

INTERTYPE RELATIONSHIP WITHIN THE CREW

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ABSTRACT

The results of experiments conducted by the author from 2004 to the present with professional pilots and students of the University of Civil Aviation are analyzed. The purpose of the study was to test the possibility of using a socionic model of intertype relationships using the theories of V. V. Gulenko and

G. A. Shulman to evaluate the effectiveness of interaction in a two-member crew of an aircraft. As a criterion, the data of indirect sociometry are used. Statistical criterial dependencies are given. The article continues the previously started topic (see World of Transport and Transportation, 2014, Iss. 5 and World of Transport and Transportation, 2016, Iss. 1).

Keywords: civil aviation, crew of an aircraft, interaction of pilots, intertype relations, sociometry, management of crew resources.

Background. «Human Factor» (HF) [1] is the cause of 80 % of all aviation accidents. Various ways to reduce the negative impact of HF on flight safety were considered in [2–4]. One of these ways, namely, the increase in efficiency of interaction in the crew of an aircraft was considered in [4–11]. This article continues the research of the author and other scientists of the University of Civil Aviation, which were published in the works [5–11].

Objective. The objective of the author is to consider the effectiveness of interaction in the aircraft crew basing on the socionic approach, that is, using the theory of intertype relations (IR).

Methods. The author uses general scientific and mathematical methods, comparative analysis, evaluation approach.

Results. Moreover, since we are talking about socionics, naturally, only the information aspect of interaction between people is considered. But the results of the studies published in [5–11] are somewhat contradictory. Thus, for example, using IR proposed by V. V. Gulenko in [12], the author has revealed only the negative influence of the discrepancy of the rational and irrational beginnings of the persons under tests, that is, the mismatch in the psychological dichotomy (PD) of «rationality-irrationality» (R/I). As a verification indicator for comparison, normality (N) was taken, determined by the method of A. Etkind [13].

Of the existing views on the theory of IR, some ideas of G. A. Shulman [14] are presented to the author as the most productive. G. A. Shulman first expressed an extremely logical, in the author's view, the idea that there are not 16 IR. Shulman himself called the number 256, and unreasonably attributed the authorship of this idea to A. Augustinavichyute [14, p. 37] (in work [10] it is shown that this is not so). However, considering that the relationship, for example, of an ethical-sensory extravert with an intuitive-logical introvert is absolutely the same as that of an intuitive-logical introvert with an ethical-sensory extrovert, then IR will still only be 136.

According to the hypothesis put forward in the monograph [11], the match of any of the PD is preferable to the mismatch, which was confirmed to a certain extent at that time. In [11], for 823 pairs formed from 81 people, the author computed socionic models of intertype relations (SMIR) using IR according to V. V. Gulenko [12], but for all 256 IR according to G. A. Shulman. Further, using the normality (N), determined by the method of A. Etkind [13], as the criterion for estimating the effectiveness of the interaction in a pair, the rank of each of 256 IR was determined. Then these ranks were summed up for each of 16 types of information metabolism (TIM)

[11, 15], in order to determine for which of TIM the relationships with other TIM are most «comfortable». The results obtained are presented in Table. 1, where the lowest sum of ranks corresponds to the greatest «degree of comfort».

(When summing, the ranks of 16 identical IR were counted one time, and the ranks of all other IR were doubled.)

According to the table C_i (the intensity coefficient interpreted as the quasi-spiragonal distance between the «nests» of TIM in the «Periodic System of the Socion» (PSS) [14, pp. 37–39]) for each of TIM, the number of negative C_i values was calculated, based on the assumption, that the highest «comfort» in the relationship will have TIM, which have the least of them (we are talking, of course, about direct contacts, since for the situation we are considering, that is, the interaction in the pair (the crew of the aircraft), they are primary ones, and not the indirect contacts.)

From a comparison of two samples obtained using the Spearman rank correlation criterion [16, pp. 208–223], we obtain a significant rank correlation of the mean force $r_s = 0,5471$ (since for $n = 16$ and $p \leq 0,05$ the critical value $r_{scr} = 0,5$ [16, p.340]).

Since a significant period has passed after the publication of the monograph [11], and many new statistical data have been accumulated, the author has repeated the calculations for the other 895 pairs formed from 72 active pilots and student pilots of the final year of study (In [10] these results were not considered, and they do not intersect with the samples from [10] and [11]. The results are shown in Table 1.

At the same time, comparing the new sample with the forecasting by the Spearman rank correlation criterion [16, pp. 208–223], we obtain only an insignificant very weak rank correlation $r_s = 0,1235$. And when comparing this new sample with the sample from [11], the rank correlation is even $r_s = 0,0676$.

The only thing that coincides in all three cases (and with the data [10] too) is a high «degree of comfort» for TIM SLE. According to the author, TIM SLE really should be the most «comfortable» for its carrier. Here we do not disagree with either G. A. Shulman [14] or with the results of both experiments. Further, the author would put (but not quite clearly in what order) such TIMs as LSE, LIE, SEE, LSI and SLI. Here the discrepancies begin already with G. A. Shulman and with the results of the experiments. The motives are most unclear to the author, according to which G. A. Shulman put rather «high» in the PSS TIM EII, «directly opposite» to TIM SLE? In our country, it turned out to be «uncomfortable»



Results of experiments and theoretical forecasts according to G. A. Shulman [14]

TIM	Forecast according to G. A. Shulman		Results of experiments			
	Number of negative values of the coefficient CI of relative intensity of IR [14, p. 37]		Data from [11, p. 231] (823 pairs)		New data of the year 2016 (895 pairs)	
			Sum of ranks for this type of TIM for individual components of SMIR with its participation	Rank according to the results of the experiment	Sum of ranks for this type of TIM for individual components of SMIR with its participation	Rank according to the results of the experiment
SLE	0	1	700	1	464	2
LSE	1	2	756	2	1400	11
ILE	12	13	849	3	1557	15
SLI	9	10,5	979	4	660	4
LIE	4	5	994	5	1504	13
ESE	2	3	1019	6	439	1
LSI	7	8,5	1090	7	1561	16
SEE	3	4	1136	8	591	3
SEI	11	12	1215	9	1236	9
ILI	13	14	1231	10	788	5
EIE	5	6,5	1267	11	1552	14
LII	9	10,5	1277	12	1155	8
ESI	5	6,5	1288	13	1357	10
IEE	15	16	1298	14	795	6
EII	7	8,5	1437	15	1500	12
IEI	14	15	1449	16	1098	7

Here: LSE is a logical-sensory extrovert; LSI is a logical-sensory introvert; LIE is a logical-intuitive extrovert; LII is a logical-intuitive introvert; ESE is an ethical-sensory extrovert; ESI is an ethical-sensory introvert; EIE is an ethical-intuitive extrovert; EII is an ethical-intuitive introvert; SLE is a sensory-logical extrovert; SLI is a sensory-logical introvert; ILE is an intuitive-logical extrovert; ILI is an intuitive-logical introvert; SEE is a sensory-ethical extrovert; SEI is a sensory-ethical introvert; IEE is an intuitive-ethical extrovert; IEI is an intuitive-ethical introvert.

in theory, in practice, and in the results of all experiments, including [10].

From this experiment it is also possible to estimate the comfort of various IR in the interaction in a pair, in the same way as was estimated in [5–11], but already with the application of G. A. Shulman's approach [14].

In Table. 2 it is shown how the sum of ranks depends on the match or mismatch in a pair of persons under tests according to individual psychological dichotomies (PD) extraversion/introversion (E/I), logic/ethics (L/E), sensorics/intuition (S/I) and rationality/irrationality (R/I). According to the hypothesis advanced in [11], the match of any of the PD is preferable to a mismatch.

However, according to the results of the experiments, this is unambiguously true (and as we shall see later, it is erroneously true) only for the PD R/I, for the other three PDs the hypothesis was not fully confirmed. It is another matter that for PD E/I, L/E and S/I, in contrast to PD R/I, the obtained sums of ranks of coinciding and non-coinciding IR differ relatively little.

According to Table 2, it is difficult to estimate which IR are the most comfortable. According to the prognosis [11], these should be identical (1111), according to the results of the experiment on the basis of 823 pairs from the same [11], the most comfortable should be the IR of irratio-relationship (1011),

according to the data from [10] the most comfortable should have been irratio-miragy IR (0011), and according to the data of the «new experiment» on the basis of 895 pairs – IR of irratio-relationship (1101).

However, in the experiment from [10], irratio-miragy IR (0011), as can be seen from Table 3, were only in third place, behind the dual IR (0001) and IR of irratio-relationship (1011). The greatest comfort of dual IR, of course, fully coincides with the theoretical prerequisites of A. Augustinavichyute [15], but it contradicts the hypothesis from the monograph [11], according to which the identical IR (1111) will be optimal in the aircraft crew as providing the best mutual understanding. If we take the results of experiments from [9] and the «new experiment», then the most convenient are the IR of ratio-relationship (1101) and the Super Ego (1001), and in the real experiment from [11] – ratio-relationship (1101) and the dual (0001).

If (even if it is not entirely correct) to add the ranks from Table. 3 on three disjoint samples from [10], [9] and the «new experiment» (the sample from [10] includes a sample of 823 pairs from [11]), the most comfortable ones in order of decreasing comfort are: SuperEgo 1001, irratio-relationship (1011), ratio-relationship (1101), dualization (0001), identity (1111), ratio-mirage (0101), irratio-mirage (0011) and neutralization (0111). The average comfort level

Table 2

The sum of the ranks of IR, depending on match or mismatch for individual psychological dichotomies

PD		E/I	L/E	S/I	R/I
According to the data from [11], based on 823 pairs	Match	8937	9217	8833	4883
	Mismatch	9048	8768	9152	13102
According to the data from [10]	Match	9005	9559	8825	5407
	Mismatch	8854	8300	9034	12452
According to the data of the new experiment based on 895 pairs	Match	8419	8719	8889	8011
	Mismatch	9238	8938	8768	9646

Table 3

The ranks of «comfort» of IR according to the forecast [11], according to the results of a survey of 2255 pairs of pilots, formed from 343 people [9] and according to experiments in 2016 from [10] and a new, based on 895 pairs, made up of 72 people

IR according to V. V. Gulenko [12]			Results of experiments of the year 2016					Rank accordin g to the data [9]
№	IR [12]		Rank according to the forecast	From [10]		New experiment		
				Sum of ranks	Final rank	Sum of ranks	Final rank	
1	identity	1111	1	773	7	975	3	4
2	quasidentity	1110	9	1586	13	1132	10,5	11
3	ratio-relationship	1101	3	806	8	970	1,5	1
4	ratio-order	1100	11	1628	15	1098	9	10
5	irratio-relationship	1011	2	590	2	982	4	3
6	irratio-order	1010	10	1462	10	1160	12	12
7	SuperEgo	1001	4	642	4	970	1,5	2
8	activation	1000	13	1518	11	1132	10,5	9
9	neutralization	0111	7	742	5	1040	7	8
10	glassiness	0110	12	1598	14	1246	13	15
11	ratio-mirage	0101	6	770	6	998	5	5
12	irratio-revision	0100	14	1656	16	1260	14	14
13	irratio-mirage	0011	5	626	3	1052	8	7
14	ratio-revision	0010	15	1448	9	1302	15	16
15	dualization	0001	8	458	1	1024	6	6
16	conflict	0000	16	1556	12	1316	16	13

(also in descending order) is provided by: activation (1000), ratio-order (1100), irratio-order (1010) and quasi-identity (1110), and very bad will be: ratio-revision (0010), conflict (0000), glassiness (0110) and irratio-revision (0100).

From the comparison of the forecast and the data from three experimental samples (from [10], [9] and «new experiment») to the Spearman rank correlation criterion [16, p. 208–223], we obtain a highly significant rank correlation in all 6 cases. But for the sample from [10], in all three cases it will be of the mean force ($r_s = 0,6853$, $r_s = 0,6647$ and $r_s = 0,6971$), and between the samples from the «new experiment», and the forecast, the correlation will be strong.

The results of the «new experiment» ($r_s = 0,9279$) are the closest to the forecast, and the closest correlation between the results of the «new experiment» and the data of [9] ($r_s = 0,9662$) (For $n = 16$ and $p \leq 0.01$ the critical value $r_{scr} = 0,64$ [16, p. 340]). That is, the

forecast looks justified. But the analysis of the results obtained raised considerable doubts.

Therefore, the author studied another assumption, that it is necessary to take into account not only match or mismatch in a particular PD, but also exactly which psychological functions or settings coincide.

In this case, we do have not $16 = 2 \times 2 \times 2 \times 2$ IR, but $3 \times 3 \times 3 \times 3 = 81$ IR, and the number of so-called initial IR according to G. A. Shulman in each of IR81 type is not the same. Accordingly, therefore, in Table 4 and 5 not the sum of ranks, but the average rank for a group of similar IR, taking into account their quantity, is indicated. And here the results turned out to be much more interesting.

The results of two similar experiments of the «old» (see Table 4) described in [11] (823 pairs composed of 81 people) and the «new» (see Table 5) conducted in 2016 (895 pairs compiled from 72 people) did not coincide in all.



Table 4

The average rank of IR, depending on match or mismatch of individual PDs for 823 pairs from [11]

		PD E/I			PD L/E			PD S/I			PD R/I		
		Match in extraversion	Mismatch in PD E/I	Match in introversion	Match in logic	Mismatch in PD L/E	Match in ethics	Match in sensorics	Mismatch in PD S/I	Match in intuition	Match in rationality	Mismatch in PD R/I	Match in irrationality
PD E/I	Match in extraversion				38,56	50,88	78,13	41,13	55,25	66,81	30,75	86,31	15,05
	Mismatch in PD E/I				53,00	69,06	91,63	56,13	71,47	83,69	41,56	102,91	35,38
	Match in introversion				73,69	85,00	96,44	72,06	87,81	92,44	47,19	117,31	58,31
PD L/E	Match in logic	38,56	53,00	73,69				43,75	55,43	63,63	27,13	85,56	20,00
	Mismatch in PD L/E	50,88	69,06	85,00				56,56	69,69	82,06	37,38	101,69	33,25
	Match in ethics	78,13	91,63	96,44				76,56	91,19	98,88	59,19	120,50	57,63
PD S/I	Match in sensorics	41,13	56,13	72,06	43,75	56,56	76,56				31,63	90,63	12,56
	Mismatch in PD S/I	55,25	71,47	87,81	55,43	69,69	91,19				42,25	104,81	34,13
	Match in intuition	66,81	83,69	92,44	63,63	82,06	98,88				44,94	109,19	63,61
PD R/I	Match in rationality	30,75	41,56	47,19	27,13	37,38	59,19	31,63	42,25	44,94			
	Mismatch in PD R/I	86,31	102,91	117,31	85,56	101,69	120,50	90,63	104,81	109,19			
	Match in irrationality	15,05	35,38	58,31	20,00	33,25	57,63	12,56	34,13	63,61			

Table 5

The average rank of IR, depending on match or mismatch for individual PDs for 895 pairs (2016)

		PD E/I			PD L/E			PD S/I			PD R/I		
		Match in extraversion	Mismatch in PD E/I	Match in introversion	Match in logic	Mismatch in PD L/E	Match in ethics	Match in sensorics	Mismatch in PD S/I	Match in intuition	Match in rationality	Mismatch in PD R/I	Match in irrationality
PD E/I	Match in extraversion				51,19	56,25	58,63	45,19	54,50	68,13	103,19	56,25	6,63
	Mismatch in PD E/I				69,63	73,34	72,38	59,19	71,84	85,81	107,88	80,06	17,88
	Match in introversion				81,00	76,38	70,13	61,38	75,81	90,88	103,19	85,06	30,56
PD L/E	Match in logic	51,19	69,63	81,00				52,63	66,88	85,06	88,63	82,88	17,06
	Mismatch in PD L/E	56,25	73,34	76,38				56,63	69,41	83,88	108,38	76,72	17,50
	Match in ethics	58,63	72,38	70,13				59,06	68,31	77,81	122,38	65,13	20,88
PD S/I	Match in sensorics	45,19	59,19	61,38	52,63	56,63	59,06				98,19	55,75	15,25
	Mismatch in PD S/I	54,50	71,84	75,81	66,88	69,41	68,31				107,69	75,09	16,13
	Match in intuition	68,13	85,81	90,88	85,06	83,88	77,81				114,19	95,50	25,44
PD R/I	Match in rationality	103,19	107,88	103,19	88,63	108,38	122,38	98,19	107,69	114,19			
	Mismatch in PD R/I	56,25	80,06	85,06	82,88	76,72	65,13	55,75	75,09	95,50			
	Match in irrationality	6,63	17,88	30,56	17,06	17,50	20,88	15,25	16,13	25,44			

The most interesting, perhaps, is the result of the PD E/I. So in the «old» experiment in 100 % of cases match in extraversion is better than mismatch in PD E/I, but that in turn is better than match in introversion. In the «new» experiment, the result is essentially the same, except for two cases: match in introversion with match in ethics is better than mismatch in PD E/I, but worse than match in extraversion, and also in match in rationality, match in extraversion and introversion is equally better than mismatch in PD E/I.

In the «old» experiment, also in 100 % of cases, match in logic is better than mismatch in PD L/E, but that in turn is better than match in ethics. In a «new» experiment, such a picture is observed only in 4 cases out of 9. In 3 cases, the opposite situation is observed, and in two more match in logic, it is better than match in ethics, and then, in turn, mismatch in PD L/E.

And in the «old» and «new» experiments, again in 100 % of cases, match in sensorics turned out to be

better than mismatch in PD S/I, but in turn it turned out to be better than match in intuition.

The greatest discrepancies between the two experiments turned out to be in PD R/I. In both cases, 100 % match in irrationality turned out to be better than mismatch in PD R/I. In the «new» experiment, mismatch in PD R/I was 100 % better than match in rationality. But in the «old» experiment with match in introversion and intuition, match in rationality turned out to be better than match in irrationality, and in 100 % of cases mismatch in PD R/I turned out to be worse than match.

Conclusion. It is probably premature to draw any unequivocal conclusions, but considering the relatively large samples that are approximately the same in volume and composition and are non-intersecting, it can be said with certain confidence that the hypothesis stated in the monograph [11] on the superiority of identical IR is not confirmed. The picture is clearly more complicated.

One can assert more or less confidently about the positive nature of match in extraversion, sensory, irrationality, and, to some extent, logically. One can also talk about the negative nature of match in introversion and intuition. However, it should be taken into account that the correlation is rather weak and normative, as a criterion of comparison, the option in this case is far from optimal. Therefore, it is necessary to continue these studies in order to further improve the training of the aircraft crews.

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