there's another very

good reason why Commander Thorne has shown such remarkable progress. It's his leaflet, reproduced herewith, headed, "Join the FLYING ACES CLUB and be Air Minded." American Squadrons will do well to follow suit with ideas like that.

Now let's see what our members have done towards getting new honorary members for the club: First of all, Fred Helmick, Washington, D. C., has just written to the effect that with the members of the F.A.C. rushing around getting the pilots of the *China Clipper* and *Hawaiian Clipper* as honorary members, he up and signed the designer of the great Clipper ships as an honorary member of the club! Glen L. Martin wrote Fred a mighty fine letter stating that he greatly appreciates the interest shown and stated that he was happy to accept his kind invitation to become associated with the FLYING ACES CLUB.

The staunch loyalty of members of the F.A.C. is indeed striking at times. Our good friend Walter Joseph, Middle Village, L. I., was so impressed upon recently being awarded his SECOND BRONZE PROP for his D.S.M., that he decided to see if he couldn't do something more than his regular work for the club. Accordingly, he wrote a letter to Major Frederick Lord, U.S. Air Corps Reserve, asking him to join in honorary capacity. Did the World War Ace, with 23 aircraft to his credit, turn Walt down? You bet he didn't! The Major wrote that he would be delighted

to accept honorary membership. Nice going, Walter!

And still other great flyers continue to land on the F.A.C. honorary tarmac! Our good friend Arthur Tickner, Commander of Flight "A," Cranebrook, Australia, has just sent in a letter from Harry F. Broadbent, accepting honorary membership in the club. You Buzzards, of course, know that Harry Broadbent recently flew from England to Australia, setting a new solo record of 6 days, 21 hours and 15 minutes—beating the record of 7 days, 4 hours and 47 minutes formerly established by

Sir Charles Kingsford-Smith.

Not to be outdone by his good friend Art, our old friend Terry McManus, also of Cranebrook, Australia, shot a letter across to us from a famous American film star, accepting honorary membership in the F.A.C. We refer to Charles Farrell, and as some of you may know, Charlie has been spending some time in Australia making a new picture—"The Flying Doctor." Terry explains that as far as he can ascertain, the story is woven around the Australian inland doctor, who, owing to the vast distances and sparsely populated sections he must traverse, uses a plane for his work. Terry further states that he understands the picture will be released here in the U.S. in about six months, and says that if American F.A.C.'s will "take it in" they'll see just what his country actually looks like. That's an invitation we G.H.Q.-ers will also accept.

The more we look over this "copy" the more convinced we become that this issue of the Club News should have been called our "Foreign Edition," since we just can't seem to stick to the good old U.S.A. Well, anyway we have to give the news as it comes to us—and here's a letter from Bob Provost, Ancon, Canal Zone, stating that his plans for an F.A.C. unit at Ancon are materializing in great shape. And Bob backs up his statement with 13 membership coupons! Fine work, Bob—that's the way

(Continued on next page)

How Are Your F. A. C. Transports Coming?

GREETINGS, model designers! Are your FLYING ACES Club Transports nearly off the production line? All those who haven't finished their ships and sent their photos in to Doug Allen should begin stepping things up a bit—for the judges have just reached a decision that the Contest will officially close on July 20th.

Of course, if you haven't begun to build your ship yet, there's still time if you rev up your tools and balsa a few notches. Full details of the Contest are given below.

Since we published a solid model entry last month, this trip we offer you

one of the flying model entries (see accompanying photo.) This job was turned out by Herman Zwinger, of Oradell, N. J.—and from the looks of it, we'll bet it's great on performance once it starts skipping around "upstairs!"

Herman, who's now 13 years old, has been "building crates for six years," according to his letter. That means, of course, that he started when he was seven—which proves he's the kind of fellow that's quick on the take-off. Nice going on that model, Herman! You've got an interesting design there—one that's worthy of the F.A.C. insignia

(Continued on page 90)



Gather around, fans, and take a look at Herman Zwinger's excellent entry in the F.A.C. Transport Contest. It's a flying model with many interesting features. Note the cabane strut which supports the wing, the novel triangular construction at the juncture of the tail, and the striking nose structure.

PILOTOPICS

By ROY HUMPHRIES



Stories Back of the Above Pictures

1—USING a biplane especially constructed for the strains of aerobatics, E. C. Hedler, of South Bend, Indiana, recently took off from Bendix Airport of that city and established a new world's record for successive tailspins, completing 24½ turns. Several authorities present confirmed his feat of breaking the former record of 22 turns. (If you ask us, Mr. Hedler is quite welcome to that record.)

2—ARMY men recently mourned the passing of "Rags," mongrel canine who died at the age of 19. "Rags," who was adopted by the American doughboys in France, saw much action along the Western Front in 1918. He went over the top with attack waves and was wounded in action. Included in his wartime experiences was a thrilling parachute descent, under fire, from an American observation balloon. (That was probably a real dog fight!)

3—KITE flying, which originated in China, is now forbidden in one important city of the Celestial Kingdom—Shanghai. This youthful pastime was banned when pilots complained that these multi-colored high-flyers were a distinct menace to aerial traffic. (If any of you boys in Shanghai see this, we want to say that the FLYING ACES model department is at your service now that your kites are put away.)

4—SOVIET Russia, pioneer in many novel aeronautical departures, now offers aviation fans "flying in easy lessons without leaving the ground." It's done not with mirrors but by mounting the novice flyers in a teetering see-saw device in which the embryo pilots can learn to maintain balance via a specially-constructed control stick. A third man on the ground operates the apparatus. (And the tyros are safe—just as long as the third man doesn't rush off to lunch and leave them up there.)

to do things!

Skipping out to the Coast, our congratulations once more go to George Cull, San Francisco. This time, however, not for securing honorary members (in which respect George holds an enviable record) but rather for having won second prize in a model building contest held by the *San Francisco Examiner*. George didn't say whether this was won with a model built from a kit or plans in FLYING ACES, but we'll bet dollars to doughnuts it was! Send in a picture of that ship, George, for use in our Model Photo section.

Jumping swordfish, here are some more honorary members! Honest, we never saw so many in one month's time. We note that our old friend, Col. Paul Guerrero, Tacoma, Washington, has secured the honorary membership of Miss Helen Richey, of the Bureau of Air Commerce, Department of Commerce, Washington, D. C.; Hugh T. Platt, Portland, Ore., has induced Gov. Chas. H. Martin of his State to join the club; and Captain Theodore Canavan, of Clearfield, Penna., has sent in a letter from John H. Jouett accepting membership in the F.A.C. Many readers will remember Mr. Jouett for his fine work in instructing the Chinese in military tactics and aviation.

Now that Summer is in full swing, F. A. C's, let's have lots of pictures on these Club News pages. We don't want to publish the same faces, and the handiwork of the same hands month after month. We want to show our members what You and You and YOU look like; moreover, the type of planes you build. So—get out those cameras this summer and help us out. We're sure you'll get a "kick" out of seeing your picture in FLYING ACES and you'll be helping us out in the bargain. We know you'll not fail us—F.A.C's never do.

And so, Happy Landings until this time next month!

—DOUGLAS ALLEN

Citations and Awards of the Flying Aces Club

The Distinguished Service Medal of the Flying Aces Club has been awarded to the following members of G-2 for exceptional services to the club:

Clyde Priest	Jimme Urquhart
Ronald Keener	Faris Whitney
J. E. Freedman	Don McPherson
E. W. Putney, Jr.	

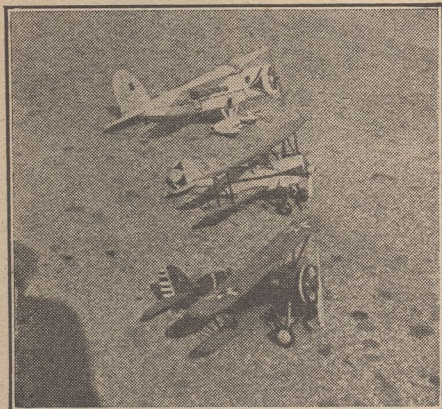
The following winners of the Distinguished Service Medal of the Flying Aces Club have been given the first award of the bronze props for additional services to the club:

Vernon N. Drew	Herman Kyle
George Foust	Bob Frankensfield
Joseph Albst	Kenneth A. Smith
James Kunis	Stewart Booth
Frank Wickersham	Charles McBee

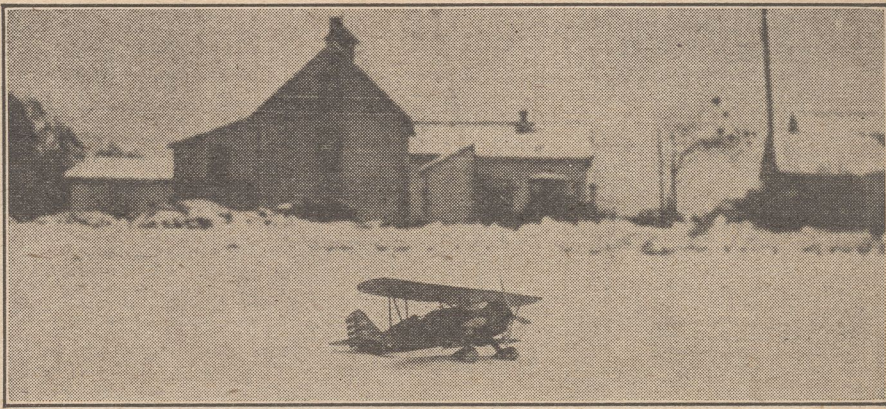
The following winners of the first award of the bronze props have been

(Continued on page 91)

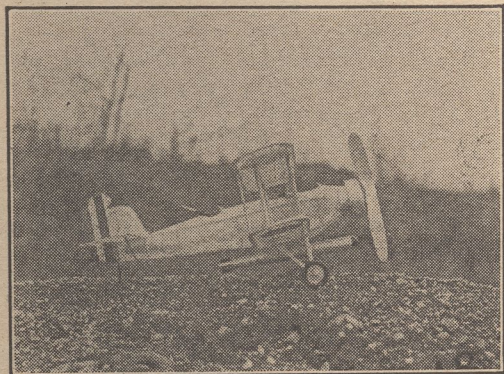
With the Model Builders



Rex Hall of Bellflower, Calif., who's done a lot with gas models, shows he's still tops with regular models, too. Here we see his Winnie Mae, Great Lakes Sport Trainer, and Army Boeing P-12E. Neat design and workmanship, we'd say!

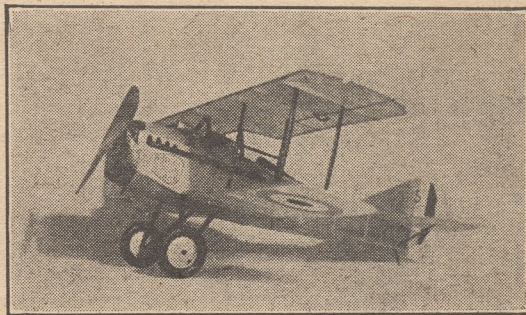


Now that hot weather is back, Warren Baker, of Delmar, Delaware, gives us a chance to cool off with this "shot" of his Curtiss P-6E Hawk. Warren apologized for this background, as a matter of fact—but we think it looks darned real. You certainly get that "feel" of a ship about to take off from a snow covered field! Pictures with such realism are always welcome here. Nice work, Warren!

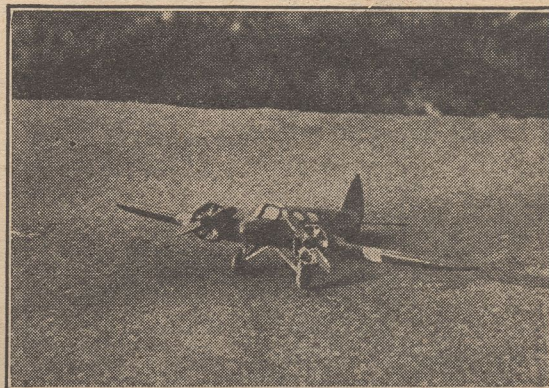


Boy, take a look at this Great Lakes Torpedo Plane, built by Robert Benjamin, of Pittsfield, Mass.! If that doesn't look like the real thing, we'll eat it! Bob says it flies well in spite of the load it carries, which speaks well for his great workmanship. Yep, we like this ship a lot, and the background is mighty good, too.

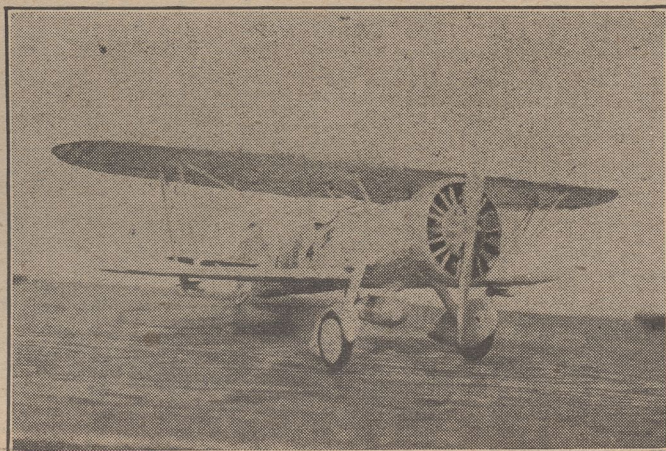
Right: To get back to our wartime models, how about this for a neat Spad? Joe Wasil built it, and he did a swell indoor photography job in clicking this picture of it. Ships certainly stand out great with a solid color background! Note all the fine detail Joe has got in his Spad. Turn the prop, and she'll be ready for a "show" over the lines right now—in fact, we'll bet Philip Strange himself would "go strong" for this baby! (Editor's note: We plan to give you war model fans plans for a Spad in an early issue, for we've got a lot of calls for it recently.)



Right: Here's our overseas contribution for this month. It was sent to us by E. J. Battle, of Leicester, England. The ship is the Airspeed Envoy, an outstanding British commercial plane used on many independent lines over there. Brother Battle has turned out a nice little model, and we might say here that any of you fans who'd like to try your hand at the Envoy will find plans for it in your December, 1935, issue of FLYING ACES.

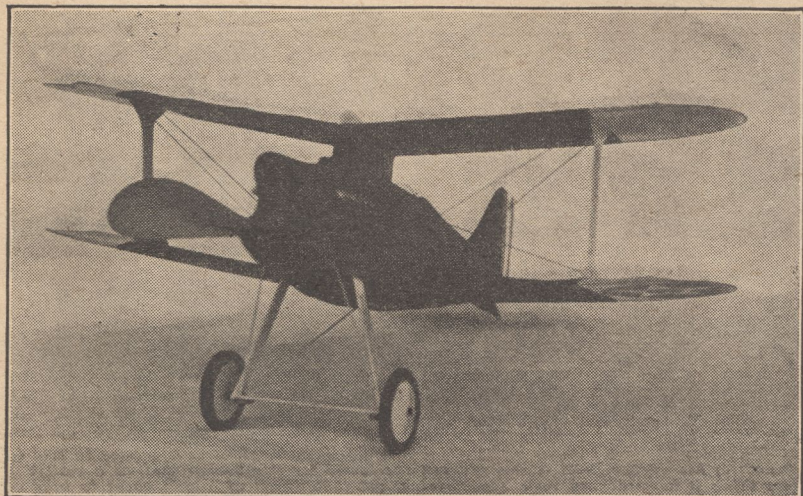


And here's our monthly personality picture—Jim Czarniecki, Jr., in the act of launching his 6-ft. Monocoupe model. Jim lives on South Drive, Fox Chapel Manor, Aspinwall. (No, it isn't in England, it's in Pennsylvania.) From all the snaps he sent us of this ship, we figure it must boast some top-notch performances, and Jim looks like a top-notch lad, too. Glad to have you with us, Jim—and we hope none of your models ever get stuck on the top of that pole back there.



Left: Speaking of modern fighters again, chalk this Curtiss Goshawk at the top of the list. Built by Bob Martin, of Milford, Utah, this ship has everything—underslung torpedo, light fragmentation bombs under the wings, and a wealth of other detail. Dog-gone, but some of you birds are certainly putting in some real work these days. This is a real nifty! Many congratulations, Bob!

Build the Curtiss Racer



Is she a good flyer? Well, now that you've seen this "shot" of Mr. Cole's sleek model we won't have to answer that question—for you wouldn't ask it. The Curtiss Racer has everything. And since the picture tells the story better than words, we'll end this caption right here.

By Cliff Cole

THIS trim little speed ship was produced by the Curtiss Company in conjunction with the U. S. military authorities in 1922. It was designated the Curtiss R-6 Racer. In this machine, wing radiators for racing purposes were used for the first time.

The radiators were faired into the wing beautifully. They eliminated the parasitic drag commonly caused by radiators of standard mounting.

This early plane had many other fine features that are still in common use on speed planes, namely, "I" wing struts, single strut undercarriage, monocoque fuselage, etc. These refinements enabled this ship to walk away with the Pulitzer Trophy Race that year, at 206 m.p.h.—at that time a new world's record.

The long and illustrious line of Army and Navy Curtiss Hawks may be directly traced from the results of the research on this ship, their famous prototype.

By carefully following the plans given here, a realistic, sturdy, and clean scale flying model may easily be made. (The scale is 1" equals 1').

This model will surprise and please you, with its powerful climb and speed enabled by the excellent streamlining that has been faithfully reproduced in the model.

FUSELAGE AND LANDING GEAR

USING the patterns given, cut all formers from 1/16" sheet balsa. Cement 1/8" sq. stiffeners, as shown on front of former B. Next cut formers M, L, and J, from 1/32" sheet, making two of each. The fuselage is made in two halves, in the simple half-shell method of construction. After tracing a duplicate outline of the fuselage, so as to make a right and left side, we may start with the actual construction. Pin formers M, L, and J, on plans in proper positions. Next put 1/16" sq. balsa strips on the outlines of the fuselage, from former F to tail of fuselage. Now cement all formers in their proper positions, making sure you have right and left sides for the fuselage.

A good scale model that's also a darned swell flyer—that's what gets the model fans' votes every time! And right here we've got a great "candidate" that can't be beat. It's the Pulitzer Trophy winning Curtiss R-6 Racer, a famous ship that'll cop the election on any man's model tarmac. You'll find it a grand addition to your line-up of post-war planes.

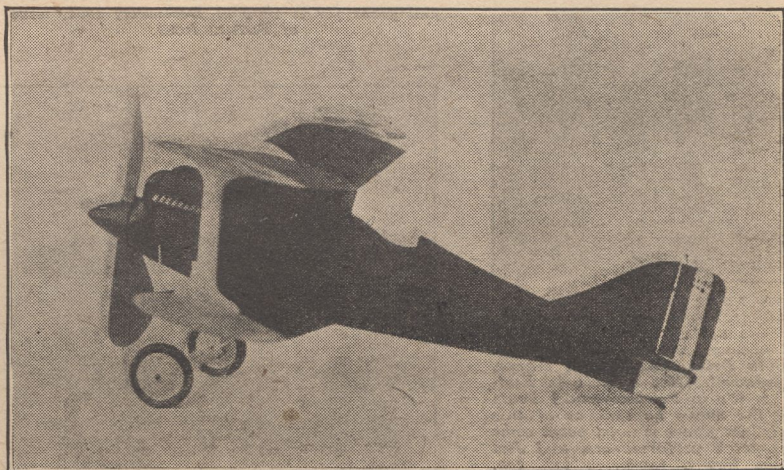
After the cement has set, put a 1/16" sq. stringer in center notches of formers, then continue applying 1/16" sq. stringers until completed. You may now trim all stringers off flush with tip and nose of fuselage, and cement the two sides together, holding the

sides together with rubber bands. Now fill in between formers E and F with 1/32" sheet balsa to form cockpit enclosure, and finish by cementing a piece of string around rim of cockpit, to form bead. Cut and apply 1/60" sheet balsa over cowl and head rest to dotted lines, then sand smooth.

We are now ready for the landing gear. Make two N struts of 3/32" hard sheet balsa, streamline and cement in place against back of former B, and to sides of former L. Spread to 4 inch tread. Next put finished spreader bar in place and cement. Assemble shock caps Y, on spreader bar, and cement celluloid guides O, and place on struts. The axle is made of No. 14 piano wire and is bound to the center of the spreader bar with silk thread. Wrap 1/32" thread rubber over axle between strut and shock cap, and tie. Place 2" hardwood wheels in place and cement washers on the end of the axle to hold them. Now brace struts with 1/20" bamboo, to formers A and D, as shown.

Cover fuselage, being sure to leave an opening for placing the lower wing in, using narrow strips of Superfine tissue to avoid wrinkles. You may now cement the celluloid windshield in place.

(Continued on page 94)



No mistake about it—she's a prize ship! This Curtiss job boasts both strength and lightness, and when you get a combination like that in a ship like this you have a REAL flyer! Note the neat simplicity of its lines.

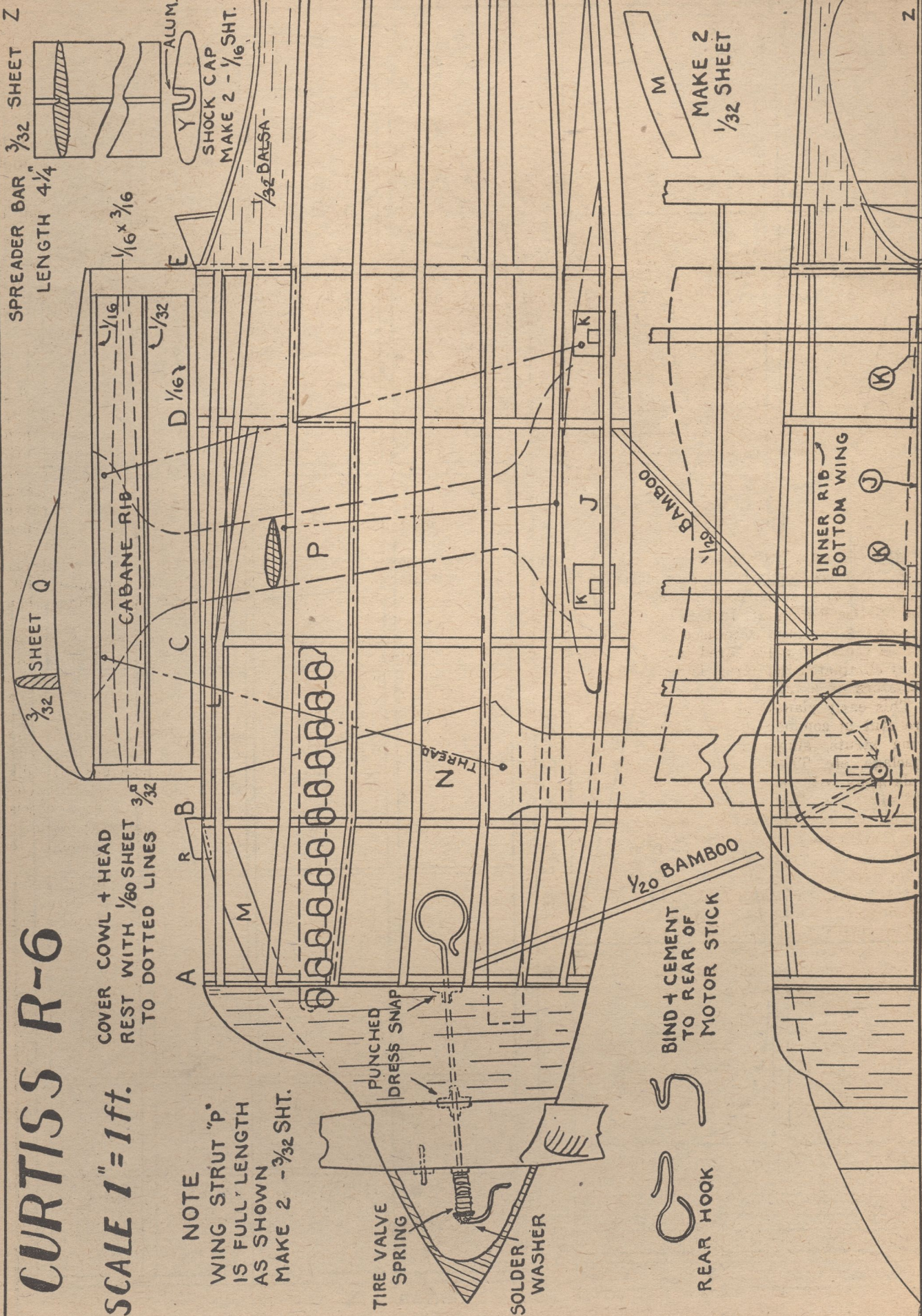
CURTISS R-6

SCALE 1"=1 ft.

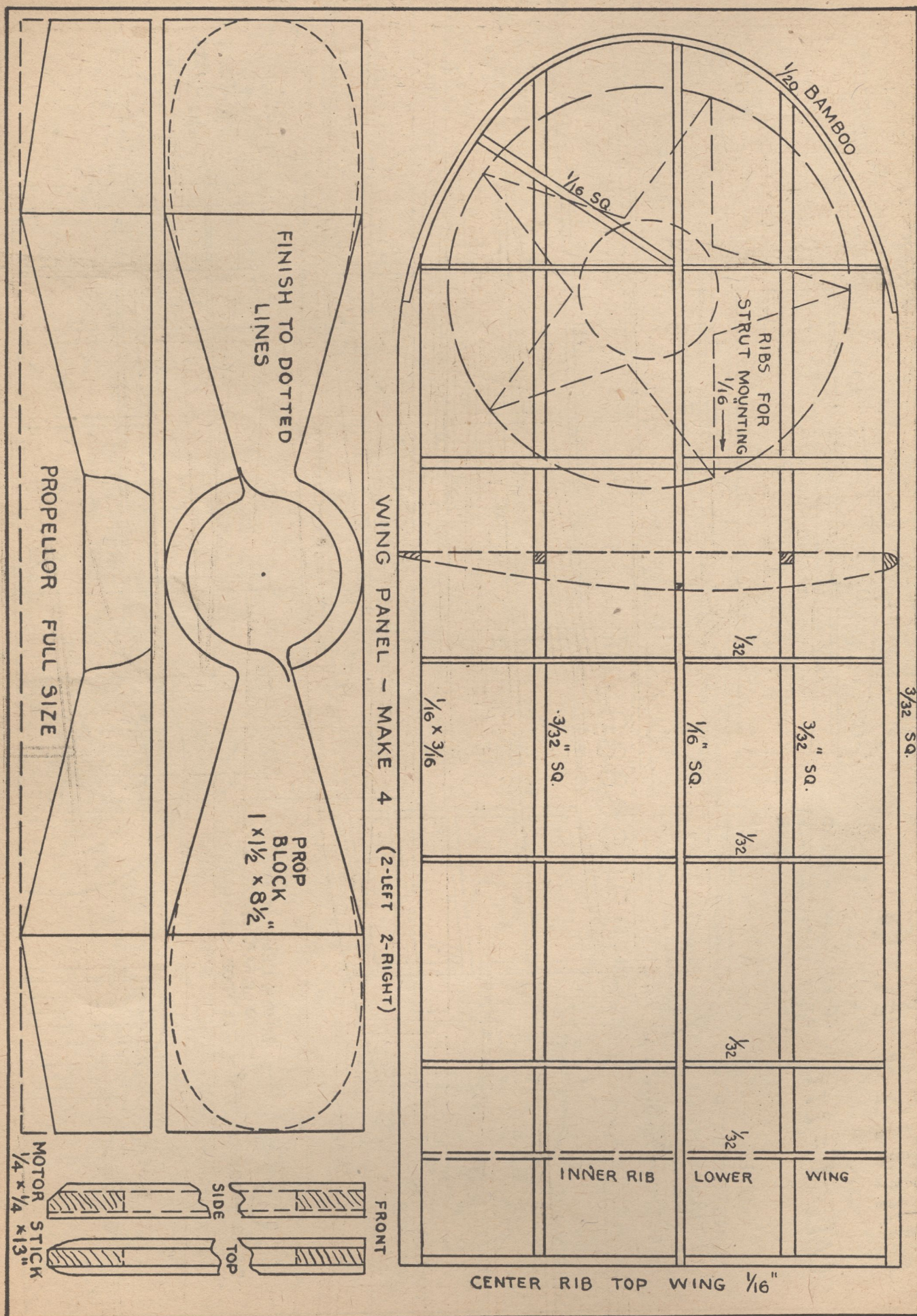
COVER COWL + HEAD
REST WITH 1/60 SHEET
TO DOTTED LINES

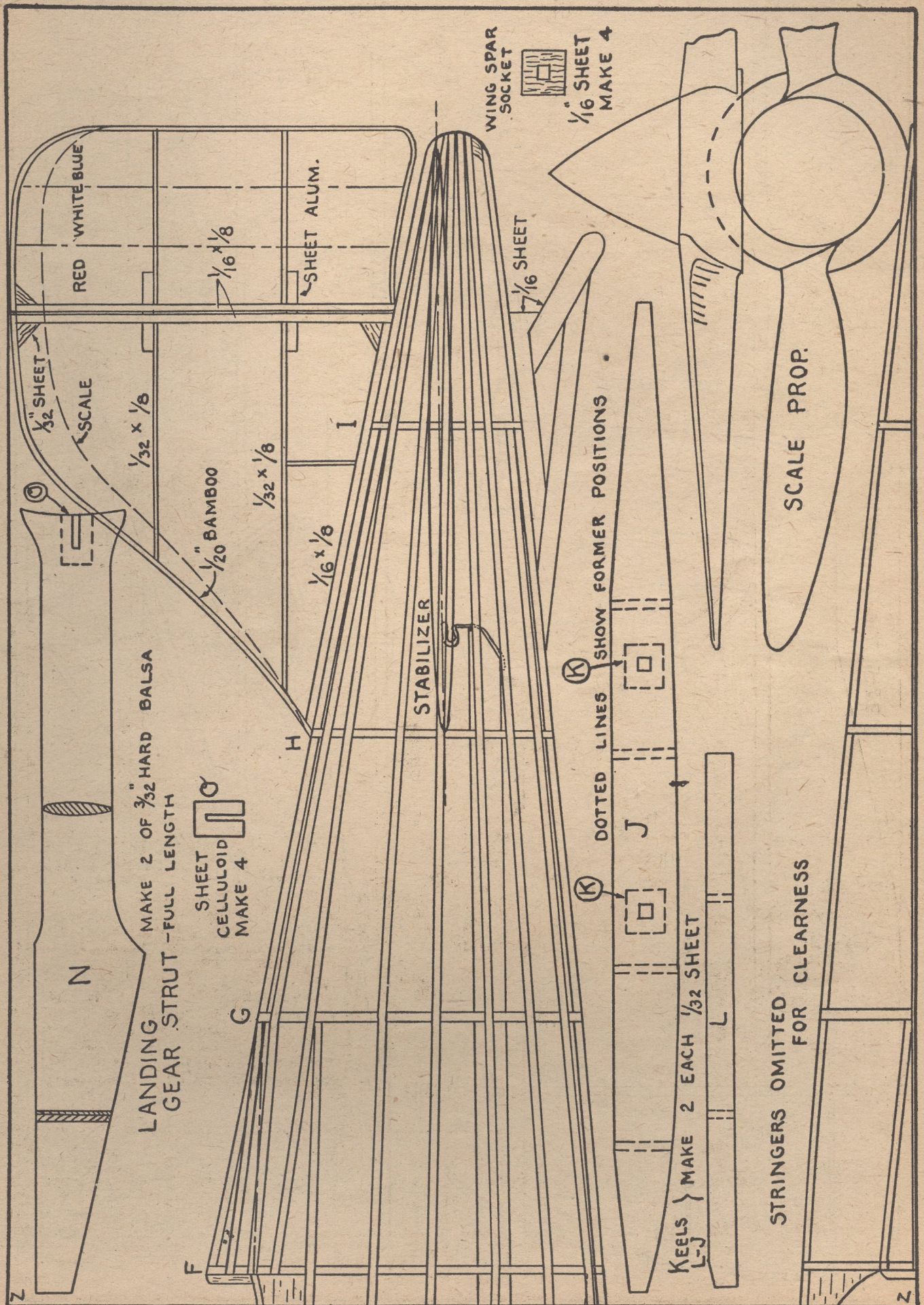
NOTE

WING STRUT "P"
IS FULL LENGTH
AS SHOWN
MAKE 2 - 3/32 SHT.

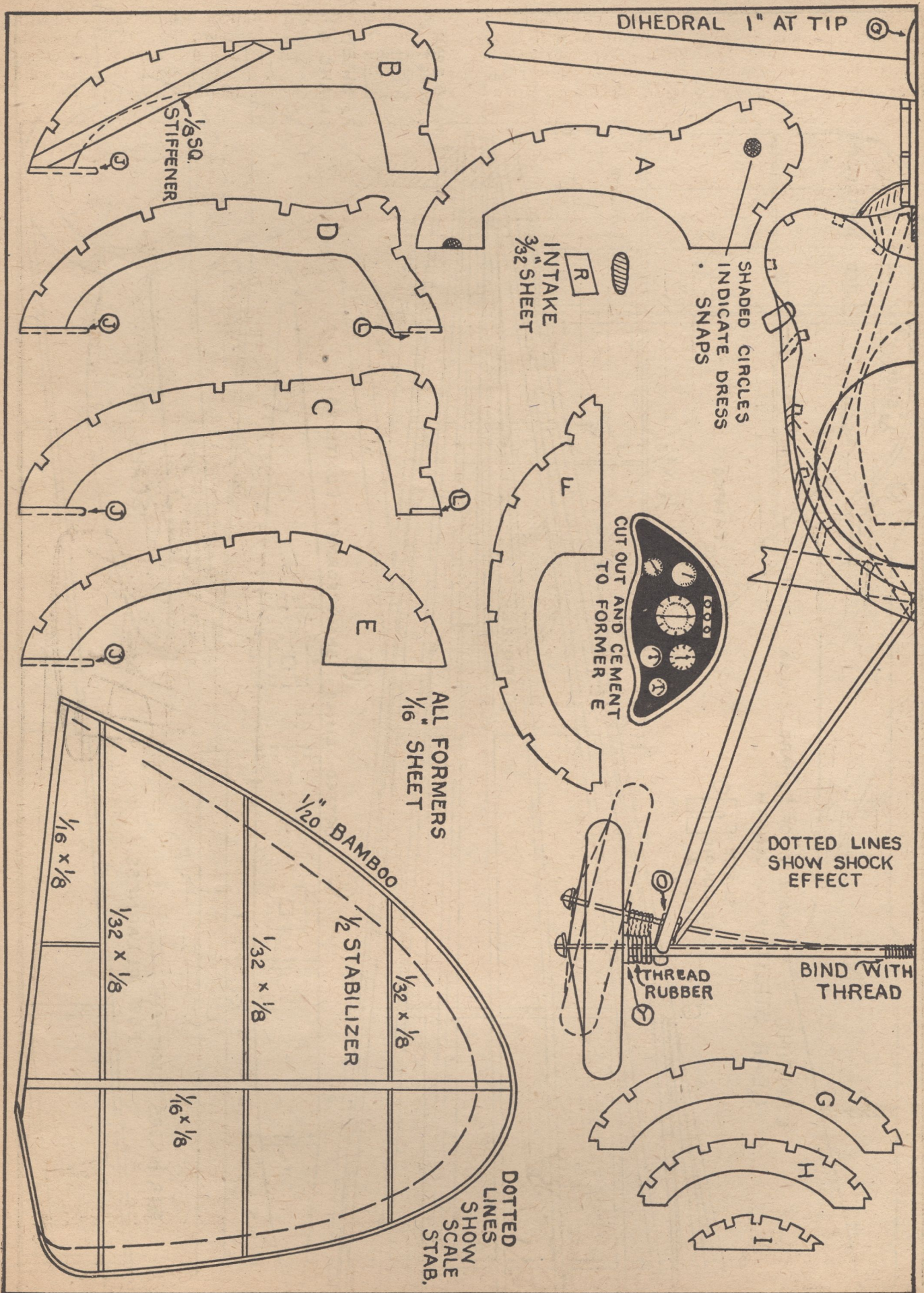


BUILD THE CURTISS RACER—Plan 2





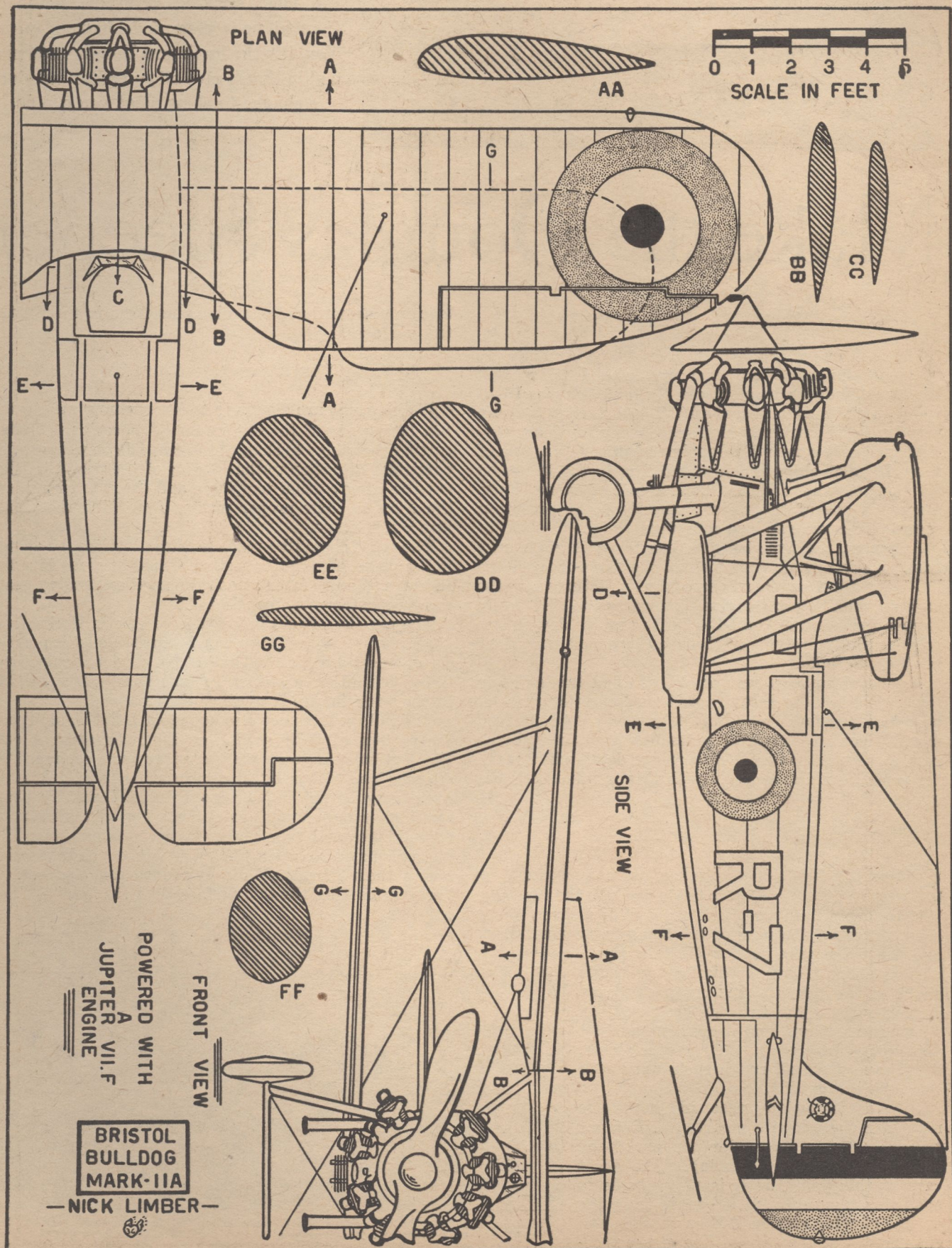
BUILD THE CURTISS RACER—Plan 4



Plans For A Solid Model Bristol Bulldog Mark IIA

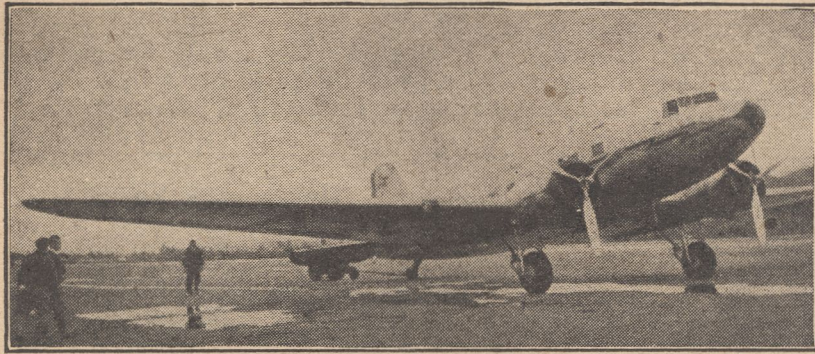
SPEEDY lines, outstanding maneuverability and performance, and an excellent record as a fighting ship have made the Bristol Bulldog a prime favorite among R.A.F. flyers and air fans alike in the British Isles. One of the most striking of this famed Bristol

"litter" is the Mark IIA Bulldog, which is powered with the Jupiter VII.F engine. Below, Mr. Limber presents authentic scale plans for this fine fighter, and cross-section patterns are included in order that you solid modelers will get correct detail in your replicas.



The excellent flying lines of this great transport are depicted to advantage in this front-quarter view of the real Douglas. Our aircraft designers are certainly catching up with the birds—in fact, this ship is enough to make any eagle or hawk envious. Note especially the detail of the undercarriage. It will aid you in building your model.

★ ★ ★



TA-TEE-TA-TAH! That's our bugle calling all you solid model fans to assemble—for this month we've rolled the most striking transport plane of them all up to your model hangar apron. Yep, it's the huge new Douglas Sleeper, a ship that'll give all you detail maniacs a chance to show what you can do.

★ ★ ★

Make the Douglas Sleeper

By Robert McLarren

IN 1933, one of the largest, fastest, and certainly the most luxurious air liner constructed up to that date, made its debut. It was the huge Douglas DC-1, which, with its successor, the DC-2, has startled the aero world with its extremely high speeds, extraordinary performance, and completely appointed cabin. It was one of these Douglas ships which placed first in the transport division of the famous London-to-Melbourne Race. Moreover, one of these craft recently broke seventeen records for speed and load carrying.

And now, the Douglas firm has brought out a new transport job which combines all the fine points of the DC-1 and DC-2 and boasts several new features into the bargain. This latest Douglas—known as the DST in its sleeper form and as the DC-3 in its regular day-service role—is the prototype of the model we will now show you how to build.

All model builders, new or old, will find this a "go to town" job. It's the type of craft that affords you a lot of detail possibilities. With it, you can "go in for" movable controls, retractable landing gear, and all the rest of those intimate little touches of detail which make for perfect solid models. So with this in mind, let's get going on the construction:

FUSELAGE

SELECT a block of good, clean balsa approximately 16½" by 1¼" by 1¼" to begin work on the fuselage. Whittle away the four rough edges with a sharp knife. Next, carve off the nose of the block to a round shape and taper the rear portion off to a rough conical shape. After obtaining the rough shape of the fuselage, cut out paste-board templates from the fuselage cross-sections shown in the plans, and check them against your rough fuselage in their proper places. Then sand down all rough spots until each template fits exactly.

Now cut away the nose and make the niche for the pilots' compartment. Cut out a large slice in the under portion of the fuselage to receive the wing. Take great care at this point, as it is very simple to spoil this connection. It is best to trace the outline of wing section E-E on the side and cut it out. Cut the rear section of the fuse-

lage in a somewhat triangular plan form to receive the tail surfaces.

WINGS AND TAIL SURFACES

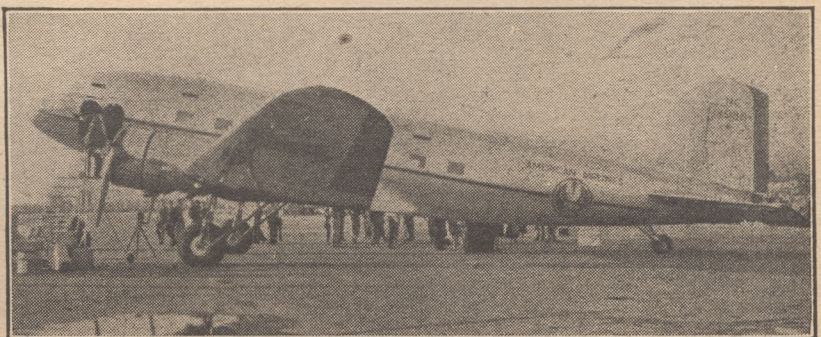
THE wings are simple to make involving merely the laying out of the outline on ⅜" sheet balsa. After cutting the wings to shape, sand them down well, paying particular attention to the sanding of the wing tips. Cut out the wing section templates and check them against the wing in their proper places. Then sand the wings into exact shape.

The wing should be made in three sections, as shown in the plans. The center section should be glued into the fuselage. We will later attach the nacelles, landing gear, and two outer wing panels to it.

The nacelles should be carved from balsa blocks; and if you have a lathe, they can be turned out in perfect form. Select a block 1¾" by ¾" by ¾" for the nacelles. Chisel out either a section in each nacelle or a section in the wing in which to place each nacelle.

The tail surfaces are also cut from 1/16" balsa. Trace the pattern of their outline on the sheet and cut out. Use section H-H to obtain their true cross section. The ailerons can either be drawn in with India ink or a niche may be cut in with your knife. I usually place small aluminum strips into the wing and aileron to form hinges and thus make the controls movable. The ailerons may also be sewn in with thread which likewise makes them movable. This procedure can also be followed in making the tail surfaces and the landing flaps movable.

(Continued on page 95)

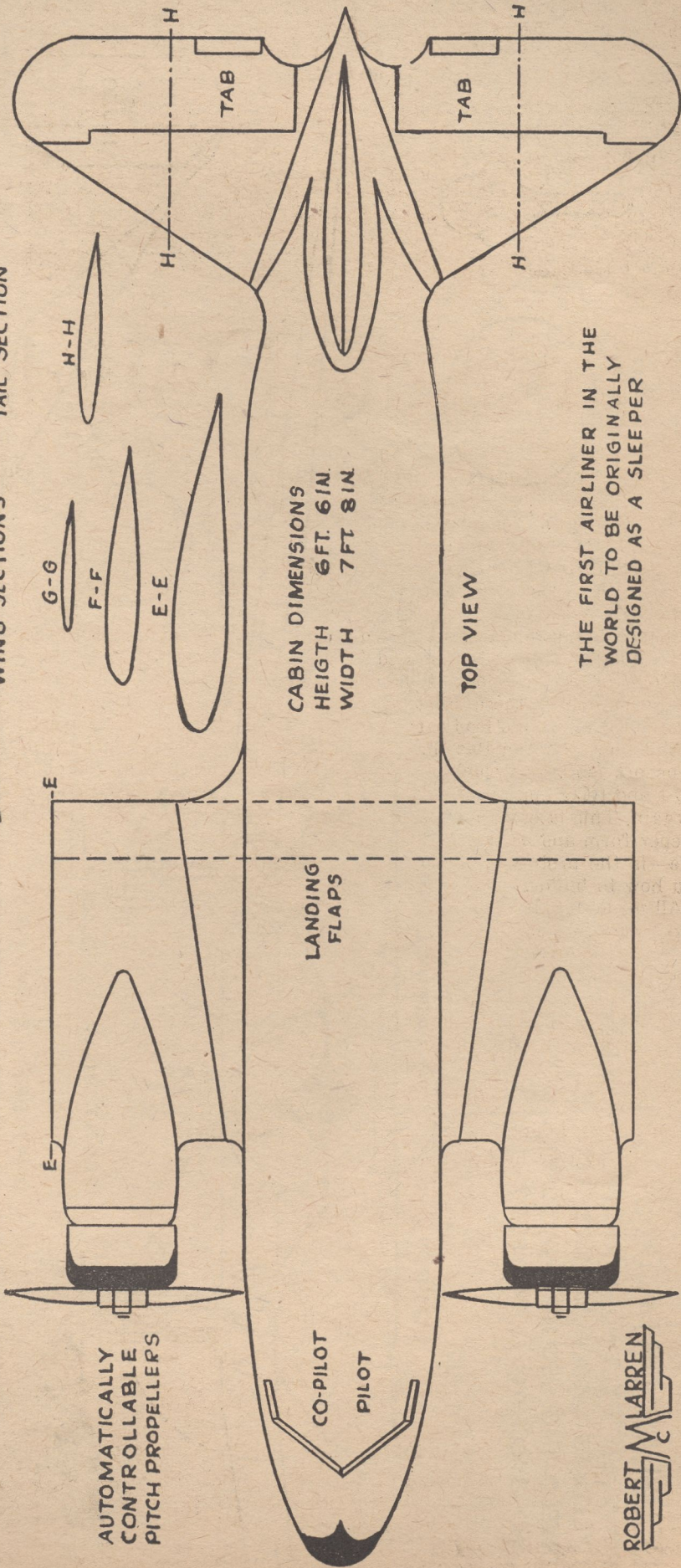
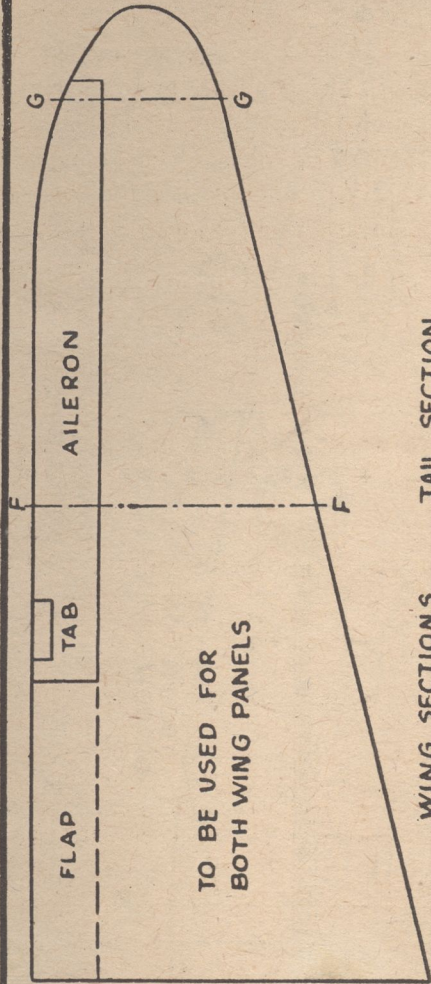


And here is a "shot" which shows the fuselage silhouette, the wing-root fairing, the dihedral, and other features. Those narrow apertures you see above alternate windows indicate the positions of the passenger berths. Georgia, you can wake me at seven!

DOUGLAS SLEEPER TRANSPORT DC-3

AMERICA'S LARGEST PASSENGER LANDPLANE

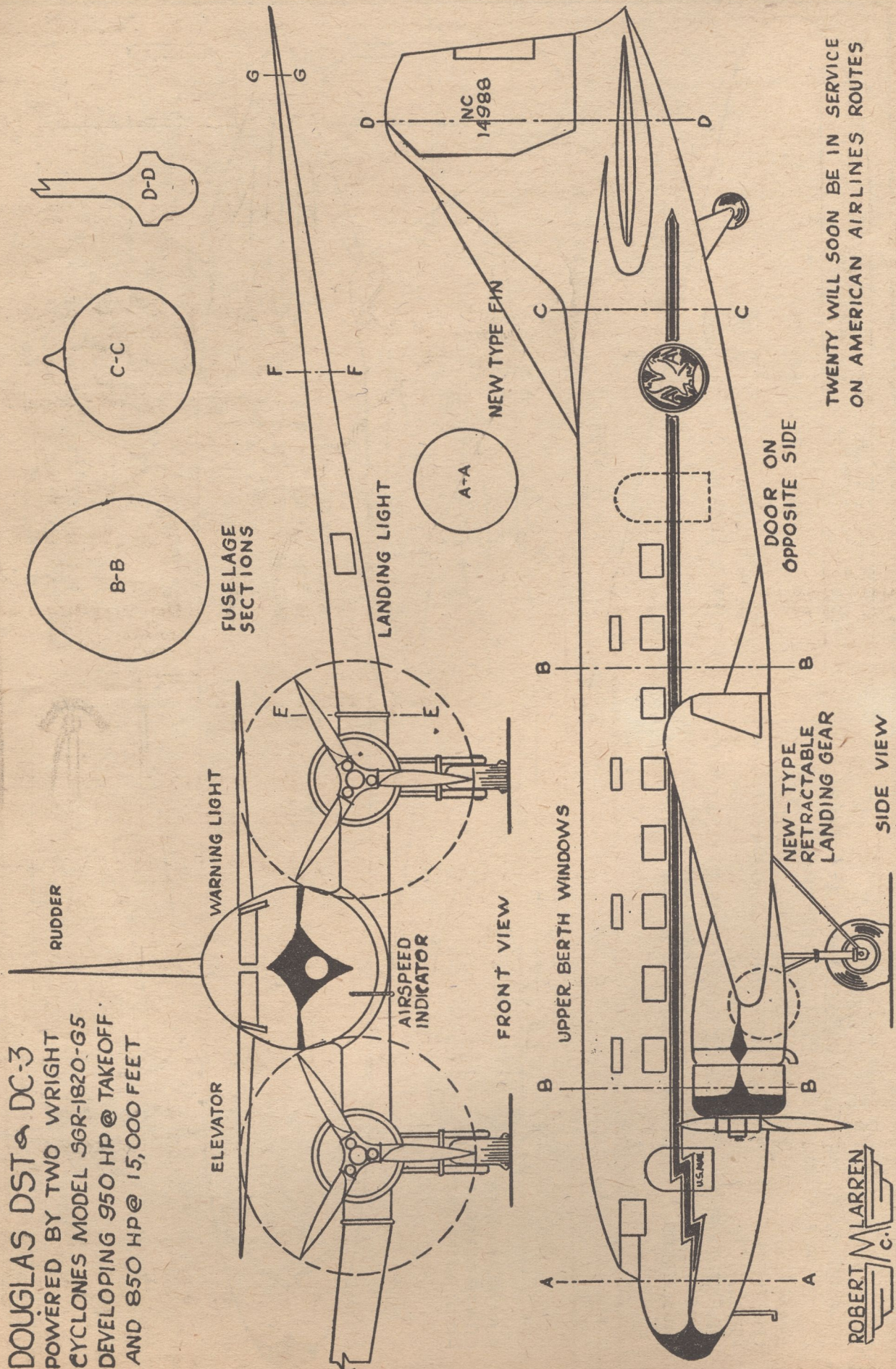
SPECIFICATIONS		PERFORMANCE	
SPAN	95 FEET	HIGH SPEED (12,000 FT)	220 MPH
LENGTH	65 "	CRUISING (12,000 FT)	190 "
HEIGHT	16 " 4 IN.	LANDING	65 "
WEIGHT (EMPTY)	15,750 LBS	CEILING (SERVICE)	23,300 FT
WEIGHT (GROSS)	24,000 "	CEILING (ABSOLUTE)	25,200 FT
PASSENGERS	16-24	CRUISING RANGE	2000 MI.



THE FIRST AIRLINER IN THE
WORLD TO BE ORIGINALLY
DESIGNED AS A SLEEPER

ROBERT WARREN

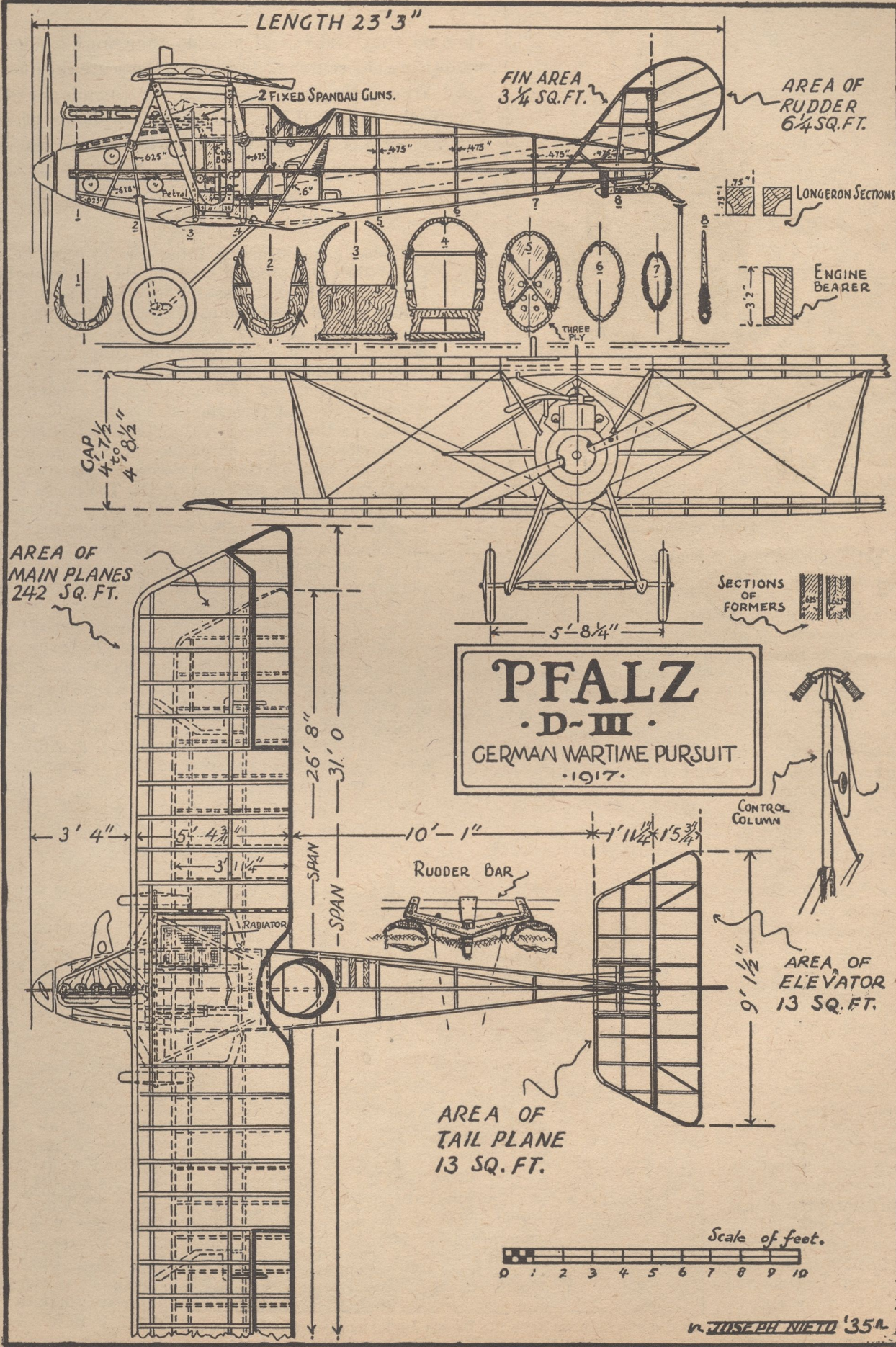
DOUGLAS DST-3 DC-3
POWERED BY TWO WRIGHT
CYCLONES MODEL SGR-1820-G5
DEVELOPING 950 HP @ TAKEOFF
AND 850 HP @ 15,000 FEET



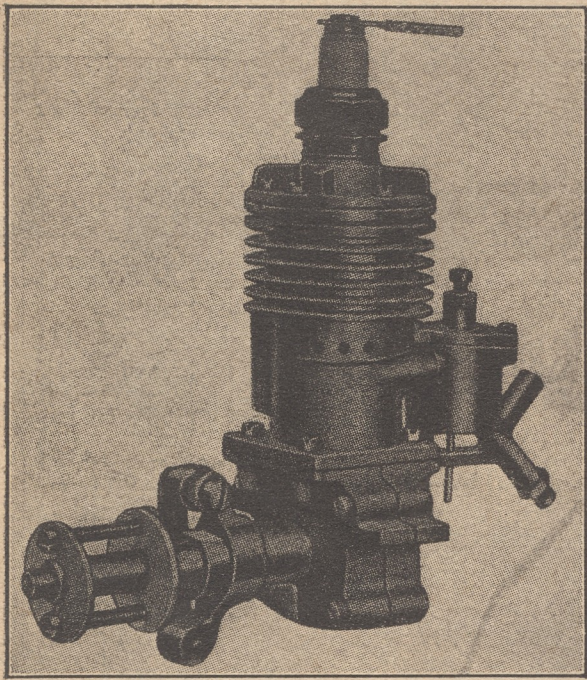
TWENTY WILL SOON BE IN SERVICE
ON AMERICAN AIRLINES ROUTES

ROBERT M. LARREN
C.

Special—Fully Authentic Plans for the Pfalz D-III



Gas Engines and What Makes



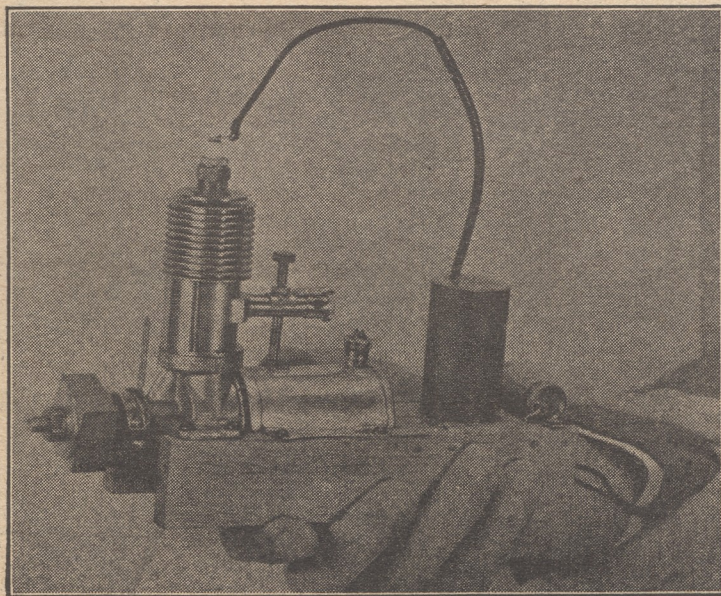
Here's the power plant offered by the Power Model Boat & Airplane Company.

NOT until the past year have miniature aircraft engines achieved a really broad commercial status, but in the laboratory these gas motors have had a five year history. Let's consider what the technicians were up against.

There were several problems involved due to the fact that the electrical system remained constant, a reduction of the engine's size did not proportionately reduce the weight. There was still the need for a spark coil, condenser, and batteries to supply the current.

An outstanding problem was the coil, which represented a bulky affair,—but eventually a miniature coil was developed which would operate on flashlight batteries with a spark of sufficient intensity to run the motor. It was not until then that the success of these model aircraft engines was at least partly assured.

Plans for a practical miniature engine for use on model planes were first developed in 1929 by Bill Brown, Jr., but it was not until a year later that he succeeded in constructing a motor that would cough two or three times. This early motor had an 11/16 inch bore and a 3/4 inch stroke. Because of the great difficulty involved in starting a motor of such minute dimension, the size was increased to its present proportions (see accompanying three-view drawing). On May 10, 1932, the first gas model contest was held with four entries powered with this Brown Junior engine.



And down here we have the Brown Junior engine, which is made by the Junior Motors Corporation.

How do they look? And how do they work? When gas motors are the center of discussion, those are the questions most frequently fired at us. So we commissioned Phil Zecchitella to corral the accompanying photos of six of the leading gas engines, together with the stories behind these compact little power plants. Here 'tis—

Probably the strangest thing ever to occur at a National Meet was brought about by the Brown engine. In 1933 National meet rules did not specify as to whether rubber power should be used exclusively—you see, gas models were not as yet separately classed. As a result, Maxwell Bassett of Philadelphia, entered his Brown-powered models in all the events in competition with rubber powered craft. When the winners were announced it was discovered that Bassett had won the Mulvihill, Stout, and the Admiral Moffett trophies! A sweep!

The effect of this unusual occurrence was electrical. New rules were drafted and a separate class was established for gasoline powered models. The model builders were completely enthusiastic and soon the Brown shop was flooded with orders for miniature engines. With the limited home shop facilities, it was soon found impossible to comply with the increased demand and a state charter was accordingly obtained for what is now known as the Junior Motors Corporation.

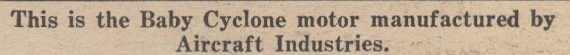
The Brown engine is one of the most efficient of the miniature engines now in production. Its workmanship is above reproach and its reliability has been established. With the exception of the crankcase, which is made of die cast aluminum-silicon alloy, the complete motor is of alloy steel. The timer is of spring steel and the wrist pin, a full-floating type, is of tool steel and fitted with a retaining washer to prevent scoring. The coil has been especially developed for the motor.

While covering the 1934 National Meet at Akron, this correspondent had the occasion to photograph Bill Atwood, of California, for publication. Upon close inspection of his gas powered model, it was discovered that the engine was of a non-commercial nature. Further conversation revealed that Atwood had designed the motor himself.

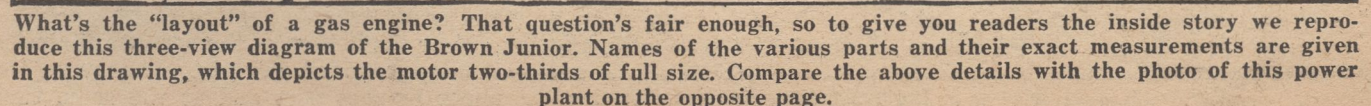
Although it was not made public at that date, Major Mosley, president of Aircraft Industries, had already interested himself in this engine, and the following year it emerged on the market as the Baby Cyclone engine. The outstanding feature of this engine is its small size and consequently it is one of the lightest engines produced to date. The feed line is a departure, be-

By Phil
Zecchitella

The carburetor of the Power Company's motor is equipped with a check valve to prevent any back pressure action which might occur. The timer, as in the case of the other engines, is located on the shaft. It is adjustable. The gas capacity of the tank enables the engine to run for about 25 minutes. (The only thing we wonder about is why the Power Company doesn't adopt a specific name for their motor. That would help us fellows a lot; for it's rather hard to designate a motor by such a long



The Loutrel engine, which for a time had been out of

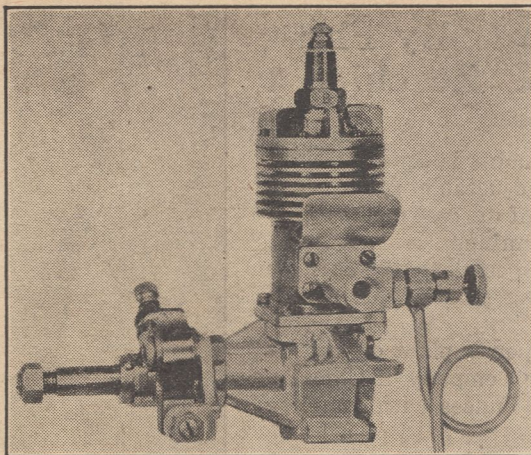


production, has now reappeared on the line under the banner of the G.H.Q. Model Airplane Co. Its bore and stroke is a noticeable variation from the other engines. While having a bore larger than most of the engines, it has a stroke smaller than any of them—a trend which during recent years has manifested itself in the large aircraft engines. The cylinder is made of cast iron with an aluminum head which is bolted on. An aluminum deflector serves to keep the exhaust away from the intake. Another novel feature is the Ford V-8 timer which is mounted over the bearing housing and which works off a cam on the shaft. The spark is adjustable. With its 15/16 inch bore and 3/4 inch stroke, the G.H.Q. Loutrel turns over at 500 to 10,000 R.P.M. and develops approximately 1/5 horsepower.

The Forster engine has undergone several minor changes since first appearing on the market and the present weight of the bare engine, as a result, is but 14 ounces. Having a bore and stroke each well over an inch, this motor is quite powerful, developing as high as one-third horsepower at 6000 revolutions. Die castings of light weight alloy, stronger than aluminum, are used throughout, and motors are available either with bronze or ball-bearing main bearings. This motor also has two piston rings.

Still another interesting gas engine is the Thlush Super Ace (just call 'er, "the Super Ace," if that name, "Thlush," is too much of a tongue-twister for you.) This motor, like the others we've just covered, operates on the two-cycle principle, and it is capable of developing 1/5 horsepower at 4500 R.P.M. The power plant has one of the greatest strength-weight ratios on the market. The fuel capacity is 2 ounces and the suction type of feeding is employed. The engine's spark control is adjustable.

THE miniature engines now in production are, as we've just intimated, all of the two-cycle type. That's because this is the simplest possible manner in which to build them. A two-cycle engine requires no



The Loutrel engine now marketed by the G.H.Q. Model Airplane Company.

three-port or rotary valve. The four port engines are the Brown, Forster Brothers, G.H.Q. Loutrel, and Thlush Super Ace. The Baby Cyclone and Power Company engines are three-port jobs.

In the four port engine the piston, in its movement up and down in the cylinder, acts as a valve in covering and uncovering the port openings, and it controls the movement of the gasses into and out of the cylinder. In the cylinder wall are the exhaust ports and the inlet ports, one above the other, each port consisting of a series of four holes.

The exhaust ports are those immediately below the bottom cooling fins, while those of the inlet port are hidden under the intake manifold. Also in the cylinder wall are the by-pass ports, upper and lower, the lower one being the two larger holes in *both* the cylinder wall and the piston skirt, and these are also hidden from view from the outside by the by-pass manifold.

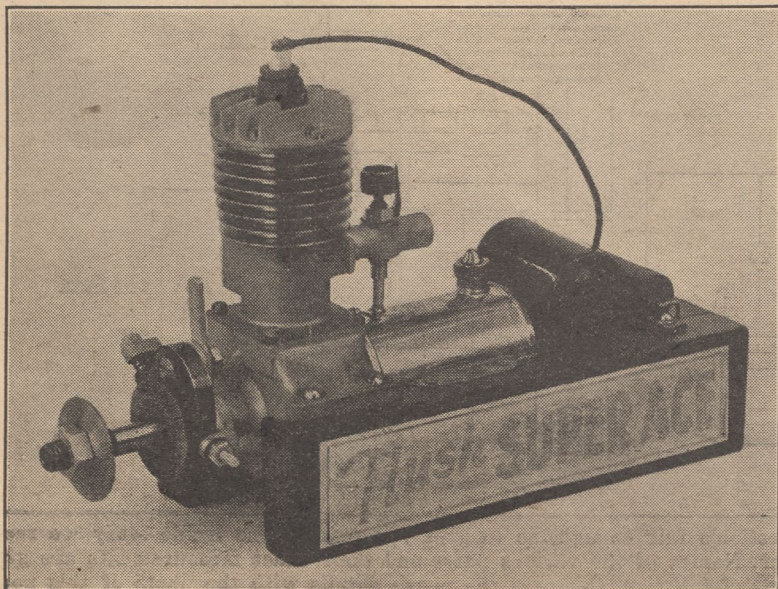
The functions of these ports are as follows: The inlet port permits a new fuel charge to be drawn through the air inlet tube and intake manifold, into the lower cylinder and crankcase spaces. The by-pass ports permit the new charges to pass from these spaces through the by-pass manifold to the top side of the piston where it does its work. The exhaust port permits the burned gas and expanded air to escape from the cylinder after they have performed their work.

In the order named, the ports function through the movement of the piston up and down in the cylinder. In traveling upward the piston acts as a pump in this manner. Shortly after starting upward, the top edge of the piston covers the upper by-pass port so that there is no opening into the crankcase through which air can pass, and as it continues upward a suction action is started in the crankcase, thus creating a partial vacuum.

This increases until the bottom edge of the piston uncovers the inlet port when air rushes in through the intake tube.

The piston, having reached the top of its upward movement, immediately starts to move downward and very shortly the bottom edge of the piston has again covered the inlet port, so that there is no opening through which the charge can escape until the piston has almost completed its downward movement. As a consequence, the charge is compressed in the lower cylinder and crankcase.

Near the bottom of the downward stroke, the top edge of the piston uncovers the upper by-pass port and at the same time



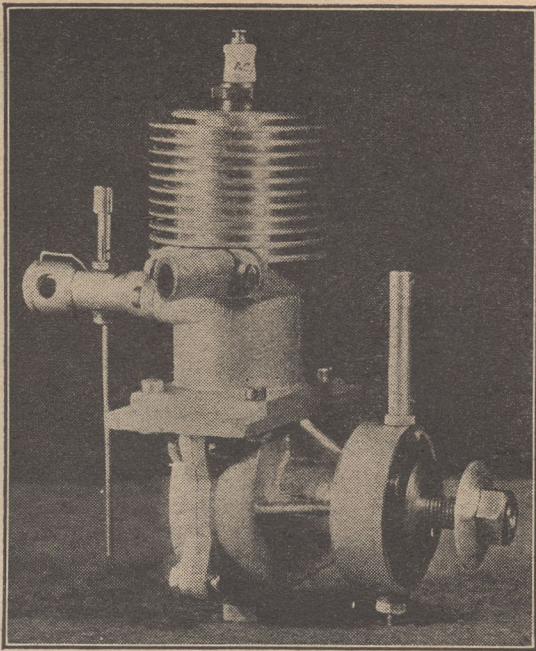
A side-quarter view of the Thlush Super Ace.

the large by-pass ports, or holes, in the skirt of the piston come opposite the large holes in the cylinder wall so that the charge now under pressure in the lower cylinder and crankcase rushes through these, up inside the by-pass manifold, through the upper by-pass port, and into the upper cylinder. Here it strikes the baffle plate on top of the piston and is deflected to the top of the cylinder. (This baffle prevents the new charge from rushing across the top of the piston and out through the exhaust port, which is also open at this time.)

While the new charge has been rushing into the upper cylinder—in the manner just described—the piston has completed its downward movement and started on the upstroke again. Both the by-pass and exhaust ports are closed very quickly, by the passage of the top edge of the piston over them, closing all from the upper cylinder, and the new charge which has just been admitted, is compressed in the upper cylinder as the piston continues to travel upward.

Ignition of the explosive mixture takes place when the piston is at or near the top of its stroke in the cylinder, and the piston is then driven downward by this force until its upper edge crosses the exhaust port opening, when it escapes into the outer air. Thus the cycle has been completed.

In other words, an explosive charge of mixed air and



Forster Brothers' gas engine, known as the Little Hercules.

gas has been drawn into the motor from the lower cylinder and crankcase to the upper cylinder, compressed into the latter, and ignited, and the power stroke started and completed, and two full strokes of the piston have been made.

In the meantime, however, another charge has been drawn into the crankcase and is ready to be by-passed to the upper cylinder as soon as the piston uncovers the by-pass ports.

IN the rotary valve engine, on the other hand, there are three ports which are placed in the same position and operate in the same manner as the four ports. The intake ports, however, are replaced by a simple valve in the form of a hole drilled lengthwise in the crankshaft with another hole drilled through the crankshaft bearing at a right angle into the shaft.

The feed line is connected to the bearing housing directly under the propeller shaft and as the piston reaches the top of its stroke the holes line up and the mixture is sucked in.

The difference in prices in the present gas motors can be best attributed to workmanship and materials used in their construction. All of the motors are good, just as all new cars are good; and likewise, the more you pay for, the more you get. The recent increase in production of gas engines is of great advantage to model fans for
(Continued on page 90)

Specifications of the Various Gas Engines

	Brown Junior	Power Company	Baby Cyclone	G.H.Q. Loutrel	Thush Super-Ace	Forster Brothers
Type	2 cycle 4 port	2 cycle 3 port	2 cycle 3 port	2 cycle 4 port	2 cycle 4 port	2 cycle 4 port
Bore	7/8"	1"	3/4"	15/16"	7/8"	1 1/16"
Stroke	1"	7/8"	13/16"	3/4"	1"	1 1/8"
Weight (complete assembly)	16 oz.	15 oz.	10.5 oz.	12 oz.	16.5 oz.	18 oz.
Cylinder fins	12	7	11	7	8	12
Head fins	none	4	none	3	5	none
Cylinder mounting	screw thread type	4 screws	4 screws	4 screws	4 screws	4 screws
Crankcase mounting	4 nuts	4 nuts	4 nuts	4 nuts	4 nuts	4 nuts
Piston rings	none	2	none	oil grooves	none	2
R. P. M.	1,200-10,000	4,000-6,500	4,000	3,000-7,000	900-12,000	1,000-6,000
Horsepower	1/5	3/16	1/6	1/5	1/5	1/3
Gas capacity	2 oz.	2 oz.	1 3/4 oz.	1 oz.	2 oz.	2 oz.
Spark control	adjustable	adjustable	automatic	automatic	adjustable	adjustable
Inverted running	yes	yes	yes	yes	yes	yes
Height overall	4 3/4"	?	4 3/8"	4 1/2"	4 1/2"	5 9/16"
Feed	suction	suction	gravity	suction	suction	suction
Needle valve position	rear cylinder wall	rear cylinder wall	crankshaft behind prop.	rear cylinder wall	rear cylinder wall	rear cylinder wall
Knock-down kit	no	yes	no	yes	no	yes
Rough casting kit	no	yes	no	no	no	no
Exhaust manifold	no	no	yes	yes	no	yes

The Flying Aces Low-Wing

By Charles Holtz

DID we hear some one say "performance?" Well, we've got a swell stick model for you here this month that'll do almost anything you want once you get it in the air. With this neat job, you'll be assured of a grand time on the model flying field.

In building this craft, first trace all the templates, then transfer them onto any stiff paper. When through with this operation, take the wing template, place it on a sheet of 3/32" by 2" by 9" balsa (as indicated in drawing), and trace its outlines onto the wood. Now cut along the pencil line with a razor or knife. Afterward sand the edges straight.

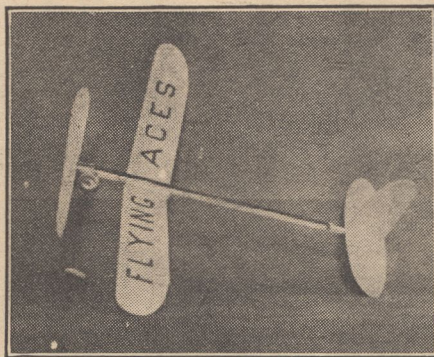
Next, take your sanding block and using coarse sandpaper rub it lengthwise along the top of the wing at the trailing and leading edges until you have formed a camber, as shown in shaded profile view on the wing panel. Now sand it smoothly, after which you build in the dihedral.

This latter is done by drawing a line across the wing's center from leading to trailing edges and running a knife or razor along the line lightly, then bending the two halves upward at the tips.

INCIDENCE BLOCK

TO keep the wing in this position you must make an incidence block, which will take care of the dihedral and angle of incidence at the same time. The incidence block is shown at the top of the drawing. Its dimensions are 2" long by 1/2" square, as shown. To make it, take a piece of balsa this size and when cut to the proper length cut a slot at the center along its full length 1/8" wide by 1/4" deep.

Then sand a bevel on the top and bottom of the block, as shown in front view, and cement it to the top of wing with the slot facing upward, driving pins through the wing and into the block to hold them together while the cement dries.



Simple to make, easy to fly! Those are the features which will make this speedy stick model a decided favorite with you fans. Get out your balsa and go to it. And how about a snapshot of your completed Low-Wing for our With the Model Builders photo page?

A sturdy little job that can always be depended upon for a good, rousing round of flights! Every fellow wants a ship like that on tap in his model hangar—and here she is, the FLYING ACES Low-Wing. This craft is keen on performance, too, so you won't want to pass 'er up.

STICK AND TAIL

THE motor stick is made from a balsa strip 1/8" by 1/4" by 15". Cut it down, as shown in the side view, and taper the front and rear ends. Then sand the edges smoothly.

The elevator is made from 1/32" by 2" by 7" sheet stock, the rudder from 1/32" by 2" by 4". Lay the templates on sheets this size and cut them out. Then cement the rudder at the center line of the elevator, as shown.

WIRE PARTS

THE wire parts are made from No. 14 music wire. Cut each piece to the proper dimensions and bend as shown. Now place the landing gear and propeller shaft bearing at the front end of the motor stick, and after binding both of them on firmly, apply some cement to the joint. Next, punch, or drill, a small hole the diameter of No. 14 wire through the motor stick at the point where the rear rubber hook protrudes, force this hook in place, and apply cement.

Now cement the tail skid spring in place, as shown. When all this work has been completed, fasten the wing and tail group in place, slip the wheels on the axles, and place the propeller and rubber on the hooks.

The model is now ready for flight. And we wish you a whole hangar-full of luck!

From the Model Builder's Workbench

SOLID MODEL HINTS

HERE are some hints for solid model builders who like detail and realism on even very small models.

It is a real task to hollow out the cockpit on a model of 1/4" scale or smaller. I have found that this little job can be done easily and neatly in the following manner:

First cut a block from the fuselage in the place where the cockpit is to be, this is done as follows: make a vertical cut about 1/8" back of the cockpit and opening down to where the floor should be, next make another vertical cut where the front wall of the cockpit is to be, then make a cut horizontally along the

fuselage at the floor line.

These cuts should be made only with a razor blade, otherwise it will be hard to fill the cracks when the cockpit is cemented back into place. The block containing the cockpit can now be lifted out of the fuselage and hollowed out with a razor blade and finished with a piece of sand paper wrapped around a length of dowel. With this method I have made cockpits with walls less than 1/32" thick. After the cockpit is hollowed out to the desired thickness it should be painted a dark color (dark brown water colors give a soft finish that resembles leather).

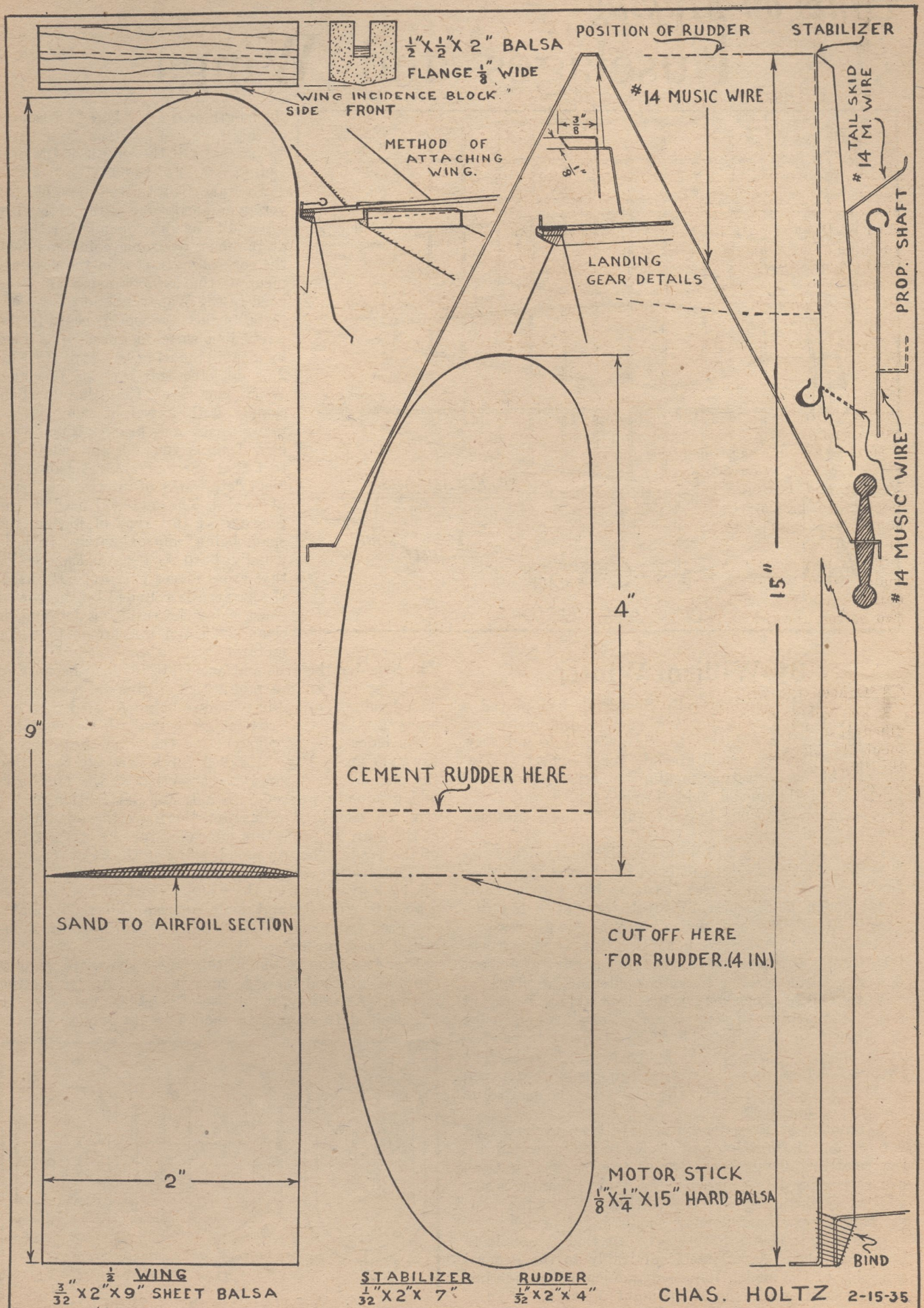
(Continued on page 62)

Attention, Model Builders!

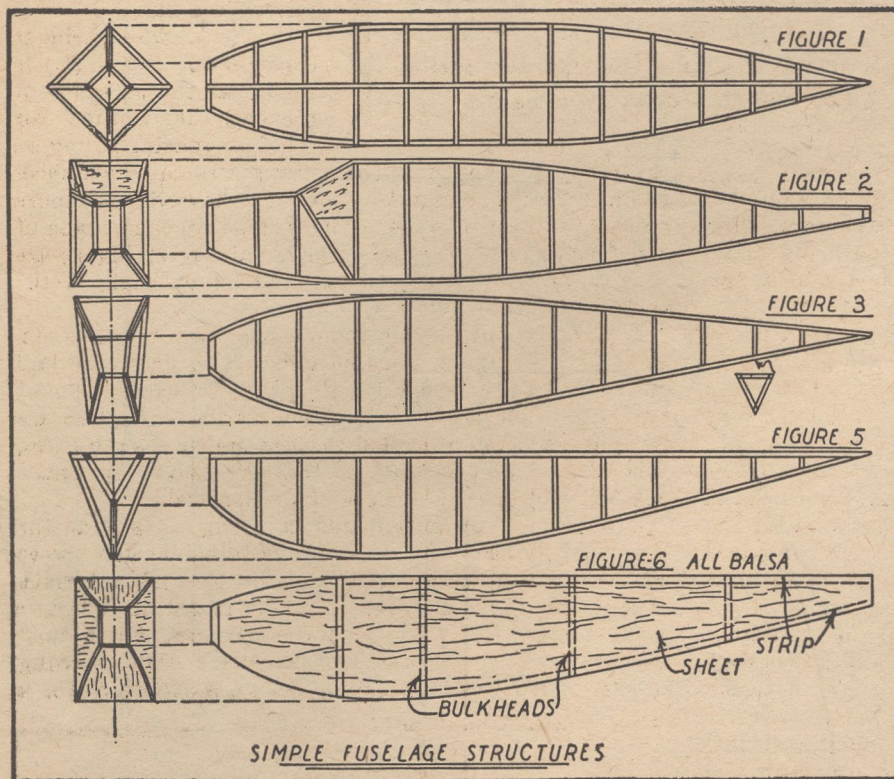
FLYING ACES wants plans and directions for building flying scale models of the latest modern planes. In order to be printed in this magazine, drawings must be done in India ink, and must fit a 7 x 10-inch page. Plans should not exceed six pages. Photographs of completed models must accompany plans. Send in your work, model builders, and get it printed! Payment is made for accepted plans.

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PLANS FOR THE FLYING ACES LOW-WING



Hints on Making Fuselages and Wings



By William Winter

JUST as the Indianapolis Speedway has played a great part as a proving ground and source of information valuable to the automobile industry, so has the modern model airplane meet come to be indispensable as a testing medium contributing toward progress in the model field. Experience, whether it's your own or some one else's, always furthers progress in structural design.

In this article, we will first describe the typical fuselage construction designs utilized by successful outdoor fuselage contestants. These fuselages have proved their worth under the fire of stiff competition; yet their structure is simplicity itself, and a study of the figures presented herewith will drive home this fact. In most cases, incidentally, it is possible to trace the ancestry of present day structural practice to some earlier noted model.

With a little experience, you will be able to work out original structures of your own. Best of all, a knowledge of these methods will enable you to convert three-view scale drawings into usable flying model layouts. The flying model, of course, requires a fine balance between what is necessary structurally and what is desired in the way of performance.

A number of fuselage types have been evolved that are not only interesting and simple to construct but are practical for all purposes. One or two types, it is true, are rather hard to construct, but their advantages are well worth the added effort. Selecting a few of the more striking types, the following should be of benefit:

In Fig. 1 is shown a fuselage unit that is simple to build and that adapts itself admirably to the general assembly of the model. Its aerodynamical advantage lies in the reduction of drag at the point of contact of fuselage and wing. The cross section is square throughout

the length of the fuselage. A fuselage of this type can be strongly built of $\frac{1}{8}$ " sq. balsa if the length of the unit ranges from 24" to 30".

To take full advantage of the aerodynamical value of the high wing job and to be able to apply the thrust at the most desirable point has been the controlling factor in the development of the outdoor cabin ships as used in the Wakefield and other contests. In fact, the world record in the particular class in question is held by a cabin model of this type. In Fig. 2 is depicted this type of fuselage. When you recall that these models comply with a weight rule and in many cases are heavier than your own designs you will appreciate the fact that their structure is of sufficient detail to be of interest and benefit to you. The material used in the fuselage of this type of model (the span being approximately 40") is usually hard $\frac{1}{8}$ " sq. balsa. Notice that cross pieces are profusely used. If the nose is rounded by the use of sheet balsa the resulting job will be clean. It is not uncommon to use a motorstick in these models. When

you consider the frequent accidents to them because of breaking rubber the motorstick begins to take on an added value. The cabin windows being covered with cellophane makes the free design as realistic as possible.

An older type of construction that came into general use (shown in Fig. 3) called for a fuselage that used the regular rectangular cross section at the front end and gradually worked into a triangular section at the rear. As seen in the diagram, there are three longerons at the rear. To build this job called for one of the tricks of the trade. The top and bottom of the fuselage were laid out rather than the two sides. This structure, by taking a great deal of the usual weight off the tail, was a boon to stability and made for clean lines. The material used was usually $\frac{1}{8}$ " sq. balsa. Note the great number of cross pieces.

Fig. 4. (at the bottom of this page) shows the various types of all-wood fuselage constructions. An interesting method (A) called for the use of one block out of which the desired fuselage was shaped to its outside dimen-

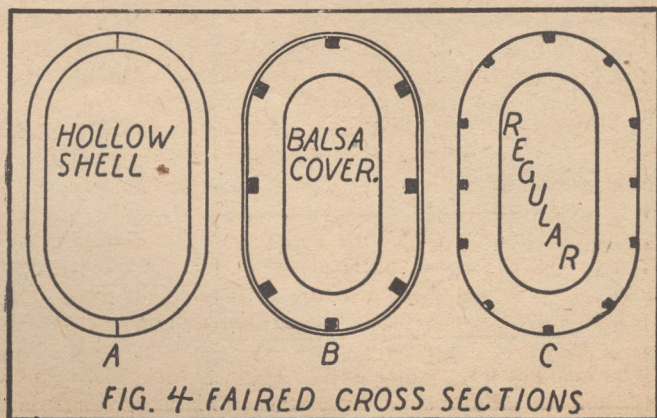


FIG. 4 FAIRED CROSS SECTIONS

sions. Once shaped the block was carefully cut in half. Each half was hollowed out, being checked as the work progressed by holding over a strong light. In this way, the shell could be worked down to a generally thin and even wall. The two finished halves were glued together again. In addition to great strength, the final appearance is all that could be desired.

The same fuselage could be built up (B) on a number of bulkheads employing a few heavy stringers. Thin sheet balsa, usually 1/32", is used as a covering material, being cut in agreement with predetermined patterns.

As shown in (C) of the same figure, this fuselage could be built by conventional methods. Still using bulkheads, a number of light stringers would attain clean form and support the paper covering to a satisfactory degree.

The bulkheads mentioned in both (B) and (C) are generally a firm grade of 1/16" sheet balsa. For the balsa covered type (B) the few stringers used—we shall say eight to illustrate—would be about 3/32" sq. The paper covered type (C) might call for sixteen or more light stringers 1/16" sq. of a hard grade.

Fig. 5 (see top of our first page again) shows a fuselage type commonly used years ago. Since it serves very few advantages for contest use, naturally it is not seen often in the present day. We are mentioning it, however, because its simplicity of construction makes it desirable for original designs, having general flight standards and structural strength as the goal. Its use is often seen in kits of simple flying models. However, the fuselage of this type is ideal when built of three sheet balsa sides mounted on a few heavy bulkheads. For a model of approximately 20" span, the material used would be 1/32" sheet balsa. The bulkheads would serve the purpose well if cut from 3/32" sheet. A larger model of 24" to 30" span would require the substitution of 1/16" sheet for the 1/32" used on the smaller size. The same type fuselage when built up in the usual manner would have the top (if the top were the base of the triangular cross section) laid out on the board. Before removing the frame thus laid out the entire fuselage is built up.

FIG. 6 displays the type of fuselage everyone is familiar with. It is illustrated here as an all wood construction. With sheet balsa sides, it is reinforced at the edges by strip balsa, as well as sheet top and bottom.

Although the construction of flying scale models is probably most common because of their great popularity, a few wrinkles have been brewed of late that go a long way in the simplification of the structure. In Fig. 7 is shown (A) a type of former cross section, (B) a keel construction, (C) master stringer construction, and (D) a construction that is unique but practical in the accomplishment of the construction of intricate fuselages.

In Fig. 7 (A) the example of former construction offered is practiced commercially to some extent. The formers, or bulkheads, are cut to shape as usual. They are cut to a size to permit their fitting a small square fuselage frame. The square opening in each bulkhead corresponds in size to the fuselage station at which the bulkhead is to be fitted. Needless to say, the internal fuselage must be accurate or the results will be aggravating.

The keel construction Fig. 7 (B) is an aid to the construction of bulkheaded fuselages. The keel itself is

Do you know how to convert three-view scale drawings into workable flying model layouts? You will, once you know the fundamentals of model fuselage and wing construction. Moreover, you will then be well on your way toward designing and building models of your own. If that's what you're aiming for, you'll find that this article will blaze the way. It's packed full of just the "dope" you want.

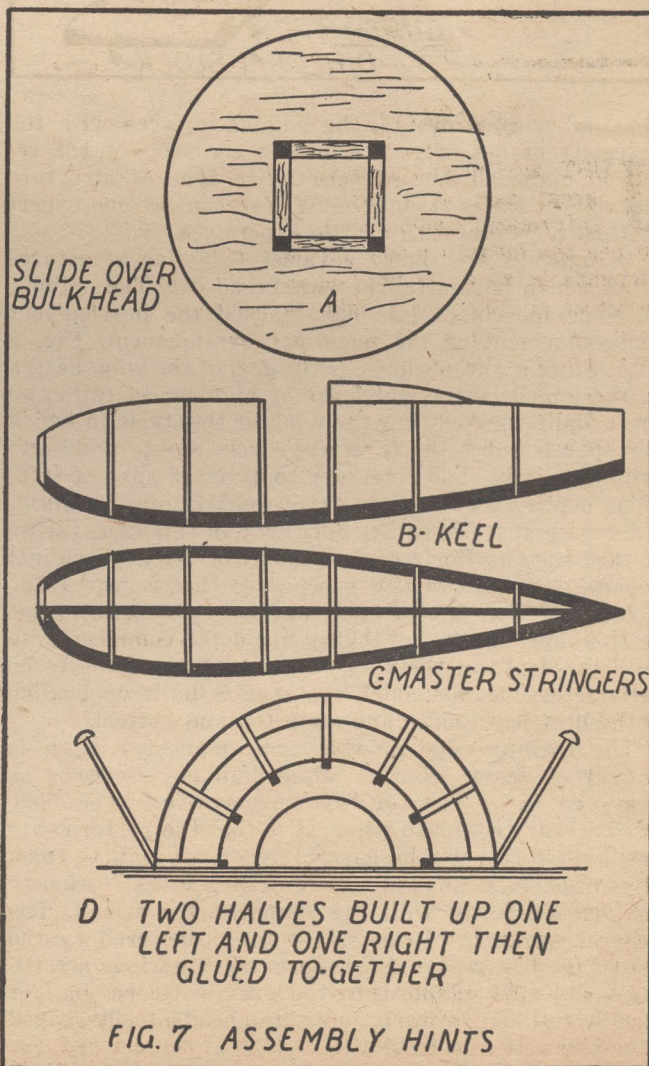
cut from 1/16" sheet balsa to a maximum depth of 1/4" to 3/8". As expected the bulkheads are glued in position on the keel. This principle, borrowed from boat construction, has proved popular.

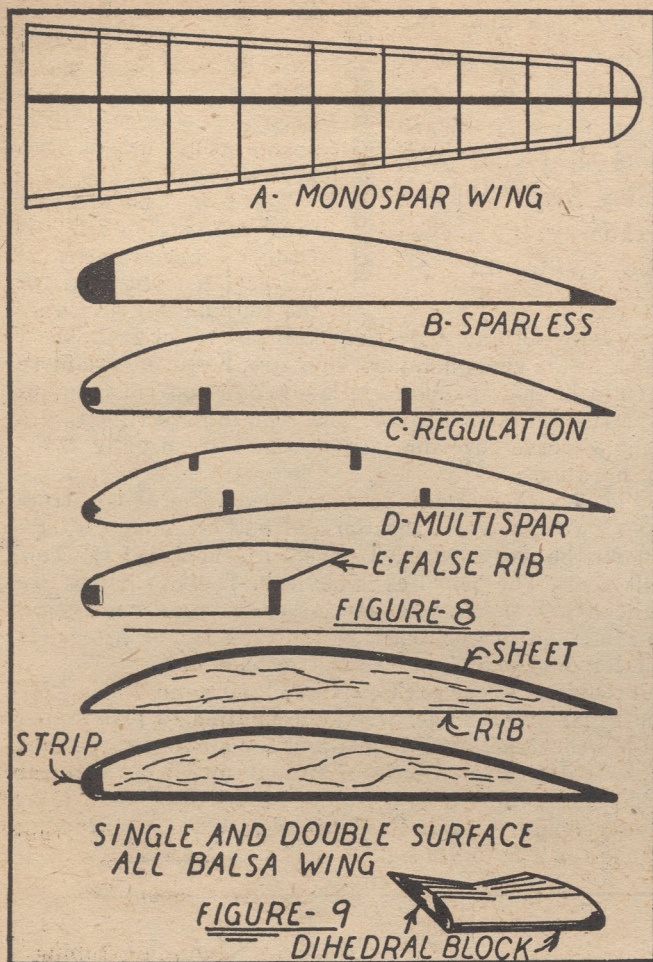
The master stringer construction Fig. 7 (C) is really a development of the keel construction, for the four master stringers

are really nothing more than keel pieces cut from sheet balsa in the same manner. They are, however, far more certain in their purpose. It is obvious that this type of construction is fool proof. The remaining stringers are light to serve covering purposes and are usually 1/16" sq. hard balsa.

Fig. 7 (D) also is a recommended form of construction. Two stringers, the top and bottom ones, are laid out on the work bench. To them are attached the half bulkheads. The principle is obvious. The two halves are built up and then cemented together. Be sure when using this method of construction that the halves are made one left and one right, never two identical.

Trouble is never anticipated in laying out a wing for the usual flying model when the obtainable plan shows all the constructional details and the sizes of materials. If it is desirable to build a similar model on a larger scale, more value is laid on the experience. As in most cases, should it be desired to convert a scale drawing to use for a flying model or to design a structure for a





wing of original design, the builder is faced with the necessity of not only determining the sizes of the required materials but of selecting a type of structure suitable to the particular need. You can become expert at this, however, with a little experience.

In figure 8 are shown a variety of wing structures all of which have attained widespread use. The outdoor fuselage models of late have caused the development and refinement of the monospar arrangement, Fig. 8 (A). Since great efficiency is the goal of the wing design in these models, the wings are of high aspect ratio and are usually tapered. For the wing of this type, in which the spar is subjected to severe stress due to wind and ordinary loads, it is necessary to design a spar of sufficient depth at the center to prevent failure in flight. This main spar, or rather only spar in this case, tapers toward the tip. For a contest model or for any original design, common practice has proved that a spar $1/16'' \times 1/2''$, $1/16'' \times 3/8''$, or some similar rectangular cross section tapering toward the tip to a depth commensurate with the depth of the wing section and the span, to be satisfactory. Occasionally, the spar is built up boxlike with sheet balsa sides and strip top and bottom.

The trailing edge of this same monospar wing is usually of heavy selection. Many builders use wood as heavy as $1/8'' \times 3/8''$ for this purpose. Once you have tried a heavy edge you will realize that the performance is enhanced rather than harmed by a large trailing edge. It is possible to shape an edge of this cross section to conform perfectly with the shape of the airfoil. The general workmanship at this point is bettered by the use of the heavy edge. Since spraying the wings according to accepted standards by the less experienced builder usually results in a warped unit, the heavy, finely shaped edge will prove desirable.

In Fig. 8 (B) is shown a wing assembly that is obvi-

ously simplicity itself. The heavy leading and trailing edges eliminate the use of the spars. The leading edge must be carefully shaped to conform with the wing section. As desirable as this arrangement appears it has a drawback that balances its preferences. As might be expected, this construction offers little resistance to twisting when covered. With reasonable care in construction trouble should not develop.

In (C) of Fig. 8 is shown the regulation construction which of course requires no additional remarks.

An arrangement using a number of spars spaced on both upper and lower surfaces of the wing is commonly used. Fig. 8 (D) explains the type sufficiently so that we may dispense with further explanation.

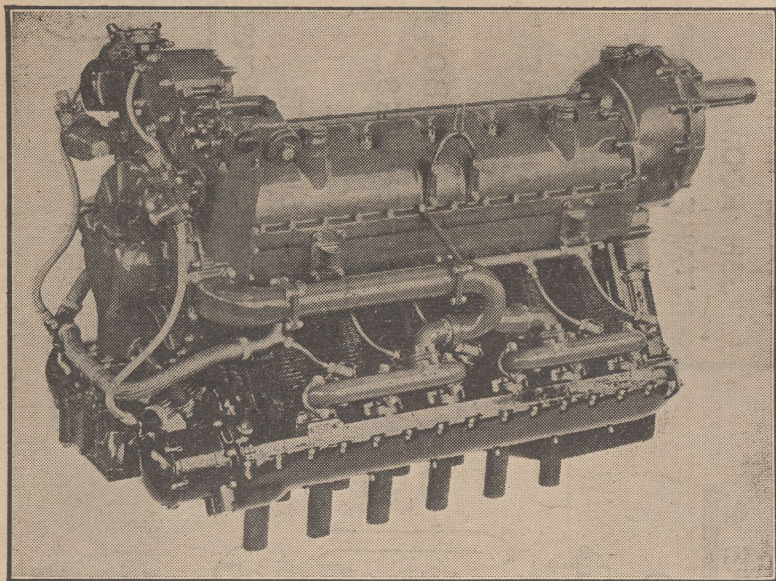
Fig. 8 (E) details an arrangement that uses false or half ribs in its construction. The more ribs that are used in the wing, the better will the wing section be adhered to. Paper naturally sags between the ribs, resulting in a departure from the desired rib section. As there is a limit due to weight and practicability the wing cannot be burdened with a multitude of ribs. Since the great importance of the rib lies in its accurate contour near the leading edge, a medium is struck by the use of false ribs. These false ribs extend only a part of the way toward the trailing edge and serve to preserve the contour of the wing near the leading edge. You have probably noticed that many of your models in the past showed a tendency for the paper to pull in tightly between the ribs near the leading edge thereby impairing the efficiency. The leading edge is often covered with thin sheet balsa for the same reason.

MANY builders favor the all balsa type of model. It cannot be denied that the all balsa wing is the most efficient from the flight standpoint. If the structure itself is handled carefully, the weight increase will be fully compensated for by the improved performance. In Fig. 9 are pictured both a single and double surface wing. The sheet balsa used for the average wing, of approximately 24" span, is $1/32''$ thick. The sheet balsa is simply bent over a few heavy ribs. If the dihedral is to start in the center of this single-surface, all-balsa wing, a block is cut, as shown in Fig. 9, to support both sides of the wing at the desired angle. The double surface wing in the same Figure has, as its name implies, both a top and bottom sheet balsa surface. The leading edge to which both surfaces are attached is a square strip. The completed leading edge is sanded round so that its actual assembly is not easy to discern when the wing is completed.

The procedure is the key to this type of structure. The bottom surface is laid on the bench. The few heavy ribs, either $3/16''$ or $1/8''$ in thickness, are cemented in place on the lower sheet. When dry, the upper surface is bent in place, the whole unit being pinned to the bench until dry. If a strip leading edge is to be employed, its incorporation in the structure will not be difficult. As shown in Fig. 9, the edge is countersunk. Dihedral makes it necessary to construct the wing in two pieces, joining them together by means of a center section block. This block, as previously mentioned, is cambered and slanted to meet its structural requirements. It forms a very neat unit.

Having originally set out on a discussion of the constructional methods employed in fabricating model fuselages and wings it is not easy to refrain from wandering over the subject in general. Though the illustrations presented and their comments probably reveal little that is new to some of you it is hoped that the majority who do not have opportunity to see models of the above types, or to otherwise become acquainted with current practices, will find in this article several beneficial ideas.

A Ranger Engine Model



The real Ranger V-770—an achievement in compact power! This "shot" of the great 12-cylinder inverted engine brings out a wealth of detail that will guide you in your model workmanship. By checking this photo with the drawings on the next page you'll quickly be able to identify all parts of this straight-geared motor.

By Joe F. Battaglia

YOU fellows came through with a mighty gratifying response when we presented the article, "Make a Model 'Cyclone' Engine," in the April issue of FLYING ACES. So here we are back again for a return engagement in the scale model engine field.

This time our prototype is the 420-h.p. Ranger V-770 SG engine, a 12-cylinder inverted power plant. (The "V" means Vee type, and "SG" means straight geared.) It's turned out by the Ranger Engineering Corp., of Farmingdale, L. I., N. Y., by whose courtesy the accompanying photos and drawings are presented.

First off, we want you to study the drawings and photos. You will note immediately that various letters are used in the three-view drawing of the Ranger (see next page) to designate the important parts of the power plant. Then right alongside you will see our "Construction Index." By checking each letter in this index you'll learn to distinguish the different units of the engine.

MATERIALS NEEDED

AND now, here are the various materials which you will need to make the motor parts, each designated by the same letters as used in the three-view drawing and construction index:

A—11/32" Birch dowl, Fins of Bristol board, or other stiff material.

B—Balsa, Pine, or Birch wood.

C—Balsa, Pine or Birch wood.

D—Balsa, Pine, or Birch wood.

E—Balsa, Pine, or Birch wood.

F—Balsa, Pine, or Birch wood.

Are you looking for something in the model line that's different? If you are, we've got it for you right here—a striking replica of the V-770, the Ranger firm's noted 12-cylinder inverted motor. This model makes a mighty snappy display piece. But whether you build it or not, you'll want to read the article—for it identifies all the engine parts for you, and every air fan should "know" his power plants.

★ ★ ★

G—Balsa, Pine, or Birch wood.

H—Balsa, Pine, or Birch wood.

I—Soft low brass tubing, or 5/32" diameter reed.

J—Birch dowl 1/8" diameter.

K—Birch dowl 1/16" diameter.

L—Birch or Pine (square strip).

M—Birch dowl 3/16" diameter.

N—Aluminum tubing or 3/32" diameter reed.

O—Small aluminum bolts or Birch dowl for crank-case bolts.

P—Small aluminum bolts or Birch dowl.

Q—Birch dowl.

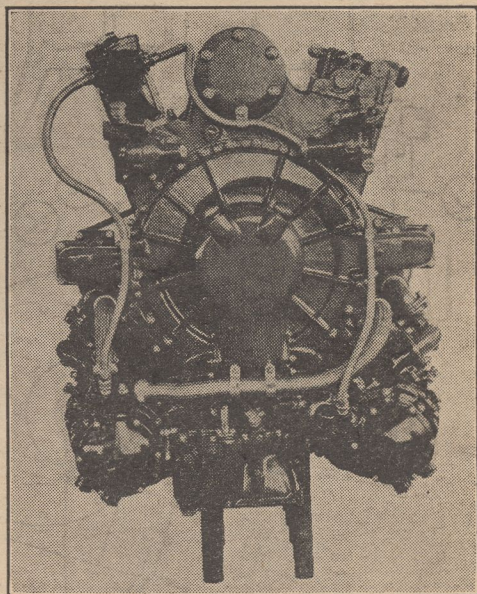
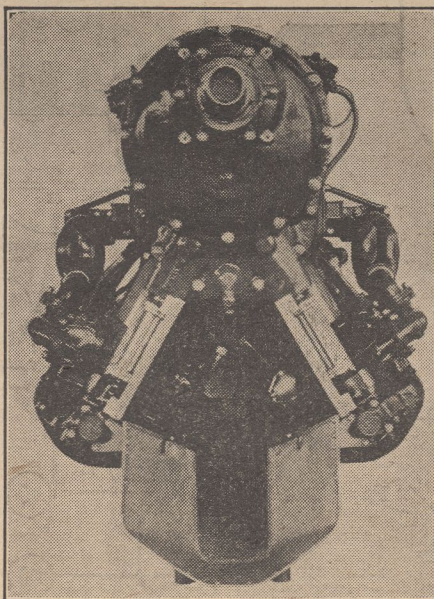
R—Birch dowl or 1/4" diameter aluminum tubing.

S—Tubing, rod, or wood dowl.

T—Soft low brass tubing or 5/32" diameter reed.

After you have all the engine parts well in mind and have gathered your materials, as listed above, you are ready to start work. Templates of all the main parts come first. These templates or patterns can be made from any stiff paper, each being cut out either with shears or with a razor blade.

(Continued on page 92)



And here we have the front view (left) and the rear view (right) of this popular power plant. These two photos, together with the side view presented at the top of the page, should gratify all you modelers who are maniacs for making exact reproductions. Note the beautiful flight-line symmetry of the Ranger. This explains why it is so well adapted for cowling streamlining.

CONSTRUCTION INDEX.

- A- CYLINDERS—MAKE 12.
- B- CYLINDER HEADS.
- C-REDUCTION GEAR BOX.
- D-OIL PUMP& INSTRUMENT-CON
- E-STARTER.
- F-MAGNETO.
- G-GUN DRIVE.
- H-CARBURETOR.
- I- INTAKE MANIFOLD.
- J- PUSH ROD.
- K-INTAKE VALVE BRACKET.
- L-MOUNTING BRACKETS.
- M-BREATHER CAPS.
- N-IGNITION WIRE.
- O-CRANKCASE.
- P-CRANK "END" BOLTS.
- Q-DISTRIBUTERS.
- R-CRANKCASE.
- S-PROP. SHAFT.
- T-EXHAUST STACKS.

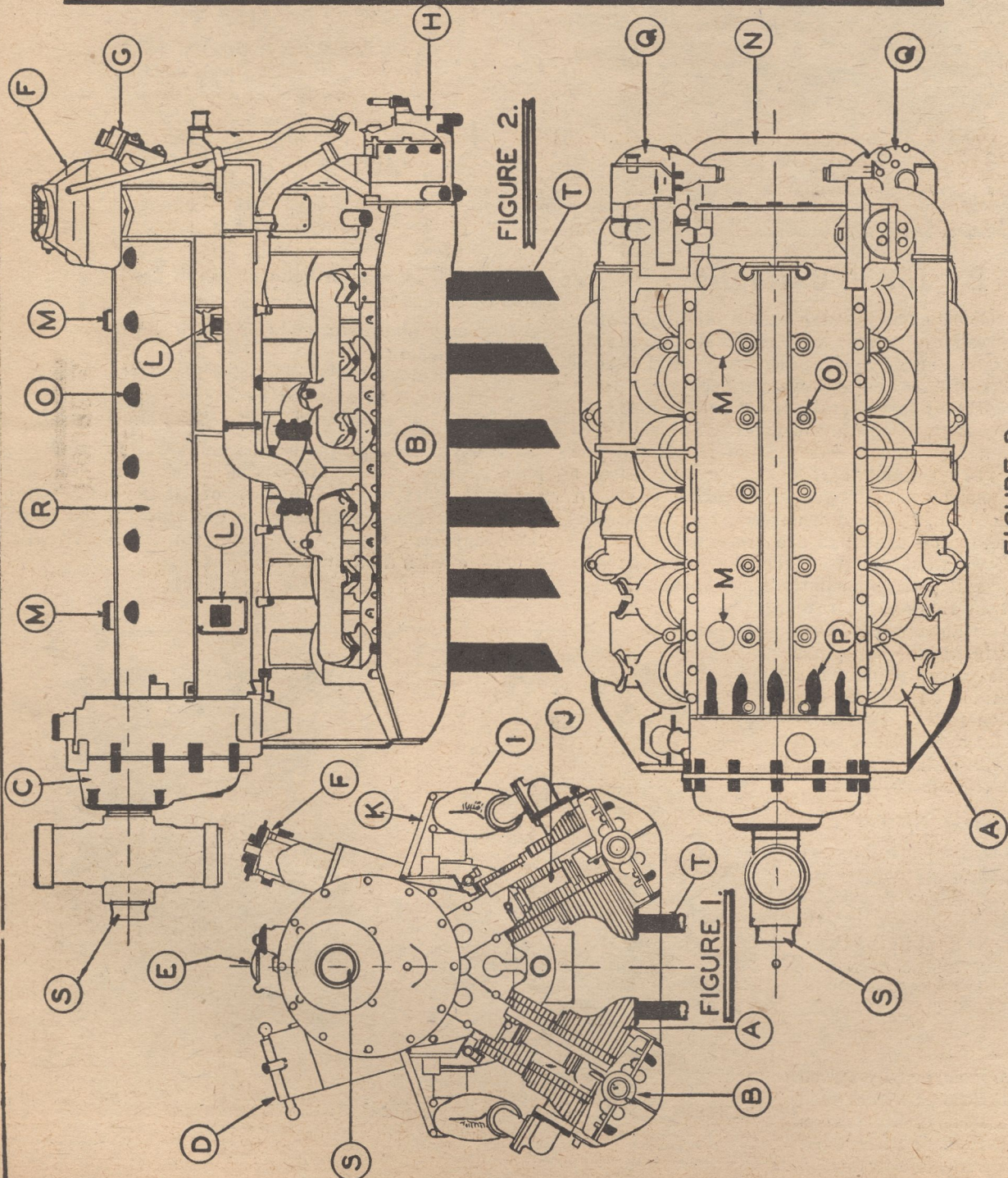


FIGURE 3.

THIS VIEW OF CYLINDER TO
FACE FRONT OF ENGINE.

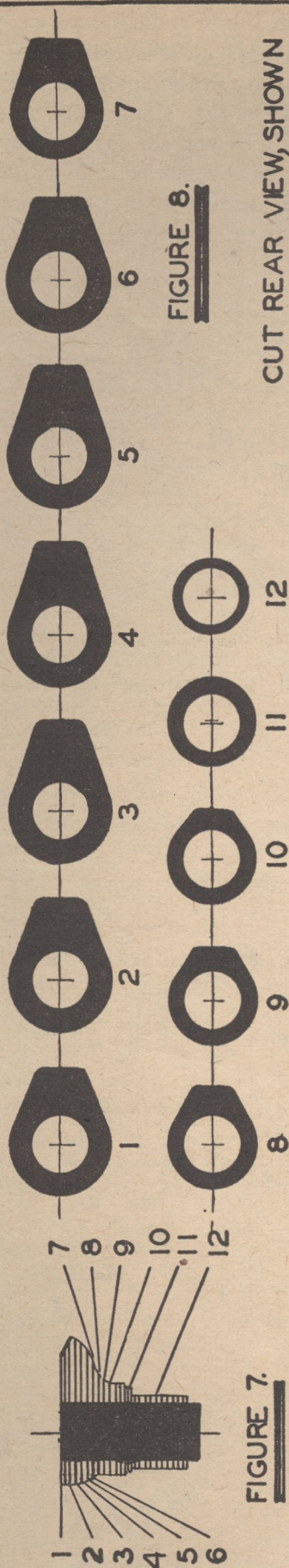


FIGURE 7.

11/32 BIRCH DOWL

THIS VIEW OF CYLINDER
TO FACE SIDE OF ENGINE.

'CYLINDER FIN' TEMPLATES

NOTE:- SHADED PARTS BELOW REPRESENT
CRANKCASE:-
BROKEN LINES SHOW IGNITION SYSTEM
OIL PUMPS & REDUCTION GEAR CASING.

CUT REAR VIEW, SHOWN
BELOW FROM SOLID
PIECE OF WOOD.

FIGURE 8.

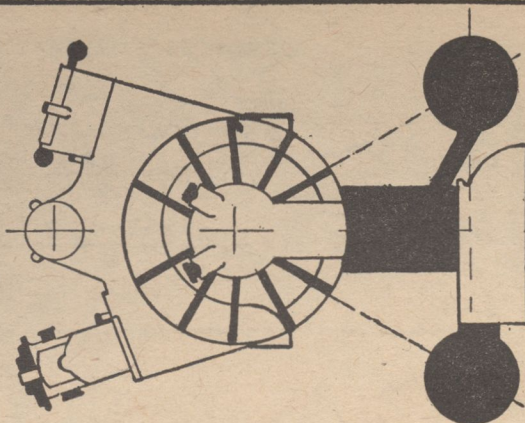
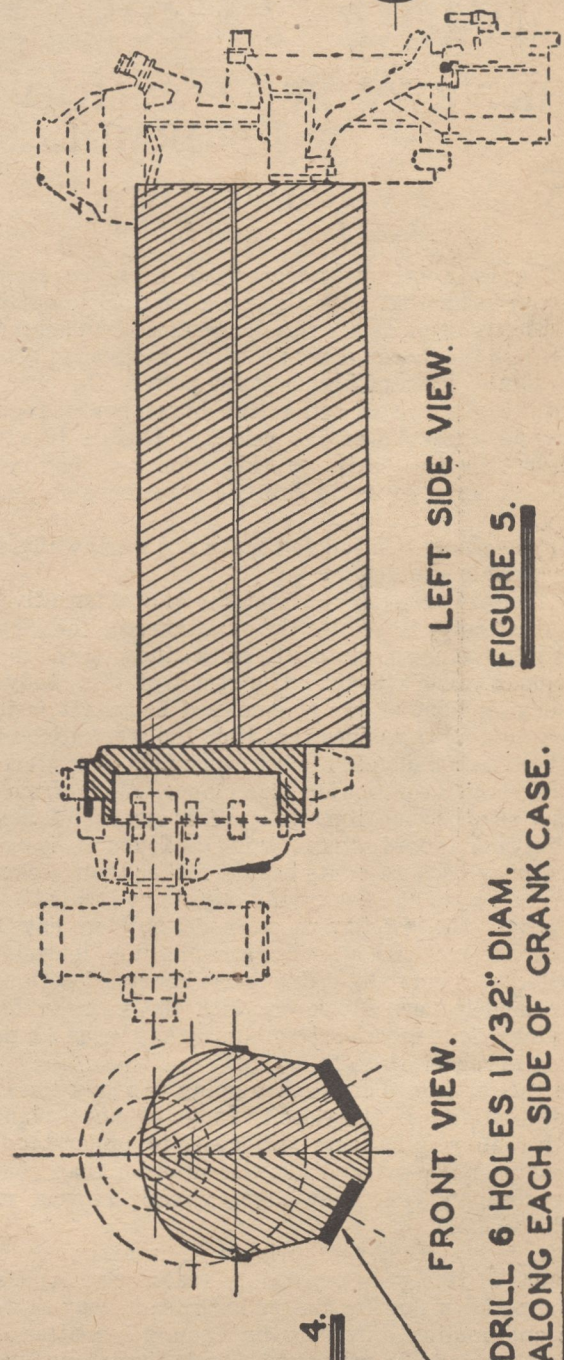


FIGURE 6.



LEFT SIDE VIEW.

FIGURE 5.

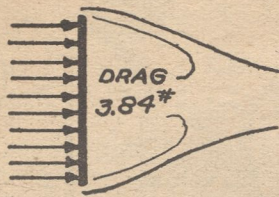
FRONT VIEW.

DRILL 6 HOLES 11/32" DIAM.
ALONG EACH SIDE OF CRANK CASE.

FIGURE 4.



$$\text{DRAG} = \text{COEFF} \times \text{AREA} \times \text{VELOCITY}^2$$



SUB:

$$3.84 = \text{COEFF} \times 12 \times 10^2$$

$$\text{COEFF} = \frac{3.84}{12 \times 100}$$

$$\text{COEFF} = .0032$$

FIG 1

With the introduction of gas-powered craft, scientific streamlining has become decidedly important in the model field. In this simply-told article, Mr. Zier tells you the inside story of this fascinating subject. No matter what kind of models you build, you'll get a lot of profit out of this information.

Flying Aces Model Laboratory

THE NEW NEED FOR MODEL STREAMLINING—COEFFICIENT FORMULAE AND THEIR USE

By Avrum Zier

Model Department Editor

IT quickly became apparent to early aeronautical engineers that unless it were possible to cut down the tremendous air resistance faced by planes traveling at high speeds it would be impractical to attempt to design engines of higher horse power. This was substantiated by the fact that the horse power required varies as the cube of the velocity; that is to say, at high speeds the early aircraft probably required an added 80 horse power to gain 10 more miles an hour in speed.

Any engineer will tell you that's not worthwhile, from an economic standpoint.

It then became obvious that the only alternative left was to attempt to reduce the resistance of the airplane itself. So the engineers set to work studying the flow of air about various bodies. The result of this study was the development of the streamlined body. (It is interesting to note that since that time the streamlined body has become common in almost every field of engineering where speed is of major importance. Aside from this it has also become something of a symbol of modern civilization. Indeed, streamlining is found in many objects today because of its beauty rather than because it is necessary to the use of the objects so treated.)

Up until the last few years, model builders have been little concerned with *scientific* streamlining, inasmuch as its effect was very slight due to the low speed with which their models flew. However, with the introduction of gasoline driven models, streamlining has become a major factor in model aircraft design.

In this article, then, we are going to study the effect of streamlining in the velocity range of model planes in order than you builders will come to understand the salient part it plays and likewise in order than you will learn to apply your knowledge correctly in your model workmanship.

Air, as we usually experience it, is extremely calm. Because of this, we often fail to realize that it actually is composed of flowing matter in the same way as water. The outstanding difference is that air is matter in an invisible state. The weight of a cubic foot of air is about .08 pounds and the pressure exerted by the air upon the earth's surface is about 14.7 pounds per square inch.

To visualize the air and its action on a body, let us, for the sake of convenience, consider air as being composed of pellets or small balls, each of which may be considered an enlarged molecular member. If now we

visualize a flat plate being passed face-foremost through the air at a certain velocity it can readily be seen that a certain number of the pellets would strike against the plate, inducing a resistance, or *drag* as it is generally termed. (See Fig. 1.)

If we now assume that a flat plate of twice the area is being passed through the air, the number of pellets now striking against the plate would be twice the number and hence twice the resistance would be set up. From this, it follows that the resistance of a body is directly proportional to its area.

WE are all familiar with the fact that the heavier a body is the more resistance it offers upon striking any object. For example, if we take a piece of lead

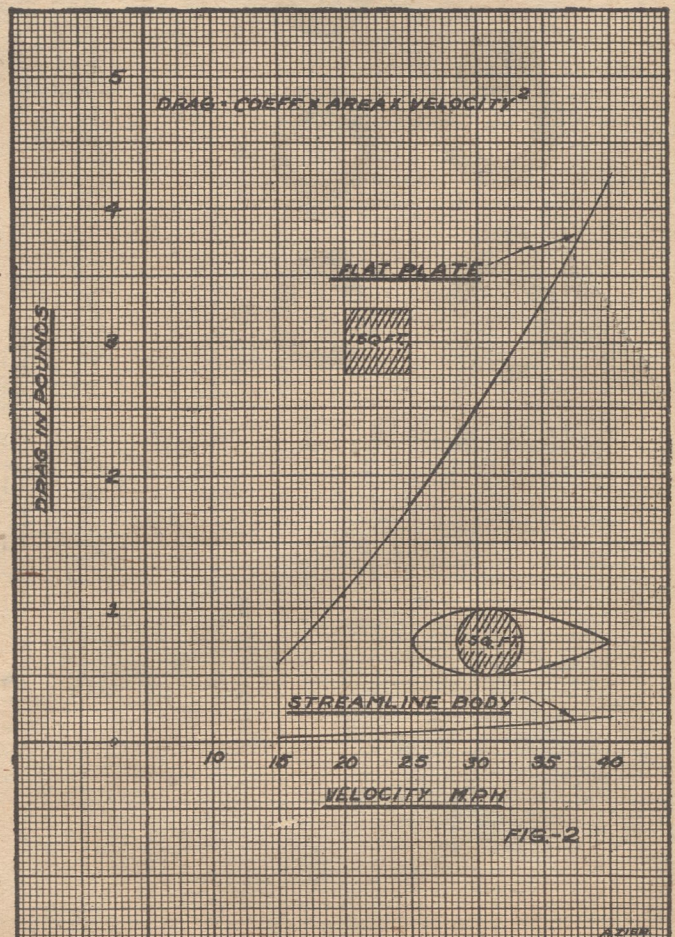


FIG-2

of a certain bulk and drop it from a height onto a scale, the scale would register a reading in excess of the weight of the lead—due to the velocity with which it struck. Now if we take a piece of wood of the same bulk and likewise drop it on the scale from the same height the reading would again be in excess to the weight of the wood—but it would be considerably less than the reading obtained with the lead. As you are no doubt aware, the difference is due to the fact that the lead weighs more than the wood, or, as we would generally say, the lead has a greater density than the wood. From this, it follows that the resistance of a moving body is also directly proportional to its density.

As we ascend into the atmosphere the density of the air decreases, so that it would be logical to assume that the resistance would be less than that experienced in the air immediately adjacent to the earth's surface. Coming back to our first example, we can now consider the air as being composed of less pellets per cubic foot the higher we ascend. With our density decreased it can be seen that the number of pellets that would strike our flat plate would be less per unit area, and hence our resistance would be less.

In both of our previous cases we worked on the assumption that our velocity remained a constant value. Let us now study the effect of the air on a body moving at various velocities. If we again consider the plate in motion through the air at a given velocity, we can readily see that each pellet will strike the plate with a certain force. If we now increase our velocity the force will likewise increase, also the number of pellets which strike the plate in each unit of time would be increased. From these facts, we learn that the resistance varies as the square of the velocity. (This fact, admittedly rather hard to visualize, has been shown to be true by experiments.)

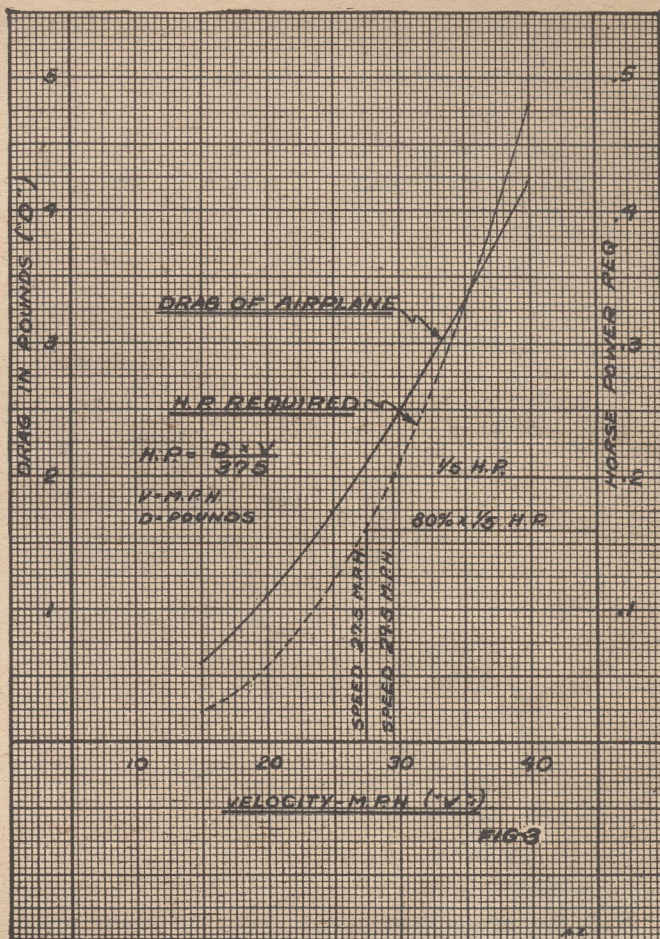
Thus far, we have shown that the resistance of any body in motion through the atmosphere is proportional to the area, times the density, times the square of the velocity. While these factors actually determine the resistance of a moving body, it has been found by experiments, that it is necessary to introduce a coefficient value, which, when multiplied in the formula, gives the correct value of the drag.

The coefficient is determined in a rather simple way. The body to be tested is placed in a wind tunnel and the amount of drag produced by it at a certain speed is then determined. Since we know the factors which enter into the determination of the resistance we have only to substitute and solve for the coefficient value.

To illustrate how this is actually done, let us take, for example, a flat plate of 12 sq. ft. in cross sectional area. Placing the plate in a tunnel, we find that at 10 miles per hour the tunnel instruments record a resistance of 3.84 pounds (see Figure 1). Applying the resistance formula, you will notice that the only unknown is the coefficient. Solving for its value, as shown in the figure, we obtain .0032. This coefficient is only adaptable under standard air density. If our test was conducted under a much lesser density it would be quite obvious that our drag coefficient would be smaller. Once we have determined the coefficient it is then possible to determine the resistance of any size plate at any speed by merely substituting the values of area and velocity.

The coefficient .0032 of a flat plate applies only to areas above 12 square feet. It has been found that below this area the coefficients must be altered to give the proper amount of resistance. A series of tests made by Eiffel on areas below 12 square feet have resulted in the development of a correction chart, which, when multiplied by the coefficient .0032, will give the corrected coefficient for the corresponding area.

In much the same way as followed in our flat plate



experiment, coefficients are determined for other types of sections, such as fuselage, wheels, struts, etc. The coefficient of an elliptical-shaped fuselage having an in-line engine has been found to be .00025. In determining the resistance of such a fuselage we use the cross sectional area in square feet (the area as we see it from the front) and multiply it by the coefficient and by the velocity squared in miles per hour to obtain the resistance.

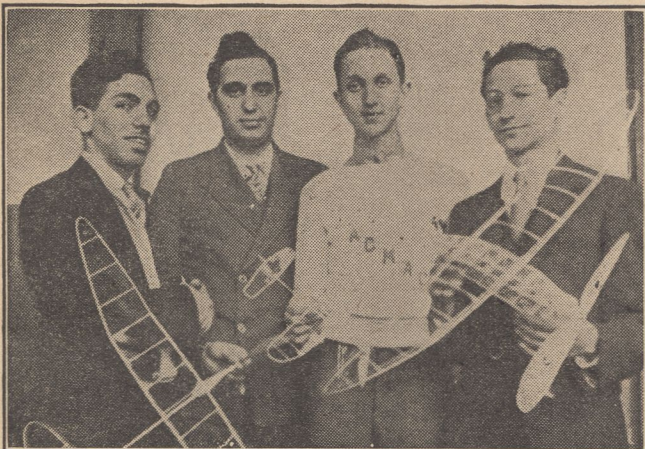
IN Figure 2 is plotted two curves, one of which is that of a streamline section having a maximum thickness of 1/3 its length and the other a flat plate of the same cross-sectional area (1 square foot). The curves themselves tell the complete story. They show how important streamlining becomes at high speeds. At low speeds—say 15 miles per hour—the resistance is comparatively small as compared to the resistance at 40 miles per hour, where the resistance of the streamline section is about 1/20 that of the flat plate.

In the same way as in Figure 2 we can compute the resistance of any part of the airplane, provided we know the drag coefficient. In the determination of wing drag, which is part of the airplane resistance, we use a different formula—one based upon N.A.C.A. tests. This formula, however, is built on the same basis, except that it incorporates dynamic pressure, which is the density times the velocity squared (in feet per second, in this case) divided by two. The resistance of a wing then becomes the drag coefficient, times the dynamic pressure, times the area in square feet.

Having determined the resistance of the airplane, it is now possible to determine its top speed. This is done as follows: First, the total resistance of the plane is plotted, as was done in Figure 2 with the streamline body. This chart then will give us the drag of the airplane at any speed. The next step is to determine the

(Continued on page 88)

Bruno Marchi—the lad on the extreme left—wears a happy smile because that sleek ship he holds took first place in the Stick Model class at the Eastern States Indoor Model Plane Championships and thereby won him the brilliant FLYING ACES Trophy. With him (left to right) are Nathan Polk, director of the meet; Merrill Malley, Baby R.O.G. winner; and Ervin Leshner, who captured the Cabin Craft Event.



Marchi Wins F. A. C. Trophy at Eastern States Meet

Many Subscriptions Awarded

E. A. C. Results

Coming Contests Announced

News of the Model Meets

SOMEWHAT handicapped by adverse air conditions, though flying their craft in one of the biggest buildings in the East—the huge Lakehurst, N. J., airship hangar—model builders from as far north as Canada and as far south as Washington, D. C., competed for the Eastern States Indoor Model Plane Championship on April 25th. In spite of the fact that both the dirigible *Los Angeles* and a blimp were in the hangar, the flying was, however, better than that usually contended with in the city armories commonly used for such meets.

Bruno Marchi, of Medford, Mass., turned in the best performance of the day—and that won him the beautiful FLYING ACES Award, a striking silver trophy which bore a neat airplane replica at the top of the shaft and which was finely engraved with the name and notations of the event. Bruno became possessor of the FLYING ACES Award when his well-designed model chalked up a mark of 20 minutes 6 seconds to capture first place honors in the Stick Model Event. Second and third places in this class were taken by Mayhew Webster and William Wert, both of Philadelphia.

Ervin Leshner, of Philadelphia, won the Cabin Craft Event with an effort of 11 minutes 42 2/5 seconds. Close upon his heels was Herbert Greenberg, of New Jersey, with a flight of 11 minutes 21 3/5 seconds.

In the Baby R.O.G. Event, Merrill Malley, of Atlantic City, came near his own National Record of 10 minutes 56 seconds, missing this excellent mark by only 14 1/5 seconds. Mahew Webster and William Luts, both of Philadelphia, placed second and third, their times being 9 minutes 43 1/5 seconds and 9 minutes 39 2/5 seconds, respectively.

Prizes consisting of silver trophies, gold and bronze medals, and magazine subscriptions were awarded those placing first to thirteenth in each event. The following fourth place winners

were awarded one-year subscriptions to FLYING ACES: Alvin Gaskrill, of Atlantic City; Charles Heimtz, of Philadelphia; and Torrey Capo, of Quincy, Massachusetts.

The Meet was sponsored by Polk's Model Craft Hobbies, Inc., of New York City, and the newly-organized Metropolitan-Model League. Nathan Polk, of the former, directed the activities. The contest was sanctioned by the National Aeronautics Association and was conducted according to their rules and regulations.

E. A. C. CONTEST RESULTS

THE Annual Outdoor Contest of the Eastern Aero Club was held in Central Park, New York City, during the early part of May. There were approximately 150 entries and a good turn-out of some 300 spectators despite the rain which marred the meet. Activities were under the direction of August Ruggeri.

Morton Kauffman, Brooklyn, took the glider event with a time of 1 minute 36 seconds; Jack Silverstein, also of Brooklyn, won the stick model contest with a flight of 2 minutes 17 seconds; and Bernard Richman captured the cabin contest with a time of 1 minute 32 3/5

Winners of second places in the three events received one-year subscriptions to FLYING ACES. These prizes went to Lawrence Low, of New York City, who

made 1 minute 8 seconds with a balsa glider; Sol Roskin, of Brooklyn, N. Y., who chalked up 2 minutes 17 seconds in the stick model event; and William Hadden, of Woodside, L. I., who did 1 minute 30 seconds in the cabin event.

DENVER PLANS CONTEST

DENVER'S first gasoline-powered model airplane meet will be held on July 3. This contest is being sponsored by the Denver Hi-Hat Aviation Club under the leadership of Tom Harch, club director. The events will be part of the air races and Gordon Bennett Balloon Races scheduled for the same day.

MEET AT ROCHESTER

THE National Aero Reserve will hold an outdoor contest at Rochester, N. Y., on July 11. Five events will be featured: An All-balsa Glider event, Stick Model event, Cabin Endurance model event, Flying Scale model event, and Solid Replica event.

The list of prizes includes a Brown Jr. gasoline engine together with a kit for building an Allen Turner Special gas job, an Imp gas engine, 50-inch Taylor Cub kits, aviation books, and ten flights in a tri-motored Stinson.

Model builders in the vicinity of Rochester may secure full details concerning the contest by writing to the *Rochester Times-Union*, the city newspaper.

From the Model Builder's Workbench

(Continued from page 52)

The equipment of the cockpit depends upon the detail the model builder wishes to put into the model. The seat can be made in two ways: The first, for seat-pack 'chutes, should be made of heavy bond paper cut and cemented to form a hollow seat. The second way is to cut the seat bottom from 1/32" sheet balsa

and the back from bond paper. Bamboo splinters are used for legs in both.

The control stick can be made of a piece of piano wire, pin, or aluminum tubing. For the instrument board, cut a piece of 1/64" sheet balsa to the required size and shape and cement onto it a piece of cellophane. Then paint with

black india ink. When the ink is dry use a sharp pointed instrument and scrape the small circles in the ink. Finish the panel with a single coat of clear dope.

When all parts are finished and installed, cement-in the hollowed out block, fill the cracks with wood filler, and sand down smooth.

To give the wings the appearance of having ribs dope threads to the wings. To do this quickly and evenly procure a piece of balsa a little longer than the span and a little wider than the chord of the wing and about an inch thick. Place the wing on the block and wrap the whole thing with thread spaced the width necessary for your particular model.

When this has been done, give the wing a coat of dope to fasten the threads to the wing. Cut the thread about 1/64" forward from the trailing edge of the wing, and back about 1/3 of the chord of the wing from the leading edge. The lower side of the wing is done in the same manner. After the threads are on the wings give them about three or four coats of clear dope, this work should be done with thin dope brushed on.

Do not attempt to sand the wings or you will have lots of grief. Follow the doping with tissue carefully doped on without wrinkles. Proceed to finish the wing with the correct color. A little elastic starch of the kind used for starching shirts added to the dope gives a very smooth shiny surface.

Corrugated surfaces may be made with the use of thread or by running a very fine comb across the balsa. *Do not corrugate surfaces on models of 1/4" scale or smaller.* These corrugations scaled down would be invisible. The same applies on flying, landing, and brace wires. If you must put the wires on for detail, pull a hair or two out of your head; these are about as fine as anything the average model builder would have on hand.

Small colored beads make good navigation lights, break them through the hole and glue them on. On very small

models, tiny drops of thick cement doped the right color are better.

The fuselage may be covered with tissue also, but wood filler or a thick mixture of starch and dope thin enough to brush is much more satisfactory.

The cockpit combing can be made of aluminum wire, balsa, or rubber tubing, whichever seems best for your model. The motor cowl can be pounded out of sheet aluminum, but one of balsa is much easier to make. Either kind can be made removable for motor inspection. The cylinders can be made of aluminum

tubing wrapped with thread and cut to the right length. Valve push rods may be made of piano wire of the right diameter.

The propeller can be bought, but those who take pride in making their own accessories can make a very realistic steel type by using aluminum tubing for the hub and carving the blades from balsa.

In closing, may we say that all of the above ideas have been successfully tested by one or the other of the authors. —DANIEL S. HALACY & J. DEV. EMERY

Don't Miss

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In The
September FLYING ACES

On Sale
July 24th

All Questions Answered

(Continued from page 26)

perhaps a lot of the boys who read this will be interested. Frank can be reached c/o the U.S.S. Buchanan (131) Panama.

Bill Fahrner, Cincinnati:—I do not know why the A.W. Quad was not used more than it actually was. Something wrong with it, somewhere, no doubt.

Jimmy Lyons, Peabody, Mass.:—Spads were originally made at the Societe Pour Aviation et ses Derives, 19 Rue des Entrepreneurs, Paris. (How do you like that?) The Fokker machines were made at Fokker Flugzeugwerke, Schwerin-Gorries, Mecklenburg, Germany. (You asked for 'em, and you got 'em!)

Gerard Donovan:—Just an old question-asker, aren't you? Well, here goes:

The Morane-Saulnier 325-C1 does 232 m.p.h. while the Dewoitine D-500 does 231 top. The Chatellerauld gun may be used in several mountings. The 325-C1 has no cowl guns. The D-8 was called the "Flying Razor" by the R.F.C. pilots because of its sharp-appearing wing. It was supposed to be about ten miles an hour faster than the D-7. The Vicker's is still believed to be the best machine gun in the world for synchronization work. I do not know what gun the Germans are making, or whether they are making Spandaus again. Yes, the present Fokkers use the Constantinesco gear. The Siskin fighter went out years ago. It used to do about 166 m.p.h.

Walter Galliford, Lakehurst, N. J.:—The Marines use several types of planes, including Boeings, Corsairs, and

Douglas observation jobs. The latest figures indicate Great Britain leads the world in the number of military aircraft.

Harold Ordway, Natick, Mass.:—In the wingless autogiro, the rotor blades are started in their whirling motion by the engine, but as soon as the craft actually leaves the ground, the clutch to the rotor blades is disengaged and they turn on forward momentum.

Neal Van Fossan, Mt. Erie, Ill.:—The Bird plane mentioned is manufactured by the Bird Aviation Corporation of Glendale, Long Island. Write to that address for further details. Other "Bird" enthusiasts please note.

—BY ARCH WHITEHOUSE

The Dead Don't Fly

(Continued from page 8)

must have."

He turned, stared at Trevor, "Got any ideas at all?"

Trevor shrugged. "Who's Tom Brock's best friend in this outfit?"

"Dick Steyne," rejoined Rex, "the lad who flies S-586."

"The way it worked in the 92nd., the dead man's best friend was always next," Trevor said. "Could you arrange for me to room with Steyne tonight?"

"What good will it do?" demanded Rex.

"I've never seen this ghost. I'd like to see it to check if you're right in believing it's a naturally-caused thing."

"Okay," snapped Rex. "Move your things over now. And it is a naturally-caused thing, Trevor. To my mind it's a deliberately created thing to attack us psychologically. To help the Germans get control of the air."

Trevor rose. "Maybe you're right. I hope to Heaven you are. I'll tell you tonight. At midnight."

He started for the door, stopped curiously and watched Rex Dene's hands. Dene's fingers, deft and graceful, were "walking" a ten-franc coin back and forth across the back of his hand, an exercising trick used by sleight-of-hand performers.

"Where did you learn that?" Trevor asked.

Dene came out of his abstraction, looked blankly at his hands.

"Oh, that? I'm a magician in civil life—studied under Houdini. That's why I think this is a trick. Houdini and I spent two years trying to see a spirit—and never did."

"Right," nodded Trevor. "Only, remember the story that came off the British front this spring—when the Germans attacked at Amiens?"

"About the ghosts of the Old Contemptibles leading the counter-attack?" Dene nodded.

"Not only that, but the men who swore that a vision of St. George mounted on a white horse turned the German right flank."

Trevor stood still, hand on the door knob. "Five million men have died in France since 1914, Dene," he mused, "maybe Death is rebelling after all. Stopping the war the only way it can be stopped—by fear. Goodnight."

All evening Rex Dene brooded over cigarettes and coffee. He heard the Dodges arrive from town, and inspected the men as they came in. They were too damned sober, too damned quiet. When fear has you, liquor fails to intoxicate. From the remarks dropped he knew these men were close to rebellion.

When the last one disappeared into his cubicle it was ten minutes to midnight. As if drawn by a magnet, Rex Dene went to Dick Steyne's cubicle and crouched in the darkness ten feet or so from the door. All was quiet within. The sentry was fifty yards or so distant.

Twice Rex Dene changed his position, trying to look through the single window. But the best he could do was per-

ceive a quarter of the west wall. In the silence, as he waited tensely, the ticking of his wrist watch was audible above the distant thunder of the guns to the north. The luminous dial, greenly lit, revealed the minute hand poisoning on the dot of midnight.

He loosened his gun in its holster—the feel of the cool butt gave him comfort.

Midnight!

He held his breath. Staring through the window he suddenly saw a faint iridescence, and blinked his eyes twice to make sure it was no optical illusion. The luminance persisted.

He heard a faint groan. A man's startled gasp. The window was open!

And he heard the words: *Dick, at two o'clock I'll come for you. You're next, Dick. The spirit world has revolted; the killing grows unbearable. You will be sacrificed to end it all.*

Rex Dene sprang up. With plunging feet he reached the door, threw it open with a crash. The luminance, gray and effulgent, was fading from the west wall. Dick Steyne was sitting up in bed, a gun in his hand, and as Rex pointed his gun and fired at the faintly seen form, he screamed, "My God, don't. That's Tom."

Crash!

Rex's pistol roared and a bullet pierced the faint figure squarely through the heart.

THERE was a sad laugh. The vision vanished. From the bed, where he had been sitting up, Trevor uttered a shaky warning, "That does no good, Dene. That was no human visitation."

Rex Dene felt the sweat spurt from his pores. Dick Steyne's face, in the light as Rex turned on the electric light, was dripping. So was Trevor's. Each face was pale as ashes.

"It was Tom Brock?" Rex asked softly.

"It was Tom," suddenly sobbed Dick Steyne. "He was dressed as he was yesterday morning. Except that in his breast there was—a hole—and blood came out and it dripped—dripped—dripped on the floor as he spoke."

Rex looked at the floor. It was dry.

Rex Dene flicked on his flashlight. He searched every crevice of the room. The appalling truth was on him: no one had come into that room while he was outside. No one had left. The vision had faded under his very eyes. Was he going mad? Was the grave yielding its victims, death surrendering its triumph?

He shook his head like a goaded bull to rid himself of such beliefs.

"It's human agency," he muttered hoarsely. He turned swiftly on Trevor who was buttoning the knees of his breeches.

"You must have some clue. How was it done?"

"The only thing I saw more than you," rejoined Trevor shakily, "was the vision in clearer form. Almost as plainly as I see you."

"You mean you think it was a visitation from the dead?"

"It can't be—it must be human—and yet—" Trevor licked his lips.

Rex Dene was jolted; this man should have helped him. Instead he was believing in this damned thing.

Dene flung back his head. "Well, whatever it is, it's set a trap for itself," he growled. "It said Dick Steyne would die at two o'clock—an hour and forty-five minutes from now. And I know," Dene roared, "that that can't happen. I'll sit right here myself and stop that."

The thought cheered him, gave reality to an incredible situation. Trevor, too, seemed more comforted. Here was something tangible to fight; a threat to kill that must occur right here in the cubicle. Trevor got his gun, spun the cylinder. Dene saw the movement.

"I'll stay right here on one side," he began.

"And I'll watch outside—at the window," Trevor said. "You can call your sentries and throw a cordon around this hutment."

Rex Dene had thought of that and dismissed the idea because he wished to keep from the men this new supernatural threat. And yet, giving it second thought now, he decided to accept Trevor's advice. What if the men did know? Indeed, why not tell them? If they knew that Dick Steyne had been threatened with death at two o'clock, and Steyne could be kept alive; then their belief in this ghostly manifestation would weaken because a threat had been made and not kept. Two-thirds of the terror of this unholy thing lay in the fact that every man so far fore-warned had, indeed, died as prophesied.

"Okay," Rex snapped decisively. "Call the sergeant of the guard."

The sergeant, aware of something unusual and guessing at another visitation, came to attention, his face slightly green.

Rex said evenly, "A threat has been made against Lieutenant Steyne's life. I want you to take a special section of the A-A men, arm them with rifles and put them around this hutment. Ten will be enough. Stay within call yourself. If anything happens to me, Lieutenant Trevor will give you other orders. Understood?"

"Right, Captain."

PRESENTLY the steady tramp of marching hob-nails resounded through the night. The men were stationed under Rex's watchful eye although he never left the inside of the hutment. When all was done, Trevor said, "I'll be right outside this door, captain—with this—" he gestured to his gun.

There was nothing else to be done.

Rex Dene sat down at the table and brought out a flask of brandy. He grinned at young Dick Steyne.

"Three big fingers, eh?"

Dick Steyne's mouth quivered. This new shock together with the sight of

his best friend killed yesterday had unnerved him to the point of hysteria. Dene saw him waver. He leaped to his feet, jerked Dick upright, and slapped his cheeks—hard.

"Get a grip on yourself, kid," he said gently. "I'd rather lose my right hand than have anything happen to you."

Steyne's body jerked. The hypnotized look left his eyes. Quietly now he reached for the flask, tilted it and drank two big gulps. He coughed, blew out a lungful of air.

"I'm okay, now, skipper," he said quietly. "Give me a cigarette."

Rex Dene nodded approvingly as he saw the youngster light the pill without a quiver of a finger. Steyne was under a terrific strain, but he was no longer unnerved. They sat across from each other and the silence became strained.

It was maddening, seated there silently, hearing wrist watches tick away the passage of time, unable to do anything but wait and endure. It was worse for Steyne because he had nothing to think of but, "shall I live beyond two o'clock?" Rex Dene was trying to organize his keen mind to grapple with this problem from a new angle.

Presently, noticing Steyne begin to tremble again, he passed the flask and said, "Tell me something, lad, about yourself."

Steyne's olive drab shirt was open at the neck. Almost unconsciously he was playing with a round bronze good luck charm hanging on a loop of pink silk ribbon. He became aware of Dene's eyes on it and smiled self-consciously.

"Germaine gave it to me," he said. "It's a Saint Anthony piece—good luck to pilots."

"It will be good luck tonight," Rex said.

Almost automatically the lad went on to speak about his youth, his times at college, the bright future that awaited him when the war was over, his ambition to be an Ace. Rex prodded him on, realizing that in talking the lad was unaware of the passage of time.

And slowly the illuminated hands of the wrist watches moved remorselessly on their endless circle of man-made time. One o'clock! Then one-fifteen! Then one-thirty! Outside the sentries paced back and forth. Trevor coughed once and Dene went to the door.

"Nothing," the Intelligence man grinned. "Just jittery—that's all."

He patted the slapping holster of his gun. The sergeant appeared at the conversation and retired when all was well. In a small swamp to the east end of the field frogs croaked mournfully. A night bird called.

One-forty-five!

CHAPTER III

DEATH FLIES HIGH

FIFTEEN minutes to go. Despite himself Rex Dene felt the tension grow. One-forty-seven!

Suddenly Rex Dene jumped to his feet. "What's that?" he asked sharply.

Dick Steyne started as if electrified,

the pallor of death leaping into his cheeks. Outside there was a sudden stirring. And over the night air, drowning the frog croaking and the rumble of the guns, came a low droning sound that was increasing with the seconds.

"Planes!" Rex muttered.

Presently, bent tensely, his keen ear detected a bell-like resonance of the exhaust ripples high up in the sky.

"Gothas!" he said in relief. "Probably on their way to Paris."

Steyne's eyes sought his. "They might be coming here."

"Impossible. This is a secret tarmac. The Boches know nothing about it. Couldn't."

He spoke confidently because this air-drome, twenty-five kilometers behind the lines, had been kept secret to keep the Boches unaware of the air strength the Yanks were massing to meet the projected huge German drive.

The roar now grew so loud it seemed to completely fill the air. Many multi-motored Gothas on their way to open the tail-gates of death and lay their deadly eggs!

"They're coming closer, sir," Steyne cried, "they're coming here."

"Impossible, I tell you!" rapped Rex. "The Jerries don't know the significance of this spot. It wouldn't even be on their maps."

Shouts and clamor came from the west end of the tarmac. Pete Jordan, anti-aircraft officer, came rushing over.

"Those night bombers are coming here," he gasped. "Rex, I've got to have my men."

Dene cursed. Was this a ruse to draw away his men from protection of Steyne? He went to the door, peered into the star-lit sky. He could see the



red exhaust flames. These Gothas were damned low. Wheeling in. A star rocket suddenly blazed from the leading plane.

It lit the air like a magnesium flare. And through its blaze suddenly wheeled a small, dark plane that was plunging through the air like a striking black bat.

"Fokkers, too," yelled Rex.

The Gothas came over with precision. The first bomb broke from the toggles and came hissing down, the whistle increasing to a shriek until finally it ended in a terrific explosion that shook the buildings. The concussion nearly knocked Rex over.

The stalk of blazing light spurted fifty feet high and lit the night as if the earth had suddenly taken fire.

"They've got us spotted," Rex cried.

Incredible, unbelievable, there could be no mistake. That initial bomb had found the east end of the tarmac with the unerring aim of genius.

Rex Dene was torn between two wills. To leave Dick Steyne might mean his death. To stay here was to permit his air-drome to be bombed and strafed.

His teeth clicked. "A-A men report," he yelled. "Okay, Pete, take 'em away and keep those swine too high to spot our hangars. Break out the machine guns—there are Fokkers there too."

He gave a yell for the bugler. The man came racing.

"Blow assembly. Emergency! Every pilot and mechanic to the hangars. Wheel the crates out! That Fokker will have incendiary slugs."

CRASH!

The second bomb came hurtling down to tear itself apart. Across the tarmac on the tail of the roar came the clear strains of the bugle. No lights flashed. But in the pale starlight, men in pajamas, men practically naked raced to the canvas hangars, began to wheel the Spads to the emergency clearing cut out of the woods for this particular purpose.

On the far end of the field the A-A guns, improvised 75's, began to slam. The shrapnel shells began to blink red eyes ten thousand feet above. The searchlights suddenly broke out, swept the heights with their swords of radiance. The rattle of machine guns added to the uproar.

Rex Dene stood it for two minutes. His watch pointed to two o'clock. The jinx was broken. He was needed out there to direct this offense, to make sure the planes were saved. The greater need summoned him.

"Trevor," he yelled.

The Intelligence man popped in, face pale, for the last bomb had been close.

"Watch Steyne. Don't let him out of this room," shouted Rex. He raced away, and a moment later his crisp orders speeded up the removal of the Spads.

Then out of the night, flying down a sword beam of radiance, came a golden Fokker.

The muzzles of its Spandaus became red-lipped and the spray of its bullets kicked dust from the ground, tore through galvanized iron roofs, struck among the A-A crew. Screams and groans betokened that men had been hit. One searchlight went out as the stream of bright yellow tracers came down the beam and struck the glass front with a smashing crash and tore into the lighting mechanism.

BA-ROOM! CRASH!

The tail-gates of hell opened and death rained down. Rex Dene was tossed twenty feet by the concussion and nearly buried by the rain of dirt that came down from the geysers of earth that were sent skyward. Over them buzzed the Fokker, raking the field. No chance to get a ship into the air to fight back. Nothing to do but have the A-A's heave their shells, the machine guns slam their strings, and curse and swear that the Yank's turn would come later.

Back and forth the Gothas circled majestically. More bombs fell. Trees

were uprooted; there were holes in the tarmac big enough for a house cellar. One hangar was burning despite the efforts of mechanics to put the fire out. But the planes had been saved and that was the main thing. Rex Dene rushed to the three batteries of A-A.

"Concentrate on the second ship," he yelled, "it's low. Here—let me."

He leaped to the aiming saddle, fingers to the laying mechanisms. He twisted, caught the range from the searchlights that had "scissored" the lower Gotha and out of which it could not twist. The light gave him the altitude and he guessed at the ninety mile an hour speed.

"Nine thousand—ninety! Up two! Ready, fire!" he yelled. "Fire at will!"

EIGHT guns began throwing steel as fast as half-naked gunners could jam the shells into the breeches, as fast as the layers, riding their seats, could turn the disc in response to the sharp yells of Rex Dene.

The air around the Gotha suddenly grew leering red eyes as the shells exploded. The Gotha nosed up to escape this hurricane. But it was too late by a second. The sky suddenly bloomed redly as if a sun had suddenly risen.

"She's afire," yelled Rex. "Let 'em have it."

Then across the night below came the black silhouette of the golden Fokker. *Rat-tat-tat-tat-tat!*

Bullets hummed around Rex. Behind him the air shook to the two Hotchkiss guns mounted on artillery wheels that tracked the Fokker and stormed it with tracer slugs. But the Fokker was making knots, and it showed no effects from this barrage. The burning Gotha was falling down the sky in crimson pieces. The searchlights held it pinned. And in their light men, driven to madness by the heat, were dropping out to hang in the spotlight for a second and then vanish on their descent to death.

The loss of one Gotha had its effect. The others turned from their courses and headed north. The Fokker after its last trip across with blazing guns, zoomed and joined the bigger monsters.

The A-A guns ceased to slam as the Gothas went out of range. The machine guns fell silent. And the stillness, after the roaring confusion, verily hurt the ears. Rex Dene, panting, and powder-blackened, sent a squad of men to look over the blazing wreckage of the Gotha which had fallen less than a mile away and which still left a crimson glow against the night.

He took a big breath and let it out.

"One hangar against one bomber," he said grimly, "I'll swap the Jerries that any time."

Then suddenly the satisfaction left his face. Dick Steyne! What of him? In the excitement of the fight the fate of the youth had completely deserted him. He glanced at his watch. Twenty-five minutes past two. Twenty-five minutes of hell!

"But he was alive at two o'clock," Rex told himself, "and that's the main thing."

He wiped his face, organized the re-

lief to bring in the Spads, and set the fatigue details to work filling up the gigantic holes in the airdrome. He'd have to use the drome on the morrow to take off and find a new field. He couldn't stay here now that the Germans had this field pin-pricked.

These necessary things attended to, he ran across the field to the hutments which had fortunately escaped a direct hit. Searchlights played on a body on the ground.

Rex Dene took a big breath—and it escaped with a curse! He strode up, looked down at the body—the dead body of Dick Steyne. Men's white faces peered up into his own grim one.

"What got him?" Rex asked hoarsely. "A machine gun bullet—squarely through the heart," Trevor said in a queer strained voice.

"How long ago?" Rex forced his voice to be steady.

"The last strafe—ten minutes ago," Trevor said, "exactly at two o'clock!"

Rex Dene's eyes went wide. He glanced down at his own watch. "You're crazy," he half-yelled, "I make it twenty-nine now."

Trevor looked at his dial, summoned one of the pilots. They compared watches. "You must be thirteen minutes fast, Dene," Trevor said quietly, "that last strafe was at precisely two o'clock by our two watches."

CAPTAIN REX DENE paced the operations office with the savage movements of a wolf. His eyes stared but saw nothing but an inner vision. He had paced this way for hours; it did not seem as if he had slept for the past seventy-two hours.

Nor, as he knew, was he alone in this perturbation. Chaumont was tearing its hair and facing the blunt possibility of a crushing defeat by the Germans. Fifteen Yank air squadron commanders



had virtual mutiny on their hands. The Germans had nearly obtained mastery of the air.

The Ghost Death, as it had come to be known, had attacked all the other Yank squadrons. Seventeen young American pilots had died, shot through the heart during high patrols after receiving the ghostly warning—and not a German plane had dropped.

The front was in an uproar. The fear had penetrated to the ground forces who called it "the rebellion of death."

Panic is a strange thing, passing like an electric wave from man to man, making water of the courage of the bravest man. Unless something was done to stop this terror, the forthcoming German drive would find little resistance. Defeatism had spread to the French. Mutiny had broken out in the

French ranks. French senators had even risen in Paris and demanded a compromise peace.

Thus had a little stone, dropped into the pool of fear, spread into a tidal wave of terror.

In that endless pacing over a floor littered with the butts of dead cigarettes, Rex Dene had thought through the affair from the first. He had delved into books brought post-haste from Paris. He had questioned mechanics and survivors of other squadrons. Bit by bit he had pieced together certain facts.

Only an hour before he had questioned a young pilot from the pool who had gone from Dene's new hidden tarmac to Bar-le-Duc.

The pilot, John Kries, said, "I only saw Germaine, and I got myself a good luck charm."

He had shown it to Rex, a small bit of bronze in the replica of Saint Anthony.

Thinking about that now, Rex Dene suddenly drove a powerful right first into the palm of his left hand.

"I've got it," he muttered. "That's the answer."

He swung to the wall, took down his rakish overseas cap. He fastened his blouse, donned his Sam Browne belt.

"Haines!" he yelled. "Bring around the Dodge."

He strode to the door just as Captain Jerry Trevor entered. Trevor's eyes widened at Dene's haste. Trevor had changed in the past seventy-two hours. He was uncommunicative to Dene, cold, aloof and little in evidence.

He said now, "What's up?"

"Going to town," snapped Dene.

Trevor shrugged. "All right. I just came to tell you that this hokus-pokus is the result of a German spy—here in your outfit. The representative of a whole German espionage ring that is organized to break down the Allied morale."

"Well?" said Dene.

"I know who that spy is."

"Arrest him then," jerked Dene.

"Easily said, but proof is lacking. This man has influence behind him."

"Who is it?" demanded Dene.

"I prefer not to say now," rejoined Trevor. "Do you agree with me?"

"About this being a human agency, yes; about a spy here, yes." Dene stared blandly. "I in fact, know how the trick is worked except for one thing."

"And that?" asked Trevor eagerly.

"I don't know how a German bombing outfit was guided to a secret tarmac whose location was only known to Corps," Dene said.

Trevor nodded. "The men are saying it was Fate, Destiny—what you will—that guided the Gothas here."

"Fate wouldn't be so biased in favor of the Germans," Dene said dryly.

The Dodge car pulled up in front of the door. He went out failing to invite Trevor. Trevor followed, "I'm in charge of this case," he said jealously, "anything you've uncovered I have a right to know."

"Yes?" Dene said in rising inflection. "You're in charge. But these are my men. They're the ones who're doing the

dying. They're the ones you suspect. They're the ones I'm protecting. You handle this case your way, and I'll handle it mine."

"Your actions are damned suspicious," snapped Trevor. "I've a notion to report you to Corps for lack of co-operation."

"Go ahead," Dene called from the car.

DENE brooded, absent-eyed, all the way to St. Meneshould. He had Germaine's address from the young pilot, John Kries. It was 28 Rue du Helder. He got out, rapped and as the door opened he looked into the face of a young, beautiful girl with hair as yellow as gold.

"Germaine?" he inquired affably.

"But yes, *Monsieur l'aviateur*," she rejoined.

"I'm a friend of John Kries'. He told me you were lovely—and you are. He told me you had good luck charms of Saint Anthony, and I'd like one, too."

As he spoke he urged his brawny body forward and as she retreated he went into the room. She was small and graceful, like a fawn compared to his immensity.

"You are most peremptory," she said, giving him a slow, provocative smile. "I usually give only my friends these charms."

"Count me a friend," grinned Dene. His restless eyes were ransacking the room, but they noted nothing that seemed important.

"Usually I am paid for my charm," she smiled again.

"I can pay. What is the price?"

"A kiss," she came close.

Dene grinned. "A dozen of them," he suggested.

Her eyes danced merrily. "You shall have it," she went to a drawer and from a number of bronze charms chose one and came to him. Dene watched her closely. She put her arms around his neck to tie the ribbon behind, and raised her face for him to kiss her on the lips.

She was very close, very sweet-smelling, very desirable. But suddenly Dene raised his left hand and grabbed her right wrist. His right hand gave her a thrust that tumbled her in a heap. The bones in the wrist of her right hand almost cracked under the twisting strain. She screamed. Her face went white. But she did not faint.

Her eyes were now murderous.

"So," said Dene softly, "you were expecting me."

He lowered his gaze long enough to inspect the deadly little Derringer, a clever German one-shot pistol no bigger than a vanity case which he had wrenched from her right hand. He dropped it into his pocket, went to the drawer and swept into his hat all the Saint Anthony medals there.

"Your wrist will mend," he said gruffly "but what a French firing squad will do to you when you're tied to a stake will be permanent. Are you talking?"

She cursed him in a mixed French and German *patois*, and the words she used belied the innocence of her face.

"What is the relation of these good

luck charms to that death which the golden Fokker fires?" Dene pressed.

Despite the pain of her wrist she laughed mockingly. "That is for you to find out, *Schwein!*"

Dene smiled grimly. "A half admission, mademoiselle, and one I can use," he paused. Then: "How many of you girls are there along the front?"

She wanted to hurt him, so she said, "Five hundred, and within a month there will not be an accursed *Amerikaner* pilot left."

"Very interesting," said Dene blandly. "They can evidently get you girls to woo the pilots faster than they can build golden Fokkers and manufacture the mechanism."

He fell silent in thought. This much was clear. When the strange deaths had started with the 92nd. there were few girls available, and only one unit of this mysterious killing mechanism. The thing must have been a sort of experiment. Heartened by what had happened the Germans now intended it on a grand scale. Rex Dene looked at the girl and hardened his heart. He had to know the connection between these bronze charms and the death bullet from the Fokker.

"If you will confess I will have your life saved," he said.

She glared, squeezing her broken wrist in pain.

"Before I can be shot the war will be over."

Slowly Dene took out of his pocket a clasp knife and opened the blade. It was sharp. Equally steadily he honed the bright blade against the leather of his puttees. As he did so he stared at the girl's face.

"I can whittle 'G' on your right cheek and 'S' on your left," he said softly. "German spy, that'll mean. And no matter what happens later you're branded. It would be good for you to live to a ripe old age then, so people could forever shrink from you as you walk down the street."

He spoke dramatically, but all the while he was carefully studying her, timing his histrionics to get the biggest effect. Slowly he drew closer. The blade sheened in the light. She watched like one in a trance.

"You wouldn't dare," she muttered, "you wouldn't. You—"

Suddenly he gripped her head in the curve of his left arm and held it close to his chest. He raised the knife, but instead of using the blade, he sliced down against her cheek with his fingernail.

"Oh—*Gott!*" she relaxed in his arm. She had fainted.

Rex Dene thrust her away with a muttered oath. He closed the clasp knife. He had failed. By the time she recovered consciousness the first shock of this surprise would be gone. She would never talk, knowing even confession would not save her from the French.

There was, however, still another way to achieve his end. But before embarking upon it he left her lying there and searched the room with a ruthlessness that brought ruin to the furniture. He tore the stuffing from the chairs, the

rugs from the floor, the paneling from the wall. He worked with the merciless knowledge of a magician who knew how cunningly people sought to hide things.

He ripped the boards from the floors, tore the bed to pieces. And reaching the closet of her clothes he took them seam by seam and tore them asunder. He came back at last, baffled yet not convinced, to stare with glowering eye at the still unconscious form.

"I've got to know," he muttered and bent over her.

He found out. Inside a concealed pocket in her dress was a small object that resembled a camera. It was a black box about as big as a square compact. In the front of it was a round bit of glass. In the top a small chromium button that worked up and down. Rex Dene pressed the button, but there came no sound from within, and nothing happened so far as he could see. Yet he knew this was valuable, a part of this plot, and he put it in his pocket.

He went out the door to summon the M.P.'s in the knowledge that one more move on his part might reveal this mystery.

"Keep her under tight lock and key," he told the lieutenant of the military police. "Attempts may be made to rescue her. She is a dangerous German spy."

AS he hopped into the Dodge he saw Captain Trevor striding down the Rue Nationale. Dene grinned.

"These Intelligence guys," he muttered and gave orders to be driven to the airdrome. Reaching the tarmac he exploded into action. All Spads on the dead-line warmed and ready in fifteen minutes. He sent Blair, the kiwi adjutant, to round up all the pilots. The listless air of horror that had invaded the tarmac faded before this relentless energy.

The pilots came. White-faced, uneasy, torn between shame and their own growing terror. A gentleness that in no way diminished the firmness of his decision came into Dene's expression.

"I know you gentlemen are scared—not of the known but of the unknown," he began. "You think ghosts are abroad, that you all are doomed. I propose with your aid this very day to make the unknown known and to show that you are victims of a German plot to win the war by fear."

They stared at him, unconvinced yet with new interest.

"We're all going topside in a few minutes on a high offensive patrol. I'll take action then that will prove to you that there are no ghosts, and that you are subject to no more hazards in air-fighting than the business requires. To do this I need one volunteer."

He reached into his pocket and produced one of the Saint Anthony charms.

"I want one of you to wear this just as Germaine told some of you to wear it—hanging down just under your tunic showing slightly through the opening next to the second button."

They stared at the bronze bit of metal as if it were the ghost itself.

"You will be in no danger," said Dene. "As soon as the golden Fokker appears

and starts to attack, take off the medal and throw it away. I merely want to decoy the Germans into attacking. After the medal is thrown away it is each man for himself—but I want the Fokker."

Again silence. Dene waited. "Who will volunteer?" he asked at length.

A shuffling of feet. Ordinarily these men would have leaped at the chance, but fear had undermined their morale. Then as they watched Dene's face the sense of shame leaped upward.

As one man they stepped forward. "We all do, sir," they chorused. "You're our leader."

Rex Dene's face flushed; his smile was gentle. "Thanks," he said simply. "I want only one. I choose John Kries, then, and the rest of you climb aboard. We're taking off at once."

Kries remained, but he did not take the charm. "I already have hers," he said coolly, and pointed to where the bronze edge stuck out from the edge of his tunic.

Dene's eyes narrowed curtly. "Very good."

He seized his coat, helmet, and goggles and strode to the tarmac, then to the dead-line where the pilots waited with a new hope animating them.

"Rendezvous at four thousand over Staples," he said. "Hold formation until the signal. Every man for himself thereafter. Good luck."

From his cockpit he called to Kries. "Remember, after the Germans' first assault tear that damned thing off and throw it away."

"I'll remember," Kries smiled queerly.

Rex Dene goosed the motor, shot out of line, blasted the tail around, and then cracked the throttle. His Spad moaned down the field with the others following one by one. They howled up the air hill in climbing turns and headed for the front.

CHAPTER IV

TREACHERY!

AT sixteen thousand feet where the air was like ice and the heart thundered for lack of oxygen Captain Rex Dene peered across the bowl of the sky and saw approaching Germans—twelve Fokkers in three steps, circling back and forth as though they awaited some one. They did—Allied pilots marked with the symbol of death.

But it was not in Rex Dene's mind to fight the Fokkers on the north side of the seamy trenches that drew jagged lines below. He would fight—he had come for that and nothing else—but he would fight at his own time and place. He flung back his head and grinned savagely. With two hands holding the stick rock-like steady he headed straight for the Germans as if he did not see them.

That the German leader had spotted him he knew at once, for the top layer of Fokkers climbed for the clouds where, sun behind them, they would lay until those below had broken the Yank formation, and then they would come screaming down to administer the shock

and killing thrust. Rex eyed them keenly, looking now and again at the churned and torn earth below. Smoke speared from woods where guns roared. The trench systems, intricate laced, told him he was now well back of the German second line.

Yet he went on, holding his men rigidly in line until the lower flight of Fokkers was less than a mile away.

Now, as if seeing them for the first time, he signaled, "Planes right about—break formation, but watch signals."

His own ship, under the urge of his joy-stick, wheeled up and over, with engine wide open and the Spads, confusedly broken, turned awkwardly, and raced for their own side of the lines. The Germans took the bait eagerly. Down from the clouds pelted the two steps until there was a single arrow-head formation, and these tore after the Yanks, gaining every yard, because Rex was now running at three-quarter throttle. He stared behind until, as he had hoped, the golden Fokker triplane eased out to take the lead.

Rex fled until Etain lay below and the Vesle marshes far behind. He had been closing the throttle gradually until now the Fokkers were a scant half-mile behind. Rex's fingers pressed the stick triggers and a warming burst cleared the guns and softened the oil. His hand flicked out in a signal.

The Germans pressed hard behind, thin wings screaming through the sky. Now Rex hauled the stick back in his lap as the throttle went wide open. The Spad howled with power, soared straight up and over on her back. Here a half roll put Rex straight for the Germans, and around him his men, familiar with this maneuver, wheeled in to present a solid front.

Too late the Germans perceived the trick. They zoomed to make a half roll themselves, but at that second with all the impact of savage fury the Yank squadron hit them.

From that second Rex Dene forgot everything. He had eyes only for the golden belly of the triplane shooting up the sky like a mad comet. He made no attempt to follow then, but zooming on a long angle, he rose to the golden Fokker's altitude, but between the Fokker and German territory. He wheeled in a pivot turn, wing anchored, and as Rex turned, the German faced the first hot blast of Dene's fire.

The triplane side-slipped out of the hail, swung in with a bank, and raked Dene's back as Dene banked to catch the tail. The Fokker was away in a second, left wing under, tight bank, curling fast to overtake Dene and make him the chased instead of the chaser.

Dene was forced inside of a minute to whip his wings straight, and boil up for a fast renversement. This time the Fokker was ready, and close on his heels in a wild swoop that for a split-second put Dene under the Spandaus.

They spoke short, crisp. *Rac-rac-rac-rac-rac!*

Five shots. Dene's right leg jerked as a slug bit through it. The back of the cockpit shredded out.

Dene realized with horror that not a

shot had missed. All five including tracers had hit in the cockpit, angling up so that had he not been slightly turned all five slugs would have struck him in the stomach. But he had no time to consider the matter. The German's wings were slanted, glittering in the sun. He was racing down for another burst. Dene threw the Spad up. It seemed to him he lifted it physically.

Rac-rac-rac-rac-rac!

Six shots! Again the back of the cockpit blasted. Another slug burned like red hot iron along his legs. He knew then that if the German got him on a level, or got above him for a down-raking fire, he was a dead man. Something was attracting those bullets in deadly hail to his cockpit. No living man could fire eleven shots and hit the same spot when two planes are passing each other at a combined speed of two hundred and forty miles an hour!

The thought shocked him for a second. The Spad howled upward. A flaming Fokker, its engine dead, its pilot screaming in fear and agony, shot by him and smoke and flames tore into him, and past.

He wheeled the Spad like a race-horse. He tore behind the smoke, aware of numbing legs, blood streaming down his calves. He unlatched the safety belt, and stood up against the man-made breeze that tore the wind from his throat, peeled the eyelids from his eyes.

He bent his head. There it was! A Saint Anthony medal! Hooked by a pin to the leather of his seat! He grabbed at it, ripped it loose.

Rac-rac-rac-rac-rac!

The golden Fokker was after him and his outstretched hands were whipped with bullets, his sleeves ripped, his arm frayed. He hurled the medal into space. As he again settled back he could hear the roar and rattle of the Fokkers machine gun behind him, but now the bullets were not coming close!

"That's it," he yelled, "part of the mechanism. And now, damn you, it's my turn!"

IF he had flown like an angel before,

Rex Dene now flew like a man possessed—a superhuman man welded to his plane, lifting it, turning it, banking it with the touch of his hands as if the Spad had been imbued with a soul. He turned on the Fokker before it could flee back into the huddle of turning, twisting, dog-fighting ships. He whipped the Kraut's engine with slugs until the pilot turned off to avoid the deadly stream. He laced the wings with his bullets, and stitched the fuselage until the hair upholstery whipped out of the crash pad alongside the German pilot's head. The man saw no hope to drive this deadly thing off his tail by turning or zooming.

Abruptly, the Fokker dived, but like a panther Rex's Spad was on him from behind. The deadly grin on Rex's mouth became set. He had his man now, and nothing would let him get away. Like a cow puncher cutting a calf out of the herd, he bullet-whipped that golden Fokker until the German pilot cringed when the glinting tracer lashed before

his gaunt eyes. When the Jerry tried to turn and head for home, a rain of golden tracer formed a barrier he could not pierce. The bullets broke his inter-wing struts so that the thin wings of the tripe began to sag. The motor discharged a spout of smoke as a burst caught the Mercedes motor and blew rocker arms, spark plugs, and cam shafts to hell.

Helpless now, the German, with the wind against him, settled into a deep glide, heading, Rex decided, for a four-square field of light yellow wheat. Rex hung after him, edging as close as he could, keeping the man in line with short, savage bursts.

The ground leaped up at them; trees took on depth; a few Yankees in a field fired rifles at the Fokker. An ambulance dashed along a road that slid under Rex's whistling wings. A shell burst to the right, just short of the fields the helpless German was trying to set down in.

With a wild zoom, Rex wheeled around the man, pointed down, and hung on in a tight bank until the German, through loss of altitude, could go nowhere else. Then he whipped open his throttle, circled to catch the wind from the shell smoke, and dipped steeply to the field. His wheels were skating over the wheat just as the German lumbered down in a dead-stick landing.

Rex nodded as he saw the German settle into the wheat ahead of him. He taxied rapidly, bearing down on the German who leaped to the ground and jerked out a flare pistol to fire a bolt into the drip pan of his motor to burn the ship.

Rex was out of his crate and racing along the ground. He had his Colt out. "Halte!" he rapped, "*feurhen sie nicht!*"

He fired a shot that burned past the German's head. The man wilted visibly, turned, and seeing the immense figure bearing down on him, shrugged helplessly. Then he as suddenly wilted and fell to the ground. Only iron courage could have kept him going so long, for as Rex bent over him he saw that the man's chest had been torn out to the ribs by a stream of tracer fire. The German had jerked off his goggles in falling and was trying with futile fingers to crush them.

Rex Dene jerked the goggles away, noticing as he did so that they were of a peculiar greenish tint, and thicker and more queerly shaped than those ordinarily used. The man smiled feebly.

"I am dying," he said clearly, "and I have failed to fulfill my oath to destroy my plane and my goggles." He paused and his face darkened. "God curse war!"

He relapsed into silence.

"What is the secret of the glasses—the goggles?" Rex asked.

"I am a German; I will not tell you." His boyish face twisted. "I am dying."

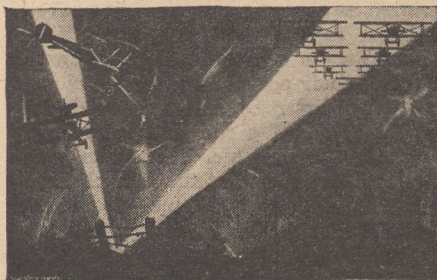
Rex did not force him. He had an idea what the goggles were for. He carefully put them on, seeing nothing unusual—except that the sunlight was a queer tint.

"You have one of the bronze attractors?" he asked.

But the German was unconscious, blood suddenly flecking on his lips. Rex went to the plane. A shell hooted down and tore itself apart near the road. Dirt splashed him, but he climbed into the cockpit and stared along the ring-sights of the Spandaus. He saw at once that they were odd guns. Near the cocking handles were large blue-steel boxes, and from these wires led to what appeared to be storage batteries moored alongside the cockpit on the inside.

Rex nodded. "Magnetic attraction," he told himself. And one look at the belt of cartridges leading to the breeches verified this. The bullets were not cupronickel jacketed slugs such as were almost universally used. They were of a yellowish metal.

Though Rex did not understand the principle he knew that magnetic attraction would draw those bullets to the bronze plaques. It was not a new thing,



this sort of attraction, although it was new so far as the war and firearms were concerned.

"The question now is," he thought, "how does this dead German know who has the plaque—the Saint Anthony medal?"

The goggles were obviously the secret. But Rex could not test those here.

Some of the Yank soldiers who had been firing at the German, now came running across the field. Rex identified himself.

"Guard this plane and this dead body," he ordered sharply. "And one of you report at once to division headquarters for a staff Intelligence man to come at once."

Rex himself climbed into his crate, taxied to the far end of the field and with a hundred and twenty yard run, hoisted the Spad into the air in a sweeping climb. The air fight above him had drifted away or broken up—he could not tell which nor did he care now. His objective was accomplished. He had the secret of the guns, and the goggles would yield still another. He headed for his own tarmac.

Twenty minutes later he fishtailed in, set down, and cut his gun. Leaping out he started almost at a dead run for the operations office where the other Saint Anthony medals were. He got half-way there when five soldiers with bayoneted rifles stopped him by pronging his body with the bayonet blades.

"That's him," said Trevor grimly. "He's the German spy that's been killing off his own men!"

OBSESSED with his discovery, intent on running this mystery to its final exposure, Captain Rex Dene lifted his eyes bewilderedly, stared at the menacing encirclement of bayonets. A young lieutenant from Corps was in charge of the men, and the way this officer fingered his drawn Colt .45 told how he longed to use it.

Dene said, "What are you talking about? What does this mean?"

"It means," snapped Trevor, "that you're under arrest, charged with treason and espionage."

Something clicked in Rex Dene's brain. He became instantly alert, cautious. Outwardly, however, he flamed indignation.

"Have you gone mad?" he cried harshly. "Why do you say such a thing?"

"I'm not mad," rejoined Trevor, talking more to the soldiers than to Dene. "The evidence is conclusive—and there is more on him now. Search him for a pair of goggles that enabled him to read German signals unseen to ordinary eyes."

Before Dene could offer resistance, hopeless as it would have been, the lieutenant brutally turned his pockets inside out, and came away with the goggles.

"This man's name is not Rex Dene," snapped Trevor, "it's Erich Dien, a German aristocrat, son of Professor Adolph Dien in whose brain the whole scheme was created. Somewhere we shall find the mechanism that created the ghost image when Dien had to be somewhere else for an alibi. He admits he is a magician, and he is a master of disguise. He is also a ventriloquist. He imitated dead men's voices and threw them to the corners of the cubicles to arouse fear."

"The girl, Germaine, was his tool. She played upon the emotions of his pilots and gave them the good-luck charms which were their death warrants. With the invisible light he signaled the Germans the location of his airdrome so they could come and kill. Dick Steyne was not shot by the golden Fokker. He was murdered by this Erich Dien."

He paused, implacable, grim. Then: "All this I can prove. Take him away, lieutenant, and guard him closely. From him we shall obtain the final facts of the conspiracy."

A hand snatched away Dene's gun. Other hands jerked off his Sam Browne belt, ripped the buttons from his tunic. His own men, greaseballs and pilots alike, stared, at first in confusion, then in growing anger. A growl went through them as if they longed to get at Dene's throat.

Trevor said, "I am placed in charge of this squadron pending the arrival of a new commander. Believe this, men, the ghost is laid."

With that the lieutenant and his men hustled Dene with frequent jabs of the bayonets to the waiting Dodge touring car. As he left, Dene heard Trevor giving orders for the servicing of the Spads for an immediate high offensive patrol. Then one of the soldiers threw the

Dodge in gear and it roared off to the main highway and south. No words were spoken until the tarmac was at least a mile behind.

Then Dene said, "Lieutenant, this is all a mistake. Either Trevor made a blunder or he—"

"Blunder?" The lieutenant laughed heartily, pulled out a long cigar and lit it. "Ach, Gott, you fool! He never makes mistakes. It is *you* who made the mistake. By knowing too much, by shooting down poor von Wiegand."

Now, indeed, Rex Dene was stunned. He had suspected much, figured more. But that the German espionage system was as perfect as this he had never dreamed.

"You are workers with Trevor, then," he finally said, "Trevor is a German spy!"

The lieutenant scowled, blew smoke in Dene's face. "Trevor is the *Graf* Erich von Dienam." He suddenly laughed. "How clever of him to twist your name so like his own."

"And the real Trevor?" asked Dene quietly.

"Rots on the end of a 75 shell, well moored to the bottom of the Marne. My friend, Germany launches the attack to end the war in forty-eight hours. A demoralized Allied Air Corps shall greet them, even if we have to kill fifty like you. The ghost legend must go on until our troops march through the Arch de Triomphe in Paris."

By the way he spoke, Rex Dene knew this car would never take him to Chalons. Somewhere enroute he would die. And—his breath hissed in a sudden gasp.

Trevor! Ordering the high offensive patrol! As if he could read the mind of this Trevor—this von Dienam—Dene knew what would follow. German Fokkers in a staircase of planes leading high into the sky! A sudden pounce after the German spy had led them into the trap. The German spy, identified by some mark, sailing off into Germany to await such honors as would be given him. The rest to die like rats in a trap!

The secret of the colored goggles remained to be solved. Dene needed evidence to bear out his theory of how the ghost had been made to walk. But all this faded into the background when faced with the necessity of saving what remained of his squadron. He became chill, grim.

The lieutenant addressed a remark to one of the alleged Yank soldiers in German. Dene maintained a blank face, although from traveling with Houdini in Europe he understood and spoke German very well. The remark had to do with what the espionage gang would do after Paris had been caught in the scissors of von Ludendorff's two armies and cut off. There was talk of mobilizing other spies in an attempt to capture Clemenceau and the French government before it could escape to Bordeaux.

Rex Dene was appalled at the daring, but not surprised. He recalled a remark of Houdini's to the effect that since the war of 1870 the German espionage system was not only the greatest but the most numerical. A master spy named

von Stieber had organized and sent into France prior to 1870 fifty thousand spies.* And Dene now gathered that German spies permeated French, British and American armies until only *Oberst Nicolai*, head of the *Deutsches Nachrichtenendienst* knew where they all were.

BUT one fact crystallized Dene's resolve. Trevor, or von Dienam to give him his right name, was taking into Germany on this present flight a list of those involved in the ghost hoax. If for no other reason than to possess this list, Dene must capture or kill the German ace spy. All else was as nothing to that end.

With slitted eyes he weighed his chances—but found them not so good. In the front seat an alleged Yank private faced him with a drawn Colt six-gun. On either side of him sat, first, the lieutenant with drawn automatic, and second, another spy who had removed his bayonet and had the naked blade pointed straight at Dene, ready to drive it home to the hilt at the first false move. Two others sat on the floor at his feet, their positions cramped.

On this dirt road, crossing the rolling Marne hills, not a car or a soldier appeared as possible aid. There was nothing for Dene to do but take his chances. "You are going to kill me—before we get to Chalons?" he asked.

The lieutenant turned to him, his mouth curling contemptuously, "We intend to get rid of you across the next hill."

Dene twisted his bound hands on which his sleight-of-hand maneuvers had already loosened and prepared the knots.

"I'm ready to die," he said, "but what will my death net you?"

Dene was sparring for time. The lieutenant, a newcomer, laughed.

"What good would it do to spare your filthy life?" he asked. Then to the driver, "Beyond this hill, Karl, there is a small trail to the left. As well to still the mouth of this *Schwein* now."

Dene by now had worked his bonds loose, the ropes were already off. Luckily, the backs of the spurious soldiers cramped in the tonneau of the machine had hidden his maneuvering from the lieutenant, who obviously believed that their thorough job of fettering could not be broken. His captors were off guard.

At this juncture they reached the old peasant road that cut off to the left. Slowing down but little, the driver veered into it, and the movement threw the armed soldier in the front seat slightly to the right. For a second or two he was not in a position to fire.

Like a flash Dene struck. His right hand snaked up, clamped on the wrist of the soldier with the naked bayonet. With all his force—with all his two hundred and five pounds of muscle and bone—Rex Dene jerked that blade forward as if toward himself.

There was a yell. The lieutenant twisted to drive the snout of his gun

into Dene's side and pull the trigger. He lacked a half-second of doing so. For the startled soldier with the bayonet yielded to the terrific power. The naked blade sang past Dene and buried itself a full five inches into the throat of the pseudo-lieutenant. He had pulled the trigger, but the bullet tore into the leg of one of the spies on the floor of the car.

A spurt of blood shot from the carotid artery of the lieutenant. A command bubbled in his mouth. But none heard his dying cry.

Working with the savage speed of a mad man, Rex Dene seized the lighter soldier, jerked him in front of him. He was just in time, for the soldier in the front seat fired—and the bullet thudded into the spy behind whom Dene had found cover. The slug tore through the German's stomach, out his back, and buried itself against the bone in Rex Dene's thigh.

Propping the body in front of him, Dene came forward, plunging with his legs, diving. The body struck the soldier in the front seat, knocked him backward so that his head bashed into the windshield and smashed it into a thousand pieces.

The spy-driver had deserted his wheel, and wrenched madly at a gun. Dene gave a roar. The bayonet torn from the one spy's hand flashed brilliantly in the sunlight. The driver saw it coming, screamed, hurled himself backward. But the blade went through his chest until the point buried itself an inch in the woodwork of the tonneau.

The Colt six-gun fell from his hand. Dene scooped it up and turned just as a piercing pain flooded his abdomen. The remaining spy on the floor was bashing around, had gotten the blade of his bayonet upward and despite the cramped position was trying to drive it into Dene. Had he had room for a forward jerk he would have done it. Dene drew back, his body bent. He had no time to pull the trigger. The weapon brought down with all his force crashed on the skull of the soldier.

It was a terrific blow—sickening. Had it been a sword edge instead of a gun it would have cleaved the man to his breast bone. As it was he fell backward his head a bloody ruin, death quickly upon him.

The next instant Dene was flung off his feet as the Dodge radiator buried itself into a pile of thorn brush. The remaining spy, uniformed as a private, had been riding outside on the running board, squatted on the bidon of extra gasoline that all military cars in France were forced to carry. He had raised up at the first commotion, then had been tossed off by the erratic movements of the car. Having lost his bayoneted Enfield, he plunged off into the brush.

Dene had been thrown off balance and half-tumbled from the car by the impact. But he recovered himself and leaped to the ground. The fleeing spy was now fifty yards away.

As coolly as if he had been at target practice on the small-arms range Dene raised the gun. The first two shots

*Sir Reginald Hall, head of the British Intelligence estimated 70,000 German spies in France in 1917.

missed. He swore harshly, steadied the muzzle across the fore-arm of his left arm. The fourth shot must have struck the spy in the back, because his arms flew up, his back arched so that his head leaned back far enough to look backwards. In that position his legs went rubber and he went down with his heels digging into his back. Slowly his body turned on its side. His fingers scratched feebly at the dirt, then lay still.

Implacable, Dene stared at the deaths he had wrought. Then with powerful arms, ignoring the blood pouring down his leg from the bayonet stab, he tumbled the bodies from the car. He got into the driver's seat, released the gear shift, and cranked the stalled motor.

"We're going to meet, von Dienam," he muttered—"just where I want to meet you. Ten thousand feet up, you and I to a finish!"

CHAPTER V

THE SECRET LIGHT

AN amazing-looking Rex Dene stormed across his tarmac thirty minutes later. He limped and blood drooled out of his puttees. The dead lieutenant's blood stained him from head to foot. His greaseballs stared. Dene waved aside the excited questioning.

"How long have they gone?" he roared. "Where are they to meet?"

The sergeant pointed to some fly-specks against the far sky.

"That's them," he said. "But my Lord, captain—"

"The hell with all that," roared Dene. "Get out the S-592. I'm going now."

He took time, however, to bind his wound for he felt a strange giddiness that told him he was losing too much blood. And while gasoline poured into the tank under his driving urge, while Vickers machine guns took their ration of cartridges, while the motor warmed, he prepared for the sky chase.

He staggered when he got into the cockpit. "It's a good thing I can do this sitting down," he muttered grimly.

He did not wait for the Hisso to warm further. This was a replacement ship, scarcely tested out. It might run forever—or it might stall on the take-off. But that was the risk he must run. He poured the gun to her. She spat, crackled, then took the gas and began to strain at the chocks. Dene let her strain until the motor stood nearly wide-open.

"Now," he screamed, and waved his hands. The chocks were pulled; the Spad leaped ahead as if geared to a cyclone. He turned her with a kick of the rudder, and a wing tip dusted the ground. Jouncing, rocking, off balance, somehow she staggered down the field, gaining momentum. The trees near the swamp loomed high, and it seemed to Dene that he bodily lifted the ship over them. She settled, then held her altitude and he tore for the front

as fast as a cold motor would take the juice.

Fate played into his hands that day. The Yank flight with the traitor leader, ran into the Fokkers over Fismes. Three stair-cases full of Fokker biplanes—D-7 models and hot for the kill! They had evidently come tumbling down and hit the Yank formation like a ton of brick. Two Spads, smoking and flaming, were rolling down the sky. But having only fifteen miles to go Rex Dene was there before they smashed into the earth.

He ignored them; he ignored the fate of wildly maneuvering Yanks as much as his heart sickened at the sight of their plight. His eyes found one target—a Spad that identified itself immediately as the German spy master's by the fact that it circled slightly to the north of the rolling dog-fight and was being ignored by Spad and Fokker alike. Dene banked around the rolling, zooming, diving battle and tore straight for the Spad. Had he had any doubts that this was von Dienam they were immediately dispelled. The man wore no helmet; his sleek dark head projected above the cockpit edge, and as he saw this Spad come roaring toward him, he whipped his Spad around to level his guns and loosed a long, golden stream of tracer fire.

Dene pushed his rudder and stick for a fast side-slip that faded his Spad out of the direct hail of slugs. But the movement warned him that his right side was stiffening. His wound was paralyzing his right leg. He knew he had to fly this ship with aileron control alone. He accepted the situation, hauled back on the stick, and howled up the sky. Fully warmed now, the Hisso gave him power to burn. The wings bent at the pins as he whipped over in a half-roll. Banking steeply, he tore after von Dienam's tail.

The German then proved himself a master flyer. Timed to the second, as



Dene nosed down in a vertical dive the German hauled his stick and came up roaring. Too late Dene tried to level off. The German shot past him, skyward, and by the time Dene had leveled and banked, the German was roaring after him with guns aflame.

Caught, Dene could do but one thing. He kicked the ship into a left spin nosed her down, and let her run. To all appearances, von Dienam's tracer stream had found a fatal mark. A Spad spinning on its own axis is not too difficult a target, as men have found, and Dene was watching warily to circumvent a straight dive.

But to his amazement the German ignored what appeared to be an easy victim. As if thinking that the papers he carried and his own hide were worth more than anything else, he nosed over to the north and began a long power

glide to the German side of the Vesle river.

By the time Dene had whipped out of the spin and leveled off in pursuit the German was three miles away.

THE situation was desperate. If von Dienam escaped with the spy list, with the goggles that would reveal the German communications system, then nothing much had been gained. Dene opened the throttle until the Spad fairly screamed across the sky. He nosed down then until the earth was under his feet and his hair seemed about to be ripped from his scalp by the terrific speed. The wings screamed, the struts and brace wires shrieked, the linen rumbled under the strain. The motor din throbbed on his ear-drums with physical agony. But the Spad went down three miles a minute, then four, and dropped faster than von Dienam.

When the ground leaped at Dene like a gigantic fist to smite him, he eased back on the stick. Centrifugal force pinned him to the seat. The blood drained from his skull, so that he went blind, almost unconscious for a brief second. Then the Spad drew level at eight hundred feet and headed north with all the speed acquired in the dive.

As Dene had hoped he shot under the slower diving Spad of the spy. Now he hauled his stick and went streaking upward. His thumbs bit into the Bow-dain stick triggers. His guns for the first time grew red-mouthed, smoke haze came back to sting his face. The tracer stream shot through the air like insane fireflies.

Wildly, the German nosed up out of his dive. For that second the man was a fool, for his tail was exposed to the upward-aimed guns of Dene. The two ships howled up the air. Von Dienam tried to head toward Germany even then, probably hoping to out-run the bullet burst and gain his own side for a quick set-down. But bullets smeared his ship, and in despair he flattened and banked to the left. Instantly, Dene leveled, shot up between the German and his own side of the lines.

He whipped the Spad around. A dead shot, animated by a ferocity of purpose that steeled his tired nerves, he pressed the stick trips and loosed another burst.

Rac-rac-rac-rac-rac-rac-rac!

There came a second when the earth seemed to stand still—when there was nothing but two roaring Spads twisting. And then a spurt of smoke burst from the German's Hisso. The ship reeled as a hawk shot in mid-flight. It fell off in a bad wing-slip, and then the flames burst from the engine pan and made a scarlet wave against the orange sides of the Spad.

Fire! Von Dienam was aflame, and the roaring fire grew bigger by seconds. Still the ship side-slipped down toward the south edge of the Vesle swamps. The Yank side of the river. Grim-eyed, mouth a wolfish smile, Dene followed, driving implacable bursts of slugs into the burning ship as swiftly as he could bank into position on the target. But he did not want a flaming kill—he wanted von Dienam alive if possible, his pos-

sessions if dead. He only fired to force the German to side-slip, to stay on the Allied side of the river.

The flames gained despite the skillful side-slipping of the German. They ate away the wing surface and struts on the left side. And twenty feet above the ground, as the spy was endeavoring to level off for some sort of landing, the wings fell off and the ship careened, struck on the remainder of the right side wings.

Dene, settling after him, saw with horror that the German did not crawl out of the wreckage. The flames were roaring swiftly now, and might reach the gas tank at any second. Regardless of his own ship, Dene rushed the Spad in, set her down so hard the wheels buried in the swamp mud and tore off along with the assembly. His ship skated on her belly across reeds and mud and stopped right side up forty yards or so from the burning ship.

Dene dragged himself out. Though he could scarcely move now, he forced himself to the burning mass. Into it he dived with no thought of himself. Hair burned, skin blistered, his clothes were aflame in a dozen places when he finally hurled himself backward from the wreckage hanging to the limp body of Erich von Dienam.

The man was conscious, but mortally wounded. Nonetheless he tried to raise his automatic. Dene struck it from his hand and they both fell to the ground.

"No use," said the German, his eyes sardonic, "my back is broken by a bullet. I'm finished—*Kaput!*"

"Not until you explain—" Dene began.

"*Schwein!*" sneered the German, "I explain nothing. You—" he paused—"only a man with your background could have stopped me. I was a fool not to kill you the first night."

He deliberately twisted himself. A shudder wracked his frame. "Better . . . death now . . . than at . . . a stake." He smiled through his agony as he twisted his body that the broken vertebrae might cut his spinal cord.

Dene tried to stop him, crawling in his own pain. But before he could reach the German the man was dead. Slowly Dene searched the body, piling everything he found inside his undershirt. Goggles, two Saint Anthony medals and two more of the small black boxes with the little glass holes. That was all Dene could do. The giddiness overcame him and he fainted.

GENERAL "HARD-TACK" BAKER, chief of American Intelligence, stared at the pair of colored-glass goggles, the two small black boxes, and the long, round black tubing that Rex Dene

had taken from its sling between von Dienam's legs.

"It's still somewhat of a puzzle, captain," he said.

Dene rubbed the scars on his hands.

"Very simple, sir, if you know the principles. Let's start with the black tubing—I'll open it."

He did so, revealing batteries, and a small photograph. "This is, in principle, a small magic lantern, but vastly improved. This little button is a dimmer control on the light that operates from the batteries. By pressing it I can make the light grow brighter or dimmer—like this."

On the wall in the darkened room a light slowly grew and a figure took form. It was the picture of Dick Steyne.

"Von Dienam got a picture of the man who was dead—Steyne in this instance. He made it appear on the wall—as I am doing. Either he or one of his men did the whispered warning. Of



course, one of his confederates pulled the trick the first night he came to our squadron, thus giving him an alibi." Dene smiled. "I've done a similar trick in a stage illusion."

"Clever—and effective," said the Intelligence chief, "but how about their magnetic bullets?"

Dene shrugged. "The principle is old to science. How the Germans did it will depend on what your scientists find when they rip down the Spandau guns we captured from the golden Fokker. You'll find radium used, I'm sure of that."

"Why?" asked General Baker.

"Because tincture of radium was used in the Saint Anthony medals to produce ultra-violet and infra-red rays."

"How do you know that?"

Dene smiled quietly. He picked up the little black box that looked like a camera. He pressed its button. "See anything, sir?"

"Not a damned thing."

"Put on the goggles, sir."

General Baker did so. Again Dene pressed the button two or three times.

"My Lord!" cried Baker. "There is light flashing out of that box." He jerked off the goggles. "Do it again."

Dene did so, but nothing could be seen. "I swear—" began the General—"what do you mean rays? How is this damnable thing done?"

"Infra-red and ultra-violet rays," retorted Dene. "The use of both ends of the spectrum. Invisible rays—Ultra-violet for use during the day, infra-red for use during the night! Those rays, unseen by the ordinary human eye, are caught only by a filter. The filter is in those goggles."

"The German pilot of the golden Fokker wore them. Looking over the Spads, he saw the emanation from the Saint Anthony medals. It told him where he was to aim his magnetically charged gun."

"I suppose the device was invented to help more accurate shooting, and then the idea of instilling a reign of terror produced this von Dienam idea. Incidentally, von Dienam's father was a noted German necromancer and stage performer. I never met him, but I've heard Houdini talk of him and his book."

"Yes, but this light! You mean that a man could signal under your nose and not be seen?"

"Exactly what happened, sir, the night our tarmac was raided. Trevor, as he was called then, simply stood outside Steyne's door and the Gotha pilot above, equipped with the filter goggles, saw the flashes that served as his target."

"It was hellish!" General Baker wiped his brow. "They damned near had us willing to believe the dead had risen."

They fell silent, listened to the heavy roaring of the guns, the triumphant roaring that told them General Gouraud was holding before Rheims, that the Yank First, Second and Third Divisions had stopped the Germans in their tracks in the attempt to cross the Marne and outflank Paris.

What they did not hear was the firing squad disposing of the Germans listed on the spy paper taken from von Dienam.

"Trust the Germans to make a discovery like that and use it," muttered General Baker. "It's a good thing you were on the job."

Dene glanced at his watch. "I'm due to make a dusk patrol in an hour, general, so I've got to be off. Goodbye."

Into the afternoon sunshine Rex Dene's huge body strode. Driving like fury he reached his tarmac in fifteen minutes, and strode among the greasballs, an order here, a suggestion there, a yell for pilots on the dead-line. Men came tumbling to the job. They always did when Rex Dene's voice roared out.

He was that kind of a leader.

*Lest the reader think I use imagination about infra-red and ultra-violet rays let him consult Robinson's *Spy and Counter Spy* to see how these rays, invisible to the naked eye, were used by the Germans in 1918.—THE AUTHOR.

Death Spans the Pacific

(Continued from page 22)

piners had been taken over with all cable communications obliterated.

It had all happened so suddenly that none could figure what it actually meant. Would it be a naval war? Would it be a mighty clash of military aircraft? Or would the forces of the Rising

Sun actually get a foothold on the American mainland?

Events in Europe had distorted the actual understanding in the Pacific. Scare-head news writers had inadvertently twisted the focus of American international interest to a flea-bitten

desert hole in Northern Africa rather than on the all-important Asiatic situation.

Even the great attempt of Lauren Cressford to span the Pacific in one hop had been completely lost in the unjustified interest displayed over the

European situation. Little did the nation know that when Cressford disappeared, the key to an amazing international intrigue went with him.

Buzz now was crossing over to the shore-line that ran toward Cape Mendocino. He was climbing all the time, clipping off miles at a tremendous rate. He fingered his 13 m/m gun that fired through the airscrew, made certain it was properly loaded. In addition he had a 7.5 m/m synchronized gun set on the other side of the cockpit.

The sky cleared slightly and the moon spread a silver curtain across everything. The Pacific below was a vast bluish-black counterpane, but here and there he caught the fan-tail trails of destroyers that surged northward.

Then things began to happen! He caught a quick glimpse of exhaust tubes, the flash of gun muzzles and belch of explosives.

"Hell-o-o-o!" husked Buzz. "Now we're heading for it. The aircraft are engaged off Cape Blanco, and there's the destroyer flotilla."

He was about to nose down to hurtle into the crazy storm of wings, wires, and tracer bullets, when something caught his eye.

A pencil line of scarlet and yellow flashed past his head. He twisted hard as something behind him rattled. Then before he could turn to inspect the damage, there was a thunderous rattle, the ominous vibration of snarling guns. Out of the corner of his eye he caught tell-tale streaks of fire that spat out of his rear gun.

"What the devil?" Buzz swore, twisting around. "Who's that?"

He could see the slim shoulders of someone crouched over the gun, peering along the sights. He could see a mop of light hair, swirled in the slip-stream that flipped along the cockpit cover. He could see a youthful figure directing a terrible death stream at an onrushing two-engined raider that had suddenly plunged from the moon-lit clouds that fringed the mêlée of raging planes.

There was a low throb, distinguishable through the rattle of the Browning gun. Then came a sudden plop, a blinding glare. An explosion echoed across the sky and the two-engined Mitsubishi 93 belched its last gulp, ripped itself apart!

Buzz yelled, pawed back at the slim figure in his rear cockpit. Was it a boy or a girl? He managed to slap the slim shoulders and the figure turned around, a picture of youthful determination.

It was a boy, a slim handsome lad of about fifteen. He turned and pointed at the tangle of burning wreckage which was falling in uneven swings toward the inky sea below. Buzz could not remember when he had seen a more manly lad, but he was somewhat annoyed to find that something had been "put over" on him.

But there was no time to ask questions now.

The engagement had driven them smack into the wild charges of the Nakajima 90-II's which were slamming at a small formation of silver Vought Corsairs.

"Say!" Buzz growled through his clenched teeth, "those Jap ships are not unlike the Corsairs. No markings to speak of. It's hard to distinguish them when you consider that the Corsairs have different colored tails, depending on which vessel they came from."

But the lad in the back seat was now in action again. He picked off a black-tailed Nakajima while Buzz hurled the Lockheed smack at the leading Jap. Two ships were going down almost together, one with a wing off, the other in flames. A three-ship element abruptly bashed at them from above and Buzz heard the rear gun rattle again. The sparky tracers seemed to split the raiders in two. Buzz wanted to yell, but he was still somewhat upset over the kid being in there.

All around them crashed anti-aircraft shells from the destroyers below. It was dangerous gunnery.

Buzz slammed in and out, broke up attack after attack. The Lockheed, its wheels tucked up into the wing roots, slid through openings, poured terrible bursts in all directions. At one time there were seven planes tumbling into the sea below—and two of them were Corsairs.

How long it lasted, Buzz never knew. But eventually they cut the raiders down, forced them to turn back toward the north. The Corsairs were weary, too. They had performed the task set for them and they were more than ready to re-form, prepare to get back to their battleship bases, refuel and rest.

Suddenly Buzz felt the small fist of the lad thumping behind him. He turned, saw that the lad was pointing past his tail assembly.

Buzz glanced back, could see nothing. He glanced quizzically at the boy's face.

"What is it?" he asked anxiously.

"Another lot—going inland. Look! Big two-engined machines."

Buzz whipped the Lockheed over, tore toward the coast line. In a few minutes he began to catch outlines of the ships the lad had seen.

"You sure have good eyesight, kid," he muttered.

THE Lockheed with the 730 h.p. Conqueror nosed down, raced after the bombers. As soon as he could get within reasonable range, Buzz got out his night glasses and judged that they were more Mitsubishi 93's heading inland.

He glanced at his fuel gauge, realized that he had little time to waste. Beside, his ammo boxes were jangling ominously. He had expended nearly all his heavy caliber stuff.

Then began a mad race inland, Buzz pouring the sauce to the Lockheed while the Japanese Mitsubishi's seemed to be drawn on by some unseen force.

"They certainly can travel," Buzz growled. "Where the devil are they heading for, anyway?"

They had crossed somewhere south of Salem, Oregon, and were still heading inland, apparently for the open country and foothills between Mt. Hood and Mt. Jefferson. There seemed to be no reason for this move, for they evidently were

giving Salem and Portland a complete go-by.

Something told Buzz they were up to no good, even so, and he nosed down again, went at them from long range. But it was no go. They spat short bursts back at him from the rear turrets and while the aim was none too steady, there were spattering flecks here and there that were not any too reassuring.

"They're heading toward the Tik-Tok Indian Reservation," Buzz mused as he saw them suddenly turn to the south-east. "Wonder what they think there is down there to blow up. After the First American, I guess."

But levity had no place there, and Buzz knew it. Those Jap bombers were not heading deep inland for the pleasure of flying. They were now nearly 150 miles inland.

"Where did they come from?" the lad behind suddenly bawled into his ear.

"Somewhere out at sea, I suppose," Buzz barked over his shoulder.

"But they are fitted with wheels," the lad argued.

Buzz jerked at that. Of course they were! They certainly had not taken off any aircraft carrier. If they had, they would soon have to be turning back unless they had an unusual range of action. He turned, peered over his shoulder again at the lad behind him. He wondered where this boy had come from and how he knew so much about planes—and guns.

"Where do you hail from?" Buzz asked in a friendly manner.

"Back there at Crissy. I got in while you were getting your 'chute."

"But how did you get into the field?"

"I live near there. I know the way to slip in."

"You're taking a long chance, young fellow. Why did you pick on me?"

"You got a Lockheed—and I think Lockheeds are the greatest ships in the world."

The sincerity of tone startled Buzz. He turned around further, studied the lad's face. Again he was struck by its clear complexion, its healthy tone in color, the steady gaze of the blue-grey eyes, the firm jaw.

"That seems like a strange reason to stow away like this," Buzz tried to argue.

"My father flew a Lockheed," the lad went on in a low tone.

"Oh, yes? Is he an air line pilot?"

"No, he was an engineer—a former Navy man. And he had some swell ideas about planes. He tried one of them out, but I guess it didn't work."

"What do you mean?"

"He had some ideas about a new carburetor that would save fuel and he tried to fly the Pacific from Tokyo to the United States . . . but he . . . he didn't get here."

"You mean Lauren Cressford was your father?" Buzz said with a catch in his voice.

The lad did not answer, just nodded his head a trifle.

"It worked every time he tried it out over here," the lad went on. "They . . . they must have done something to it

... over there."

"The Japanese?"

The lad nodded again, stared ahead. While Buzz studied his face, fascinated by the character reflected there under the dim illumination of the dashboard lights, he saw the boy's lower lip tremble a trifle. Then the lad's eyes suddenly opened wide and Buzz wheeled around.

"They've gone!" young Cressford cried. "While we were talking. They've gone . . . somewhere. Through those clouds."

Buzz nosed down through a thin layer of cirrus, tried to spot the Jap bombers. There was no trace of them anywhere! Not a flash of exhaust! Not the fleck of a prop! Below them for miles in every direction swept a vast blanket of dull, greenish black. But he knew that blanket was spiked with the towering tips of Oregon pine.

"Whew! They certainly put one over on us that time," Buzz snapped. "But they couldn't land anywhere down there."

"It was my fault," the lad muttered. "I should not have talked to you."

"Forget it, son. They're around here somewhere, and we'll find them eventually. They don't just disappear in thin air, you know."

"What are you going to do now?" demanded the lad.

"There's an emergency field near the Dalles beacon. I think we'll pull in there for tonight and see how things lay. Then I'll have to find a way to get you back to San Francisco."

"But I don't want to go back to 'Frisco," the boy argued. "I want to stay with your Lockheed."

"You're Lockheed-loony, aren't you?" Buzz gagged. "We'll talk about it later."

THEY turned north, picked up the silver ribbon of the Deschutes River, eventually spotted the beacon at Dalles and landed. There were several sleepy-eyed soldiers on guard there and Buzz was at once covered—until he showed his new identity card. Then they helped him run the plane into a small canvas hangar. Then, when they saw the boy they began to be suspicious.

"Don't worry about him," grinned Buzz. "He's a real soldier! I'll be responsible for him."

A bow-legged top-sergeant came up, got the story, then showed Buzz where he could bunk. They found another cot for young Cressford while Buzz went to the telephone and got in touch with Crissy field. He did not mention the boy, though.

"Now then, young fellow," he said when he came back to find the boy deep in a tin can of hot milk, "let's get your story straight. It somehow gets under my skin. When did your father take off from Tokyo?"

"It was about 8 o'clock at night, on July 18th. That was Tokyo time, I guess. They heard his signals aboard the steamship *Sampoon Maru* almost twenty-four hours later."

"Twenty-four hours?" muttered Buzz. "Then he must have gone at least 4,000 miles!"

"If everything went okay, he did," agreed the lad, peering out of the tent into the darkness beyond.

"Then if he was on a normal course he should have been somewhere along the coast of Alaska—or even as far down as British Columbia."

"He was to follow the Kuril Islands, cut across to the Aleutians, pick up his course at the tip of the Alaskan Peninsula, follow the southern shore along to Juneau, then come down the Pacific coast to Seattle. It seemed safe enough," the boy explained.

"You're sure about that *Sampoon Maru* business—and the time?" demanded Buzz.

"Sure! Here's some clippings from the papers," the boy said anxiously.

Buzz had forgotten most of the important details of the flight, but the clippings soon brought it all back.

"All I can say, kid," Buzz said, "is that if he was in the air for twenty-four hours, he must be on the mainland somewhere."

"But now this war business stops all chance of anyone going out to look for him, doesn't it?"

"That guy back there at Crissy Field. He's your uncle, isn't he?"

"Sure, my father's brother. Did he tell you about me?"

"In a roundabout way, yes. I never thought I'd get up to 5,000 over Gold Beach and find you popping up in the back seat. What was the idea, anyhow?"

"I don't quite know now. It seems silly and crazy to you, I suppose," Lonny Cressford went on slowly, "but then, when I saw that Lockheed, something made me get in and hide. I think I thought you were going to look for my father, and I wanted to go along."

"Don't worry. Maybe this will work out yet. Your father was a pretty smart guy, wasn't he?"

"He knew about everything," the lad said proudly. "He taught me all about guns, but he never let me fire one. That's how I knew how to handle that one in the back of your plane."

"Did he ever tell you anything about this carburetor business he invented?"

"No, not much. That was his pet idea and nobody was in on it all. He first tried it on a car and it worked. Then he tried it on a boat and it worked, so then he made another to fit the back of a Wasp engine and eventually it was tried on his Lockheed Altair. He used to say he could fly from Japan to New York if the weather was anywhere near reasonable."

"In an Altair?" asked Buzz.

"Sure. That's what he was flying."

"Why the Altair has a cruising range of 1,025 miles or thereabouts. Did he have any special tanks put in for the Pacific flight?"

"One, in the mail compartment."

"All right, but even so at the best that would only bring the normal range up to about 2,000 miles. Do you mean to say his carburetor idea would increase it that much? That would be three times as much if he expected to do even six thousand miles non-stop."

"He said it would, and I believe him,"

the boy said quietly, still staring out into the night.

"Whew! Then this puts an entirely different angle on it all. Suppose the Japs copied that idea somehow and put it on their planes?"

"Golly, sir. I guess I'd go crazy."

"Those Mitsubishi machines we just lost," Buzz went on as though he were talking to himself, "suppose they were fitted with Cressford's idea. They could fly across the Pacific, bomb important points, and get back again. What that would do to modern military science—Wow!"

"My dad said it was a very simple idea—something about air-mixture jets that used more air than the ordinary carburetor, and so did not use so much gasoline."

"They've been working on that idea for years, but never got anywhere with it," Bension went on. "Did he leave any blueprints or models of his idea?"

"No, he said he wasn't taking any such chances as that. No one outside of us knew what he was doing. He just built these carburetors and when they did not work he destroyed them."

"Then the Japs didn't know just what he was doing?"

"They weren't supposed to."

"That makes it even more complicated," said Buzz. "Let's cork off for a few hours. Maybe something will turn up."

BUZZ lay for hours, pondering on his strange day and attempting to figure out a solution to the many twists. Young Cressford lay near him, tossing and talking in his sleep. Buzz listened for some time and realized that the youth was dreaming about his father.

Buzz got up once and sat near the boy. Finally, Lonny relaxed, settled back to a sound sleep. How long they slept, Buzz never knew; but he was aroused next morning by the boy who stood near him with a tray of breakfast.

"Whew! This is service," said Buzz sleepily. "How long have you been up?"

"Not very long . . . just long enough to lift some chow from the field kitchen outside. How do you feel?" the lad asked cheerfully.

"I'll be okay when I've had a wash or a shower. Any chances?"

"Sure. I had one over there in the men's quarters. Hurry up, we got a lot to do today."

Buzz wandered off and came back in about fifteen minutes more refreshed and clean. The breakfast was simple but encouraging and they sat on some ammunition cases and read a morning paper while they ate.

"No news of the Pacific Fleet yet, I see," Buzz said as he munched his bread.

"No news of my father, either," added young Cressford. What was a mere war where his father was concerned.

"No. And they can't find any trace of the two Pan American Clipper ships that started out from Guan. two days ago."

"I'd like to know where those big two-engined ships went," young Cressford

broke in again. "By the way, Mr. Benson, what were you heading up this way for, anyhow?"

"I have a special job, Lonny. A Japanese military plane of some sort has been seen around the southern end of Alaska—somewhere off Point Beauchaire. No one seems to know what it is up to and it refuses to answer Coast Guard signals."

"Gee! Maybe we might find some trace of my father if we went up that far. Let's get going," young Cressford boomed.

"Take it easy. Your father didn't come into this picture. I'm supposed to nail this Jap. He probably was selecting a spot suitable for a landing."

"Do the Japs have marines?"

"Sure they do, and it might be a good move for them to get a foothold somewhere in that area. You see, it would mean that we would have to get permission to go through British Columbia to get at them, and that might not be forthcoming."

"Gosh, the Canadians will help us, won't they?"

"I think they would, but those things are not settled in a few hours. It might take months, for it would involve the whole British Empire and we have to think of the British situation in the Pacific, too."

"It's all pretty complicated, isn't it? Still, we might go up that way and look around. I feel certain my father is down somewhere in that area."

Buzz smiled at the boy and admired his courage, but he wondered how they would find Cressford, should they come upon his plane.

"I'm not afraid," the lad said. "I realize that if we find him, he might be dead, but I want to know *what* happened to him. I want to know whether he got a square shake on that show."

"Pack up!" said Buzz with authority. "If you can take it, I can."

"Swell! I'll see that everything is stowed away, Okay. You take care of the ship, eh?"

Buzz smiled at the manner in which the lad assumed his responsibilities. He felt that he could trust him to the finish.

He made another call through to Crissy Field, then checked the ship, fuel and guns. The available mechanics had done a good job on the Lockheed, but they were somewhat puzzled as to what it was all about. All about them hummed the mad activity of a squadron on active service. Men arrived in trucks, others went thundering out. Labor corps were set to work filling sandbags and building up defense gun emplacements. Overhead flights of fighters, bombers, and observation machines churned out toward the coast, all intent on a valiant stand against—the unknown.

Reports went out that Seattle had been badly bombed during the night by machines that had appeared out of the east—not the west. Buzz and young Cressford exchanged glances at that. Then they heard that a minor naval engagement had been staged off Queen Charlotte Island and that only the excellence of the American gunnery had staved off a major defeat. As it was,

the stronger Japanese force had been evaded and left to grope out of a smoke streaked area that was a death trap owing to the daring of Yankee submarine commanders.

More newspapers came out with more rumors and deeper and blacker headlines. Troops were pouring across the country toward the Pacific Coast. Three troop trains running over the tracks of the O. C. & E. lines were bombed from the air fully 500 miles from their destination. No one knew how, or by whom. A troop transport working its way through the Panama canal ran aground in Gatun Lake and sank in a mysterious manner, but most of the passengers and



crew were saved and official Washington breathed a deep sigh of relief that no such disaster had happened in one of the locks.

"It's getting to be quite a war, son," Buzz said, folding his map to show a new area. "Let's get going before they draft us for some real service."

"Okay, skipper," replied young Cressford. "But I still think we pulled a boner when we let those Mitsubishi jobs get way from us last night."

"You're telling me?" snapped Buzz. "But there's no way of finding them, working blind. We've got to get something to base our movements on. Next stop somewhere in Alaska."

"I hope it's warm," said young Cressford.

"Don't worry. I got you an outfit inside. You'll be warm. You can slip it on when we get upstairs."

"You're a swell, guy, Mr. Benson," said Cressford.

BUZZ made sure he would have enough gas for the 600 mile run up to the southern tip of Alaska and in his heart he wished he had one of Cressford's fuel-saving gadgets, for he realized that they would have to economize pretty closely to make it on what they were able to carry. If they got into trouble, they might have to come down in British Columbia. That might take a lot of explaining and no end of international complications would result.

They climbed in, these two Argonauts of the air, and took off. The staff of the Dalles field had little time for them; for they were preparing to accommodate a fast pursuit group coming in from the East, and a lone, free-lance Lockheed had little standing with them. Could they have known what an important part that mere Lockheed was to play in this mad drama of war, they would have given it more attention. But Buzz was perfectly satisfied to get away without any unnecessary flourishes.

They climbed carefully with their load, shot across the state of Washington, headed for the tip of Cape Flattery, and then cut wide of Vancouver Island and studied the ground of the Canadian

territory closely through glasses as they sped on for the indistinct blot of Moresby Island. Young Cressford worked hard all the way up, taking his turn at watching the sky all around them and then the sea beyond.

It was an eerie trip, watching the fuel gauge, the British Columbia coastline, and the furtive movements of surface vessels below. Once they passed a wide-spread formation of Navy scouts that came up close, then sheered off again after identifying Benson's ship. The Pacific below was leaden and surly with few whitecaps to add a frill to its dull scowl. Buzz wondered what conditions were like farther out.

Then young Cressford tapped him on the shoulder quietly, as if he was uncertain.

"What is it?" Buzz said over his shoulder. He also noted at the same instant that they were now nearing the strip of water between Queen Charlotte Island and the tip of Alaska known as Dixon Entrance.

"Look! Down that way toward those rocks along the mainland," young Cressford said. "I keep seeing something, but I can't keep my glasses on it."

Buzz eased over, for he had a lot of respect for the lad's sight. He slammed the Lockheed through a thin wisp of mist, curled away toward the mainland again.

"Shut down a bit," said Lonny. "Let's go down lower and look carefully."

Buzz nodded, then suddenly caught the flash of a steel prop and the glint of a newly doped wing.

"There it is," he said quickly. "Look, over there, flying low over the rocks."

"Whew! That guy's taking a chance," young Cressford said.

"And for a reason, I'll bet. He's looking for something."

"Let's go after him."

Buzz wheeled closer inland, skudded through the ribbony cirrus clouds, and coursed after the strange ship they had seen skirting the dangerous coastline.

"You know what that is?" Buzz said suddenly when they got their first real glimpse of it.

"Looks small to me," said Lonny.

"It is. It's one of the new Aichi folding-wing seaplanes they carry on the new Kawasaki subs. Now we're getting somewhere."

"Where's the submarine?"

"Lord only knows. Those new Jap subs have a range of about 3,000 miles. That plane down there is unusual. It is not particularly fast because it has a light powered engine, but it nevertheless has a wide range of action. They say they can be stunted to a fare-thee-well and it is almost impossible to hit one once the pilot starts throwing it about."

"What's he looking for, though?"

"You got me. Perhaps for some of his own men—or a Jap plane that has been shot down or lost."

"Let's get him!" snapped Cressford.

"Okay! Let's go."

YOUNG CRESSFORD broke out the rear gun, set out his shop for action. Buzz smiled at his thoroughness and

opened the motor wider. The Lockheed slammed down toward the Aichi which was now about two miles away. Buzz was uncertain what to do about it and decided to attempt to cut it off and drive it inland, but young Cressford was anxious and before Buzz could do anything about it, he had ripped back the cockpit panel and was pouring a long-range burst at the flickering Aichi.

"Wait a minute!" Buzz yelled.

But the youngster's shots had told already. The Jap plane jerked, twisted in agony, then suddenly sheered off and shot toward the coast line.

"Golly!" gasped Buzz. "What's he up to now?"

They saw the tiny seaplane curve in toward a jagged spire of rock that jutted out of the water like a storm-swept cathedral. The Jap pilot screwed past the tip of it with inches to spare and suddenly nosed down. His guns chattered for a minute at something neither Buzz nor young Cressford could see. Then it came up from beyond the jagged spire and seemed to jerk twice.

"Bombs!" yelled Buzz. "He's bombing something!"

Then, as the small fragmentation missiles swept out from the light racks under the Aichi, there came several other detonations that crashed out all about the Lockheed!

BA-ROOM! BONG! BASH

Buzz charged at the Aichi, whipped a crashing burst of heavy caliber stuff at it, and saw its nose jerked again. The Aichi swept over on one wing, side-slipped beautifully over the spire of rock, and nosed for the water.

Buzz shot at him again, made him twist. The Jap hurtled through an opening between two towers of rock, disappeared again. They raced after him and heard two more bombs belch somewhere among the rocks.

"What the hell is he after?" Buzz muttered under his breath.

But young Cressford was screaming in his ear.

"What's up. You hit?" demanded Buzz. But when he turned he saw the youngster directing a stream of fire at something out to sea.

BAH-ROOM! BONG!

Two more heavy concussions bashed out above them—and now Buzz saw the source of the shell fire which had menaced them. A long gray submarine, its deck dripping and sleazy, was belching fire and smoke from a fixed gun mounted forward of the conning tower. Two more shots crashed about them, and Buzz whipped away, tried to clear.

"So that's where the Aichi came from! Well, here goes. Glad we brought the hardware along."

Young Cressford was spinning back and forth in the aft cockpit, firing short bursts.

"Hold it! Hold it!" Buzz roared. "We'll need all that stuff in a minute. Where did that Aichi guy go?"

"I don't know. He disappeared down there behind those rocks."

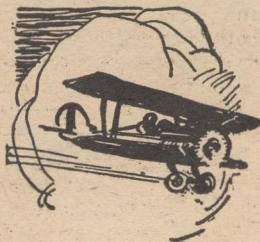
"Well, hang onto your eye-teeth, youngster. You're going to witness the first real victory of this war. Here we go!"

Buzz shot the Lockheed up hard, climbed in crazy jerky circles while the gunners aboard the submarine peppered at him with everything they had. Buzz crawled back and forth then for a minute under slow speed, broke up their calculations.

"Now, then, hang on and give 'em plenty when we zoom up again."

The youngster turned, steadied himself behind the gun and felt the Lockheed heel over. Buzz let her dangle there for a few seconds and faked a hit. Then, when they held their fire for the fraction of a second, he let her have her head and reached for the bomb rack plugs. He drove the blunt nosed fighter down dead on the conning tower of the Jap sub. The wind screamed past their coupe top, the steel bladed prop raged madly. Buzz caught the sub's outline in the bomb sight and pulled two plugs. The Lockheed jerked with the loss of the weight and he could see the grimaces of fear on the faces of the men along the rail. He whipped up as they leaped for the gun again.

Behind, as he zoomed up, young Cressford braced himself and drew a long bead on the groups huddling against the conning tower. He blazed away. Then came two terrific explosions. One of Benson's bombs had caught the stern and elevating fins of the sub while the other bounced off the sleek back of the undersea boat and exploded below the water. A great jet of greenish-black water went up and came down with a



flop all over the front gun. The other blew chunks of metal out of the steering gear and the undersea boat heeled over badly.

"That's the stuff!" Buzz yelled. "Keep them away from that gun while I have another crack at them."

Cressford swept his gun back and forth wildly, and Buzz charged point blank into a salvo of three-inch stuff and released two more bombs. The first hit square under the conning tower at an angle, and a grim sheet of flame belched out. The second caught the stern again and twisted the gear even worse. Cressford, screaming at the top of his lungs, battered them again and carefully picked out the groups of men that were attempting to break out another gun.

TRAT-TA-TAT-TAT-TAT!

Buzz feinted a move, then cut away again. He watched the frantic efforts of the men as they tried to break out more weapons and hold him off. He steadied the youngster behind him, then suddenly tore at the sub again. They tried to hold him off with a light machine gun and the wild gun-laying of the three-incher, but this time, Buzz was out for

neck or nothing. He steadied the nose as the Lockheed danced in the wild concussion and directed two light, but effective, bombs at her hull from a low angle.

He raced at the sub at top speed, then let drive with two bombs. They spurted out of the racks like metal slugs from a giant catapult and caught the big Kawasaki boat square in the midsection. There was a wild glare of strange flame, a tremendous roar, and Buzz whipped her out of danger.

"That was her magazine," he yelled. "Give 'em what you got left. It will be charitable, at least. They'll never get away from that."

But Lonny Cressford was pouring it to them without any invitation.

They watched the sub flounder once and roll hard to port. The hull showed great gaps through which spumed fire and smoke. Another explosion blew the conning tower awry. Then the craft threw her stern high, showing her screws, and went down nose first. It was a quick and merciful finish for all concerned and Buzz winced as he realized what a few small bombs had done.

"Well, what about that Aichi seaplane?" demanded young Cressford.

"Golly, yes! I almost forgot about him. Where did he go?"

"Down behind those rocks."

"What was he bombing?"

"Let's go over and see."

BUZZ rounded her clear again and headed back toward the mainland. Throughout the action against the submarine he had forgotten all about the little Aichi and was amused at the spirit and enthusiasm of the youngster who had reminded him of it.

They headed for the tall needle of rock that marked the spot and climbed high to get a better view above the jagged necklace of rocks that swelled out and left a snug lagoon of sheltered water lapping against a bright yellow fringe of sand.

They peered down, saw the Aichi bobbing aimlessly in the lagoon. Buzz stared down amazed.

"How did he get in there—right side up?" he said.

But young Cressford was yelling: "Look . . . NR 333Y . . . NR 333Y . . . look! On that wing!"

Buzz looked, but all he could see was the small Aichi with Japanese Naval markings.

"What are you talking about?" he barked at the lad.

"Look! On the wing down there . . . NR 333Y . . . NR 333Y . . . On that Lockheed wing, over there. Not the Jap ship!"

Buzz wheeled over again, stared down at the far end of the hidden lagoon. Then he saw what the youngster was yelling about—a reddish wing leaning against a pile of rocks. And across it, in bright lettering, he read: NR 333Y.

"What do you make of that?" he asked the lad.

"What are you waiting for?" young Cressford yelled. "That's my father's plane—or at least a wing from it. Those are his numbers—NR 333Y."

"Holy Moses! No wonder that Jap

guy was bombing in there. He was trying to finish off your father—or his plane."

"What are you waiting for?" screamed the lad again. He was pulling the cowl back, seemed to be all set to leap out and take to his parachute.

"Wait a minute! Take it easy. You'll kill yourself trying to drop in there!"

Buzz took another look at the wing, then studied the layout below. It was a risky attempt, but it was worth it, he figured. The Lockheed was well down in fuel and should handle easy as far as her gliding angle was concerned. "If she only had flaps!" he mused.

"Look here," he yelled over his shoulder. "I'm going to try to get in there and run along that sand. You're sure those are your father's identification numbers?"

"Positive!" young Cressford yelled, fumbling through his outfit for the inevitable bundle of newspaper clippings. "I'd know that number a mile off if it was printed on the leg band of a homing pigeon!"

"Okay! Hang on, I'm going to try to get her in. If we crack up, we can start digging in for the winter."

"That's what my father's probably done—dug in."

"I hope so. With that guy dropping fragmentation junk in there like that."

"I'll kill him if he hurt him," young Cressford barked.

"Don't worry. That Jap's as dead as a door nail. Look over there."

Young Cressford looked down at the Aichi. The pilot was hanging half out of his cockpit and there was a tell-tale pennon of scarlet dripping down on the lower wing.

"Uh! I hope I didn't do that," said young Cressford.

But Buzz was now trying to figure a way into the lagoon and the possibility of landing on the stretch of beach below.

"You'll never get in there," young Cressford said anxiously.

"That Jap did. Look at him. Didn't crack a strut."

"Sure, but look at his bus. Small light biplane—but I think you can do it, Mr. Benson. Let's have a go at it!"

"You make me do the funniest things, Lonny," Buzz said. "Well, here goes."

They circled again and Buzz cut the gun considerably and watched for the wing. He dropped a smoke bomb that spluttered on the water and disclosed that there was little or no wind in the lagoon. Then he lowered his wheels and set the XP-9 into a slinky side-slip. The wingtip dropped below the level of the rock spire and they knew then that they had to go through with it.

They slid frantically for some depth, then Buzz jabbed the throttle forward an instant, got some headway, and nosed down. The Lockheed leaped forward, then Buzz held her in a tight spiral, timing every circle so that he could touch the sand beach on the correct side.

He stiffened as the wing-tip all but brushed a rock, then he held her steady again. The Lockheed eased around once more and he fishtailed madly to hold

her back. Then he slammed the wheels down, rammed on the footbrakes, shut his eyes, drew his arm up over his face—and waited.

There was a rumble, and the next thing Buzz knew, young Cressford was blazing away with the rear gun. The shots echoed out across the lagoon and Buzz peered out. He was fighting a mad duel with the supposedly-dead pilot of the Aichi who now sat up pouring a terrible storm out of the nose of the gently bobbing biplane. The Aichi was slightly tilted, however, and the Jap's shots went over their heads a foot or so.

Buzz ducked, then the shooting suddenly stopped and he realized that young Cressford had nailed the Jap this time. He peered over his nose, saw that they had pulled up not ten feet from a sand-streaked rock.

"I thought you said that Jap was dead," remonstrated young Cressford.

"Sorry, my mistake," replied Buzz with a side glance at the lad. "You're a handy hunk of kit to have along on a show like this. Do you do card tricks or . . . sing?"

"I'll sing, if we find my father!" the lad replied getting up to get out. "By the way, that was a swell landing, Mr. Benson."

"I had to do it."

"Had to?"

"Sure. I couldn't let the House of Cressford down, you know."

"You're a swell guy, Mr. Benson."

"Thanks," said Buzz realizing that in those few words he had received a very sincere and loyal expression of trust.

They both climbed down and young Cressford started down the sands.

"Wait a minute!" snapped Buzz. "We don't run off like that, you know."

"What do you mean? My father—"

"Sure, but we make all arrangements for a quick get-away—just in case, son," Buzz said in a friendly tone.

"Okay! Sorry! What do we do?"

"Turn her around first so that we can get away quick—if we have to. Then we don't go unarmed, either. And if your father is down in here we had better take a first-aid kit and some grub along."

"Golly, and I used to think I was a pretty keen Boy Scout," said Lonny with a guilty grin.

"Never mind. Let's work fast. Anything may happen, yet."

THEY turned the Lockheed around and then selected stuff out of the emergency locker. Buzz took a pistol and stuffed it in his coverall pocket. Then they set off down the sands to where they had seen the Lockheed wing.

They made their way carefully along the sand, watching the Jap plane that still bobbed gently on the lagoon. The Jap was out cold this time and Buzz realized that he had made one final gallant effort and had passed out. With the assistance of young Cressford's gunnery, the limit of human endurance had been reached.

They measured the stretch of sand off carefully, figured that it gave them about one hundred and thirty yards of

take-off space. But on all sides there were jagged fingers of rock, lowering columns of wind-swept granite and frowning crags that made their take-off almost impossible.

Young Cressford was naturally anxious to get to the wreckage of his father's plane and he kept Buzz moving along at a stiff clip. They found the wing and studied it for several minutes. It was evident that it had been ripped away from the main wreckage and laid out so that it would form a ground signal.

The lad's face dropped: "Where's the rest of it?" he asked in a pained tone.

Buzz inspected the rocks all around and tried to find evidence of the direction it had been dragged. He paused, stared all about for several minutes, then began to clamber over the rocks.

All around them the crags and shelves were pitted with the shrapnel or steel fragments that had exploded from the bombs that had been released. But there was no sign of any other part of the Lockheed. Without a word they clambered about, inspected the rocks closer.

Suddenly the lad halted, stared about. His face was tense and drawn and he seemed to be listening for something. Then, like a deer he sped across the great boulders and began tearing at a jumble of heavy slabs. Buzz followed, puzzled. By the time he reached young Cressford's side, the lad was working like a madman and calling: "Dad! . . . Hey dad! . . . It's Lonny . . . and Mr. Benson . . . dad!"

"What the deuce are you up to?" demanded Buzz.

Then he, too, listened carefully and caught a low cry from somewhere beyond the rocks.

"How did you know he was in there?" demanded Buzz, climbing out of his heavy parachute harness and coverall.

"Something just told me he was buried in a cave, or something, here."

"You two must be a swell pair of pals," panted Buzz, tugging madly at the rocks.

IT was more than an hour before they could get an opening wide enough to get through with safety, but eventually they succeeded and young Cressford, with a glance of gratitude toward Buzz, clambered through, yelling at the top of his lungs.

Buzz crawled in after him with first-aid kit and flashlight. He flashed the bright gleam about the dank cave for several seconds and finally brought it to a trembling stop in a far corner. He saw young Cressford clambering at a recumbent form.

He knew they had found Lauren Cressford!

For minutes they worked on the man who was gaunt, unshaven and only partially alive. He sobbed, clutched at the shoulders of his son who worked like a beaver.

First they dragged the flying man clear and got him outside in the air and sunshine. They built a fire of stringy driftwood and propped him up against a flat stone. They used their chutepacks and coveralls for bedding

and tried to get his story as they worked.

Buzz found some medicinal brandy and a tube or two of concentrated food. They found water, boiled it, and made weak tea to start with. Gradually, Cressford was brought out of his half-stupor.

For nearly an hour they worked on him, bathing his face, massaging his legs, and enticing the strength back into his limbs. He spoke in disjointed sentences at first, then went to sleep. Young Cressford sat staring at his father, then appealed to Buzz with wide eyes.

"Don't worry. He'll come through, all right," Buzz encouraged.

"But what happened?"

"He came down somewhere near here and crashed, I suppose. Then he ripped off that wing and laid it out as a signal. In the meantime the Japs found him and tried to bomb him—to finish him off. But he evidently slipped away in that cave and the resulting explosions of the bombs started that rock slide that trapped him."

"But where's the rest of his ship?"

"Not far from here, I'll bet."

"You see," young Cressford said anxiously. "I was right. He did have something put over on him, but he escaped—this far."

"I think you're right. He's sleeping now and he'll feel much better when he wakes up. Let's go and see if we can find his plane. That may help."

They did not have long to look. The Lockheed with the remains of a crumpled wing still bolted to the battered fuselage, lay in a shallow gully about 300 yards away and further inland. They clambered over the rocks to it, stared at the wreckage. How Cressford had walked away from that crack-up was a marvel.

Suddenly Buzz hurried up to the nose of the ship. The Wasp engine was still in position under the high-speed cowlings, but the cowlings told the story.

Buzz pointed.

"Bullet holes!" young Cressford said.

"Yes, and they were not fired from above, either. They were fired while the machine was in the air. Notice how they all come up through the bottom?"

"Then he was fired on and shot down?"

"Positively!"

They stood staring at the wreckage, reading its silent story. Then they heard a faint cry from the elder Cressford.

"Lionel! . . . Lionel!" the voice called.

They rushed back to the clearing before the rocky cave. The trans-Pacific pilot was on his hands and knees trying to crawl back to the cave.

"Take it easy!" the boy yelled pulling his father back to the fire.

"Lionel . . . Who's this?" the man said faintly.

"This is Mr. Benson, dad. He found you and he brought me along."

"He means *he* found you, Cressford," broke in Buzz. "I just came along and learned a thing or two. He's a great boy. How do you feel?"

"Benson . . . Benson? . . . Ah, yes, I know of you. Glad you came.

Awfully tired of sitting in there. But they'll be back. They'll be back. They've been trying hard to get me . . ."

"They won't get you now. We finished them off," Buzz said quickly.

"Thought no one would ever come. I put the wing out and it only brought those swine."

"They shot you down, didn't they?"

"You found the bus?"

"It's still over there. We were just looking at it."

"*They knew I knew!*" Cressford suddenly muttered.

"Who . . . what?" snapped Buzz.

"Their game . . . I learned something in Tokyo . . . by mistake. Wait until I get to Washington. I'll tip them off."

"Tip them off? . . . It's too late. The war is on already. It's been on for nearly a week," Buzz said, suddenly realizing that the man had probably been bottled up in there for some time.

"The war is on? . . . Already?"

"Sure. They've got Guam and the Philippines and they've destroyed the Asiatic Squadron. Seattle has been bombed and several minor naval engagements have been staged off the Pacific coast."

"My Lord!" gasped Cressford, staring at his son. "What's the date?"

"August 1st, dad," young Cressford replied.

"August 1st? Then . . . then we still have time?"

"Time for what?" asked Buzz puzzled.

"That's what I found out. They have a hidden air field at Silver Lake in Harney County, Oregon. Silver Lake is a dried-up lake bed, you know, and was once a part of the old Malheur volcano which somehow disappeared about one hundred years ago. The lake is an unusual affair, offering a marvelous landing area that is well sheltered. And in addition, the great caves left by the old volcano are perfect for underground hangars."

"How do you know all this?" demanded Buzz.

"Remember those two-engined ships we saw yesterday, Mr. Benson?" young Cressford broke in.

"That's right, son," the elder Cressford went on. "They are the new Mitsubishi bombers. They came all the way across the Pacific on their own!"

"Your father needs a rest, Lonny," Buzz broke in.

"Don't get me wrong, Benson," the elder Cressford said seriously. "They did it—with my carburetors. Now, do you realize why they shot me down—and have since tried to finish me off?"

"Whew! Then that jet idea really does work?"

"No question about it. They stole the idea while I was waiting for the weather in Tokyo. They're out to bomb Washington—tonight, if this is the 1st. I found that out, because one of those damn fool Japs who had been fooling around my machine, left a copy of his secret orders in my cockpit."

"Wait a minute. That might have been a plant."

"No, it wasn't—because I got it back to him without his knowing he had mis-

laid it. It's no plant. It's serious!"

"Say, let's get this straight, Cressford," said Buzz taking out a map and a pencil.

"All right. Their secret field is at Silver Lake—that's about 225 miles south-east of Portland, near Silver Creek and a town named Wagontire, of all places."

"I got it! Go on!" snapped Buzz.

"They were supposed to get a full Army squadron—that's eighteen of that type—in there by the 30th. They were to have a day's rest, which brings it up to the 31st, and on the night of August 1st they were to take off for the 2,100 mile flight to Washington—fully loaded."

"You're sure they intend to make the trip and get back again on their gas load?" asked Buzz still unconvinced.

"They made it all the way to Oregon from Tokyo, didn't they?" Cressford argued.

"If they're at this Silver Lake place, they must have done it," said Buzz puzzled.

"Well, we saw those Mitsubishi ships, didn't we, Mr. Benson?"

"I sure am being talked down this time," smiled Buzz.

THEY were busy making Lauren Cressford comfortable during all this conversation. Young Cressford was sponging off his face, chest and arms. Buzz was massaging new life back into his legs, giving him short but refreshing drafts of beef broth, and brandy in warm water. As he talked, the elder Cressford seemed to come out of his semi-coma. He glanced around and studied his son and the man who had flown him in.

But even so, Buzz was worried about him.

"What are we going to do?" demanded the youth.

"I'm trying to make up my mind. There's no radio in that ship of mine, you know, and I presume yours is dead, Cressford."

"Went out soon after they fired on me. No, we can't warn anyone in that manner, and don't forget you have *got* to stop those devils—somehow," said the elder Cressford with spirit.

They both looked at him and marvelled at the fire in his eyes. After all, Lauren Cressford was only a few steps removed from the grave.

"But father!" cried young Lionel. "What *can* we do. You come first, remember. We have to get you out of here."

Benson and the elder Cressford exchanged knowing glances. Both admired the lad and sensed that he had said something that had taken all his will-power. They both knew he was itching to get his young fingers around a gun again and train it on the Mitsubishi ships that had eluded them.

"You're a grand guy, Lionel," smiled the elder Cressford, "but you're a rotten actor. I know how you feel and I appreciate what you just said, but I've been here so long that a few more days won't make any difference. It's up to you—and Mr. Benson—now."

"Swell," agreed Buzz, with a smirk. "Only both of you, in your act, seem to have forgotten one thing."

"What's that?" asked Cressford, twisting in his bed.

"We have only about fourteen gallons of gas in my boiler and that's not enough to get her really warm."

"Whew!" whistled young Cressford. "Then we're sunk."

The elder Cressford closed his eyes. "It means they'll get through—unless we can think of something."

"Wait a minute," said Buzz suddenly. "That Jap seaplane—the Aichi out there on the lagoon."

"There's an idea. He may have some left—unless I shot his tank full of holes," Lionel jabbered.

"Go and take a look," said the elder Cressford.

They wrapped him up again in their extra clothing, then went over the rocks to the lagoon. Together they stripped on the sandy beach and swam out to the still-bobbing Aichi.

They climbed up on the blood-spattered pontoon, stared inside. Young Cressford clambered on the wing and studied the ship carefully with his youthful enthusiasm, but Buzz was more interested in the tanks.

"Let's get it ashore and see what we can do there," Buzz suggested.

"Okay. Here's a rope in the side locker. Let's attach it to the strut of the pontoon and tow it across."

No sooner said than done and in about ten minutes they had the bullet-slashed Aichi up on the sand and securely anchored to a rock near the Lockheed. Then they carefully drew the dead Jap pilot out and dragged him across the sand to the cover of the rocks. There they huddled him away under one of his own motor covers and planted the edges down with rocks. Then they went back to the plane and seriously undertook the fuel question.

The only gas tank they could find was fitted in the upper center-section of the wing. Fortunately it had not been hit by any of the wicked bursts both young Cressford and Buzz had smashed at it.

Benson rapped on the metal tank. The resulting hollow sound was none too reassuring.

"Sounds bad," he said. "Get a wrench and the collapsible water bucket in our bus. We'll run what's left off and put it in the Lockheed."

"Right away," said Lonny with enthusiasm.

They carefully unhooked the copper supply pipe and let the gasoline run into the canvas service bucket, but when they were through they had not added more than three gallons to what was left in the Lockheed tanks. They went over the Aichi again, but they could find nothing more—no other tanks anywhere aboard.

"Well, they really didn't need an awful lot on a machine of this type," Buzz explained. "She was probably launched off a catapult as near to her target as was possible, and any weight they could save, would be worth considering."

"Sure. But where do we come off with those guys starting out sometime tonight?" moaned young Cressford.

"They're about 900 miles away from here," Buzz growled, "and even if we are able to get to the mainland and get a message through, what chance have we of making them believe us? Can you imagine the mug on the Chief of Staff when we tell him that eighteen two-motored Mitsubishi bombers are leaving the West Coast to bomb Washington tonight? Can you imagine what he'll say?"

"What will he say?"

"It will go something like this: 'Hm. Think I care to listen to such drivel as that. How can machines of that type get across the Pacific and then continue on across the continent to bomb Washington?'"

"It will sound silly, of course," young Cressford agreed, wagging his head like a weary old man. "But if we could tell him that my father did it and was shot



down before he got to the American mainland, they would have to believe it."

"Wait a minute!" gasped Buzz. "That motor of your father's!"

"What about it?"

"That carburetor! If we put it on the Conqueror . . ." Buzz went on.

"That's right! I wonder . . . Say! Come on. Let's see what he says."

BOTH were stunned by the realization of the whole situation. For fully a minute both Buzz and the lad stood staring at the big Conqueror motor.

"But the Conqueror has two carburetors," husked Buzz. "The Wasp has only one."

"Gee!" young Cressford said hopelessly.

"Wait a minute," Buzz said suddenly, whipping around and glaring at the Aichi and her Jimpu engine. "Perhaps—"

They gently raised the cowl flaps of the Aichi and stared behind the Japanese radial. Then young Cressford let out a whoop.

"Sure enough!" he cried. "That's one—that copper attachment that fits over the float chamber. Let's unscrew it."

Buzz was not certain, but he let the boy unscrew the somewhat complicated attachment and crawl down off the pontoon.

"So you fellows had the same idea I had," a voice faltered behind them. They whipped around and saw Lauren Cressford standing near them with one of the strange copper tubing gadgets in his hand. He was swaying like a drunken man, but he was game to the core.

Buzz leaped, caught him before he keeled over.

"Yeh. Let me sit down somewhere, and you birds do as I say."

Lonny Cressford was unrolling a kit of tools and selecting the small glinting wrenches that were designed especially for the Stromberg carburetors.

"Now get this straight," the elder Cressford was saying. "I know the Stromberg and these things will go on okay if you attach them in through the air-bleed tube and tie it up with the economizer metering jet. You'll notice that once it is attached correctly and the control bar placed back, the device will be working at its most economical efficiency when the throttle is set in the intermediate position on the quadrant. Be sure you leave sufficient room for easy movement of the two pistons in the carburetor throttle openings. Get it?"

"I'm beginning to," muttered Buzz. "Why in hell didn't someone think of that idea before?"

"They did," grumbled Cressford, "but they were working backwards. What they were thinking of was to bleed more air into the mixture rather than cutting down the quantity of gas vapor necessary. That sounds crazy I know—but, you see, my device not only cuts down the amount of gas used, but it actually creates a more efficient mixture at normal cruising speed. Of course, if you want to go crazy and get 300 m.p.h. out of this barge of yours, you'll have to open the air-bleed wider and suck in more gas. So until you actually go into action, keep her at half throttle and she'll maintain normal cruising speed."

And while Buzz and young Cressford attached the economy devices to the Strombergs, they planned their next moves.

"What are we going to do with him, Mr. Benson?" young Cressford muttered when they had their heads under the cowl.

"He's ready to accept it. He'll have to stay here until we can get back or until we can send help for him."

"How long can he hold out?"

"Hard to say. He's not so bad now. We can leave him what grub and medical supplies we have and we can make him comfortable with stuff from the smashed Lockheed."

"You think we'll ever get him out?"

"Why not?" demanded Buzz, as he adjusted the last throttle connection.

"I hope so. He's a grand guy, and it would be tough to lose him now—after all this."

"Don't worry. He'll hang on, now."

They finished up and tested the motor. Buzz kicked the starter and let her idle while the elder Cressford listened and made suggestions for the minor adjustments. At last he was satisfied. He nodded to Buzz to cut her.

"How many gallons of fuel have you got aboard?" he asked.

"A little over seventeen—perhaps eighteen," said Buzz. "How far can we go on that?"

"Nearly 600 miles," said Cressford, figuring mentally.

"Well, we might make Seattle, then."

"You should. But you've got to have

the breaks and use that throttle right."

"But that Silver Lake place is more than 300 miles from Seattle," wailed Lonny. "What good will that do?"

"Well," mused Buzz. "That's the best we can do. We can at least argue with someone and try to get help. There's one of the Attack Groups in that area somewhere. If we get there—to Seattle—in time, we can pick up a gang of the boys and go in and do a swell job."

"Yeh," growled the elder Cressford, "but it's dollars to doughnuts that no one will give you a tumble."

"That's the risk we have to take," snapped Buzz. "Now come on. Let's get moving, if we are to get out of here in time. Who's to go with me?"

"Don't be silly," snapped the elder Cressford. "You'll have to take him. He's lighter, for one thing, and he's in shape to help you if things get tough. I can stick it out here for a few more days now. You get going—but get me back to that cave and gather me some wood so that I can at least keep warm."

Buzz hurried about it, for he realized that the longer they hung about the more chance there was that young Cressford would break down, and he did not want that now. Too much depended on him.

In half an hour they had the elder Cressford fixed up as comfortable as conditions and available equipment would allow. They piled driftwood near the entrance to the cave and built an extra shelter with chunks of the wings and other parts from Cressford's Lockheed. Then they backed off guiltily and tried to act as though they had done the same thing hundreds of times. But Buzz had to lug young Cressford away.

His father waved gamely and simply said: "Shove off—and good luck to you. I'll be here when you get back."

They scrambled off and clambered into their flying kits under the lee of the fuselage. Then they climbed in and Buzz wound the starter again.

The Conqueror caught without a hitch, then Buzz stared about the lagoon, wondered how they would get out.

But there was nothing to question now. They *had* to get out—somehow.

He tested the motor several precious minutes and let her warm considerably before risking the mad attempt. Then he nodded to young Cressford and ordered him to fasten his belt.

They stood there poised on the yellow sand, the nose of the XP-9 smirking at the cruel crags and walls of granite ahead. Buzz figured his distances again and jammed on his foot brakes. He opened the motor to the limit and held her there until she threatened to stand on her nose. Then with a jerk he loosened the brakes and the trembling Lockheed leaped away and tore down the sandy stretch.

"Hold on!" screamed Buzz.

The Lockheed sped for the far wall at breakneck speed and Buzz lifted the wheels at once and tucked them away. With inches to spare he whipped her around and slammed down the lagoon in the other direction.

Again the Lockheed seemed headed

for an impassable wall and again Buzz whipped her out just in time amid the tremendous roar of the Conqueror. They paced back once more and Buzz now threw all caution to the winds. He hoiked her clear and slammed his wingtip down just when it seemed that he must wash the ship out on one of the spires of rock. They curled through between two cruel points of rock and cleared out into the open.

Buzz breathed a sigh of relief, then cut round and headed down the coastline, his fingers fumbling to get the throttle into the intermediate position so that the Cressford economizer would go into action.

Immediately the Conqueror assumed a quiet contented purr and the air-speed needle trickled back to the 190 m.p.h. mark.

So far, so good!

COLONEL HOMER DODD, C.O. of the Eighth Pursuit Group now huddled on the small Barling Field just outside Seattle, listened with mingled feelings of amazement and incredulity as Buzz Benson and his youthful passenger told their story.

The clock on the wall was well past eight before they had finished and Buzz was getting frantic.

"But you don't mean to stand there and tell me you came all the way down from Alaska on seventeen or eighteen gallons of gasoline with a cock and bull story like that, do you?" the Colonel demanded, thumping his desk.

"I'm telling you and you're listening!" Buzz raged. He was pretty fed up with military minds by now. "We found Lauren Cressford piled up a few yards inland, being bombed by a Jap Aichi. We 'got' the Aichi and the submarine he was working from. Now all we're asking of you is some help to 'get' the rest of them—before it's too late."

And for the second time Buzz went over Cressford's amazing story, while Colonel Dodd sat and tapped the table with his pencil. Young Cressford broke in every so often with a few words that made it all the more binding.

"All right, Mr. Benson," Colonel Dodd agreed finally. "I'm inclined to believe you, but what can we do? I can advise Washington, but I'm certain they'll take me for a madman—a man who has cracked under the new war strain. They'll do nothing about it."

"I know that, sir. That's where we come in. There's no use in trying to stop them over or just outside Washington. You know the Japanese air code: 'Our ships have it on any American plane because we *always* have a range of action twice that of yours. We only figure the distance *out*. We do not plan to come back!'"

"Yes Yes, damn them," husked Colonel Dodd.

"We've got to stop them over Silver Lake, or we're licked!"

"But how? I can't give you help," Colonel Dodd said.

"If those Mitsubishi bombers get anywhere near Washington, you can have 500 fighters in the sky to stop them, but you won't. They'll just put their noses

dead on the Capitol, shut their eyes, and ram the throttle forward. There's no defense for that, Sir!" Buzz raged.

"I agree, but my orders are to stand by here to stop raids on Seattle and the aircraft factories in this section. I can't spare a ship or a pilot."

"There's eighteen Mitsubishi 93 bombers hidden away at Silver Lake. Each carries three tons of high explosive. Figure that out! A man risked his life to cross the Pacific flying solo to let us know about it. Are you going to turn him—and this lad, his son—down, Colonel?" Buzz pleaded.

He glanced up at the clock.

"We've got only a short time to do something and you're the only man in the world who can do it, colonel. It's the biggest chance you ever had, or ever will have, if this war goes on for forty years. You may save a whole nation with a word—not just a troop, not a mere regiment, not a division. A whole nation, colonel!"

"I either do that, or I fail miserably," muttered Colonel Dodd. "I'm either a hero or—a wash-out."

"Are you afraid to fail, colonel?"

"I'm not sure."

"If I fail, colonel—if *we* fail, this lad and I," Buzz went on, buttoning up his coverall, "we'll never know much about it. If you fail, they'll send you a nasty letter—and that's all. If you win—well, *you win*, and how!"

"I'll tell you what I'll do," Colonel Dodd said with a gesture of resignation. "I have a squadron—a new squadron of mad-cap kids, just organized a few days ago. I don't know how good they are. They're probably terrible. They're flying what we had left—a few old Curtiss Hawks . . . a lot of old iron, as far as I can make out. You know, the old models."

"Perfect!" said Buzz. "They won't run away from me. Go on."

"A Major Ralph Grace has them so far, and as far as you are concerned, he still leads them when he can yell over their incessant babble. I think you will be doing me—and the group in general—a good turn if you take them for a little night show up to Silver Lake—just in case you have a bum steer. Get what I mean, Benson?"

"Perfectly. And it's a grand way to handle it."

"I'll get you a gunner too, for your bus. He'll report before you leave."

Young Cressford made a quick move, but Buzz stopped him.

"That's out, colonel," Buzz said quietly, and the colonel knew he had pulled a boner. "Young Cressford has been with me on this show since it started, and he's going to finish it."

"What about his father?"

"That's next. He's up there and you must arrange for someone to get him out tonight or early tomorrow. A Coast Guard cutter would do it easily, or even better one of the Coast Guard amphibians. Here's the pin-points and full details of how to get in to him."

"I'll have that taken care of at once," Colonel Dodd said, giving young Cressford another glance. "How soon do you want to get off?"

Buzz looked up at the clock. "At once, sir. We have little time to lose. You couldn't get any other help for us, could you—from any other field?"

"They wouldn't even listen to such a story, Benson. Beside, the rest are all down around San Diego trying to work with the Navy. It's all yours—and you can have it, if what you say is true."

"Thank you, sir. We'll love it!"

THE activity on the Barling Field now increased in tempo, with the scream of sirens, the growl of motors, and the rattle of guns being tested. Youthful pilots raced back and forth, picking up the tag ends of their equipment, snatching at maps and signing log books. Flood lights were tested, then doused until they were ready for the actual take-offs. More sirens screeched, more bells jangled, and loud-speakers barked from their metallic throats.

Colonel Dodd, Major Grace and his three young flight commanders huddled around Buzz and his kid gunner. In quiet tones, Colonel Dodd explained that the squadron was being sent off on a special night show, mainly for experience, but that they were to expect anything. But when he explained that their objective was a dried-up lake bed 300 miles inland, a few of them sniffed and decided that it was nothing but a routine experience patrol.

"Make no mistake about this, gentlemen," Colonel Dodd said in a quiet but authoritative tone. "Every man and machine has to reach Silver Lake. There will be no shirking, no horse-play because of the presumed nature of the mission. Every man must get there. What happens when you do get there is another matter, and it will be entirely in your own hands then. I wish you all the luck in the world. That's all, gentlemen!"

They stiffened into attention, saluted and raced away. But one or two cast suspicious eyes on Benson and his kid gunner. They tried to fathom that, and realized that there was more to it than met the eye.

In fifteen minutes three formations of Hawks, garish in new paint and varnish, but wary and worn underneath, slammed into the star-flecked sky and took up their position behind a mysterious Lockheed attack ship piloted by an unknown civilian who carried a youngster in his back seat for a gunner.

The race against time to Silver Lake was on.

NINETEEN to eighteen! Buzz contemplated the situation as they raced south and tried to figure out a plan. Nineteen against eighteen—and the eighteen were high speed, multi-gun bombers manned by fanatics charged with an insane patriotism.

The Mitsubishi ships carried at least six high-speed guns. There were two men in the armored nose turret and two in the rear cockpit firing over the tail, and in addition the rear gunner had two more weapons mounted on a bracket that fired through a metal tunnel under the tail.

He hoped these kids behind him had

Advertisers' CONTACT

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VOLUME 25

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WHOLE NUMBER 36

A Call to the Colors!

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Wow—how's that for a challenge, F.A.C.'s? Unless ACES UP is terribly mistaken, a lot of you Buzzards are going to take exception to this statement, and you're going to do something about it!

It so happens that ACES UP has been working day and night on the manufacturer concerned, and of course we can't get "sore" and tell him that he doesn't know what he's talking about. Frankly, though, he doesn't—since we know that you members and readers are loyal to FLYING ACES and do patronize our advertisers. We have many letters from enthusiastic Squadron C.O.'s testifying to the fact that their entire units purchase from advertisers so far as possible. But before we can "land" this manufacturer—as well as several others we have in mind—we'll have to show 'em they're wrong.



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been instructed in the art of attacking bombers of this type. He hoped they had—but he wondered, for as far as he knew no true method had ever been devised.

"Well," he said, trying to find some solace, "at least they are young and enthusiastic. That may help. The less they know about these babies, the better off they'll be."

He hoped they would get there before the Mitsubishi had left the ground. If they could time their arrival with the take-off of the first flight, they would stand a good chance of getting the rest. If they arrived late, it meant that they would have to chase them until they ran out of gas, and that would not be long.

Three hundred miles to go!

They had to do that in less than ninety minutes to stand any chance at all. It was well after 10 o'clock when they cleared the Barling Field and the Mitsubishi were scheduled to leave on the dot of midnight.

Buzz hoped. He was thinking of the man huddled up beside a driftwood fire nearly one thousand miles away who would be wondering. He knew Lauren Cressford would be counting the minutes and checking their every move in his mind. He knew he would be figuring the carnage that would be taking place on the dot of midnight, and he knew he would be hoping and praying for his courageous son.

"We've got to win," Buzz prodded himself as he led the formation across the Washington-Oregon border. "We've got to win—if only for this kid in the back. He's given everything for this and I couldn't think of him suffering a defeat at this stage of his life. No, we've got to stop these devils!"

Then for another half hour he sat and guided the thrumming Lockheed through the night sky, checking every so often with Major Grace who flew in the plane just above him.

"Well," mused Buzz once. "They may be old Hawks, but they are still hammering along. Every one is still here. If they can only hang on a few more minutes, we'll give those kids something to let off steam."

He was glad they had all carried light fragmentation bombs.

They'd come in handy if they could get a few on the ground.

SILVER LAKE blew into their sights some time before Buzz expected. There had been a very friendly tail wind and they were over the strange sparkling lake bed before they realized it. Buzz glanced at his watch, saw that they had arrived exactly at 11:50. That night, or might not, give them a break. He signalled to Major Grace to split his formations up into three elements of six planes and deploy them off in echelon until Buzz could discover what was actually going on.

He soon had his mind made up for him. In the jagged shadows of a wall of pinnacled rocks, that loomed like gaunt sentinels, Buzz caught the first tell-tale flashes of Jap-Jupiter exhausts. He gave the Army signal for attack on

ground target by flipping his ailerons. He shoved a signal pistol in Lonny Cressford's hand and bawled: "Fire that directly up!"

The red flare shot straight up in the air and Buzz yelled: "Get ready—and don't waste a round. I'll handle the bombs. You shoot at anything that has two motors. All set?"

Then began the merciless movements of the Hawk leaders.

They flipped their attack signals by rocking their ships and pointing at the tiny flashes that snorted from the steel nostrils of the Jupiters below. Even then, most of the youngsters had no idea what was expected of them, but they eased back, took up positions as they caught the extended arm of their squadron leader, Major Grace.

Then a strange triangle of flickering lights suddenly crawled across the dry lake bed like a monstrous arrow-head. Buzz knew that one of the Jap flights was taxiing out. He frantically fired another red light.

The natural bowl below now bubbled with a broiling stew of Mars. Six turret-nosed Mitsubishi came up at them through the velvety blackness and spat Kobe lead from twelve tubes of death. Buzz cringed, huddled behind his Conqueror. They came on and the signal lights from Major Grace's cockpit deployed his three flights out to cut them off from acute angles.

Buzz opened his heavy caliber gun first and picked off the lead ship. His fire was deadly, for he had held his bead until it seemed that the Mitsubishi and the Lockheed must crash head-on. He tripped the firing lever, held her in aim as long as he dared. Then he flipped his nose up, slashed over the body of the bomber, and charged at the sub-leader in the rear rank.

Immediately, the gun in the back turret began to chatter. But young Cressford, steady as a rock, mowed the No. 2 ship down with amazing coolness. His bullets had struck a gas tank, and the first blood had been scored by the Americans!

Buzz raced headlong at the sub-leader, slammed a long burst at him, and made him turn. It was another victory, for the sub-leader in his eagerness swung too wide and locked wing-tips with the No. 6 ship. They swerved into each other and fought with spars, longerons, ribs and whirling props like two fantastic broadswordsmen. They belched fire, exploded together, and, locked in a frantic embrace, went down with a terrifying crunch to the lake bed.

But Buzz had no time to watch collisions. He continued on through and sought the spawning ground to nail the next flight before they got off. He was too late. Already the second spearhead was churning across the dry lake-bed to make its get-away.

Behind him, Lonny Cressford was hammering short, punching jets of fire at every Mitsubishi that was attempting to cut clear. The Hawks were coming down at them now, hell for leather. Two Hawks, misjudging their speed, plunged head-long into a faltering bomber. The three went down in a tangle and then

went up in the eruption of explosive that lay in the belly of the bomber.

BA-ROOM!

The glare from the burning wreckage threw mad shadows across the natural bowl and another flight of Hawks came out of a climbing column of smoke and slammed pell mell at the climbing Mitsubishi. There was a harsh grating of metal and clangor of gunfire and two more bombers nosed down. A Hawk shot up the sky clawing for breath with its spatted wheels poised like anguished claws of a slug-spattered bird. It slid back on its tail, wagged its gaunt head once, rolled over into a slow spin and hit the ground, burying the engine fully five feet.

"That's the way to get it, if you have to," muttered Buzz. "He 'went out' fighting with his boots on."

The remnants of the first formation of bombers were being driven back over the lake by the No. 3 Flight of enthusiastic youngsters. They tried to re-form with the bombers that were coming up, but Major Grace slammed in with the four Hawks he had left and cut two more down.

Meanwhile Buzz and young Cressford were bashing through the tail-end of the second formation of bombers and were fighting like mad to get at the machines that were still on the ground. Buzz was blocked off once by a bomber that swung out of position and threw a curtain of machine-gun fire across his path, but young Cressford, screaming his wrath, picked it off with a snap-shot that all but cut the Jap pilot's head off. The Mitsubishi was too low to be saved. When the pilot went over his stick, her nose went down and there was no time to rip her out. Then the other Japs tried gamely, but she hit the ground, bounced hard, came down to her knees, and rolled over, a bundle of flame.

"Great!" yelled Buzz. "Now watch my tail. I'm going to bottle the rest up."

He slammed the raging Lockheed at the black wall that was dotted with caves. He held her steady and zoomed up the face of the rock, pulling his bomb-toggles as he climbed.

CRASH! BONG! CRASH!

Insane explosive bashed against the granite walls, belched fire and concussion. The Lockheed caught it full and went over on her back. Buzz yelled, hung on and nosed her down toward the ground to get up speed before he dared try to wing her over again.

From their crazy position they could see the Hawks pounding the Mitsubishi to mangled metal. They lost a Hawk here and there, but there were still fully a dozen left to continue the battle.

Buzz now saw the ground coming at him. Upside down, he risked a roll. The Lockheed came out with a jerk, groaned. He cleared with but inches to spare, raced across the sunken bowl, and hurled at a skulking Mitsubishi that was trying to escape through the smoke screen the burning bombers were putting up. The Lockheed caught her, danced through a torrent of lead, and tangoed up to a position dead behind the Mitsubishi's rudder where both guns were blanked out.

He pressed his trigger for a short burst, got the line, and gave the Jap ship a long belch. The Mitsubishi rolled once, scraped her wing-tip into the dirt, then slammed her turret nose into the dust and lay there a wreck.

Lonny Cressford was yelling and Buzz turned. The Hawks had driven the Mitsubishi back all the way to the walled caves and were hammering them literally into the granite. Hawks tore in from every angle and spat fragmentation bombs among the remaining planes below. The burning ships added to the weird glare as the Yankee single-seaters slashed in and out, picking off the weary Mitsubishis and bundling them to earth.

BUZZ charged the wall again and blocked off all attempts of the Japs to get the last flight out. His bombs, heavier than those carried by the Hawks, had sufficiently blocked the passage through which the bombers had to be wheeled to get onto the lake-bed.

Once he signalled to Major Grace while young Cressford picked off a Mitsubishi that was trying to get clear by taxiing into the darkness beyond. Grace gave him an answer and put up a signal: "Land by flights!"

The flight commanders fishtailed and set up a series of short zooms and dives, indicating what was desired. They went down, six of them, and lined up between two burning bombers. Their guns were trained on the cave wall opposite while Buzz and young Cressford raced around in widening circles and counted the piles of blazing wreckage.

"One got clear!" snarled Buzz. "Hello, there he goes!"

He shot the juice to the Lockheed and tore after a slinking bomber that was climbing madly through the still piling smoke columns. They saw it clear two jutting spires of rock and disappear. Buzz snarled again and plunged on, checking his guns as he did so. They came up to the spires and slipped through, just as the Mitsubishi had.

As they slammed out, dancing on the gusty eddies of air formed in the rocks, they were met with a terrific curtain of fire. The Mitsubishi had attempted to trap them. There was no way out, they

had to go through and face it.

Buzz yelled: "Duck!" Then he pressed every gun trip he had and let her go. The weapons raged under the cowlings and Buzz had to sit back—and hope. There was a tremendous explosion that seemed to make the Lockheed stop dead in its tracks, and then they staggered on through a crazy quilt of flame, smoke, battered metal, and debris that a moment before had been a beautiful airplane.

"Whew!" they both said, sitting back and letting the Lockheed have its head.

"Well," Buzz said finally. "I think that's the last one!"

"I'm certain of it. I've been counting them all the time. The others are still in the caves. Let's beat it back and see the Major," said Cressford.

They arrived to see the Hawks—ten of them—lined up, blocking off any attempt of the Japs to get off again. As a matter of fact, Benson's bombs had securely blocked off the main passage into the big cave and six brand new Mitsubishis lay beyond, completely gagged.

Buzz found Major Grace and congratulated him, while the young pilots went in and mopped up the mechanics and grounded Jap airmen. It was hours before the job was complete, for they had to make certain that every ship had been accounted for. But by the time the first specks of dawn crept through the spire-like crags, they had completed their report and Buzz was ready to fly back to Seattle.

The secret of the Mitsubishi bombers and their long range had been solved. The nation's Capitol had been saved. And Lauren Cressford's fuel economizer had passed another severe test.

* * *

Back at Barling Field Buzz and Lonny Cressford crawled into bed, exhausted but happy.

"Give us ten hours of real sleep, colonel," Buzz said, "and then we'll go up and see that they bring Cressford in Okay."

The colonel smiled at the boy, nodded to Buzz, and left the room.

The dull buzz of a radio spark clicking off its message came along the corridor and lulled them off before the footsteps of the colonel had fully died away.

Blois, Blois, Black Sheep

(Continued from page 17)

of a Frog apothecary shop. Soon the fuselage of the house breaker hove into view followed by the headlamps. The ensemble dropped to the ground and was greeted by Lieutenant Pinkham—who seized him by the collar.

"Why you dirty second-story man, y-you—robbed that drugstore an'—why it's O'Rourke! Well, well, Red O'Rourke! Huh, once a crook, always a—I should never have saved you from them guys who was chasin' ya a couple of months ago. You was wanted back in Waterloo for bank robbery an' they thought it was me because ya look just like me, red hair, freckles and all. Say, O'Rourke, why don't ya mend your ways?"

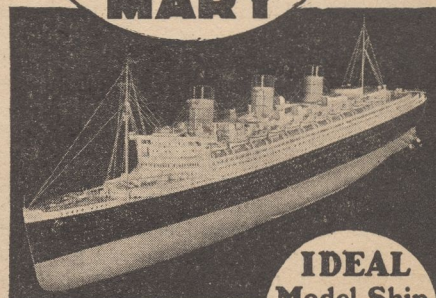
"Aw, Lieutenant, I had a headache an' I needed aspirin," replied Phineas' dead ringer. "Huh, I just couldn't wait until mornin' as—"

"That's darn' funny lookin' aspirin," Phineas confronted the red-head, pointing to a handful of francs. "Now ya better come with me as you're a disgrace to the army. Let's take a walk out of Barley Duck."

"T'anks, Lieutenant," chirped O'Rourke. "I—I was just keepin' in practice—ha! ha! Youse is a swell guy."

"Oh, I'm not thinkin' of turnin' ya loose," Phineas countered. "We've got to have discipline in the army."

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After that, Phineas had a long, earnest talk with Red O'Rourke. Somewhere between midnight and dawn the two members of the A.E.F., both in poor standing, took leave of each other.

Major Rufus Garrity was wrenched out of dreamland that morning by a loud yell outside his door.

Bump Gillis was hollering, "He's here, sir, he's here! Phineas Pinkham is back. Come an' git him before he escapes again. We have three men sittin' on him."

"Hold him! Wait until I get my pants on. I—I—"

Phineas was dragged into the Operations office just five minutes later to face the Old Man.

"Well, you're back, eh?" snorted Garrity. "Good thing—er—I might give you a chance to crawl out of—you look a little washed out, Pinkham. Huh, staring Blois in the face doesn't sit so good with you, does it? Look here, I got into a mess last night—er—purely by accident. (See if anybody's listening out there.)" A pause while Phineas seized the door and yanked it open suddenly, looked out, and then swaggered back to the Major's desk shaking his head. "No? Well, I need a man to testify that I was carrying some paper money with me—patched with tape. It'll clear me. Then I'll see—er—what I can do about—"

"I don't know a thing about paper money," the freckled petrel tossed out. "Anyways, I ain't talkin'—a lawyer told me once—"

"You'll talk or go to Bl—"

"Haw-w-w-w-w-w!"

"Now listen, Pinkham, we've been good friends, ha! ha! Let's forget bygones, huh?" coaxed Garrity. "We—"

"No, I will go to Blah. I hope you git forty years for robb'ry—er—that was what ya said, wasn't it?"

"H-Huh? Why, all right, Pinkham! You get the works, you ungrateful speckled, buck-toothed son-of-a-sea cook! Get out of here before I—" The Old Man yelled for the guard. Doughs came on the run.

"Haw-w-w-w-w-w!" guffawed the buck-toothed patriot as the guards snagged him. "I had on a bullet proof vest yesterday P. M. Did I fool ya?"

"Take him away," Garrity thundered, dancing up and down in rage. "Take that uniform off him. He's headed for ditch-diggin' on the Loire."

"Adoo, Carbuncle!" chorused the pilots of the Ninth, giving Phineas their favorite insulting name. "There's an end to everything—even a temperance lecture. Adoo, ol' pal, ol' pal of mine!"

"Go to—!" retorted the busted pilot as he trudged off. "I won't have to look at your pants in Blah—that's one thing."

KERWHA-A-A-A-AM! The tarmac suddenly seemed to shift. Spads rattled from stem to stern. From off to the left, in the direction of Vold, came a puff of smoke. It billowed up into the ozone in plain sight.

"Goodbye, rations!" sang out Bump Gillis. "I sure would hate to be a private from now on. That Heinie hell-juice

has oozed out again."

"Haw-w-w-w-w!" resounded a familiar horse laugh. "See what it'll mean without a Pinkham to get ya out of a hole! Boys, when they git to makin' that stuff in big batches, you'll be jealous of me safe in Blah. Au revoy, garsons. I go a martyr, haw-w-w-w-w!"

"Try and escape, will you please?" Sergeant Casey suggested sardonically. "Boys, how I'd like to take a shot at ya. I been savin' up things to say to ya when you got broke."

"That's a pal for ya," snorted Phineas as he went on his way. "Makes partin' anything but sweet sorrow."

Hours later, "A" Flight went out half-heartedly to try for a gander at the Heinie explosive works. But in the vicinity of where it was supposed to be, there were a dozen suspicious looking structures and near-structures. They were spread miles apart. Moreover, six Boche did not give them chance for reflection. Howell and his men had a hell of a fight on their hands to get back to the drome with their Spads. Phineas Pinkham's going, although no one admitted it, had given their morale a swift kick in the tail assembly. The Old Man did not seem to show any interest in the fact that Howell and his company had gotten back whole.

"It's no use," wailed Bump Gillis. "Nobody'll ever spot that place. If the D. H.'s can't, how can we? The only way to do is ask for enough bombs to start blowin' up the whole back area from the Vosges to Belgium and then we might hit the chemical works."

"Nobody asked you," the Old Man snapped irritably. "Let them blow everything up. It'll save me from—uh—if they'd only drop some on Chaumont. Maybe all the evidence and the—"

"What?"

"Nothin'," the C.O. glared at Captain Howell. "Mind your business. Bah!" Garrity got up and stamped out of the house.

"It's gittin' him," Bump Gillis gulped. "I bet he's crazy about Phineas. Now—well, I miss the bum, too. I—who's blubberin'? It's the damn' horse-radish I et!"

AND now let us skip across a flock of kilometres and look in on a place called Blois which is situated on the Loire River. In a drab room that serves as the commanding officer's sanctum in the reform school of the air, a hard-bitten captain was eyeing a new prisoner with calculating glimmers.

"So ya got here at last!" cracked Captain Hardburn. "I've been expectin' ya for months. I remember a time you put rice in the radiator of my car over near Commercy. An' ya give me a cigar—"

BANG! BANG! BANG! BANG!

The officer leaped up and charged out of the place like a fireman answering an alarm. He looked out over the parade ground and bellowed a question as to who had tried to escape. A corporal came up and saluted. His face was black and his eyebrows were still smoldering.

"It was somethin' that went off in my

face, sir," he explained. "I was smokin' a cigar in the barracks. Me an' Pinky an'—this guy give 'em to us." He pointed at the freckle-faced captive.

"They took 'em!" yelped the freckled culprit as the C. O. whirled to face him. "Is that my fault, huh? I—"

"Oh, you'll like it here," the captain growled. "When I git you out there doin' double-quick time around the grounds with a fullpack an'—when yuh push that wheel barrer loaded with rocks. See them guys out there? They're helpin' build a stone fence. There is also a sewer being put in—"

"How interesting," remarked the latest arrival as he fished into his pocket for a chocolate bar. He calmly began to unwrap it under the captain's nose.

"Gimme everything ya got," bawled the officer, snatching the chocolate bar. "Then go with the sergeant here an' git yourself a nice suit of dungarees. They ain't got wings on 'em. Ha! ha! Look at the nice barbed-wire we got. It's between here and the vineyards, ya see. Of course, nobody but officers can get *vin rouge*, though. Oh, ya'll like it here, Pinkham."

"I am tickled," grinned the irrepresible one. "I been in need of exercise. When do I start, huh, sir?"

The C. O. did not answer. He had broken the chocolate bar in half and rammed one piece in his mouth. The new prisoner grinned as he was escorted away. An hour later a car came tearing into the layout. Two medicos barged into the captain's quarters with a stomach pump. Long drawn out groans and cuss words floated out of an open window to the ears of the freckled patriot who was just being introduced to the homely fare of enlisted men who are not in good standing. And then, before the C. O. had recuperated, the barracks at one end of the parade ground caught fire. Far into the night the prisoners fought the flames.

"All I done was strike a match to look under my bunk," explained a dough. "The match blowed up an' the straw mattress took fire. I'm tellin' ya, sir, it blowed up."

"Pinkham, you big slob, I'll put you in irons for this!"

"That's it, blame me! Ya took everythin' I owned—"

"Nuts to the C. O.!" came a voice. Captain Hardburn spun around. Nobody seemed to be where the voice had come from.

"Who said that?" he cracked.

"Here's your watch, sir," cried his new nemesis, handing the timepiece to him. "I caught a guy tryin' to steal it when ya wasn't lookin'. I won't tell who it was as I don't tell on guys. But here it is just the same."

The C.O. of the disciplinarian layout swore and pawed at his sweaty face. "You fathead," he blustered, "somehow—if I could just prove you—get out of here! Get!" He yelled for a sergeant. "Take this big-eared playboy out of here. Give him the dirtiest job ya can find in the whole place. Give him a wheelbarrow—" The captain strode back into his sanctum. The next second he was dashing toward the fence that

marked one boundary of the military reservation. "Git somethin' an' kill it! It's a cobra. It's got its hood up—don't go near it—git a gun—a machine gun—"

"Huh," grinned the freckled culprit as he was shown his lowly chore, "it is only stuffed and has a spring run through it to make it move. So this is what I get for my deeds of valor, huh? Well, I do it under protest. When I see President Wilson, he will hear of this."

TWENTY-FOUR hours later the word reached Major Rufus Garrity that the C. O. of the Blois reform school wished to have somebody relieve him quickly of the charge of Lieutenant Phineas Pinkham. He did not care how. If possible he would like permission to shoot the ape. The place had gone nuts. Doughs and ex-officers were complaining of hearing things and seeing things that were not meant for mortal man. Nobody dared pick up even a piece of paper. They shied and took detours around tin cans. They had rebelled, had this lowly company of men at Blois, against policing up the reservation. One showed a good reason why. The tips of his fingers were well-sizzled by a red hot half dollar that Prison Enemy No 1 had carelessly laid on the steps of the barracks.

"Well, it looks like they got enough of him already," sighed Major Garrity to a brigadier who had come in for a powwow, following another explosion between Bar-Le-Duc and the Meuse. "What d'you figure on doing now, major?"

"Got to get him out," the Old Man admitted. "But give him three or four more days, the crackpot. My case don't come up—er—I mean I've got a case of champagne comin' up from—well, any news from the Intelligence Corps on the Boche works? Got to shellac that place, sir. Our lives won't be worth a—"

"Not a word. They're stumped, Garrity. Better tell your pilots to keep on watching for it. Keep 'em in the air all the time. Get them over at night. Solo—got to work fast. Everything depends on the Allies getting to the bottom of that explosive. If we can't match it—"

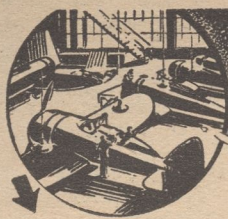
"Yeah—now if Pinkham—"

"Bosh," snorted the brigadier. "He's no superman. In fact, it's pleasantly quiet here, Garrity, without that cluck. Last time I was here I sat in some glue—swallowed a bug with my coffee, and—good thing he's in Blois. Maybe we'd better keep him there. Goodnight."

"Why—eh—uh—look here, sir—"

The phone was ringing. A message from Divisional Headquarters across the Meuse. "This is Gillis, sir," Garrity heard when he put the receiver to his ear. "Got forced down an' went lookin' for a town or some outfit that had some tools. When I got back my crate was gone. I might not be able to get there until early mornin' if I have to walk. If I git a ride—"

"Stay there!" barked the Major. "I hope when you cross the Meuse there won't be any bridge and it sprouts baracudas and sharks. Bah!" The Old Man wrecked the telephone in severing the



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connection. "Of all the cock-eyed messes—robbery and assault—court martial—if I don't get Pinkham out—oh-h-h-h!"

In the meantime near a small Frog village between Dommartin and Sivry a Spad was rolling to a stop, having negotiated a journey of approximately thirty miles with a missing Hisso. A freckle-faced buck-toothed pilot got out of the pit and scratched his head reflectively. "Haw-w-w-w!" he guffawed to himself, "When Red O'Rourke knelt down in front of the safe, they laughed; but when he opened it with a hairpin—well, I got to git me some pliers and a wrench or somethin' if I want to git further away from Barley Duck than this. To think that I would be flyin' like this—I bet the officer who left this Spad didn't think that the dough who sat on top of that old dugout could fly a ship. Boys, you can't judge a book by what is writ on the cover."

He went prowling around and soon came to what appeared to have been a hardware shop before the Boche shells sent the proprietor high-tailing it for the Pyrennees. He spotted an old pump in one corner and it reminded him that he was thirsty. With a tin dipper in one hand, he began to agitate the handle of the pump. It squeaked in protest for several seconds, then let loose a stream of rusty water. The freckled man poured it into a barrel. A sizzling sound followed, then came a most repulsive odor. The spad snitcher dropped the dipper, stooped over the barrel. Then he remembered. That odor was reminiscent

of older and more carefree days. A car-bide lamp he had had on an old bicycle had smelled that way.

"Well, well, well," soliloquized the prowler. "That gives me an idea. Maybe I could try it an' help make up to the U. S. for all the trouble I been in the past. 'Red O'Rourke—His Life by Horatius Algebra! From second story work to brave aviator in six easy zooms! It's a panic."

Quickly he picked up the dipper again and bailed out that portion of the carbide that was sizzling. Then he examined the barrel and found that the rest of the stuff was well wrapped in a canvas sack. Evidently a nosy rodent had gnawed a hole in the sack to determine whether the contents were edible.

All that afternoon he worked. Close to dusk he had a contraption assembled and heaped close to his crate. He walked across the meadow to where a sunken, camouflaged road snaked its way along. There he waited until he heard the sound of an approaching convoy of A.E.F. fourgons. He stopped a vehicle that was in the van and the driver "whoaed" his mules to peer down at the soldier in the road.

"I wanna borrow a wrench an' some pliers," explained the freckled faced one. "I got me a motorcycle busted down an'—"

"Okay," the driver of the long-eared quadrupeds said and turned to holler back to a dough to locate the desired implements. The borrower then went back to his Spad and proceeded with his job

while the mule-drawn hack ambled on. It had only progressed along the road to the other end of the field by the time he was through and returned the tools.

A SHORT time later the Spad took off and headed across the Meuse. Into the back area it flew until it reached a section of Boche real estate about which much had been said in and around air fields, Intelligence sections, and Divisional Headquarters. It was now night and there was a ring around the moon. The air smacked of the proximity of Jupe Pluvius, the flying man with the sprinkling can. The man in the Spad grinned at the expectations of rain over "Sunny" France as he dived down to take a close squint at the Heinie backyard. He saw a large structure that looked suspicious but noted an anti-aircraft battery stationed close by. The shells it tossed up missed the Spad by a whisker and sent him skimming away to another likely looking spot.

Five hundred feet up he looked down over the layout beneath him swiftly. He caught the glow of lighted pipes and burning cigarettes. Again he winged away to another point on the compass. A pile of bricks that looked somewhat like a hospital caught his eye next. Spread out not a quarter of a mile from it was a Jerry air squadron.

"No spinach!" sighed the red-headed man in the night-flying bus as he kept on circling.

Suddenly he spotted signs of activity below. It was around a strange-looking place that appeared to be a brick kiln with two chimneys jutting out from a low, flat roof. There were heaps of bricks out in front of the structure and a truck-load of them was moving away from the entrance. The Allied intruder now went down low, his trucks almost kissing the roof. He flashed between the two chimneys and yanked a cord that had been fastened to a little staple near the cockpit. A lot of gray, chunky stuff cascaded down to the roof while his machine guns beat out a tattoo to drown the sound of the thudding against the tin roof.

"Haw-w-w-w!" yelled the Yank. "As Pinkham would say, 'Haw-w-w-w!' Well, that is that, if I can only git back. If it rains, I have got to call up somebody on a 'phone quick as somethin' tells me I have struck oil. I never saw a brick kiln at work at night without a firebox goin'. When it comes to smart thinkin', they got to consult the O'Rourke!"

Put-put-put-put-put! It was not a motorboat because the Spad was a long way from water. It was a pair of Spandau guns taking cracks at the Yankee bat. The flash of a Mercedes exhaust blinked through the blackness.

"Now wouldn't ya know it?" the Yank gulped. "I bet if I flew over Russia durin' a monsoon, there would be a Boche somewheres near. Huh, well I'm gonna go closer to the carpet. If I wash out against clothes lines, I maybe will pancake on some light fall underwear, haw! That's a good one."

Down, down, down munched the bat flyer until he could almost lean out and

pick birds' eggs from the trees. Once he came so close he took feathers out of the nape of a duck's arched neck near a Frog barn. The freckled one now zoomed a little and reached the elaborate height of a hundred feet.

"Haw, that's shakin' him off! Ugh!" R-r-r-at-at-at-tat! P-p-p-p-put-put-put! The Spad kicked upside down. Flames belched from the motor bays.

"Cripes! Cr-r-r-r—!" Spla-a-a-sh!

A SHORT time later, a Yank with his eyebrows singed off, part of his nose peeling, and otherwise feeling like twenty-minute steak, crawled out of a canal like a sick toad and wriggled to dry ground. He lay there awhile thinking it over, then sat up and looked around. A splash of water hit his mottled pan.

"Haw-w-w-w-w! Fancy that—rain in France!" He laughed out loud and clambered to shaky pins. "That means I got to telephone veet!"

"O-o-o-o-ola-la! Garcon! Vous est mort—non?" This from a Frog peasant who came waddling to the bank of the canal. For greeting, the Yank ran up, kissed him soundly on a stubbled cheek.

"This is one time I kiss a Frog an' like it!" he yelled. "Boys, for a minute I thought you said somethin' that sounded Dutchy. Non—I ain't mort. My name is — uh — O'Rourke. Haw-w-w-w-w! Avez voos oon telephphone, nest paw?"

"Je ne comprend pas, M'sieu," said the Frenchman, scratching his head in puzzlement. "Ze air sheep she ees sink, oui?"

"If it didn't somethin' reached out an' swallowed it," countered the Yank. "Veet, Monsoor, ze telephphone—"

"Je ne—"

"Aw nuts to voos," yelled the Yank and started running.

The sky was emptying fast when the Yank finally reached a patrol of Yankee doughs.

"Quick, bums, I got to call up the brass hats. The nearest general—anythin' that has got spurs on. Quick!"

"Foller me," said a sergeant. "I'll take ya to the commandin' ossifer. An' quit yellin'. The Boche is only four miles away. D'ya wanna tell 'em where we're at?"

The Spad driver entered a dugout in the side of a hill fifteen minutes later. There was a field 'phone in it.

"Quick, call up a bombin' squadron! There's a place I want bombed. It'll be marked and it's over close to Conflans. It's the Kraut hell broth factory. Hurry up as the carbide will git wet an' it'll burn an' show up at night. Come on, before the Heinies clear the roof of it—aw hurry up, gimme that 'phone!"

"Say, are you—?"

"Wha—? Yeah, sure, Red—uh Lieutenant Pinkham, Ninth Pursuit — haw-w-w-w-w-w!" The pilot left the dugout and ran into the night before the officer could collect his wits. Hurriedly he picked up the 'phone.

Two hours later, officers and men along the front from Nancy to the Argonne were shocked out of their slumber. It seemed as if the whole front had been split apart. Window panes rattled and

fell out. Hangars quivered. Trucks did variegated tap dances on the roads from the back area to the front lines. On the drome of the Ninth Pursuit Squadron, Major Rufus Garrity and several pilots stood in their underwear in the big farmhouse and stared at each other.

"Maybe Vesuvius went off," suggested Bump Gillis.

The telephone bell jangled. Garrity hopped over to it. Pilots studied his face while he was listening to the voice on the wire. It turned green—then purple—then white. He gulped, tried to speak. His eyes bulged and his teeth rattled. Down went the receiver.

"Chaumont," guessed Captain Howell with a gasp. "Blown up—the Boche—"

"N-No," stuttered Garrity, staggering out of his office, like a punch-drunk pug. "A guy called up from near Thiaucourt. He said—git me some water somebody—he said Phineas Pinkham come in an' reported that he had located the Kraut hell factory near Conflans an' had marked it. The officer said that was the thing that was just blown up by the Yankee bombers. Git me a drink—I—it's a lie! Pinkham's in Blois. He—"

"Didn't the guy say where he is now?" Bump Gillis hooted.

"He ran out of the dugout an' they forgot to catch him they were so knocked off their pins," the Old Man groaned. "They—git out of the way! I'm gettin' dressed. I'm going to take off a couple of days to visit Blois. It's the only way I can find out that I am not goin' nuts. He must be there—he handed out them cigars—an'—"

Again the telephone called. The Major picked it up and yelled into the mouthpiece. He squeaked a little, then fainted. When he came to, he looked around like an old soak coming out of a three-day binge.

"It wasn't Pinkham, they said. It was a guy they been lookin' for for bein' A.W.O.L. Name's Red O'Rourke. He's been arrested—for impersonating an officer."

"Red O'Rourke?" yelled Gillis. "I remember him. Him an' Phineas got mixed up before. They—somethin's screwy. That guy O'Rourke couldn't fly a kite. And who would ever think of spottin' that Heinie factory that way except Pinkham?"

Garrity yowled and buried his head in his hands. "My dome is all mixed up. If that crackpot—"

Brass hats from Chaumont, from everywhere, flocked to the Major's Ninth Pursuit Squadron the day they brought a certain member of the A.E.F. back from a way-station Allied klink in Souilly. He looked like Lieutenant Phineas Pinkham—he walked like Phineas. He talked like him. But he insisted that he was Red O'Rourke and that he had learned to fly when he was a boy scout. For an hour they worked on him, first with threats, then with offers of immunity. Medals were waiting for him, they said. More than that—

"I don't trust none of ya," the freckled, buck-toothed one retorted. "I know when I'm bein' kidded — haw-w-w-w-w-w!"

"Where did you git the Spad?" Gar-

rity hurled at him, tearing out a tuft of hair as he spoke. "Where—?"

"A guy walked away from it—a guy—" The prisoner looked at Bump Gillis. "Why—that's the cuss, haw-w-w! Well, if that is all—"

"Now listen here," the Old Man strangled, "we—"

"Yes," a sweating brigadier soothed, "I'll put it in writing if you'll—"

Suddenly an orderly came in with an irate Frenchman. The Frog shook his finger at all the officers gathered and demanded in hysterical French jargon restitution for a certain mule that the U. S. had promised to pay up for.

"I go see him Foche—ze Pres'dent of la belle France! I want ze argent for ze mule she is stole. Mon Dieu—Sacré!"

"Aw, I'm sick of hearing about that damn' mule," the freckled Yank suddenly spouted. "Here's the argent for it. Thirty francs. Take it or leave it. It wasn't worth a taller candle, ya snail eater. Ugh—why, er, I forgot—well, it's out of the bag. I am Phineas Pink—"

BUT the C. O. hardly heard, for he was staring at a Frog banknote that was pasted up with tape. Homicidal waves swept over him from scalp to in-sides.

"Y-you dirty double-crossin'—!" he yelled. "It was you, you bat-eared—let me through there! I'm going to kill him."

It took the whole personnel of the flying field to stop a murder. Finally Major Garrity was ganged under a tree into the branches of which Lieutenant Phineas Pinkham had scrambled.

"Calm down, Garrity!" a brigadier yelled. "Let's study this all out. Got to keep it quiet. Pinkham is supposed to be in Blois. Who is there? Who is this Red O'Rourke person? How—?"

"You come down here, Lieutenants," another brass hat shouted.

"If I came down there, I would be tray nuts," Phineas retorted. "Not until you put the Major in a cage. I can stay up here as long as you can stay down there, haw-w-w-w! The Pinkhams are good flagpole sitters. I will do my confessin' up here. I did it because the Allies needed me worse than Blah did. I met my old pal, Red O'Rourke in Barley Duck—with the—well, I says you are in a sling anyways and if you don't do like I say, you will get shot for—well, I know what!"

"Oh, yes, Major, they *did* haul me off to Blois—but I just didn't go inside after I got there! Haw-w-w-w-w! You see, Red O'Rourke and I traded places just outside the gates when they were checking in my entrance papers with the sentry."

"Well, for several days previous I'd been spottin' around for the Kraut hell juice mill in my spare time and I was just gittin' hot when you busted me and had me tagged for sewer engineer in Blah. So I marked the place and had it bombed. You see, a Pinkham has got you out of a hole ag'in. Awright, you take the gun away from Garrity and I'll go an' change places with O'Rourke in Blois. But I will see a lawyer when I serve my time—"

"It is that trick you pulled in Bar-

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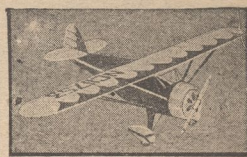
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Le-Duc that makes me sore," Major Garrity ground out. "That Blois thing was only a—well, to teach you a lesson. You're still a Lieutenant—ask the brigadier, Pinkham. Come on down an' hand over those francs you've got left."

"Awright," chuckled the tree-sitter. "I bet O'Rourke raised hell in Blah. I gave him a lot of my tricks an' things. My voice throwin' invention—lots of things. It took me three hours to teach him a lot of things. He was so dumb. Boys, that was a horse on you in Barley Duck, Major. Look out! I'm comin' down."

Major Garrity held himself in when the wonder from Boonetown hit terra firma but he was boiling like a tea kettle. The brass hats repaired to the Old Man's sanctum to unravel the mixup. Phineas took a seat in a corner of the big room outside the Operations office and taunted his fellow pilots. A communication arrived at the Ninth Pursuit during the powwow of officers. It was a report from Blois saying that Lieutenant Phineas Pinkham had escaped and that soldiers were out spotting him. Major Rufus Garrity was close to epilepsy by midnight. The upshot of it was that a message was sent

to Blois for the Commanding Officer there to forget the whole thing.

"Imagine it!" Phineas chortled when it was over. "Puttin' me in Blah! It is plain silly, haw-w-w-w-w!"

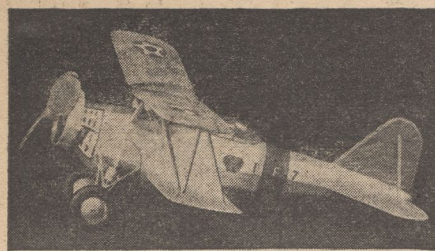
When the brass hats had gone, the Old Man called Lieutenant Pinkham into his private quarters. When the prestidigitator emerged, he had an eye that promised to be closed up before sunrise.

"It is cheap at any price," the inimitable pilot from Boonetown, Iowa, brayed. "Haw-w-w-w-w-w! I won't even press any charges."

MILES away, scootched down in the bushes on the banks of the Loire, Private Red O'Rourke, one time safe cracker, jail breaker extraordinary, watch snatcher par excellence, bit his finger nails and wondered where he could get a change of clothes. Stripes would have been cordially welcomed in exchange for the Pinkham habiliments.

"I'd ought to've had sense. That Looney is poison," he groaned. "I shoulda walked right to a bastille an' confessed to robbin' that drugstore. Well, if I can only git a Frog's suit—git to Spain—or somethin'. I could join up with the Foreign Legion—Cr-r-ripes!"

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Flying Aces Model Laboratory

(Continued from page 61)

amount of drag our engine is capable of pulling. This is determined by the simple formula: Drag times Velocity divided by 375 (where the drag is in pounds and the velocity in miles per hour). To illustrate how this is done, let us consider the curve of the flat plate as that representing the drag of a complete gas model (Figure 3). Assume that we have an engine which is capable of delivering 1/5 horse power via the propeller. In Figure 3 is given the formula for horse power. By substituting the corresponding values of drag and velocity in the formula, we plot a curve as shown. This curve in-

dicates the horse power required at any point to overcome the drag of the airplane at the corresponding speed. Since we have assumed that our engine is capable of developing 1/5 horse power at the propeller, we need only to locate the value on the horse power curve and read the corresponding velocity, which in our case is 29.5 m.p.h. This velocity is then our top speed (Figure 3).

It must be remembered that in no case will the horse power delivered by the propeller be equal to that developed by the engine. There is always a certain amount of loss which, as we have seen in our propeller design, is measured in percent. For example, suppose our propeller is only 80% efficient and our engine is rated at 1/5 (or .2) horse power—then the horse power actually delivered by the propeller is only 80% of .2 or .16 horse power. If we now look on the chart, we notice that our top speed corresponds to 27.5 m.p.h.

The value of streamlining can be appreciated when we consider that it would only require .02 horse power to overcome the resistance of a streamline body of one square foot cross-section at 40 miles per hour, whereas it would require .48 horse power to overcome the resistance of a flat plate of the same cross-sectional area at the same speed. Figure 3 shows that the difference increases very rapidly as the speed goes up. This is due to the fact that the horse power required varies as the cube of the velocity.

It becomes quite obvious to the model builder of gasoline driven models that the importance of streamlining cannot be over-emphasized. While this article has only covered a small portion of the topic, we hope, in the very near future to be able to adapt the proper coefficients for the designing of gasoline driven jobs. Until next month, Snappy landings!

Tactics of Two Seaters

(Continued from page 19)

than trying to put the whole story together in words via an inter-cockpit phone.

And therein lies the secret of good two-seater design. Today, they have gone even further. There is not even the old Scaarf gun mounting ring to break up the close association between the pilot and the observer. The two cockpits are virtually made into one, and the observer's guns today are mounted on a suitable device that has the same wide angles of fire but which in no way interferes with the close association of the crew.

In general, as we have stated, the maneuvers, tactics and strategy of two-seater fighters are the same as those employed by single-seater formations. The difference in speed is now so little that it is no longer considered, and the

observers of today are far more skilled in their jobs than were those of the war days. They are *trained*—not simply exposed to a little gunnery, camera work, Morse code and telegraphy. In fact, the observer today, in many Air Services is a far more skilled airman than the pilot. He has to know many subjects and know them well. He is usually a man *selected* for the job, not simply a pilot wash-out who failed to go solo or couldn't do a loop.

Today the modern two-seater outfit is usually an eighteen-ship squadron with definite objectives. Whether they work in conjunction with the Army or with the Navy, their formations and tactics are generally the same. (We are now speaking of the out-and-out two-seater fighters, of course, not special two-seater bombers or torpedo carriers.) Often they carry light fragmentation bombs, possibly a light camera, and now and then special equipment to carry out certain reconnaissance patrols.

As a fighting unit the two-seater outfit, out-guns and out-mans the single-seater unit of the same number of ships, and the only edge the single-seater has is extra speed (if any)—and sometimes the possibility of using the element of surprise.

Strange as it may seem, it is easier for a single-seater pilot to surprise a two-seater crew than it is for the single-placer to catch another single-seater napping. This paradoxical situation arises because of the close companionship of the pilot and the observer. It is perfectly natural that the pilot at some time or another relies on the observer to be on the alert, and in the same breath we add that the observer has his lax moments when he assumes that the pilot is watching. Sometimes, too, they're busy talking. It is during these unguarded moments that the successful single-seater pilot scores over the two-seater and which has created the impression that two-seaters are "cold-meat." Perhaps it's something to do with too many chefs spoiling the soup.

TO GET at the true tactics for the two-seater, we must first consider the maneuvers the single-seater uses to "get" the two seater and then simply reverse them—describe, in short, the movements employed to offset the single-placer's attack.

For instance, a lone single-seater attacking a two-seater first must get the gunner out of the way. So he sets his trap, sometimes using the sun, sometimes a cloud for his element of surprise. Or, as is more often the case, he comes up from below and behind and "gets" the gunner through the blind spot created by the tail-assembly.

The reader should now note the accompanying diagram explaining the arcs of fire in a two-seater. These drawings not only indicate the blind spot from the observer's point of view, but also the blanked-out area through which he cannot fire his bursts because of the all-important tail surfaces.

What, then, is the two-seater's method of defense in this case?

In the first place, if the attacking single seater scores on the initial burst—which gives him a five-second edge on the two-seater team—he wins. By that, we mean if he gets the observer on his first burst, he stands a good chance of getting the ship complete. But woe be to him, if he misses!

You see, when he misses the observer and pilot know that they are being attacked. They have been five seconds behind in getting into action, but what about the single-seater now that he's tried and failed? If he goes under the two-seater, he has lost both his "upper-hand" and his height. If he zooms up, he must suffer that inevitable instant when he is almost stalled at the top of the zoom, and it is then that the observer has his best chance of nailing his enemy.

From that point on, the single-seater fights to get another bead on the observer—or he tries for a "break" which will give him the pilot or the fuel tank. On the other hand, the observer now works with his pilot to keep the single-seater in some spot behind him where the single-seater pilot cannot get in a broadside shot. (The one exception to this latter rule is depicted in Fig. 3 of our second diagram. We will consider this in a moment).

What is most important, the observer attempts to maintain the fight so that he does not have to fire across wind—that is, across his slip-stream. To fire cross-wind, he risks inaccuracy in "laying-off" for direction and also must fight against the pressure of the slip-stream.

In other words, the observer tries to keep his tail directed, in a general way, at the enemy ship, in the same manner that the single-seater tries to keep his nose on his target. In the meantime, both ships attempt to avoid cross-fire or shorts at targets off their line of flight.

Now, if the observer is keen, he can outfight the scout, because all he has to do is direct the fire of two flexible machine guns and direct the movements of the ship by tapping his pilot or by talking to him. The attacking scout, on the other hand, has to fly his own high-speed plane, handle his guns, and maneuver to get his position.

There is no question, now, but that the two-seater has the edge.

Now note Fig. 1 at the top of our second diagram. If the single-seater attempts to attack openly and single-handed from the beginning he must have a wide element of luck on his side to outwit the gunner who, as we have said, fires from a steadier platform and who in taking his enemy nose-on not only has the scout's engine to fire at, but is also firing point blank into the single-seater pilot's face. These are both very important psychological points in the gunner's favor. They cannot be sniffed off.

Should the enemy scout attack from behind and below, as shown in Fig. 2 of our second diagram, the situation is a little harder; but if the pilot and observer have worked out their signals well, the attacking scout pilot finds himself

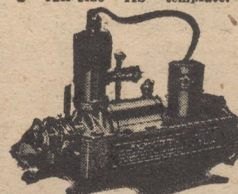
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4 oz.18 1 pt.60 1 qt.1.00 1 gal.2.00	010 per sq ft. .19 015 per sq ft. .30 1/32" .6x6" .15	These blanks are machine cut. Thrust range, 3 to 3½ lbs. PRICE: 3 times price of propeller blocks above.
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4 oz.18 1 pt.60 1 qt.1.00 1 gal.2.00	Any size, any wood, any shape. PRICE: only \$1.75 Grained specially selected, well seasoned, spruce.	Clear Straight Grained specially selected, well seasoned, spruce.
Paper Adhesive	Per sq ft.	Hard Balsa Sheet 36" Lengths
Special for gas model models. (Same price as clear dope.)	Kiln-dried and clean, excellent for ribs, covering, struts, spars, etc.	3/16x1/2 .6 for .25 3/16x1 .ea. .10 3/4x1/2 .6 for .30 3/4x1 .ea. .15 Hard Balsa 5 Ft. Lengths
Colored Dope	Per sq ft.	Same sizes as spruce above. White, hard, straight grained. Same price as all respects.
4 oz.20 1 pt.65 A high-gloss color. Choice of: Red, Blue, Black, White, Green, Orange, Yellow, Silver, Cream.	1/32x2 .2 for .10 3/64x2 .2 for .12 1/16x2 .2 for .12 3/32x2 .2 for .14 1/8 x2 .2 for .15 1/4 x2 .2 for .25	Double price of 2" widths. Ignition Wire Special for gas jobs .per ft. .05
Spring Steel Wire	Per ft.	Bamboo Paper 18" Long
1/16 dia. 5 for .12 3/32 dia. 5 for .15 1/8 dia. 5 for .25	18" Long Walnut - Spruce - 2 Sheets .ea. .15	Plans for the record breaking gas model built by Alphonse Bellantonio holds the WORLD'S OPEN RECORD and an unofficial flight record of 4 hrs. & 16 min. Plans drawn to ¼ scale. We include a full-size rib template. PRICE: only 20c



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¾" Bore x 1" Stroke—Approx. 1/5 H.P.

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Ukulele	Flute
Cornet	Harp
Trombone	Cello
Saxophone	Piccolo
Mandolin	Guitar
Banjo	Accordion
Trumpet	Harmony and Composition
Voice and Speech	Culture
Drums and Traps	

being fired on from a position slightly above, in which his own top wing—in the case of a biplane or high-wing monoplane—becomes something of a deadly blind.

Not so good!

The only reasonably-certain spot to attack the two-seater, then, is the behind-and-dead-astern position which blanks out the two-seater gunner's arc of fire. From this position, the attacking single-seater has the edge, both in surprise and in effectiveness (see Fig. 3).

AS we have pointed out, the gunner is the most important figure in the defense of the two-seaters, but he also plays a big part in the attack movements.

The main point of attack is the dive, just as that adopted by the single-seaters. Two-seaters employ most of the attack formations shown last month; but after the main thrust is made by the front guns, the two-seaters zoom and give the gunners their whack at the enemy with broadsides or shots over the tail (see Fig. 5).

In Fig. 6 we show you how two-seaters in an attack of the dive-and-zoom type effectively bring their guns into play. Note that in the dive the

front guns rain lead upon the attacked formation; then on the zoom, the rear guns go into action following up the front-gun attack just completed in the dive.

The diagrams also show how the gunners cover each other in all movements, particularly in the accepted six-ship formation—the stepped-up Vee—where it will be noticed that the first three planes can cover the others and leave the rear-rank gunners free to hold off attacking machines. The attackers, of course, attempt to get the leader first. After that, the rest is easy (see Fig. 7).

Next month we will show some of the tactics and maneuvers employed by the pilots and gunners aboard the larger multi-seat bombers and long range reconnaissance machines, and here we wish to emphasize that the maneuvers and tactics offered in these articles are *not* those employed by a particular air service. They have been compiled from a study of the methods employed by the major air powers of the world and are only intended as a general study of the systems which have been created to fit certain conditions and types of fighting planes. We simply aim to give you fellows a brief idea of what air-tactics and maneuvers are all about—and we hope you like these articles.

Gas Engines and What Makes 'em Tick

(Continued from page 51)

several reasons. The first is that it has pulled down the price of motors. The first motors on the market were \$36.50! Today, the tiny engines cost 1/3 to 1/2 that price.

In regard to efficiency: The average compression ratio of a 1936 automobile is 6.7 to 1. Compression on a minia-

ture model airplane engine of 1 inch stroke and 3/8 inch bore is 14 to 1—which means a direct pressure of over 600 pounds on a crankshaft less than half an inch in diameter.

We suspect that several mechanical improvements in the model plane gas motors are on the way. The needle-valve adjustment is one that will bear watching. On five of the motors this adjustment is located directly behind the cylinder and in the path of the exhaust—hence the boys certainly have a hot time adjusting the fuel mixture! On the sixth engine the needle valve is located just behind the propeller. So it's a question of which method is the lesser of two evils—to burn your fingers or chop your knuckles? But all of us brave fellows will carry on—despite.

The F. A. C. Transport Contest

(Continued from page 35)

you've "spotted" on its fuselage.

RULES OF THE CONTEST

YOUR ship may be either a flying or solid model. The model *must be of your own design*—that is, it should not be a standard ship or a craft made from a kit. The model, moreover, must be painted in the F.A.C. blue and gold colors and must carry the letters, "F.A.C."

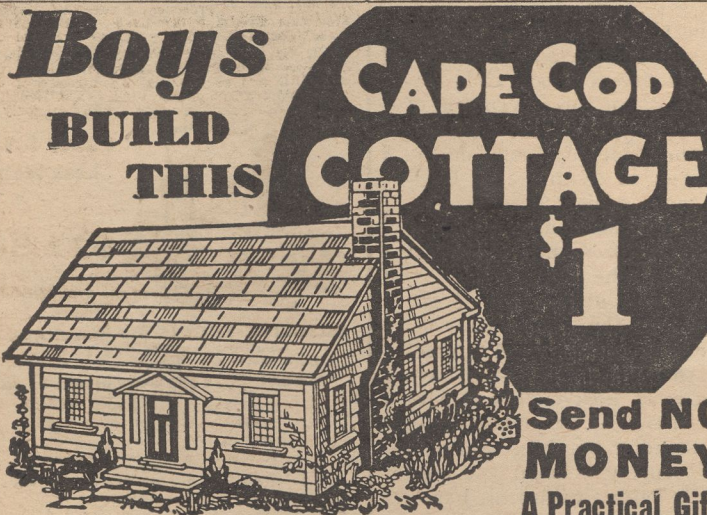
After you've got your model built, get out your camera, snap a picture of

GAS ENGINES FOR MODEL AIRPLANES—BOATS

The G.H.Q. "Loutrel" Motor is most spectacular achievement in model airplane history—actually one of the most powerful motors ever constructed! Has broken records for amazing performance—flies model planes up to 10 ft. wing spread. Easy to start—just a twist of the wrist—and simple as A-B-C to assemble (So easy only a screw-driver is needed). Steady running (runs 27 minutes on ounce of gas). Cylinder and piston lapped to within .0003. Kit includes plug, coil, condenser, tank, ignition wire, cylinder, piston, connecting rod, timer, crankshaft, all screws, nuts, bolts, etc. Every part is fully machined and finished. No oil, gas, batteries or propeller included. Postpaid for only \$5.50.

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it, and send the photo to Doug Allen, FLYING ACES Headquarters, 67 West 44th St., New York City. The best photos received will be reprinted here in the Club News, and the very best one will bring a prize—a yearly subscription to FLYING ACES. The contest closes

July 20th. A six-month subscription will be second prize, and a special prize will be on tap here for every builder who sends in a good photo entry. Of course, the first-prize ship will be christened The New FLYING ACES Transport.

Happy Landings

(Continued from page 31)

Of course, there's still that weather report business to worry about. But that's the way things go. Perhaps if they give Commander Rosendahl a really free hand, he'll do something about that, too.

Yes, they can go in for airships again if they'll only act smart for a change and worry more about the length of service they can get out of them, rather than the length of the framework.

You tell, 'em, Commander!

Citations and Awards

(Continued from page 36)

given the second award of the bronze props for additional services to the club: Richard McLemore Bob Rosenbush
W. D. Davis Sherman R. Higdon
James Flaherty

The following winners of the second award of the bronze props have been given the third award of the bronze props for additional services to the club:

Eddie Munzing John Wenglarz
Harold Lloyd Edith M. Davis

The following members of G-2 of the Flying Aces Club have been awarded the silver F.A.C. ring for exceptional service to the Club:

Adolf Jacobs R. D. Simonson
Leonard Tarver Sally Ford

The following member of G-2, of the Flying Aces Club, has been awarded a pocket knife for exceptional services to the Club:

Gaston Auger

The following members of G-2, of the Flying Aces Club, have been awarded Aviator's Identification Bracelets for additional services to the Club:

Anthony Konseavage Martin Schatzer
George Bertolozzi Walter Smith
Helen Greene

The following members of G-2 have been cited by the Flying Aces Club for exceptional services to the club and are being considered for the Distinguished Service Medal:

Harry Smith Donald Heyman
J. Hixson Francis Gentile
Armand Beaulieu Billy Shue
Fred Sobel George Berg
Leroy Settergren J. B. Winter
Les Newman Ephraim Connor
George Lamprinos Bert Morgan
Nartz Gajewski Raymond Neigel
Robert Foster Sam T. Hoyle
Karl Yena Charles Phillips
Victor Weber Eugene Greenwell

The Dramatic Story of Attack Plane Progress

(Continued from page 25)

It is interesting to note that the Americans—who were mainly trained along French lines and who got in little attack work—are now the leaders of the system. But it must be explained here that attack aviation today does not mean trench-strafting in the same sense as it did in 1918. The modern theory is that front line areas can be accounted for by the light and heavy artillery and that attack aviation should work in the area between 25 and 120 miles behind the enemy front line. They would be sent out on definite missions and not simply to attack "opportune targets."

These ships, moreover, should be able to attack enemy airdromes far behind the line. They would be expected to neutralize enemy anti-aircraft guns before their own bombers appeared over the enemy targets. They would be called upon to destroy important railroad junctions and harass enemy troops. In

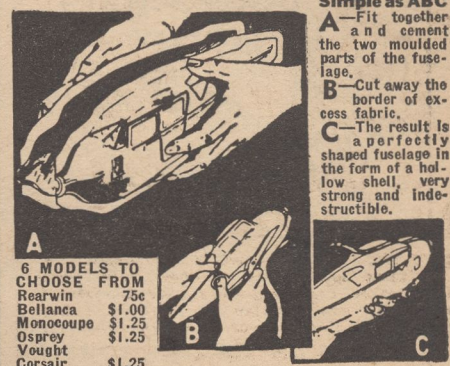
fact, a modern nine-ship flight of attack ships should be able to destroy a complete regiment.

Each plane would carry several 25-pound fragmentation bombs and would mount several machine guns—enough to take care of a complete battalion. Indeed, the latest attack ship is said to carry twenty 25-pound bombs and six machine guns.

NOW let's look over the many models of attack ships that have been introduced in our Air Corps.

Believe it or not, the first actual attack plane built in this country was a massive triplane built by the Boeing firm in 1921. We include a picture of it to give you an idea of what was considered tops in attack equipment in those days. This ship was heavily armored; but later the Boeing firm turned back to a less elaborate biplane attack ship listed as the GA-2 which was also

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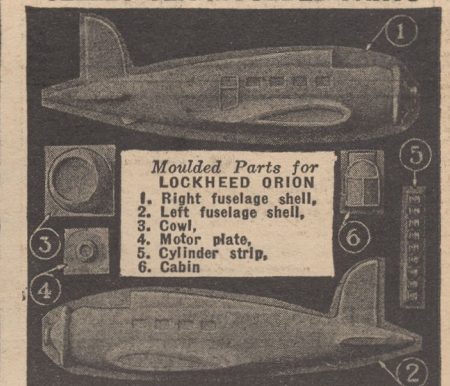
Wing Span, 20"
Length...12 1/2"

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ORION

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15c Postage

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LOCKHEED ORION

1. Right fuselage shell,
2. Left fuselage shell,
3. Cowling,
4. Motor plate,
5. Cylinder strip,
6. Cabin

Spun Aluminum COWLS

	Drag	Open	Closed
1"	15	15	15
1 1/2"	18	18	18
2"	20	20	20
3"	28	28	28

Aluminum Disc	Rubber Tired Wheels
1 3/16" dia.	5c ea.
1 1/2" dia.	6c ea.
1 3/4" dia.	7c ea.
1 7/8" dia.	8c ea.
2" dia.	9c ea.
1 1/4" dia.	10c ea.
1 1/2" dia.	11c ea.

Balloon Tire
Alum. Disc Wheels
1 3/16" dia. 25c pr.
1 1/2" dia. 28c pr.
1 3/4" dia. 30c pr.

Treaded Rubber Tire
Aluminum Disc
1 3/16" dia. 30c pr.
1 1/2" dia. 40c pr.
1 3/4" dia. 50c pr.

5 3/8" dia. \$1.50 pr.
6 1/4" dia. \$2.00 pr.
7" dia. \$2.50 pr.

Axle Fork and
Swivel Joint
1/2 up to 3/4" wheel 10c
3/4 up to 7/8" wheel 15c

Postage 3c pair, on Rubber Tired Wheels, 4c pair.

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SWIVEL TYPE GUNS

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1 1/4" Long 10c	1 3/4" Long 10c
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RING MOUNT GUNS

1 1/4" Long B 25c	1 3/4" Long A 30c
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WHEELS

Aluminum Disc	Rubber Tired Air Wheels
1" dia.	15c pr.
1 1/4" dia.	18c pr.
1 1/2" dia.	20c pr.

Celluloid Balsa
Wheels
3/4" dia. 06c pr. 04 pr.
1" dia. 08c pr. 05 pr.
1 1/4" dia. 10c pr. 07 pr.
1 1/2" dia. 18c pr. 10 pr.
3" dia. 35c pr. 35 pr.

Balloon Tired

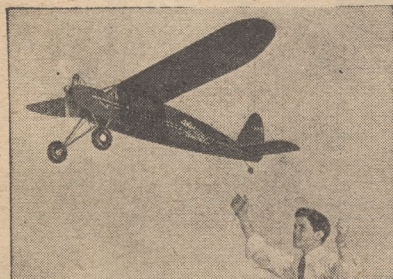
Celluloid Disc Wheel
1 1/4" dia. 30c pr.
1 1/2" dia. 33c pr.
2" dia. 35c pr.

AXLES Threaded and fitted with washers, bushings and nuts.

Lengths 1/16 3/32 1/8	2" 3" 4" 5" 6" 7" 8" 9" 10" 11" 12" 13" 14" 15" 16" 17" 18" 19" 20"
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THE NEW

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GAS MODEL



7 ft. Wingspan • Wt. 4 1/2 lbs. • 22 min. on 1 oz. • 18 to 1 Glide

● Here is truly the last word in gas models, emphasizing SCIENTIFIC leadership in design, construction, performance, and outstanding value.

● The "Miss America" is the result of our determination to develop a really superior type of gas model.

● Among features of the "Miss America" model are shock-proof landing gear, landing gear brackets, balance tabs on rudder and stabilizer for correct adjustments of flights, and new type battery box.

● The model is beautifully colored, wings being doped a brilliant red and fuselage blue with black and white trim. It is built to accommodate either the Brown or Cyclone engines (or any reliable motor now on the market).

● Here's What You Get:—
1 Pr. Pneumatic Rubber wheels, two giant full-size detailed plans streamline tail wheel; wood cement, bamboo paper cement, red and blue dopes; printed-out ribs, bulkheads, wing tips, etc.; special covering material; celluloid; rubber; hard wood propeller blank; complete hardware; 1/32" 3-ply birch for covering front of model; strip balsa; complete insignia, etc.

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218-220 F8 Market St., Newark, N.J.

armored and provided with an open top center-section where the pilot sat—high and dry, but apparently very blind as to his downward vision.

The Douglas firm broke out in 1922 with an attack biplane known as the XA-2. This ship was unarmored, although she was fitted with eight machine guns and an inverted Liberty motor. A very nice job—but.

The first really successful attack plane built in this country was the Curtiss Falcon—the A-3B model is shown in our gallery of attack ships. It had the early Conqueror engine and was a biplane. The Falcon ships were the real backbone of the attack service until the Curtiss A-8 attack ship came out. In the meantime, they tried an improvement on the A-3B model—the XA-4 job which mounted a Pratt and Whitney "Wasp"—but this ship, they tell us, was a rank failure.

Curtiss next tried the XA-5 a Prestone-cooled job which had a top speed of 165 m.p.h. Really a re-designed XO-16 observation job, it did not break any records in production.

The last of the Falcon line was the Curtiss XA-6 which was powered with the twin-row Chieftain motor, a power plant that boasted a noble streamline design but which gave considerable overheating trouble. A glance at the accompanying picture will disclose this smart design.

The first of the long line of low-wing attack ships was built by the Fokker company when it had a factory in this

country. Known as the XA-7, little information about it is available. Later, the same firm tried it again with the same model revamped on a streamlined undercarriage. These machines came out about 1931.

Then the Curtiss A-8 attack series came out and blasted the hopes of the Fokker machines. The A-8 was the first monoplane attack ship to be accepted by the government for squadron equipment. Another model using the geared Conqueror was developed in an effort to get more speed. This was known as the Curtiss XA-8A, but nothing particular came of it.

About the same time that the first A-8 came out the Lockheed firm made a game attempt to get in on the attack wave with the Lockheed XA-9 shown in our list, but during the initial test the plane cracked up and the pilot was killed. Later, the same firm tried out an improved version of the same machine, but nothing startling has been heard of it.

The Consolidated firm then startled the country with its first attack ship, known to the trade as the A-11. It used the Conqueror and had a reputed speed of 235 m.p.h. But the powers-that-be turned it down.

Now we come to an interesting point of the Curtiss attack designs. After the A-8 came out, it appears that the Air Corps desired more speed, so they gave up the Conqueror type and went in for the air-cooled radial. The first model to use this engine was the Curtiss XA-10 shown herewith. Our readers will notice the effort to streamline the engine cowl and still give a sufficient cooling air-stream for the Pratt & Whitney engine. This broke the trim line of the nose, as may be seen, so they rebuilt the ship and used the Wright 750 h.p. Cyclone radial and cleaned her up. Result—the present day Curtiss A-12, kingpin of the attack service.

At the present time there are several other firms shooting for the attack-plane business. In fact, we may expect many interesting models within the next few weeks. The Northrop A-13, shown here, is one of the most interesting.

In summary, American attack aviation appears to be far more alive than any other branch of the service—as far as interesting types are concerned.

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A Ranger Engine Model

(Continued from page 57)

THE CRANKCASE BLOCK
WHEN your templates are ready, cut a block of wood the size of the crankcase (Figs. 4 and 5) and placing the templates on the front and rear ends, trace the outlines onto the block. Now either whittle or plane this block-piece down to the proper shape. Drill twelve holes of 11/32" diameter into the lower left and lower right sides—six on each side. Bore these holes at a 45 degree angle and just deep enough so that the cylinders will fit nicely into them. Finally, cut and

cement-on two narrow strips of wood to represent the bolted "beading" along the sides of the crankcase. These strips are to indicate where the two halves of the real crankcase fit together (see side-view photo and Figs. 4 and 5).

GEAR HOUSING

THE next step will be the gear housing. You must make this in two separate parts because the front section contains the shaft boss above the center line, as you can see in the photos and drawings, while the rear half is hollow to allow free movement of the propeller shaft. Should you have the use of a lathe, it would be advisable to turn all your round pieces on it, if not they can be whittled out or hand-sawed just as effectively.

You will notice that each of the above pieces have flanges running along their outer rims. If you turn your work on a lathe you can easily work these flanges in on each turning, but otherwise it is advisable to make the housing shells and the flanges separately, cementing them together when shaped. The inside of the rear gear housing should be scooped out (as shown in Fig. 5 in dotted lines) to allow the shaft to revolve freely. When you have joined the two halves, make the crank-end bolt bosses (of which there are 12 around the outer edges, as shown) and cement each in place.

PROP SHAFT AND BEARING

THE propeller shaft is next. You can make it of tubing, rod, or wood-dowl. In order to have a smooth bearing surface for the shaft, an outer tube should be forced tightly into the front half of the gear housing. A ring or washer should be fastened to the end of the prop shaft extending into the housing. This is to keep it from sliding out. Another such washer should be fastened on at a point where the shaft protrudes from the bearing ring to prevent it from pushing back in.

REAR PORTION OF ENGINE

THE magneto oil pump, distributor, etc., (shown in Fig. 6) can be cut from one solid piece of wood. This piece can be hand-sawed or cut with a coping saw equally well. When you have cut this part, sand it smooth and add the smaller detailed parts, such as jets, tubes, wires, etc. (see photos and plans for details). When completed, cement it to the rear end of the crankcase.

CYLINDERS AND CYLINDER HEADS

OUR cylinders are next. To build these use the material described in the list. The cylinder barrels can be

made of 11/32" diameter tubing or wood dowl. Cut 12 pieces to the proper lengths, face off the ends, and then go on to the fins (see Figs. 7 and 8). Cut each of the latter from 3-ply Bristol board. (If you have a metal turning lathe, you can make a hollow tube punch for cutting out the holes in the center of each).

This done, mark off the spaces on the cylinder barrels to which the fins are to be fastened, slide each fin into its respective place, and cement it firmly.

The cylinder heads are next. For these, cut two blocks to the proper sizes, then shape them according to the templates. Finally, cement them in place at the large ends of the cylinders and when dry, force the completed cylinders into place in the holes on the lower sides of the crankcase block.

INTAKE AND EXHAUST MANIFOLDS

INTAKE manifolds can be made from reed or soft low brass tubing, which is very pliable and can be bent into any shape without kinking or cracking. The reed should be steamed before use. Whichever you decide to use, cut each tube to the proper length, bend each to shape, and fasten in place, as shown. The exhausts can be made of the same material, but each piece is straight, as front view shows. Cut 12 pieces and insert them in their respective places.

PAINTING THE RANGER

FOR those who wish to add further details, the photos will be of aid, but for those who wish to complete the model Ranger at this point, the paint job is the next step.

Black and gray are our colors. Make these units black—Cylinders, cylinder heads, magneto, exhaust stacks, and distributors; and make these units gray—Crankcase, gear housing, oil pump, intake manifolds, and other parts. The side-view photo of the real Ranger engine brings out the black and gray color scheme rather well, so you might refer to it to get an idea of the effect. If you have a copy of the January FLYING ACES at hand, you might turn to my article, "Perfect Finishes for Models," appearing on page 42. You will find this of help in selecting paints and achieving a good finish on your Ranger motor model.

Once painted, your V-770 is complete. And so, good luck with your model! And watch for another miniature engine in an early issue.

For any added information, write the author c/o FLYING ACES, 67 West 44th St., New York City, enclosing a stamped, self-addressed envelope.

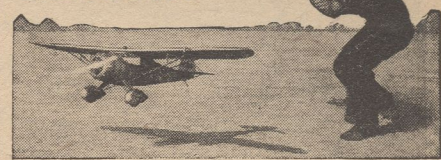
When Our Transports Say, "Ah!"

(Continued from page 12)

eight general stages. The intricate gears for driving the timing and ignition system, forcing fuel and lubrication where it is needed and lifting the valves at the exact instant, are assembled first. Meanwhile, the master rod and the eight connecting rods are assembled on the crankshaft.

Then through the other steps of assembly, the motor begins to resume its normal shape and size. Cylinders are replaced, spark plugs inserted into the proper openings, wires, lubricating valves, all the other fittings and "gadgets" unimportant by themselves but vastly necessary to the entire assembly,

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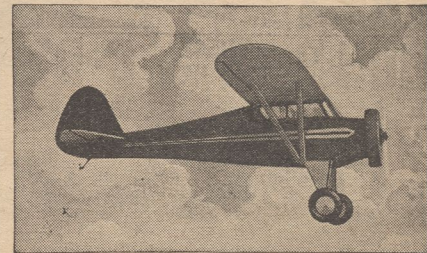
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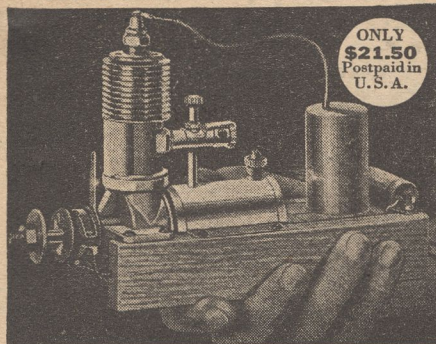
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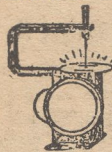
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are inserted in their proper place.

Each nut as it is fitted to its corresponding bolt is tightened and then wired on—no chance for vibration to shake it loose.

On the present overhaul schedule, one motor starts through the plant each day and one is finished each day. About a week is required to complete the circuit. The schedule could be doubled should it become necessary. Dozens of spare motors are held in reserve so that should anything interrupt the normal schedule operations the planes are not delayed.

As a last resort the completed motor is taken to the test block, installed on a "rack" in the same position occupied when in flight. There, it is operated under its own power for an entire day at speeds corresponding to the cruising speed of a plane. Its consumption of oil and gasoline are carefully checked and

the operation of the motor recorded on detailed charts. Another sad eyed mechanic "doctor" stands by. He's usually hopeful—but he's generally doomed to disappointment.

And so the next time you see one of these huge mechanical birds of cargo speeding through the skies with their passengers, mail, and express, just listen to the tuneful drone of the powerful motors. Visualize the two pilots sitting confidently at the controls. Then recall the excellent reasons for their confidence. Transport pilots today are very important parts of an air line organization. But back of each pilot are about six specialists on the ground whose expert hands and critical eyes have looked into the most intimate parts of those motors and planes. The pilot keeps the plane up—but it is the army of air-plane doctors which keeps the pilot up!

On the Light Plane Tarmac

(Continued from page 32)

"At present, I am taking the Chief Forester around over the Island in the Cub thereby allowing him to get a bird's eye view of inaccessible places in the tropical mountains. I also take him to different points of the Island where Government work is in progress, saving him many days in time, since the roads are very crooked and in poor repair. I have been unusually successful in finding places to land, even at altitudes of three and four thousand feet in the mountains. Of course, I get in and out of places that one could not look at with a heavier ship.

"Needless to say, my Cub has been a big hit!"

A SERGEANT BUILDS HIS OWN

AND now, here's the story of a man who built his own ship. And he turned out a beautiful job, as proved by the photo on the first page of this department.

As an observer, Sergeant Truman F. Taylor, of the Fourth Observation Squadron, U.S. Air Corps, Luke Field, Hawaii, had made many flights. In fact, he had several thousand "passenger"

hours to his credit.

But Taylor's real ambition was to have a ship of his own to fly, so he took a commercial flying course, got his flying license, then got busy building a plane in the basement of his quarters at Luke Field. His airminded wife was his only helper. After nearly a year's work the ship was completed, trundled out, and inspected by Department of Commerce representatives from Honolulu. Then came the acid test. Sergeant Taylor climbed into the midget machine's cockpit and took off on its first flight!

The flight was successful and the government representatives passed the small craft as airworthy. Thus did Taylor realize his ambition.

Taylor's home-made plane is the smallest craft to fly above Hawaii. It has a wing span of 20 feet and an overall height of six feet, six inches. Powered by a five-cylinder LeBlond motor, it has a top speed of 70 miles per hour and can climb to a three thousand feet ceiling. Its soldier-builder estimates its cost of construction, including second-hand motor, to be about \$500.

Build the Curtiss Racer

(Continued from page 38)

WINGS AND STRUTS

CUT eighteen ribs of 1/32" sheet and five ribs of 1/16" sheet, to rib pattern. Pin 3/32" sq. balsa to plan and assemble ribs and top spar, as designated. The leading edge is 3/32" sq. and the trailing edge is 1/16" by 3/16". It will be noted that the only difference in the upper and lower wing construction is the center rib placing. Leave spars, leading and trailing edges projecting to center on the lower wing panels. The wing tips are of 1/20" bamboo, bent by flame and inset as shown. Assemble two halves of the top wing, giving it 1" dihedral at each tip, and cement center rib in place. Now sand all leading and trailing edges to shape,

and cover.

Cover each side of upper and lower wing panel with one piece of tissue, and decorate with stars.

Make two wing struts P, of 3/32" sheet balsa and streamline as shown.

Now make three cabane ribs to pattern—one of 1/32" sheet, two of 1/16" sheet. Cut leading and trailing edges of cabane, which are the same as the wing, and sand to shape.

To assemble wings, the author decided on the following method: Cement wing sockets K, to both sides of former J, lining them up with a piece of 3/32" sq. balsa. Trim 1/32" off of lower wing panel, leading and trailing edge, and bevel for dihedral. Insert wing spars

and sockets, and blocking up for one inch dihedral, as top wing, cement. Cement wing struts P, on lower wing in proper position, and place the top wing in position. Cut leading and trailing edges of cabane, and insert; put cabane ribs in place, then cover with tissue.

TAIL ASSEMBLY

BEND 1/20" bamboo to shape with heat, and pin around outline of stabilizer; pin 1/16" by 1/8" spars in place, fit in 1/32" by 1/8" ribs, and after stabilizer is finished, sand ribs to streamline shape.

The same procedure is followed on the rudder, with the exception that it is hinged on thin sheet aluminum strips to secure an easy adjustment for torque.

The tail skid is constructed of 1/16" sheet, cut to pattern, and cemented on fuselage as shown.

Cover tail surfaces on tail skid with separate pieces of tissue for each side, and decorate the rudder with three vertical stripes of red, white and blue. Cement parts to fuselage as shown.

MOTOR AND NOSE

THE nose is carved from a piece of soft balsa 1" by 2 1/4" by 3 1/4". Glue lightly to former A and cut to shape, smoothing with sand paper. Cut nose loose and imbed three dress snaps in former A and nose, as shown.

Make the motor stick of two 1/16" by 1/8" by 13" strips, cementing them together to form a square stick thirteen inches long. Plug both ends with balsa, as shown, and cement stick into nose. Give stick two coats of dope to resist rubber lubricant.

Using the pattern shown, carve the propeller and spinner assembly in the usual manner. The propeller can be finished to a velvety gloss by applying three coats of dope, sanding between each coat.

The free wheeling assembly is very simple, the wire parts are No. 14 piano wire and an ordinary tire valve spring furnishes the disengaging unit.

Care should be taken to give the propeller negative thrust, as shown in plan. The punch dress snaps hold the shaft firmly in position and form an excellent wear-resisting bearing.

Bend rear hook to S shape of No. 14 piano wire. The motor mount is bent from No. 18 piano wire and is lashed to the rear of stick with silk thread. The model is powered with eight strands of 1/8" brown rubber.

Make twenty-four exhaust stack

Make the Douglas Sleeper

(Continued from page 44)

LANDING GEAR AND PROPELLERS

THE landing gear is one of the most interesting points to the model, and it is at this point that your skill and ingenuity should come to light. Follow the plans carefully at this point and check with the photographs. It is quite possible that a group of the older builders will make the gear actually retract-

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stubs of 5/32" balsa, dowel and cement in position. Intake R is cut from 3/32" sheet, as is the radiator inlet fairing Q. Cut and sand to shape and cement in designated positions. Rig the ship with heavy black carpet thread.

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TEST your model for adjustment by gliding over deep grass until you secure the proper glide. If the model tends to stall, add a little weight to the nose until it has a long flat glide. Now set the rudder over 1/8" for a right turn, and hand-winding your model, launch it into the air on its maiden flight. With slack, well-lubricated rubber, five hundred turns may be put in with the winder, and durations of forty seconds and over are easily attained.

able. However, for novices we shall leave it in its unretracted state.

In making the landing gear, bamboo sticks should be used throughout in order that you will have a sturdy landing gear. The tail wheel gear should be made from a small balsa dowl. Then turn out a tiny wheel and insert in a slot in the carved dowl. This gear is of

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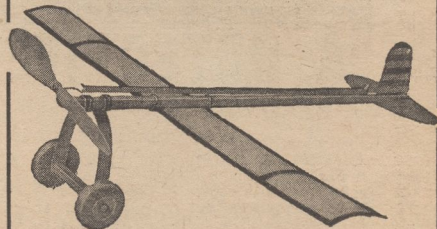
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on pages 88 and 92 of this issue

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the controllable type, so place it on a swivel mounting.

Make your propellers as follows: From pieces of balsa, cut out two prop hubs, as shown on Plan 2; then carve your blades and glue them to the prop hubs or fit them on with bits of a small needle. If you wish, incidentally, you may paint-in radial engine cylinders in the front of each motor nacelle.

PAINTING AND FINAL ASSEMBLY

ALL parts should be painted before assembly. The fuselage of the real ship is left in the shiny aluminum metal color. To imitate this, aluminum or silver paint can be used. The stripe around the fuselage and the coloring about the nose and cowlings is orange and the interior of the insignia is blue.

The engine, wheels, and tail wheel should be painted black. The windows in the side of the cabin as well as the pilot's compartment should also be in black. Paint in black squares for the landing lights in the wing. Leave the warning light in the nose white, however.

After painting begin assembly. Take the fuselage and join to it the wing center section in the niche which we cut out. Use plenty of ambroid or glue. A good streamline fillet can be made by using either putty, plastic wood, or balsa fillings mixed with ambroid. Make a good streamlined fairing to the rear of where the wing joins the fuselage as it will add materially to the swift lines of your model.

Next, glue in the engine nacelles. After these are well dried assemble the landing gear. Incidentally the landing gear sticks might be made 1/8 inch longer than required and driven into the balsa of the wing, then glued; since when the carriage is only glued onto the flat surface it is liable to become weak and break at the joint, especially if the model is handled often.

Next glue on the tail wheel. The tail

surfaces have no dihedral angle, so glue them on at right angles to each other. The outer wing panels should now be glued on. As they have a very decided dihedral angle, their tips should be placed on a small book or balsa block about 1/2" high. Attach the direction finder radio wire from the rudder to the fuselage as shown and also the small airspeed indicator. Sand down all points at which glue has oozed out. Touch up sanded spots with white paint. Your model will then be complete.

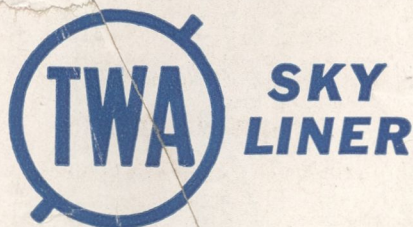
Answers

TO QUESTIONS ON PAGE 26

- 1—There have been two airships named *Akron*. The first was destroyed with the loss of five lives off Atlantic City on July 12, 1912.
- 2—The Vought XSB2U-1 is a new low-wing monoplane scout bomber for aircraft carrier use.
- 3—The new P. & W. Twin-Wasp is rated at 1,000 h.p., but it can be boosted to 1,150 h.p.
- 4—Howard Hughes' new land-plane record of 352 miles per hour was set over four laps of a three-kilometer course at Santa Ana, California.
- 5—The Hawker Nimrod is a naval version of the noted Fury, strengthened for catapult work and carrying considerable equipment for naval service.
- 6—"Old Charlie" was the name given to Georges Gynemer's famous Spad.
- 7—Count Zeppelin completed his first dirigible in 1900.
- 8—Amelia Earhart and Jean Batten were jointly awarded the Harmon trophy for women for their splendid flights in 1935.
- 9—The Aeronca, the Fairchild 24, and the Cessna are very popular in English light plane clubs. David Llewellyn, a noted British pilot, recently flew an Aeronca from London to Cape Town in 130 hours of flying time.
- 10—There are 404 licensed women pilots in this country and 69 of them have transport tickets.

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2. Do not build or send a model.

3. Each suggestion entered in the contest must be accompanied by the ends of cartons from 3 DIFFERENT Megow Kits.

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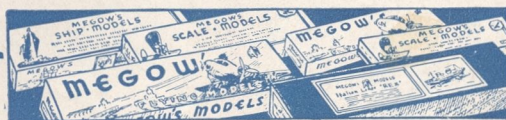
1000 Prizes — Fifty-cent solid model airplane Kit made by Megow Model Airplane Shop.

Every entry will receive a copy of Megow's new book "The A.B.C. of Model Building."

6. Each entry must be accompanied by name of dealer from whom models were purchased—or by the name of a dealer in your town from whom you want to buy Megow Models.

7. Judges' decisions are final.

8. All entries must be post-marked before midnight August 31, 1936. Winners will be notified by September 15th.



MEGOW MODEL AIRPLANE SHOP—Dept. F.A.,
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Inclosed is a 3-cent stamp. Please send me your big 20-page catalog of Megow models.

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Guaranteed 40 Power \$2.48 Long Distance Telescope

Postage
FREE



Now satisfy your desire to own a high quality Telescope . . . read all about this special offer and you will be amazed at the sensational WINN value that is presented to you here. This WINN telescope is guaranteed laboratory tested 40 power. Permits you to clearly bring distant objects close to your eye. You easily see far away subjects magnified with this TESTED SUPER 40 POWER TELESCOPE. Look from your roof or out of your window and far away sights become as clear as if you were on the spot when focused with this trusty WINNESCOPE. See close-up of the moon, stars, ships, sport events, etc. Have fun with far away neighbors. Look at what they are doing and phone and tell them about it. They'll wonder how you know. Makes objects miles away appear in front of you. A scientific achievement that defies competition . . . precision made by expert telescope manufacturers right here in the good old U.S.A. Durably made, and brass bound like very expensive telescopes. Has 4 extra powerful lenses. It is 1 foot long closed and about 3 feet long when open . . . an incomparable value at the bargain price of \$2.48.

These Special Features Make This An Outstanding Value!

1. Made in U.S.A.
2. Guaranteed laboratory tested 40 power
3. Makes objects appear 1600 times as large in area
4. Four powerful lenses
5. Black fiber tube . . . brass bound
6. When closed 1 foot long; opens to about 3 feet long
7. Can also be used as a microscope
8. Money back guarantee protects you against risk
9. Special price at only \$2.48
10. Big FREE pocket telescope offer



The top illustration shows a distant view as seen with the unaided eye and when viewed through the Winnerscope. Below, you see how an ordinary finger print looks when examined with the microscope feature of the Winnerscope.

Can Be Used As A Microscope

When collapsed, this telescope makes an efficient microscope for observing crystals, feathers, finger-prints, insects, and for other scientific or experimental purposes. This feature alone stamps this telescope as an outstanding value.

Money Back Guaranteed

The House of Winn has been recognized for a good many years as manufacturers and distributors of high standard chemicals, laboratory supplies, microscopes, etc. . . this 40 power, long distance telescope is guaranteed the same as all WINN products . . . you must be 100% satisfied or money back.

How to Order . . .

Sign your name to the coupon below and return to us at once. You must act at once inasmuch as the number of telescopes to be distributed at this bargain price is limited. If you enclose money order for \$2.48 we ship postage free. If C.O.D. is preferred, pay postman \$2.48, plus postage on arrival. **RUSH COUPON TODAY AND GET IN ON OUR BIG FREE OFFER.**

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Not only does the House of Winn give you the telescope bargain of a lifetime, but if you act once, you will receive with Mr. Winn's personal compliments, a handsome pocket and practical compass telescope. This closed measures only 2" and easily fits into the vest pocket. Great to carry for emergency sights! Order today and get yours FREE.