ACHIEVEMENT OF SALVATION - EVACUATION MAPPING FOR HENRY COANDA AIRPORT

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Abstract: *In accordance with international regulations for the safety of airports, each international airport must achieve a salvation - evacuation map for special cases. Special cases can be fires, aircraft accidents, catastrophic events on the airport or around of the airport. The map is carried out on areas mainly as two parts, one close to the airport and the other far away. The salvation - evacuation map must contain certain elements of interest for such events. For example: hospitals, medical aid points, water sources close to the points, etc. Surveyor specialist role is vital in such cases and without his contribution, the map can not be achieved under optimum conditions.*
Keywords: *salvation - evacuation map, distance, special cases*

1. GENERAL CONSIDERATIONS

An airport can be compared to a tourist town, where it is swirled thousands and hundreds of thousands of people in a very short time. In addition to people there is a traffic aircraft carrying passengers and merchandise at a rate that depends on where it is physically located. Like any vehicle, aircraft may be damaged or other problems may occur on board which may lead to air disasters. Let us remember that in the Henry Coanda Airport neighborhood an unfortunate event occurred . On March 31, 1995 , TAROM Flight 371 Bucharest - Brussels crashed near a railway of Baloteşti Commune and 59 people died in the largest aviation disaster in the history of Romania. The Airbus A-310 aircraft that were three Americans, a Frenchman, a Dutchman, two Spaniards, a Thai, nine Romanian and thirty two Belgian took off from Otopeni airport at 9.11 .

In such cases the availability of a salvation - evacuation map is vital to conduct oparation of rescue and assist victims. First is the need to know exactly the point where the accident happened. The point is located on the existing map and in function of the place the decision is taken. Firstly it seeks the nearest gateway to that point and how intervention teams can reach this point. It is fire trucks, ambulances , official cars, etc. On the map on finds all roads in the area, specifying road pavement. Respectively if asphalt, stone, ground or other materials. Each bridge or culvert on the way from airport to the point must have mentioned the weight it can support so that fire trucks can pass in good condition.

Another important element to be mapped is the nearest water source because in case of fire, fireman must know the nearest water source and how it can connect to this source . Water sources can be hydrants for inside of localities and fountains, flowing rivers, lakes, etc. for outside of city.

Also very important are hospitals and first aid points. At each such location must be written the following: - You can treat in the hospital or aid point (depending on the material facilities and specialists) - The number of available beds Salvation - evacuation maps are talking generic is referred to aircraft language "Squared maps" . We quote from the decision of the Director General of the Romanian Civil Aviation Authority no. 636/24.07.2012, which defines in Article 2.3.2.15, the squared maps.

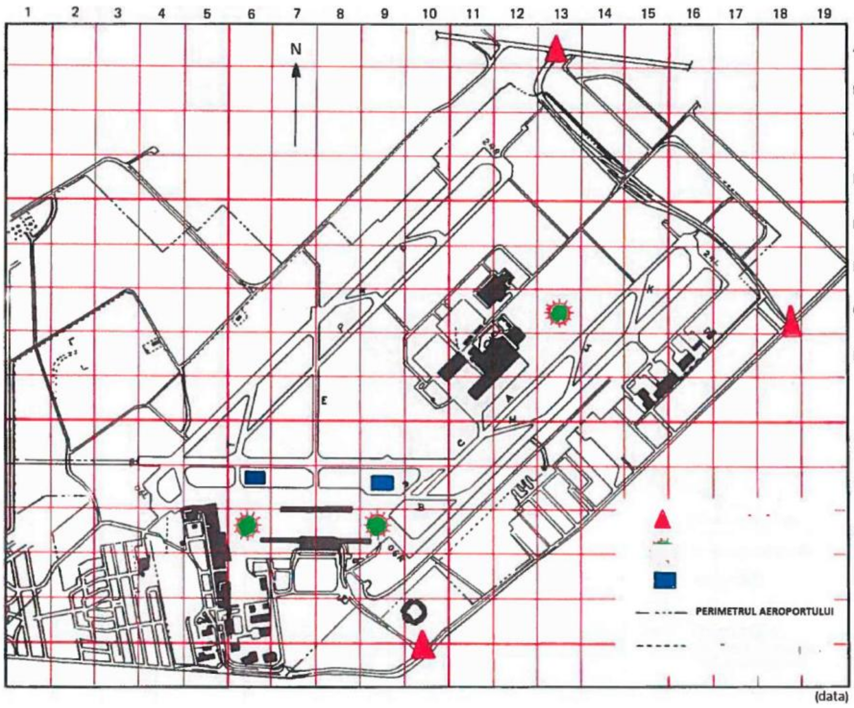
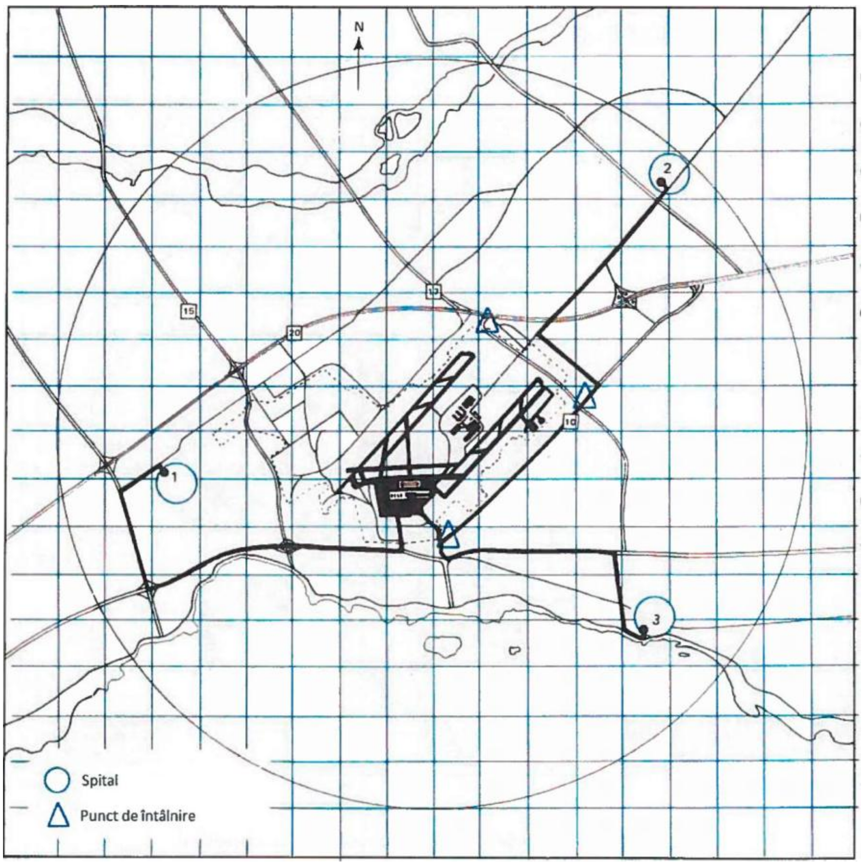


Figure 1.1 , the squared maps , a) Detailed map

(1). Squared maps are used to coordinate and inform all emergency forces the place on - site with the emergency point and share with the emergency plan and includes:

a) Detailed map of the aerodrome and its vicinities, who must present the plan of the aerodrome, gateways (resistance to heavy vehicles), the location of the water tank, the meeting points of the forces and institutions that come to intervention, waiting areas, and so on.

b) Map of classification in the area of the aerodrome, which must include the surrounding towns and describe related medical facilities, gateways (resistance to heavy vehicles) meeting points to be transported away the emergency victims,



facilities available

Figure 1.1 , the squared maps, b) Map of classification in the area of the aerodrome

(1). medical, information about potential ability to receive hospital beds and medical specialties hospital .
(2). Each hospital will be identified (numbered) distinct and medical specialty, number of beds, staff , etc., shown separately.
(3). The two maps grid will be established so as not to allow overlapping quadrate encoding encryption between the two maps, in order to avoid misinterpretation of maps and different colors will be used for squares .
(4). It will determine how to update the maps and the destruction of those who are no longer valid. .
(5). Both squared maps on A3 format, printed front / back will be distributed to all forces and institutions when signing / agreeing mandatory plan and will be used to indicate both the location of the emergency and the exercises and emergencies. They will be placed compulsory on board all means of transport saving intervention participating in the intervention.

2. CURRENT SITUATION

For an airport to become international that operate with abroad aircraft must meet some minimum requirements. One of the conditions required it is to achieve the squared maps, so every major airport hire specialized companies to perform this work. Practically every airport, at the time it was declared International have a map of this type. The maps were made at the time of 1996-1997 and includes situations at the time. In 2011, Henri Coanda International Airport launched a procurement procedure for making the necessary topographical works of his activity at the airport. Among the works performed included the squared map or salvation - evacuation map. During 2012 the airport launch the preparation of these maps and was performed within about three months. The rest of Romanian airports order the achievement of these maps by organizing public tenders.
The squared map is part of so called "emergency plan" that includes several documents and procedures in accordance with international requirements imposed by the Civil Aviation Authority. As events where the squared map is necessary are listed :
- Aviation accident on airport, aviation accident outside the airport,
- Failure of the aircraft in flight ,
- Fires in buildings and installations of the airport, bomb threat (aircraft or structure / building),
- Unlawful seizure of aircraft, crisis caused by adverse weather events (heavy snowfalls, storms, etc.)
- Crisis caused by epidemics,
- Natural disasters, incident at the airport ,
- Emergencies in difficult environments .
These squared maps were made for airports Henry Coanda and Aurel Vlaicu, both serving the Romanian capital, Bucharest.

3. CASE STUDY

The case study is focused on achieving square maps for Henry Coanda airport. As was shown in Chapter 1 , are drawn two squared maps , one within the airport , and other within the airport and surroundings .
To accomplish the work, two teams were formed , one to collect data within the airport and one for data collection outside the airport . Each team was composed of five persons,

specialists in determining the position. Each person had equipped GNSS receiver type TOPCON GMS 2, which provides sub-meter absolute determination system .
To determine the position of the points we used ROMPOS system.
ROMPOS include the following services :
- ROMPOS DGNSS - for applications with real-time kinematic positioning accuracy of 0.5 - 2m. RTCM data format .
- ROMPOS RTK - for applications with real-time kinematic positioning accuracy of up to 2 cm. RTCM data format .
- ROMPOS GEO - for post-processing applications and a positioning accuracy of less than 2cm . RINEX data format .
The position will be based on direct observations to satellites and differential corrections transmitted in real time from a fixed station or a network of reference stations.
Corrections submitted :
- Corrections pseudodistance
- Corrections of variation of the pseudodistances

The pseudodistances (satellite receiver distance) is determined based on:
- Codes (version DGNSS)
- Measurements made using phase carrier wave (RTK version)
Transfer corrections are done through the internet. Data are transmitted in a standardized format RTCM (Radio Technical Commission for Maritime Services) using NTRIP technology (protocol data distribution format RTCM via Internet). NTRIP allow broadcasting differential corrections in RTCM format and internet access to mobile telecommunication networks based on IP (Internet Protocol) - GSM, GPRS, EDGE .
Accuracy of the positioning depends on the solution obtained :
- Fixed solution provides accuracies of the order of 2 - 3cm at a distance of 30 km from the reference station
- Float solution provides accuracies of the decimeter order. This precision is not supported by ANCPI, and either of users for precise measurements or even for small scale measurements detail. Solution occurs when in the area of measurements exist obstructions (buildings, trees, etc.), or when the distance from the reference station is too high.
To make sure we obtained accuracy using ROMPOS, was stationed the same points with geodetic GPS receivers class and measured both methods statically and ROMPOS. The difference between the two methods were in the order of 2-3 cm for fixed ROMPOS solution and 30-40 cm ROMPOS float solution. ROMPOS float solution, for two points difference was about 1 meter. ROMPOS float solution, for two points difference was about 1 meter . The results are shown in Table 3.1
Another method of determining the details was the ortho. On orthophotomap were identified driveways. In the land was established type of specifying road pavement and how to access the road (one-way, special conditions, etc.).

Table 3.1, Results of the measurement

Statically methods				ROMPOS				Differences			
Stereografic 1970 coordinate				Stereografic 1970 coordinate				Differences			
Point name	x [m]	y[m]	h[m]	Point name	x [m]	y[m]	h[m]	dx [mm]	dy [mm]	dh [mm]	Solution
S17	444578.681	227850.506	120.378	S17	444578.685	227850.51	120.411	-4	1	-33	Fixed
S18	444666.74	227691.548	119.938	S18	444666.744	227691.55	119.924	-4	2	14	Fixed
SX1	434162.265	199378.014	86.044	SX1	434162.249	199377.91	85.666	16	102	378	Float
SX10	443769.702	220955.008	109.85	SX10	443769.803	220954.99	110.086	-101	14	-236	Float
SX100	434659.363	201739.431	88.585	SX100	434659.39	201739.23	88.522	-27	204	63	Float
SX11	443821.56	220871.626	110.506	SX11	443821.392	220871.55	110.023	168	74	483	Float
SX12	443023.204	214534.486	100.885	SX12	443023.415	214534.65	100.494	-211	-163	391	Float
SX13	443011.97	214493.616	103.275	SX13	443011.903	214493.68	103.364	67	-65	-89	Float
SX14	443513.054	218519	105.713	SX14	443513.109	218519.18	105.766	-55	-179	-53	Float
SX15	443544.436	218579.427	108.106	SX15	443544.776	218579.46	108.24	-340	-34	-134	Float
SX16	441956.723	209246.718	96.257	SX16	441956.738	209246.49	95.961	-15	225	296	Float
SX17	441970.884	209243.96	96.27	SX17	441970.859	209243.8	96.461	25	165	-191	Float
SX18	439402.669	204551.164	91.474	SX18	439402.092	204551.25	90.945	577	-88	529	Float
SX19	439393.429	204521.571	90.799	SX19	439392.353	204520.94	91.018	1076	635	-219	Float
SX2	434180.348	199478.311	86.42	SX2	434180.442	199477.94	86.039	-94	367	381	Float
SX20	444168.76	225922.244	117.404	SX20	444169.049	225922.13	117.419	-289	119	-15	Float
SX21	444181.881	225723.238	114.142	SX21	444182.329	225723.34	114.894	-448	-98	-752	Float
SX3	434774.346	203165.52	88.303	SX3	434774.388	203165.44	88.174	-42	84	129	Float
SX4	434746.003	203221.256	88.097	SX4	434746.108	203221.08	87.934	-105	181	163	Float
SX5	435623.43	206330.396	92.513	SX5	435623.244	206330.2	92.924	186	197	-411	Float
SX6	435702.777	206317.624	91.577	SX6	435702.621	206317.38	91.836	156	249	-259	Float
SX7	437645.5	210163.551	95.507	SX7	437645.381	210163.46	95.733	119	93	-226	Float
SX8	440339.859	212484.503	96.849	SX8	440340.336	212484	96.329	-477	502	520	Float
SX9	440339.078	212541.345	99.818	SX9	440339.084	212541.33	99.792	-6	19	26	Fixed
SX99	434980.208	201919.236	87.651	SX99	434980.195	201919.24	87.681	13	0	-30	Fixed

4. CONCLUSIONS

Given the above, the method we used to determine the details of the squared maps is very good . The accuracy of determining the points is of about 1 m and is sufficient for the needs of the subject. It was identified a number of 75 hydrants that are on the detailed map, inside the airport. In addition, on the map of classification in the area of the aerodrome, has been identified a number of hydrants 21.

Also identified 21 points of first aid and hospitals.

We can say that the method was chosen corresponds qualitatively with the requirements of decision number 636/24.07.2012 of the Director General of the Romanian Civil Aviation Authority.

Table 3.1 is significant in this respect, the differences between determination geodetic class GNSS receivers and determination with receivers of the type TOPCON GMS 2 are insignificant for the needs required in the paper.

Figures 4.1 is squared maps made for Henri Coanda International Airport (inside). The map outside the airport can not be presented due to the scale of representation.

Figure 4.1

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