EFFECTS OF COUPLING AN OPERATIONAL PHILOSOPHY AND A CORPORATE CULTURE IN A SOCIOTECHNICAL SYSTEM

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The article is considered the content, functions and displays of operating philosophy. Suggested the additional model for the analysis of areas of possible incompatibilities in the structure of human factors in view of the "operating philosophy" genesis and manifestations. The results of an empirical study of the interrelationship of the professional worldview on human factor issues and judgments on the desirable socio-cultural characteristics of ATS units among begining air traffic controllers are presented.

The human factor is distinguished by the complexity of its structure and linkages of elements. This makes it difficult to estimate and correct the effects of the ongoing evolution of technology and equipment from the viewpoint of human role and capacities.

In the general view, a human factor is commonly understood as a whole set of effects related to the contact of a human with information, tools, tasks and rules of activities, as well as a physical and social environment that have an impact on performance. However, the simple enumeration of the elements included in the classical model of the human factor, as well as the lines of their contact, does not reflect the whole complexity of the real picture. Everything that a person deals with, he fills with meanings that express his worldview and are caused by involvement in society. It seems obvious to us that these meanings impose an imprint on the functioning of any socio-technical system. A person in sociotechnical system manifests his professional worldview both at the level of the fundamental philosophy of activity and at the level of interpretation of the meaning of various rules. In addition, the organizational life in which people manifest themselves at the personal level leaves an imprint on any professional action in any workplace, even if we do not see obvious relationships.

It should also be noted that aviation technologies are spreading globally and thus are used in different cultures. We can expect that the philosophy of the same professional activity in different cultures would be different. Another point is that the professional worldview of technology developers and users often does not coincide.

This caused our interest in the professional representations of people who obtained aviation education in the field of operator activity, about the fundamental ideas of organizing and implementing their activities, and also the interrelationships between these ideas.

The Development of Ideas about Human Factor

The evolution of human factor concepts reflected the desire for exhaustive coverage of its important aspects. The transition from the Edwards model to the Hawkins model highlighted an attention to such factors as teamwork, communication, leadership, social norms (Hawkins, 1987).

Socio-cultural aspect found an explicit expression in a model of the human factor SCHELL, where component C is defined as "organizational and national cultures that influence the interaction" (SMS for Aviation – a Practical Guide, Civil Aviation Safety Authority, Australian Government, 2012).

We analyzed complex and contradictory processes manifestations of the socio-cultural factor in the post-soviet space in the context of regulation of joint activity in the composition of the flight crew and practices of crew training by programs for learning effective interaction. The analysis of crew's training programs prevalent on the post-soviet space testified that some of them directly contradict the modern

concept of CRM, but consistent with the inherited corporate culture and individual professional worldviews (Petrenko, 2010).

In spheres where sophisticated equipment is operated, an important component of the human factor is the specific entity that we call operational philosophy. Under this concept we understand the basic ideas and requirements for the content and organization of the process of people activity as a part of socio-technical systems, as well as ways to ensure reliability of human component and the whole system.

One of the functions of operating philosophy is to ensure the unity of design solutions machine component and specified operational rules. But the fundamental role of operational philosophy is a conceptual agreement between all the components of the human factor.

Inconsistency of prescribed operational philosophy and socio-cultural features of the organization of the operator can pose a very real danger. Operation philosophy has non-contradictorily fit into the corporate culture and space of individual worldviews.

In our view, the operating philosophy is based on an understanding of the capabilities and vulnerabilities of human and, thus, on a notion situations and risks that could be handled through human potential, as well as on a notion of the risks and difficulties that may arise due to limitations of a human (Fig. 1). It is important that this concept should be applied to both individual and team activity.

Based on the above, we see possible entered in consideration of the human factor aspects such as "requirements for a human" and "operating philosophy", correlating them with the possibilities of human and socio-cultural features of team and organization (Fig. 2).

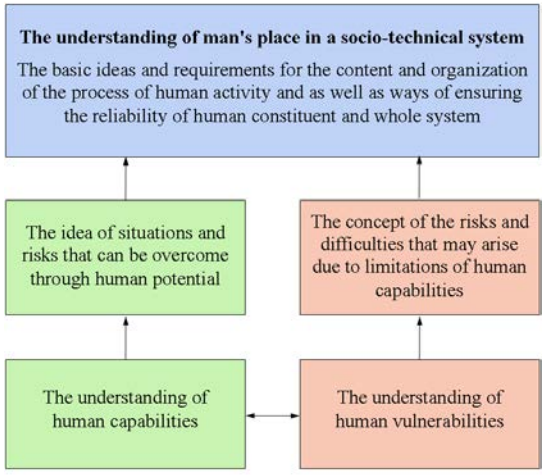

Figure 1. Genesis of operating philosophy

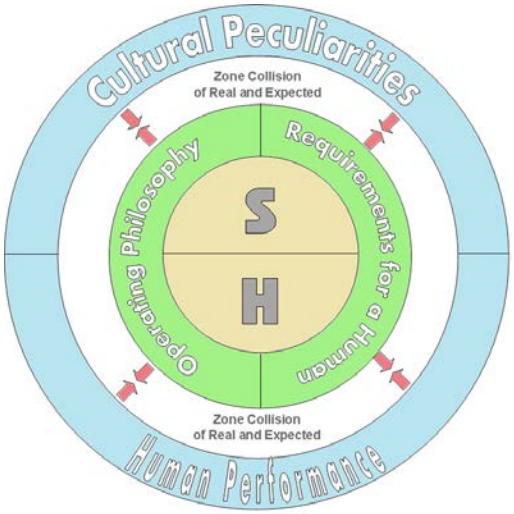

Figure 2. Areas of dangerous incompatibilities manifestation (Petrenko, 2015)

This model directs attention to the "zone of collision of a real and expected". It identifies four key areas for analysis:

- accordance between human capabilities and requirements for human;
- accordance between requirements for human and cultural peculiarities of social space;
- accordance between operation philosophy and human capabilities;
- accordance between operation philosophy and cultural peculiarities of social space.

Empirical Studies of Individual Representations of ATC-Beginners Regarding Safety Philosophy of Air Traffic Management and Organizational Culture of ATM Units

Methodology

The aim of this study is to establish interrelation patterns between individual ideas about the philosophy of safe work of an air traffic controller and the appropriate organizational culture traits for ATM units. The study is based on the idea of dependence of an organizational culture from a professional worldview of a personnel.

As responders were chosen novice air traffic controllers, as a carriers of ideas which have not yet been distorted by the organizational traditions and prejudices.

Using questionnaires with a set of scales respondents evaluated the significance of the assertions related to professional worldview (their list is given in Table 1), and reflect their ideas about the desired features of an organizational culture (Table 2). Stimulus material forms were drafted by expert interviews with open questions, and based on existing typologies of organizational cultures.

The stimulus material of the questionnaires was created based on the expert survey with open questions and on the existing classifications of organizational cultures.

To assess the degree of correlation r-Pearson coefficient was used.

Table 1.
Professional worldview statements offered to respondents for evaluation

1	Presence of emotional problems of the staff poses a threat
2	Individual capabilities of information processing require evaluation and consideration
3	A psychological climate in a team may endanger the safety of air traffic
4	It is necessary to constantly maintain readiness for difficult situations
5	Loss of motivation poses a danger
6	Personal attributes of air traffic controllers could be dangerous
7	The system must be protected from failures of an individual
8	Quality of a working activity is influenced by an objectivity of its evaluation
9	Quality of a working activity is influenced by a timeliness and adequacy of response to shortcomings
10	Quality of a working activity is influenced by a perfection of a rules
11	Quality of a working activity is influenced by a workplace ergonomics
12	Quality of a working activity is influenced by an automation
13	Quality of a working activity is influenced by a regular training and skills transferring
14	Quality of a working activity is influenced by a practice of staff motivation
15	Quality of a working activity is influenced by an appropriate health and well-being of staff
16	The positive psychological atmosphere improves the quality of a working activity

Table 2.
Organizational culture characteristics offered to respondents for evaluation

17	Control - Trust
18	Openness and communication - Psychological distance
19	Initiative – Diligence
20	Tough demands from management - Goodwill and tact of management
21	Team spirit, mutual assistance and support - Focusing in own responsibilities, autonomy
22	Enthusiastic work - Working without superfluous emotions
23	Focus on the organizational stability - Focus on the organizational development
24	Adherence to principles from the management
25	Permanent analysis of performance
26	Attention to detail
27	Criticism and analysis of shortcomings
28	The presence of the development strategy and the ability to see the perspective by the management

Table 2.

29	Interest in innovation
30	Commitment to corporate traditions and their strengthening
31	Attention to the moral aspects of life of an organization
32	Caring for people
33	Attention to the people's opinion
34	Participation of employees in making important organizational decisions
35	Team cohesion

Result and Discussion

We analyzed the relationship between the assertions of the professional worldview. The presence of branching statistical relationships (Fig. 3) leads to the conclusion that novice air traffic controllers in general have a quite complete and complex picture of professional views on basics of safe operation and risks related to human factor.

Interrelations between the characteristics of organizational culture, represented in individual perceptions of the respondents (Fig. 4) allow to see the presence of several fairly distinct groups of social and cultural features.

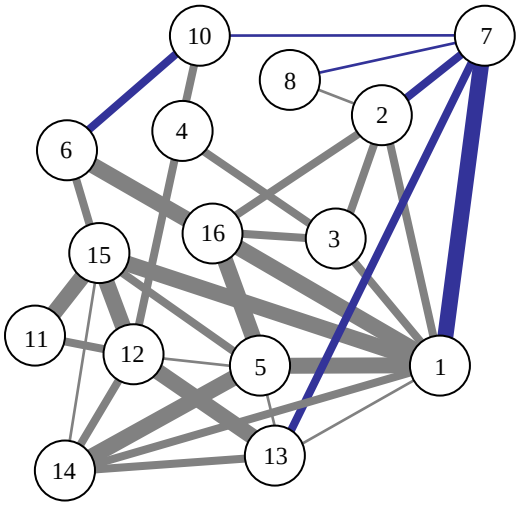

Figure 3. Pleiade of correlations between components of individual representations about the philosophy of safety air traffic management

Table 3.
Correlations (Fig. 3)

Couple	r	p	Couple	r	p
1 - 2	0.439	< 0.05	5 - 14	0.520	< 0.01
1 - 3	0.480	< 0.05	5 - 15	0.496	< 0.05
1 - 5	0.635	< 0.01	5 - 16	0.547	< 0.01
1 - 7	-0.512	< 0.01	6 - 10	-0.416	< 0.05
1 - 13	0.351	< 0.1	6 - 15	0.465	< 0.05
1 - 14	0.500	< 0.05	6 - 16	0.509	< 0.01
1 - 15	0.572	< 0.01	7 - 8	-0.337	< 0.1
1 - 16	0.509	< 0.01	7 - 10	-0.349	< 0.1
2 - 3	0.408	< 0.05	7 - 13	-0.474	< 0.05
2 - 7	-0.484	< 0.05	11 - 12	0.423	< 0.05
2 - 8	0.348	< 0.1	11 - 15	0.517	< 0.01
2 - 16	0.404	< 0.05	12 - 13	0.580	< 0.01
3 - 4	0.409	< 0.05	12 - 14	0.458	< 0.05
3 - 16	0.481	< 0.05	12 - 15	0.559	< 0.01
4 - 10	0.417	< 0.05	13 - 14	0.434	< 0.05
4 - 12	0.437	< 0.05	13 - 15	0.404	< 0.05
5 - 12	0.348	< 0.1	14 - 15	0.370	< 0.1
5 - 13	0.358	< 0.1			

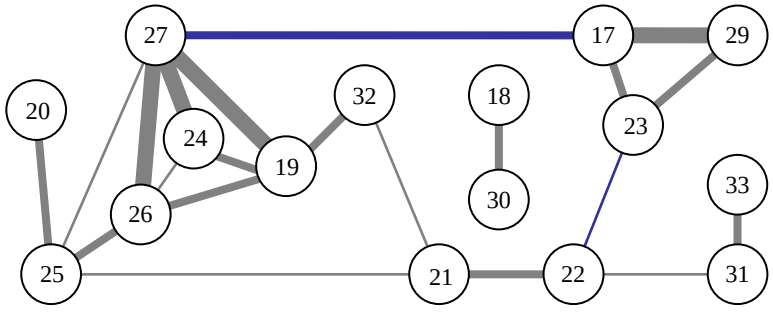

Figure 4. Pleiade of correlations between components of individual representations about organizational culture of ATM units

Table 4.
Correlations (Fig. 4)

Couple	r	p
17 - 23	0.486	< 0.05
17 - 27	-0.398	< 0.05
17 - 29	0.517	< 0.01
18 - 30	0.455	< 0.05
19 - 24	0.400	< 0.05
19 - 26	0.413	< 0.05
19 - 27	0.549	< 0.01
19 - 32	0.425	< 0.05
20 - 25	-0.457	< 0.05
21 - 22	0.458	< 0.05
21 - 25	0.356	< 0.1
21 - 32	0.347	< 0.1
22 - 23	-0.383	< 0.1
22 - 31	0.371	< 0.1
23 - 29	0.485	< 0.05
24 - 26	0.392	< 0.1
24 - 27	0.619	< 0.01
25 - 26	0.410	< 0.05
25 - 27	0.341	< 0.1
26 - 27	0.750	< 0.01
31 - 33	0.401	< 0.05

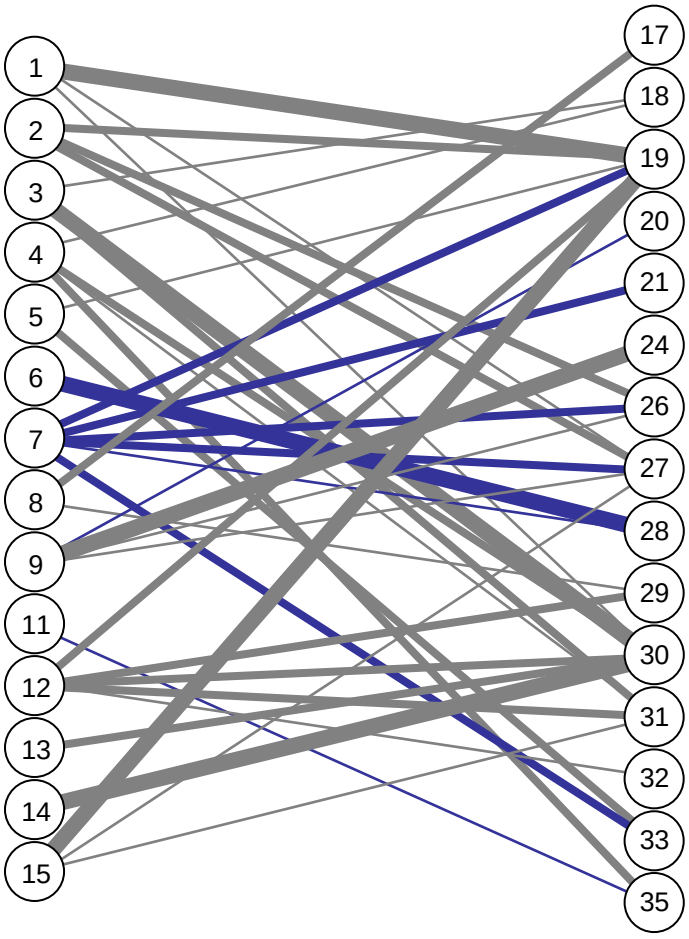

Figure 5. Statistical relationships between individual representations on approaches to safety of air traffic control and individual representations on optimal organizational culture of ATM system

Table 5.
Correlations (Fig. 5)

Couple	r	p
1 - 19	0.529	< 0.01
1 - 27	0.355	< 0.1
1 - 30	0.388	< 0.1
2 - 19	0.478	< 0.05
2 - 26	0.411	< 0.05
2 - 27	0.416	< 0.05
3 - 18	0.340	< 0.1
3 - 30	0.538	< 0.01
3 - 31	0.449	< 0.05
4 - 18	0.384	< 0.1
4 - 30	0.477	< 0.05
4 - 31	0.358	< 0.1
4 - 35	0.398	< 0.05
5 - 19	0.399	< 0.05
5 - 33	0.405	< 0.05
6 - 28	-0.512	< 0.1
7 - 19	-0.465	< 0.05
7 - 21	-0.410	< 0.05
7 - 26	-0.413	< 0.05
7 - 27	-0.451	< 0.05
7 - 28	-0.353	< 0.1
7 - 33	-0.398	< 0.05
8 - 17	0.404	< 0.05
8 - 29	0.349	< 0.1
9 - 20	-0.387	< 0.1
9 - 24	0.557	< 0.01
9 - 26	0.339	< 0.1
9 - 27	0.384	< 0.1
11 - 35	-0.394	< 0.1
12 - 19	0.397	< 0.05
12 - 29	0.439	< 0.05
12 - 30	0.467	< 0.05
12 - 31	0.450	< 0.05
12 - 32	0.373	< 0.1
13 - 30	0.426	< 0.05
14 - 30	0.517	< 0.01
15 - 19	0.555	< 0.01
15 - 27	0.369	< 0.1
15 - 31	0.345	< 0.1

The links 26-27-19, 17-23-29 seem quite understandable, as well as 31-33 and 21-22 (Fig. 4). But the link 18-30 appears to be paradoxical. One of the possible interpretations of this link may be in some formal attitude to the corporate values. This requires additional research.

Statistical relations between professional worldview on human factor in the air traffic management system and individual view on optimal organizational culture in the ATM system (Fig. 5) show sensitivity of the organizational life to the personnel qualification regarding human factors. But at the same time these relations demonstrate possible risk of appearance of incompetent actions due to deformation of organizational life. Positive effects of combination of certain organizational culture with a certain operating philosophy are possible as well as negative ones.

Through the efforts of the aviation community operator personnel gets knowledge on human factors at the appropriate level in any part of the world, but the practice of organizational management is more dependent on organizational and national cultures, which creates the likelihood of situations in which the required expertise simply would not be realized.

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