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PROTECTING ROCKETS FROM LIGHTNING

by

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PROTECTING ROCKETS FROM LIGHTNING

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Mention lightning and not only is everyone familiar with it but they are very much afraid of it. Thunderstorms are most common in the summer and fall. Every summer after the arrival of the rainy season, many cloud formations become electrically charged.

[Omitted is a brief description of how lightning is produced].

In order to avoid being struck by lightning, people use lightning rods on the tops of buildings. Lightning rods are designed on the basis of the point discharge principle. Today man's space activities have become more and more frequent and more and more large rockets are launched. In order to ensure that a launch is successfully carried out, people have to pay close attention to weather conditions for the period of the launch. Since, at the time the rocket is set upright on the launch pad, if there are electrically charged clouds approaching above it, there is the danger of the rocket being struck by lightning, and particularly after its has been fueled with propellant, if it is struck by lightning it can explode. This would be devastating to the entire launch pad.

What can be done? First of all it is necessary to rely upon the local weather reports in order to rationally plan the launch operation and to prevent the rocket and the electrically charged cloud

formation from meeting each other. But this is a passive measure. Today's weather reports can neither ensure sufficient accuracy nor a lack of danger. At many launch pads this problem appears to be even more serious, particularly during thunder storms.

Such being the case, what are the positive measures? This involves doing whatever possible in the area outside the launch pad to head off dangerous cloud formations which may be drifting toward the sky above the launch pad. This path is relatively broad and at present there are three steps which can be employed. The first is the principle of using lightning rods, within which the first measure is the placement of many vertical rods under the target cloud, and using the point discharge of these vertical rods to prevent electrical charging of the cloud formations. The second measure is using "lightning rods" which are extended into the cloud layer. This also can be accomplished by two measures. One is using a small solid-fuel rocket, such as a low-priced hail dispersing rocket, to raise a conductor wire up into the clouds, the other end of the conductor wire being buried in the ground giving rise to a connection between the sky above and the ground below (See Fig. 1). The electrical charge in the cloud formation can then be drawn through the conductor wire to the ground, causing the electrical charge in the cloud formation to disappear, and thereby eliminating the "electrified" cloud formation. Also using normal balloons, the conductor wires are carried into the clouds, and the result is the same as the above method (See Fig. 2). The second measure is using the gas dynamics method to try to change the path of movement of the target cloud formation. For example, using aircraft to drop into the clouds large amounts of substances which can have a scattering effect, causing the air currents to descend or to change directions. The third measure is trying to cause neutralization of the opposite charge in the target cloud formation. With this method aircraft can be used to drop into the cloud formation some metallized fiber chaff. These ultra-thin conductors cause the two different characteristic charges in the cloud to be joined and neutralized. Also, using small size rockets to penetrate electrified cloud formations can trigger lightning causing the two opposite charges to

become neutralized.

The various measures described above are, in principle, all feasible but the degree of difficulty in actually implementing them differs greatly. The science of the atmosphere is very complex and with respect to certain mechanisms of lightning, they are now still not completely understood. An infinite amount of energy is contained in the lightning occurring on the earth. The amount of energy stored in charged cloud formations in an area of 1000 cubic kilometers is comparable to that of several atomic bombs. If we had a more profound understanding of the mechanism of lightning phenomena, knew how to harness its efficiency and could just become the masters of the lightning, we could change harm into benefit and obtain good therefrom.

Fig. 1

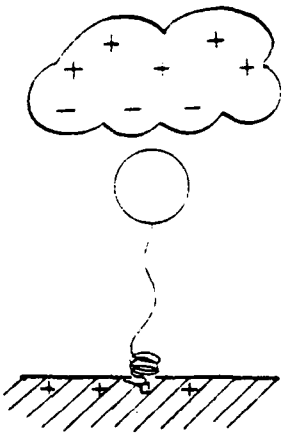

Fig. 2


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