Some Results of Investigation of IL-14 Airplane Electrization in Clouds and Atmosphere

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ABSTRACT: Data on IL-14 airplane electrization in clear atmosphere, convective and stratified clouds, clouds of the explosion of anti-hail gear Elbrus-2 have been presented.

INTRODUCTION

The study of the airplanes electrization is very important for providing the flights safety [Imianitov, 1970]. We have a considerable quantity of experimental data about IL-14 airplane electrization. But we have few publications on this question [Amiranashvili, et al.,1988].In this short work some new results have been presented.

DATA DESCRIPTION

Measurements were conducted in different regions of Georgia since 1965 to 1977. The airplane speed was approximately 250 km/hr. Flights were conducted in more than 450 convective clouds (including 25 clouds, affected by a crystallizing agent PbI2) and in 30 stratified clouds. In 40 cases, the flights were conducted in clear atmosphere. In 58 cases, there was investigated an airplane electrization in clouds of explosion of an anti-hail gear Elbrus-2, containing reagents AgI, PbI2 and NaCl. In some cases, at the same time, concentration of aerosols of over 0,7 mkm diameter was measured in a free atmosphere. A unit of an airplane charge measurement Q is given in 10^-6 C, omitted further for better convenience.

RESULTS

The Table 1-2, and Figure 1-2 presents some data of plane electrization Q:

Table 1. Data of airplane electrization Q under different conditions of flight , 10^-6 C.

Flight conditions	Flight altitude (km)	Cloud vertical thickness (km)	Q mean	Q max
Clear atmosphere	1.0		2-10	25
	2.0		1.5-6	15
	3.0		0.5-4	8
Cloud of	3.0 (PbI2)		6-8	
Explosion of	3.0 (AgI)		8-10	
Elbrus-2	3.0 (NaCl)		4-6	
Convective clouds		0.7-1.0	6.9	60
		1.5-1.8	16.5	120
		2.3-2.6	23.1	200
		3.1-3.4	30.4	280
Convective clouds affected by PbI2		2.0-2.8	40	350
Stratified clouds				
(St)	3.0		25	60
(As)	4.0		80	110
(Ns)	4.0		120	180

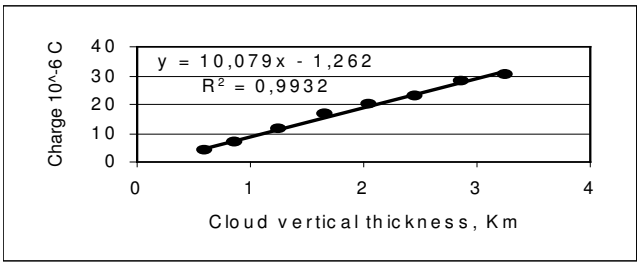

Figure 1. Airplane electrization in the middle part of convective clouds.

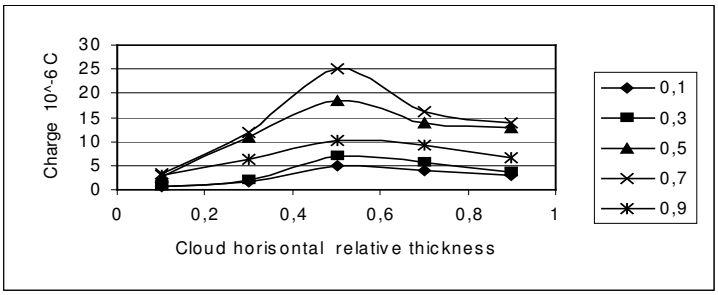

Figure 2. The airplane electrization in different parts of convective cloud.

Table 2. The airplane electrization Q in different parts of convective cloud.
X –cloud horizontal relative thickness. X = 0.1, 0.3, 0.5, 0.7, 0.9

Cloud vertical relative thickness	Airplane charge, 10^-6 C
0.1	Q = 295.31 X^4 – 613.33 X^3 + 409.72 X^2 – 90.667 X + 6.1633
0.3	Q = 420.83 X^4 – 881.46 X^3 + 594.6 X^2 – 133.89 X + 9.1019
0.5	Q = 725.26 X^4 – 1405.8 X^3 + 839.22 X^2 – 141.84.X + 9.8252
0.7	Q = 1462.5 X^4 – 2904.4 X^3 + 1824.9 X^2 – 368.01 + 24.609
0.9	Q = 223.18 X^4 – 473.96 X^3 + 307.49 X^2 – 54.66 X + 5.8127

Figure 1-2 and Table 2 shows a generalized picture of airplane electrization in different parts of a convective cloud. In particular, electrization of a plane is a maximum in the middle of a cloud at the level of 0.7 part from its vertical thickness (Figure 2).

CONCLUSION

Airplane electrization Q depends on the atmosphere condition. The greatest value Q was observed in the convective cloud, affected by crystallizing agent PbI2. Mainly electrization of a plane is a maximum in the middle of a cloud at the level of 0.7 part from its vertical thickness

REFERENCES

Amiranashvilvili, A.G.,A.G.Nodia, A.Z.Makharashvili , Electrization of airplane IL-14 in free atmosphere depending on the of the aerosols content,“Atmospheric electricity”,Gidrometeoizdat, Leningrad, 264-265, 1988, (in Russian).

Imianitov, I.M., Airplanes electrization in the clouds and precipitation, Gidrometeoizdat, Leningrad, 1-210, 1970.