FLYING SAFETY

INSPECTOR GENERAL · U. S. AIR FORCE · RESTRICTED

"AVIATION IN ITSELF
IS NOT INHERENTLY
DANGEROUS BUT LIKE
THE SEA, IT IS TERRIBLY
UNFORGIVING OF ANY
CARELESSNESS, INCAPACITY
OR NEGLECT"

FLYING SAFETY AWARDS

IN A NOVEMBER MEETING, a Flight Safety Research Council of officers evaluated the safety records of the various USAF, ANG and Air Reserve bases and organizations for the six-month period January through June 1951. After thorough deliberation, the Council selected two Air Reserve, two Air National Guard and 20 USAF bases for awards of the bronze and mahogany Flying Safety plaques. Congratulations to the winners:

2230th AFRTC, Floyd Bennett Naval Air Station, Brooklyn, N.Y.
2585th AFRTC, Miami International Airport, Miami, Florida.
MATS Units, Westover Air Force Base, Chicopee Falls, Mass.
SAC Units, Ramey Air Force Base, Aguadilla, Puerto Rico.
TAC Units, Miami International Airport, Miami, Florida.
MATS Units, Brookley Air Force Base, Mobile, Alabama.
146th Composite Group, ANG, Van Nuys, California.
Selfridge Air Force Base, Mount Clemens, Michigan.
138th Fighter Squadron, ANG, Syracuse, New York.
Tinker Air Force Base, Oklahoma City, Oklahoma.
McClellan Air Force Base, Sacramento, California.
Pope Air Force Base, Fort Bragg, North Carolina.
Larson Air Force Base, Moses Lake, Washington.
Davis-Monthan Air Force Base, Tucson, Arizona.
Great Falls Air Force Base, Great Falls, Montana.
Maxwell Air Force Base, Montgomery, Alabama.
Mather Air Force Base, Sacramento, California.
Rapid City Air Force Base, Rapid City, So. Dak.
Stewart Air Force Base, Newburgh, New York.
Lackland Air Force Base, San Antonio, Texas.
Air Force Units, Hensley Field, Dallas, Texas.
Brooks Air Force Base, San Antonio, Texas.
Ellington Air Force Base, Houston, Texas.
Griffis Air Force Base, Rome, New York.

JET FLIGHT PLANNING

You'll find a rather lengthy article beginning on page 2, entitled "Jet Flight Planning." Besides being one of the longest, we think it is one of the best that has ever appeared in this magazine. As the by-line indicates, it was prepared by the instructor staff of the USAF Instrument Pilot School which recently moved from Tyndall AFB to Moody. The people who wrote this article are the Air Force's experts on the subject.

When we visited them in November, we were impressed by the fact that their number one aim is to spread the gospel of instrument flying, of which flight planning is a most important part. They don't want to wait until a pilot goes to their school to pass him the word—they want every pilot flying today to benefit as much as possible from what they have learned and from what they have to teach. We thank these instructors for their cooperative attitude and for their offer to write more articles for us in the future.

Regarding the article itself, little is said about in-flight navigation or planning techniques. After all, one story can't cover everything. We'll try to get something out on in-flight procedures in a future issue.

• • •

NEXT MONTH

You jet pilots may look forward to another good article by the instructor staff of the Instrument School in the February issue. It's on recovery from unusual attitudes and gives some good pointers which might take away some of the sweat and prevent the formation of new gray hairs next time a wingman gets lost from his flight leader on the gages . . . especially if those gages should be tipping all over the instrument panel. Also, we plan to run an article on Air Rescue Service, the organization which brings 'em back alive from behind enemy lines among other places.

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RESTRICTED

For this issue only, the classification tag is back on the magazine. Actually, only the Jet Flight Planning article is restricted. All others may be quoted, reproduced or discussed without worrying about security. We promise not to classify FLYING SAFETY unless it is absolutely necessary.

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OOPS!

We got our knuckles slightly rapped for a short item which appeared on page 28 of the November magazine. It's the very last paragraph on the page, which recommended that tiptank gas caps (F-80's) not be tightened until just prior to takeoff. This has not been approved for the ZI yet. So, for the present, leave this procedure to FEAF. In their type of operations, they have a few prerogatives which others can't exercise. And it's a good thing they have, too.

• • •

THE COVER

The idea for this month's cover comes from Lt. General H. A. Craig, the Inspector General, USAF, who was impressed by the Flight Safety import of the quotation. Credit for the quotation goes to Captain A. G. Lamplugh of British Aviation, Inc., Ltd.

Flying SAFETY

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The printing of this publication has been approved by the Director of the Bureau of the Budget.

Jet FLIGHT PLANNING

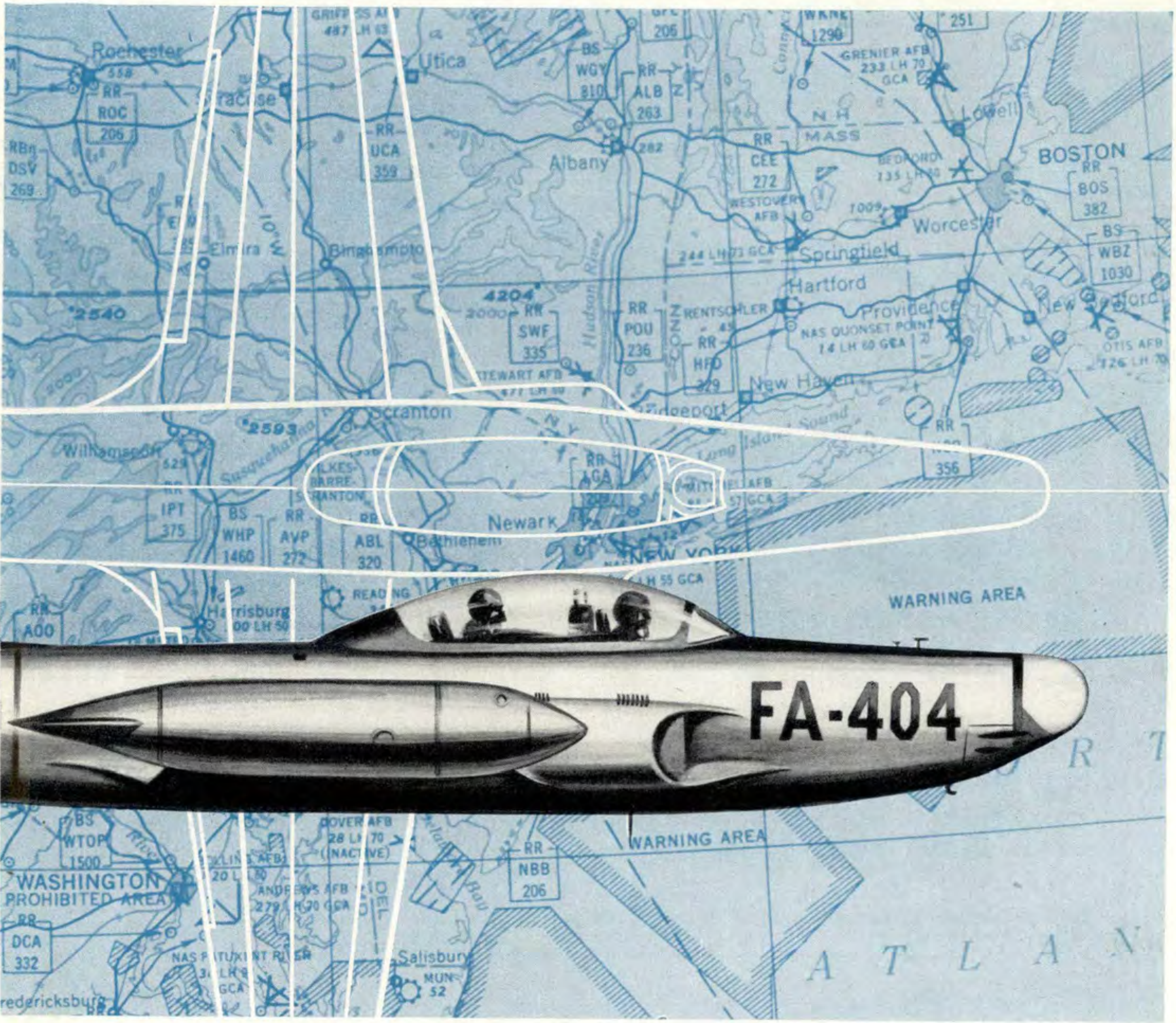
Good flight planning includes a check of fuel load. It should also include assurance of pilot proficiency in jet simulator or link trainer.

By USAF Instrument Pilot School

REMEMBER THE FAMILY PICNICS? Everyone hustled around packing food and utensils, checking each item as it went into the picnic basket. There were unorganized checks and double-checks to see that everything was packed. Then you drove to the picnic grounds, unpacked and . . . invariably something was forgotten.

Usually it was a trivial item, a box of napkins or a beer can opener, and forgetting it seldom constituted a crisis. Everyone put up with greasy fingers and Uncle Fud bit holes in the tops of his beer cans. The point remains, people are always forgetting something.

Planning a flight in a jet is a lot like planning the family picnic. There are a lot of items to go, only



Jet Pilots Can Be Sure of Getting Where They're Going if They Plan Their Flights Like the Experts Do

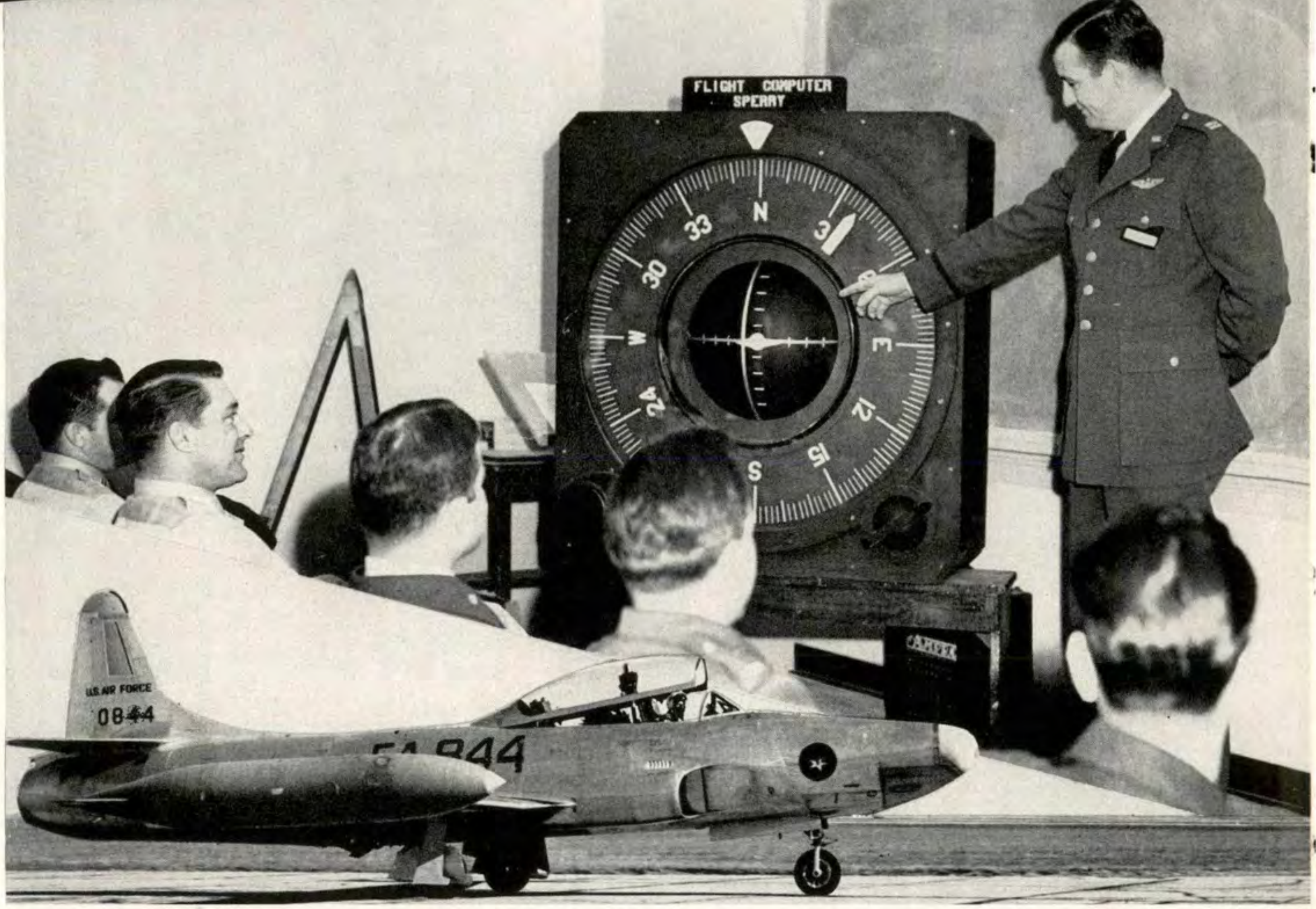
most of them go packed in your noggin. Unlike the picnic, the item you forgot may well be the contributing factor to a crisis, and the only way to lick that human weakness for forgetting is to use organized, detailed flight planning.

The problems in jet flight planning are not entirely new. Most of them are the big brothers of the problems which arose in flying conventional aircraft. Endurance, range, weather, all the old problems are still here. However, with a jet, the newest wrinkle is the combination of short endurance and comparatively long range. This range, in turn, means a larger variety of weather on a single flight. In short, the jet lumps several old problems together and tosses them in your lap on every flight.

There's little that is drastically new in the solution of these problems. It's still called flight planning, only now it's done in greater detail.

There are a heap of ways to figure how far you can travel in one jet flight. You've heard them. "Seven hundred miles eastbound, six hundred westbound," "two miles to a gallon at 35,000 feet" . . . there are a lot of

Jet FLIGHT PLANNING



Capt. E. J. McDonnell, instructor at USAF Instrument Pilot School demonstrates to class how to use the zero reader. Training aids and diagrams are used extensively at the school to get across instruction such as contained in this article.

them. Some of them even work. Some of them will get you to a destination . . . others will *almost* get you there.

However, there's one system that pays off every time. It's been proven in flight to be basically sound, and, if used properly, guarantees no unscheduled hikes from the "boondocks" to destination.

This system is used by the USAF Instrument Pilot School in the cruise control and flight planning phase of its course to give pilots an understanding of the factors that affect jet range from takeoff to landing.

It's a method that entails more work than the average pilot ordinarily devotes to the business of going from here to yonder. But out of the detailed planning on which the system is based, has come a Climb Compensation Chart and Flight Logs that actually simplify jet flight planning to the point where the time factor is no longer prohibitive.

CHECK THE WEATHER

It all starts with a trip to the weather office. You're covering a lot of ground in a short time and you can expect fairly rapid changes in the variety of weather through which you are travelling. If a check on weather reveals that your flight can be conducted under visual flight rules, the problem is made easier. But where instrument flight conditions are forecast, detailed flight planning is a must for consistently successful jet flight.

There's a wealth of information available to the pilot in the weather office, and you don't have to shout, "Open, Sesame" to get it . . . just ask for it. Remember though, that simply asking for the weather "from point

A to point B" will hardly excite the forecaster into pouring out his heart on your weather briefing. He gets such requests often, and frankly speaking, all pilots look pretty much alike to the forecaster. Therefore, they all face the same routine problems, and if the forecaster is not advised, he has no way of distinguishing between your flight problems and those of the B-36 pilot or the pilot of an L-5. This doesn't mean that one should walk into the weather office and dump a P-1 helmetful of kerosene on the forecaster's prognostic charts. Just let him know your type of aircraft, the altitudes at which you expect to fly, your approximate time en route, and any additional information which will assist him in visualizing your problem.

Once you have given the forecaster this information, he is then equipped to brief you fully and accurately on the weather that will affect your individual flight. When getting your weather briefing, remember to get forecast as well as existing weather. When the forecaster has finished his briefing, you should have the following information:

Destination

- Ceiling
- Visibility
- Freezing level
- Tops of clouds
- Precipitation

En route

- Ceilings
- Visibilities
- Cloud types at flight altitudes
- Tops of clouds
- Turbulence
- Temperatures aloft
- Winds at flight altitudes

Takeoff Point

- Ceiling
- Visibility
- Freezing level
- Temperatures and winds up to flight altitude

Alternates

- Ceiling
- Visibility
- Freezing level
- Tops of clouds
- Precipitation

Sounds involved, doesn't it? But it's only a matter of minutes to get this information. Once you have it, you have all the weather information necessary to plan an instrument flight successfully, and, equally important, you have the answer to that big question, "Where's the best place to go?" if an in-flight emergency occurs.

Knowledge of the ceiling, visibility and freezing level at your destination is imperative. It's also vitally important to know the type and intensity of precipitation which exists or is forecast at your destination. Poor cockpit visibility may turn an otherwise routine approach into a fast session of low-level aerobatics with disastrous results.

Temperatures and winds up to flight altitudes must be known to compute accurately the distance to be covered during your climb and the fuel to be consumed.

With a complete picture of en route ceilings and visibilities, valuable time is saved when an aircraft malfunction or other emergency forces you to decide where you can land with the least difficulty.

The types of clouds at flight altitudes will give the pilot a good idea of the kind of low frequency radio reception he'll have to work with. The presence of turbulence in the ice crystal zone will virtually assure that corona static will be present. Frequently ice crystal clouds will cause corona static of such intensity that the low frequency radio will be useless and all navigation must be dead reckoning.

Weather at takeoff point is an item often neglected in flight planning. Knowledge of this weather will be the deciding factor when a decision must be made either to return to destination or continue to an alternate in the event of an emergency soon after takeoff. A forecast on weather at takeoff point may bring out a future weather condition not apparent to the casual observer.

Alternates should be chosen approximately 200 miles apart, or if possible, within gliding distance of the air-

Capt. James Hamilton, in front seat, is jet instructor. His student is 1st Lt. W. K. Van Brunt. Course includes actual weather flight as well as hood.

craft. Once selected, they are then readily available if the need for an alternate arises anywhere along the route of flight.

USE FACILITIES OF BASE OPERATIONS

Loaded with your weather information, you're then ready to visit the operations office for a check of the radio facilities along the proposed route of flight. The Radio Facility Chart, AN 08-15-1, is your best source of this information. Your destination should be checked for:

- Length of runways
- Airport elevation
- Type of fuel available
- Jet starting unit
- Status of:
    - Radio range
    - GCA or ILAS
    - Homing facilities
    - VHF/DF homer
- Obstructions (found in Pilot's Handbooks)

This information should also be collected for each alternate airport. A check of NOTAMS will give the latest information pertaining to radio facilities and airport condition.

When you've completed your check of weather, radio facilities, and airport condition, then make the final plans on your route of flight. If maps are used to plan the route, be sure to check all radio facilities against the Radio Facility Chart, NOTAMS, and The Airman's Guide.

At this point in your planning, you are a fountain of information, but oddly enough the time consumed in gaining this information is not prohibitive. About thirty minutes should give you the complete picture. Starting in the weather office and then working into operations eliminates those many trips back and forth picking up information which could have been gained in one chat with the forecaster. Then, too, if one piece of the information which you have helps to avoid *walking* home from your flight you'll have saved one whale of a lot of time in the long run.

Forecasting your fuel requirements and flight time is your next step. Using the proper techniques it is possible to forecast fuel requirements within ten gallons and flight time within two minutes.

THE CLIMB

Normally, jet aircraft climb to high altitudes (25,000 to 50,000 feet) at high indicated airspeeds (200 to 450 knots). Naturally, this means a large quantity of fuel is burned in the climb and a considerable distance over the ground is covered before reaching cruising altitude.

Because of these facts, the climb assumes extreme importance in jet flight planning. In fact, it's possible to deal yourself right out of the card game in the climb, by neglecting to figure how much fuel you'll have in your "poke" when you hit the cold blue yonder.

The rate of climb will affect the time for the climb and the fuel used during the climb. The most important factor determining the rate of climb is the temperature of the air through which the aircraft is climbed. The higher the temperature, the lower the rate of climb for any given power setting and altitude.

The distance flown during the climb will depend on the true airspeed, time spent in the climb and wind velocities at the various altitudes through which the aircraft passes.

It's obvious, even at this point, that we need some performance data, rates of climb for instance, on a certain type aircraft before we can go much further. The Pilots Flight Operating Instructions for your particular aircraft will give you the information you need. The examples in this article are based on flight data for the T-33A, but the procedures are applicable to any jet aircraft when performance data for that particular aircraft is substituted.

The climb data that we need is found in the climb chart of the Flight Operating Instructions. A typical climb chart is on page 7. The data contained in the climb chart is based on a standard day. A standard day is the slipstick driver's answer to the average man, "there hardly ain't no sech animal." A standard day is a day at 40° latitude when the temperature is 59° F., pressure is 29.92 and the adiabatic lapse rate is 3.55° per thousand.

Imagine!

Since the climb data is based on such a day, most climbs will have to be computed for the actual flight conditions existing at the time of the climb. The climb chart carries a note which explains how such computation is carried out: "To correct Rate of Climb values for air temperature different from standard day temperature, subtract 35 feet per minute from the Rate of Climb for every degree Fahrenheit above standard day temperature for both clean configuration and drop tank configuration." Uh huh!

level, the rate of climb is 3,800 feet per minute and the time is 1.2 minutes. This doesn't mean that a rate of climb of 3,800 feet per minute was flown for 1.2 minutes. It means that at the 5,000-foot level, the rate of climb was 3,800 feet per minute, and the elapsed time from sea level to 5,000 feet was 1.2 minutes.

To determine the approximate average rate of climb to 5,000 feet, just take the average of the rates of climb at sea level (4,300 fpm) and at 5,000 feet (3,800 fpm). Thus, the approximate average rate of climb to 5,000 feet is established at 4050 fpm on a standard day.

So what?

Well, by using the average rate of climb on a standard day and applying a temperature correction, the corrected rate of climb can be established. Once we've got the corrected rate of climb we're in business, since we can then compute the elapsed time, fuel used to climb each 5,000 feet, and the distance flown during the climb.

CLIMB CHART
Standard Day
59 Degrees F at Sea Level

AIRPLANE MODEL T-33A — ENGINE MODEL J-33-A-23

Rate of Climb and Rate of Descent given in feet per minute

100% RPM					
	APPROXIMATE				
RATE OF	FROM SEA LEVEL			CAS	PRESSURE ALTITUDE
CLIMB	DISTANCE	TIME	FUEL	MPH	FEET
WITH DROP TANKS 14,250 LBS. 14,250 LBS. GROSS WEIGHT					
4300	0	0	30 (1)	310	SEA LEVEL
3800	8	1.2	45	300	5,000
3300	16	2.6	61	290	10,000
2800	25	4.3	77	280	15,000
2350	37	6.3	93	270	20,000
1950	51	8.6	111	260	25,000
1550	70	11.5	128	250	30,000
1150	97	15.3	148	240	35,000
350	145	21.9	176		40,000

NOTES: (1) Taxi and take-off allowance.

(2) To correct Rate of Climb values for air temperature different from standard day temperature subtract 35 ft. per min. from the Rate of Climb for every °F above standard day temperature for both clean configuration and drop tank configuration.

You'll also note, in Figure #1, that the climb chart gives a rate of climb for an altitude, the time to climb each 5,000 feet, the fuel used to each 5,000 foot level, and the calibrated airspeed (CAS) for the climb.

To use the chart properly, it should be clarified. The rate of climb shown opposite each 5,000-foot level is the rate of climb at the given CAS *as the aircraft passes through that level* and *not* the average rate of climb through 5,000 feet of altitude.

For example, on the chart opposite the 5,000-foot

TEMPERATURES

Somebody mentioned temperatures. The adiabatic chart gives the standard day temperatures for all altitudes. It also gives the actual temperatures at all altitudes. The weatherman will be of great assistance in helping you to get actual temperatures from the chart.

To figure our way from sea level to 5,000 feet, we first get the average standard day temperature between these levels, i.e., the temperature at 2,500 feet. Then here's what happens.

The standard day temperature at 2,500 feet is 50° F. Let's assume that the adiabatic chart shows the actual temperature at 2,500 feet to be 80° F. This is 30° warmer than the temperature for a standard day at that altitude. As instructed by the tech order we multiply the difference in temperature (30°) by 35 fpm, and find that the corrected rate of climb will be 1050 fpm less than on a standard day or 3,000 fpm (4,050 minus 1050 fpm).

Once we have corrected rate of climb, it's a simple matter to set up a ratio on the E6B Computer between the standard day rate of climb and the corrected rate of climb. Set 3,000 on the inner scale opposite 4,050 on the outer scale, then opposite 1.2 on the inner scale (time for the climb on a standard day) read 1.6 on the outer scale. This is the time in minutes required to climb to 5,000 feet at the corrected rate of climb. Without changing the computer setting, read the corrected fuel for the climb on the outer scale opposite 15 on the inner scale (gallons of fuel necessary for climb on standard day). In this case, 20 gallons.

Neat, huh?

Now, notice on the climb chart that a CAS of 310 mph at sea level is indicated. On an average, the T-33 requires 2.0 minutes and 24 gallons of fuel for takeoff and acceleration to climbing airspeed (310 CAS). Since the climb is not started until that CAS is reached, we tack 2.0 minutes and 24 gallons to our previous findings. Consequently, the aircraft would pass through the 5,000-foot level 3.6 minutes after takeoff roll was started and would have burned 44 gallons.

Now, how far have we flown? We started on the deck at 310 mph; as we pass through the 5,000-foot level our calibrated airspeed as shown on the climb chart should be 300 mph. Therefore, we have held an average CAS of 305 mph from sea level to 5,000 feet. Using this average CAS, the average temperture, and the average altitude (2,500 feet), we compute our true airspeed. Use the forecast winds at 2,500 feet and apply them to the TAS, using the wind face of the computer. This will give you the ground speed and the wind correction angle to 5,000 feet. In some cases the wind velocity and/or the true airspeed is too high to be used on the wind face of the computer unless divided by two or three. Be sure to divide both by the same number, and also be sure to multiply your result by the same number. Your wind correction angle need not be multiplied as it will remain constant.

When you have your ground speed, multiply it by the corrected time for the climb (1.6 minutes) and compute the distance flown in the actual climb. To this distance add three miles, the distance flown in accelerating to 310 mph CAS. The result is the distance which the aircraft will be from takeoff point when passing through the 5,000-foot level.

Using the same method, the rate of climb, time, fuel and distance flown can be computed for each 5,000 feet up to cruising altitude, and entered on an appropriate log. Add the times required for each 5,000 feet of climb to get the total time for climb to cruising altitude. In like manner, the fuel used and distance flown during the climb can be ascertained. A typical flight log in the summer in southeastern United States would indicate the following data: time to climb to 35,000 feet—30.2 minutes, fuel consumed to 35,000 feet—240 gallons, distance flown in the climb 197.4 miles.

This method of computing corrected climb data is basically sound and is valuable in training pilots in basic theory of jet cruise control. However, the time necessary to correct the climb data makes it impractical for everyday use.

For normal use in correcting climb data, a Climb Compensation Chart should be compiled for the specific type of jet aircraft being flown. See page 9 for a T-33 Climb Compensation Chart. Such a chart is constructed by computing the corrected rate of climb, time necessary to climb, fuel to be used and true airspeed for each 5,000 feet of climb for various temperatures normally found at the different altitude levels. The chart is based on the average temperature and the average rate of climb for each specific 5,000 feet of altitude on a standard day. For example, the rate of climb used as the basis for the climb from sea level to 5,000 feet is the average of the sea level rate of climb (4,300 fpm) and the rate of climb at 5,000 feet (3,800 fpm) or 4,050 fpm, on a standard day. The average rate of climb and the temperature at the average altitude (2,500, 7,500, etc.) on a standard day for each 5,000 feet of climb listed, will be found between the heavy vertical lines on the chart.

Centigrade temperatures were used in compiling the chart since the temperatures received from the forecaster are normally in Centigrade. For each degree Centigrade that the temperature was above or below the standard temperature for that altitude, 63 feet per minute were subtracted from or added to the average rate of climb for a standard day. This resulted in the corrected rate of climb. This corrected rate of climb was used in turn to compute the corrected time and fuel for the climb through each 5,000 feet altitude.

To use the Climb Compensation Chart, the pilot has only to get the average temperatures in degrees Centigrade and the winds aloft for each 5,000-foot increment of the climb, using surface, 2,500, 7,500, 12,500-foot levels, etc. This takes about five minutes in the forecaster's den. Then whip out the chart and opposite the applicable level find the temperature. Immediately below the temperature, read off corrected rate of climb, corrected time, fuel to be used and true airspeed. That's more like it, isn't it?

If the temperature you have is not on the chart at the applicable level, a little interpolation may be necessary. From this point, the flight planning procedure is the same as that previously explained for computing ground speed, drift correction angle, and the distance flown during the climb.

The big problem is putting the finger on the guy in the outfit who's going to make up the chart. If there's a man with a head full of figures, numerals that is, he's a good bet. But watch him pretty closely, things get a little binding about the 35,000-foot level.

OTHER FACTORS

There are a few other points that should be kept in mind when working with climb computations. Note the words "pressure altitude feet" above the altitude column

T-33 CLIMB COMPENSATION CHART (TEMP.)

WT. 14,250 POWER 100% EXT. LOAD 2-165 GAL. TANKS

35,000 TO 40,000	TEMPERATURE	-73	-71	-69	-67	-65	-63	-61	-59	-57	-55	-54	-53	-52	-51	-50	-49	-48	-47	-46	-45
	RATE OF CLIMB	1909	1783	1657	1531	1405	1279	1153	1027	901	775	712	649	586	523	460	397	334	271	208	145
	TIME	2.7	2.9	3.1	3.3	3.6	4.0	4.4	5.0	5.7	6.6	7.2	7.9	8.7	9.8	11.1	12.9	15.3	18.2	24.6	35.3
	FUEL	11	12	13	14	15	17	19	21	24	28	31	34	37	42	47	55	65	76	104	149
	TRUE AIRSPEED	445	447	449	450	452	454	456	457	459	461	462	463	464	465	466	467	468	469	470	471
30,000 TO 35,000	TEMPERATURE	-68	-66	-64	-62	-60	-58	-56	-54	-52	-50	-48	-46	-44	-42	-40	-38	-36	-34	-32	-30
	RATE OF CLIMB	2523	2397	2271	2155	2029	1903	1777	1651	1525	1350	1224	1098	972	846	720	594	468	342	216	90
	TIME	2.0	2.1	2.2	2.4	2.5	2.7	2.9	3.1	3.4	3.8	4.2	4.7	5.3	6.1	7.1	8.2	11.0	15.1	23.8	57
	FUEL	11	12	12	13	14	15	16	17	18	20	22	25	28	32	38	46	58	79	125	300
	TRUE AIRSPEED	401	403	405	407	408	410	412	414	416	418	420	422	424	426	427	429	431	433	435	437
25,000 TO 30,000	TEMPERATURE	-58	-56	-54	-52	-50	-48	-46	-44	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20
	RATE OF CLIMB	2884	2758	2632	2506	2380	2252	2128	2002	1876	1750	1624	1498	1372	1246	1120	994	868	742	616	490
	TIME	1.8	1.9	1.9	2.0	2.1	2.2	2.4	2.5	2.7	2.9	3.1	3.4	3.	4.	4.	5.	5.	6.	8.2	10.4
	FUEL	10	11	11	12	13	14	14	15	16	17	18	20	22	24	27	30	34	40	48	61
	TRUE AIRSPEED	381	383	386	387	389	390	392	394	396	397	399	401	403	404	406	407	409	410	412	414
20,000 TO 25,000	TEMPERATURE	-48	-46	-44	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10
	RATE OF CLIMB	3319	3193	3067	2941	2815	2689	2563	2437	2311	2140	2040	1888	1762	1636	1510	1384	1258	1132	1006	880
	TIME	1.5	1.5	1.6	1.6	1.7	1.7	1.9	2.0	2.1	2.3	2.4	2.6	2.8	3.0	3.3	3.5	3.9	4.3	4.9	5.6
	FUEL	11	11	13	13	14	14	15	16	17	18	19	20	22	24	25	28	31	34	38	44
	TRUE AIRSPEED	363	365	367	369	370	372	374	376	377	379	380	382	384	385	387	388	389	391	393	395
15,000 TO 20,000	TEMPERATURE	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20°	-17	-14	-11	-8	-5	-2	+1	4	7	10
	RATE OF CLIMB	5400	5085	4770	4455	4140	3825	3510	3195	2880	2565	2313	2124	1935	1746	1557	1368	1179	990	801	612
	TIME	1.0	1.0	1.1	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.7	2.9	3.3	3.7	4.3	5.1	6.4	8.4
	FUEL	8	8	9	9	10	11	12	13	14	16	18	19	21	23	26	30	35	41	51	66
	TRUE AIRSPEED	329	332	336	339	342	346	349	353	357	361	363	365	367	369	371	373	376	378	380	382
10,000 TO 15,000	TEMPERATURE	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10°	-7	-4	-1	+2	5	8	11	14	17	20
	RATE OF CLIMB	5885	5570	5255	4940	4625	4310	3995	3680	3365	3050	2861	2672	2483	2294	2105	1916	1727	1538	1349	1160
	TIME	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.7	1.8	1.9	2.1	2.3	2.5	2.6	3.0	3.4	3.8	4.5
	FUEL	8	8	9	9	10	11	12	13	14	16	17	18	20	21	23	25	28	32	36	42
	TRUE AIRSPEED	315	317	321	325	328	331	335	338	341	344	346	348	350	352	354	356	358	360	362	368
5,000 TO 10,000	TEMPERATURE	-45	-40	-35	-30	-25	-20	-15	-10	-5	-0°	3	6	9	12	15	18	21	24	27	30
	RATE OF CLIMB	6385	6070	5755	5440	5125	4810	4495	4180	3865	3550	3361	3172	2983	2798	2605	2416	2227	2038	1849	1660
	TIME	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.1	2.2	2.4	2.7	3.0
	FUEL	9	9	10	10	11	12	13	14	15	16	17	18	19	20	22	23	25	28	31	34
	TRUE AIRSPEED	302	306	309	312	314	317	320	324	327	330	332	334	335	337	339	340	342	344	345	347
SEA LEVEL TO 5,000	TEMPERATURE	-35	-30	-25	-20	-15	-10	-5	0	5	10	13	16	19	22	25	28	31	34	37	40
	RATE OF CLIMB	6885	6570	6255	5940	5625	5310	4995	4680	4365	4050	3861	3798	3609	3420	3231	3042	2853	2664	2475	2286
	TIME	0.7	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.1	1.2	1.3	1.3	1.4	1.5	1.6	1.6	1.8	1.9	2.0	2.2
	FUEL	9	10	10	10	11	11	13	14	14	15	16	16	17	19	20	20	22	24	25	27
	TRUE AIRSPEED	290	293	296	299	302	305	308	312	314	316	318	320	322	323	324	326	328	329	331	333

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of the climb chart. This means that the data on the chart is based on pressure altitudes and that pressure altitude variation should be considered. If not computed, a very small error will result; however, if the pressure altitude variation is 600 feet or greater, it should be computed. This means that the corrected rate of climb, fuel and distance must be computed for 600 feet of climb using the corrected sea level rate of climb before computing the data for the first 5,000 feet of climb. For example, if the corrected rate of climb at sea level is 4,200 feet per minute, it will take 17 seconds or .3 minutes to climb 600 feet and four gallons of fuel will be consumed.

Another factor that must be considered in computing climb data is the altitude of the field from which the flight is to be made. When taking off from an airfield at an altitude other than zero feet, the climb data must be adjusted to compensate for this difference. For example, assume the flight is to originate from Lowry AFB, where the field elevation is 5,420 feet. Obviously the first 5,000-foot increment to be computed will be the level from 5,000 to 10,000 feet, but it is necessary to subtract the time, fuel and distance that would be necessary to climb 420 feet.

During the climb, the airspeed should be changed smoothly and gradually. For instance, the climb from sea level is started at 310 CAS and is *gradually* changed so that, as the aircraft passes through the 5,000-foot level, the airspeed is 300 mph CAS. The airspeed is changed throughout the climb in this manner.

FLIGHT EN ROUTE

En route flight planning is the planning of that portion of the flight at cruising altitude from the point of level-off until the aircraft is over the destination or to the point at which the descent is begun, whichever is sooner.

Normally, the best altitude at which to cruise will be one which gives the best cruising range when the wind, fuel consumption and true airspeed factors are considered. To explain the factors involved in determining best cruising altitude, let's look at the following example:

Assume the data computed for the climb indicated that a T-33 aircraft will have 500 gallons of fuel remaining on reaching 35,000 feet. Also, assume a tailwind of 80 mph at 35,000 feet and a tailwind of 40 mph at 40,000 feet, with standard day temperatures at both altitudes.

At first, it appears that 35,000 feet would be the best cruising altitude. However, the final selection of the cruising altitude must be made by reference to the Flight Operation Instruction Chart in the tech order for the aircraft.

On this chart we find that the best cruising power setting for an 80 mph tailwind at 35,000 feet gives a range factor of 1.2 with a ground speed of 488 mph. The best cruising power setting with a 40 mph tailwind at 40,000 feet gives a range factor of 1.1 with a ground speed of 492 mph. By referring to the data opposite the 500 gallon fuel level under the 35,000-foot column on the chart, it is found that under a no wind condition, the maximum range of the aircraft is 1,005 miles by remaining at 35,000 feet; however, by climbing to 40,000 feet with the same wind condition, the maximum range is increased to 1,110 miles. The maximum range with an 80 mph tailwind at 35,000 feet is found by multiplying the maximum range under a no wind condition (1,005 miles), by the range factor (1.2); 1,005 × 1.2 = 1206 miles maximum range. Computing the maximum range for a 40 mph tailwind at 40,000 feet in a like manner, it is found to be 1,221 miles (1,100 × 1.1 = 1,221). Therefore, it can be seen that the maximum range is increased by 15 miles by climbing to a cruising altitude of 40,000 feet with the above wind conditions. The Flight Operation Instruction Chart used above provides for the descent to sea level and landing with a fuel reserve of 50 gallons. The chart for the specific engine model used in the aircraft should be used and the chart should be checked closely to determine whether or not an allowance was made for reserve fuel on landing.

The best power setting to produce the greatest range for the wind condition and altitude is shown on the Flight Operating Instruction Chart as is the CAS and ground speed to be expected from the power setting. It should be noted that the indicated airspeed is normally higher than the CAS as is indicated on the Airspeed Correction Table in the Technical Order for the aircraft. At the beginning of the flight, the CAS will normally be lower than shown on the chart for the power setting because of the weight of the fuel. As the gross weight of the aircraft diminishes with the use of fuel, the airspeed increases, until near the end of the flight the airspeed wll be higher than that shown for the power setting.

The altitudes on the Flight Operation Instruction Chart for computed fuel consumption, calibrated air speed and groundspeed are for a standard day on which pressure altitude, indicated altitude and density altitude are one and the same. Aircraft performance is based on density altitude, therefore the pilot must determine and fly the indicated altitude necessary to make good the selected density altitude. This is accomplished on the E6B computer as follows:

Assume the density altitude of 30,000 feet has been selected as the desired cruising altitude and that a temperature of −25° C. is shown on the adiabatic chart at 30,000 feet. On the altitude compensation scale of the computer, set −25° C. opposite 30,000 feet. Then, opposite 30 on the outer scale (miles scale) read the indicated altitude (27,700) to be flown to make good a density altitude of 30,000 feet. Therefore, an indicated altitude of 27,700 feet must be maintained in order that the en route cruise control computations for a density altitude of 30,000 feet will be correct, and the climb data should be adjusted to compensate for the difference in climb.

The en route groundspeed and drift correction angle is determined on the E6B computer by applying the forecasted wind direction and velocity to the true airspeed. In-flight ETA's between fixes should be based on the groundspeed computed during the pre-flight planning and not recomputed because of an apparent error between two fixes. At high altitudes the azimuth indicator of the radio compass fluctuates and does not give an instantaneous indication of station passage and, when flying radio range signals, the cone of silence is of such width that there may be an error of one to three minutes in determining station passage. At a groundspeed of 550 mph with check points 200 miles apart, an error in time of this size would mean an apparent error in groundspeed of 65 mph. Hence, the same method of determining station passage should be used for all check points, i.e., if the movement of the azimuth indicator through the 90 or 270-degree point is used for the time of station passage over the radio aid, it should be used in the same manner over subsequent radio aids. In general, through experience, it has been found that the groundspeed computed for cruising altitude during the pre-flight planning should be used in flight for determining all ETA's.

Constant pressure and temperature levels vary in actual height above sea level. Since the true altitude for a given indicated altitude changes with any changes in temperature or pressure, the aircraft will climb or descend while a constant indicated altitude is being maintained. These climbs or descents may cause the indicated airspeed to change by as much as 10 mph.

In order to attain maximum efficiency from an aircraft that derives some engine efficiency from a ram intake, climb above the cruising altitude (200 to 300 feet for the T-33), then descend at approximately 200 feet per minute to the desired altitude, allowing the indicated airspeed to build up to or above that desired for cruising before reducing the power from the climbing power setting. Fly the aircraft smoothly and maintain the desired altitude closely in order to hold the airspeed as nearly constant as possible.

PENETRATION AND LOW APPROACH

Judgment is a word that comes in two sizes . . . good and bad. Pilots have been exercising both sizes in airplanes for over a quarter of a century.

Until the arrival of jets on the aviation scene, only a certain few types of flights really taxed a pilot's ability to analyze a flight situation and exercise the proper judgment to take himself and his aircraft through the situation successfully.

With jets the frequency of situations demanding good judgment is stepped up considerably. The climb, cruise, and the descent all present peculiar problems calling for sound judgment in any jet flight. Like charity, of the three, the greatest of these is the descent. For the success or failure of many jet flights will depend solely on the judgment exercised in planning a descent from cruising altitude, whether conditions are VFR or IFR.

The Descent Chart in the pilot's Flight Operation Instructions (above) contains the data necessary to plan a descent with the most favorable range-fuel ratio for your particular aircraft. The chart indicates the distance from destination at which a descent should be started, under a no-wind condition. It also shows the proper airspeeds to be used and the fuel which will be consumed in the descent, together with prescribed rates of descent. The data on the chart is based on a standard day with the power set at idle and the aircraft "clean," unless otherwise stated. The chart shown in the illustration contains data applicable to the T-33 aircraft.

AIRPLANE CONFIGURATION & GROSS WEIGHT WITH DROP TANKS 9600 LBS., GROSS WEIGHT					PRESSURE ALTITUDE FEET
	APPROXIMATE TO SEA LEVEL			CAS	
RATE OF DESCENT	DISTANCE	TIME	FUEL	MPH	
1200	85	12.5	19	200	40,000
1700	63	8.7	14	230	35,000
2400	46	6.4	11	260	30,000
3200	34	4.7	8	285	25,000
4100	24	3.3	6	315	20,000
5150	16	2.2	4	350	15,000
6300	9	1.4	3	385	10,000
7550	4	0.6	1	420	5,000
8900	0	0	0	455	SEA LEVEL

To llustrate the use of the chart, assume a cruising altitude of 35,000 feet on a standard day in a T-33. With the throttle in idle and the aircraft "clean," the initial rate of descent will be 1,700 feet per minute at 230 mph calibrated airspeed (CAS). The letdown should be started 63 miles from a destination with a sea level elevation. The time required for the descent will be 8.7 minutes and the fuel used will be 14 gallons. The rate of descent and CAS are increased with the loss of altitude as shown on the chart, and these changes should be constant and smooth throughout the descent.

The Descent Chart just about whips the problem in a VFR descent. However, if the destination is IFR other factors must be considered in planning a descent at destination. If the destination is IFR, a plan must be made for a penetration that is safe, expeditious, positive, can be controlled by the appropriate control agency,

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and which places the aircraft in the most advantageous position to make the type of low approach contemplated.

Experience has proven that it is very poor judgment to descend below 20,000 feet en route to a destination that is IFR, even if an expedited approach is assured. For example:

A jet reports over the fix at 10,000 feet. The pilot is advised to hold because ARTC has an aircraft at a lower altitude in the vicinity that has not reported over a designated fix, or Approach Control has cleared an aircraft to take off and the pilot of the departing aircraft has forgotten to report passing a designated fix. As a result, the incoming jet pilot must declare an emergency and descend through altitudes without positive separation. Another illustration: A severe rainstorm has moved over the field and GCA cannot pick up the jet fighter, which has approximately 1/6 the reflecting area of the F-51. The ceiling and visibility is too low for a range approach and the jet, at 10,000 feet, does not have sufficient fuel to climb out and go to the alternate. The result is obvious.

If, however, the pilot remains at a minimum of 20,000 feet until reaching the fix and receiving clearance, he is then in a position to make an approach within his capabilities or to proceed to an alternate.

Twenty to twenty-five thousand feet is a good altitude range in which to report over your destination fix. From this altitude your time for penetration is not excessive and you have altitude working for you in the event you must proceed to an alternate. If cruising at altitudes higher than these, use the Descent Chart in planning a descent to arrive over the fix at the desired altitude. By subtracting the figures opposite the new desired altitude on the chart from those opposite the cruising altitude, the fuel, time and distance for the descent can be determined. For example, a T-33 aircraft cruising at 40,000 feet is cleared to cross the destination fix at 20,000 feet. Under a no-wind condition, the chart indicates that the descent should be started 61 miles from the fix; the descent will take 9.2 minutes and 13 gallons of fuel will be consumed.

Upon reaching the fix, there are several methods of making a penetration, depending upon traffic conditions, terrain, fixes, approach aids available and/or a combination of these factors. It's a good practice to simulate penetrations in VFR weather from altitudes between 20,000 and 25,000 feet to determine (1) the amount of fuel consumed during the penetration and low approach, (2) the total elapsed time for the descent and approach and, (3) the ground pattern covered by the aircraft while making various types of penetrations.

There are many types of penetrations that can be successfully accomplished. Some of the various penetration and low approach procedures are described and illustrated on the following pages. Although the airspeeds, power settings and techniques are those specifically applicable to the T-33, corresponding airspeeds in knots can be used in the F-86 and the F-94.

TYPES OF APPROACHES

Approach Using a Homing Facility on the Approach Bearing: Figure 1

This type penetration and approach is ideal for jets when the homing facility is located on the approach leg of the range so that the low cone altitude provides terrain clearance for an aircraft descending inbound from the homing facility to the low cone.

The penetration is made from the homing facility, on the reciprocal of the approach bearing. Lose one-half the altitude before starting the procedure turn. Any airspeed, gear, flap and power combination can be used during the penetration but the indicated airspeed must be held constant and the rate of descent must not be permitted to decrease. The aircraft must remain within reception distance of the radio aid and sufficient power must be used (1) so that the pilot will get a reasonable amount of acceleration from the engine if needed and (2) so that sufficient heat for the defrosters and anti-icers will be assured.

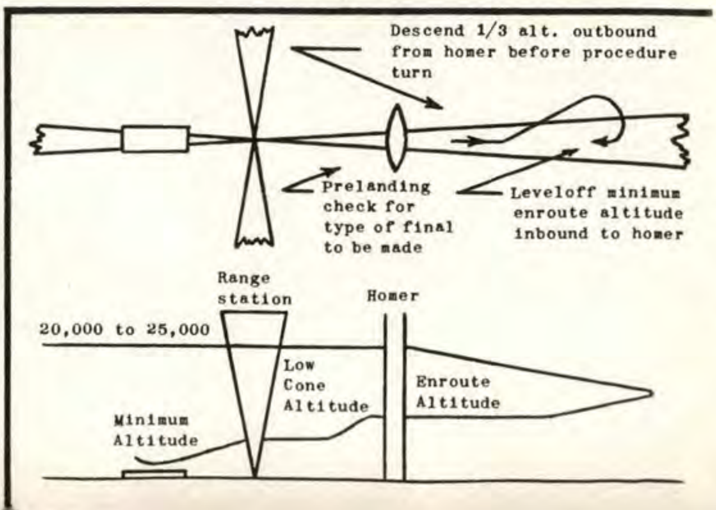
The recommended conditions for the F-80C or T-33, single ship or in formation, are: 175 mph indicated airspeed, full flaps, dive flaps, gear down and 65% power (if in formation use 70% when turning into the element).

After the procedure turn is completed, the level off is started 1,000 feet (2,000 feet in formation) above the minimum en route altitude for the range leg. The level off is accomplished by retracting the wing flaps completely without hesitation, raising the landing gear, and when 200 feet above the desired altitude, retracting the dive flaps. Research has shown that this is also the most satisfactory sequence for formation level-offs. The aircraft then proceeds to the homing facility at the minimum en route altitude at a power setting of 65%. When over the fix, make the pre-landing check in preparation for the final approach whether it be GCA, ILAS, radio range or a combination of any of these approaches.

If for any reason the aircraft (T-33) should have to hold at a low altitude, the power should be adjusted to maintain a fuel pressure of 60 psi. Sixty psi fuel pressure usually can be held at approximately 65% RPM and a fuel consumption rate of 4 gallons per minute results. Sixty-five percent RPM is sufficient power to maintain airspeed and altitude in a turn using up to a 30-degree angle of bank with a fuel load of 200 gallons or less.

If a GCA or ILAS approach is used, lower gear, dive brakes and 35 to 60% wing flaps over the fix and reduce

Fig. 1



the indicated airspeed to 130 mph (140-145 mph in formation). Add five miles per hour to the above airspeeds for each 100 gallons of fuel remaining in excess of 200 gallons. Descend to the altitude which will intercept the glide path at the proper point. Then adjust the power to maintain altitude and airspeed. The amount of fuel used in this type penetration and low approach for the T-33 is 65 to 70 gallons.

If a straight-in range approach is made, lower the gear after passing the fix inbound, descend to low cone altitude holding 200 mph. Upon reaching the low cone altitude, level off, permit the airspeed to drop off to 160 mph, then add power to 74% to maintain this airspeed. The total fuel used in this type penetration and low approach from 20,000 feet in the T-33 is 60 to 65 gallons and the total time for the approach should be between 10 and 14 minutes.

Approach Using Radio Range Only (No Lower Traffic)

Cross the radio range station at 20,000 to 25,000. Proceed out the range leg opposite the procedure turn leg. Lose one-half the altitude outbound as previously outlined. Return to the range station at the en route altitude of the leg you have just flown or at the procedure turn altitude, whichever is higher. Upon crossing the range station execute a normal range approach as published for that station. Proceed from the station out the procedure turn leg not over one minute and thirty seconds at approximately 200 mph (65% in T-33) and descend to procedure turn altitude with dive brakes down. Upon reaching procedure turn altitude, raise dive brakes. Execute the procedure turn, and when on course inbound, lower the gear, hold 200 mph and descend to low cone altitude. At low cone altitude, level off and permit the airspeed to drop to 160 mph, then add power to about 74% to maintain 160. Use dive brakes to descend from low cone altitude to minimum altitude, retracting them after reaching that altitude. This approach will take 60 to 68 gallons of fuel and 15 to 17 minutes total time. It can be made with a formation.

Approach in an Open Quadrant Using Homing Facility (With Traffic Holding at the Homing Facility) Figure 2

Proceed to the homing facility at 20,000 to 25,000 feet. Upon passing the fix, steer 45 degrees off the range leg into the quadrant which does not contain the stack. If there are no aircraft holding within 5,000 feet below your aircraft, a descent can be started immediately. Descend one-half the altitude outbound as described above, continue descending in the procedure turn, return to the homing facility at the assigned altitude and make an approach straight in; GCA, ILAS or radio range.

If aircraft are within 5,000 feet below you, proceed out into quadrant one minute or more before descending. Then proceed as above. This type of penetration and approach takes 60 to 70 gallons of fuel and approximately 14 to 15 minutes.

Approach With Traffic Involved on All Legs of the Range and no Homing Facility Available. Figure 3

In the event through traffic, holding traffic, etc., has all legs of the radio range occupied, proceed as follows: Cross the range station at 20,000 to 25,000 feet and proceed outbound (terrain permitting) on the bisector heading of either of the quadrants which has the landing field located on the range leg separating them.

To avoid descending through occupied altitudes on the range leg, level flight is maintained on the outbound bisector heading until clear of the range leg and/or the airway, normally one or two minutes, depending on ground speed. The penetration is made as described above for the radio range approach except, instead of descending on the range leg, the penetration is made in an open quadrant. Return to the range station at an assigned altitude from which a normal range approach, GCA or ILAS can be made. Eighty to ninety gallons of fuel will be consumed and the approach will take 16 to 18 minutes total time.

If a GCA is made using a rectangular pattern after returning to the range station, approximately 110 gallons of fuel will be consumed and 18 to 23 minutes required for the complete letdown from 20,000 feet to touchdown. It's a good idea to request GCA to pick you up inbound upon completion of the procedure turn, for a straight in GCA. With proper planning, a track can be flown from the range station to get in position for a straight in GCA approach.

These are only a few of the basic types of jet approaches that are available to a pilot in the event a letdown is necessary. As you can see, no one type of penetration fits every situation. Judgment, once again, determines your choice of method.

The old, old method of "Ready or not, here I come," just doesn't fill the bill for jet IFR letdowns.

Fig. 2

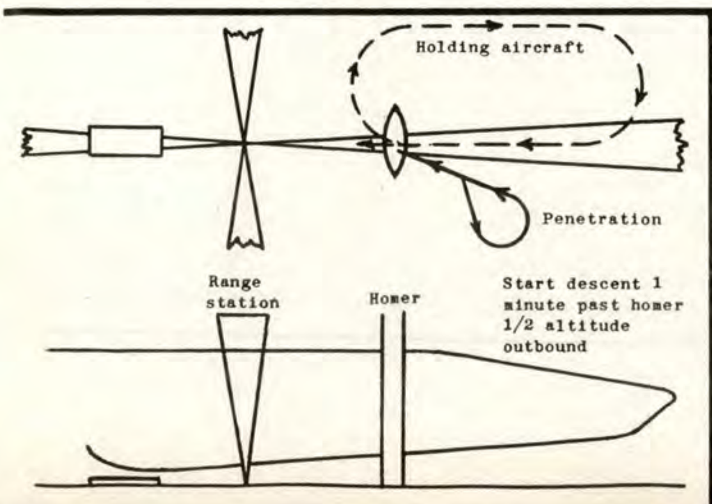
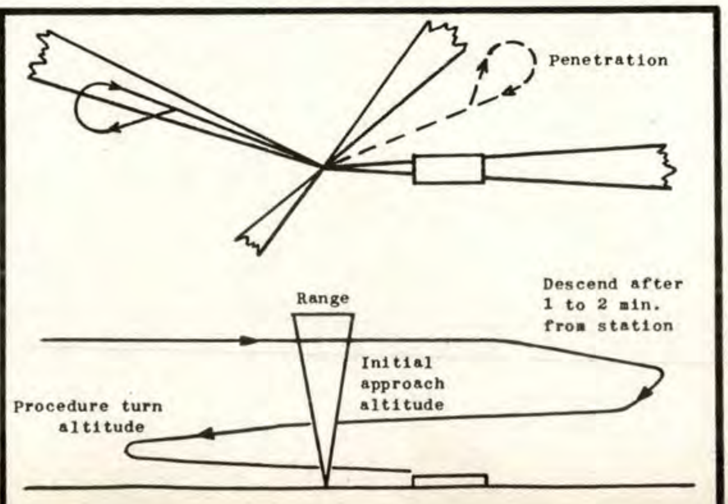


Fig. 3



Bracken's Folly!

"Oops! too darn many straps to this parachute — hangs up on everything . . .

Hey! this twirling should take the stiffness from out of this mike cord . . .

and make it a lot more flexible when I get around to wearing it . . .

Yaaaah! A drop kick. Just like the good ol' days at Vassar . . .

THE MORE IMPORTANT ITEMS of personal equipment for the pilot and aircrew member usually consist of parachutes, hard hats, G-Suits and oxygen masks. All of these things spell safety in flight and it follows, logically, that these particular pieces of equipment should receive the best of care and inspection from the man who uses them.

But this is not always the case. Some pilots and crew members are just plain careless with their flying equipment and their own safety. Our photo-story featuring Eddie Bracken, Warner Brothers star, shows how *NOT* to treat your personal equipment if you'd like to become an old, old pilot.

Bracken here acts out in an exaggerated fashion a careless Joe who seems to have the idea that his new personal equipment—a 'chute and a Hard Hat—are necessary evils which not only need "breaking-in" but can also be used in horseplay.

And, as our photo series shows, when Bracken breaks in equipment . . . it's broke!

Ugh! Something's gotta give if I keep pulling hard enough . . .

Somebody oughta clean up all this oil around here - - - now, let's see . . .

This 'chute is mighty heavy to drag along . . . Oh well, guess I can soften up this Hard Hat . . .

Well, slap me down and call me Maxie. Just take a look at that!!

Aaaaah . . . guess it's broke in a little too much — wonder if I should go back and get another one?"

A PAGE FROM THE PAST

Balloons or Bombers, Safety Problems Just Naturally Go With Flying

FLYING ACCIDENTS are neither new nor funny. However, in digging into old accident records there can be found cases that would give today's flying safety officer or accident investigator many a headache. And the problems that some of the early flying machines gave the embryo pilots approach the fantastic when considered in the light of our present day thinking and flying.

Take, for example, in 1918 when balloons were still an important part of military aviation, a claim was put in against the government for a twenty-dollar bill. It seems that during a routine training flight, a cadet found himself being carried out toward the ocean. He dropped some of his ballast and rose up to 8400 feet to catch another wind and reverse his direction. Arriving inland he valved down to 2,000 feet, spotted an open field and decided to land. When close to the earth he was picked up by a 25-mile-an-hour ground wind which carried him toward some high tension wires. He tried all deflationary measures but these functioned too slowly and the basket caught on a telephone wire, with the balloon, partially deflated, bobbing around in the center of the road.

About this time a "horseless carriage" came whipping down the road at a fast 15 mph and the driver hesitated and then decided to try to pass under the balloon. The cadet yelled at him to stop, but the driver either did not hear or disregarded the warning and went on. As the auto came directly under it, the balloon, driven by a gust of wind, completely enveloped the car. Three occupants of the car jumped out and headed for safety while the driver tried to cut the machine free. A moment later the gas in the balloon ignited, either from contact with the hot radiator or from an engine spark, and an explosion occurred. The car caught on fire and was completely burned. The driver sustained first and second degree burns on his face and hands. He placed claims against the government for the twenty-dollar bill which happened to be in a pocket of a coat in the car, the coat, the car, a fur scarf, a wool sweater and three baby pillows. How would today's accident investigator figure that one?

Another cadet was at 3,600 feet in a balloon when he heard an explosion and noted that he was rapidly descending. He jumped from the basket, but in doing so caught his parachute ropes on the map board and found himself dangling about a foot below the basket. He climbed back into the basket, but by the time he had untangled the ropes, it was too late to parachute. He stayed where he was and rode safely to the ground in the balloon, which had fallen approximately 1,000 feet and then, with the deflated bag acting as a canopy, had become a parachute in itself. Out of this came a recommendation that students be instructed during training not to put their map boards on the side of the balloon from which they must jump, should an emergency arise.

High winds frequently played havoc with the balloons. A gale in Southern California caused the destruction of one, while two others broke completely away from their moorings. The one destroyed was ripped by a large piece of metal which the high wind carried through the air. The other two, although securely tied with ¾-inch rope and ballasted with heavy sand bags, were torn right out of their beds. Another time a sudden gust of wind caught a balloon that was anchored to a winch by a steel cable and snapped the cable, allowing the balloon to float free. An energetic lieutenant chased it on a motorcycle and was finally able to catch its drag rope and bring it back to earth.

Balloon problems were strange enough, but when the airplane came along it brought new angles which at times were even more odd. Unique in its way was a crash that happened in those early days that found the pilot dazed but unhurt, with his engine in the tail of the plane, it having passed under or over him in a manner still unexplained.

Another crash occurred after two pilots had spotted a large number of ducks in a certain area. They returned to the base, secured shotguns, and took off in a two-seater. Apparently they flew to low or slow, because they crashed during their airborne duck hunt. The accident was chalked up to a stall with insufficient altitude.

The ground crews had their troubles, too. In fact, mechanics were killed test-flying and crashing the planes on which they were working. They did not have the problem of jet exhaust but quite a few were hurt by revolving props.

Two reports can be found of pilotless crashes. The custom was for the crew chief to warm up a plane and then leave it idling while he placed it in position to taxi. On a certain type of plane, the lifting of the tail to turn the plane about could cause the throttle to advance. On one occasion the plane "took off" and then ground-looped on a nearby road. Another time the pilot standing near the plane was knocked flat. This plane also ground-looped and ended up on its back.

Wording of accident reports was often very brief and *not* to the point. "Machine turned over and fell into a lake." "Unauthorized attempt to change from rear seat to front." "Fell out of plane." "Stick or prop broke," are some of the examples.

Accident boards had a knack of coming up with some unusual recommendations. Here are a couple of samples:

"A speedometer or airspeed indicator is one of the worst things to put on a training machine, as a pupil very soon relies on his instrument, which is generally wrong (none are accurate), and becomes a mechanical flyer, rather than a pilot with the proper 'feel' of the machine"; and "hard helmets interfere with the use of goggles and the turning of the head."

Another recommended the use of mirrors to enable the pilot to see behind and to the side, but this was later rejected when it was decided that it was better for the pilot to put his head on a swivel rather than rely on gadgets. One suggestion called for the placing of enlisted men on pilot status in order to take some of the glamour and thus some of the recklessness out of flying.

One man wrote to the President suggesting that the structural iron workers' rule of quitting work for the day when a man was killed, be taken up by the Air Force. He stated that he had noted that death came in bunches of three and four in the same day at the flying schools.

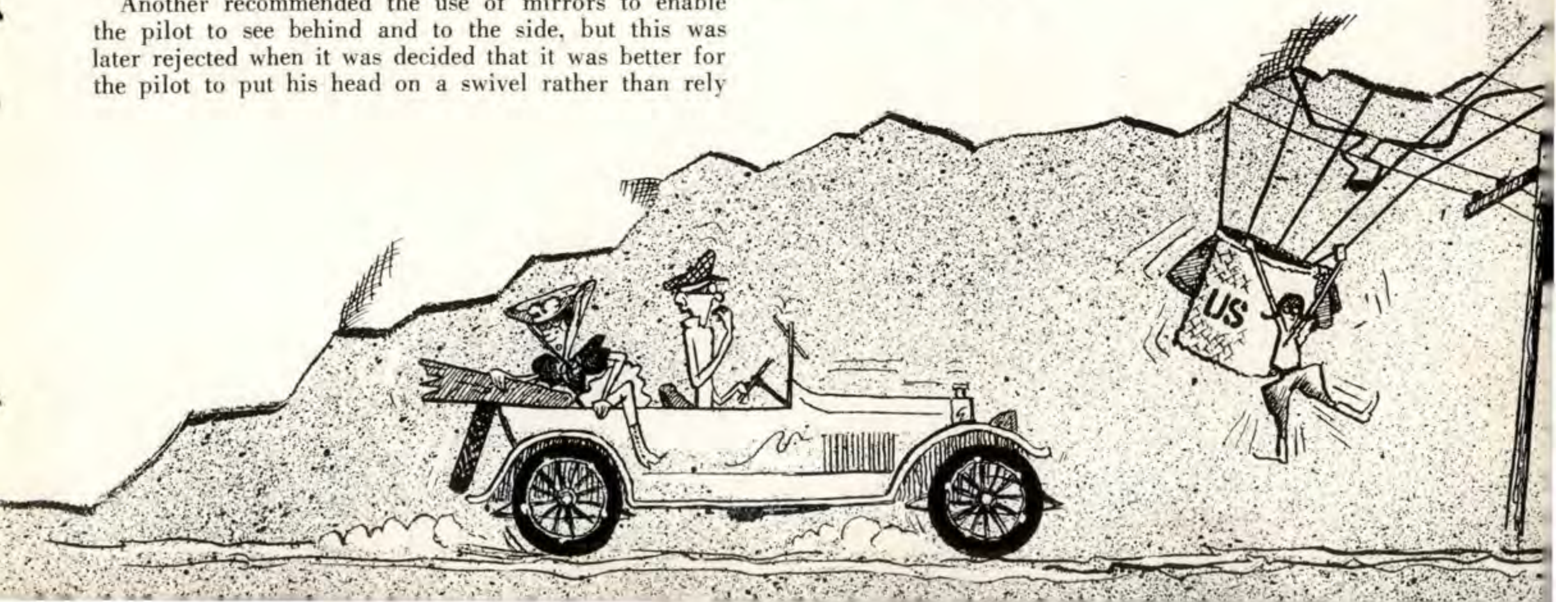
One of France's chief pilots during World War I recommended his safety principles of excess speed, excess altitude and a constant lookout for places to land. At least the last of these principles is still considered a good one.

Some of the board findings were much more practical. One was a device which would throw a student off the controls if he became frozen on them. Others were hard helmets, this in contradiction of the earlier board's findings; an indicator to show maximum speed limits; landing and takeoff patterns; strengthening of a structural design, and that students be given training in forced landings while in flight school.

In the period from 1908 to 1920 there were 2,080 hours flown for every fatality, with 506 killed during the 12 years. On the field which showed the worst record, 20 pilots were produced for every one killed. Even so, the overall safety record was better than that of any other country flying at the time. Considering the equipment used and the little that was known about weather, safety devices and aviation as a whole, the safety records were not so bad. They would be alarming today, of course.

Then, as now, the main causes for fatalities were carelessness and the disregarding of safety rules. Every year since airplanes came into being, some crash causes have been buzzing; acrobatics with insufficient altitude; failure to wear parachutes; exceeding limits of the aircraft; rate of speed too great on landing, and so on.

The men who flew airplanes when flying was a brand new game had to learn their safety lessons through the hard knocks of experience—trial and error. Today we can profit by their mistakes and by the mistakes of all those who have followed. The rules of safety have been written for us . . . sometimes in blood. Let's not disregard them.



'COPTERS AND GAGES

The Full Capabilities of Helicopters Cannot Be Realized Until All-Weather Flight Is a Reality.

INSTRUMENT FLYING in helicopters sounds like something a sane person would rather have no part of. Imagine sitting in a cloud with an airspeed reading of zero! And if you can imagine that, your immediate reaction is probably, "No, thanks. Not for me." Actually, flying the gages in a helicopter is not a whole lot different from any other aircraft. Regarding that zero degree air-speed reading, the answer is that you just don't let your speed go down to zero.

The realization that proper and full utilization of the capabilities of helicopters would require flight under weather conditions, came several years ago. Development of an Air Force program to explore the problems and establish the feasibility of helicopter instrument flying was started in the summer of 1949. At that time, the Director of Helicopter Training at Connally AFB and the project officer for instrument flying made a tour of several helicopter factories, and Navy and Coast Guard helicopter using agencies to observe developments which may have been made in instrument flying technique. While all agencies were interested, little actual development had been accomplished.

Experimental instrument flights were first commenced in March of 1950. An H-5D Sikorsky Helicopter was equipped with orange polaroid plastex to be used with the complementary blue goggles. The standard aircraft instrument panel was used with standard flight instruments, consisting of bank and turn indicator, artificial horizon, directional gyro, airspeed indicator, rate of climb indicator and magnetic compass. Several instruments were relocated for a more rapid cross-check. These initial flights brought the realization that instrument flying was both feasible and practicable.

First, the project officer flew about five hours of experimental hooded flight. Later, helicopter instructors, selected at random, and members of the instrument board who had no previous helicopter time were also put under the hood. All pilots were able to fly the aircraft with reasonable success.

As final proof of the practicability of instrument flying in the helicopter, an actual instrument flight was accomplished 19 April 1950. On that date the Connally Air Force Base weather was 700 feet overcast, four miles visibility with light rain. An ARTC clearance was obtained to climb to 2000 feet on course to the Waco Range and hold at 2000 feet for an approach clearance. These instructions were complied with and after receiving approach clearance, a let-down was satisfactorily accomplished. No difficulties were encountered at any time during the flight. This flight was accomplished by Major George P. Gaffney, now a Lt. Colonel and Commanding Officer of the Training Group which conducts helicopter training at San Marcos Air Force Base, and Capt. John Eggleston. Much of the credit for the initial phase of development of the instrument program goes to these two pilots.

PROGRAM DEVELOPED

On the strength of the initial flight experiments a basic program was developed covering the following maneuvers:

- Straight and level flight at airspeeds ranging from 50 to 80 miles per hour.
- Climbing and descending turns.
- Instrument takeoff going directly into translational lift and climbing to cruising altitude.
- Radio range true-fade orientation and beam following.
- Autorotations from all altitudes under the hood.
- Radio range let-downs to minimum altitudes.

GCA let-downs were not included in this program since there were no GCA facilities within a reasonable distance for training purposes. However, the project officer successfully completed several GCA runs under the hood.

A service test was approved to test the presentation of the above maneuvers to two classes during 1950. A proposed syllabus was drawn up to include 10 hours of flight instruction and five hours of instrument trainer time. During the service testing of the first of these classes, all of the instruction was presented by two instructors, one of whom was assigned as the new project officer. During the service testing, the tentative syllabus was modified and an "Analysis of Maneuvers" in Training Project Outline form was written.

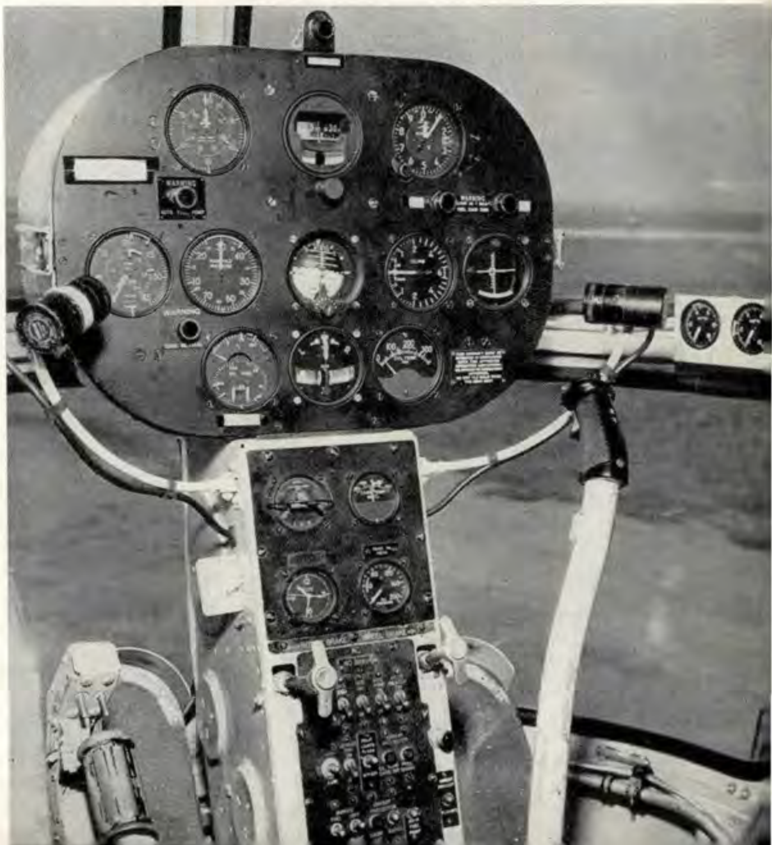
Between the service testing of the two classes, additional instructor training was accomplished. Due to the shortage of aircraft, this training was limited to slightly more than two hours under the hood for each instructor, with a comparable amount of observer time in team rides. However, with increased briefing and using the Analysis of Maneuvers as a teaching guide, service testing of the second class was accomplished.

In testing both classes, each student was given ten hours of hood time and five hours of instrument trainer time. Nine students in the first class and eleven students in the second class participated. Results of the tests of the two classes were amazingly similar. All students became proficient enough to maintain a safe flight attitude at all times.

The three most noticeable difficulties the students encountered were overcontrolling, pilot fatigue, and getting lost on the radio range due to false builds and fades resulting from changes in attitude of the aircraft. Overcontrolling is difficult to overcome because of the lag in azimuth control. The aircraft responds more slowly than the student expects and additional correction is applied. Repeated explanation and practice are necessary to eliminate overcontrolling.

Pilot fatigue was apparent in all students. Because of the instability of the aircraft and the lack of trim tabs, most students became noticeably fatigued after 30 to 40 minutes of hooded flight. This was combated in part by pointing out to the student that during straight and

Above, the USAF arrangement has pairs and groups of related instruments along the horizontal axis of the panel. Below is the arrangement of helicopter instruments as currently used by the Los Angeles Airways.



level flight the left hand need not always be retained on the throttle. Also if the student altered his position by leaning slightly forward with his elbows on his knees, holding the azimuth stick very lightly, thereby relaxing, fatigue was reduced.

While nearly all students were able to make a range orientation and approach successfully under the hood, a number of them expressed a lack of confidence in their ability under actual weather conditions. It was believed that this lack of confidence could be overcome as instructors themselves become more experienced so that actual weather could be flown during the student's training program.

Progress of the students was consistent throughout training. In most cases the student's final instrument grades were slightly higher and within seven per cent of their final contact grade.

The Project Officer flew with at least one student from each instructor to insure consistency of instruction and grading. Very little variance was noted.

During instruction of the second experimental class the syllabus of instruction written during the first class was examined critically. Apparently it was well written, as all instructors agreed that it was satisfactory with one exception. That was that the two hours of range orientation should be regarded as the minimum and that additional time should be given consistent with student proficiency and availability of aircraft.

EQUIPMENT MODIFIED

To improve the training, a number of physical changes were recommended and accomplished on equipment in the aircraft.

Early in the program a vacuum pump was installed on the hydraulic hoist bracket and the electrical gyros were replaced by suction type instruments.

VHF equipment was installed in the aircraft for the convenience of the pilot and for possible GCA training if facilities should be available.

An extension to the volume control of the radio range receiver was made on the left side of the cockpit. Previously the pilot had to use his right hand to control the volume and used his left hand for azimuth control, which is very difficult.

The radio antenna on the H5-D was relocated from a position along the right side of the tail boom to a position beneath the aircraft. This was done because it was believed that the false builds and fades of radio range signals when the aircraft attitude was changed were due to the location of the radio antenna.

TRAINING INSTRUCTORS

In the fall of 1950, arrangements were completed for two Air Force pilots from the helicopter school, then located at Connally AFB, to fly with Los Angeles Airways, Inc. This company operated the first scheduled helicopter mail service and was selected to give instrument training to Air Force pilots because of its unique experience accumulated in more than three years of flying mail flights, day and night, in all types of weather conditions. Los Angeles Airways, Inc. had two years previously been awarded approval to operate helicopters at night and had also received the first CAA okay for instrument flights.

The two Air Force pilots chosen for the instrument training program developed by the company were Capt. Joseph E. Barrett and Capt. Willis R. Kusy. Both officers are now stationed at San Marcos where their experience is being put to good use in the training of Air Force helicopter pilots. During their tour of duty with Los Angeles Airways, each of these pilots flew about 60 hours, of which approximately half was on instruments.

Thus, helicopter instrument flying had received a good strong start by late fall of 1950. Two classes of students had been given instruction in instrument flight and the instructors were well on their way toward becoming sufficiently experienced to provide the best in training.

But then the affair in Korea stepped in to halt the whole program. The requirement in the combat theater for more and more helicopters to be used in rescue, transport, and courier operations gradually drained the available aircraft from the school until it was impossible to continue the instrument phase. It is fully intended that instrument instruction will be resumed as soon as it is possible to do so. To date, sufficient aircraft are still not available; however, the instructor staff has a complete instrument course available and ready to put into operation.

Here's what the instrument course looks like. A total of ten hours of instruction, supplemented by the link trainer, will be given. The first seven hours are devoted to basic instruments and the last three to radio range procedures.

Straight and level flight is the first flight maneuver on the agenda. Normally, the speed will range from 50 to 80 mph at a manifold pressure of about 26 inches Hg. Standard rate turns of about seven degrees bank follow. During these two maneuvers, altitude control is stressed. To maintain constant altitude, rapid cross-checks among altimeter, flight indicator, and vertical speed indicator are necessary. Airspeed is used as a reference.

Autorotations on instruments are also given. During any phase of flight, the instructor is likely to tap the hooded student on the shoulder and say, "Engine failure!" The student immediately places the pitch stick in the full down position with engine rpm at 2000. He is to maintain his heading in a wing level attitude and an airspeed of 70 mph. At not less than 300 feet above the ground, the instructor tells the student he has "broken out." The goggles are then raised and the autorotation is completed visually to a landing. During autorotations, the instructor must be particularly alert that the student does not enter an extreme bank or pitch attitude, that he does not lose directional control at high speed, and that airspeed does not increase above 80 mph with nose low pitch attitude.

Instrument takeoffs are also made in helicopters and tricky maneuvers they are. The first few feet of the takeoff in an H-5D are made straight up to avoid ground resonance. A very close cross check of the flight indicator, directional gyro and airspeed indicator is necessary until 60 mph is reached. Also, the rate of climb and altitude must be watched closely. A common error is to relax forward pressure on the azimuth stick as the airspeed increases during the initial climb. This results in a decrease in airspeed when the miniature aircraft of the flight indicator raises above the horizon bar.

The helicopter, like any other aircraft, can also be flown on partial panel. The airspeed indicator is then the primary pitch attitude, but it must be closely crosschecked with the altimeter and the vertical speed indicator. The turn needle and the magnetic compass become the bank instruments when gyros are caged.

The vertical S, alternately descending and climbing 500 feet, is a practice maneuver in helicopter instrument flying. An advanced version is the same maneuver done while making a standard rate turn.

Radio range procedure is very much the same as for other craft. The helicopter pilot must be especially alert for false fades when the pitch attitude is nose low, and for false builds when the nose is high. Also, during turns there is sometimes a false fade due to the installation and rigging of the antenna in relation to the position of the station. The helicopter instrument pilot must be infinitely patient when flying a radio range as the low airspeed results in a very slow approach to the station. The power setting for the instrument letdown is 18 inches Hg. and the airspeed is 60 mph.

A visit to the helicopter school at San Marcos AFB will impress anyone with the obvious sincerity of the school's staff in their belief in the future of helicopters. To a man, they are convinced that the potential of the helicopter has been only lightly tapped. But much of the potential depends upon the removal of the present restriction to visual flight. The true capabilities of the helicopter can only be realized when flight under any weather condition is possible.

And the staff of the school stands ready to help put helicopter flying on an all-weather basis just as soon as the equipment is available.

The "goldfish bowl" Hiller helicopter is a flying training copter for the school. Below, two of the key men in the USAF's helicopter instrument training program are Capt. Joseph E. Barrett, standing, and Capt. Willis R. Kusy. Currently, they're at San Marcos and are ready for the resumption of the instrument program.

CHARTS *to fly by*

UP TO THE MINUTE AERONAUTICAL CHARTS MUST BE AVAILABLE TO OUR WORLD-WIDE AIR FORCE . . . AND THEY ARE.

By Colonel Paul C. Schauer, Commanding Officer
USAF Aeronautical Chart and Information Service

SIX AERONAUTICAL CHART and Information Offices overseas and one in the ZI function on the principle that safety in aviation depends in part on adequate aeronautical charts properly used. Recently established, these ACIO's are developing methods calculated to provide Air Force personnel everywhere with the most current charts and aeronautical information with the greatest possible dispatch.

Operating in Germany, the United Kingdom, Japan, Hawaii, the Canal Zone, Alaska and Westover Air Force Base, the ACIO's are designed by the USAF Aeronautical Chart and Information Service, an Air Materiel Command agency, to aid in accomplishing its mission of providing the Air Force with all aeronautical charts and related materials required in peace and in war.

On 1 February 1951 the Chart Service, as it is often called, became a center for aeronautical information within the Air Force and was assigned the added responsibilities of collecting and disseminating that information and of production of radio facility charts and other aeronautical information publications. By Air Force directive, distribution directly to users through Chart Service facilities replaced distribution through depots as Class 30 material. Consequently, the ACIO's were set up.

To do the job, it was decided to dispense any hampering formalities in the distribution of charts or aeronautical information. A telephone call, a visit in person or any legible requisition will get Air Force users the required material quickly. Except in cases of recurring large orders, formal requisitions are not necessary.

Telephone calls have saved much valuable time. For instance, an officer in Paris had a special planning job to do and little time in which to do it. He phoned to the ACIO at Schierstein, Germany. The charts were on his desk next day.

Calls also make for flying safety. A pilot complained that the frequency of an Italian radio station was not the same as shown in his radio facility chart. He had flown over the vicinity and, just by trying frequencies, stumbled upon the true one for that station. The ACIO made immediate inquiries and discovered that the frequency had been changed the very day the aviator had tried to use the station. A correction by NOTAM was made at once, and the new frequency was shown in the next radio facility chart.

Word came to Captain Russell G. Fitzgerald, officer-in-charge of the ACIO at Hickam AFB, Hawaii, that a strategic reconnaissance squadron, medium, weather, was flying a special mission and that previous attempts to get charts for such missions had been unsatisfactory. He sent an emergency requisition to the Chart Service's main production facility at St. Louis, Missouri, and the squadron had its charts within a few days.

Personnel of the ACIO's do not wait to be asked, however. They make the rounds of the Air Force units personally, by telephone, by mail or by wire. "Very close, in fact almost hourly contacts," reports Major Robert M. Caserta, OIC of ACIO-Germany, "are required to feel the 'pulse' of the Command in order to service the present and planned requirements for aeronautical information.

"In an area such as this, much traveling is involved and many personal contacts must be made, both with the planning staffs and the units and air crews in the field. Contacts must be made with the men who use the publications only at a desk and those who use the charts in the air and must rely on their clarity and accuracy. To complete the coordination, close liaison is maintained with the ACIO in England to assure meeting the requirements of the whole theater."

The size of the ACIO-Germany task is indicated by the officer's estimate that approximately 5,000,000 charts are on hand at all times, with a monthly outgoing distribution of well over 100,000 charts.

The ACIO's publish the radio facility charts of their respective areas. As this is written, most of them were distributing all aeronautical charts, while some were in the process of acquiring sufficient office and warehouse space to take over the function from the theater depots. Without exception, they are staffed by officer, airman and civilian personnel, some of whom are pilots, selected because they are highly trained in the aeronautical chart field. Some of the most efficient and experienced officers assigned to the Chart Service were placed in the ACIO's.

Contacts have brought some enlightening facts to light. Captain Ralph M. Koth, OIC of the ACIO at Sealand, United Kingdom, found a sort of "Alice in Wonderland" situation. A depot officer said, when asked why he did not have certain charts on hand, "I'm like the grocer. If no one asks for potatoes, I don't carry potatoes." That officer did not stock certain charts because there was no demand for them. There was no demand for them because the men in the field did not know the charts were available. It's one of the ACIO jobs to correct such conditions. Education is the answer, with ACIO personnel in the role of educators.

Major Caserta reports that in USAFE instruction courses on the use of the radio facility chart are held and that it is planned to expand the program to include briefings on all types of aeronautical information material. There is also a good deal of informal instruction given at the various offices and in the field as ACIO men talk to planners and air crews. One of the major problems is to let users know about the different types of charts and help them to select the kind best suited to specific missions or other purposes. When a special mission is planned, it is an ACIO duty to offer advice as to the kind of chart, coverage, scale and grid system most advantageous for the particular requirements, and to procure all necessary charts for the users.

In addition to being teachers, ACIO personnel also become students. Pilots and navigators can teach them many things. These students are ever alert for suggestions which might be utilized to improve the charts. They must also assess the widely varying opinions heard. Pilots and navigators of different kinds of aircraft do not always agree, and there is often a considerable variance of thought between the officers who use charts only at the desk and those who use them in the air. Many a session is held with air crews discussing details on charts spread out on the wings of their aircraft.

Particularly important in the work of the ACIO's is the radio facility chart. ACIO people act as detectives in pursuit of vital changes in information, such as new radio frequencies. Many personal contacts are a help. Captain Ray F. Willets, in charge of the ACIO at Westover AFB, found one of his best contacts at a party. A naval aviator happened to mention a change of frequency he had discovered. Now that officer is watchful for data to report to Captain Willets. The captain gathers added facts because he flies twice a month with a transport squadron of the Atlantic Division of MATS.

ACIO personnel are unanimous in the plea that radio facility chart users report immediately any errors or changes they may find. They are equally anxious to explain the charts or answer any question about them. In fact, they are enthusiastic as teachers, students or detectives.

Captain William E. McLendon plans a flyover of all or most of Alaska for information which may help in the accomplishment of his duties at the ACIO at Elmendorf AFB near Anchorage. Personnel under the command of Captain John M. Desloge in the ACIO at Albrook AFB, Canal Zone, undertook a 17-day flying trip to air missions and air attaches throughout South America to screen the present charts for correctness and to pick up any pertinent air information.

The task of Captain LaVoi B. Davis, OIC of the ACIO at Tokyo, has been more immediate. His office has been supplying fighting men in Korea as well as pilots in more peaceful areas of the Far East. Speed in getting charts to pilots and navigators for battle use is as essential as speed in supplying them with ammunition. Also, the Chart Service is developing new charts for jets and for close air support of ground troops. The past few months have shown a great acceleration in supply as the result of the new system.

Individual contacts made throughout the world give promise of providing closer approximations of theater chart requirements, which will aid the Chart Service to control production more accurately and to gauge the particular demands of each area. For example, Captain Fitzgerald, surveying the situation for Hawaii, writes:

"Eventually we will have a complete network of contacts. For the first time, it is believed, the overall stock requirement for this area is becoming known. Previous methods of stock procurement, which varied greatly among the many organizations, created a situation where no one office or organization knew the overall requirement."

These contacts are valuable in uncovering very special requirements which using units did not know could be met. They are studied and fulfilled as expeditiously as possible. They also provide advance notice of military maneuvers for which special charts may be required. This gives time to produce new, adequate charts not obtainable on last-minute requisition.

The ACIO's now in operation appear to meet present requirements. If others become essential to cover other areas, they will be established. Our effort is continuously to foster safe flying through providing necessary chart and aeronautical information material to Air Force personnel whenever and wherever they need it. Your part in promoting flight safety is equally important and can be fulfilled by constant vigilance in observing and reporting information you obtain. Give your ACIO your requirements and your suggestions. Help them to help you.

Charts are important to safety. For ACIO it's a continuous job of chart inventory, corrections and checking new editions.

☆ CROSS FEED ☆

WE KEEP TRYING! — I enjoyed reading the October, 1951, issue of FLYING SAFETY which was devoted entirely to winter flying. We pilots detailed to recruiting duty find it quite difficult to keep abreast of the old techniques, not to mention the new ones, about which we might never be made aware were it not for your magazine.

—Capt. Joseph R. Kuhlman
Recruiting Officer
Philadelphia, Penna.

CAMERA vs. COMPASS — Cameras and accessories have become so common that recently an Army Colonel inquired of an Air Force Sergeant: "Are cameras a standard item of issue in the Air Force?" Some types of cameras and all types of light meters when placed in the cockpit of an aircraft or near the magnetic compass will cause the compass to err from five to 15 degrees. This is caused by the magnetic field within these instruments.

Pilots should use extreme care not to place photographic equipment in any location within the aircraft where the magnetic compass could be affected.

—Capt. Edward A. Miller
452nd Bomb Wing (L)
Safety Officer, APO 970

MULTICOLORED LIFE RAFTS —I would like to suggest that all life rafts carried by aircraft flying over water between the United States and foreign countries be of various color and multiple color combinations; that all life rafts on one aircraft be of the same color, and that they be installed at departing station and removed at destination.

Also, that the color code be recorded for that particular aircraft on clearance. This would enable rescue crews to make positive identification of a downed aircraft at sea.

—M/Sgt. Charles E. Johnson
403d Maint. Sqdn.
403d T.C. Wing (Med)
Portland Int'l Arpt., Oregon

AH-CHOO!—It was with considerable interest that I read the article on the common cold in your October, 1951, issue of FLYING SAFETY. As you know, we in the aviation medicine service are always glad to see articles of a practical medical nature, such as this one, appearing in the journals and magazines. Your reader public is primarily the flying crews to whom we would like to see the message relayed.

—Maj. Joseph A. Connor, Jr.
Office of The Surgeon General

ENGINE CHECKS—The information contained in the article, "How to Check an Engine," published in the August, 1951, issue of FLYING SAFETY, has proven very helpful in explaining proper engine run-up methods to the pilots stationed at this base. Although the figures in the article pertain to C-47's, the procedures, and reasons therefor, apply also to B-25's which are flown here.

—Maj. Otto W. Kuhlmann
Flysafe Project Officer
James Connally AFB, Tex.

A POSY—Would like to toss a bouquet your way on the October special winter issue of FLYING SAFETY. In the opinion of Scott pilots, it was one of the best issues you have put out.

—Maj. William G. Ehart
Flying Safety Officer
Scott AFB, Illinois

LATRINE RUMORS — When the Rex Riley and other posters are received in this office I post two on the bulletin boards and the rest in the men's latrines. Consequently, they can't miss 'em. It has proved to be the best day-by-day flight safety reminder and the widest form of publicity this squadron has experienced. All male personnel of the outfit have commented on the posters, especially Rex Riley. So numerous have been the comments that I'll not endeavor to list them; although we receive gripes when the posters are left up too long.

Also, if we have any extra copies of FLYING SAFETY magazine we punch a hole in 'em, attach a string, and hang them in the latrines, too. We figure a man might as well use *all* his time to advantage. The way the magazines have become dog-eared within a day's time can assure anyone that they receive plenty of attention.

The above avenues of publicity may not be unique or strictly according to the book, but the results are overwhelming. I thought you'd care to share our personal satisfaction that FLIGHT SAFETY is reaching all of our personnel.

—T/Sgt. LeRoy R. Yagel
Selfridge AFB, Mich.

Ed. Note: We don't care much where you put our publications, just so they're read and something is gained from the reading. If the latrine is the place, that's OK. Our reputations can't suffer much, anyway.

SURVIVAL — In response to your "Help Wanted" Ad in the October issue of FLYING SAFETY, I'd like to make a suggestion as to what I'd like to have appear as a series. More about Survival.

I found your article, "Down But Not Out" (October, 1950), very interesting and in some respects very helpful.

I am working, besides my flying duties, as a Survival Officer and have a deep interest in spreading the word around to my fellow "Fly Boys" on some of the subjects that may mean life or death to them once they are forced to leave the sanctuary of their aircraft, many miles from nowhere. The knowledge gained also comes in handy when on a leave to some camping site, whether fishing or hunting.

I, for one, think FLYING SAFETY would be an excellent medium for spreading the survival word.

—Paul Gardella
Capt. USAF
Carswell AFB, Tex.

Ed. Note: We've also heard from a couple of sources that survival is emphasized too much in FLYING SAFETY. *The reasoning apparently is that such subjects do not prevent accidents. Our stand is that survival articles may save lives after the accident occurs, so we will continue to print them.*

SEQUEL—Your letter pertaining to the article on Flight B, carried in the November issue of FLYING SAFETY, was appreciated as were the courtesy copies forwarded and the excellent manner in which our article was treated. It may interest you to know that we are continuing our safety record without a major accident but that a minor accident ruined the perfect record. However, it was incurred under entirely justifiable circumstances; the same pilot featured in the article was called upon to perform an emergency evacuation on a small island far above the Arctic Circle.

The mission involved extreme hazard, including landing on water amid floating ice and flying through adverse weather conditions. Returning to Goose Bay with the patient aboard, the plane encountered sudden high head winds, was advised that an alternate field was below minimums, and was left with insufficient fuel to reach its destination. The pilot advised Goose Bay of his plight, was intercepted by another rescue aircraft, and performed a night landing on a small lake in Labrador.

In landing, slight damage to the hull was incurred but another aircraft completed the evacuation of the ailing patient and the amphib was later repaired and returned for duty. An investigation board exonerated the pilot of any blame and shortly after he was recommended for the Air Medal for action taken during the emergency. So, though the perfect record no longer exists, it was sacrificed to save a man's life!

—Capt. Arthur R. Locker
Ernest Harmon AFB

JACK-BOX—In the August issue of FLYING SAFETY magazine an article by S./Sgt. Frederick J. Nelson on multi-channel monitoring by modification of the standard jack-box (Training for IFR, page 20) was of particular interest to this squadron, since our present mission is training.

Can a wiring diagram or schematic of this modification be obtained? If so, where? Any help you can give us on this matter would be greatly appreciated.

—Capt. Billy N. Atteberry
Communications Officer
Lake Charles AFB, La.

Ed. Note: Anyone interested in the wiring diagram should write to: Officer in Charge, Instrument Training Section, Sewart AFB, Tennessee.

HOW SHARP ARE YOU?...

If you know your business, you'll answer all these questions correctly. Answers are on page 28.

1. If a pilot were flying in the bi-signal zone of an "N" quadrant, approximately every 30 seconds he would hear:
a. Both station identification signals the second of which is the stronger of the two;
b. Both station identification signals the first of which is the stronger of the two;
c. A strong station identification signal followed by a period in which no signal is received;
d. A period in which no signal is received followed by a strong station identification signal.

2. In passing over a fan marker beacon you notice the amber light on your instrument panel flashing a signal of three flashes. This would indicate to you that the fan marker was:
a. On the NE leg;
b. On the NW leg;
c. On the SE leg;
d. On the SW leg.

3. The weather entry on the Form 175 for a pilot without clearing authority is valid for:
a. Two hours after time of weather entry;
b. One hour after time of weather entry;
c. Two hours after proposed takeoff time;
d. One hour after proposed takeoff time.

4. In solving the 180° ambiguity, if the relative bearing of the radio compass has decreased, the radio station is:
a. To the right;
b. Directly ahead;
c. To the left;
d. Directly behind.

5. The heading of an aircraft is 230°. The radio compass shows a relative bearing of 285°. In order to intercept an outbound track of 270° at an angle of 45°, the pilot will turn to a heading of:
a. 45°
b. 315°
c. 240°
d. 225°

6. An aircraft flying "off airways" on a magnetic course of 315° should maintain an altitude of:
a. Even thousands feet;
b. Even thousands plus 500 feet;
c. Odd thousands feet;
d. Odd thousands plus 500 feet.

7. If it takes one minute and 15 seconds to fly through a 20-degree angle change using ADF, how many minutes and seconds is the aircraft from the station?
a. 3 minutes, 54 seconds;
b. 3 minutes, 45 seconds;
c. 4 minutes, 10 seconds;
d. 3 minutes, 15 seconds.

8. The flight levels presenting the greatest frequency of hazards to aircraft during thunderstorm penetration seem to be in what altitude range?

9. A dissipating thunderstorm cell is generally recognized by what visual feature?

10. Fog can be expected to dissipate when .... and .... are expected to be present.

11. The normal decrease of temperature with altitude in the atmosphere is generally termed ....

12. The frequent low ceilings and poor visibilities in the southeast United States in the winter result mainly from the flow of .... air from the south into the region.

13. A solid purple line on a weather map indicates ....

14. The surface wind immediately west of a cold front in the United States generally blows from ....

15. Winds aloft codes normally become available in the weather station prior to the corresponding winds aloft chart. For this reason a pilot should be familiar with such codes. One such code follows:

```
PBUS  9891-3  160900Z
ADW   09  03009  311Z
      23320   3323  43428
       3430  63430   0139
      80140   0235  00230
```

Using this code we find that the wind direction and speed at "ADW" at 7,000 feet MSL is ....

SAC'S Flying Safety Year

A "Flying Safety Year" Campaign is Giving New Emphasis to Strategic Air Command's Aggressive Accident Prevention Program.

By Dave Karten
Flight Safety Office
SAC Headquarters

FOR THE PAST TWO and a half years, SAC's accident rate has compared very favorably with the average for the entire Air Force.

But SAC's tremendous expansion has increased the accident exposure element and the number of assigned inexperienced personnel. To offset these factors, SAC's Flying Safety Division launched a year-long accident prevention campaign and General Curtis E. LeMay designated the period September 1, 1951, through August 31, 1952, as "Flying Safety Year."

To implement the plan, Major General J. B. Montgomery, SAC's Director of Operations, called for a maximum effort on the part of all SAC combat and ground crew personnel.

Radio and television talks by Colonel Frank W. Ellis, Chief of the SAC Flying Safety Division, explained the benefits of such a program to the average taxpayer—savings in lives, dollars, and increased combat readiness. An illustrated 55-page brochure, brimming with fresh and original flying safety promotion ideas, was prepared by Capt. Kenneth L. Maxwell and Mr. Jim Nelson, under supervision of Col. Alfred F. Kalberer, SAC's Director of Public Information.

Base newspapers throughout the command front-paged news stories outlining the details of the campaign. All SAC bases cooperated in a week of special activities to kick off the year of increased safety consciousness and the Flying Safety Year was officially under way.

Focal point of interest in the campaign is a handsome trophy which will be awarded—appropriately engraved —in September, 1952, to the SAC base compiling the best safety record for the entire year. During the campaign the trophy is given each month to the base with the lowest accident rate that month.

Every month during the campaign SAC bombardment stations choose a "Crew of the Month" and fighter bases select a "Pilot of the Month." These selections are submitted to SAC's Flying Safety Division, where their merits are compared, and the most outstanding crew and pilot, respectively, named SAC "Crew of the Month" and "Pilot of the Month." A SAC-wide slogan contest was conducted, and Lieutenant Paul J. Hill of the 301st Refueling Squadron of Barksdale AFB, submitted the winning slogan — "Preflight Checks Stop In-flight Wrecks."

Pictures and stories of the monthly winners are featured in a special section of COMBAT CREW magazine, the Strategic Air Command's monthly flying safety publication for SAC flight personnel.

To add zest and incentive to winning the trophy, a purse of $1,000 accompanies its award each month. Money for the purse—$12,000 for the 12 consecutive monthly awards—is collected from SAC officer personnel in a "Hobo Barrel," which makes the rounds of SAC stations. A dollar donation from each officer in SAC is making it possible for each of the 12 trophy winners to celebrate their winning the trophy with a base-wide flying safety party.

Primary goal of SAC's Flying Safety Year is to promote flying safety consciousness throughout the command, save lives and equipment, and promote SAC's combat readiness. To achieve this goal, the Flying Safety Division has initiated a seven-point program: (1) train to proficiency—and maintain proficiency; (2) instruct in and emphasize emergency procedures; (3) require compliance with SOP's and all flying regulations; (4) eliminate hazardous or accident-provoking conditions; (5) eliminate maintenance errors; (6) reduce materiel failures by thorough preflight inspections; (7) complete investigations and careful analysis of aircraft accidents to determine their cause factors, both primary and secondary, and disseminate the information to all who might encounter the same cause factors.

Throughout the campaign, all accidents, regardless of their seriousness, are counted as equal.

"For the purposes of the campaign," explains Major Wilford J. Crutsinger, SAC Flying Safety Division officer in charge of Flying Safety Year promotion, "we have set rates for bombers and fighters. This puts the competition between fighter and bomber stations on a fair and equitable basis. For example, during the campaign the record of a base which had two minor accidents with only slight damage to the aircraft involved, would be marred as badly as if the accidents had been of major importance resulting in loss of life and property. In this way SAC hopes to eliminate not only the major accidents but also minor mishaps which hamper operating efficiency at base and squadron level and result in the tie-up of tactical and administrative aircraft."

In its first three months of operation the SAC Flying Safety Year campaign has achieved the stature of a sound plan, worthy of imitation by other commands within the Air Force in promoting safer flying.

"One good reason why the Flying Safety Year has succeeded so far in steadily decreasing the accident rate," explains General LeMay, "is the excellent cooperation flying safety officers throughout the command have received from public information officers in utilizing all possible public information media to carry the story of the campaign to all personnel. Timely editorials and monthly photographs of 'Combat Crews of the Month,' 'Pilots of the Month,' and 'Hobo Barrel' activities in SAC base newspapers are helping to keep alive the interest in the Flying Safety Year."

The following excerpt from an editorial in The Spokane Bomber News (Fairchild AFB) crystalizes the whole idea behind the campaign: "The real reason for flying safety campaigns is not the attainment of the best record or a trophy. The lives saved; the injuries averted; the equipment and money saved; the proficiency safe flying indicates—these are the benefits which accrue from safe flying. Each of us should do whatever possible to keep our record spotless. In the final analysis, it's our lives, our equipment, our taxes which are being saved."

Side by side with the flying safety officer, the wing commander and public information officer have been tireless in their efforts to make the Flying Safety Year the safest in SAC's history.

Their success with this fresh and original approach to accident prevention will be measured at the end of the campaign in terms of lives and equipment saved and increased combat readiness to carry out SAC's mission.

Gen. Curtis E. LeMay and Col. Frank W. Ellis, SAC CG and FSO, contribute to safety year hobo barrel.

WE THANK YOU

In the last six months of 1951, FLYING SAFETY printed twenty articles written by people other than staff members. This does not include the many contributors to the Crossfeed Section, those who preferred that their names not be used, and those who helped us dig up the material for staff written articles. We feel that the cooperative attitude of all those who wrote for us or helped us obtain material to be printed is indicative of a high state of safety consciousness in our Air Force. And we also feel it is most complimentary to FLYING SAFETY magazine. Besides making our work easier, these people have contributed to the well-being of the entire Air Force. Some of them may have saved lives and valuable equipment.

Here is a list of those whose contributions were printed in the July through December, 1951, issues of FLYING SAFETY:

Mr. Paul Mantz
Lt. Col. Don Williams
Capt. Glen T. Noyes
Capt. George E. Schafer
Maj. Gen. Victor E. Bertrandias
Maj. Gen. George W. Mundy
S/Sgt. Frederick J. Nelson
Mr. Bob Hope
Capt. Robert M. Bell
Lt. Lewis A. Dayton, Jr.
Maj. Gen. Lyman P. Whitten
Lt. Jerry N. Downen
Maj. Robert O. Celotto
Capt. David F. McCallister
Capt. Arthur R. Locker
Capt. John H. Seward
Capt. Cesar J. Martinez
Capt. Phillip D. Gardner
Mr. Rid Dowding
Col. Don S. Wenger
Brig. Gen. Frank P. Lahm (Ret.)

Our sincere thanks goes to these men. And how about *you* adding your name to the next list. **—The Staff**

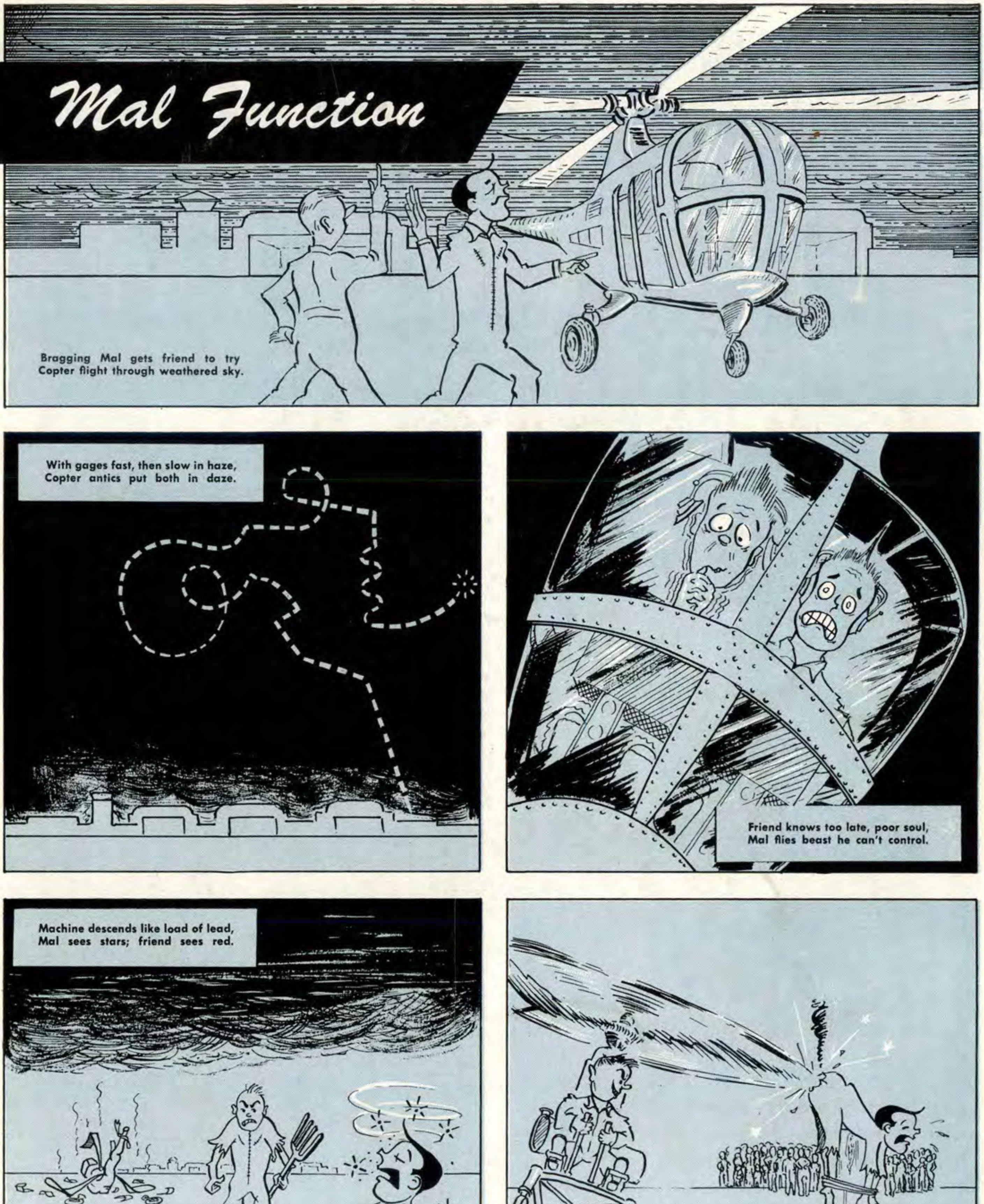
ANSWERS TO QUIZ ON PAGE 25

1—b. 2—d. 3—b. 4—c. 5 — d. 6 — b. 7 — b. 8 — 10,000 to 25,000 feet above terrain. 9—The anvil top. 10—Strong winds and surface heating. 11 — Lapse rate. 12—Maritime tropical. 13—An occluded front. 14 — The northwest. 15 — From 10 degrees at 39 knots.

Relax!

Take it easy. But be sure to do it at the right time. Like the man said, there is a time and place for everything. And relaxing is no exception. There are also times and places when you've got to be alert and on your toes. When you are flying or working on an airplane, for example, you've got to be alert. That's no time to relax. Fact is, it could be fatal. Under a beach umbrella by a swimming pool . . . then, take it easy.

— Elyse Knox — Monogram Pictures



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