

CARRIER

COLD STARTING SENSE



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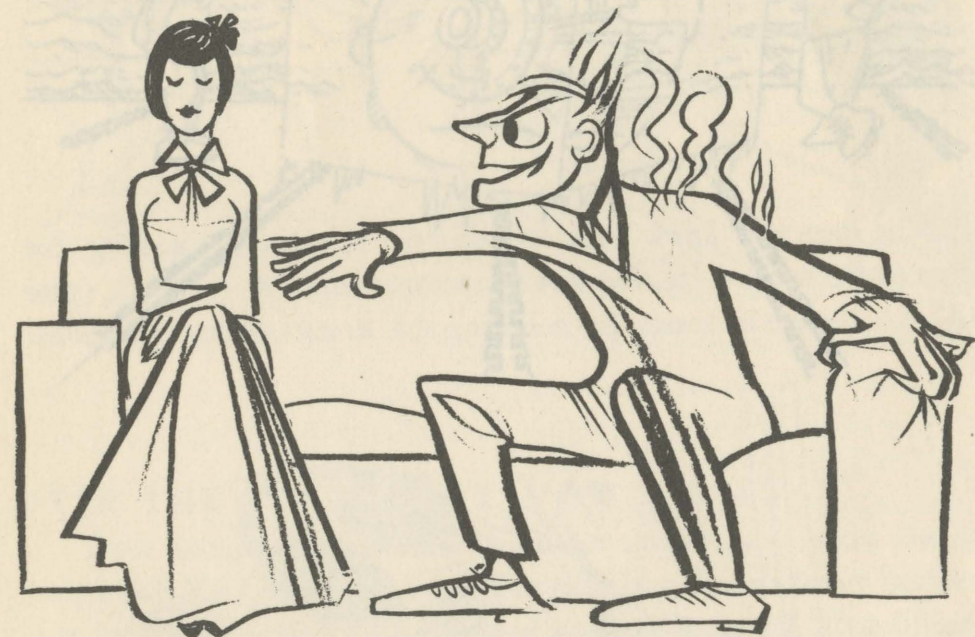


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CARRIER COLD STARTING SENSE



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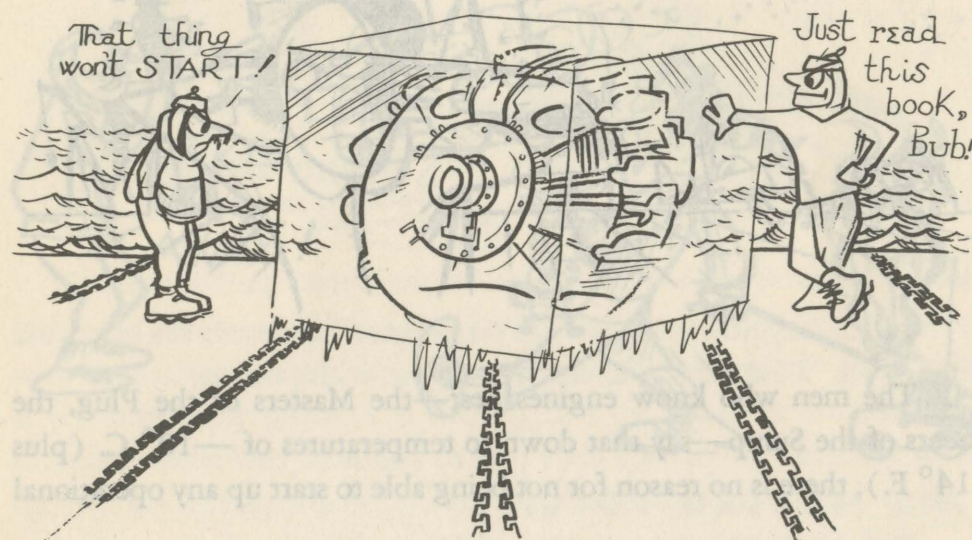
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CARRIER COLD STARTING SENSE



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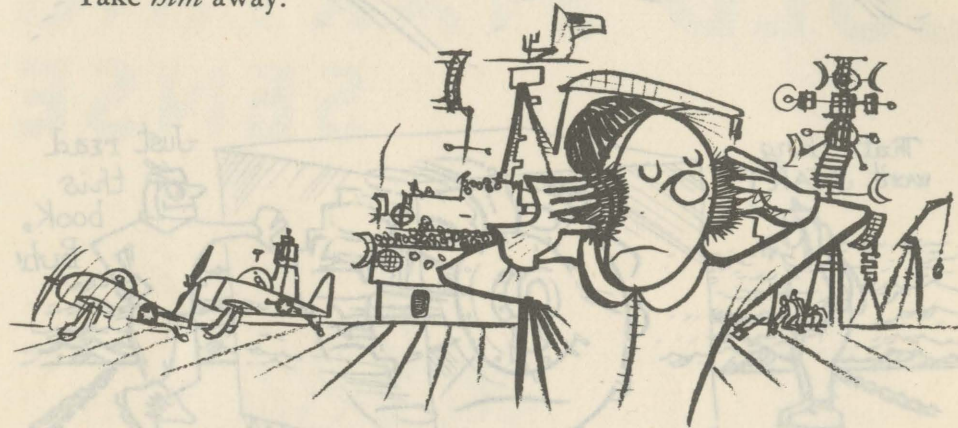


A COLD ENGINE requires the same careful approach as a cold fried egg. Handle with caution or you'll end up with the cold shakes.

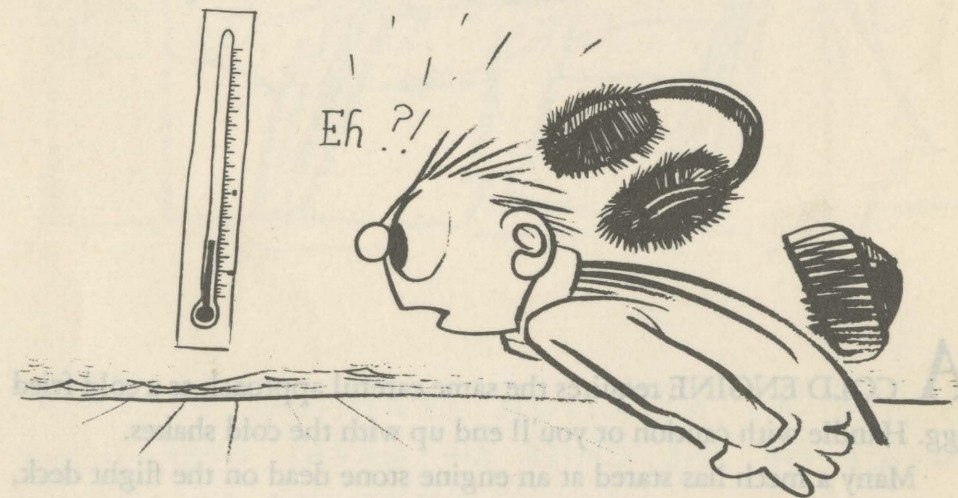
Many a mech has stared at an engine stone dead on the flight deck, with a flooded carburetor, fouled plugs, and no oomph, wondering how

it got that way. "Too cold," says Spoiler, adjusting his ear muffs. "The man doesn't live that can start one of these jobs in such weather. Take it away."

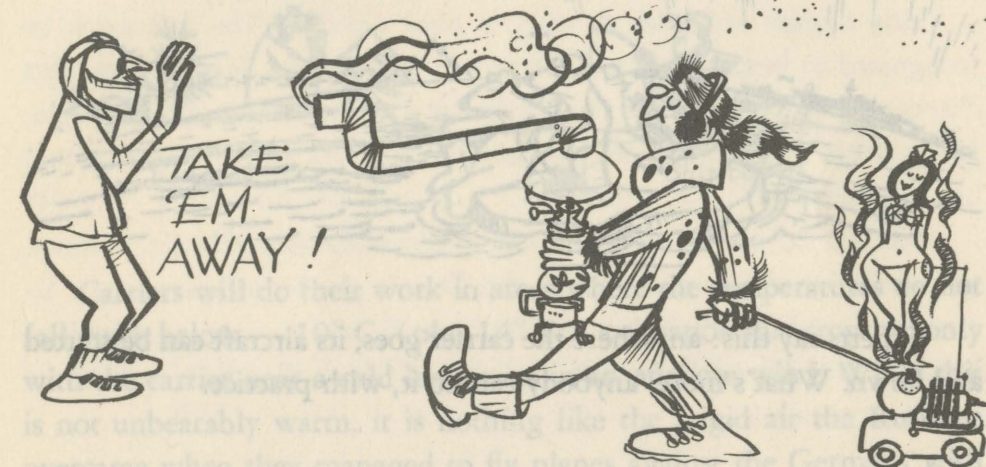
Take *him* away.



The men who know engines best—the Masters of the Plug, the Seers of the Sump—say that down to temperatures of -10°C . (plus 14°F .), there is no reason for not being able to start up any operational



aircraft in the Navy, unless half its insides are missing. They claim also that the trick can be done without a lot of complicated gear: no stove-pipes, no hot running water, no fur jackets for the valves.

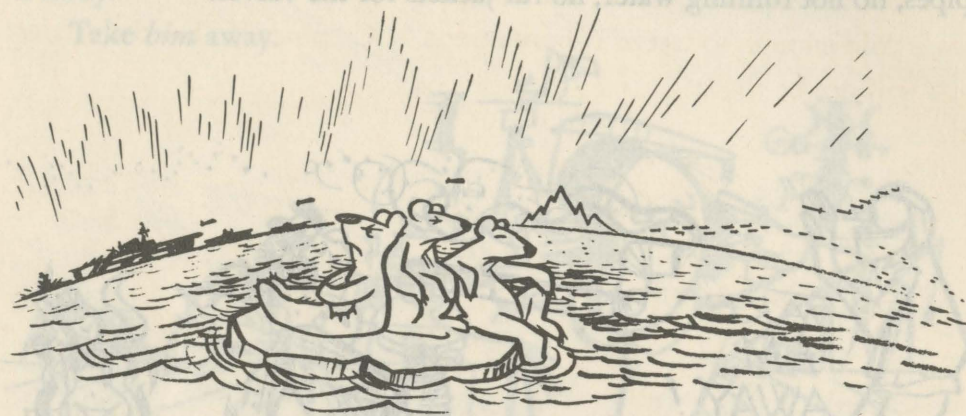


IT'S THE WAY THAT YOU DO IT

Even though we've just finished a hot-weather war in the Pacific, only a pair like Dilbert and Spoiler would figure that all future business is to be conducted under conditions of heat and humidity. That attitude is as sensible as sprinkling horseradish on ice cream. Tomorrow may find the boys with their mittens on and shirt collars buttoned tight, broken out in a cold sweat, not heat rash.

So this matter of starting aircraft engines when the cold winds blow and the oil won't flow is important. An aircraft carrier exists to bring planes to a place where they can do some good. If the planes have to be

launched over territory populated mostly by polar bears—amen, brother. The idea there or anywhere else is to put them in the air.



Experts say this: anywhere the carrier goes, its aircraft can be started and flown. What's more, anybody can do it, with practice.

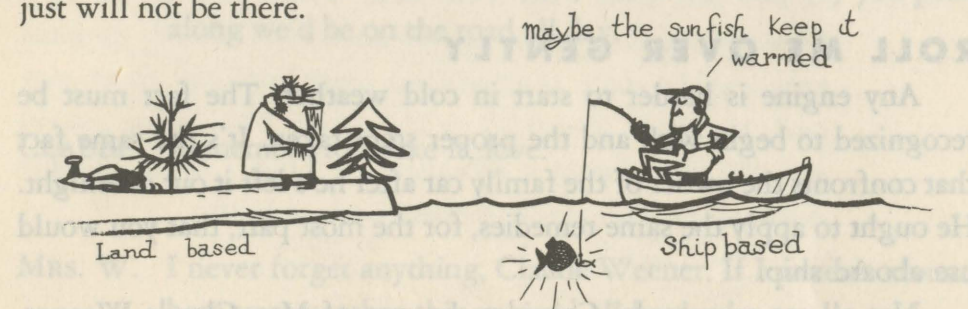
THE ICEBERG FOLLIES

What is "cold" in terms of carrier operations?

Not forty below, which is sometimes regarded as coolish in Bismarck, North Dakota. It's tough to start a kiddie car in such weather.

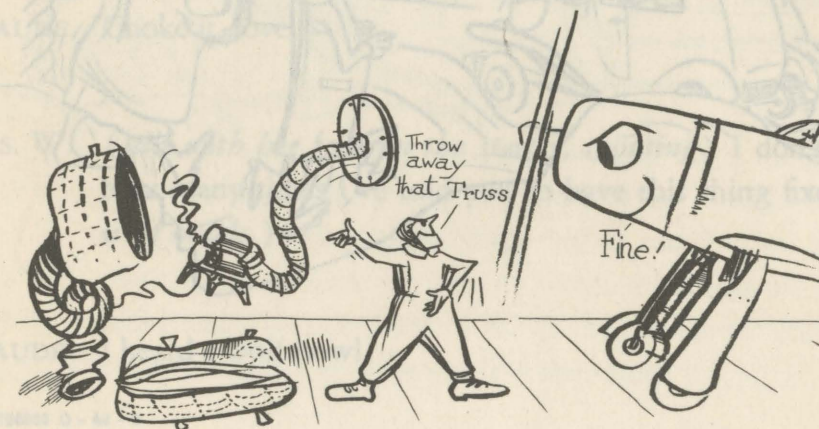


Fortunately for shipbased people, that is the kind of mercury reading the shore crowd has to worry about. It may feel that cold on a carrier deck but it won't be because sea water warms up the surface air. If the sea is cold enough to freeze (about minus 4° C., plus 27° F.) the carrier just will not be there.



Carriers will do their work in areas where the temperatures do not fall much below — 10° C. (plus 14° F.), a situation that crops up only with the carrier near a cold land mass in an offshore wind. While this is not unbearably warm, it is nothing like the frigid air the Russians overcame when they managed to fly planes against the Germans with the mercury hitting fifty below. But they had to use clumsy contraptions and gadgets to do it and these would have no place on a flight deck.

Because of the relatively mild temperatures characteristic of the sea, carrier aircraft can be started with comparative ease. They don't have to be coddled in covers or blankets. External heat is unnecessary.



With a smart hand at the switches and throttle, they can be cranked and warmed up with just about the same gear provided for the South Pacific, except for added electric power, usually externally provided.

ROLL ME OVER GENTLY

Any engine is harder to start in cold weather. The fact must be recognized to begin with and the proper steps taken. It's the same fact that confronts the owner of the family car after he's left it out overnight. He ought to apply the same remedies, for the most part, that you would use aboard ship.

Not all car owners do. Consider the case of Mrs. Claude Weener, housewife, as she hurries out of the Dumleigh Arms apartments, located in Frigid Gulch, Montana, one bitter February morning. Her husband, Claude Weener, is one step ahead of her as they rush toward the family automobile.



CLAUDE. (*nervously*). Watch out for wolves, dear. Hurry.

MRS. W. Don't be silly. There aren't any wolves in Montana. (*She pushes him into the back seat.*) I'll drive. The way you poke along we'd be on the road all day.

CLAUDE. Remember to choke it, love.

MRS. W. I never forget anything, Claude Weener. If I weren't around here to remember things, we'd all be dead.

CLAUDE. I could have sworn I saw something move then. Something furry.

MRS. W. This would be a better world if everyone handled a car the way I do. Care saves wear, Claude. (*She turns on the ignition and jabs at the starter, which whirrs. Nothing else happens.*)

CLAUDE. Choke it, love.

MRS. W. (*still with her foot on the starter, shouting*) I don't know how many times I've told you to have this thing fixed. (*A wolf howls.*)

CLAUDE. I heard a wolf howl.

MRS. W. (opening her window and mopping her brow) Shut up.
This is not the steppes; this is Montana.

CLAUDE. Watch out, love. (He is too late. A wolf appears at Mrs. Weener's window and drags her out of the car. Her husband immediately shuts the window, leaps into the front seat, pulls the choke, and steps on the starter. The engine catches and Mr. W. warms it up carefully. Then Claude Weener drives off into the dawn, without looking back.)



THE TWO BIG REASONS

Even a character like Mrs. Weener has to know something about engines (and wolves) in order to get going in cold weather. Fortunately she has never been caught at the controls of an F8F on a frosty morning,



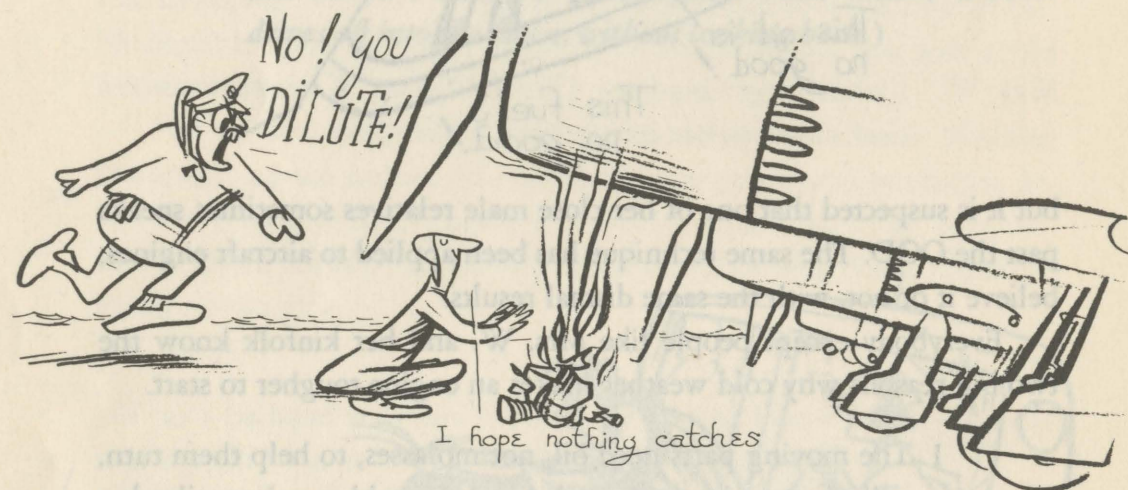
but it is suspected that one of her close male relatives sometimes sneaks past the OOD. The same technique has been applied to aircraft engines, believe it or not, with the same dismal results.

Everybody except people like Mrs. W. and her kinfolk know the two big reasons why cold weather makes an engine tougher to start.

1. The moving parts need oil, not molasses, to help them turn, roll over, or jump up and down. In cold weather, oil takes longer to heat up and thin out enough to circulate around; therefore the moving parts don't get the immediate help they require. Even Dilbert can figure out that the idea is to give the oil a boost in the right direction.
2. When the mercury drops past the freezing mark, the gasoline does not vaporize as easily as it does when the air is warm enough for dress whites. More fuel is required to produce the normal amount of vapor. That's what Claude had in mind when he urged use of the choke. Of course you *prime* aircraft engines, but the result is the same.

Those two facts ought to be firmly anchored in the head of anyone who even lifts a finger to an aircraft engine in polar bear weather. And a man with sense enough to know them would realize also that there is a chance ice has formed in oil and vent lines to do its part toward preventing the smooth and easy flow that makes engines happy. He looks into that matter too.

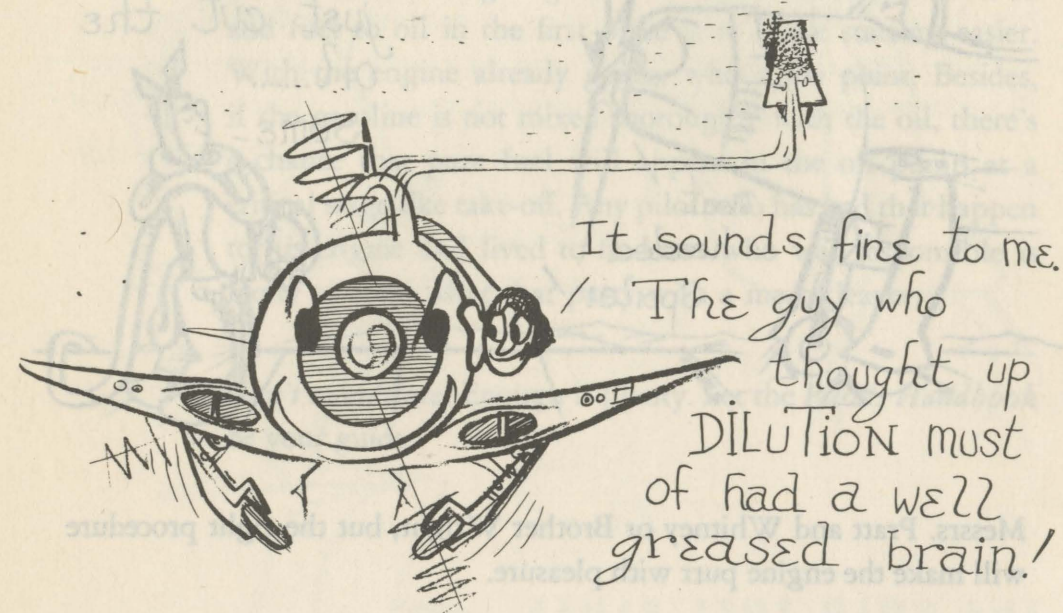
The idea is to know WHY it's tough to get an engine turning over on a cold day and HOW to overcome its stubbornness.



THE DILUTION SOLUTION

It was a smart operator who figured out that by adding gasoline to oil in the right amount and at the proper time oil can be thinned enough to flow freely at temperatures that ice up the brass monkeys. This dilution process reduces its thickness temporarily so that no lubricating values are lost. The lightened oil can thus reach and limber up those stiff moving parts. With correct dilution—and the *Pilot's Handbook* tells you exactly what "correct" is—you can produce the same free flow at zero degrees Fahrenheit that you can at thirty-five without mixing.

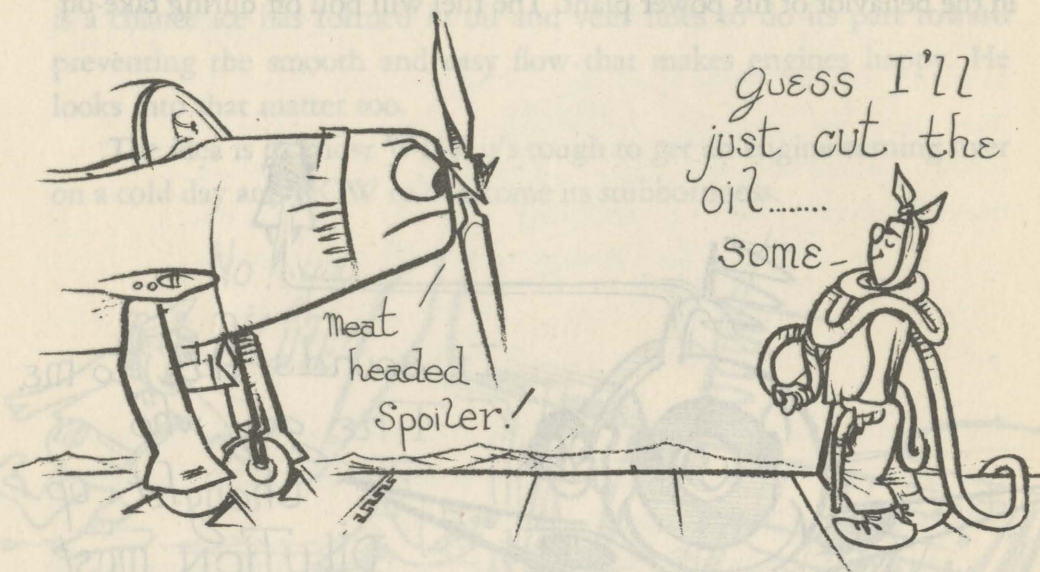
An engine with properly diluted oil, you'll find, turns over easier and warms up faster, just what the doctor ordered. If the diluter has followed the rules, the pilot (or dilutee) won't notice a bit of difference in the behavior of his power plant. The fuel will boil off during take-off



and climb, leaving the engine with nicely warmed up oil to do the work of lubricating. The pilot must remember that he is starting his flight with a smaller oil supply flowing around in there than he has aboard on a July hop from Pensacola, but otherwise he can concentrate on his flying.

Dilution will not hurt any aircraft engine if it is done according to directions. A Spoiler at the valve can foul up the job, but that's no criticism of dilution. Even breathing is dangerous if it's done under

water. The current directives have the word on the correct temperatures, time, and percentages to use, and they should be followed to the letter. *Improper*, or meatheaded, dilution can damage the finest product of the



Messrs. Pratt and Whitney or Brother Wright, but the right procedure will make the engine purr with pleasure.

WHEN TO DILUTE

As the carrier moves into areas where the temperature is likely to drop below 2°C . (35°F .), the order will come to start the dilution process. The best current method is to begin diluting as soon as aircraft are taken aboard and reach the forward spot position. With cutting the engine and before respotting, the man in charge turns the diluter valve and starts the business of mixing. Some old hands may claim that this procedure calls for doing the job at higher temperatures than they've been used to, but the engine won't suffer at all.

HOLD ON

There's always a gent around with a time-saver that can turn out to be a life-taker. No short cuts, please.

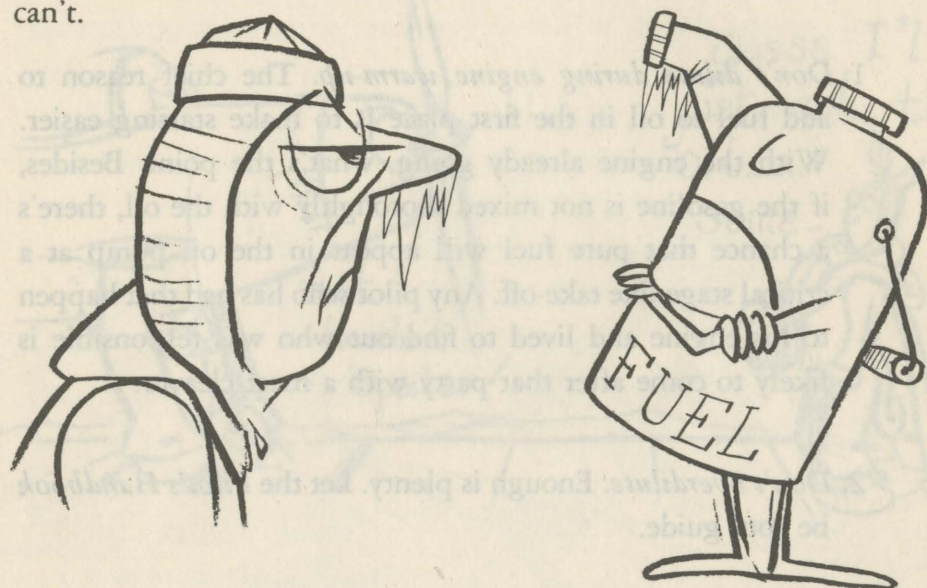
Remember the important dilution "don't's":

1. *Don't dilute during engine warm-up.* The chief reason to add fuel to oil in the first place is to make starting easier. With the engine already going, what's the point. Besides, if the gasoline is not mixed thoroughly with the oil, there's a chance that pure fuel will appear in the oil pump at a critical stage like take-off. Any pilot who has had that happen to his engine and lived to find out who was responsible is likely to come after that party with a meat cleaver.
2. *Don't overdilute.* Enough is plenty. Let the *Pilot's Handbook* be your guide.

Some Spoiler
always thinks
he knows better



Dilution is an aid to cold weather starting and warm-up, but like anything else connected with aircraft it has its dangers when performed improperly. Every operation on a plane engine must be successful. Maybe the old family doc could get by with an occasional slip, but you can't.



THE COLD FUEL BLUES

No matter how free and easy the diluted oil wants to flow, you can still be singing the blues on cold mornings. The second complication must also be overcome: the unwillingness of fuel to vaporize readily at low temperatures.

As the mercury drops, gasoline is more and more difficult to light up. That's the fact our friend Mrs. Weener was too ignorant to face and the one her not-so-stupid husband recognized as he plied the choke with care and started up with ease.

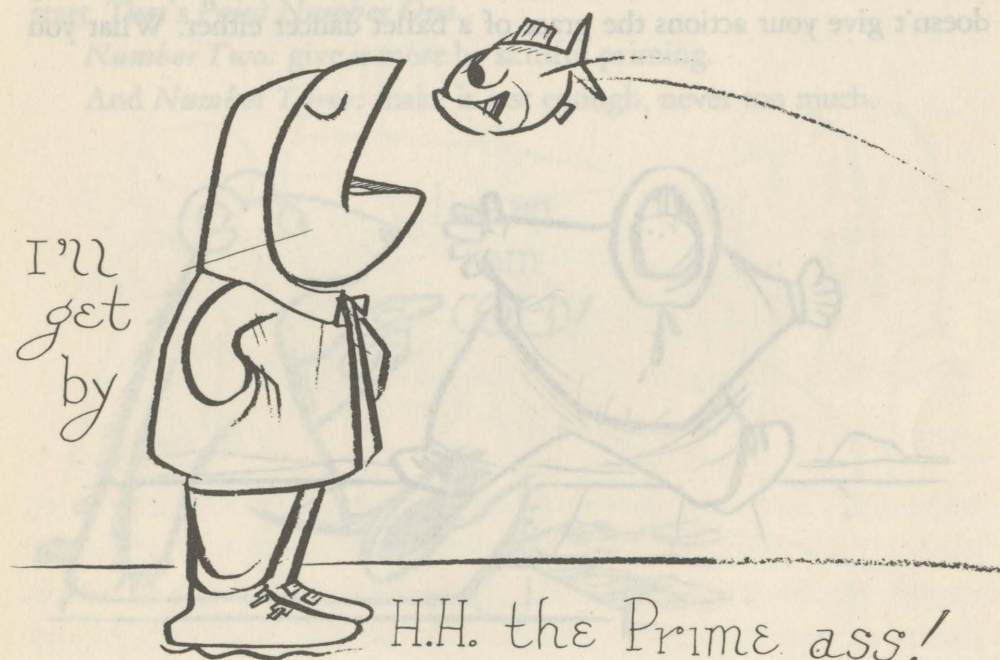
The solution is simple enough. All you have to do is use more fuel to get the amount of vapor you'd normally be feeding the carburetor

on a temperate day. And until the carburetor air temperature is raised enough to supply a warmer flow to the mixture and the engine is turning over smartly, you have to keep on feeding an increased amount of fuel to sustain combustion; that is, to keep the fire lighted.

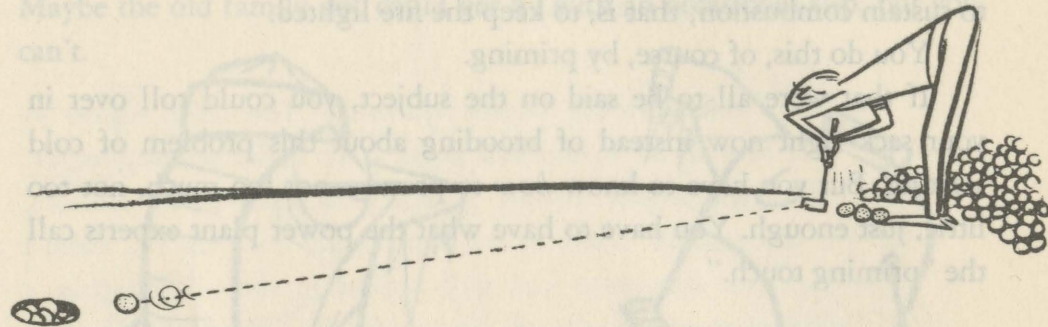
You do this, of course, by priming.

If that were all to be said on the subject, you could roll over in your sack right now instead of brooding about this problem of cold starting. But you have to know *how* to prime—not too much, not too little, just enough. You have to have what the power plant experts call the "priming touch."

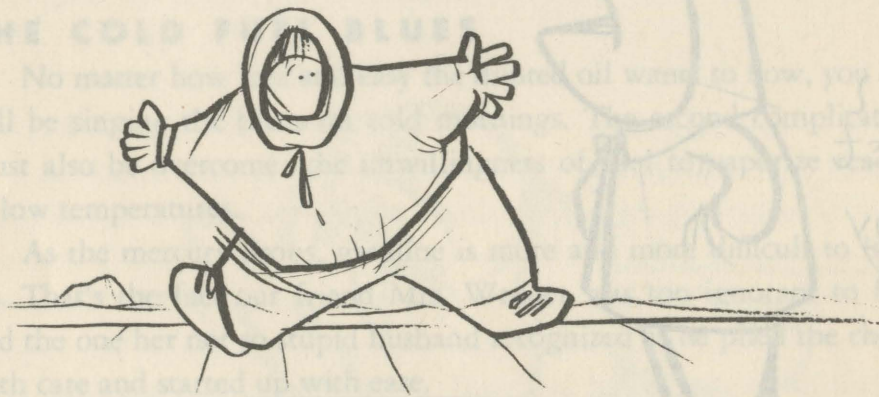
*Throw a fish to Hansel Hime;
He never fails to overprime.
His skipper doesn't love him much,
For he doesn't have that priming touch.*



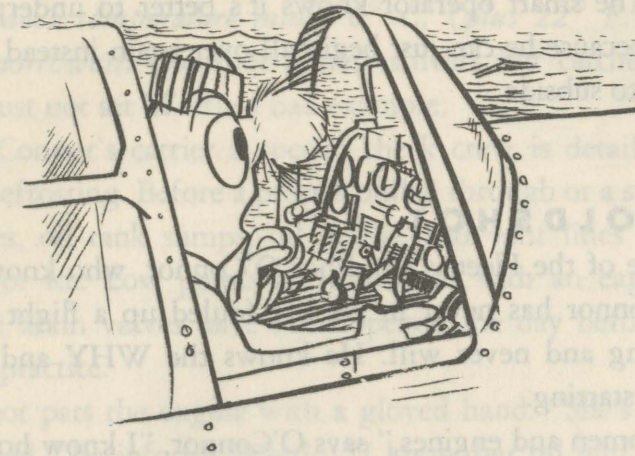
Like good golf putting or banking one off two cushions into the corner pocket, correct priming comes only with practice.



The penalties for a false move in cold weather are rough. Low temperatures just naturally slow people down. Heavy winter clothing doesn't give your actions the grace of a ballet dancer either. What you



do has to be done right the first time or you suffer for it. Many a Spoiler has sat in back of a flooded engine discovering to his amazement that the thing in front of him was not a popsicle but his own frozen breath.



When the mercury goes down, the engine requires more fuel to start. That's *Point Number One*.

Number Two: give it more by skillful priming.

And *Number Three:* make it just enough, never too much.



Practice your priming touch until you know the exact moment when a cold engine is picking up on that extra fuel. Then practice some more. That way you'll never be mistaken for a frozen mackerel on anybody's flight deck. The smart operator knows it's better to underprime than to overdo it because he can just begin all over again instead of waiting for the flood to subside.

MEET COLDSHOT

The pride of the Fleet is Coldshot O'Connor, who knows his way around. O'Connor has never in his life fouled up a flight deck on a frosty morning and never will. He knows the WHY and HOW of cold weather starting.

"Cold women and engines," says O'Connor, "I know how to make 'em purr."

"Tell us more," says Seaman Second Wattle, an admirer of the great man.



"I will not describe my activities in the boudoir at this time," replies Coldshot, "but will show you how to handle a cold engine. Follow me."

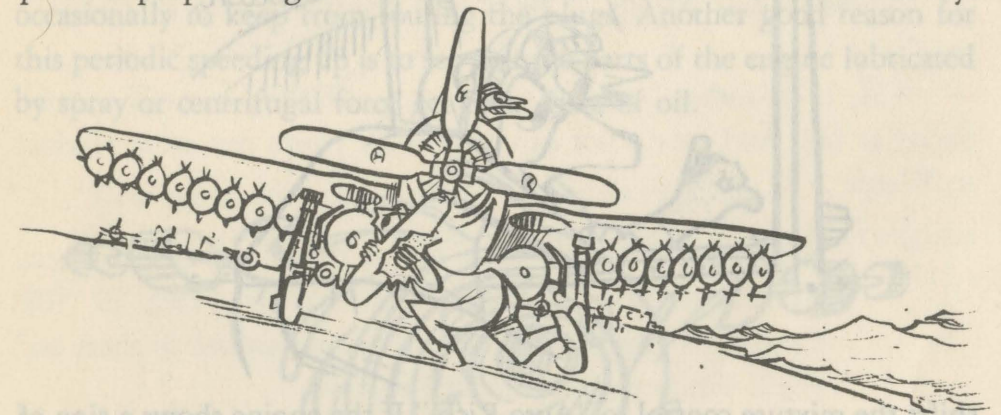
"Shucks," says Wattle.

Flight deck temperature minus 6° C. (plus 22° F.), cold wind from the northwest. Coldshot almost shivers but catches himself in time; he must not set Wattle a bad example.

On O'Connor's carrier a special check crew is detailed to attend to engine defrosting. Before a prop is pulled through or a switch flicked, drain valves, oil tank sumps, oil drains, and vent lines are carefully inspected for ice. Low points are examined with an eagle eye, even though the drain valves have been opened the day before as regular post-flight practice.

Coldshot pats the engine with a gloved hand. "She's been diluted and defrosted," he informs Wattle. "I know her oil will flow because I attended to the job myself."

After a quick cockpit check, Coldshot allows as how Wattle can pull the prop through three or four times. Wattle does. This is always

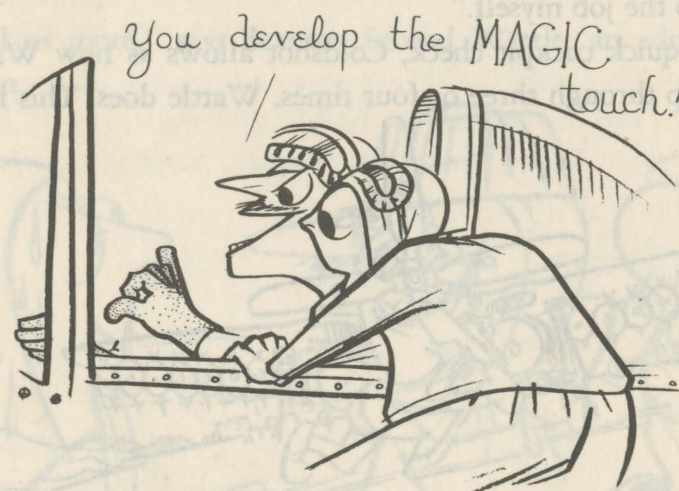


good engine-loosening practice in any weather but extra smart when it's cold because the starter has a tougher time overcoming initial inertia. Wattle also hooks up the auxiliary power unit and stands by. Battery capacity goes down with the thermometer; rather than beat the aircraft

batteries to pieces, the APU is used to twirl the starter. Coldshot's special trick of holding *on* the starter switch for a second or two after the engine first fires is also good for helping the power plant over that first big hump.

In the cockpit Coldshot sets the mixture control as "Idle Cut-Off" and just barely cracks the throttle, which the power plant experts say should be set at about ten per cent. In terms of the carburetor throttle handle this means about a quarter of an inch from complete shut-down and no more. O'Connor takes a deep breath.

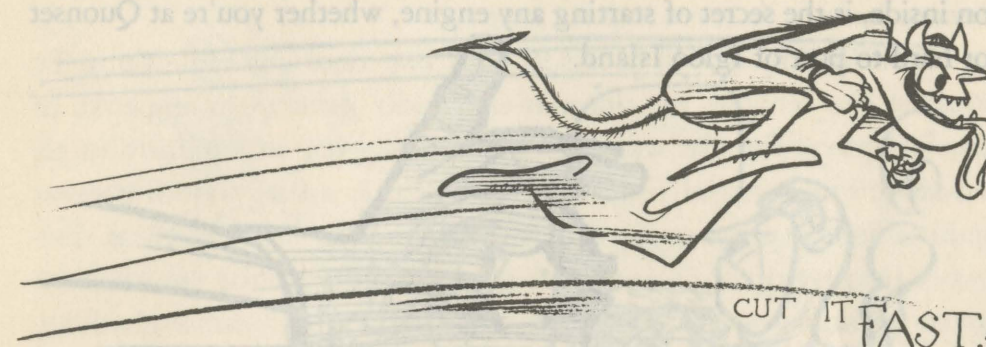
"This is zero hour," he shouts to Wattle. Coldshot is now on the starting hot spot. With the "All Clear" from Wattle, he engages the starter and the cold engine turns over. When she does, our boy flicks the primer switch and holds it on until the engine fires. *As soon as she picks up on the prime*, O'Connor releases the primer and smoothly



shifts the mixture control to "Auto Rich." If the engine shows a sign of conking out, even hints at giving up, Coldshot slips the primer switch a flick or two, but he is very careful not to overdo it.

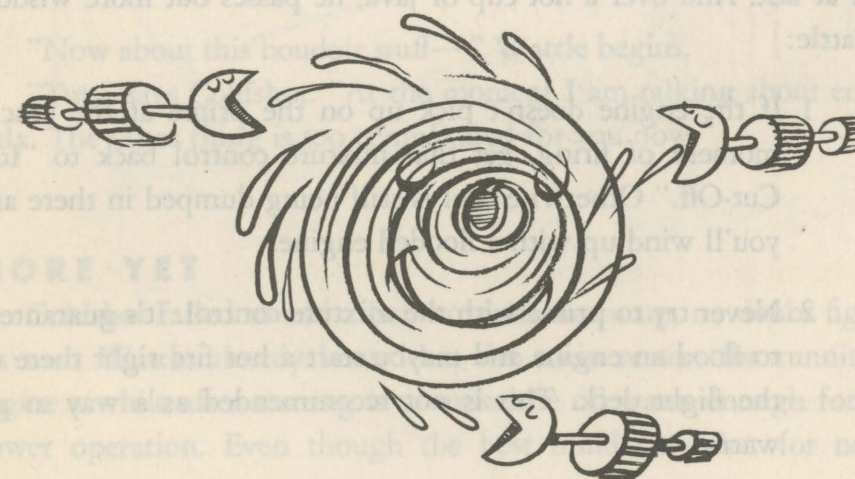
"Better under than over," says O'Connor and we all know what he means.

With the engine firing, Coldshot turns his attention to the oil pressure gage. If it doesn't show pressure within thirty seconds, he cuts the engine with all the speed of a shore-hungry sailor making the first

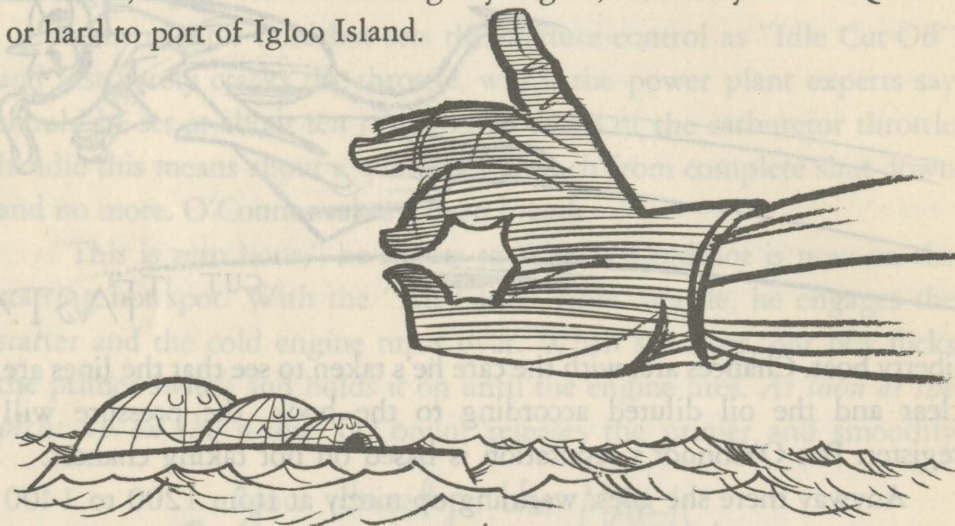


liberty boat. Chances are, with the care he's taken to see that the lines are clear and the oil diluted according to the book, the pressure will register. But O'Connor's reputation is based on not taking chances.

Anyway there she goes, warming up nicely at from 1200 to 1400 RPM's. After the oil has had a chance to hot up, our boy revs her up occasionally to keep from fouling the plugs. Another good reason for this periodic speeding up is to see that the parts of the engine lubricated by spray or centrifugal force get their share of oil.



Coldshot has a savvy hand, especially at the crucial moment when the engine first begins to fire. Through experience and practice he knows just how much to use the primer. That, plus a good idea of what goes on inside, is the secret of starting any engine, whether you're at Quonset or hard to port of Igloo Island.



"Thanks," says Wattle, "I have a lot of trouble with cold women too."

"Oh, br-r-r-rother," replies Coldshot, permitting himself a small shiver at last. And over a hot cup of java, he passes out more wisdom to Wattle:

1. If the engine doesn't pick up on the prime at the crucial moment of firing, get that mixture control back to "Idle Cut-Off." Otherwise fuel is still being dumped in there and you'll wind up with a flooded engine.
2. Never try to prime with the mixture control. It's guaranteed to flood an engine and maybe start a hot fire right there on the flight deck. This is not recommended as a way to get warm.

"To conclude," says Coldshot, finishing his coffee, "I see no reason why even you, Wattle, can't start 'em and warm 'em on the coldest days."



"Now about this boudoir stuff—" Wattle begins.

"Tut," says Coldshot. "At the moment I am talking about engines only. The other thing is too complicated for you now."

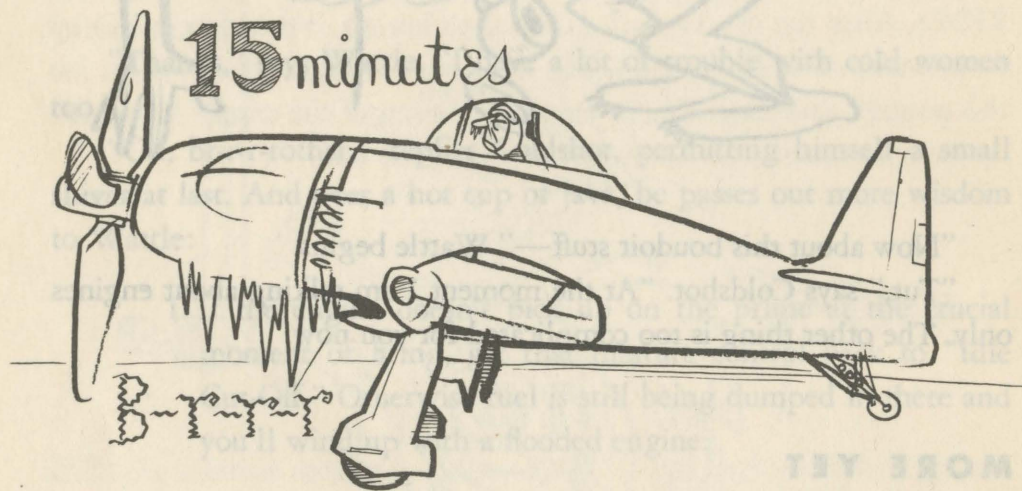
MORE YET

Coldshot failed to add a last word on warm up, no doubt figuring his man Wattle already knew that the main reason for running an engine a while after starting is to make the oil warm enough for high power operation. Even though the best minds say that for normal

circumstances the safe oil temperature should be 40° C. (104° F.), it's not absolutely necessary to wait that long if dilution has been used. The thing to watch for is *normal and steady* oil pressure. The engine is then ready to be revved up for keeps.

And fouling should be underlined like this: fouling. It's to be avoided like cards up the sleeve in a friendly game of penny ante. In the first place, the idle mixture should have been set carefully in accordance with *General Engine Bulletin No. 2*, a sure way to prevent gummed spark plugs as the oil is being given the heat treatment. Frequent clearing of the engine at higher RPM's after the oil has been given a chance to circulate around is your way of double checking. The pilot triple checks by running through the prescribed idle mixture test set forth in Technical Order 80-44.

Frequent warm up's during the course of a cold day are not necessary. In just fifteen minutes the engine's temperature is right back



where it was before the first start of the day. At that rate you'd have to ground-run all the time to do any good, which is rough on power plants and taxpayers.

Rely on careful dilution and savvy priming to start an engine, not on the hope that she's still warm from last time. The chances are she'll be as cold as a polar bear's hind paw.

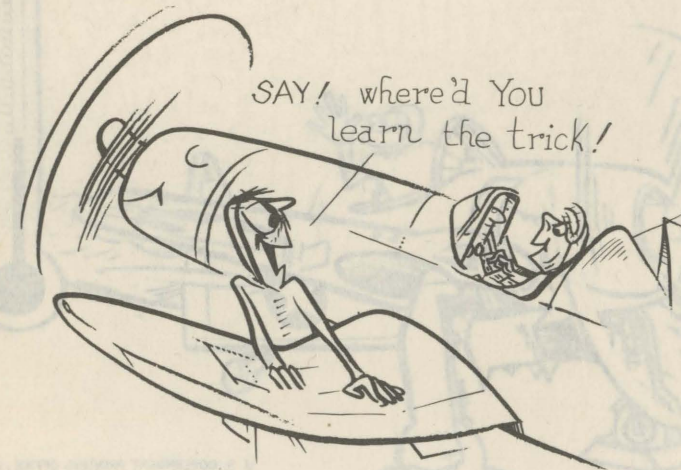


EVERYBODY'S DOING IT

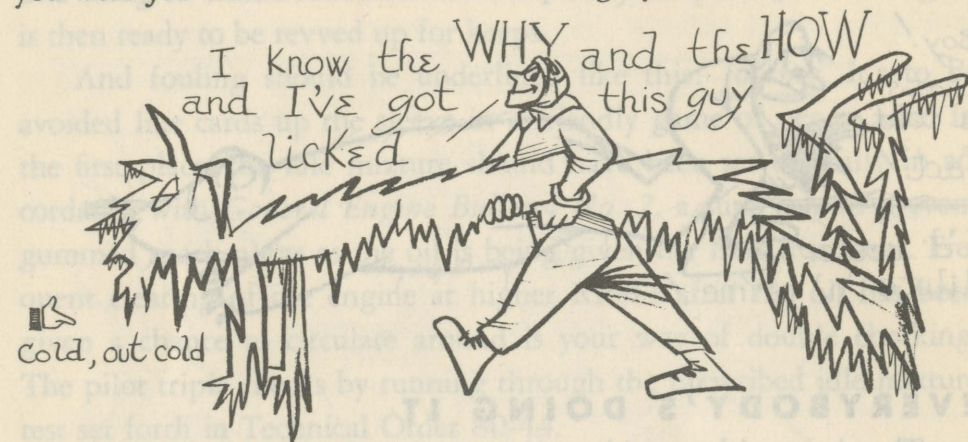
There's no trick to cold weather starting that *you* can't learn.

They laughed when the fellow sat down to the piano, but he made them take it back when he tore into "The Skaters' Waltz."

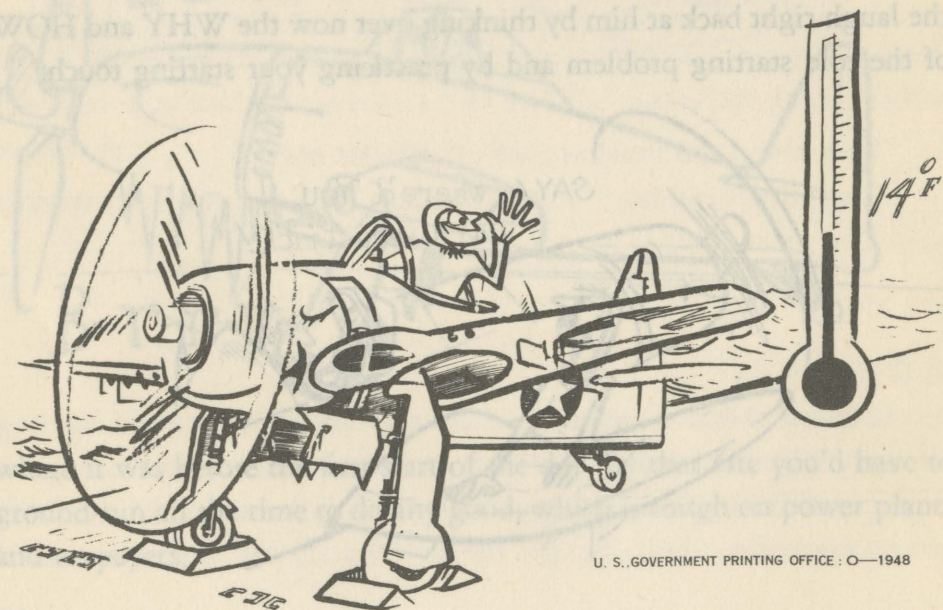
Maybe an old hand like Coldshot O'Connor will give you the horse-laugh as you make your first attempts at a frigid engine. You can throw the laugh right back at him by thinking over now the WHY and HOW of the cold starting problem and by practicing your starting touch.

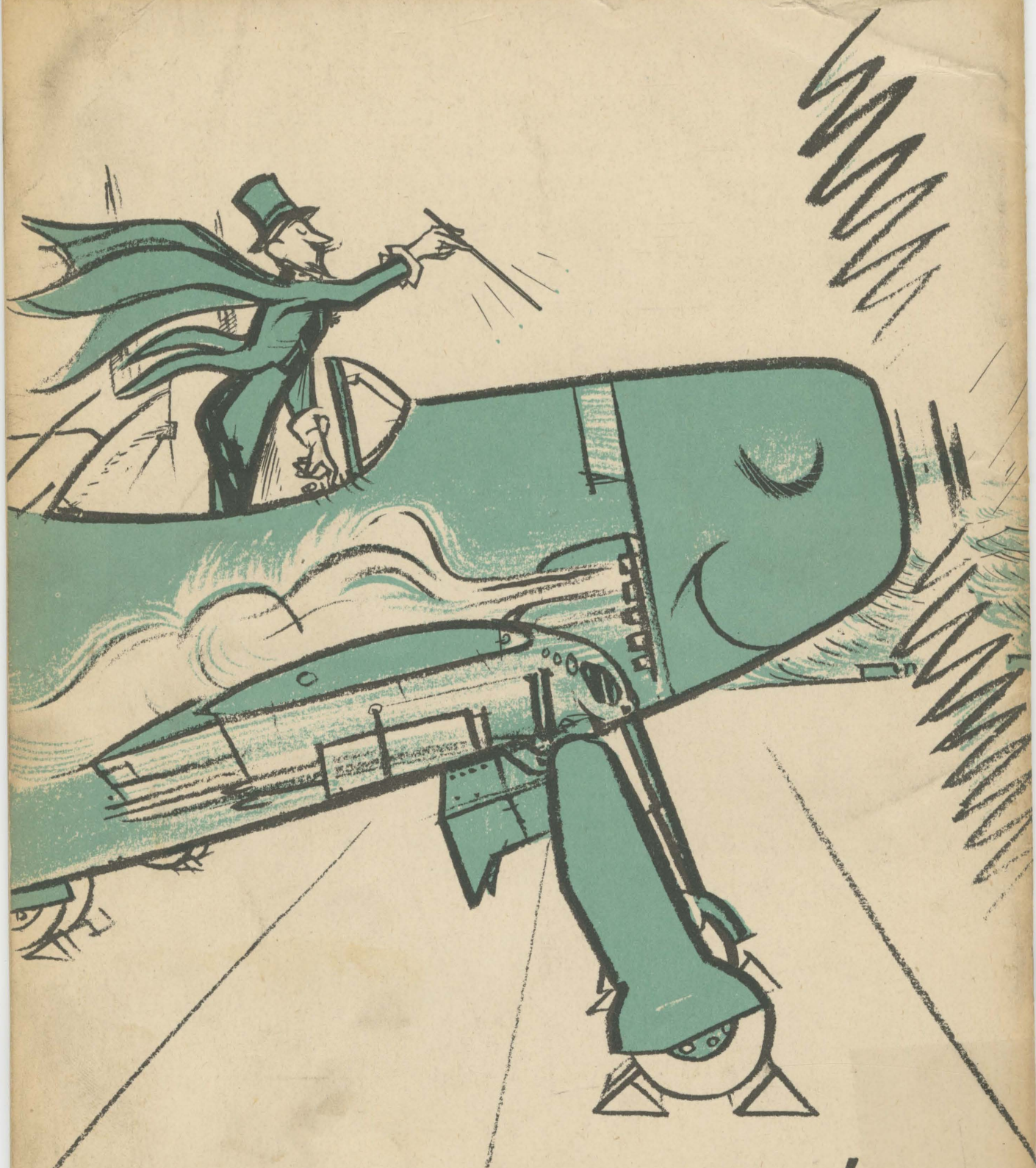


Know WHY it's hard to start an engine in cold weather.
Know HOW to play tunes on the controls of that engine just as if
you were Joe Blow at the console of the mighty Wurlitzer.



There are good reasons for knowing how to meet and beat the cold. The time may come when your life and the lives of your shipmates can depend on starting and launching planes in a hurry as the carrier races into cold weather areas. You'd better be ready.





YOU are the magician!