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Evaluation of Coordination and Optimal Route of Military-Military Integration Logistics System

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Abstract: In order to promote the deep development strategy of national civil-military integration, establish a mutual coupling and coordinated development of military local logistics system, and promote the sound and rapid development of national economic development and national defense modernization, this paper studies the construction and coordination evaluation of civil-military integration logistics system from the field of logistics. This paper briefly describes the relationship between military logistics and civil logistics, at the same time, according to the current situation of domestic epidemic situation, on the basis of the military civilian integration logistics system constructed by scholars, an emergency response mechanism is added to constitute the index system and evaluation model of the coordination degree of the military civilian integration logistics system. This paper uses fuzzy analytic hierarchy process (FAHP) to analyze the new evaluation model of military civil integration logistics coordination degree, and the evaluation matrix of each criterion relative to the overall evaluation objective is obtained. According to the evaluation matrix, and puts forward corresponding suggestions and opinions aiming at the possible problems existing in the current military civil integration logistics system, so as to provide reference for the construction and adjustment of the military civilian integration logistics system by the relevant national departments in the future.

Keywords: Integrated Civil-military Logistics System, Coordination Evaluation, Emergency Response System, Fuzzy AHP

1 1 2 1 1 1

1

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1

“ ”

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[2]

[3]

[1]

[4]

1998 2003
2008
2019

[5]

[6]

[7]

[4]

[8]

2

2.1

1 [4]

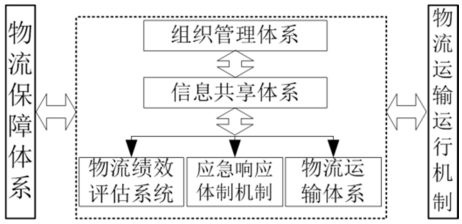
2

3 [9]

2.2

7

1



1

[4]

GDP

[4]

3

3.1

1

1

U	A	B
U	A1	B11
		B12
		B13
		B14
	A2	B21
		B22
		B23
		B24
	A3	B31
		B32
		B33
	A4	B41
		B42
		B43
		B44
	A5	B51
		B52
		B53
		B54
		B55
	A6	B61
		B62
		B63
		B64
		B65
		GDP B66
	A7	B71
		B72
		B73
		B74
		B75

3.2

3.2.1

T.L.Saaty 1970

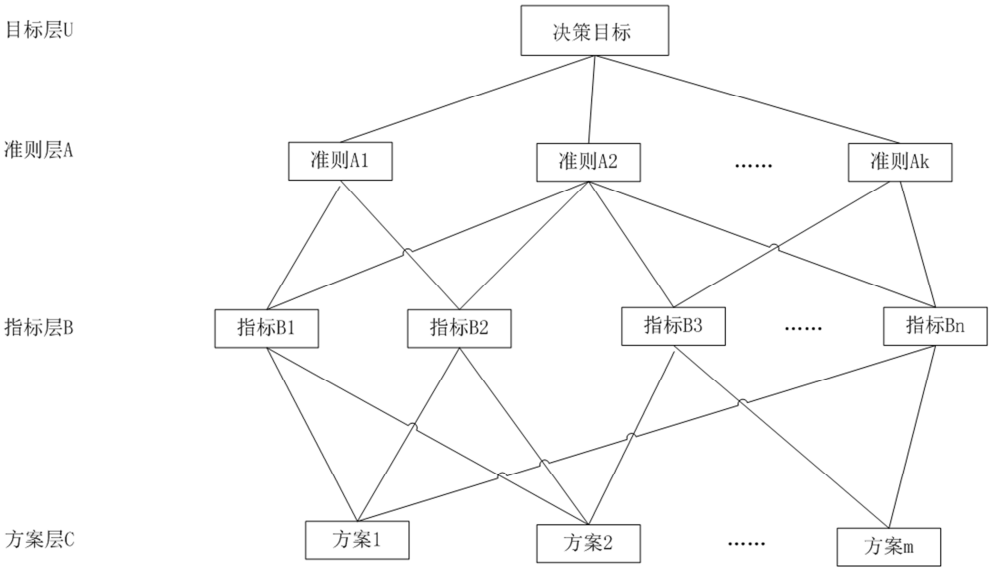
[10]

[11]

[12]

1

U A B C[13] U 2



2

A6
U B61 B62 B63
B64 B65 GDP
A1 A2 B66 A7
A3 A4 A5 B71 B72
A6 A7 B73 B74
B75
A1 B11 B12
B13 B14 2
A2 B21 B22
B23 B24
A3 B31 B32 $A\left[a_{ij}\right]_{m\times m}$ m 9
B33 A4
B41 B42 B43
B44 A5
B51 B52 1-9 [14] 2
B53 B54 B55

2 1-9

a_{ij}	
1	
3	
5	
7	
9	
2 4 6 8	
$1/a_{ij}$	i j a_{ij} j i $a_{ij}=1/a_{ij}$

3

$\lambda_{\max}$

$W=[w_1, w_2, \cdots, w_m]$ W

[19]

$\lambda_{\max}$ W [11]

1 A

$m_i = \prod_{i=1}^{n} a_n \quad i = 1, 2, \cdots, n$

2 m_i n $\overline{w_i} = \sqrt[n]{m_i}$

3 $\overline{W} = [w_1, w_2, \cdots, w_m]$

$W=[w_1, w_2, \cdots, w_m]$

4 $\lambda_{\max}$

$\lambda_{\max} = \frac{1}{n}\sum_{i=1}^{n} \frac{(AW)_i}{w_i}$ $i = 1, 2, \cdots, n$ $(AW)_i$

AW i

4

[16]

n > 2

“A B B C C A ”

[18]

1 $CI = \frac{\lambda_{\max} - n}{n-1}$ n

$\lambda_{\max}$

2 $CR = \frac{CI}{RI}$ RI

$CR \le 0.1$,

$CR \ge 0.1$

3.2.2

U

V

R

W

[9]

1

$U = [u_1, u_2, \cdots, u_m]$

$V = [v_1, v_2, \cdots, v_n]$

$V = [v_1, v_2, \cdots, v_n]$

4 $v_1 =$ $v_2 =$ $v_3 =$ $v_4 =$ [17]

[0,1] n 1/n [0,1/n],[1/n,2/n],[3/n,4/n],…,[i/n,(i+1)/n],…,[(n-1)/n,1], i=1,2 …,n[13] $v_4 =$ [0,0.25]; $v_3 =$ [0.25,0.5]; $v_2 =$ [0.5,0.75]; $v_1 =$ [0.75,1]

$U_1 = [A_1, A_2, A_3, A_4, A_5, A_6, A_7]$,

A_1 A_2 A_3 A_4 A_5 A_6 A_7

$U_{A1} = [B_{11}, B_{12}, B_{13}, B_{14}]$

$U_{A2} = [B_{21}, B_{22}, B_{23}, B_{24}]$,

$U_{A3} = [B_{31}, B_{32}, B_{33}]$

$U_{A4} = [B_{41}, B_{42}, B_{43}, B_{44}]$

$U_{A5} = [B_{51}, B_{52}, B_{53}, B_{54}, B_{55}]$

$U_{A6} = [B_{61}, B_{62}, B_{63}, B_{64}, B_{65}, B_{66}]$

$U_{A7} = [B_{71}, B_{72}, B_{73}, B_{74}, B_{75}]$

2

V

r_{ij} i u_i

$r_i = [r_{i1}, r_{i2}, \cdots, r_{in}]$ m

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix} \quad (1)$$

3

W

R

B

$$B = W \times R = \left[w_1, w_2, \cdots, w_m \right] \times \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix} \quad (2)$$

4

4.1

1-9

1-9

U A

A1

A2

5 1/5

$$U = \begin{bmatrix} 1 & 5 & 1/2 & 3 & 5 & 2 & 1 \\ 1/5 & 1 & 1/5 & 1/3 & 3 & 1/3 & 1/3 \\ 2 & 5 & 1 & 5 & 5 & 5 & 2 \\ 1/3 & 3 & 1/5 & 1 & 3 & 1/2 & 1/3 \\ 1/5 & 1/3 & 1/5 & 1/3 & 1 & 1/3 & 1/5 \\ 1/2 & 3 & 1/5 & 2 & 3 & 1 & 1/3 \\ 1 & 3 & 1/2 & 3 & 5 & 3 & 1 \end{bmatrix} \quad (3)$$

U

$\lambda_{\max}$ W

1 U A

$$W = \left[0.1964, 0.0531, 0.3306, 0.0806, 0.0352, 0.1029, 0.1959 \right] \quad \lambda_{\max} = 7.3799 \quad (4)$$

CI =0.0633 CR =0.0480 < 0.1

$W = \left[0.1964, 0.0531, 0.3306, 0.0806, 0.0352, 0.1029, 0.1959 \right]$

A3

A1 A7 A6

A4 A2

A5

2 A B

A1 A2 A3 A4

A5 A6 A7

$$A_1 = \begin{bmatrix} 1 & 5 & 3 & 5 \\ 1/5 & 1 & 1/3 & 3 \\ 1/3 & 3 & 1 & 3 \\ 1/5 & 1/3 & 1/3 & 1 \end{bmatrix} \quad (5)$$

A_1

$W_1 = \left[0.5495, 0.1293, 0.2476, 0.0736 \right]$, $\lambda_{\max}$ =4.1981 CI =0.660 CR =0.0734<0.1

$$A_2 = \begin{bmatrix} 1 & 3 & 5 & 6 \\ 1/3 & 1 & 2 & 3 \\ 1/5 & 1/2 & 1 & 2 \\ 1/6 & 1/3 & 1/2 & 1 \end{bmatrix} \quad (6)$$

A_2

$W_2 = \left[0.5767, 0.2216, 0.1251, 0.0766 \right]$, $\lambda_{\max}$ =4.0340 CI =0.0113 CR =0.07126<0.1

$$A_3 = \begin{bmatrix} 1 & 3 & 4 \\ 1/3 & 1 & 2 \\ 1/4 & 1/2 & 1 \end{bmatrix} \quad (7)$$

A_3

$W_3 = \left[0.625, 0.2385, 0.1365 \right]$, $\lambda_{\max}$ =3.0183 CI =0.0091 CR =0.0158<0.1

$$A_4 = \begin{bmatrix} 1 & 3 & 1/2 & 5 \\ 1/3 & 1 & 1/3 & 3 \\ 2 & 3 & 1 & 5 \\ 1/5 & 1/3 & 1/5 & 1 \end{bmatrix} \quad (8)$$

A_4

$W_4 = \left[0.3248, 0.1486, 0.46, 0.0665 \right]$, $\lambda_{\max}$ =4.1042 CI =0.0347 CR =0.0386<0.1

$$A_5 = \begin{bmatrix} 1 & 3 & 3 & 5 & 5 \\ 1/3 & 1 & 2 & 3 & 3 \\ 1/3 & 1/2 & 1 & 3 & 3 \\ 1/5 & 1/3 & 1/3 & 1 & 2 \\ 1/5 & 1/3 & 1/3 & 1/2 & 1 \end{bmatrix} \quad (9)$$

A_5

$W_5 = [0.4593, 0.2239, 0.1695, 0.0839, 0.0635]$, λ_{max} =5.1727

CI =0.0432 CR =0.0385<0.1

$$A_6 = \begin{bmatrix} 1 & 3 & 3 & 4 & 4 & 2 \\ 1/3 & 1 & 2 & 3 & 4 & 1/3 \\ 1/3 & 1/2 & 1 & 2 & 3 & 1/3 \\ 1/4 & 1/3 & 1/2 & 1 & 2 & 1/3 \\ 1/4 & 1/4 & 1/3 & 1/2 & 1 & 1/3 \\ 1/2 & 3 & 1/3 & 3 & 3 & 1 \end{bmatrix} \quad (10)$$

A_6

$W_6 = [0.3588, 0.1717, 0.117, 0.0763, 0.0554, 0.2208]$, λ_{max} =6.1118 CI =0.0224 CR =0.0185<0.1

$$A_7 = \begin{bmatrix} 1 & 1/2 & 2 & 3 & 3 \\ 2 & 1 & 3 & 5 & 5 \\ 1/2 & 1/3 & 1 & 2 & 2 \\ 1/3 & 1/5 & 1/2 & 1 & 1/2 \\ 1/3 & 1/5 & 1/2 & 2 & 1 \end{bmatrix} \quad (11)$$

A_7

$W_7 = [0.2491, 0.4360, 0.1481, 0.0716, 0.0951]$, λ_{max} =5.0738

CI =0.0185 CR =0.0165<0.1

4.2

B

3

3

E0[1]	FE0[2]	FW[3]	SEO[4]	SW[5]	RANK[6]				
						OTS[7]	GOOD[8]	SED[9]	POOR[10]
			A11	0.5495		0.2	0.4	0.3	0.1
	U1	0.1964	A12	0.1293	R11	0.3	0.5	0.2	0
			A13	0.2476		0.4	0.3	0.1	0.2
			A14	0.0736		0.2	0.4	0.2	0.2
			A21	0.5767		0.3	0.1	0.3	0.3
	U2	0.0531	A22	0.2216	R22	0.5	0.2	0.1	0.2
			A23	0.1251		0.2	0.3	0.3	0.2
			A24	0.0766		0.3	0.2	0.1	0.4
			A31	0.625		0.1	0.3	0.2	0.4
	U3	0.3306	A32	0.2385	R33	0.4	0.3	0.1.	0.2
			A33	0.1365		0.3	0.2	0.1	0.4
			A41	0.3248		0.4	0.1	0.2	0.3
	U4	0.0806	A42	0.1486	R44	0.3	0.2	0.2	0.3
			A43	0.46		0.4	0.2	0.1	0.3
			A44	0.0665		0.4	0.2	0.3	0.1
U			A51	0.4593		0.3	0.2	0.1	0.4
			A52	0.2239		0.1	0.3	0.2	0.4
	U5	0.0352	A53	0.1695	R55	0.2	0.1	0.3	0.4
			A54	0.0839		0.3	0.1	0.2	0.4
			A55	0.0635		0.2	0.2	0.2	0.4
			A61	0.3588		0.1	0.3	0.4	0.2
			A62	0.1717		0.3	0.1	0.3	0.3
	U6	0.1029	A63	0.117	R66	0.4	0.3	0.1	0.2
			A64	0.0763		0.4	0.2	0.3	0.1
			A65	0.0554		0.3	0.3	0.3	0.1
			A66	0.2208		0.3	0.2	0.2	0.3
			A71	0.2491		0.4	0.3	0.1	0.2
			A72	0.4360		0.3	0.1	0.2	0.4
	U7	0.1959	A73	0.1481	R77	0.2	0.4	0.2	0.2
			A74	0.0716		0.3	0.3	0.3	0.1
			A75	0.0951		0.3	0.1	0.2	0.4

1 EO Evaluation objectives
2 FEO Evaluation objectives at the first level
3 FW Weight of first-level evaluation indicators relative to evaluation objectives
4 SEO Evaluation objectives at the second level
5 SW Weight of second-level evaluation indicators relative to evaluation objectives
6 RANK
7 OTS Outstanding
8 GOOD
9 SED Secondary
10 POOR

B_1 R_{11};
B_2 R_{22} B_3
R_{33} B_4 R_{44} B_5
R_{55} B_6 R_{66} B_7
R_{77}

1

$R_1 = W_1 \times R_{11}$,

U_{A1}
U_{A2} U_{A3}
U_{A4} U_{A5}
U_{A6}
U_{A7}

$$\begin{aligned} R_1 &= W_1 \times R_{11} \\ R_2 &= W_2 \times R_{22} \\ R_3 &= W_3 \times R_{33} \\ R_4 &= W_4 \times R_{44} \\ R_5 &= W_5 \times R_{55} \\ R_6 &= W_6 \times R_{66} \\ R_7 &= W_7 \times R_{77} \end{aligned} \tag{12}$$

$W_i \quad i = (1,2,3,4,5,6)$
$B_1 B_2 B_3 B_4 B_5 B_6 B_7$

$$\begin{aligned} W_1 &= [0.5495, 0.1293, 0.2476, 0.0736] \\ W_2 &= [0.5767, 0.2216, 0.1251, 0.0766] \\ W_3 &= [0.625, 0.2385, 0.1365] \\ W_4 &= [0.3248, 0.1486, 0.46, 0.0665] \\ W_5 &= [0.4593, 0.2239, 0.1695, 0.0839, 0.0635] \\ W_6 &= [0.3588, 0.1717, 0.117, 0.0763, 0.0554, 0.2208] \\ W_7 &= [0.2491, 0.4360, 0.1481, 0.0716, 0.0951] \end{aligned} \tag{13}$$

$$\begin{aligned} R_1 &= [0.2625, 0.3882, 0.2302, 0.1192] \\ R_2 &= [0.3318, 0.1548, 0.2404, 0.2730] \\ R_3 &= [0.1989, 0.2863, 0.1625, 0.3523] \\ R_4 &= [0.3851, 0.1675, 0.1606, 0.2867] \\ R_5 &= [0.2319, 0.1971, 0.1710, 0.4000] \\ R_6 &= [0.2476, 0.2359, 0.2904, 0.2261] \\ R_7 &= [0.3101, 0.2086, 0.1822, 0.299] \end{aligned} \tag{14}$$

7 A1

0.2625 0.3882 0.2302 0.1192 A1

A3

0.3523

A5

0.4000

A7 0.3101

0.299

2

$B = W \times R = [0.2604, 0.2647, 0.1962, 0.2734]$

W=[0.1964, 0.0531, 0.3306, 0.0806, 0.0352, 0.1029, 0.1959]

$V = [\quad]$

$D = [1.0, 0.75, 0.5, 0.25]$,

$B = [0.2604, 0.2647, 0.1962, 0.2734]$

0.6254 [0.5,0.75]

$v_2 =$

,

5

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