Risk Perception and Safety Attitudes in IAF Rotary and Fixed Wing Aviators

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Abstract

The objectives of this research was to study the relationship of risk perception and safety attitudes in 130 IAF fixed wing aviators, and to study the relationship of risk taking and being involved in hazardous events to risk perception and safety attitudes in IAF helicopter pilots. Variables were measured using the questionnaire based method.In helicopter pilots, high risk attitude was related to higher risk taking tendency. Higher risk taking tendency was associated with involvement in hazardous events. In fixed wing pilots, high level of self-confidence was significantly associated with decreased delayed, nominal and immediate risk perception. Instructors were found to have higher levels of self confidence in flying than non-instructors. Risk perception decreased significantly as instrument rating and rank increased. In both groups some demographic and flying history variables showed significant differences.These findings will help in building effective research based interventional training programs as accidents and incidents can be prevented by improved pilot training involving risk and attitude identification and management. Effective research based interventional training programs could focus on building up self confidence in flying skills for fixed wing aviators whereas in helicopter pilots risk orientation and perception play an important role. The results of this study suggest that aviator risk management training programs are needed to modify attitudes and risk perception especially in the beginning and middle of the flying career in fixed wing pilots and during mid-flying career in rotary wing pilots.

IJASM 2012; 56(2): 9-20

Key words: risk perception, safety attitudes, aircrew

Introduction

The term risk is generally used in the commonly understood sense. That is, risk is the possibility of loss of life or injury, and it encompasses both the probability of an encounter with a hazard and the severity of a hazard. In that sense it is equivalent to what Sanders and McCormick [1] term danger. They argue that the term risk should be used to denote the probability of an adverse encounter with a hazard, independent of the nature of the hazard. However, the current usage follows Slovic, Fischhoff, and Lichtenstein [2], who suggests that risk perception is determined by a combination of severity and likelihood of injury.

Risk Perception and Aeronautical Decision Making

Risk assessment and management is one component of the broader process of pilot decision-making. Poor pilot decision-making has been implicated as a leading factor in fatal general aviation accidents [3], and poor risk assessment can contribute significantly to poor decision-making. O'Hare [4] suggested that "…an unrealistic assessment of the risks involved may be a factor in leading pilots to 'press on' into deteriorating weather." He found that pilots substantially underestimated the risk of flying relative to other activities, and similarly underestimated their likelihood of being in an accident. They were fairly accurate in their appraisal of the proportion of weather-related accidents, but estimated the rating for the pilot causal factors

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at 57%, when the actual figure is approximately 80%.

The development of expertise in aeronautical decision making (ADM) is not well understood. There are no verifiable or clear-cut criteria for assessing expertise in ADM. There are many different models that describe expert ADM. For example, one model [5] used interviews of experienced pilots to assess the characteristics of expert aviators. Four components were identified: An expert pilot has aviation experience, ability and motivation to attend to the task of flying, dynamic problem-solving skills, and excellent risk management. Risk management encompasses risk perception and risk tolerance [6]. Risk perception is the detection of risk associated with a situation or hazard, from within an individual or the environment. Whereas risk perception is a cognitive activity, risk tolerance is usually considered to relate to temperamental or dispositional characteristics. Deery's model [7] of why automobile drivers take unnecessary risks can be adapted for aeronautical risk management. According to this model, a driver might take risks because of poor risk perception, poor driving skills, or a high level of risk tolerance. In this model, risk perception encompasses the perception of the hazard, the subjective experience of risk, and the self-assessment of skill. The self-assessment of skill involves the pilots' recognition of his or her ability to fly in these situations.

Previous studies have found that ADM errors are related to risk perception [6]. For example, O'Hare and Wiegmann [8] found that pilots who flew into adverse weather during a simulated flight gave lower ratings of the perceived risk compared to other pilots. Risk perception is a key component of expert pilot decision making [5, 9]. Risk perception has largely been measured by having pilots rate the risk involved in various hypothetical flight scenarios [4, 6]. However, although this procedure measures how much risk a pilot perceives in a situation, it does not effectively measure how good the pilots are at perceiving risk. It is because there are no gold standards, or clearly correct responses, to compare a judgment [10].

Therefore, risk perception is the recognition of the risk inherent in a situation. Risk perception may be mediated both by the characteristics of the situation and the characteristics of the viewer. Situations which present a high level of risk for one person may present only low risk for another. Underestimation of the external situation and overestimation of personal capacity leads to a misperception of the risk and is frequently seen as a factor in aircraft accidents. Risk perception may therefore be conceived as primarily a cognitive activity, involving the accurate appraisal of external and internal states.

Hunter [11] described two measures of pilot risk perception. One measure assessed pilots' perception of the level of risk experienced by other fictional pilots, and the second measure assessed the pilots' perceptions of the level of risk they would experience if they were personally involved in a set of scenarios. Analyses for factor scores were derived from the 2 measures. Analysis of variance demonstrated significant differences in the risk ratings for the 4 pilot certificate groups, with the more advanced certificate holders (i.e., commercial and airline transport) reporting lower levels of perceived risk. Construct validity was assessed using only private pilots (N=369).Correlations between the factor scores and measures related to the constructs generally supported the construct validity of the risk perception measures. Inaccurate risk perception, measured as the discrepancy between the perceived risks of flying and driving, was found to be a better indicator of involvement in hazardous aviation events than any of the factor scores.

Safety Attitudes

The current concept of differential accident liability holds that personality characteristics may, at different times and in different situations, place an individual at greater risk of accident involvement; however, the effects are situation specific and not a general tendency of the person to have accidents. Personality components are clearly recognized in the models of pilot behavior proposed by Jensen [12] and in the more general accident causation model of Sanders and Shaw [1]. Several researchers [13, 14,15&16] have evaluated the relationship of attitudes to accident involvement among pilots, with mixed results.

Although not synonymous with personality, attitudes are a closely related construct. Attitudeis defined as "a learned and relatively enduring perception, expressed or unexpressed, influencing a person to think or behave in a fairly predictable manner toward objects, persons, or situations" [17]. Berlin and his co-workers [18] developed an ad hoc program to improve the decision making of pilots that focused heavily on pilots' attitudes, or what they termed *hazardous thought patterns*. From that initial work, the Federal Aviation Administration (FAA) published a series of documents. The documents included a self-report scale that pilots used to identify their characteristic hazardous thought patterns (i.e., macho, antiauthoritarian, impulsive, resigned, invulnerable), and the documents then provided guidance on how to control those patterns. Several studies [19, 20] have found that the training program was effective at improving the in-flight decision making of pilots, at least immediately after completion of the training. However, the design of those studies made it impossible to determine the effect of the hazardous thought pattern components.

Another significant obstacle to evaluating the contribution of the hazardous attitudes training has been the scale used to assess the attitudes. As part of a nationwide probability sample survey of pilots, Hunter [21] developed a 27-item attitude scale that also used a Likert response scale. This scale contained two items worded to reflect each of the five hazardous thought patterns, whereas the remainder of the items addressed other attitudes believed to be reflective of safety, or conversely, risky flying. A subsequent study [22] of the retrospective and prospective validity of the items for aircraft accident involvement found that only the items that assessed the pilots' opinion of how careful and cautious they were consistently predicted accident involvement. A limitation to this study was that only the individual item responses were evaluated, and summated scales from the attitude items were not created or evaluated. Subsequently, an initial analysis of the scale found that a 7-item subscale generated from the original 27 items significantly correlated with a criterion of involvement in hazardous aviation events [23].

Hunter [24] presented data on the psychometric characteristics and construct validity of two Likert-type scales constructed to assess pilots' attitudes. These new scales were developed to assess the factors (Antiauthority, Macho, Invulnerability, Impulsivity, and Resignation) that have been suggested by previous research as being related to pilots' involvement in accidents. Results from the new scales were compared with results from an ipsative scale contained in training developed by the Federal Aviation Administration. The results clearly demonstrated the superiority, both in terms of psychometric characteristics and construct validity, of the Likert-type scales. He suggested that the new scales should be used in those instances in which accurate measurement of the attitudes is needed, specifically to assess the contribution of pilots' attitudes to accident involvement and to assess of the impact of training.

Training

Risk management is a central concept in much of the current aviation training. Although the terminology differs radically, the basic principles of risk management are incorporated in training designed for novice pilots [25] to airline captains in the civilian sector, while similar programs, usually termed Operational Risk Management, have been established in each of the military services. All of these programs focus upon an assessment of risks through the identification of hazards and their expected likelihood, and the development of plans to counter those risk factors. Others [26] described the development of a CD-ROM based training product for the development of risk perception skills. This effort was in response to earlier studies that identified four specific skills as critical in moderating the crash risk of novices. One of those skills was risk perception, which they define as "the ability to detect, perceive and assess the degree of risk associated with actual and emerging hazards."

Aim and Objectives

The aim of the study was to observe the relationship between risk perception and safety attitudes in rotary wing and fixed wing pilots and risk taking and involvement in hazardous events in rotary wing pilots.

The results of this study would help promote a scientific understanding of the processes and attributes of people and situations that contribute to decision making, and potentially to accidents in military aviation. Secondly, these results would help in building effective research based interventional training programs as accidents and incidents can be prevented by improved pilot training involving risk and attitude identification and management.

Methodology

Procedure

The sample of 83 military helicopter pilots and 130 fixed wing pilots was obtained from IAF squadrons. The demographic characteristics of the rotary wing aircrew and fixed wing sample are shown in Table-1& 2 respectively. 72 rotary wing and 93 fixed wing pilots were married.

Table 1: Demographic characteristics of the rotary wing aircrew population

Characteristic	Group Mean (SD)
Age (yrs)	33.18 (5.34)
Education (yrs)	15.27 (0.68)
Service (yrs)	11.22 (5.30)
No. of flying hours	2132.49 (1043.86)

Table 2: Demographic characteristics of the fixed wing aircrew population

Characteristic	Group Mean (SD)
Age (yrs)	35.75 (6.84)
Education (yrs)	15.71 (1.61)
Service (yrs)	13.98 (7.00)
No. of flying hours	2159.50 (1247.05)

Tests were administered in small groups of 10-12 pilots. An informed consent was taken, after which the questionnaire was handed out to be filled by all individuals after establishinga rapport with the pilot group. They were instructed about each of the tests and were told to give their first and natural response to the statements and answer them carefully and truthfully. The participants were instructed not to omit any question / statement.

The two questionnaires were administered to both rotary wing and fixed wing pilots;(a) Aviation Safety Attitude Scale[21] consisting of 27 items, each designed specifically to assess pilots' attitudes with respect to aviation safety issues. Ten items reflected the five hazardous attitudes suggested by

Berlin et al. [18]. Additional items assessed attitudes regarding weather; the risks encountered in aviation, the likelihood of experiencing an accident, and self-perceived skill. There were three sub factors self-confidence (SC), risk orientation (RO) and safety orientation (SO). Reliability and construct validity of this scale was reported by Hunter [24]. (b) Risk Perception Scale [11] consisting of 17 scenarios depicting aviation situations in which the participants were asked to rate the level of risk present in the situation. The scenarios were written in the third person, so that respondents rate the risk for the pilot described in the scenario and not for themselves. A response scale of 1 (*low risk*) to 100 (*high risk*) was used, and descriptions of the extreme and middle anchor points were given. There were three sub factors delayed risk (DR), nominal risk (NR) and immediate high risk (IHR). Reliability and construct validity of this scale was reported by Hunter [11].

To measure involvement in hazardous events the rotary wing pilots were administered the Army Hazardous Event Scale [27], a 36-item scale that assessed participants' involvement in hazardous aviation events. Participants were asked to indicate how often during the previous 24 months they had been involved in the event. The response scale ranged from 0 to 4 or more. Higher scores indicated the person had experienced more hazardous events. Reliability and construct validity of this scale was reported by Hunter & Stewart [28].

The fixed wing pilots were administered the Hazardous Event Scale[21], a 10-item scale that assessed participants' involvement in hazardous aviation events. Participants were asked to indicate how often during the preceding 24 months they had been involved in the event. The response scale ranged from 0 to 4 or more as above. Four separate studies have reported reliability and validity coefficients [21, 6, 13, &29].

In addition to this the rotary wing pilots were administered the Risk Taking Tendency[30] which consisted of five hypothetical scenarios regarding helicopter operations. For each scenario the subject had to choose one of two action alternatives. A risk taking tendency index (RTI) was then computed. The AHES and Risk Taking Tendency scale were not administered to fixed wing pilots as these pertained specifically to helicopter operations.

The results were hand scored according to the authors' instructions and subjected to statistical analyses using the STATISTICA® software. The association between the independent variables (risk perception/attitudes) and the dependent variables (hazardous events/risk taking tendency) were computed using Pearson's Product Moment Correlations and significances noted. The effects of demographic and flying history variables (such as instrument rating and instructor status) were derived using ANOVA and t tests of significance.

Results

Rotary wing aviators

The descriptive statistics for the whole sample (N=83) on all variables are shown in Table-3.

Table 3: Descriptive Statistics of Variables (Rotary wing aviators)

Variable	Mean	(SD)
AHES	16.55	13.82
ASAS – Total (T)	86.23	8.00
ASAS – Self Confidence (SC)	46.15	5.27
ASAS – Risk Orientation (RO)	21.45	4.81
ASAS – Safety Orientation (SO)	15.43	1.89
RTI	4.34	09.90
RPO	1085.91	160.07
RPO – Delayed Risk (DR)	68.31	12.01
RPO – Nominal Risk (NR)	40.45	16.60
RPO– Immediate High Risk (IHR)	87.32	11.41

Table 4: Correlation Coefficients between Independent and Dependant Variables

Variable	AHES	ASAS (T)	ASA S(SC)	ASAS (RO)	ASAS (SO)	RTI	RPO	RPO (DR)	RPO (NR)	RPO (IHR)
AHES	1.00									
ASAS-T	0.08	1.00								
ASAS-(SC)	-0.16	0.68	1.00							
ASAS (RO)	0.29	0.65	-0.04	1.00						
ASAS (SO)	0.10	0.56	0.21	0.28	1.00					
RTI	0.27	0.02	-0.17	0.24	-0.01	1.00				
RPO	-0.19	-0.19	-0.13	-0.20	0.00	-0.21	1.00			
RPO (DR)	0.04	-0.17	-0.11	-0.18	0.02	-0.08	0.64	1.00		
RPO (NR)	-0.03	0.03	0.01	-0.01	0.06	-0.19	0.65	0.18	1.00	
RPO (IHR)	-0.30	-0.26	-0.16	-0.23	-0.04	-0.08	0.50	0.22	-0.10	1.00

Relationship of independent variables with the dependant variable of RTI - High scores on RO were related to higher risk taking tendency(r = 0.24, p< 0.05).

Relationship between independent variables - High scores on ASAS RO were associated with low scores on immediate high risk perception (r =-0.23, p< 0.05). Sub factors of Aviation Safety Attitudes and Risk Perception were significantly correlated between themselves indicating high internal consistency of responding.

Role of demographic and flying history variables - Some demographic and flying history variables showed significant differences in safety attitudes and risk perception. ASAS SC was positively correlated with flying hours (0.29) and years of service (0.23). Instructors had a significantly higher SO (17.50 ± 9.04) than non-instructors (15.21± 10.36), t value was -3.47, p<0.0008. Differences in DR were seen with rank with squadron leaders showing higher levels of DR perception than other ranks, F=3.32, p<0.02.

Fixed Wing Aviators

The descriptive statistics for the whole sample (N=130) on all variables are presented in Table-5.

Table 5 : Descriptive Statistics of Variables (Fixed wing aviators)

Variable	Mean	(SD)
AHES	05.88	04.69
ASAS – Total (T)	87.67	6.73
ASAS – Self Confidence (SC)	47.98	4.61
ASAS – Risk Orientation (RO)	21.82	3.48
ASAS – Safety Orientation (SO)	14.74	1.72
RPO	1099.29	184.85
RPO – Delayed Risk (DR)	68.61	13.56
RPO – Nominal Risk (NR)	40.66	14.70
RPO– Immediate High Risk (IHR)	86.18	09.98

Relationship of independent variables with the dependant variable of HES - None of the safety attitudes or risk perception were associated with involvement in hazardous events. The correlation coefficients between independent and dependant variables are shown in Table-6.

Relationship between Risk perception and Safety Attitudes - High scores on ASAS SC were associated with low scores on risk perception (total), delayed, nominal and immediate high risk perception (r =-0.31, -0.31,-0.20,-0.23 p<0.05). Sub factors of Aviation Safety Attitudes and Risk Perception were significantly correlated between themselves indicating high internal consistency of responding.

Table 6: Correlation Coefficients between Risk perception and Safety Attitudes

Variable	HES	ASAS (T)	ASAS (SC)	ASAS (RO)	ASAS (SO)	RPO	RPO (DR)	RPO (NR)	RPO (IHR)
AHES	1.00								
ASAS-T	-0.04	1.00							
ASAS(SC)	0.03	0.82	1.00						
ASAS RO)	-0.06	0.58	0.12	1.00					
ASAS (SO)	-0.15	0.46	0.24	0.01	1.00				
RPO	0.02	-0.27	-0.31	-0.12	-0.02	1.00			
RPO (DR)	0.03	-0.26	-0.31	-0.09	-0.03	0.88	1.00		
RPO (NR)	0.06	-0.16	-0.20	-0.04	-0.06	0.66	0.40	1.00	
RPO (IHR)	-0.06	-0.23	-0.23	-0.16	-0.06	0.61	0.22	0.19	1.00

Table 7: Correlation Coefficients between Risk perception, Safety Attitudes and Demographic variables

	Age	Yrs ofService	Flying Hrs
HES	0.14	0.13	0.18
ASAS-T	0.01	0.01	0.13
ASAS-(SC)	0.19	0.19	0.31
ASAS (RO)	-0.26	-0.27	-0.18
ASAS (SO)	0.02	0.00	-0.04
RPO	-0.23	-0.25	-0.20
RPO (DR)	-0.22	-0.24	-0.22
RPO (NR)	-0.05	-0.06	-0.03
RPO (IHR)	-0.28	-0.28	-0.20

Role of demographic and flying history variables - Some demographic and flying history variables showed significant differences in risk perception and involvement in hazardous events as shown in Table-7. Instructors had a significantly higher SC level (49.14 ± 4.99) than non-instructors (47.29 ± 4.20),t value was -2.25, $p<0.02$. Pilots who had been involved in accidents/incidents were involved in a higher number of hazardous events (7.45 ± 5.97) than pilots who had not been involved (5.38 ± 4.11). Delayed and immediate high risk perception varied significantly with rank ($F=3.10$, $p< 0.02$; $F=2.47$, $p<0.05$) and instrument rating ($F=3.05$, $p< 0.03$; $F=2.72$, $p<0.05$). Higher rank and instrument rating exhibited lower levels of risk perception.

Discussion

The group total mean number of hazardous events that both these samples had been involved in is less compared to another study on 200 US army aviators [27] where the mean number was around 23 events. The difference for this finding could be due to the fact that army aviators in the US are used to reporting incidents and events and therefore do not refrain from doing so. In India they are not used to doing so and therefore may under report. Hunter [24] reported ASAS values as SC- 46.13 (6.67), RO- 17.21(3.26) and SO- 15.97(1.74) on samples of 428, 438 and 440 general aviation pilots. He reported [11] another set of values on 228 general aviation pilots as SC- 45.39 (5.76), RO- 17.39 (2.98) and SO-16.15 (1.64). Those SC and SO values are similar to the findings in this study, however the RO values are higher and this difference could be due to the sample studied here which was military pilots unlike previous studies where civil pilots were studied. The values on RPO-DR, NR and IHR in our study are similar to those reported by Hunter [11] as DR-73.63 (10.92), NR-39.94 (15.83) and IHR-86.84 (9.50).

Rotary wing aviators

The total RP score and the sub factors of DR and NR did not show a significant correlation with AHES similar to Hunter [24,11] who also found no significant correlation between the total RP score and the HES and did not report any significant findings in the sub factors. However IHR perception was negatively correlated with the HES, indicating that high level of risk perception was associated with a lower number of hazardous events, presumably because it would curb risk taking .Higher risk taking tendency was significantly associated with increased involvement in hazardous events, this is similar to our previous finding on army helicopter pilots [31].

Decreased perception in IHR perception scores was associated with higher risk taking tendency, which indicates lowered perception leads to higher risk taking. This is similar to our previous finding on army helicopter pilots [31]. High scores on RO were related to higher risk taking tendency; as risk orientation increases risk taking also increases.

On the ASAS the present study found a significant negative correlation between RO and IHR perception, similar to Hunter [11] but different because that study also found significant relationships between all the ASAS sub factors and RPO. Hunter [24] reported significant negative correlations between ASAS SC (-0.167) and ASAS RO (-0.206) and RP. Our results of SC do not show any significant correlation but RO indicates significant negative correlations with RPO-IHR similar to Hunter's finding. Sub factors of Aviation Safety Attitudes and Risk Perception were significantly correlated between themselves indicating high internal consistency of responding and these are similar findings to those of Hunter [11].

ASAS SC was positively correlated with flying hours (0.29) and years of service (0.23). Instructors had a significantly higher SC (17.50 ± 9.04) than non-instructors (15.21± 10.36), t value was -3.47, $p<0.0008$. Differences in DR were seen with rank with squadron leaders showing higher levels of DR perception than other ranks, $F=3.32$, $p< 0.02$. This study found that on ASAS SC, instructors were significantly higher than non-instructors, self-confidence was found to be higher with more flying hours and service. The safety attitude of self-confidence appears to be based on flying experience and should be one of the factors that need to be built up during interventional training programs. Differences in DR perception were seen with rank. This finding is in line with Hunter [24] who found the same direction of difference between student and commercial certificate pilots.

Fixed wing aviators

The total RP score and the sub factors did not show a significant correlation with HES similar to Hunter [24, 11] who also found no significant correlation between the total RP score and the HES and did not report any significant findings in the sub factors. The ASAS sub factors also did not show any significant correlations with HES similar to Hunter's [24] findings but different from his because he found a significant correlation between SC and HES.

ASAS SC showed significant negative correlations with risk perception (total), delayed, nominal and immediate high risk perception indicating that as self-confidence increases risk perception decreases. This is essentially because that as self-confidence increases the individual feels more in control and tends to think that he can overcome/deal with obstacles and therefore perceives less risk. Hunter [24] reported a significant negative correlation between ASAS SC

(-0.167) and RP. Sub factors of Aviation Safety Attitudes and Risk Perception were significantly correlated between themselves indicating high internal consistency of responding and these are similar findings to those of Hunter [11].

ASAS SC was positively correlated and RO negatively correlated with age, flying hours and years of service. As age, flying hours and years of service increase self-confidence increases, risk orientation and risk perception decreases. Hunter [11] found significant negative correlations between total flight time and RPO sub factors.

Instructors had a significantly higher SC level than non-instructors. Delayed and immediate high risk perception varied significantly with rank and instrument rating. Higher rank and instrument rating exhibited lower levels of risk perception. This finding is in line with Hunter [24] who found the same direction of difference between student and commercial certificate pilots with more experienced pilots perceiving less risk.

Differences between rotary and fixed wing pilots

The descriptive statistics of variables in both groups are similar but there were some differences in the pattern of correlations. The main difference between the two groups was that in rotary wing aviators ASAS-RO and RPO was significantly correlated with being involved in hazardous events whereas in fixed wing aviators, safety attitudes and risk perception were not related to hazardous events. Risk orientation was significantly correlated to safety orientation and IHR perception in helicopter pilots whereas this relationship was not observed in fixed wing pilots. In fixed wing aviatorsself-confidence was significantly correlated with risk perception and safety orientation whereas in rotary wing aviatorsself-confidence was seen more as rank and instrument rating progressed. It appears that self-efficacy is an important component in fixed wing operations maybe because task demands are higher. In rotary wing operations risk orientation plays a prominent role because of its relationship to safety orientation and IHR perception.

Conclusion

Risk assessment and safety attitudes are components of pilot decision-making. Poor pilot decision-making has been implicated as a leading factor in fatal aviation accidents. Hazardous attitudes and poor risk assessment can contribute significantly to poor decision-making.

The objective of this research was to study risk perception and safety attitudes in military pilots since relatively little is known about the relationship between these variables and accident involvement, especially in the Indian context. 83 helicopter pilots from various Aviation Squadrons of different Commands were asked to complete a demographic data sheet and four questionnaires. The results were scored and subjected to statistical analyses which computed the association between the independent variables (risk perception/attitudes) and the dependent variables (hazardous events/risk taking tendency) using Pearson's Product Moment Correlations. 130 fixed wing pilots from various Aviation Squadrons of different Commands were asked to complete a demographic data sheet and three questionnaires. The results were scored and subjected to statistical analyses which computed the association between risk perception and attitudes using Pearson's Product Moment Correlations.

In rotary wing aviators, high risk attitude was related to higher risk taking tendency. Higher risk taking tendency was associated with involvement in hazardous events. Some demographic and flying history variables showed significant differences In fixed wing aviators, high level of self-confidence was significantly associated with decreased delayed, nominal and immediate risk perception. Some demographic and flying history variables also showed significant differences. Instructors were found to have higher levels of self confidence in flying than non-instructors. Risk perception decreased significantly as instrument rating and rank increased. This indicates that with flying experience risk perception becomes less as the pilot grows in confidence and control of flying skills. This indicates that risk taking attitudes in Indian pilots are similar to their western counterparts and the type of flying operation may determine the predominant safety attitude i.e. self-confidence or the risk orientation safety attitude. Helicopter operations during peacetime may be inherently more risky than fixed wing operations.

These findings will also help in building effective research based interventional training programs as accidents and incidents can be prevented by improved pilot training involving risk and attitude identification and management. Effective research based interventional training programs could focus on building up self confidence in flying skills for fixed wing aviators whereas in helicopter pilots risk orientation and perception play an important role. The results of this study suggest that aviator risk management training programs are needed to modify attitudes and risk perception especially in the beginning and middle of the flying career in fixed wing pilots and during mid-flying career in rotary wing pilots.

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