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Basics of the flight safety risks

Abstract

A szerző áttekintette a repülési biztonságot fenyegető kockázatok alapvető kategóriáit, e kockázatok értékelésének releváns meghatározóit, összegezte a kockázatkezelés legfontosabb módszereit. A cikk ismereteket közöl a katonai repülésbiztonsági statisztikák elemzésének törvényszerűségeiről és a repülés biztonság és repülőkiképzés összefüggés rendszeréről.

The author overwied the basic categories of flight safety and the determining factors of flight safety. Moreover this article gives a short summary the methods of evaluation of flight safety risks and risk management. With the help of this essay we can get information of connection between flight safety risks and the military flight statistics and the training and flight safety.

Kulcsszavak: *repülésbiztonság, repülésbiztonsági kockázat értékelés, repülési statisztikák, flight safety, evaluation of flight safety risks, flight statistics*

The exact measurement and its immediate handling is a primary priority. The first step of the risk awareness is its recognition. All facts and conditions can be considered a risk factor that can cause an air accident. Flying itself carries these risks, both evidently and in hidden form.

But the realisation of the risk factors itself is not enough for safety counter- measures. In this case it is not enough to know the size of the risk, or its seriousness, it is necessary to be clear about the possibility of the event. Only these two factors together are able to provide the basis for risk management. The level of the risk is indicated by the product of the risk seriousness and the possibility of its happening. The third factor that is important when defining risks is the level of endangerment, in other words, how endangered both the crew and the aircraft are.[2]

Risk can be objective, or in other words, existing in its original and independent form, or it can be subjective, i. e. starting from an identified source, calculated and estimated. It can be evident and it can be latent. It is obvious that we cannot exist without some kind of risk either in our everyday life or in flying. There is some form of risk management in all our daily activities, for example, when crossing a busy road. The success of this management depends greatly on our knowledge of the surrounding world or what we see from it. Experience, consequently, is extremely important, as well as remembrance and attention when we deal with the dangers of everyday life. If we are not familiar with the danger or we do not have information about it, we will not be able to deal with it either. The same applies to flying.

Experience is achieved from the events in flying. If we do not learn from catastrophies and accidents, we will tend to make the same mistakes. To avoid this, it is not enough to realise the causes, but they need to be precisely recorded and researched. It supposes the existence of a database which is easily accessable for decision-makers and flight safety specialists and can deliver all neccessary information. Furthermore, data must be summarised to be easily

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[2] Dr. Vasvári Ferenc: Biztonságtudományi jegyzetek I. kötet Egyetemi jegyzet, ZMNE 2000. 79. p.

managed. Unlike in everyday life where the value of information is in its exclusiveness, the value of flight safety information is strenghtened by the number of people posessing it.

Consequently, we must not forget the feedback, in other words, data applying to the first line executives should have free access. Data collection is impossible without computerised information intake and flight event information systems. Information collection is the memory of flight safety, and it is based on experiences of the flight events. Besides, it is extremely important to pay attention to dangers, which means awareness of the first protocols of the danger risks.

1. Evaluation of flight safety risks

It is the best case if the pilots are aware of the dangers they have to face during the flight. Then it is the decision-maker's , the commander's responsibility, which available risk reducing option is the best to choose. His decision is influenced by the importance of the task and many other factors he needs to take into consideration. The consideration in all cases should aim at the optimal balance between the benefits and the possible losses of the activity. The contradiction is that the decision is always reached at the higher level than the execution. The judgement of the risk is closer to the level of the execution, however the means of the risk reduction are with the higher command. The final decision is in the hands of the executives only in less urgent cases. The other critical point of risk management is the establishment of the acceptable risk level.

The remaining risk after the risk reduction process or the risk that does not need reduction can be greater than previously evaluated. The reason for this is the risk or danger that had not been identified and consequently, was not taken in account. When analysing real risks, this must always be accounted for.

Military aviation posesses the highest risks of flying. Its safety cannot be quaranteed with absolute certainty, due to the elevated risk factors arising from the special environment and the methods of the flight tasks. At the same time, concerning the new challenges the human element needs to face, there are several other possibilities for the reduction of risk. All of them are connected with providing more safety for the human element and their mutual influence. The human factors of aviation can mean both safety and the dangers it faces. All activities connected with the elevation of safety are connected to this area in one way or another.

Since the reasons for most accidents are connected to this area, it is obvious that the target of prevention should be in this area. The basis for this is the establishment of the risk awareness. Risk can be possible only together with danger awareness. For flight safety specialists only an update information base can provide this kind of knowledge. A kind of information bank that gets the facts not only from one tenth of the entire flight safety information, but from the most reliable and the best sources, from the mistakes made by the first liners together with their experiences. It is very important, consequently, that the pilots and their surroundings should posess the knowledge that help the realisation of the problems and the mistakes, and at the same time they should want and dare to speak about their eperiences and tell their opinions. The encouraging and not criticising work atmosphere and leadership style can motivate the openness of information exchange. Further motivation can be achieved by introducing a rewarding leadership style, which has no traditions in our country. Its opposite, however, the implementation of sanctions, for example, is practised and has nothing but negative motivation.

This, however, endangers the activities and the self-assurance which are vitally important for successful everyday work. This is not the only source of danger that should be considered.

Flying and the maintenance of skills connected with it is of outmost priority. The establishment of the material basis, the tasks of the poltical leaders, and modenisation of the training is the responsibility of those closer to the level of executives.

Secure military flying and preparation for military tasks can be achieved only by the total transformation of the training system. In modern pilot training system safety, effectiveness and success appears as one component. These are based on preparation prior to flying, safety knowledge, approach, culture and danger awareness.

1.1 Possibilities of risk management

As we have already seen, the risk of flight safety is constantly present and it is unavoidable. Its management is a number one task for commanders and there is a wide variety of its means. There are five possiblities for crisis reduction. [3]

- to accept the risk
- to avoid the risk
- to spread the risk
- to shift the risk
- to diminish the risk

The above-mentioned options are not equal. The choice of the options by the leaders depends on the circumstances of the task execution, on its importance and urgency.

1.1.1. Risk Acceptance

This is the most critical form of risk management,. Since danger cannot be excluded entirely from flying, all flights have the same danger. It is so whether we are aware of the danger or not. All pilots, so military pilots, too, have the tendency to get used to danger, which leads to indifference towards risk, and this can be the cause of accidents. Judgement of flight safety depends on the level of the risk acceptance. For the maintenance of the acceptable level it is neccessary to identify and survey the dangers precisely and inform those involved in flying. The main aim of the risk management is to reduce the level of risk in accordance with the importance and urgency of the task execution.

1.1.2. To avoid risks

Risk can only be avoided if the given risks are known. Only then can the decision of its avoidance can be made. In extreme cases the decision can be to stop the activity, but execution of the task can be arranged at another time or alternative.
If in military aviation we had this kind of risk management, it would result in a very rigid and powerless structure. Let's imagine the consequences of cancelling of a vitally important air support, referring safety reasons. Consequently, this way of risk reduction cab be applied only in a very specific case or in peace time.

1.1.3. Spread of the risk

One or more risks can also be avoided if we keep away from them either spacially or in time. If personnel can keep away from danger either spacially or in time, risk can be reduced, Similar results can be achieved if danger is faced for a short period of time.

1.1.4. Risk shift

[3] Dr. Pokorádi László: A kockázat kategóriái, Új Honvédségi Szemle, Zrinyi 1999/6 szám p.28-35.

In cases of more complex flights, like instrumental flights, for example, there is a possibilitry for partial shift of risk. During the executiion of higher risk level flights, personnel rely on data from highly precise ground equipment or traffic controllers. Collision risk can be avoided with the help of on-board prevention systems.

1.1.5. Risk reduction

There are many methods for the reduction of risks. There are no risk- free activities, so we cannot aim at zero risk reduction in flying. The aim in this case is to minimise the risk level to acceptable. The level of acceptance is established by the commander depending on the circumstances. Obviously it is lower in peacetime and higher in times of conflicts. As it has already been mentioned, when judging risk we need to take into consideration the probability of the flight event and the seriousness of the consequences. The previous two actually indicate the endangerment of the flight crew, in other words, the exposure of the crew to danger.

1.2. Methods of risk reduction.

From the above mentioned, theoretically there are three ways of risk reduction:

- with the reduction of danger
- influencing the possibility of the event
- alleviation of consequences

We will see and it can already be seen from the listed risk management possibilities that all measurements are connected with the three above-mentioned factors.The risk itself is the least manageable, since it is present in flights, whether we want it or not, and quite often we are not even aware of it. The other two factors can be influenced with some of the following methioeds.

1.2.1. Planning based on safety approach

The most efficient method of risk reduction is if the flight technics and the development of the corresponding equipment is the result of safety based planning. In a given time a unit or the air force is not capable of using this method of risk reduction, since they have to deal with the problem with obsolete equipment, used by many generations. But when buying new equipment , safety aspects should also be taken into consideration. One thing is for sure: that commissioning 4th generation strategic aircraft means not only better combat capabilities, but also import of safety.

1.2.2. Training, education

This is the second line of risk reduction. The establishment of danger awareness or its knowledge can be reached the easiest this way. Naturally, the positive role of the general professional intelligence and the deep, appliable knowledge cannot be emphasized enough in risk reduction. It means that thorough and continuous education is neccessary for all those connected with aviation. It is important to stress that the biggest challenge in flight safety concerns risk reduction for the human element methodical flight safety training should be aimed not only for specialists, but all personnel connected within flying. The fact that only flight safety specialists should be trained since they are the ones responsible for this area, and they produce safety, is not applicable any more. This fact cannot be true even regarding the small number of such specialists.

Even an air force that deals with everyday problems and with personnel down-sizing cannot quarantee safety with just a few specialists. But if they are forced to do so, at least the front line workers should be provided with sufficient flight safety training.

1.2.3. Modification of flight frames

The main leaders often deal with the emerging problem by changing the flight parameters. It may seem an effective method, but it only has short-term results. Let's see an example. Certain forms of flying are more risky than others. Flying in the earth's vicinity belongs to the first category. It is evident that in this kind of flight there are more flight events. Risk reduction is achieved quite often by the limitation of flight parameters, in our case by the elevation of the bottom limit of the flight height. In the long run it may lead to the decrease in the personnel skills in this flight mode.

There is a consequence of the decrease of skills, a new kind of risk. That is why, when applying this method, the leading guidance should be the same as with other forms of risk management. That means, during practice for the task the extra risk must be compared to the risk of skill loss appearing at the strickening of flight frames.

1.2.4. Safety equipment and clothing

It is a general, widely used method of reducing risks for personnel. Safety equipment and clothing help reduce the unfavourable work conditions (overload, noise, etc.) Others, like energy consuming seats and parachutes reduce the possible cosequences of flight events.

1.2.5. Indirect methods

Any equipment, not mentioned above, can be applied for risk reduction, provided it does not create another risk. Any physical or non-physical limit that keeps the personnel away from danger belongs here. Indirect methods can appear as tactical regulations, which strenghten personnel protection during perfomance of different maneuvres. The exact reconnaissance, jamming and deception are all activities that add to risk reduction of a given task. Thorough planning is also an important part of risk judgement, and consequently, its reduction.

2. Connection between flight safety risks and the statistics

The basis of prevention is the exact judgement of risk. The first step is the recognition of the risk. Any factor can be a risk that can lead to a flight event. These risks are part of flying, either obviously or in hidden form. But the awareness of the sources of danger in itself is not enough for countermeasures. It is not enough to know the size of the risk, its strength, It is neccessary to know its possibility as well. Only these two factors are able to show the basis for risk management. The level of risk is shown by the product of seriousness of danger and the possibility of its happening. The third factor, which is neccessary to take into account when defining risk is the level of endangerment, or in other words, the duration and the method of the exposure of personnel and the aircraft to the danger.

It is evident that in everyday life and in flying as well, we cannot exist without a certain amount of risk. If we are not aware of the risk or if we do not know about it, we will not be able to deal with it. The same applies to flight safety. All flight events, ensued or remained in the phase of direct danger, can serve as a lesson for the prevention of future events. When we

analyse flight events or the mistakes leading to them, or when we record and archive flight safety indexes, we compare past and present by the means of statistics.

Experience, which serves as the basis for analysis and prevention, means knowledge gained from flight events. If we do not learn from catastrophies and accidents, if we do not process experiences, the gained knowlege will disappear, and we will make the same mistakes again. To avoid this, it is not enough to analyse the way leading there, but it is neccessary to record this information and make it accessable for researchg. It supposes a current database operation, which can be easily accessable for decision-makers and flight safety specialists. Furthermore, data should be processed in statistics for easier handling.

Unlike civilian life, where the value of information is in its exclusivity, flight safety information is more valuable whwn more people posess it. That is why we must not forget about information feedback, or in other words, information known to the first liners should be known to all. It is impossible to load databases without computerised information and flight event report systems.

3. The relationship between training and risk

It is vitally important for understanding flight risks to show the difference between the nature of danger and risk. In traditional interpretation risk depends on the size of danger, the possibility of it happening and the duration of exposure.

The factors of danger are present in all elements of the ”person- machine- environment” trio. We need to know that whichever element is mentioned, it influences all others. That is why, flying as a system cannot be examined in a fragmented way, but only as interaction of the system elements.

The trio of the human- machine- environment performs flight in such a specific mixture of specific effect, where the permanent interaction of the elements is a risk strengthening and reducing factor at the same time.

One example: let’s view a flight of a transport helicopter as a basic situation. A well-designed, well-maintained aircraft with trained personnel, in ideal weather conditions performs its task in acceptable risk conditions. In this case risks arising from the nature of flying are in balance with the benefit level of the task, so the flight does not posess an extra risk. Let us see some factors that can elevate the level of risk!

If in similar conditions the helicopter transports passengers as well, the risk level of this simple routine task would change the balance of the previous example. It is important to realise that a basically similar task can be of higher risk. In this case the elevation in the seriousness of consequences depends on the number of people on board.

From the point of view of flight safety it is the task that is placed in the intersection point of the three factors is the one to be examined from the point of view of risk. In the training system of today’s air force are arranged in spiral shape according to the level of difficulty and complexity. The basis of the training system is such a spiral structure where the aircraft pilots go through strictly arranged tasks arranged in accordance with the weather conditions and battle application requirements, returning to simpler tasks from time to time. The analysis of the Warsaw pact-time training methods could make up another paper, that is why I have no intention of introducing it here.

The only thing I want to mention is that several air forces uses instead of the spiral system the so-called module system, where the different training exercises and flight tasks are built into the modules, similarly to the way the modules themselves are arranged, like bricks in the wall.

In our country's system the description of tasks is mainly technical and covers the so-called safety regulations. In a developed system it is advisable to mention the risk factors of flight practice, which itself would assist danger awareness.

Summary

The level of safety can be established by how it appears in the system of flights, in the risk judgement and management of the dangerous activities. Dangers appearing in flights can arise from any factors influencing flight safety. The risk itself is the danger, or to be more precise, the consequence caused by danger, the possibility ensuing of the exposure, or the duration of being exposed to the danger. Risk judgement begins with risk calculation. On the one hand, danger awareness depends on the training level of the human element, on the other hand, on the system of flight safety and the safety awareness of the organisation.

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