SOUTH AFRICAN CIVIL AVIATION AUTHORITY

SKYwatch

SAFETY BRIEF SEVENTH EDITION | MARCH 2023

EDITORIAL NOTE BY THE DIRECTOR OF CIVIL AVIATION

Keeping our SKIES SAFE

Dear Aviators,

Achieving the highest levels of safety and security in the civil aviation space continues to be the key priority of the SA Civil Aviation Authority. That is why we want to encourage all aviators not to skimp on the cost of aircraft maintenance and safety practices in the current economic realities.

The International Monetary Fund (IMF) has indicated that South Africa's economy will grow by 1.2% this year, which is slightly higher (+0.1%) than its forecast in October last year. It cautioned that "weaker external demand, power shortages, and structural constraints" will weigh on economic growth this year. In January, the Reserve Bank slashed its expectation for economic growth in 2023 to only 0.3%. It is tempting to cut corners in such an economic environment, but aviation safety should remain the first priority for aviators.

Among the top ten causal factors attributed to accidents in the last financial year, *"Mechanical, Engine and Powerplant"* was the second highest category. This gives us cause to pause and consider the consequences of poor maintenance and neglecting to service aircraft when necessary. Although our airlines have a proud record of safety and security, the general aviation sector still battles with the unnecessary loss of lives due to some avoidable aircraft accidents.

What seems to be giving hope to this concerning situation is the current implementation of the five-year General Aviation Safety Strategy (GASS). The SACAA has adopted a multifunctional approach and strategy in addressing the underlying factors that form the chain of events leading to aviation accidents in general aviation. You may read more about this in the article 'New enthusiasm for GA safety strategy' in this edition. In the new financial year, we will focus our efforts on reviewing the GA Safety Strategy in terms of reducing accidents in the GA sector; specifically on greater awareness of shared airspace in the uncontrolled environment and the effect of RPAS in this airspace; and interventions required to deal with increased air proximity incidents.

The Instrument Rating Syllabus will also be reviewed, while continuing research and testing the viability of a "PPL limited IF" study unit to assist pilots to deal with loss of situational awareness. Furthermore, efforts towards the growth and development of the industry will intensify by increasing outreach activities, focusing on youth involvement in occupational opportunities in technical and operational fields in GA, and on community responsibility in the Recreational Aviation environment.

Other articles cover the issues of crew resource management, loss of control, and air proximity occurrences.

Being always prepared is the best way to deal with sudden surprises in the course of your flight!

Until next time.

Ms Poppy Khoza
Director of Civil Aviation (CEO)

INSIDE THIS ISSUE

New enthusiasm for GA SAFETY STRATEGY

In the quest to find solutions and help decrease the rate of aviation accidents in general aviation, the South African Civil Aviation Authority (SACAA) is continuing to implement its five-year General Aviation Safety Strategy (GASS), which involves stakeholders across the entire spectrum.

Reducing the number of general aviation (GA) accidents remains a national, regional, and international imperative. To achieve this goal, the SACAA researched the complexity of the GA sector within our country and came up with a multifunctional approach and strategy to address the underlying factors that form the chain of events leading to aviation accidents. These factors include the environment in which we fly, starting from the moment we decide to go on that flight, until we close the hangar door.

We looked at the initial stages when the flight is being planned, including considerations like fueling, aircraft airworthiness and infrastructure. We considered the information available to the pilot before and during a flight, and reflected on the mental state of readiness and medical fitness of the pilot.

Then there is the recency of the pilot, and his or her ability to make decisions during changing weather, fuel management, conflicting flying traffic, communication, and other pressures that come into play, all while navigating safely. Other factors considered were the way in which operational and safety oversight is done, the role of the various levels of organisations in our industry, as well as the appropriate guidance obtained from regulations and technical standards.

Inputs from the industry were obtained through consultative sessions and were considered together with inputs from departments within the SACAA. All this culminated in the General Aviation Safety Strategy (GASS) that was approved by the Executive of the SACAA and the Director of Civil Aviation, to run over a five-year term. Near the end of the term, the strategy will be reassessed to align it with the latest developments, to be approved for another five-year cycle.

The current strategy, although focusing on GA, should be seen as a national approach to flight safety. For the efficient implementation of the five-year strategy, everyone in the flying fraternity, from the regulator, aviation training and maintenance organisations, to everyone in the aviation sales and retail sector, to designated medical examiners, to name but a few, need to be part of this safety drive.

Specialised focus groups have been formed and are currently devising new plans in support of the various areas of delivery and implementation.

To further enhance the effective implementation of the strategy, one particular focus group will be monitoring safety trends, whilst another will be focusing on the development of the industry. Another focus group will home in on safety seminars presented during a national air safety week, while developing continued professional development-based guidance material to help pilots identify and deal with accident-precipitating factors which might occur during the various phases of flying.

Education and communication will therefore be the key elements in getting the safety message across to the end-users, subsequent to which the Safety Outreach focus group was formed that established the SKYwatch publication, a newsletter that is loaded with highly relevant safety information.

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New enthusiasm for GA SAFETY STRATEGY

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A medical focus group will soon be established to consider matters that could assist the pilots and Designated Aviation Medical Examiners alike, going beyond physical medicine issues, by exploring both holistic and mental health issues.

Contact details of the various focus group leaders are included in the SKYwatch publication, and anyone wishing to participate is invited to contact them.

BELOW IS A GRAPHICAL DEPICTION OF THE VARIOUS FOCUS GROUPS.

The implementation of the General Aviation Safety Strategy will continue with new zeal in 2023, after ending on a high note last year with outreaches to the Western Cape and Gauteng; and the first General Aviation Accident Reduction Webinar.

We once again extend heartfelt gratitude to everyone from the industry and the Regulator alike, who have expended much of their time and energy into getting this project launched.

CRM ISSUES OF THE BOTTOM FEEDER

By: Charlie Marais

On a monthly basis, and in some cases even more often, we are confronted with Crew Resource Management (CRM) issues that have led and could still lead to aircraft accidents. I know one must do CRM every year, but in the safety environment we are faced with the re-enforcement of CRM issues on at least a weekly basis.

CRM has become the domain of psychologists and those learned in the psychoanalytical fields. The basics of CRM, however, always loops around the same old, same old. CRM is mainly airline cockpit, or as they prefer, flight deck, orientated. The main issues leading to accidents have to a huge degree been addressed and new phenomena is feverously sought to stay relevant and noticed in the CRM environment. Let's face it, the airline industry has managed to make CRM so directed and intertwined in their procedures, that there is very little scope to add to the list. Many a time crew functions and procedural flows have been defined and practised to the degree that mistakes have become totally abnormal behaviour, in which case the transgressor cannot give an answer as to why the transgression was committed, and there is no history to predict this behaviour. The point is, CRM has been catered for in Line Oriented Flight Training (LOFT) scenarios, discussions and safety meetings and briefings to the extent that CRM fatal failures are far and few between. Yes, there are probably airlines where this argument would not hold water, but our South African airlines operate with excellent resource management, as far as the entire crew complement is concerned.

This leaves presenters with the task of thinking out new psycho-phenomena. Left brain, right brain and personality profiling, communication skills, probably embedded in people skills, are fancy and neuron-analytically based, and of very little use when trouble hits the fan. I like to call these soft human factors. The hard human factors are at the coalface and depend only partly on personality make-up and child-referenced behavioural anomalies. CRM can only be valid if certain basics are met. The first serious observation I want to make is that accidents are directly related to oversight or procedural enforcement. If you can role-play all the possible scenarios you can think of, and then what others can think of, you simply need to make the rules and ensure that they are followed.

Manufacturers are supporting all of this, but in a different way. Automation is such a 'yesterday' word. Technology has now surpassed what we used to think of as automation. Gone are the days when you were astounded by the functionality of an auto-pilot system. Then we started looking at auto-dependency, auto-addiction and many other auto-antics. But I think this is all 'old-school' thinking, as the new aircraft manufacturers have entered the artificial intelligence (AI) environment, far

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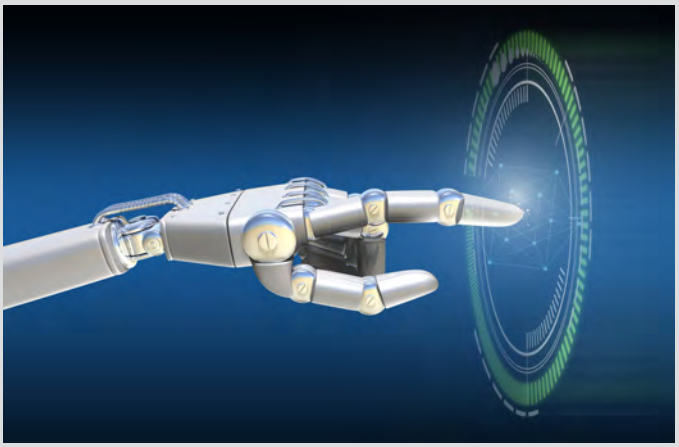
more effectively side-lining us than we care to think. 'Artificial intelligence' is not a new phrase, but the integration of auto-logic and auto-decision-making is here. It is not that we are losing the ability to fly, but rather that we are losing the ability to make sound decisions under adverse conditions. In our cars we follow the GPS and the GPS now tells us which route to follow where lesser delays will occur. This is only a small example of AI's ability to be more situationally aware than we can ever hope to be. Okay, I agree that the machine does not know all the tricks, but through clever self-learning algorithms, the decision-making is slowly but surely taken away from man. Not so, for the low altitude aviators. They must still fly. AI is a bit behind in this environment, but I guess it will catch up within the next decade. However, this already means that the CRM of the latest state-of-the-art airliner differs dramatically from the CRM required by the bottom feeders.



What I probably want to say, is that the same CRM for an airline pilot does not fit in with a normal GA pilot, who is involved in activities such as game capturing, low-level tactical flight and anti-poaching or anti-crime flight profiles. This is not a complete list of examples, but the point is that when you are doing a medical flight, it differs hugely from a mountain rescue mission, a tactical deployment of troops or cornering a poacher, to name but a small portion of unsung extremely capable pilots, flying without automation to stabilise, or to feed awareness into the cockpit. Notice that the normal aircraft and helicopters still have cockpits and there is no set sequence of knobs to push when cornering a wild animal. CRM in this instance has a very different meaning to that described by psychoanalysis, practised in expensive LOFT simulation devices. There is nothing wrong with that kind of CRM, but it is of little to no use between the trees where three-dimensional flight is practised. Now human factors take on a very different posture, changing from scenario to scenario as the jobs and the environment continually change. This requires the ability to fly, one eye outside, one eye on the engine and flight parameters, talking to ground support or forces and managing power as the demand changes from second to second. No, I am not trying to make heroes of these pilots, I want the soft human factors practitioners to realise that their topics have very little to no real value in the 3-D world. Now CRM must have a very practical application. The problem is that if you do not know the environment, you can in no way understand the real CRM issues of the other side of the flight spectrum. An aerobatic pilot continually changes the three basic flight parameters: heading, height and speed. The judgement of man and his machine in the low level, hard manoeuvring environment, suffers no nice guys. It is tough, it is hard, the stakes are high and very little leeway exists. To get there takes many moons and when we expose those pilots to airline CRM, we miss the boat, or should I say aircraft, entirely.

> The pilot on the tail of a Lechwe, getting into a position where the dart will find its mark, must be in full harmony with the machine and the environment; flying, judging distance, judging height, closing speed, animal dodging, weaving and swerving, talking to the vet, taking aim, all while ground support wants to know what is happening.

Oh, then there are wires, trees, rocks and so on. The concept of decision-making, communication, situational awareness, and so I can carry on, takes a very different form. Human factors of reactive and impulsive behaviour versus taking your time as a hunter, avoiding buck-fever and stage fright, comes through training, more training and then experience and CRM relevant to that environment. Now, I suppose you will surmise that this is not a multi-crew environment and as such not as complex. Sorry, but you are wrong. It actually is a multi-crew environment. The game pilot and the vet make the team. The job cannot be done by one without the other. No, this is not something you can learn in the cockpit of a King Air 1900 or a Super Puma. There are no simulators for this kind of work. CRM when under fire or when chasing criminals, will as a rule always have more than one crew member to be able to make the operation work. CRM, when one is under threat, again takes on another meaning. No ATC to clear the way, no radar control and no company weather warnings or system monitoring. I implore you to reconsider what CRM really means to the different cockpit environments and as I have shown, very diverse crew members involved.

As a DFE I must follow the marksheet of, let us say a helicopter pilot, and my task is to test the pilot according to standards, without teaching or undue interference. Pilots may not do emergencies on their own. Every six months they do either a line proficiency check, or as we call it a revalidation check, after another six months. How can I test the pilot's autorotative skills after an engine cut in the environment where he operates? (Please read he/she as the same, as a pilot with no gender differences, as flight safety knows no gender.) Where was I? Right, back to the testing in a specific environment. I start off at normal height and then, when it is a game pilot, the engine cuts must be tested in their operating environments. Very few people can teach that, and CRM in that environment is mostly action-driven, with decisions pre-made. One needs

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to understand the machine and the mechanics, as well as aerodynamics, to be able to take the correct action when time is measured in split seconds. Hard CRM is now required. The training of auto-reaction proves in many of these cases to be the only countermeasure for instinctive reactions. Coming out of a loop in your aerobatic aircraft with very little height left, will make for instinctive pulling back on the stick. I am definitely not trying to be word sensitive as per an instructor's manual, just to say it as we do it. The wrong move; slow speed and an increase in the load factor bodes an ill outcome of death and destruction. Push forward, change potential energy into kinetic energy. These are contra-natural human reactions, but the only way to outsmart physics and mechanics. Height now becomes a very valuable resource and the use of the little you have, will make the difference between a spectacular performance and a spectacular failure. The resources to be managed by the flying pilot, many times without other pilots or even other specialists on board, needs the handling of normal human factors to be replaced by pre-programmed behaviour.

I think I have made the point. You can debate and discuss the latest discoveries to explain why people fail, or you can start working on how we recover when things have gone bad. We always train the symptoms of an impending stall. Recognition that you are getting into trouble is the first antidote. Then, as we are only human, we slip up and stall. Now we need to be able to recognise that we are in a stall and only then can we be taught how to take recovery steps. There are no suggestions hidden in what I have just described. It is simple. Have the knowledge and then have the skills to operate with your machine in a particular environment and follow the rules; they were blood-earned by many unlucky pilots before you. So, what is the hard CRM in this one? Well, human factors stem in many cases from natural reactions to abnormal situations. It is good to know what part of the brain now comes into play, but the value is in knowing or recognising the situation and then reacting as trained. In the single pilot, multi-crew environment, synergy is indeed tangible. The slipup from one or the other could mean anything from death to mission failure. There is no way that I can list all the hard human factors here and there is no intention to do so. My intention is for all the readers to stand slightly back and come to the realisation that the airline environment application of rules, regulations and crew integration, does not help certain operations in GA very much. Yes, we can see what the basic rules are, but in many a case we form permanent teams through natural selection and are not rostered to work together. A Captain and 2nd officer have a lot of skills that overlap. Specialist crew members have very little overlapping with piloting skills. Yet, they must synergise, or the outcome would be unfavourable.

In conclusion I would like to stress that, although oversight is a clear indicator of safety expectations, the oversight defined by ICAO/ IATA is not a fit-all solution. Oversight and how to manage resources require another approach in certain areas, although many basics will overlap with conventional CRM or human factors handling. As far as the airlines are concerned, I believe they have a good thing going and their approach to CRM to be fit for purpose. Now we must define, qualify and quantify what CRM means in other specialist fields where it may be single crew, and as such one pilot only, but also multi-crew with one pilot.

Please stop using high level CRM suitable for airline operations when you fly single and low-level specialist jobs. Get the real deal befitting the job environment. You must get a CRM certificate anyway, why settle for something that is nice? Settle for training that is useful, applicable to your specific mission or task, and as money will part your pocket without a doubt, let it be of use and for self-development. If not, you have not wasted your money, but your time. As we all know, my time must either enhance my capabilities and abilities, or it is wasted.

LOSS OF CONTROL IN FLIGHT:
still an unsolved mystery

By: Johan Lottering

After attending an ICAO Upset Prevention Recovery Training (UPRT) online webinar some two years ago, the presenter and I made a point of randomly asking pilots the simple question as to what they think is the biggest force on an aircraft. I would urge them to give the first answer that 'popped' into their head, as that would determine their reaction to, for instance, an inadvertent stall; perhaps due to inattention or distraction when levelling off during an approach to land and forgetting to add power to stabilise the descent.

A few of the pilots quite unequivocally but no less incorrectly replied 'the engines, of course'! However, the ratio of lift from the wings to power from the engines typically range between 10: 1 and 20:1, meaning 10 to 20 kg/f lifting force for every 1 kg/f thrust produced by the engines. If the wings are (inadvertently) aerodynamically stalled, it would be imperative to lower the nose to restore the disrupted airflow, instead of adding power 'to fly her out of the stall'.

Adding thrust would also cause a pitch-up moment in aircraft with underslung engines, due to the thrust-drag couple, aggravating or deepening the stall. In most propeller-driven aeroplanes, adding power before restoring the airflow may increase the risk of un-commanded roll due to torque and yaw because of the airscrew effect of the propwash, usually to the left with clockwise rotating propellers.

Once rolled, the aircraft would start to side-slip. The weathercock action would yaw the nose towards the earth. Except for drag, three of the four vectors in level flight namely lift, thrust and gravity would momentarily be pointing towards the earth. At low height there would be little or no chance of recovery and impacting the surface in an inverted or sidewise attitude would leave occupants with no structural protection at all.

CHOICE BETWEEN 'NEGATIVES'

Choosing between the proverbial 'devil and the deep blue sea' if stalled at low height leaves the pilot with very little choice, but to immediately push the elevator forward to restore the airflow. Even if a collision in a level attitude is inevitable, the restored lift may still serve to 'soften the blow' and increase survivability.

Incorrect concepts are often the primary reason for inappropriate responses when pilots/crews become flustered and situationally disoriented due to the 'startle effect'. The primary response is said to be 'freeze, fight or flight'. But startled pilots invariably also revert to the first set of behavioural patterns learnt, often based on the concepts (and any misconstrued notions) they originally learnt and internalised.

A perfect example may be the Bombardier Q400 which stalled and lost control during the final approach phase on the Colgan Air Flight 3407 from Newark, New Jersey and Buffalo, New York, which claimed the lives of all 49 people on board and one on the ground.

The chairperson of the NTSB board of investigation would later point out that fatigue may have contributed to the crew becoming flustered, situationally unaware and reacting inappropriately. The captain had gone against basic flying principles when the stick shaker warned of an impending stall by pulling back and adding power to 75% instead of pushing the elevator column forward; thereby momentarily doubling the g-load and increasing the stall speed. The co-pilot had 'inexplicably' raised the flaps, increasing the stall speed even more.

EXPONENTIAL INCREASE

It is also vital to bear in mind that when pulling out of a dive or maintaining a steep turn, due to the g-forces on the aircraft, representing centripetal force, not only is the load factor (n) increased exponentially but so is the stalling speed. The steeper the bank angle, the exponentially higher is the stalling speed. Pilots have all been taught Stall Speed Banked equals the Stall Speed Level divided by the square root of the Cosine of the Bank Angle. But please actually do the maths by turning your mobile phone sideways so the Sine, Cosine, Tangens and Sqaure Root functions may appear, and you may very well be surprised.

In practice it means at 60 degrees angle of bank double the amount of lift is required, at 70 degrees 2.92 times and at 85 degrees 11.47 times. This may be food for thought for conventional GA pilots who fly in planes certified to withstand a maximum of 3.8 g before breaking up in mid-air. The bottom line is, if the plane stalls, whether banked or at low height, to firstly 'unload' the aeroplane by releasing the back pressure or pushing forward on the elevator control column!

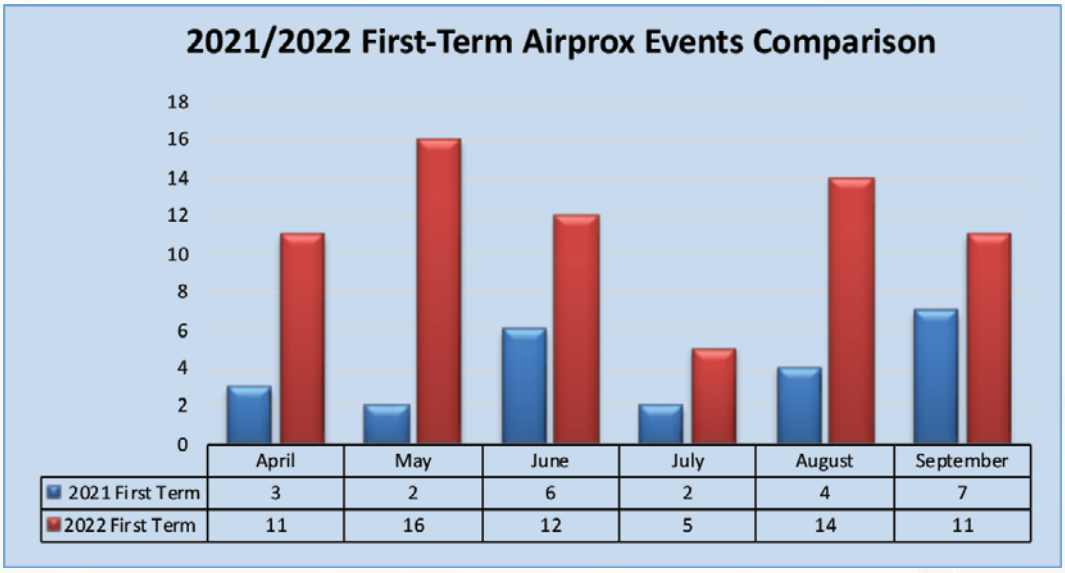
AIR PROXIMITY OCCURRENCES

This information was supplied by the Safety Information unit within the SACAA's Accident and Incident Investigation Department

The Safety Information unit within the Accident and Incident Investigation Department (AIID) has carried out a study on the safety data on the AIRPROX related occurrences that were recorded.

It is worth noting that AIRPROX occurrences do not form part of the top five events reported by AIID on a regular basis. However, a study of the data has revealed these occurrences as a concerning emerging trend and this is evidenced by the comparison made between the 2021 and 2022 fiscal first term AIRPROX data, as depicted in Graph 1 below.

The total of AIRPROX incidents reported in the first fiscal term of 2022 totals to 69 reports. It became apparent that AIID must prioritise further analysis of this data to prevent another catastrophic accident similar to the Mid-Air Collision (MAC) that occurred between ZS-OMN and ZS-PXI in 2021.



Comparison of 2021 and 2022 first-term AIRPROX data

The above representation shows that for the first term of 2021 (April - September) we recorded 24 Airproxes and in 2022 over the same period, we recorded 69. This is a 187.5% increase as compared to the 2021 first-term data. Since the average reporting rate has escalated, an in-depth analysis of 2022 data was conducted to identify the risk caused by these occurrences and their associated causal factors.

AIRPROX EVENTS ACCORDING TO AIRSPACE USERS

The data reveals a high rate of AIRPROX reports between commercial and other aircraft operations. This increase could be related to various reasons, which may include a good reporting culture in commercial operations and awareness of Airproxes brought about by ground-based and airborne safety nets. GA operations and training activities also signal a concern. Graph 2 below depicts the AIRPROX events according to airspace users.

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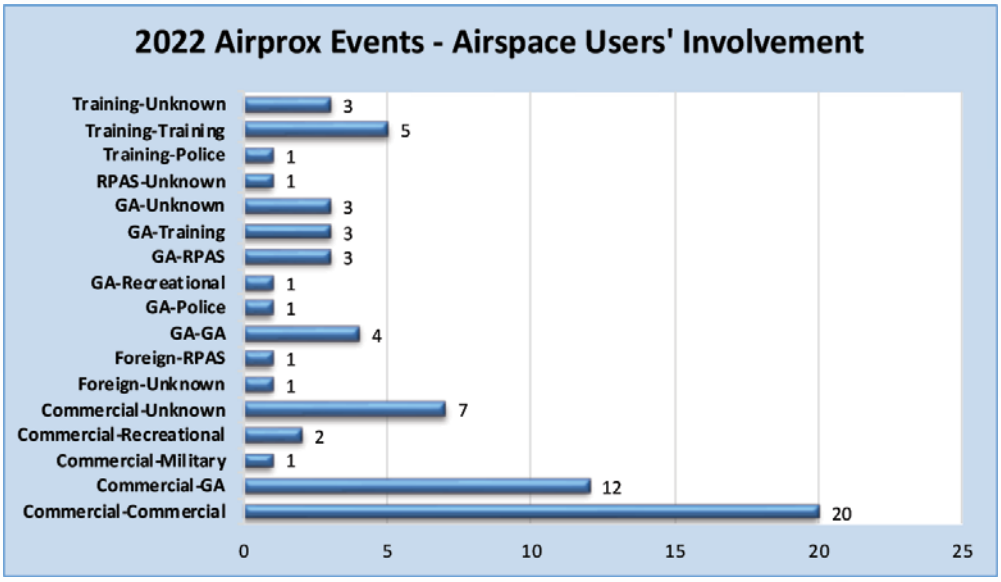
AIR PROXIMITY OCCURRENCES



2022 First-Term AIRPROX events according to airspace users

RISK CATEGORIES RELATED TO AIRPROX EVENTS

Risk level assessments are based on what took place and not on what may or may not have happened. There are four ICAO AIRPROX categories that AIID uses to assess the risk level of the events, according to information extracted from Doc 4444:

A **RISK OF COLLISION:** *An actual risk of collision existed*

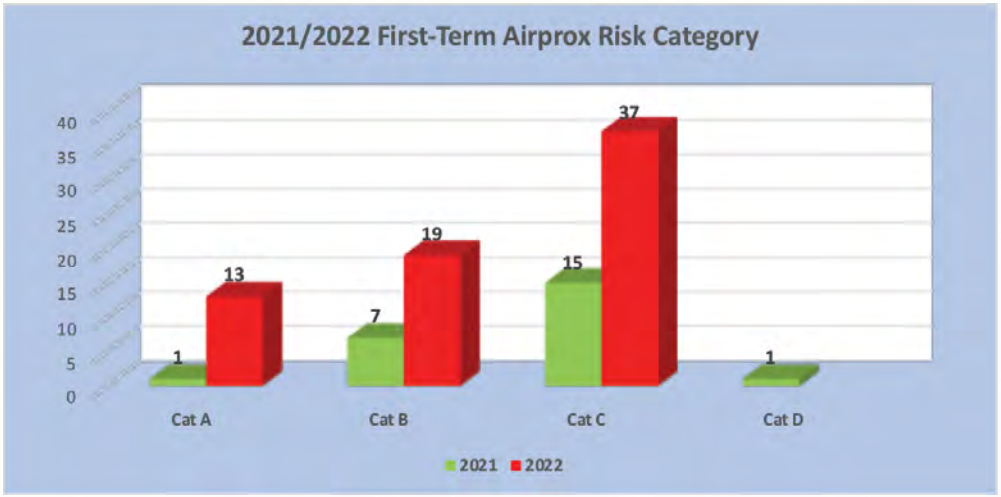
B **SAFETY NOT ASSURED:** *The safety of the aircraft was compromised*

C **NO RISK OF COLLISION:** *No risk of collision existed*

D **RISK NOT DETERMINED:** *Insufficient information was available to determine the risk involved, or inconclusive or conflicting evidence precluded such determination.*

Out of a total of 69 risk bearing Airprox reports, 37 were classified as Category C (CAT C), 19 were classified as Category B (CAT B) and 13 as Category A (CAT A).

Although the risk is at an acceptable level due to the effectiveness of ground-based and airborne safety nets and other barriers that provide mitigation against mid-air collisions between aircraft, AIID is currently investigating three serious incidents as Near Mid-Air Collisions (NMAC).



2022 First-term AIRPROX risk categories

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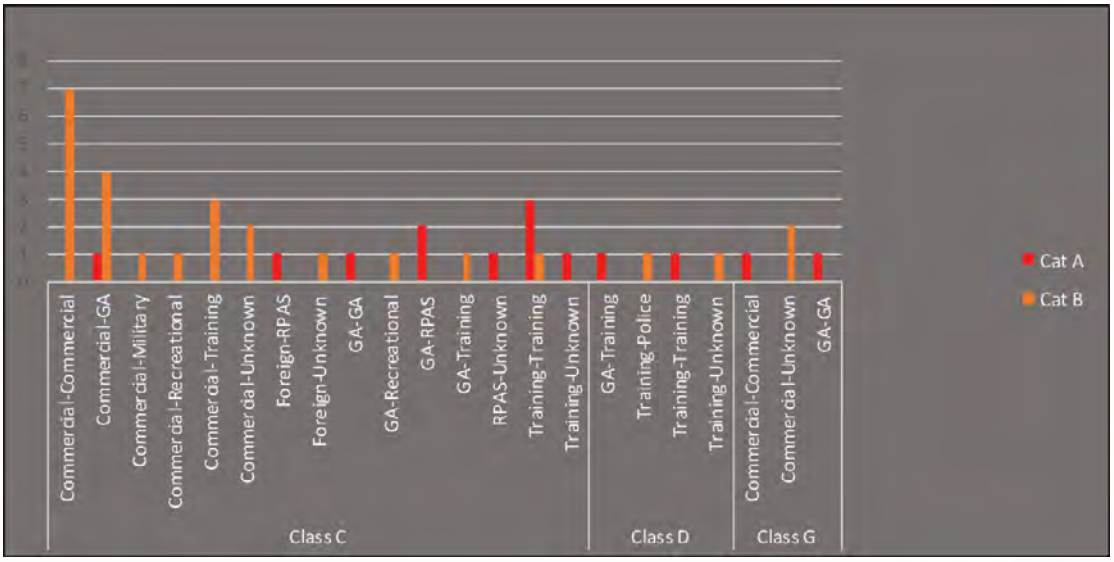
AIR PROXIMITY OCCURRENCES

As a result of these serious incidents and the increase in the total number of AIRPROX reports as compared to 2021 first-term data, we narrowed down the focus to CAT A and CAT B events to further understand the behaviour of these Airproxes in the different airspace classifications.

AIRSPACE CLASSIFICATION IN RELATION TO CAT A AND B AIRPROX EVENTS

The below graph shows a breakdown of the Cat A and B risk-bearing events according to the affected airspace classification. Class C airspace displays the highest number of Cat A and B risk-bearing occurrences.



South African airspace classification in which risk Cat A and B conflict took place

CAUSAL FACTORS OF CAT A AIRPROX EVENTS IN CLASS C AIRSPACE

Data reveals that organisational factors feature as the most prevalent causal factors related to the 14 Cat A risk-bearing events in Class C airspace.

It is worth noting that any one AIRPROX event can have more than one causal factor, as represented in the table below. A breakdown of the organisational factors reveals that a disregard for policy and/or procedures and a lack of, or substandard training of pilots has contributed to twelve (12) AIRPROX mishaps.

It is evident that human factors are also predominant causes behind thirteen (13) of the Cat A risk-bearing AIRPROX in Class C and these are also identified as being borne from perceptual factors, which include situational awareness and conflict assessment by ATC and procedural/ task performance factors, such as pilots' failure to scan their environment during flight, violations, communication failures and ATC's failure to pass traffic information.

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AIR PROXIMITY OCCURRENCES

Lastly, it is also observed that one (1) AIRPROX occurred due to unfavourable weather patterns and the complexity of the operating environment (airspace).

	Causal Factor 1: Organisational factors (12)	Total of elements	Attributed to
Disciplines	Elements		
Policy/Procedures	Procedures	12	Pilot
	Rules of the air	12	Pilot
Training	Pilot	3	Pilot
	Causal Factor 2: Human Factors (13)		
Disciplines	Elements		
Perceptual	Situational awareness	7	Pilot
	Conflict assessment (ATC)	1	ATC
Procedural/task performance	Scan environment	5	Pilot
	Violation (general)	8	Pilot
	Action/inaction (non-intentional) (Communication	1	Pilot
	Traffic information (ATC-Pilot)	2	ATC
	Causal Factor 3: Operating Environment Factors (1)		
Disciplines	Elements		
Infrastructure	Airspace complexity	1	Other
Weather	IMC	1	Other

Distribution of Airprox causal factors of Cat A reports in Class C airspace

GA Safety Strategy Contacts

WORKING GROUP CHAIRPERSON	Neil de Lange	082 884 9303	delangen@caa.co.za
ACC TRENDS CHAIRPERSON	Erik du Rand	083 451 2617	durande@caa.co.za
DEVELOP GENERAL AVIATION CHAIRPERSON	Pierre Laubscher	082 899 7385	laubscherp@caa.co.za
DEVOLUTION OF POWER CHAIRPERSON	Subash Devkaran	083 461 6418	devkarans@caa.co.za
GAARS CHAIRPERSON	Johan Lottering	083 451 2674	lotteringj@caa.co.za
SAFETY OUTREACH CHAIRPERSON	Pappie Maja	083 451 2627	majap@caa.co.za

The SACAA and Safety Outreach FG would like to acknowledge the efforts and contributions of its own staff and other external parties involved for their dedication towards making this publication a success.

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Please submit your article to skywatch@caa.co.za for consideration.

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