

AC NO: 90-36

DATE: 5/22/68



ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

SUBJECT: THE USE OF CHAFF AS AN IN-FLIGHT EMERGENCY SIGNAL

1. PURPOSE. This circular is to advise the aviation community of the value and proper usage of chaff to alert radar controllers to the presence of an aircraft in distress which has a two-way radio failure.
 2. REFERENCES.
 - a. Airman's Information Manual, Part 1.
 - b. Federal Aviation Administration (FAA) Handbook 7110.8, Chapter 6.
 - c. FAA Handbook 7110.9, Chapter 5.
 - d. Federal Aviation Regulations (FAR) Part 91.127.
 3. DEFINITIONS.
 - a. Chaff. Strips of coated material, usually aluminum foil, cut to a specific length making them tuned dipole antennas which reflect radar energy. Chaff manufactured to be detected by FAA air route surveillance radars (ARSR) is approximately four and one-half inches long and will reflect energy on frequencies from 1250 MHz to 1350 MHz. Chaff intended for use with airport surveillance radars (ASR) is approximately two inches long and covers the frequencies from 2700 MHz to 2900 MHz.
 - b. Chaff Bundle/Package. A small box, approximately 3x5x1 inch in size, which contains about six ounces of chaff. Packages designed for civilian use should contain a quantity of both lengths necessary to cover ARSR and ASR frequencies. The construction of the packet is such that after the pilot drops it from the aircraft the slipstream will open it and scatter the chaff.
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- c. Triangular Patterns. The triangle shaped flight patterns described in the Airman's Information Manual, the Department of Defense Flight Information Publications and FAA Controller Handbooks which are designated for use by an aircraft in distress which has radio failure.
- d. Radar Coverage. The airspace in which a radar facility is capable of detecting aircraft. See FAA Advisory Circular number 90-32 for a detailed explanation of radar capabilities and limitations.

4. DISCUSSION.

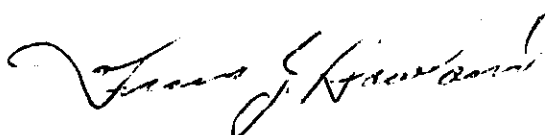
- a. Distress signals for in-flight emergencies vary from visual methods to sophisticated electronic devices. The declaration of an emergency by transmitting a "Mayday" call on voice radio is the most commonly used and is a very reliable method for a pilot to make his plight known. Another reliable system, which is dependent upon being within radar coverage of a ground radar facility, is the use of the radar beacon transponder.
- b. Pilots of aircraft not equipped or with malfunctioning radios and transponders face the predicament of choosing an alternative course of action when emergency assistance is required. The requirements of FAR 91.127 apply to operations under IFR after two-way radio failure. Under emergency situations or when operating VFR, there are two other methods for alerting the controller. The left or right triangular pattern system has been in effect for many years with varying degrees of success. In recent years the increase in the number of aircraft flying and the corresponding increase in air traffic control controller workload make it somewhat less likely that a radar controller will observe an emergency triangle. Also, small light aircraft possess a smaller degree of radar reflectivity, fly at lower altitudes where radar is less effective and usually are not equipped with beacon transponders. A means of target enhancement, designed primarily for light aircraft, has been developed and implemented by utilizing the principles of chaff.
- c. The procedure for utilizing chaff as an emergency signal is described in the Airman's Information Manual and in Controller Handbooks. A series of four spaced drops are recommended because the radar return which results will often resemble an emergency transponder return. Even if it does not, the distinctive appearance of the chaff should be sufficient to attract the attention of controllers. By dropping the chaff while flying a constant heading and then making a series of 360° turns, information will be provided to the controller as to the line of flight of the aircraft in distress and its relative position.

Additionally, it is conceivable that a radar controller might request a lost aircraft with an operable radio to drop chaff as a means of target enhancement. Pilots should never dispense chaff unless they are in distress and cannot make radio contact with a ground station or unless they are requested to do so. Indiscriminate drops could easily cause a hazardous situation by deteriorating the radar system or by initiating unwarranted rescue operations.

- d. Chaff was first used by the British during World War II as a confusion device to create false targets on enemy radar. This military application still exists and chaff bundles are also placed in parachutes and ejection seats to aid in the location of downed aircrews. The many thousands of strips contained in each packet cause a reflective cloud to appear on radar screens which remains visible as long as it is within radar coverage. The size of the "cloud" depends upon wind velocity, the speed of the aircraft which drops it, and the quantity of strips contained in the packet. The normal rate of fall for aluminum chaff is approximately 150 feet per minute when no thermals exist.
- e. Proper care of chaff packets is important and printed instructions should accompany them when they are purchased. Each strip has been coated to ensure dispersal and to prevent corrosion so there should be no deterioration. The three main points to remember are:
 - (1) Do not let water freeze within the packet. Water, in itself, will not harm the chaff but ice in the packet will probably prevent proper scattering when it is dropped.
 - (2) Do not compress the packet to the extent that the shape of the strips might be altered or matted. Each strip is made in a slight V shape to ensure the best reflectivity and ease of separation.
 - (3) Do not open the packet prior to use. The packets are made to facilitate scattering by the slipstream and premature opening will probably allow spillage and loss of contents.

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- f. Chaff may be procured from commercial sources and should be readily available to those who wish to take advantage of the additional safety and security it will provide. If a source is not available, local pilot organizations should have information pertaining to chaff purchase.



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