Rules Supplementing The 'See And Be Seen' Concept

Routes, altitudes, rights-of-way and aircraft position lights—all are definitely specified in the FAA regulations. Compliance with these 'rules of the road' is important to maximum safety in flight

EDITOR'S NOTE: This is the third article in the series "Flight Rules For The VFR Pilot." In the first article we studied the VFR weather minimums and the segments of airspace to which the various minimums relate. In the second article we discussed the VFR rules relating to FAA's Air Traffic Service. In this article we will study the rules which supplement the "see and be seen" concept.

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VFR flight means flight in accordance with the visual flight rules. The VFR weather minimums are designed to provide that the VFR pilot exercising reasonable care will be able to see well enough to avoid collision with other aircraft or with the ground, or with structures which project into the navigable airspace. This is the so-called "see-and-be-seen" concept. This concept is supplemented by other flight rules which are designed to enhance the "see-and-be-seen" concept. These are the flight rules which specify altitudes, which assign rights-of-way and which require night lighting of aircraft. These rules are important because the pilot can expect that other pilots, operating VFR or IFR know these rules, and comply with them. If all airspace users know and comply with the rules, the pilot can anticipate and rely upon their actions.

Routes

Before discussing these rules, it may be well to say a word about routes. A pilot operating VFR—that is, under the visual flight rules—need not operate on established airways. Generally, an aircraft can be flown VFR over any route from departure to destination.

However, many VFR operations are conducted on the airways. We studied the airways structure in the first article of this series. We noted that there has been a gradual transition from the low/medium frequency ranges to the omniranges which is now virtually complete. This has engendered an important rule change. The VOR airway pattern is based on the principle that aircraft will be flown along a radial of a VOR station designated as forming the center line of a VOR airway and not to the right of the airway centerline as had been the practice in flying the L/MF range airway. Consequently, the rule that aircraft operating along an airway shall be flown to the right of the centerline of the airway has been rescinded. There is no regulatory requirement that the VFR pilot fly the centerline of the VOR airway.

Altitudes

The VFR pilot has available to him for his flight operations a whole spectrum of altitudes up to a practical ceiling of 24,000 feet MSL (mean sea level). This ceiling is caused by area positive control which is currently in effect from 24,000 feet to 60,000 feet (technically called Flight Level 240 to Flight Level 600) over virtually the entire continental United States. VFR operations cannot be conducted in area positive control. A pilot must have an instrument rating and special equipment to operate there.

In selecting an altitude below 24,000 feet MSL for his operation, the VFR pilot must comply with (1) the minimum safe altitude rules and (2) the cruising altitude rules.

Minimum Safe Altitudes. There is one overriding minimum safe altitude rule—a pilot must operate his aircraft at an altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface (Figure 2). In addition to this rule, the pilot must maintain a minimum safe altitude depending on the nature of the terrain or water over which he is flying (Figure 2). If he is flying over a congested area of a city, town or settlement, or over any open-air assembly of persons, he must maintain an altitude of at least 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet. In operating over populated, but noncongested, areas, he must maintain an altitude of at least 500 feet above the surface. Over open water or sparsely populated areas, he may operate his aircraft at any altitude but not closer than 500 feet to any person, vessel,

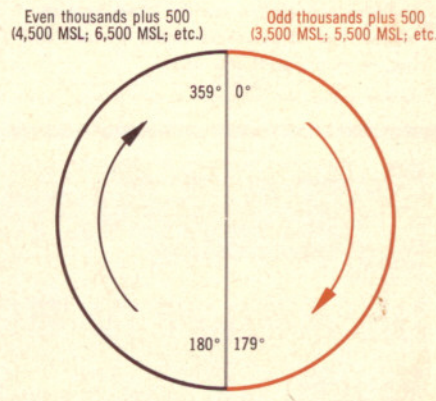


FIGURE 1

vehicle or structure. Helicopters may be operated at less than the minimums prescribed if the operation is conducted without hazard to persons or property on the surface.

The question is frequently raised as to what constitutes a congested area. We can get some guidance from recent enforcement cases. Sublette, Kan., with a population of about 1,000 has been held to be a congested area. So has Fort Yukon, Alaska, and the same has been held of a settlement consisting of a gasoline service station and cabins along U.S. Highway 90 between Biloxi and Gulfport, Miss. A residential area of about one square mile with a population of over 3,000 people has been held to be congested.

Landing and takeoff operations are excepted from these minimum safe altitude rules. This special treatment is needed because of the slanting nature of the flight path in takeoffs and landings. It is true that, in the case of some airports, full compliance with the minimum altitude rules is possible even during landing or takeoff. In many others, however, particularly in the case of those airports close to urban centers, compliance with these rules is not possible. So the rules provide that "except when necessary for takeoff or landing" the minimum safe altitudes must be observed. This permits the pilot to take full advantage of the performance capabilities of his aircraft.

In effect, it requires the pilot to do the best he can consistent with sound flying practice and the machine at his disposal to avoid unduly prolonged low flight. An aircraft pursuing a normal and necessary flight path in climb after takeoff or in approaching to land is in compliance with the minimum safe altitude rules. Maximum safety is achieved by relating the requirement to the particular performance capabilities of the aircraft under existing conditions.

The VFR pilot complies with the minimum safe altitudes by visual estimates of his altitude above the terrain and by reference to his aircraft's altimeter taking into consideration the altitude above mean sea level of the terrain below. When operating at or near minimums, it is important to remember that the altimeter may indicate an altitude higher than the actual altitude of the aircraft under certain atmospheric conditions.

The altimeter is a pressure measuring device which is accurate at all altitudes only when standard atmospheric conditions exist, i.e., when sea level barometric pressure is 29.92 inches Hg., when sea level free air temperature is 15°C, and when temperature decreases 2°C with each 1,000-foot increase in altitude. The local altimeter setting "corrects" for the difference between existing pressure and standard atmospheric pressure. But nonstandard lapse rates and temperatures usually produce small errors and these must be corrected mentally.

The effects of atmospheric temperature and pressure changes on the altimeter are summarized by the adage; "Cold or low, look out below"—when flying from warm air to cold air, and/or from high pressure to low pressure, your aircraft is lower than the indicated altitude, unless the altimeter is adjusted to compensate for the change.

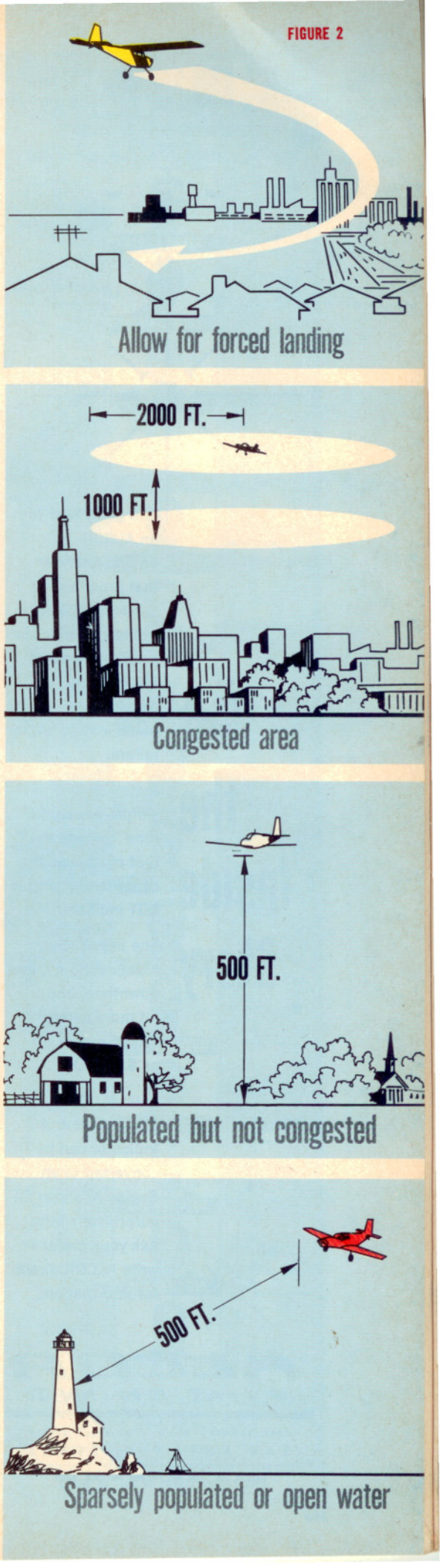
Cruising Altitudes. Below 3,000 feet AGL (above ground level), the VFR pilot may cruise at any altitude provided he complies with the minimum safe altitude rules. In selecting a cruising altitude at or above 3,000 feet AGL, the VFR pilot must consider his direction of flight. The rules establish cruising altitudes appropriate to the direction of flight. If his direction of flight is on a magnetic course of 0° through 179°, he must fly at any odd-thousand-foot MSL altitude plus 500 feet (such as 3,500 feet, 5,500 feet or 7,500 feet). If he is on a magnetic course of 180° through 359°, he may fly at any even-thousand-foot MSL altitude plus 500 feet (such as 4,500 feet, 6,500 feet or 8,500 feet). These are sometimes referred to as the semicircular rules (see Figure 1). Above 18,000 feet MSL the altitudes are technically referred to as flight levels, but the rules are the same up to 29,000 feet MSL (Flight Level 290).

The purpose of these rules is to provide aircraft operating in accordance with them a safe margin of altitude separation during level cruising flight. These rules are intended to provide the VFR pilot with at least 500-foot separation from IFR aircraft and at least 1,000-foot separation from VFR aircraft operating in an opposing direction from him. Aircraft operating under the instrument flight rules cruise at cardinal altitudes. IFR operations would normally be conducted at odd thousands on magnetic courses of 0° to 179° and even thousands on courses of 180° to 359°. However, ATC can and does modify these IFR altitude rules when issuing individual clearances. Aircraft operated IFR and cleared "on top" operate at altitudes prescribed for VFR flight. These rules apply in uncontrolled as well as controlled airspace so long as the flight is being conducted at or above 3,000 feet above the surface.

The cruising altitude rules do not purport to provide separation during periods of climb, descent, turning, or while holding in a holding pattern. It must be emphasized that the application of these rules in no way reduces the obligation of pilots to exercise utmost in-flight vigilance for collision avoidance purposes.

Each pilot maintains his cruising altitude with respect to the altimeter in the aircraft he is operating. Most aircraft are equipped with an altimeter setting window (sometimes referred to as the Kollsman window) which gives the pilot a way to adjust his altimeter for atmospheric pressure variations. In order that the system work, an attempt is made to standardize the altimeter settings of the aircraft operating in our airspace system. When operating below 18;000 feet MSL, the rules require that

FIGURE 2



each person operating an aircraft have his altimeter set to the current reported altimeter setting of a station along the route and within 100 nautical miles of the aircraft. If there is no station within this area, then the pilot may set his altimeter to the current reported altimeter setting of "an appropriate available station." In the case of an aircraft not equipped with a radio, the pilot can set his altimeter to the elevation of the departure airport or use an appropriate altimeter setting available prior to departure.

If each pilot operating an aircraft in a given area uses the same altimeter setting, each altimeter would be equally affected by temperature-pressure variation errors, making it possible to maintain desired altitude separation between aircraft. In this way, the altimeter setting provides common reference for indicated altitude.

In operating at or above 18,000 feet MSL (the jet routes) the rules provide for a standard altimeter setting of 29.92 inches Hg. The experience gained with the present volume of jet operations has led the FAA to conclude that the use of the standard setting is a requisite at higher altitudes. Standard setting eliminates altitude conflicts caused by altimeter settings derived from geographically different sources. In the average flight, one resetting during climb and one resetting in the terminal area before descent will replace the frequent resetting made necessary by rapid transit of pressure systems. Besides being better adapted to automatic flight and improving correlation between performance data and actual performance, the standard setting system eliminates station barometer errors and some of the altimeter instrument errors.

In order to facilitate compliance with the altimeter setting rules for flights below 18,000 feet MSL, both airport traffic control towers and flight service stations issue current altimeter settings in scheduled weather broadcasts (15 and 45 minutes past the hour), in communications with aircraft operating below 18,000 feet, and upon specific request.

Rights-Of-Way

Another set of rules whose purpose is to prevent in-flight collision are the "near-miss" and right-of-way rules. The overriding general rule is that no person may operate an aircraft so close to another aircraft as to create a collision hazard. Prearrangement is required for formation flight.

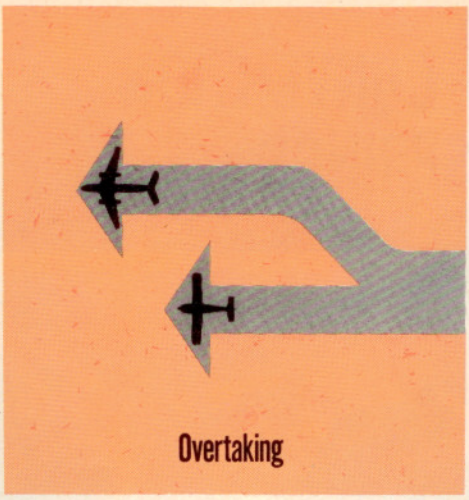
The right-of-way rules provide that when a pilot is able to see another aircraft and this other aircraft presents a potential collision hazard, the aircraft without the right-of-way must give way to the aircraft with the right-of-way. A pilot need not comply with the right-of-way rules if, because of restrictions to visibility beyond the pilot's control, the other aircraft cannot be seen. But the restriction must truly be beyond the pilot's control. This is illustrated by a recent court case which involved a collision between a Cessna in the traffic pattern doing touch-and-go landings and a Beech entering the pattern. The Beech entered the pattern in a 10° to 15° bank so that the Cessna was hidden under the wing and fuselage of the Beech. The court held that this restriction to visibility was not beyond the pilot's control and therefore the right-of-way rules applied.

FIGURE 3

The regulations assign the following rights-of-way. An aircraft in distress has the right-of-way over all other air traffic. When aircraft of the same category are converging at approximately the same altitude (except head-on, or nearly so), the aircraft to the other's right has the right-of-way (Figure 3). If the aircraft are of different categories, the right-of-way is given to the less maneuverable aircraft, i.e., (1) a balloon has the right-of-way over any other category of aircraft; (2) a glider has the right-of-way over any airship, airplane or rotocraft; and (3) an airship has the right-of-way over an airplane or rotocraft. An aircraft towing or refueling other aircraft has the right-of-way over all other engine-driven aircraft. During towing or refueling the aircraft involved are handicapped from maneuvering, and airplanes being refueled are critically short of fuel, which increases the necessity for refueling to continue without interruption.

When aircraft are approaching each other head-on, or nearly so, the pilot of each aircraft must alter course to the right (Figure 3). In certain situations, it is difficult to determine whether two aircraft are converging or approaching head-on. The regulations are not helpful in determining at what angle convergence ends and approaching head-on begins. In one violation case, one aircraft heading 330° and one heading 160°, it was held that the aircraft were head-on and not converging.

An aircraft that is being overtaken has the right-of-way and the pilot of an overtaking aircraft must alter

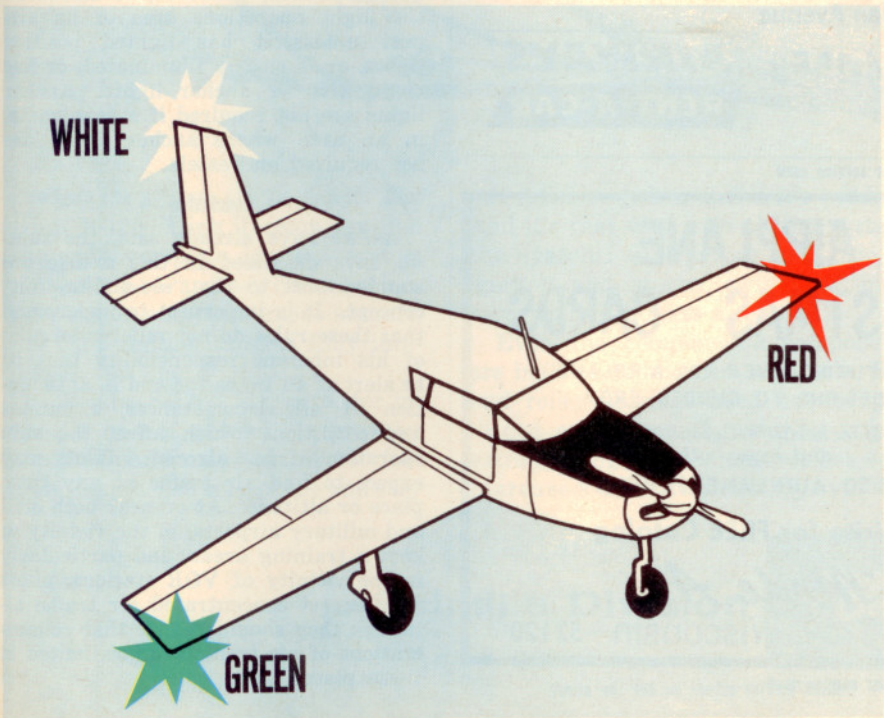


course to the right to pass well clear (Figure 3). In a recent violation case the pilot of the overtaking aircraft, instead of altering his course to the right, raised the nose of his aircraft and climbed over the overtaken aircraft. He was held in violation of the regulations.

Aircraft, while on final approach to land, or while landing, have the right-of-way over other aircraft in flight or operating on the surface. When two or more aircraft are approaching an airport for the purpose of landing, the aircraft at the lower altitude has the right-of-way, but it must not take advantage of this rule to cut in front of another which is on final approach to land, or to overtake that aircraft. When two aircraft are on final approach to the same runway at the same time, the one that is ahead of the other has the right-of-way even though at a higher altitude. These rules apply even at controlled airports. The FAA takes the position that controllers are provided to assist pilots, but they do not relieve pilots of their obligation under the regulations to observe and avoid other air traffic and to comply with the right-of-way rules.

Aircraft are required to comply with the applicable marine rules of the road when operating on water. These are similar to the aircraft right-of-way rules. When aircraft, or an aircraft and a vessel, are on crossing courses, the aircraft or vessel to the other's

FIGURE 4



right has the right-of-way. When aircraft, or an aircraft and a vessel, are approaching head-on, or nearly so, each must alter its course to the right to keep well clear. Each aircraft or vessel that is being overtaken has the right-of-way, and the one overtaking must alter course to keep well clear. When aircraft, or an aircraft and a vessel, approach so as to involve risk of collision, each aircraft or vessel shall proceed with careful regard to existing circumstances, including the limitations of the respective craft.

We noted in an earlier article in this series that in an emergency requiring immediate action, a pilot may deviate from the flight rules to the extent required to meet that emergency. But it has been consistently held that a pilot may not violate the right-of-way rules where he himself created the emergency. In one of the cases mentioned above, the pilot overtook and climbed over an aircraft. In defending a violation case he claimed that this action was required by the emergency, but it was held that the emergency was of his own making since he did not maintain a careful lookout for other traffic.

FAA recommends, "If you think another aircraft is too close to you, give way instead of waiting for the other pilot to respect the right-of-way to which you may be entitled. It is a lot safer to pursue the right-of-way angle after you have completed your flight."

Aircraft Lighting

Another set of collision avoidance rules relates to aircraft lighting. During the period from sunset to sunrise, an aircraft cannot be flown unless it has lighted position lights (Figure 4). In Alaska, lighted position lights are required when a prominent unlighted object cannot be seen from a distance of three statute miles or the sun is more than 6° below the horizon. During these darkness times, an aircraft cannot be parked, anchored, or moved on the flight operations area of an airport unless it has lighted position lights, or is clearly illuminated, or has obstruction or anchor lights. Anchor lights are not required if a seaplane is in an area where anchor lights are not required on vessels.

Conclusion

As we have already said, the rules we have discussed in this article are supplemental to the "see-and-be-seen" concept. It is important to understand that these rules do not relieve the pilot of his inherent responsibility that he be alert at all times for and in anticipation of all circumstances, situations and conditions which affect the safe operation of his aircraft. Pilots may expect to find air traffic at any time, place or altitude. At or near both civil and military airports, in the vicinity of known training areas, and particularly in the vicinity of VOR stations, pilots may expect concentrated air traffic although they should realize that concentrations of air traffic are not limited to these places only. ●