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A SENSE OF SAFETY

"All is now set for January. We will have a lot of fun! The forecast is for a good dump of snow. We will have at least 60 cm of fresh powder up there and, I will tell you what, we should ride that powder." The two from the nearby table in the café I was sitting in were in discussion with vivid animation and gestures. "Let me tell you that for advanced riders it pays-off to invest in some winter gear. Some body armour, elbow pads, wrist guards and definitely a new helmet. You should see the new double-shelled advanced piece. Ventilation, anti-penetration, multi-directional impact protection …you name it…going for some freestyle excitement at over 100 km per hour with such protection. At speeds like that it's terrifying stuff and pure adrenaline, I can tell you."

What do you think the chance is to get some paramedics involved in this "winter thrill story"?

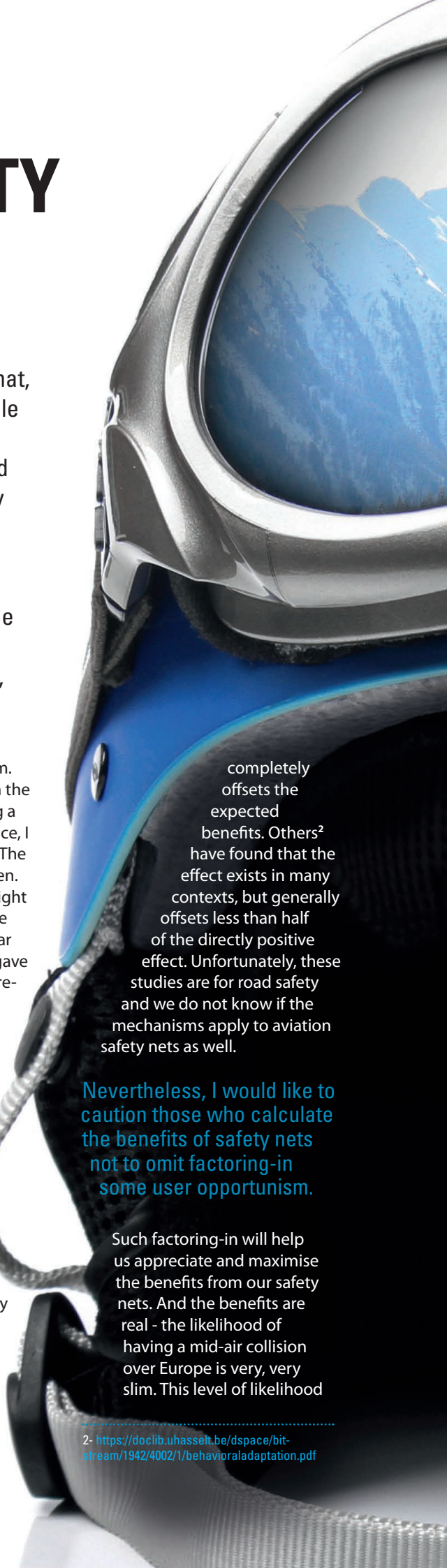
What additional risk-taking behaviour is encouraged by the additional feeling of protection provided by the new gear?

Helmets are safety gear, safety nets to protect us in case of an impact. We wear them to protect ourselves but knowing we have such a protection consciously or subconsciously affects the way we act.

This is called 'risk compensation'. This theory suggests that, in general, people adjust their behaviour as a response to their perceived level of risk. They become less vigilant when they feel more protected and more vigilant when they feel less protected. Overall, risk compensation yields lower net benefits from risk protection than might be expected.

I remember the time when I first experienced the stability control technology in my car. As I knew that I had many protection devices in my car, I think my way of driving slowly evolved to take advantage of them. Until one December day, when on the road at a normal speed and taking a slight bend one would hardly notice, I suddenly felt I was losing control. The road surface must have been frozen. The car started 'dancing' left and right and the fences on either side came dangerously close…and yet the car corrected the skidding itself and gave me the chance to decelerate and re-gain normal control.

Could this have happened to me in a car without stability control? Definitely yes, but probably not at this speed! I realised that the stability control may have saved my life which I had endangered by relying on stability control! Job well done by the device one may say, but the point is that the benefits of a safety net may turn out to be less than we expect. Some[1] even controversially argue that the risk compensation effect is so great that it completely offsets the expected benefits. Others[2] have found that the effect exists in many contexts, but generally offsets less than half of the directly positive effect. Unfortunately, these studies are for road safety and we do not know if the mechanisms apply to aviation safety nets as well.



Nevertheless, I would like to caution those who calculate the benefits of safety nets not to omit factoring-in some user opportunism.

Such factoring-in will help us appreciate and maximise the benefits from our safety nets. And the benefits are real - the likelihood of having a mid-air collision over Europe is very, very slim. This level of likelihood

1- "The effects of automobile safety regulation", Sam Petlzman, Journal of Political Economy, 1975, last retrieved from http://www.jstor.org/stable/1830396?&seq=1#page_scan_tab_contents

2- https://doclib.uhasselt.be/dspace/bitstream/1942/4002/1/behavioraladaptation.pdf

is supported by the safety nets we have. Ground-based Short-Term Conflict Alert systems and Airborne Collision Avoidance Systems provide complimentary layers of protection in ours skies. These 'loyal guardians', these last lines of defence, are there to 'cast their safety nets' and capture the most dangerous events. It is not surprising that when safety nets which exist are called-on but are unavailable or not properly used then the result is serious.

Every year, as part of European Network Manager work on prioritising the Top 5 risk, I study with European Air Navigation Service Providers a sample of the most serious safety incidents, using comprehensive barrier models of safety protection called Safety Functions Maps (SAFMAPs). This year's sample included four incidents which breached all the barriers in the mid-air collision SAFMAP and were 'saved' only by providence, by pure chance.

All four of these dangerous incidents had something to do with relevant safety nets. Two of them involved pilots' manoeuvring in the opposite direction to an ACAS RA and two involved a failure of a transponder. It is a real concern to me to know that, after all these years of promotion, awareness and strong emphasis on operating procedures, some TCAS RAs are followed by a manoeuvre in the opposite direction!

Transponder failure is another paradox. Not many will consider a transponder to be as critical as an aeroplane engine. And it is not awarded with the same attention. After all, aeroplanes can fly without a serviceable transponder! Yet, transponders can be as safety critical as engines are. Inoperative transponders can be the single point of failure in the overall aviation structure we have that manages the mid-air collision risk - no surveillance if ATC is using only secondary radar, no STCA and no ACAS. Yes, all these rely on the transponder!

Talking to pilots about this problem I am told that ATC would see the failure promptly and would react accordingly. Talking to Controllers I am advised that for sure pilots would immediately be aware of a transponder failure and switch to the other one or even that there would be an automatic switch from the faulty transponder to the alternate one. None of this is really true!

Transponder failure is an example of an underestimated problem where everyone expects that someone else would take care of it.

Both risk compensation and risk underestimation affect the benefits gained from safety nets by not properly ensuring the reliability of the safety nets as an overall aviation concept involving ground and air, automation and procedures.

As more 'gear' is designed and brought into use, we are becoming more and more 'advanced riders'. We should fix these two issues, otherwise safety nets will actually give us a lower margin of safety than we perceive to be the case.

Enjoy reading HindSight!