

Electronic Supplementary Material 1 (ESM 1) for
**Development and Validation of an Aviation Safety Climate Scale for the
German Armed Forces**

Content

Table E1 Comparison of the original Aviation Safety Climate Scale from Evans et al. (2007) and the adapted ASCS-GAF	2
Table E2 Results of t-tests for independence of both split samples	4
Table E3 Intercorrelations of the ASCS-GAF factors	5
Table E4 Summary of four-factor model.....	6
Figure E1 Four-factor Model of the Aviation Safety Climate Scale for the German Armed Forces.....	8
Table E5 Summary of two-factor model	9
Figure E2 Two-factor Model of the Aviation Safety Climate Scale for the German Armed Forces.....	11

Table E1

Comparison of the original Aviation Safety Climate Scale from Evans et al. (2007) and the adapted ASCS-GAF

Factor	Original item	Translated & adapted item	Modifications made
<i>Management Commitment and Safety Communication</i>	Suggestions for improving safety were encouraged	Das Personal wird ermutigt, eigene Vorschläge zur Verbesserung der Sicherheit einzubringen.	Rephrasing into an active form
	Management were genuinely interested in safety issues	Die Verbandsführung interessiert sich ernsthaft für sicherheitsrelevante Themen.	“Management” → “Unit leadership”
	Pilots were consulted about safety issues	Das Personal wird bei sicherheitsrelevanten Themen beteiligt	“Pilots” → “Personnel”
	Pilots were able to openly discuss safety problems with supervisors or managers	Das Personal kann offen mit Vorgesetzten und Verbandsführung über sicherheitsrelevante Probleme sprechen	“Pilots” → “Personnel” “Managers” → “Unit leadership”
	Pilots were given sufficient feedback regarding safety incidents involving company aircraft	Das Personal erhält genügend Feedback über Zwischenfälle mit bundeswehreigenen Luftfahrzeugen	“Pilots” → “Personnel” “Company aircraft” → “German Armed Forces aircraft”
	Management had a good understanding of operational issues that impacted on flight safety	Die Verbandsführung hat ein gutes Verständnis der operationellen Themen, die einen Einfluss auf die Flugsicherheit haben	“Management” → “Unit leadership”
	Management regarded safety to be an important part of company operations	Die Verbandsführung sieht das Thema Sicherheit als einen wichtigen Teil des täglichen Dienstbetriebes an	“Management” → “Unit leadership” “Company operations” → “Service operations”
	Management looked for underlying factors that contributed to safety incidents rather than blame the people involved	Die Verbandsführung sucht bei sicherheitsrelevanten Vorkommnissen eher nach den dazu führenden und beitragenden Faktoren anstatt das beteiligte Personal zu beschuldigen	“Management” → “Unit leadership”
	Pilots were encouraged to consider that safety was more important than keeping to the schedule	Das Personal wird ermutigt zu berücksichtigen, dass Sicherheit wichtiger ist als Zeitvorgaben zu erfüllen	“Pilots” → “Personnel”

	Management allocated sufficient resources to safety	Die Verbandsführung stellt genügend Ressourcen für die Flugsicherheitsarbeit zur Verfügung	“Management” → “Unit leadership” “Safety” → “Flight safety work”
<i>Safety Training</i>	There was regular training to update knowledge	Es gibt regelmäßige Trainings, um das eigene Wissen auf aktuellem Stand zu halten	-
	Regular training was provided in a range of emergency	Regelmäßiges Training der unterschiedlichen Notverfahren wird angeboten	-
	Company training provided appropriate skills and experience for normal operations	Das angebotene Training führt zu genügend Kompetenz und Erfahrung für den täglichen Dienstbetrieb.	“Company training“ → „Offered training“ „Normal operations“ → „Daily service operations”
	Training was provided for new procedures or equipment	Für neue Betriebsverfahren oder Ausrüstung wird ein Training durchgeführt.	-
<i>Equipment and Maintenance</i>	Aircraft were maintained to a safe standard	Im Verband führt die Wartung und Instandsetzung der Luftfahrzeuge zu einem hohen Sicherheitsstandard.	Rephrasing into an active form “maintenance” → “maintenance and repair”
	Equipment was updated or replaced when necessary	Wenn nötig wird die im Verband vorhandene Ausrüstung modernisiert oder ersetzt	-
	Reported technical faults that impacted on safety were rectified	Gemeldete technische Mängel, die Auswirkungen auf die Sicherheit haben, werden korrigiert.	-
	Adequate resources were made available to perform maintenance	Es werden genügend Ressourcen für die Wartung und Instandsetzung zur Verfügung gestellt	“maintenance” → “maintenance and repair”

Note. All items were rephrased into a present form to fit the needs of the Directorate Aviation Safety of the German Armed Forces.

Table E2*Results of t-tests for independence of both split samples*

Item	Sample A			Sample B			<i>t</i>	<i>df</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>			
1 Suggestions for improving safety were encouraged	3.50	.97	496	3.53	.95	490	-.50	984	.62
2 Management were genuinely interested in safety issues	3.66	.97	494	3.57	1.02	490	1.52	982	.13
3 Pilots were consulted about safety issues	3.54	.96	494	3.54	.94	490	.06	982	.95
4 Pilots were able to openly discuss safety problems with supervisors or managers	3.81	1.00	495	3.80	1.00	489	.13	982	.89
5 Pilots were given sufficient feedback regarding safety incidents involving company aircraft	3.28	1.07	496	3.27	1.07	491	.08	985	.94
6 Management had a good understanding of operational issues that impacted on flight safety	3.39	.89	491	3.33	.87	483	1.13	972	.26
7 Management regarded safety to be an important part of company operations	3.89	.96	493	3.89	.92	489	-.02	980	.99
8 Management looked for underlying factors that contributed to safety incidents rather than blame the people involved	3.32	1.07	492	3.36	1.03	487	-.60	977	.55
9 Management encouraged pilots to consider safety more important than keeping to the schedule	3.34	1.15	496	3.39	1.09	490	-.69	984	.49
10 Management allocated sufficient resources to safety	3.35	1.00	492	3.34	.95	485	.18	975	.85
11 Training was received at regular intervals to refresh and update knowledge	3.19	1.10	494	3.23	1.03	489	-.61	981	.54
12 Regular training was provided for a range of emergency situations	3.06	1.16	487	3.11	1.07	479	-.60	960	.55
13 Company training provided adequate skills and experience to carry out normal operations safely	3.21	1.30	491	3.23	.97	480	-.24	969	.81
14 Training was received when new procedures or equipment were introduced	3.23	1.07	491	3.25	.99	484	-.24	973	.81

15 Aircraft was maintained to safety standards	3.96	.86	489	4.01	.83	484	-.87	971	.39
16 Equipment was updated and replaced when necessary	2.63	1.06	492	2.66	1.50	487	-.46	977	.64
17 Adequate resources were allocated to perform maintenance	3.68	1.00	493	3.72	.97	487	-.69	978	.49
18 Reported technical faults that impacted on safety were rectified	2.68	1.13	490	2.72	1.07	484	-.50	970	.62

Table E3

Intercorrelations of the ASCS-GAF factors (Sample A, n=483)

	Factor 1	Factor 2	Factor 3
Factor 1		.61**	.60**
Factor 2	.61**		.53**
Factor 3	.61**	.54**	

Note 1. Upper right half shows correlations of the original structure, lower left half shows adapted structure.

Note 2. ** $p < .01$.

As can be seen, intercorrelations yielded a solid indication that these factors in fact depict different facets of the broader underlying construct “safety climate”.

Table E4*Summary of four-factor model (Sample A, n=483)*

Items	Item Loadings			
	1	2	3	4
1 Suggestions for improving safety were encouraged	.62			
2 Management were genuinely interested in safety issues	.54			
3 Pilots were consulted about safety issues	.78			
4 Pilots were able to openly discuss safety problems with supervisors or managers	.83			
5 Pilots were given sufficient feedback regarding safety incidents involving company aircraft				
6 Management had a good understanding of operational issues that impacted on flight safety				-.56
7 Management regarded safety to be an important part of company operations				-.72
8 Management looked for underlying factors that contributed to safety incidents rather than blame the people involved	.52			
9 Management encouraged pilots to consider safety more important than keeping to the schedule				
10 Management allocated sufficient resources to safety			.46	
11 Training was received at regular intervals to refresh and update knowledge		.63		
12 Regular training was provided for a range of emergency situations		.89		
13 Company training provided adequate skills and experience to carry out normal operations safely		.85		
14 Training was received when new procedures or equipment were introduced		.60		
15 Aircraft was maintained to safety standards				
16 Equipment was updated and replaced when necessary			.63	
17 Adequate resources were allocated to perform maintenance			.44	

18 Reported technical faults that impacted on safety were rectified	.73
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Note 1. Items of the original scale are presented due to better readability.

Note 2. Factor loadings <.30 are not depicted.

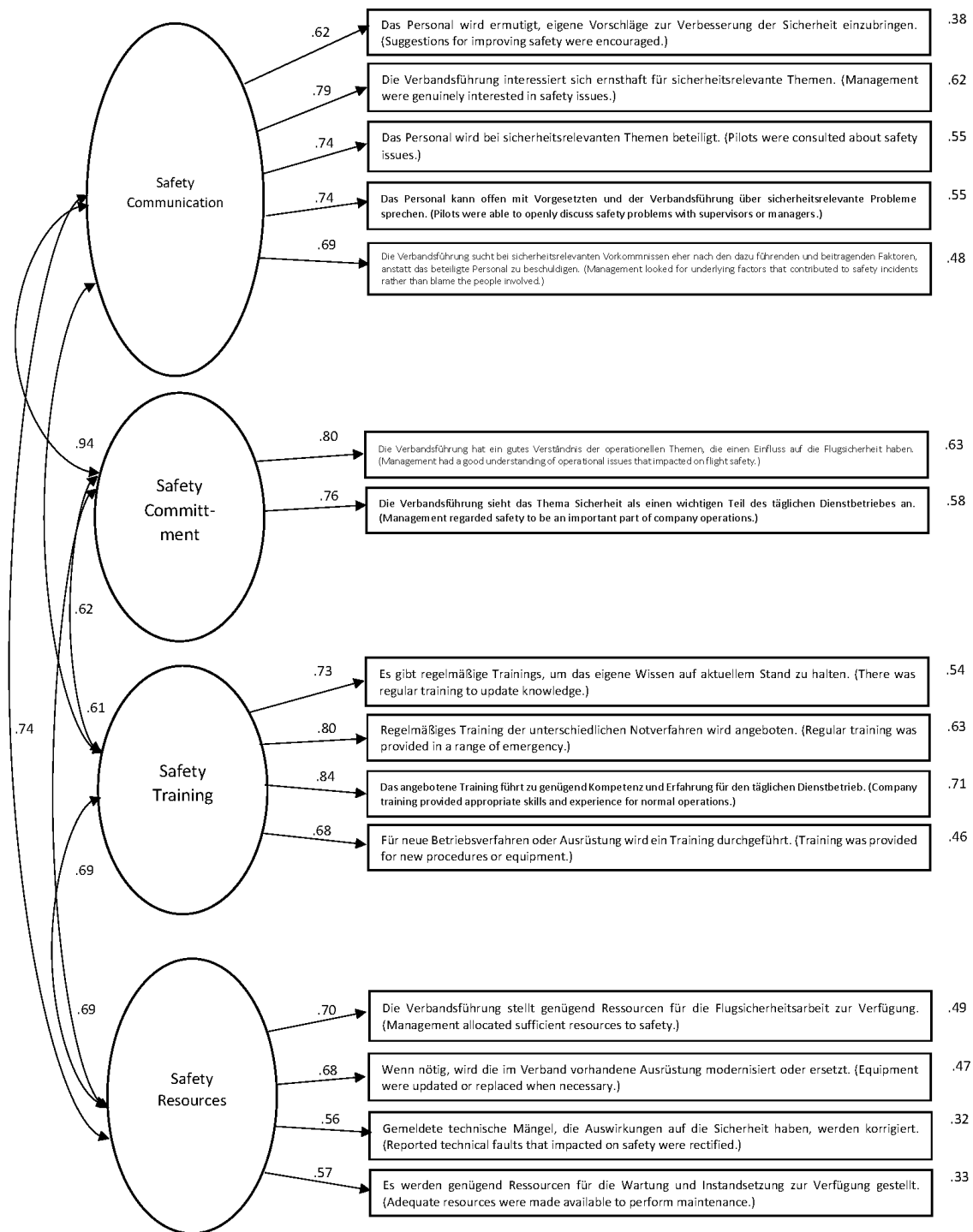
Note 3. Total variance explained=52.17% (Factor 1=40.57%; Factor 2=5.96%; Factor 3=4.01%; Factor 4=1.64%).

Note 4. Summary data for Factor 1 (Eigenvalue=7.76, $M=3.56$, $SD=1.00$); Factor 2 (Eigenvalue=1.48, $M=3.17$, $SD=1.07$); Factor 3 (Eigenvalue=1.22, $M=3.26$, $SD=1.01$), Factor 4 (Eigenvalue=0.78, $M=3.64$, $SD=.93$)

As can be seen, compared to the three-factor-solution, factor 1 was "shortened" to five items, whereas two items did not load on any other factor and two items loaded on factor 4. Factor 2 remained the same as in the three-factor model while factor 3 remained similar (item 15 does not load on it in this model). Explained variance of this model was 52%.

Figure E1

Four-factor Model of the Aviation Safety Climate Scale for the German Armed Forces



Note. Values from left to right: Correlations, regression weights, variances.

Table E5*Summary of two-factor model (Sample A, n=483)*

Items	Item Loading	
	1	2
1 Suggestions for improving safety were encouraged	.59	
2 Management were genuinely interested in safety issues	.80	
3 Pilots were consulted about safety issues	.76	
4 Pilots were able to openly discuss safety problems with supervisors or managers	.81	
5 Pilots were given sufficient feedback regarding safety incidents involving company aircraft	.39	
6 Management had a good understanding of operational issues that impacted on flight safety	.70	
7 Management regarded safety to be an important part of company operations	.81	
8 Management looked for underlying factors that contributed to safety incidents rather than blame the people involved	.67	
9 Management encouraged pilots to consider safety more important than keeping to the schedule	.63	
10 Management allocated sufficient resources to safety	.31	.44
11 Training was received at regular intervals to refresh and update knowledge		.65
12 Regular training was provided for a range of emergency situations		.83
13 Company training provided adequate skills and experience to carry out normal operations safely		.87

14 Training was received when new procedures or equipment were introduced	.70
15 Aircraft was maintained to safety standards	.37
16 Equipment was updated and replaced when necessary	.40
17 Adequate resources were allocated to perform maintenance	.31
18 Reported technical faults that impacted on safety were rectified	.42

Note 1. Items of the original scale are presented due to better readability.

Note 2. Factor loadings < .30 are not depicted.

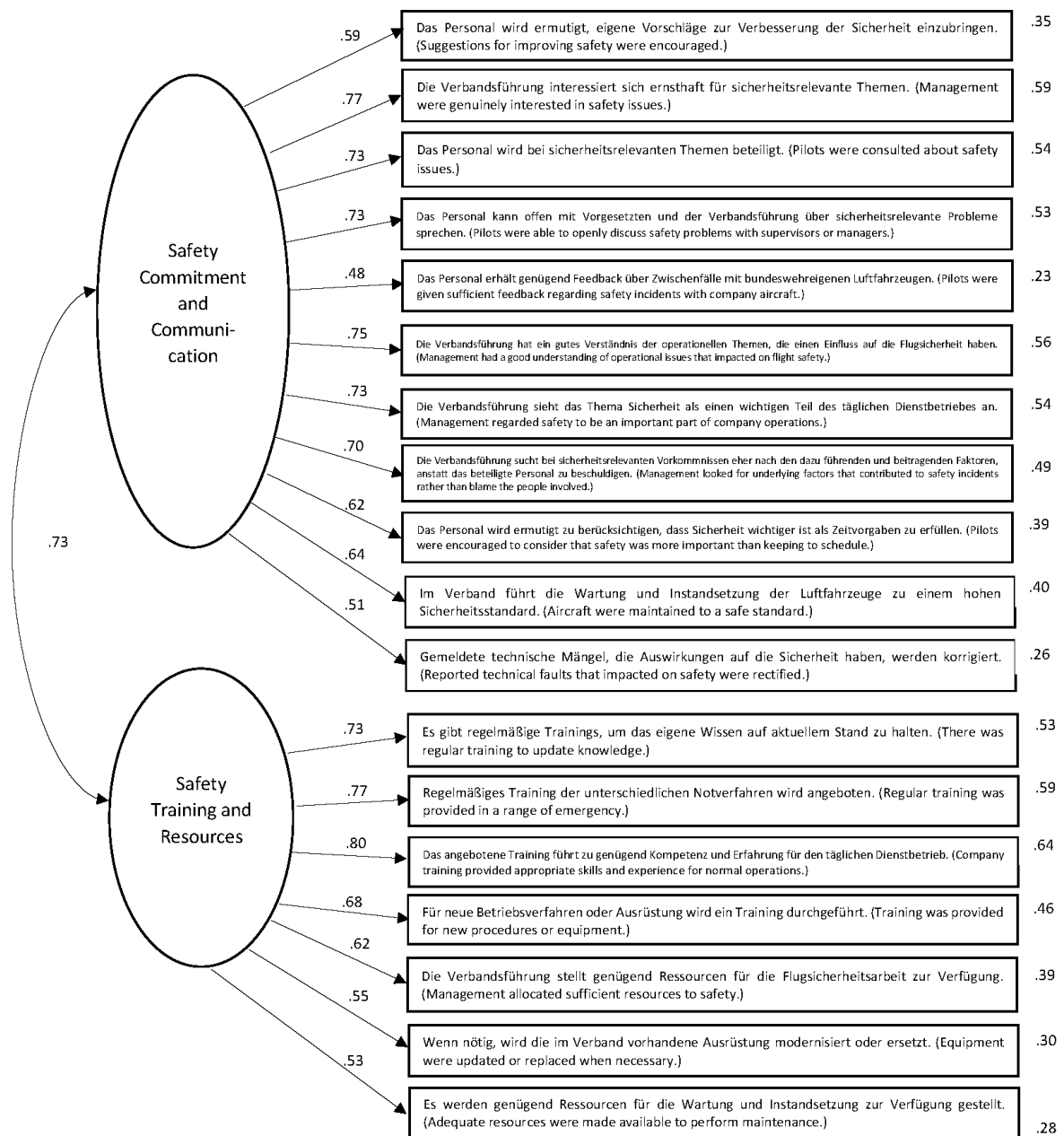
Note 3. Total variance explained=45.84% (Factor 1=40.26%; Factor 2=5.59%)

Note 4. Summary data for Factor 1 (Eigenvalue=7.76, $M=3.58$, $SD=.99$); Factor 2 (Eigenvalue=1.48, $M=3.04$, $SD=1.07$)

As can be seen, the following changes happened compared to the three-factor model: Factor 1 of the bifactor solution consisted essentially of Factor 1 of the three-factor solution plus two items from the original Factor 3. The core of Factor 2 also remained and was supplemented by two items from the original Factor 3 plus item 10, which basically loaded on both factors (although slightly higher on Factor 2). Explained variance of this model was 46%.

Figure E2

Two-factor Model of the Aviation Safety Climate Scale for the German Armed Forces



Note. Values from left to right: Correlations, regression weights, variances.