

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

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MARKING AIRDROKES.

By

P. James.

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Laboratory.

## MARKING AIRDROMES.\*

By

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Necessity of adopting for all aviation fields, civil or military, a single system of markers for giving the direction for starting and landing (with an automatic indicator of the direction of the wind) and of indicating the good part of the field.

Aviation accidents are very rare in full flight. Statistics show that 70% of the accidents are at the airdrome. They are almost always due to a disregard of two fundamental rules for piloting near the ground.

1. Start and land on good ground with a sufficient distance in front free from obstacles.
2. Start and land facing the wind and avoid turning too near the ground.

The methods commonly employed for indicating the direction of the wind often give false indications or are not sufficiently visible. Aviation fields are seldom defined clearly enough so that the markers are visible from above. The fields of Villacoublay and Bourget are exceptions. By giving pilots the means of knowing exactly the direction of the wind and the good portions of the field, we can eliminate at a single stroke nearly all airdrome accidents.

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\* From Premier Congrès Internationale de la Navigation Aérienne, Paris, November, 1921. Vol. II, pp. 115-118.

Methods hitherto employed. During the war, there was no general plan for marking military aviation fields and each commander, following his own initiative, made more or less satisfactory arrangements on his own field. We had to deplore the loss of excellent men and a large quantity of material, for the lack of rigid instructions and a systematic marking of the fields. The three methods of marking were:

Cloth T on the ground;

Cloth wind sleeves;

Smoke.

1. The Cloth T presents theoretically two advantages. It is plainly visible from the air and can be placed, for a given direction of the wind, on the most favorable part of the field, the part which has in front of it, in the direction indicated by the T, the best and longest strip of land.

In practice, since the T must be moved by hand, it does not always indicate the right direction and has therefore been gradually abandoned. Where it is still used, it generally indicates the location of the hangars.

2. Cloth sleeves. - These turn with the wind and at least have the advantage of not giving false indications. But they are not very visible, cling to the pole when the wind is weak and do not really indicate the direction for starting and landing, but rather two opposite directions (from which and toward which the wind blows) which may easily be mistaken. Lastly, the cloth is worn out quite quickly by the wind.

3. Smoke. - This has the advantage of being visible. It can moreover be produced in the part of the field to be utilized for starting and landing. It has the disadvantage of requiring the continual presence of a man to keep the fire going and to move it to the suitable locality.

Remark. - All these methods become valueless at night.

It is superfluous to dwell longer on the defects of these methods which seemed quite satisfactory during the war, when a few human lives counted but little and when aviation accidents passed unnoticed among all the other losses.

It is quite different today, when the main obstacle to the development of aerial transportation is the danger, which it is most urgent to diminish in every possible way.

The adoption of a mechanical indicator showing automatically the direction from which the wind comes is therefore of prime importance.

The desirability of providing all aviation fields, both civil and military, with one and the same type is no less evident.

#### Methods of marking now proposed.

After the armistice, this matter was taken up by the Technical Section of Aviation, to which we suggested certain methods of marking.

At the same time we carried out a series of experiments for the purpose of determining the shapes and colors most visible

from the air, and therefore most suitable for marking.

Our experiments were performed at Villacoublay by means of silhouettes of exactly the same surface area, which were all observed simultaneously by aviators at different altitudes.

The best shape for indicating direction was found to be a T and the next best was an arrow with a broad head (approaching a T).

The most visible color on all backgrounds is white, then bright red. Borders and bars, designed to differentiate the silhouette from snow, diminished its visibility by dividing up the surface. The visibility of the T is improved by putting cinders under it.

We recommend an automatic indicator in the form of a T turning with the wind.

We have seen that it is necessary to show the pilots:

1. The direction for starting and landing;
2. The part of the field which has in front of it, in the direction of the wind, the longest strip of ground free from obstacles.

The automatic T we recommend gives these indications accurately. In fact:

1. It is clearly visible up to 1000 or 1500 meters, according to the state of the atmosphere, an altitude great enough to enable any pilot to land at the right spot.
2. It turns automatically with the wind and constantly indicates the direction for starting and landing.

3. A sufficient number of them, placed on the perimeter of the field, indicate the part of the field it is dangerous to leave.

4. When placed on the perimeter of the field, there is, for every direction of the wind, one T which has in front of it the longest possible strip of good ground inside the limits.

5. By night, the indicators can be rendered luminous and furnish the same indications as by day.

6. Being mounted on ball bearings, they are very sensitive.

7. The simplicity and inexpensiveness of these devices make it possible to equip all fields liberally with them. It must not be forgotten that, at the present time, any airplane in flying order represents a value of 250000 to 300000 francs. The equipment of an aviation field with these T's costs less than a single serious accident.

#### Construction of the Automatic T.

This device, simple in appearance, presents some difficulties in construction. It has a metal frame for withstanding the very violent winds which sometimes prevail on the airdromes, and is mounted on ball bearings, in order to increase its sensitiveness to light winds and remove all cause for jamming.

The difficulty lies in giving it a nearly constant sensitiveness to winds of very variable intensity or, in other words, to make it sufficiently sensitive to a feeble wind, without dan-

ger of its becoming deranged in a strong wind.

The first ones made were continually in motion, due to local gusts of wind, often producing oscillations of great magnitude which were very disturbing for the aviators and which might lead to false deductions in regard to the true direction of the wind.

We were led to try a damping device consisting of paddles moving in a viscous and non-congealable liquid. The continual oscillations of the T are thus prevented and the latter only indicates the mean direction of the wind, instead of responding to every local gust. This principle has been applied to a certain number of T's constructed for the Aerial Navigation Service, with entirely satisfactory results.

#### Dimensions of T.

The dimensions adopted by the Aerial Navigation Service seem to be satisfactory. The T has a length of 7 meters, a span of 6 meters and a width of 1.2 meters.

For the sake of economy, only one T has thus far been installed on each field, the rest of the field being marked by red and white air-sleeves.

#### Height of T above Ground.

In our opinion, the T should be 2 or 3 meters above the ground, a height at which it is necessary to have a head wind in landing.

Translated by the National Advisory Committee for Aeronautics.

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