Model to formation data base of secondary parameters for assessing status of the state secret protection

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Abstract

Protection of classified information, especially state secrets, is an important task in the field of national and information security of the state. To minimize possible damage to the national security of Ukraine from violations in the field of state secret protection and to reduce the negative international rating and other serious consequences at the state level, the task of creating specialized databases, developing and improving existing methods and models that implement relevant assessments is urgent. That is why the theoretical-multiple presentation of the parameters of the "Report on the State of Protection of State Secrets" in tuple models allows solving the actual scientific and practical task of formalizing the process of assessing the negative consequences of leaking a state secret, its disclosure or loss of Material Carriers of Secret Information (MCSI), violation of the secrecy regime and state of ensuring the protection of country's secrets in general. Previously, a tuple model of primary and internal parameters was developed, and now, as its completion, a model of secondary parameters and its hierarchical structure has already been proposed, due to the integrated theoretic-multiple representation of sets characterizing information: the implementation or ordering (scientific and/or scientific and technical support) of secret research, development, design and other scientific works, manufacture of secret products, regime premises, objects of information activity, international cooperation, etc., allows to determine sets of input and output parameters for the formation of special databases and formalization of the process of damage assessment caused to national security by violations of state secret protection mechanisms. In the future, to implement the above-mentioned process, it is necessary to develop a method of assessing the state of protection of the country's secrets both separately for the subject of regime-secret activity (reporting entity) and for the organization (institution) to which the reporting entities are directly subordinated.

Keywords

limited access information protection, state secrets protection, parameter model

1. Introduction

From 2014 to the present, the number of security breaches as a result of treason and/or sabotage, in terms of loss, disclosure, or transfer of information including information with limited access, especially State Secrets (SS), is increased significantly both in the world [1, 2], as well as in Ukraine [3]. This process became more active after the occupation of certain territories of Ukraine (Donetsk and Luhansk regions, the Autonomous Republic of Crimea). As a result, to strengthen national security in the sphere of State Secret Protection (SSP), the NSDC decisions "On additional measures to strengthen the national security of Ukraine" and "On the state of overcoming negative consequences caused by the loss of material carriers of secret information in the temporarily occupied territory of Ukraine, in the area of the anti-terrorist operation in the Donetsk and Luhansk regions" were taken. To improve reporting on the state of protection of SS and by the requirements of the law [4], the appropriate forms of reports on the status of SS protection (hereinafter—Report) and instructions on the procedure for their execution and submission [5] were approved and updated.

The report was supplemented with dynamically changing sets of identifying and evaluation parameters for determining the state of the provision of SSP, presented in separate sections of this report. The specified update makes certain corrections and additions to the already developed model for assessing the consequences of the leaks of state secrets from cyber attacks on the critical information infrastructure of the country [6]. There is also a need for further improvement of methods and models for evaluating damage to the national security of Ukraine in the event of an SS leak [7–12], taking into account the use of a theoretical-multiple approach [13], and the development of a method for assessing the state of ensuring the SSP of a

CSDP-2024: Cyber Security and Data Protection, June 30, 2024, Lviv, Ukraine
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reporting entity as a Subject of Regime-Secret Activity (SRSA), (for example, a Critical Infrastructure Object (CIO), in the event of classified information leaks. To implement such a method, models for forming a database of a section of the parameters (primary [14], internal [15]) for evaluating the state of provision of SSP for SRSA at CIO were developed.

2. Formulation of the problem

To minimize the consequences of possible damage to the national security of Ukraine from breaches in the field of SSP and to reduce the negative rating at the state level, it is necessary to create databases, methods, and models that implement appropriate assessments. Therefore, the theoretical-multiple presentation of the parameters of the Report defined by its separate sections, which contain information about [5] the reporting entity, its subordination and departmental affiliation; financing of SSP activities; personnel of the reporting entity having permission and access to SS; the number of material carriers of classified information; implementation and ordering (scientific and/or scientific and technical support) of secret research, development, design, and other scientific works, manufacturing of secret products; regime premises, objects of information activity; facts of losses of MCCI or disclosure of information constituting a state secret, as well as classified information about foreign states, international organizations and international cooperation [16–18].

Therefore, the generalization and presentation of these parameters by a tuple model is an urgent scientific goal, which allows solving the scientific and practical tasks of forming a database of parameters of the state of SSP provision for creating a method of processing input data (identification, static and other sets) and formalizing the process of assessing the state of SSP at CIS from the negative consequences of a SS leak or caused by the loss of MCSI or its disclosure.

In this regard, the purpose of this work is to develop a model for the formation of a database of secondary parameters, which, due to the theoretical multiple representations of parameters as identification, static, and other sets of input data, allows to assess the state of provision of SSP for SRSA at OCI in the event of negative consequences (damages) caused by the leak of SS, its disclosure or loss of the MCCI, breach of the secrecy regime, etc.

3. Completion of model development

We will use the set of all possible identifiers of IS (Information about the Subject) tuples, which can be used to display information about SRSA and use it in the process of detecting and assessing the consequences in case of loss of SS [19, 20]:

$$\mathbf{IS} = \left\{ \bigcup_{\varphi=1}^{z} \mathbf{IS}^{\varphi} \right\} = \{\mathbf{IS}^{1}, \mathbf{IS}^{2}, \dots, \mathbf{IS}^{z}\}, \quad (1)$$

where $\mathbf{IS}^{\varphi} \subseteq \mathbf{IS}$ $(\varphi = \overline{1,z})$ is the identifier of the tuple of parameters characterizing the φth SRSA.

For example, at $z = 4$ (1) will have the form [15]:

$$\mathbf{IS} = \left\{ \bigcup_{\varphi=1}^{4} \mathbf{IS}^{\varphi} \right\} = \{\mathbf{IS}^{1}, \mathbf{IS}^{2}, \mathbf{IS}^{3}, \mathbf{IS}^{4}\} = \{\mathbf{IS}^{\mathrm{NAU}}, \mathbf{IS}^{\mathrm{ZMI}}, \mathbf{IS}^{\mathrm{SSU}}, \mathbf{IS}^{\mathrm{SII}}\},$$

where $\mathbf{IS}^{1} = \mathbf{IS}^{\mathrm{NAU}}$, $\mathbf{IS}^{2} = \mathbf{IS}^{\mathrm{ZMI}}$, $\mathbf{IS}^{3} = \mathbf{IS}^{\mathrm{SSU}}$, $\mathbf{IS}^{4} = \mathbf{IS}^{\mathrm{SII}}$ is respectively, the identifiers of the tuples of the SRSAs National Aviation University (NAU), Zhytomyr Military Institute named after S. P. Koroliov (ZMI), National Academy of the Security Service of Ukraine (SSU), Sumsk Investigator's Isolator (SII).

For the φ^{th} SRSA, the tuple of parameters that characterizes it has the following form:

$$\mathbf{IS}^{\varphi} = \langle \mathbf{IS}_{1}^{\varphi}, \mathbf{IS}_{2}^{\varphi}, \dots, \mathbf{IS}_{i}^{\varphi}, \dots, \mathbf{IS}_{k}^{\varphi} \rangle, \quad (2)$$

where $\mathbf{IS}_{i}^{\varphi} \subseteq \mathbf{IS}^{\varphi} (i = \overline{1,k})$ is the component of the tuple, which is a sub-tuple, maps the i^{th} identifier to the φ^{th} SRSA parameter, and k is the maximum number of such parameters. Significantly, all members **IS** are characterized by order property.

For example, according to the Generalized Report and the Report [5] at $k = 9$ the tuple (2) we define as:

$$\mathbf{IS}^{\varphi} = \langle \mathbf{IS}_{1}^{\varphi}, \mathbf{IS}_{2}^{\varphi}, \dots, \mathbf{IS}_{9}^{\varphi} \rangle,$$

where, for example, subtuple $\mathbf{IS}_{1}^{\varphi}$ is section 1 ("Information about SRSA, it is subordination and departmental affiliation"), and other components are indicated in Table 1.

Let's divide the components $\mathbf{IS}^{\varphi}$ of Table 1 by types of parameters primary, internal, and secondary. The first group of (primary) and the second group of (internal) parameters are discussed in detail in scientific papers [14, 15], and therefore we will describe the following third group of secondary parameters $\mathbf{IS}_{5}^{\varphi} .. \mathbf{IS}_{9}^{\varphi}$ to complete the development of a model for the formation of a database of parameters for evaluating the state of provision of SSP.

Table 1
An example of the description of components $\mathbf{IS}^{\varphi}$

Type of parameters	$\mathbf{IS}_i^{\varphi}$	Symbolic designation	Description of $\mathbf{IS}^{\varphi}$
Primary	$\mathbf{IS}_1^{\varphi}$	**Section I**	Information about the reporting entity, its subordination, and departmental affiliation
56,067	$\mathbf{IS}_2^{\varphi}$	**Section II**	Information about RSO, financing of activities for SSP
Internal	$\mathbf{IS}_3^{\varphi}$	**Section III**	Information on whether employees of the reporting entity have permission and access to state secrets
54,636	$\mathbf{IS}_4^{\varphi}$	**Section IV**	Information on the number of material carriers of classified information (MCCI)
Secondary	$\mathbf{IS}_5^{\varphi}$	**Section V**	Information on the implementation (scientific and/or scientific and technical support) of secret research, development, design, and other scientific works, the manufacture of secret products
56,010	$\mathbf{IS}_6^{\varphi}$	**Section V(A)**	Information regarding the orders (scientific and/or scientific and technical support) of secret research, development, design, and other scientific works, the manufacture of secret products
56,532	$\mathbf{IS}_7^{\varphi}$	**Section VI**	Information about regime premises, objects of information activity
54,775	$\mathbf{IS}_8^{\varphi}$	**Section VII**	Information about the facts of losses of the MCCI or the disclosure of information constituting a state secret, as well as information with limited access to foreign states or international organizations
50,066	$\mathbf{IS}_9^{\varphi}$	**Section VIII**	Information about international cooperation
Primary	$\mathbf{IS}_1^{\varphi}$	**Section I**	Information about the reporting entity, its subordination, and departmental affiliation
53,709	$\mathbf{IS}_2^{\varphi}$	**Section II**	Information about RSO, financing of activities for SSP

The fifth component of the sub-tuple $\mathbf{IS}_5^{\varphi}$ is Section 5 ("Information on the implementation (scientific and/or scientific and technical support) of secret research, development, design, and other scientific works, the manufacture of secret products") is filled in by the SRSA (institutions) that are contractors of works and products as of the end of the reporting period by filling in the appropriate columns (parameters):

$$\mathbf{IS}_5^{\varphi} = \langle \mathbf{IS}_{5.1}^{\varphi}, \mathbf{IS}_{5.2}^{\varphi}, \dots, \mathbf{IS}_{5.10}^{\varphi} \rangle = \langle \mathbf{N}^{\varphi}, \mathbf{SS}^{\varphi}, \mathbf{tW}^{\varphi}, \mathbf{SW}^{\varphi}, \mathbf{nSW}^{\varphi}, \mathbf{pSW}^{\varphi}, \mathbf{tP}^{\varphi}, \mathbf{SP}^{\varphi}, \mathbf{nSP}^{\varphi}, \mathbf{pSP}^{\varphi} \rangle,$$

where $\mathbf{IS}_{5.1}^{\varphi} = \mathbf{IS}_{1.1}^{\varphi} = \mathbf{N}^{\varphi}$ (*Name*) is the set "Actual and conditional (if available) name of the reporting entity";

$\mathbf{IS}_{5.2}^{\varphi} = \mathbf{IS}_{4.2}^{\varphi} = \mathbf{SS}^{\varphi}$ is the set *Secrecy Classification*;

$\mathbf{IS}_{5.3}^{\varphi} = \mathbf{tW}^{\varphi}$ is the set *Total works* (the sum of graphs 6–13);

$\mathbf{IS}_{5.4}^{\varphi} = \mathbf{SW}^{\varphi}$ is the set *Including works under the state defense order*;

$\mathbf{IS}_{5.5}^{\varphi} = \mathbf{nSW}^{\varphi}$ is the set *Number of secret SRW, RDW, projects, and other scientific works*;

$\mathbf{IS}_{5.6}^{\varphi} = \mathbf{pSW}^{\varphi}$ is the set N*umber of component parts of secret SRW, RDW, project, and other scientific works*;

$\mathbf{IS}_{5.7}^{\varphi} = \mathbf{tP}^{\varphi}$ is the set *Total products* (the sum of graphs 16–21);

$\mathbf{IS}_{5.8}^{\varphi} = \mathbf{SP}^{\varphi}$ is the set Including *products under the state defense order*;

$\mathbf{IS}_{5.9}^{\varphi} = \mathbf{nSP}^{\varphi}$ is the set *Number of secret products*;

$\mathbf{IS}_{5.10}^{\varphi} = \mathbf{pSP}^{\varphi}$ is the set *Number of component parts of secret products*.

For example, to assign specific values to the next ten parameters of the fifth component $\mathbf{IS}_5^{\varphi} \subseteq \mathbf{IS}^{\varphi}$ let us use SRSA $\mathbf{IS}^1 = \mathbf{IS}^{\mathrm{NAU}}$ [5, 14, 15, 19, 20]:

$$\mathbf{IS}_{5.1}^{\varphi} = \mathbf{IS}_{1.1}^{\varphi} = \mathbf{N}^{\varphi} = \left\{ \bigcup_{i=1}^{h_1} N_i^{\varphi} \right\} = \left\{ N_1^{\varphi}, N_2^{\varphi}, \dots, N_{h_1}^{\varphi} \right\}, \quad (4)$$

where $N_1^{\varphi} \subseteq \mathbf{N}^{\varphi}$ $(i = \overline{1, h_1})$ is the i^{th} valid name and conditional name of φ^{th} SRSA, and h_1 is the number of these names (for example, at $\varphi = 1$, $y_1 = h_1$, $h_1 = 1$) then(4) acquires the form [14]:

$$\mathbf{N}^{\varphi} = \left\{ \bigcup_{i=1}^{3} N_i^{\mathrm{NAU}} \right\} = \left\{ N_1^{\mathrm{NAU}} \right\} = \{\text{"NAU"}\}.$$

$$\mathbf{IS}_{5.2}^{\varphi} = \mathbf{IS}_{4.2}^{\varphi} = \mathbf{SS}^{\varphi} = \left\{ \bigcup_{i=1}^{k_2} SS_i^{\varphi} \right\} = \left\{ SS_1^{\varphi}, SS_2^{\varphi}, \dots, SS_{k_2}^{\varphi} \right\}, \quad (5)$$

where $SS_i^{\varphi} \subseteq \mathbf{SS}^{\varphi}$ $(i = \overline{1, k_2})$ is i^{th} identifier of the number of secrecy classifications, and k_2 is their quantity.

According to the Law of Ukraine "On State Secrets" [4] and taking into account [5] the MCSI and the information constituting state secrets have such secrecy classifications

$$\mathbf{IS}_5^{\varphi} = \langle \mathbf{IS}_{5.1}^{\varphi}, \mathbf{IS}_{5.2}^{\varphi}, \dots, \mathbf{IS}_{5.i}^{\varphi}, \dots, \mathbf{IS}_{5.y}^{\varphi} \rangle, \quad (3)$$

where $\mathbf{IS}_{5.i}^{\varphi} \subseteq \mathbf{IS}_5^{\varphi}$ $(i = \overline{1, y})$ is the component of subtuple that displays the i^{th} identifier of the parameters of the φ^{th} SRSA (organization), and y is their quantity.

For example, according to [5], $y = 10$ $(i = \overline{1,10})$ the formula (3) can be represented as follows:

as: “secret” (S), “top secret” (TS) and “of special importance” (SI), that’s why at $y_2 = k_2$, $k_2 = 3$ the formula (5) has the form:

$$\mathbf{SS}^{\varphi} = \left\{\bigcup_{i=1}^{3} SS_i^{\varphi}\right\} = \{SS_1^{\varphi}, SS_2^{\varphi}, SS_3^{\varphi}\} = \{\text{“S”, “TS”, “SI”}\}.$$

$$\mathbf{IS}_{5.3}^{\varphi} = \mathbf{tW}^{\varphi} = \left\{\bigcup_{i=1}^{y_2}\left\{\bigcup_{j=1}^{y_3} tW_{i.j}^{\varphi}\right\}\right\} = \left\{\left\{tW_{1.1}^{\varphi}, \dots\right\}, \dots, \left\{\dots, tW_{i.j}^{\varphi}, \dots\right\}, \dots, \left\{\dots, tW_{y_2.y_3}^{\varphi}\right\}\right\}, \quad (6)$$

where $tW_{i.j}^{\varphi} \subseteq \mathbf{tW}^{\varphi}$ $(i = \overline{1,y_2}, j = \overline{1,y_3})$ is i^{th} identifier of the number of total works (the sum of graphs 6–13), and y_3 is their number according to y_2, that is, according to a specific secrecy classification (for example, at $\varphi = 1$ for $y_2 = 2$ $(i = \overline{1,2})$, $y_3 = 1$ $(j = 1)$, then (6) will acquire the form:

$$\mathbf{tW}^{1} = \left\{\bigcup_{i=1}^{2}\left\{\bigcup_{j=1}^{1} tW_{i.j}^{\text{NAU}}\right\}\right\} = \left\{\left\{tW_{1.1}^{\text{NAU}}\right\}, \left\{tW_{2.1}^{\text{NAU}}\right\}\right\} = \{\{\text{“30”}\}, \{\text{“15”}\}\},$$

therefore, works in total at the NAU by secrecy classification: “secret”—30, “top secret”—15:

$$\mathbf{IS}_{5.4}^{\varphi} = \mathbf{SW}^{\varphi} = \left\{\bigcup_{i=1}^{y_2}\left\{\bigcup_{j=1}^{y_4} SW_{i.j}^{\varphi}\right\}\right\} = \left\{\left\{SW_{1.1}^{\varphi}, \dots\right\}, \dots, \left\{\dots, SW_{i.j}^{\varphi}, \dots\right\}, \dots, \left\{\dots, SW_{y_2.y_4}^{\varphi}\right\}\right\}, \quad (7)$$

where $SW_{i.j}^{\varphi} = \mathbf{SW}^{\varphi}$ $(i = \overline{1,y_2}, j = \overline{1,y_4})$ is i^{th} identifier of the number of works including the state defense order, and y_4 is their quantity for y_2, that is, according to the actual classification of secrecy (for example, at $\varphi = 1$ for $y_2 = 2$ $(i = \overline{1,2})$, $y_4 = 1$ $(j = 1)$, then (7) will acquire the form:

$$\mathbf{SW}^{1} = \left\{\bigcup_{i=1}^{2}\left\{\bigcup_{j=1}^{1} SW_{i.j}^{\text{NAU}}\right\}\right\} = \left\{\left\{SW_{1.1}^{\text{NAU}}\right\}, \left\{SW_{2.1}^{\text{NAU}}\right\}\right\} = \{\{\text{“30”}\}, \{\text{“15”}\}\},$$

i.e. the NAU performs the works, including the state defense order, with the secrecy classification “secret”—30, “top secret”—15).

$$\mathbf{IS}_{5.5}^{\varphi} = \mathbf{nSW}^{\varphi} = \left\{\bigcup_{i=1}^{y_2}\left\{\bigcup_{j=1}^{y_5} nSW_{i.j}^{\varphi}\right\}\right\} = \left\{\left\{nSW_{1.1}^{\varphi}, \dots\right\}, \dots, \left\{\dots, nSW_{i.j}^{\varphi}, \dots\right\}, \dots, \left\{\dots, nSW_{y_2.y_5}^{\varphi}\right\}\right\}, \quad (8)$$

where $nSW_{i.j}^{\varphi} = \mathbf{nSW}^{\varphi}$ $(i = \overline{1,y_2}, j = \overline{1,y_5})$ is j^{th} identifier of the number of secret SRW, RDW, design, and other scientific works, and y_5 is their number for each y_2, that is, according to the specific i^{th} secrecy classification (for example, taking into account [5], at $\varphi = 1$ for $y_2 = 2$ $(i = \overline{1,2})$, $y_5 = 4$ $(j = \overline{1,4})$, then (8) will be as:

$$\mathbf{nSW}^{1} = \left\{\bigcup_{i=1}^{2}\left\{\bigcup_{j=1}^{4} nSW_{i.j}^{\text{NAU}}\right\}\right\} =$$

$$= \left\{\left\{nSW_{1.1}^{\text{NAU}}, nSW_{1.2}^{\text{NAU}}, nSW_{1.3}^{\text{NAU}}, nSW_{1.4}^{\text{NAU}}\right\}, \left\{nSW_{2.1}^{\text{NAU}}, nSW_{2.2}^{\text{NAU}}, nSW_{2.3}^{\text{NAU}}, nSW_{2.4}^{\text{NAU}}\right\}\right\} =$$

$$= \{\{\text{“10”, “2”, “1”, “6”}\}, \{\text{“5”, “2”, “1”, “3”}\}\},$$

i.e. at the NAU the number of secret scientific research work (SRW), research and development work (RDW), design, and other scientific works with the secrecy classification:

1) “secret”: completed in the reporting period—10; terminated in the reporting period—2; which were not performed in the reporting period—1; the implementation of which as of the end of the reporting period continues—6;

2) “top secret”: completed in the reporting period—5; terminated in the reporting period—2; which were not performed in the reporting period—2; the implementation of which at the end of the reporting period continues—1).

$$\mathbf{IS}_{5.6}^{\varphi} = \mathbf{pSW}^{\varphi} = \left\{\bigcup_{i=1}^{y_2}\left\{\bigcup_{j=1}^{y_6} pSW_{i.j}^{\varphi}\right\}\right\} = \quad (9)$$

$$= \left\{\left\{pSW_{1.1}^{\varphi}, \dots\right\}, \dots, \left\{\dots, pSW_{i.j}^{\varphi}, \dots\right\}, \dots, \left\{\dots, pSW_{y_2.y_6}^{\varphi}\right\}\right\},$$

where $pSW_{i.j}^{\varphi} = \mathbf{pSW}^{\varphi}$ $(i = \overline{1, y_2}, j = \overline{1, y_6})$ is j^{th} identifier of the number of components of secret SRW, RDW, design, and other scientific works with the secrecy classification, and y_6 is their number for each y_2, that is, according to the specific i^{th} secrecy classification (for example, considering [5], at $\varphi = 1$ for $y_2 = 2$ $(i = \overline{1,2})$, $y_6 = 4$ $(j = \overline{1,4})$, then (9) will be as follows:

$$\mathbf{pSW}^1 = \left\{\bigcup_{i=1}^{2}\left\{\bigcup_{j=1}^{4} pSW_{i.j}^{\text{NAU}}\right\}\right\} =$$

$$= \left\{\left\{pSW_{1.1}^{\text{NAU}}, pSW_{1.2}^{\text{NAU}}, pSW_{1.3}^{\text{NAU}}, pSW_{1.4}^{\text{NAU}}\right\}, \left\{pSW_{2.1}^{\text{NAU}}, pSW_{2.2}^{\text{NAU}}, pSW_{2.3}^{\text{NAU}}, pSW_{2.4}^{\text{NAU}}\right\}\right\} =$$

$$= \{\{\text{“5”}, \text{“2”}, \text{“1”}, \text{“3”}\}, \{\text{“2”}, \text{“1”}, \text{“1”}, \text{“1”}\}\},$$

i.e. at the NAU, components of secret SRW, RDW, design, and other scientific works with the secrecy classification:

1) “secret”: completed in the reporting period—5; terminated in the reporting period—2; which was not performed in the reporting period—2; the execution of which continues as of the end of the reporting period—1;

2) “top secret”: completed in the reporting period—2; terminated in the reporting period—1; which were not performed in the reporting period—1; the implementation of which continues as of the end of the reporting period—1.

$$\mathbf{IS}_{5.7}^{\varphi} = \mathbf{tP}^{\varphi} = \left\{\bigcup_{i=1}^{y_2}\left\{\bigcup_{j=1}^{y_7} tP_{i.j}^{\varphi}\right\}\right\} = \left\{\left\{tP_{1.1}^{\varphi}, \dots\right\}, \dots, \left\{\dots, tP_{i.j}^{\varphi}, \dots\right\}, \dots, \left\{\dots, tP_{y_2.y_7}^{\varphi}\right\}\right\}, \quad (10)$$

where $tP_{i.j}^{\varphi} = \mathbf{tP}^{\varphi}$ $(i = \overline{1, y_2}, j = \overline{1, y_7})$ is j^{th} identifier of the total number of products (the sum of graphs 16–21), and y_7 is their number (for example, taking into account the specific secrecy classification) at $\varphi = 1$ for $y_2 = 2$ $(i = \overline{1,2})$, $y_7 = 1$ $(j = 1)$, then (10) acquires the form:

$$\mathbf{tP}^1 = \left\{\bigcup_{i=1}^{2}\left\{\bigcup_{j=1}^{1} tP_{i.j}^{\text{NAU}}\right\}\right\} = \left\{\left\{tP_{1.1}^{\text{NAU}}\right\}, \left\{tP_{2.1}^{\text{NAU}}\right\}\right\} = \{\{\text{“10”}\}, \{\text{“5”}\}\}.$$

Therefore, at the NAU products in total with the secrecy classification “secret”—10, “top secret”—5.

$$\mathbf{IS}_{5.8}^{\varphi} = \mathbf{SP}^{\varphi} = \left\{\bigcup_{i=1}^{y_2}\left\{\bigcup_{j=1}^{y_8} SP_{i.j}^{\varphi}\right\}\right\} = \left\{\left\{SP_{1.1}^{\varphi}, \dots\right\}, \dots, \left\{\dots, SP_{i.j}^{\varphi}, \dots\right\}, \dots, \left\{\dots, SP_{y_2.y_8}^{\varphi}\right\}\right\}, \quad (11)$$

where $SP_{i.j}^{\varphi} = \mathbf{SP}^{\varphi}$ $(i = \overline{1, y_2}, j = \overline{1, y_8})$ is i^{th} identifier of the number of products, including the state defense order, and y_8 is their number for y_2, that is, according to the specific secrecy classification (for example, at $\varphi = 1$ for $y_2 = 2$ $(i = \overline{1,2})$, $y_8 = 1$ $(j = 1)$, then (11) will have the form:

$$\mathbf{SP}^1 = \left\{\bigcup_{i=1}^{2}\left\{\bigcup_{j=1}^{1} SP_{i.j}^{\text{NAU}}\right\}\right\} = \left\{\left\{SP_{1.1}^{\text{NAU}}\right\}, \left\{SP_{2.1}^{\text{NAU}}\right\}\right\} = \{\{\text{“10”}\}, \{\text{“5”}\}\}.$$

Therefore, at the NAU the number of products, including products by state defense ordering with secrecy classification: “secret”—10, “top secret”—5).

$$\mathbf{IS}_{5.9}^{\varphi} = \mathbf{nSP}^{\varphi} = \left\{\bigcup_{i=1}^{y_2}\left\{\bigcup_{j=1}^{y_9} nSP_{i.j}^{\varphi}\right\}\right\} = \left\{\left\{nSP_{1.1}^{\varphi}, \dots\right\}, \dots, \left\{\dots, nSP_{i.j}^{\varphi}, \dots\right\}, \dots, \left\{\dots, nSP_{y_2.y_9}^{\varphi}\right\}\right\}, \quad (12)$$

where $nSP_{i.j}^{\varphi} = \mathbf{nSP}^{\varphi}$ $(i = \overline{1, y_2}, j = \overline{1, y_9})$ is j^{th} identifier of the number of secret products, and y_9 is their number for each y_2, that is, according to the specific i^{th} secrecy classification (for example considering [10], at $\varphi = 1$ for $y_2 = 2$ $(i = \overline{1,2})$, $y_9 = 3$ $(j = \overline{1,3})$ then (12) will be as follows:

$$\mathbf{nSP}^1 = \left\{\bigcup_{i=1}^{2}\left\{\bigcup_{j=1}^{3} nSP_{i.j}^{\text{NAU}}\right\}\right\} =$$

$$= \left\{\left\{nSP_{1.1}^{\text{NAU}}, nSP_{1.2}^{\text{NAU}}, nSP_{1.3}^{\text{NAU}},\right\}, \left\{nSP_{2.1}^{\text{NAU}}, nSP_{2.2}^{\text{NAU}}, nSP_{2.3}^{\text{NAU}}\right\}\right\} = \{\{\text{“4”}, \text{“1”}, \text{“1”}\}, \{\text{“1”}, \text{“1”}, \text{“1”}\}\},$$

i.e. at the NAU, the number of secret products with the secrecy classification:

1) “secret”: manufactured in the reporting period—4; which were not produced in the reporting period—1; the

production of which continues as of the end of the reporting period—1;

2) "top secret": produced in the reporting period—1; which were not produced in the reporting period—1; the production of which continues as of the end of the reporting period—1.

$$\mathbf{IS}^{\varphi}_{5.10} = \mathbf{pSP}^{\varphi} = \left\{\bigcup_{i=1}^{y_2}\left\{\bigcup_{j=1}^{y_{10}} pSP^{\varphi}_{i.j}\right\}\right\} = \left\{\left\{pSP^{\varphi}_{1.1}, \dots\right\}, \dots, \left\{\dots, pSP^{\varphi}_{i.j}, \dots\right\}, \dots, \left\{\dots, pSP^{\varphi}_{y_2.y_{10}}\right\}\right\}, \quad (13)$$

where $pSP^{\varphi}_{i.j} = \mathbf{pSP}^{\varphi}$ $(i = \overline{1, y_2}, j = \overline{1, y_{10}})$ is j^{th} identifier of the number of components of secret products, and y_{10} is their number for each y_2, that is, according to the specific i^{th} secrecy classification (for example, considering [5], at $\varphi = 1$ for $y_2 = 2$ $(i = \overline{1,2})$, $y_{10} = 3$ $(j = \overline{1,3})$, then (13) will be as follows:

$$\mathbf{pSP}^1 = \left\{\bigcup_{i=1}^{2}\left\{\bigcup_{j=1}^{3} pSP^{\text{NAU}}_{i.j}\right\}\right\} =$$

$$= \left\{\left\{pSP^{\text{NAU}}_{1.1}, pSP^{\text{NAU}}_{1.2}, pSP^{\text{NAU}}_{1.3}\right\}, \left\{pSP^{\text{NAU}}_{2.1}, pSP^{\text{NAU}}_{2.2}, pSP^{\text{NAU}}_{2.3}\right\}\right\} = \{\{\text{"2"}, \text{"1"}, \text{"1"}\}, \{\text{"1"}, \text{"0"}, \text{"1"}\}\},$$

i.e. at the NAU the number of components of secret products with secrecy classification:

1) "secret": manufactured in the reporting period—2; which were not manufactured in the reporting period—1; the manufacture of which as of the end of the reporting period continues—1;

2) "top secret": manufactured in the reporting period—1; which were not manufactured in the reporting period—0; the manufacture of which continued at the end of the reporting period—1.

The sixth component of the subtuple $\mathbf{IS}^{\varphi}_{6}$ is Section V (a) ("Information about ordering (scientific and/or scientific and technical support) of secret scientific research, research and development, design and other scientific works, production of secret products") is completed by the SRSA (institutions) that are the customers of works and products as of the end of the reporting period by filling in the corresponding columns (parameters).

Subtuple $\mathbf{IS}^{\varphi}_{6}$ should be $\mathbf{IS}^{\varphi}_{6} \subseteq \mathbf{IS}^{\varphi}$ in case SRSA (institution) is the customer and not the contractor of works and products.

Then filling in the parameters of the subtuple $\mathbf{IS}^{\varphi}_{6}$ is identical to the parameters of the subtuple $\mathbf{IS}^{\varphi}_{5}$ as $\mathbf{IS}^{\varphi}_{6} = \mathbf{IS}^{\varphi}_{5}$ or otherwise $\mathbf{IS}^{\varphi}_{6} \notin \mathbf{IS}^{\varphi}$ and there is only the presence of subtuple $\mathbf{IS}^{\varphi}_{5}$ according to formula (3), that is, SRSA (institution) is the contractor, not the customer of works and products.

The Seventh Component of the Subtitle $\mathbf{IS}^{\varphi}_{7}$ is Section VI ("Information about Premises, Objects of Information Activity") is completed by the SRSA (institution) as of the end of the reporting period by filling in the corresponding columns (parameters):

$$\mathbf{IS}^{\varphi}_{7} = \langle \mathbf{IS}^{\varphi}_{7.1}, \mathbf{IS}^{\varphi}_{7.2}, \dots, \mathbf{IS}^{\varphi}_{7.i}, \dots, \mathbf{IS}^{\varphi}_{7.r} \rangle, \quad (14)$$

where $\mathbf{IS}^{\varphi}_{7.i} \subseteq \mathbf{IS}^{\varphi}_{7}$ $(i = \overline{1, r})$ is the component of the subtuple that displays i^{th} identifier of the parameters of φ^{th} SRSA (institution), and r is their number.

For example,, according to [10], at $r = 5$ $(i = \overline{1,5})$ the equation (14) can be represented as follows:

$$\mathbf{IS}^{\varphi}_{7} = \langle \mathbf{IS}^{\varphi}_{7.1}, \mathbf{IS}^{\varphi}_{7.2}, \dots, \mathbf{IS}^{\varphi}_{7.5} \rangle = \langle \mathbf{N}^{\varphi}, \mathbf{SS}^{\varphi}, \mathbf{nRR}^{\varphi}, \mathbf{nCO}^{\varphi}, \mathbf{nCS}^{\varphi} \rangle,$$

where $\mathbf{IS}^{\varphi}_{7.1} = \mathbf{IS}^{\varphi}_{1.1} = \mathbf{N}^{\varphi}$ (*Name*) is the set "Actual and conditional (if available) name of the reporting entity".

$\mathbf{IS}^{\varphi}_{7.2} = \mathbf{IS}^{\varphi}_{4.2} = \mathbf{SS}^{\varphi}$ is the set "*Secrecy classification*" (or "the highest secrecy classification").

$\mathbf{IS}^{\varphi}_{7.3} = \mathbf{nRR}^{\varphi}$ is the set "*Number of regime rooms*".

$\mathbf{IS}^{\varphi}_{7.4} = \mathbf{nCO}^{\varphi}$ is the set N*umber of certified objects of information activity, suitable for the circulation of linguistic secret information.*

$\mathbf{IS}^{\varphi}_{7.5} = \mathbf{nCS}^{\varphi}$ is the set N*umber of certified information and telecommunication systems suitable for the circulation of classified information.*

For example, to assign specific values to the following five parameters of the seventh component $\mathbf{IS}^{\varphi}_{7} \subseteq \mathbf{IS}^{\varphi}$ let us use SRSA $\mathbf{IS}^1 = \mathbf{IS}^{\text{NAU}}$ [5, 14, 15, 19, 20]:

$$\mathbf{IS}^{\varphi}_{7.1} = \mathbf{IS}^{\varphi}_{1.1} = \mathbf{N}^{\varphi},$$

at $\varphi = 1$, $r_1 = h_1$, $h_1 = 1$ that is according to formula (4) [14, 15]:

$$\mathbf{N}^1 = \left\{\bigcup_{i=1}^{1} N^{\text{NAU}}_{i}\right\} = \left\{N^{\text{NAU}}_{1}\right\} = \{\text{"NAU"}\}.$$

$$\mathbf{IS}^{\varphi}_{7.2} = \mathbf{IS}^{\varphi}_{4.2} = \mathbf{SS}^{\varphi},$$

at $\varphi = 1, r_2 = k_2, k_2 = 3$ that is according to formula (5):

$$\mathbf{SS}^1 = \left\{\bigcup_{i=1}^{3} SS^{\text{NAU}}_{i}\right\} = \left\{SS^{\text{NAU}}_{1}, SS^{\text{NAU}}_{2}, SS^{\text{NAU}}_{3}\right\} = \{\text{"S"}, \text{"TS"}, \text{"SI"}\}.$$

$$\mathbf{IS}_{7.3}^{\varphi} = \mathbf{nRR}^{\varphi} = \left\{\bigcup_{i=1}^{r_2}\left\{\bigcup_{j=1}^{r_3} nRR_{i.j}^{\varphi}\right\}\right\} = \left\{\left\{nRR_{1.1}^{\varphi}, \dots\right\}, \dots, \left\{\dots, nRR_{i.j}^{\varphi}, \dots\right\}, \dots, \left\{\dots, nRR_{r_2.r_3}^{\varphi}\right\}\right\}, \quad (15)$$

where $nRR_{i.j}^{\varphi} = \mathbf{nRR}^{\varphi}$ $(i = \overline{1,r_2}, j = \overline{1,r_3})$ is j^{th} identifier of the number of regime premises, and r_3 is their number for each r_2, that is, according to a specific i^{th} secrecy classification (for example, taking into account [10], at $\varphi = 1$ for $r_2 = 2$ $(i = \overline{1,2})$, $r_3 = 2$ $(j = \overline{1,2})$ then (15) will be as follows:

$$\mathbf{nRR}^1 = \left\{\bigcup_{i=1}^{2}\left\{\bigcup_{j=1}^{2} nRR_{i.j}^{\text{NAU}}\right\}\right\} = \left\{\left\{nRR_{1.1}^{\text{NAU}}, nRR_{1.2}^{\text{NAU}}\right\}, \left\{nRR_{2.1}^{\text{NAU}}, nRR_{2.2}^{\text{NAU}}\right\}\right\} = \left\{\{\text{“1”}, \text{“2”}\}, \{\text{“1”}, \text{“1”}\}\right\},$$

i.e. at the NAU, the number of regime premises with the secrecy classification:

1) “secret”: intended for the storage of MCCI during non-working hours—1; other regime premises—2;

2) “top secret”: designated for storage of MCCI during non-working hours—1; other regime premises—1.

$$\mathbf{IS}_{7.4}^{\varphi} = \mathbf{nCO}^{\varphi} = \left\{\bigcup_{i=1}^{r_2}\left\{\bigcup_{j=1}^{r_4} nCO_{i.j}^{\varphi}\right\}\right\} = \left\{\left\{nCO_{1.1}^{\varphi}, \dots\right\}, \dots, \left\{\dots, nCO_{i.j}^{\varphi}, \dots\right\}, \dots, \left\{\dots, nCO_{r_2.r_4}^{\varphi}\right\}\right\}, \quad (16)$$

where $nCO_{i.j}^{\varphi} = \mathbf{nCO}^{\varphi}$ $(i = \overline{1,r_2}, j = \overline{1,r_4})$ is i^{th} identifier of the number of certified objects of information activity, suitable for the circulation of linguistic secret information, and r_4 is their number for r_2, that is, according to a specific i^{th} secrecy classification (for example, taking into account at $\varphi = 1$ for $r_2 = 2$ $(i = \overline{1,2})$, $r_4 = 1$ $(j = 1)$ then (16) will acquire the form:

$$\mathbf{nCO}^1 = \left\{\bigcup_{i=1}^{2}\left\{\bigcup_{j=1}^{1} nCO_{i.j}^{\text{NAU}}\right\}\right\} = \left\{\left\{nCO_{1.1}^{\text{NAU}}\right\}, \left\{nCO_{2.1}^{\text{NAU}}\right\}\right\} = \left\{\{\text{“1”}\}, \{\text{“1”}\}\right\},$$

i.e. at the NAU the number of certified objects of information activity suitable for the circulation of linguistic secret information by secrecy classification: “secret”—1, “top secret”—1.

$$\mathbf{IS}_{7.5}^{\varphi} = \mathbf{nCS}^{\varphi} = \left\{\bigcup_{i=1}^{r_2}\left\{\bigcup_{j=1}^{r_5} nCS_{i.j}^{\varphi}\right\}\right\} = \left\{\left\{nCS_{1.1}^{\varphi}, \dots\right\}, \dots, \left\{\dots, nCS_{i.j}^{\varphi}, \dots\right\}, \dots, \left\{\dots, nCS_{r_2.r_5}^{\varphi}\right\}\right\}, \quad (17)$$

where $nCS_{i.j}^{\varphi} = \mathbf{nCS}^{\varphi}$ $(i = \overline{1,r_2}, j = \overline{1,r_5})$ is j^{th} identifier of the number of certified information and telecommunication systems, suitable for circulation of secret information, and r_5 is their number for each r_2, that is, by a specific i^{th} secrecy classification (for example, taking into account [5], at $\varphi = 1$ for $r_2 = 2$ $(i = \overline{1,2})$, $r_5 = 4$ $(j = \overline{1,4})$ then (17) will be as follows:

$$\mathbf{nCS}^1 = \left\{\bigcup_{i=1}^{2}\left\{\bigcup_{j=1}^{4} nCS_{i.j}^{\text{NAU}}\right\}\right\} =$$

$$= \left\{\left\{nCS_{1.1}^{\text{NAU}}, nCS_{1.2}^{\text{NAU}}, nCS_{1.3}^{\text{NAU}}, nCS_{1.4}^{\text{NAU}}\right\}, \left\{nCS_{2.1}^{\text{NAU}}, nCS_{2.2}^{\text{NAU}}, nCS_{2.3}^{\text{NAU}}, nCS_{2.4}^{\text{NAU}}\right\}\right\} =$$

$$= \left\{\{\text{“1”}, \text{“2”}, \text{“1”}, \text{“1”}\}, \{\text{“0”}, \text{“0”}, \text{“1”}, \text{“1”}\}\right\},$$

i. e. at the NAU the number of certified information, telecommunication, and information-telecommunication systems, suitable for the circulation of secret information with the secrecy classification:

1) “secret”: local computing networks—1; PCs (including local computing networks)—2; other information, telecommunication, information-telecommunication systems—1; the number of subscriber installations of long-distance/city government communications—1;

2) “top secret”: local computing networks—0; PC (including local computing networks)—0; other information and telecommunication systems—1; number of long-distance/local government communication subscriber installations—1.

The eighth component of the subtuple $\mathbf{IS}_8^{\varphi}$ is Section VII (“Information on the facts of the losses of MCCI or the disclosure of state secrets, as well as information with restricted access of foreign states or international organizations”) is completed by the SRSA (institutions) as of the end of the reporting period by filling in the relevant graphs (parameters):

$$\mathbf{IS}_8^{\varphi} = \langle \mathbf{IS}_{8.1}^{\varphi}, \mathbf{IS}_{8.2}^{\varphi}, \dots, \mathbf{IS}_{8.i}^{\varphi}, \dots, \mathbf{IS}_{8.w}^{\varphi} \rangle, \quad (18)$$

where $\mathbf{IS}_{8.i}^{\varphi} \subseteq \mathbf{IS}_8^{\varphi}$ $(i = \overline{1,w})$ is the component of the subtuple that displays i^{th} identifier of parameters of φ^{th} SRSA (institution), and w is *their quantity*.

For example, respectively [5], $w = 4$ $(i = \overline{1,5})$ formula (18) can be represented as follows:

$$\mathbf{IS}_8^{\varphi} = \langle \mathbf{IS}_{8.1}^{\varphi}, \mathbf{IS}_{8.2}^{\varphi}, \mathbf{IS}_{8.3}^{\varphi}, \mathbf{IS}_{8.4}^{\varphi} \rangle = \langle \mathbf{N}^{\varphi}, \mathbf{nD}^{\varphi}, \mathbf{nL}^{\varphi}, \mathbf{nDL}^{\varphi} \rangle,$$

where $\mathbf{IS}_{8.1}^{\varphi} = \mathbf{IS}_{1.1}^{\varphi} = \mathbf{N}^{\varphi}$ (*Name*) is the set *Actual and conditional (if available) name of the reporting entity.*

$\mathbf{IS}_{8.2}^{\varphi} = \mathbf{nD}^{\varphi}$ is the set *Number of facts of disclosure of information constituting a state secret.*

$\mathbf{IS}_{8.3}^{\varphi} = \mathbf{nL}^{\varphi}$ is the set *Number of facts of loss of MCCI.*

$\mathbf{IS}_{8.4}^{\varphi} = \mathbf{nDL}^{\varphi}$ is the set *Number of facts of disclosure of information with limited access to foreign states or international organizations and Losses of its MCCI.*

For example, to assign specific values to the next four parameters of the eighth component $\mathbf{IS}_8^{\varphi} \subseteq \mathbf{IS}^{\varphi}$ let us use SRSA $\mathbf{IS}^1 = \mathbf{IS}^{\text{NAU}}$ [5, 14, 15, 19, 20]:

$$\mathbf{IS}_{8.1}^{\varphi} = \mathbf{IS}_{1.1}^{\varphi} = \mathbf{N}^{\varphi},$$

at $\varphi = 1$, $w_1 = h_1$, $h_1 = 1$ that is according to formula (4) [14, 15]:

$$\mathbf{N}^1 = \left\{ \bigcup_{i=1}^{1} N_i^{\text{NAU}} \right\} = \{N_1^{\text{NAU}}\} = \{\text{“NAU”}\}.$$

$$\mathbf{IS}_{8.2}^{\varphi} = \mathbf{nD}^{\varphi} = \left\{ \bigcup_{i=1}^{w_2} nD_i^{\varphi} \right\} = \{nD_1^{\varphi}, nD_2^{\varphi}, \dots, nD_{w_2}^{\varphi}\}, \quad (19)$$

where $nD_i^{\varphi} \subseteq \mathbf{nD}^{\varphi}$ $(i = \overline{1, w_2})$ is i^{th} identifier of the number of facts of disclosure of information constituting a state secret, and w_2 is their quantity (for example, at $\varphi = 1$, $w_2 = 1$ $(i == 1)$ then (19) will be as follows:

$$\mathbf{nD}^1 = \left\{ \bigcup_{i=1}^{1} nD_i^{\text{NAU}} \right\} = \{nD_1^{\text{NAU}}\} = \{\text{“0”}\},$$

i.e. at the NAU the number of facts of disclosure of information constituting a state secret—0.

$$\mathbf{IS}_{8.3}^{\varphi} = \mathbf{nL}^{\varphi} = \left\{ \bigcup_{i=1}^{w_3} nL_i^{\varphi} \right\} = \{nL_1^{\varphi}, nL_2^{\varphi}, \dots, nL_{w_3}^{\varphi}\}, \quad (20)$$

where $nL_i^{\varphi} \subseteq \mathbf{nL}^{\varphi}$ $(i = \overline{1, w_3})$ is i^{th} identifier of the number of facts of losses of MCSI, w_3 is their quantity (for example, at $\varphi = 1$, $w_3 = 1$ $(i = 1)$ then (20) will be as follows:

$$\mathbf{nL}^1 = \left\{ \bigcup_{i=1}^{1} nL_i^{\text{NAU}} \right\} = \{nL_1^{\text{NAU}}\} = \{\text{“1”}\}.$$

That is the number of losses of MCSI—1.

$$\mathbf{IS}_{8.4}^{\varphi} = \mathbf{nDL}^{\varphi} = \left\{ \bigcup_{i=1}^{w_4} nDL_i^{\varphi} \right\} = \{nDL_1^{\varphi}, nDL_2^{\varphi}, \dots, nDL_{w_4}^{\varphi}\}, \quad (21)$$

where $nDL_i^{\varphi} \subseteq \mathbf{nDL}^{\varphi}$ $(i = \overline{1, w_4})$ is i^{th} identifier of the number of facts of disclosure of information with limited access of foreign states or international organizations and losses of its MCSI, and w_4 is their quantity (for example, at $\varphi = 1$, $w_4 = 1$ $(i = 1)$ then (21) will be as follows:

$$\mathbf{nDL}^1 = \left\{ \bigcup_{i=1}^{1} nDL_i^{\text{NAU}} \right\} = \{nDL_1^{\text{NAU}}\} = \{\text{“0”}\},$$

i.e., at the NAU, the number of facts of disclosure of information with limited access to foreign states or international organizations and losses of its MNI—1.

The ninth component of subtuple $\mathbf{IS}_9^{\varphi}$ is Section VI, i.e. the NAU carried out work on components of secret SRW, RDW, design, and other scientific works with the following secrecy classifications:

1) “secret”: completed in the reporting period—5; terminated in the reporting period—2; which was not performed in the reporting period—2; the execution of which continues as of the end of the reporting period—1.

2) “top secret”: completed in the reporting period—2; terminated in the reporting period—1; which were not performed in the reporting period—1; the implementation of which continues as of the end of the reporting period—1.

“**Information about regime premises, objects of information activity**” is completed by the SRSA (institution) as of the end of the reporting period by filling in the corresponding columns (parameters):

$$\mathbf{IS}_9^{\varphi} = \langle \mathbf{IS}_{9.1}^{\varphi}, \mathbf{IS}_{9.2}^{\varphi}, \dots, \mathbf{IS}_{9.i}^{\varphi}, \dots, \mathbf{IS}_{9.e}^{\varphi} \rangle, \quad (22)$$

where $\mathbf{IS}_{9.i}^{\varphi} \subseteq \mathbf{IS}_9^{\varphi}$ $(i = \overline{1, e})$ is the component of subtuple that displays i^{th} identifier of parameters of φ^{th} SRSA (organizations), and e is their quantity.

For example, accordingly [5], $e = 5$ $(i = \overline{1,5})$ the formula (22) can be represented as follows:

$$\mathbf{IS}_9^{\varphi} = \langle \mathbf{IS}_{9.1}^{\varphi}, \mathbf{IS}_{9.2}^{\varphi}, \dots, \mathbf{IS}_{9.5}^{\varphi} \rangle = \langle \mathbf{N}^{\varphi}, \mathbf{nRD}^{\varphi}, \mathbf{nDR}^{\varphi}, \mathbf{nFA}^{\varphi}, \mathbf{nFT}^{\varphi} \rangle,$$

where $\mathbf{IS}_{9.1}^{\varphi} = \mathbf{IS}_{1.1}^{\varphi} = \mathbf{N}^{\varphi}$ (*Name*) is the set “Actual and conditional (if available) **name** of the reporting entity”.

$\mathbf{IS}_{9.2}^{\varphi} = \mathbf{nRD}^{\varphi}$ is the set *Number of premises visited by delegations of foreign states and international organizations, as well as by foreigners and stateless persons.*

$\mathbf{IS}_{9.3}^{\varphi} = \mathbf{nDR}^{\varphi}$ is the set *Number of Delegations of foreign countries and international organizations received.*

$\mathbf{IS}_{9.4}^{\varphi} = \mathbf{nFA}^{\varphi}$ is the set *Number of Foreign Advisers who are at the SRSA.*

$\mathbf{IS}_{9.5}^{\varphi} = \mathbf{nFT}^{\varphi}$ is the set *Number of foreign business trips.*

For example, to assign specific values to the next five parameters of the ninth component $\mathbf{IS}_{9}^{\varphi} \subseteq \mathbf{IS}^{\varphi}$ let us use SRSA $\mathbf{IS}^{1} = \mathbf{IS}^{\mathrm{NAU}}$ [5, 14, 15, 19, 20]:

$$\mathbf{IS}_{9.1}^{\varphi} = \mathbf{IS}_{1.1}^{\varphi} = \mathbf{N}^{\varphi},$$

at $\varphi = 1$, $e_1 = h_1$, $h_1 = 1$ that is according to the formula (4) [14, 15]:

$$\mathbf{N}^{1} = \left\{\bigcup_{i=1}^{1} N_i^{\mathrm{NAU}}\right\} = \left\{N_1^{\mathrm{NAU}}\right\} = \{\text{“NAU”}\}.$$

$$\mathbf{IS}_{9.2}^{\varphi} = \mathbf{nRD}^{\varphi} = \left\{\bigcup_{i=1}^{e_2} nRD_i^{\varphi}\right\} = \left\{nRD_1^{\varphi}, nRD_2^{\varphi}, \dots, nRD_{e_2}^{\varphi}\right\}, \quad (23)$$

where $nRD_i^{\varphi} \subseteq \mathbf{nRD}^{\varphi}$ $(i = \overline{1, e_2})$ is i^{th} identifier of the *number of premises visited by delegations of foreign states and international organizations, as well as by foreigners and stateless persons,* and e_2 is their quantity (for example, at $\varphi = 1$, $e_2 = 1$ $(i = 1)$ then (23) will be as:

$$\mathbf{nRD}^{1} = \left\{\bigcup_{i=1}^{1} nRD_i^{\mathrm{NAU}}\right\} = \left\{nRD_1^{\mathrm{NAU}}\right\} = \{\text{“5”}\},$$

i.e. at the NAU, the *number of premises visited by delegations of foreign states and international organizations, as well as by foreigners and stateless persons is* 5.

$$\mathbf{IS}_{9.3}^{\varphi} = \mathbf{nDR}^{\varphi} = \left\{\bigcup_{i=1}^{e_3} nDR_i^{\varphi}\right\} = \left\{nDR_1^{\varphi}, nDR_2^{\varphi}, \dots, nDR_{e_3}^{\varphi}\right\}, \quad (24)$$

where $nDR_i^{\varphi} \subseteq \mathbf{nDR}^{\varphi}$ $(i = \overline{1, e_3})$ is i^{th} identifier of the *number of* delegations of foreign states and international organizations received, and e_3 is their quantity (for example, at $\varphi = 1$, $e_3 = 1$ $(i = 1)$ then (24) will be as:

$$\mathbf{nDR}^{1} = \left\{\bigcup_{i=1}^{1} nDR_i^{\mathrm{NAU}}\right\} = \left\{nDR_1^{\mathrm{NAU}}\right\} = \{\text{“8”}\},$$

i.e. the *number of* delegations of foreign states and international organizations received at the NAU is 8.

$$\mathbf{IS}_{9.4}^{\varphi} = \mathbf{nFA}^{\varphi} = \left\{\bigcup_{i=1}^{e_4} nFA_i^{\varphi}\right\} = \left\{nFA_1^{\varphi}, nFA_2^{\varphi}, \dots, nFA_{e_4}^{\varphi}\right\}, \quad (25)$$

where $nFA_i^{\varphi} \subseteq \mathbf{nFA}^{\varphi}$ $(i = \overline{1, e_4})$ is i^{th} identifier of the *number of* foreign advisers which are on the SRSA, and e_4 is their quantity (for example, at $\varphi = 1$, $e_4 = 1$ $(i = 1)$ then (25) will be as follows:

$$\mathbf{nFA}^{1} = \left\{\bigcup_{i=1}^{1} nFA_i^{\mathrm{NAU}}\right\} = \left\{nFA_1^{\mathrm{NAU}}\right\} = \{\text{“0”}\},$$

that is at the NAU the number of foreign advisers which are on the SRSA is 0.

$$\mathbf{IS}_{9.5}^{\varphi} = \mathbf{nFT}^{\varphi} = \left\{\bigcup_{i=1}^{e_5} nFT_i^{\varphi}\right\} = \left\{nFT_1^{\varphi}, nFT_2^{\varphi}, \dots, nFT_{e_5}^{\varphi}\right\}, \quad (26)$$

where $nFT_i^{\varphi} \subseteq \mathbf{nFT}^{\varphi}$ $(i = \overline{1, e_5})$ is i^{th} identifier of the *number of* foreign trips, and e_5 is their quantity (for example, at $\varphi = 1$, $e_5 = 1$ $(i = 1)$ then (26) will be as follows:

$$\mathbf{nFT}^{1} = \left\{\bigcup_{i=1}^{1} nFT_i^{\mathrm{NAU}}\right\} = \left\{nFT_1^{\mathrm{NAU}}\right\} = \{\text{“12”}\},$$

i.e. at the NAU the number of foreign trips is 12.

The general hierarchical structure of the developed model (taking into account the above examples) is presented in Fig. 1.

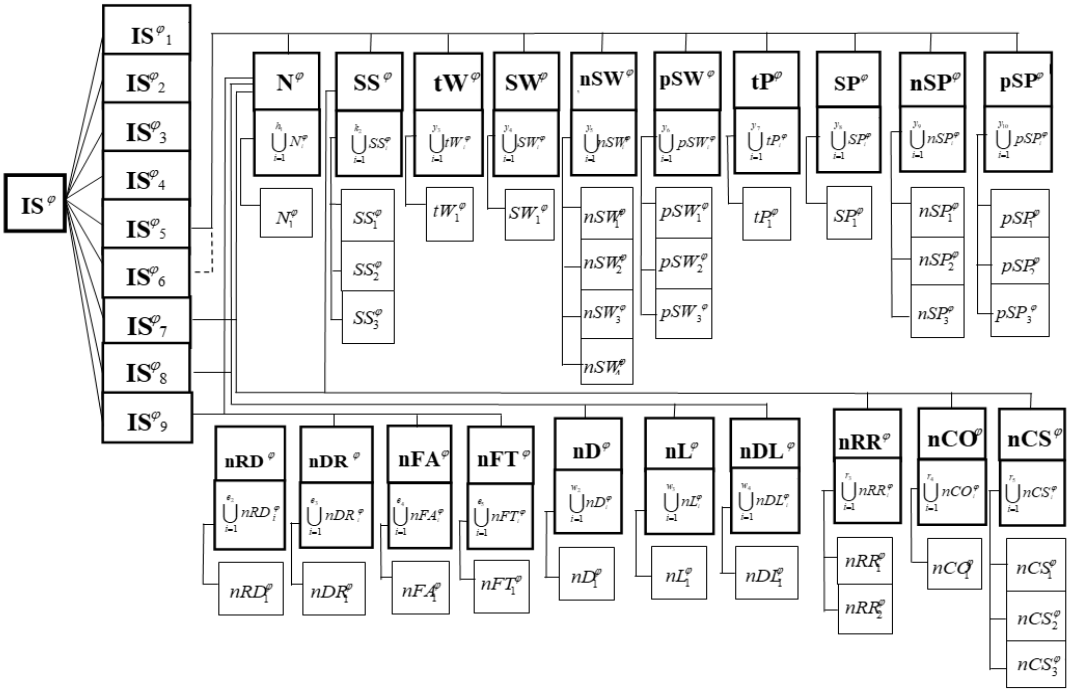

Figure 1: Hierarchical structure of the tuple model of secondary parameter database formation

4. Conclusions

A tuple model was developed, which, due to the theoretical-multiple approach to the formation of sets of tuple models, provides an integrated representation of the secondary parameters of the state of provision of SSP in the SRSA, which characterizes the information on the implementation of ordering (scientific and/or scientific and technical support) of secret research, research and development, design and other scientific works, the manufacture of secret products, as well as on regime premises, objects of information activity, international cooperation, etc., allows determining a set of input and output parameters for the formation of special databases and the formalization of the process of assessing the negative consequences (damages) caused to the national security of Ukraine from violation of the secrecy regime and the state of provision of SSP.

In the future, to implement the above-mentioned process, it is necessary to improve the existing methods [3–6] and develop new ones for evaluating the state of protection of SS both separately for the SRSA (reporting entity) and for the organization (institution) to which these reporting entities are directly subordinated by the requirements of domestic and international legislation, especially of NATO and European Union member states.

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