Ethical Aspects of Technical Safety

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Abstract— Uncertainty and inequality are the most important phenomena that lead to the Situation in which the modern technical age in contrast to the pre-modern technical phase gives rise to specifically moral problems which in the pre-modern era played only a marginal role or no role at all. So modern technically constituted societies must learn to develop from the initi al perception of dangers to a rational risk assessment. In order to justify this ethical Obligation the first *section* discusses the relation between danger and risk. The problem of weighing risks is analysed in the *second section;* in this context the conce pt of "pragmatic consistency" is introduced. In the *third section* the term "Safety" is explicated as a comparative concept by means of the principle of pragmatic consistency.

Index Terms— culture, ethics of technical activity, pragmatic consistency, risk, risk assessment, safety, technology assessment, uncertainty, inequality, insecurity

'T'HE partial Systems of our society and its media in the fields of knowledge, art, language, law, the state etc. are shaped by our technically oriented life-world. They are not fulfilled entirely by this characteristic but without it they are inconceivable. Irrespective of whether we deplore or applaud this fact, we are living in a *technical culture.* No-one is capable of even imagining the price, in terms of quality of life in the comprehensive sense, that would have to be paid if one were to stray from this technical path in the direction of a pre-modern or post-modern - non-technically shaped form of life.

I am speaking of a technical *culture* and in so doing repudiate the now commonly applied distinction between a level of civilisation epitomised by the lower functions of life preservation (to which the technical sphere is generally assigned) and a higher sphere of sensibility, perceiving art and culture in the emphatic use of the word (which is then understood as transcending the technical sphere). On the contrary, man's technical activity is indeed part and parcel of our culture and not simply a lower base upon which it rests.

This does not mean, however, that our technical culture is so strongly determined by innate invariants that other alternative life forms could not be or should not be considered. The technical activity of man is not a product of nature nor is it a natural phenomenon but rather it is a cultural phenomenon and thus a sphere in the constant transformation of human activity. Therefore, technical activity bears witness to a far-reaching cultural historical dynamism of its own, thus begging the question with regard to technical activity (and no source of nature is able to supply us with an answer to this question) as to the manner in which we wish to and the way we should live.

With this question, concerning preference and constraint, we are entering the realm of ethics, more precisely the *ethics of technical activity* - a domain, as I freely admitted at the outset, to which we possess merely the inklings of an approach and the further development of which is an indisputable desire of human reflection.

Now the human being, as far as we know from our cultural history, has always been dependent on some kind of technical appliances, i.e. acting technically in order to ensure the desired quality of life or, indeed, even to survive. For a long time the appliances and devices of human activity occasioned no *specifically* moral problems. The appropriate seminar example is as follows: whether I kill a human being with my bare hands or by means of some technical device is, morally speaking, irrelevant. For a considerable period in the past and in wide circles even today tools were and still are regarded as good, as long as they are a suitable means to fulfil certain ends, and bad if they fail to achieve said ends. In this connection I should like to speak of a pre-modern technical phase, or better expressed: of a pre-modern attitude towards things technical. In contrast, the modern attitude to the use of technical appliances and devices is characterised by a twofold additional complexity:

Firstly this attitude is due to the fact that the means only achieve their ends with a certain degree of probability because, among other things, between the initial Situation and the final attainment of the ends there are many intermediary stages, or also because the consequences ensuing from technical activities are often other than those intended.

Secondly modern technology is characterised by the fact that those who must bear the burden of a technical Implementation are often the very ones who do not benefit from it.

Both aspects can be summarised by saying that modern technical activity and the

modern attitude to it are determined by the problems of acting under conditions of uncertainty and inequality.

Uncertainty and *inequality* are the most important phenomena that lead to the Situation in which the modern technical age in contrast to the pre-modern technical phase gives rise to specifically moral problems which in the pre-modern era played only a marginal role or no role at all. Is it permissible, in any case, to accept or even to expect others to accept the risk of a dangerous enterprise in the light of uncertainty regarding the achievement of the intended aims? And even more pertinent: Can one thrust danger in the path of others that have not freely chosen to accept it and who, with any degree of certainty, may not even reap any benefit from the ends intended. These are the focal questions that must be addressed from the ethical point of view in relation to modern technical activity.

Thereby it is unmistakeably so that initially modern technical culture has drastically reduced life risks - a fact that often does not receive due attention in the public discussion. The reduction of risks is even in many cases the decisive motive behind a given technical Innovation and not solely - as is frequently presupposed - the maximisation of benefits. Today, the minimisation of dangers and the maximisation of benefits are the two most important motives for initiating technical Innovation. At the same time, and this must be recognised without reservation, modern technical activity has given rise to a different quality in the perception of and attitudes towards dangers, which is essentially due to the previously indicated unpredictability and incomprehensibility of the consequences of any given technical activity. It is this incomprehensibility and the unpredictability of the consequences of actions that cause the uncertainty and the inequitable distribution of the gains involved. Furthermore, - and this is logically connected with the unpredictability of the consequences - not only individual players appear as subjects and objects of a potentially dangerous activity but also the state has to expect its citizens to accept the risks of certain activities, whereby the probability of the occurrence of damage should be as small as possible but where it must be seen that in many interesting cases it cannot be entirely ruled out.

Now the *concept of risk* has long been a proven Instrument for the perception and description of dangerous situations, which based upon this are to be assessed and consequently overcome. It must be seen, however, that in many questions the perception

of *dangers* on the part of members of our society on the one hand and the expert and Professional assessment of *risks* on the other hand are widely at odds with each other, which, by the way, in some cases is due to a growing rationality in the manner of dealing with risks. This is especially so because when there is a high risk sensibility on the basis of better knowledge and improved possibilities for taking action, expectations with regard to the safety Standards that one would like to see fulfilled are also raised to a higher level. In a certain way, we are faced with a paradoxical phenomenon: It is only after the advent of modern technology that it has first become possible to attain a high Standard of safety, which former generations would not even have dared to formulate. The fact that in many cases this Standard can be more or less satisfactorily met, however, also awakens new expectations regarding even higher safety Standards. Meeting safety Standards demands on the other hand Investments, which in their turn also involve risks (not the least of which being technical); and especially such risks are often not accepted in our society.

In the interests of avoiding such a paradoxical Situation, which paralyses technical activity, I should like to formulate a demand and my further argumentation shall contribute towards justifying it. The demand is as follows: *that modern technically constituted societies must learn to develop from the initial perception of dangers to a rational risk assessment, so that on the basis of this risk assessment they may formulate and describe their safety policy and safety technology*. This demand is ultimately not a scientific, not a technical, not an economic but rather an *ethical* demand. It requires a fundamental change in the way of behaving on the part of the members of a society. This demonstrates that acting under risk within the framework of a modern technical culture is no longer a problem merely involving engineering science or insurance economics, it is the problem of a fundamental attitude of man towards his own actions in relation to his environment and to the world of which he is a part, a problem of the *ethics of acting under risk.*

The treatment of ethical aspects in regard to this topic is new from several points of view. It is new from the point of view of the history of ethics and therefore, regrettably, there is little that we can expect to draw from the great treasure trove of this history in the way of wisdom that will aid us in gaining orientation. It is also new, however, from the point of view of those disciplines in whose areas of competence the subject of risk

has hitherto been located, namely decision-making theory, insurance mathematics or safety technology. Now it is this ethical aspect that I should especially like to highlight- and it is this aspect alone to which I, on behalf of Professional philosophy, am able to make a contribution - and I will illustrate some of the problems and suggest to you some Solutions or at least the approaches to their solution. In *the first section* I should like to speak about the relation between danger and risk, in *a second train of thought* to say something about the problem of weighing risks and to the concept of pragmatic consistency, and *thirdly* to substantiate the term "Safety" as a comparative concept by means of the principle of pragmatic consistency.

I. THE PERCEPTION OF DANGER AND RISK ASSESSMENT

Everyone will have become aware of the fact that in the public debate the word "risk" is used in various different meanings and there is no doubt that this concept has to be clarified. Now, of course, in principle, one can Start by stipulating the meaning of a term in a conventional manner. But especially for this reason it is necessary to consider what it is that constitutes a practically valid definition of a term.. Since, in our context, (as I indicated in my introduction) it is also a matter of distribution problems — it is a question of distributing risks and chances -, we must find a term to cover the concept of risk which also expresses distribution considerations, that means it must provide the possibility to speak of risks in such a way that they may be compared one with the other. *Distributability presupposes comparability.* Furthermore the results of such a comparison must not be simply arbitrary; it must not be merely subjective: possibilities must be developed that will allow such results to be universalised. *Comparability in turn presupposes universalisability.* Thus we need a concept of risk with the help of which we may describe the aspects involved in being able to distribute, to compare and to universalise. Such a concept shall be termed in short " *rational risk concept"* - whereby it is immediately necessary to underline that, of course, we can not guarantee that there is only *one* such term that meets these conditions.

Many uses of the word "risk", however, do not meet these conditions. For example, it would be incompatible with these conditions to accept as an indicator of the degree of risk attached to a certain action the fear or aversion evoked since it is impossible to universalise in terms of the extent to which such fear is perceived by the individual or by a group.

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In order to arrive at a definition of the meaning of a rational risk concept, it is first necessary to consider that we never focus on the risk as such in itself but rather on actions or ends that bear the attribute of involving risk. We must therefore begin with a brief, general reconstruction of "actions" in order to determine in what sense actions are to be termed "risky".

Ideally, we proceed as follows: we pursue the *consequences* from the first to the n-th (n = 1,2,3,4,...) order until reaching the *end* we have set ourselves to achieve and in which certain *aims* that we intended to attain have been realised. Now everyone already knows from simple everyday experience that such ideal cases are always jeopardised by certain disruptions. For example, when certain intended consequences, although they occur, are accompanied by other consequences that are not intended by our actions and are not part of the action plan. Occasionally, certain expected consequences do not occur at all because we have presupposed a false causal nexus. Thus, whatever we do, we are always acting under insecurity and uncertainty. Furthermore, alongside those consequences that were intended ensue those that were not intended - the side consequences. In the fundamental assessment of risks it must also be considered that side consequences are not always undesirable side effects; in many spheres of life we often act for the very reason that we hope that certain desirable side consequences will occur even though they are not freely at our disposal. In the technical field one speaks here of "spin-off". In many areas, take for example the scientific field, we hope that over and above the set ends there will also ensue positive side consequences. Of course, it can happen that there are unwanted side consequences of dramatic proportions and it is these eventualities that

are at the moment claiming the attention of public debate more than the possibility of desired side consequences.

In addition to the consequences of actions, events occur within our sphere of activity that, in so far as we know the causalities, we cannot understand at all as being the consequences of our own actions. We speak of "coincidence". Above all, when it is difficult to form a clear picture of the circumstances surrounding our actions, we reckon on there being chance occurrences over and above those direct consequences of our actions that we can plan ahead in order to facilitate the realisation of an end. Here we speak of "fate" which, when the effect is desirable, is termed "good luck" and in the undesirable case is called "bad luck". One's behaviour in the face of fate can ideally be divided into two typical modes of behaviour: one can either behave in a resigned manner in the belief that a favourable outcome will not occur. But one can also have a confident attitude to fate. The confident attitude, therefore, is characterised by confidence in the assumption that the uncertainties of fate with which one also has to contend could be overcome in one way or another, i.e. could be avoided, removed or counterbalanced by taking certain precautions. A subservient attitude to fate, roughly speaking, is the basic attitude of man in the middle ages. It makes itself evident still today in east Asiatic cultures as the predominant life attitude. Regarding life from the point of view of overcoming fate, on the other band, is a product of new age, occidental self-understanding.

With the advent of the new age, enlightenment and new science a confident approach to life emerges on the scene. However, there are at present strong tendencies in the direction of a shaking of this confidence and this is perhaps the underlying reason for the current crisis regarding the acceptance of science and technology, which is therefore ultimately a culture crisis.

The occidental new age at any rate is characterised by endeavours of non-resigned man to be in a position to overcome dangers by means of precautionary action with the aim of precluding dangers. Insurance against damage and life assurance, for example, constitute a strategy based on a confident approach to cope with coincidence, and rational gambling on games of chance is an other example. Both examples, by the way, concern genuine human-cultural contexts of activity. They are not specifically related to technical devices or machines. This must be emphasised especially because occasionally

one hears the criticism that the following recommended understanding of risk is said to be related to specific machinery and thus alien to the human being as such. In fact, however, the understanding of risk that I shall presently speak about has its historical origin in the field of human self understanding and it is from there that it has been transmitted through a kind of anthropomorphous transfer to machinery and human beings.

If anyone should be inclined to think that it is somewhat out of place for a philosopher of all people to be referring to the rational behaviour of gambling it may be permitted to recall that it was Pascal, no less, who even constructed proof of the existence of God on the basis of rational gambling behaviour. At any rate, it was the need in society for a procedure of insuring oneself and gambling that stimulated the ascendance of a formalised probability theory which, once made available by J. Bernoulli, opened the possibility of a numerical formulation of the concept or risk. According to this, the degree of risk equals the numerically expressed damage multiplied by the numerically expressed probability of occurrence.

By means of these references to intellectual and scientific history it shall be underlined that this concept of risk -*firstly* - is a rational concept of risk according to the criteria already introduced and — *secondly* that it represents a kind of highly stylised life form for coping with the exigencies of fate, i.e. a concept primarily established in the cultural sphere of human activity.

The reconstruction of activity put forward thus far began with the insecurity and uncertainty of acting in the face of the danger that may result in the event of negative consequences ensuing from such action and ends now with the concept of risk. Now it all depends on a precise distinction being made between danger and risk or between the perception of danger and risk assessment respectively. The degree of risk in respect of an action is indeed not the same as the subjective awareness of danger - whether individual or collective. Risk assessment is more a possible, many times proven instrument for coping with danger, namely it is the attempt to determine the quality of danger for a particular type of action independently of whether a given Situation is perceived as more or less dangerous. Danger is the moment of the concrete occurrence that the individual or a group of persons may be faced with and is thus perceived in this way, whereby the perception itself may be more or less reliable. Risk, on the other band,

is determined for a *type* of Situation in relation to a *typical* participant in the given Situation. The gambler believes subjectively perhaps that the big win is just around the corner, the chances, on the other hand, (e.g. from the point of view of the bank) are always equally distributed. The insurance premium, therefore, is not determined according to the subjective, very strongly varying perception of danger - one person thinks of himself as immortal while an other reckons with death at any moment - no, it is calculated on the basis of "risk". Thus, though it depends on starting from the perception of danger and the wish to preclude danger, it also means contrasting the perception of danger with the assessment of the risk as a rational Instrument for coping with and overcoming dangers.

II. WEIGHING THE RISKS AND PRAGMATIC CONSISTENCY

When it is typical for certain actions that they be executed under danger, then it is necessary that one may differentiate between action options with regard to the respective dangers involved. When, furthermore, risk assessment is the instrument for an extra-subjective means of coping with danger, then the risks involved must be compared with one another. In view of popular polemics aimed against risk comparisons it must be emphasised that: in a society that wishes to organise itself *rationally* we cannot relinquish the possibility of comparing action options one with another by, among other things, comparing the risks.

Risks comparisons serve fundamentally to clarify the " degree of acceptability" of the consequences of an action that one expects others (including oneself) to accept. In this connection it is very important to distinguish between the *acceptance* and the *acceptability* of risks. Regrettably in the debate set in motion by sociologists concerning the risk society there is again and again a confusing mixture of concepts. By risk acceptance is meant the factual, possibly empirical, socio-scientifically describable willingness of an individual or a group to understand, to perform or to permit an action which under some circumstances may give rise to dangerous consequences.

For more than 20 years we have had at our disposal well confirmed results stemming from empirical socio-scientific acceptance research , and in regard to the point of view of rationality, these results are disappointing. These studies merely establish what those who are engaged with questions of safety know from everyday experience, namely that the factual acceptance behaviour of individuals and groups is neither without self-contradictions nor is it compatible with even very simple rationality Standards. This includes the attitude to accept (supposedly) voluntarily taken risks more readily than risks thrust upon us without voluntary Option. Thus, for example, though the risk of skiing is higher by far than the risk involved in the field of impure or chemically contaminated foodstuffs (whereby one can hardly claim that skiing is a more useful activity than eating), the risk of skiing, however, is generally more readily accepted than the risk of eating unfit foodstuffs. A further example: The controllable consequence of an occurrence irrespective of the degree of risk will always be more readily accepted than an uncontrollable consequence, whereby one can often be considerably deceived about the degree of controllability involved. The driver of a car thinks that he is able to control his car simply because he has his hands on the steering wheel, whereby, in contrast, the airline passenger rightly has no feeling of being in control. Familiar risks are more readily accepted than unfamiliar risks, independent of the question as to whether the degree of familiarity has anything at all to do with the degree of risk, whereby in many cases the mere assumption of familiarity suffices in itself. Risks that arise later are more easily accepted than risks that occur at once. This is also well-known: risks with a higher damage potential are less accepted than those with lower damage potential independent of the likelihood of damage occurring - which is an attitude that is unjustifiable in accordance with the understanding of risk as adumbrated earlier.

Now it is not the Intention here to show up the everyday human being in a bad light - we are all everyday human beings, but rather it is simply to show that many impulsively made presumptions have no supportable reliability for the solution of certain problems. A partial unreliability in regard to initial presumptions and attitudes can also be found in other life circumstances, there would be no science if the initial presumptions and attitudes of our life world proved always to be thoroughly reliable. For example, no-one,

unless he were a traffic policeman or otherwise engaged professionally in such matters, would regard his ability to assess speed as the basis for showing a high degree of willingness to gamble on it.

In more complex cases, this proposition is, of course, easier to grasp, above all in those fields where an initial human perception does not exist, for instance in the area of ionising radiation. This means that we all presuppose that no matter how important our initial presumptions and attitudes may be and however important they are as the starting point and initiator and as a critical phase in the rational way in which we plan our actions that they are not the ultimately reliable basis for action.

For this reason we need the term *acceptability* as a term which can be contrasted with the term acceptance, i.e. we need Standards and norms upon the fulfilment of which it will be made to depend whether a certain presumption is reliable or not. And therefore, to refer back to the example with the assessment of speed, we have invented speed measuring devices upon which, in case of doubt, we should rather rely than on our sensory perception. Correspondingly, also for risk assessment we need reliable acceptability criteria, i.e. the determination of acceptance in accordance with rational criteria.

Now there is some doubt as to whether such acceptability criteria exist at all, and one of the decisive reasons for the current aversion to technical things and for the sceptical attitude towards technology lies in the fact that many people believe that there is no such thing as acceptability criteria related to risks and chances. Such a generally sceptical view is not by any means widely shared in our daily life, for example, otherwise we would not indulge in most of the comparisons we make in regard to the different options for our actions. However, it must also be conceded that we may not expect to find acceptability criteria that would allow us to *categorically* prescribe certain courses of action. For example, there is certainly no possibility of formulating a criterion that would allow us to demand that everyone should accept the risk of flying as an airline passenger. This would be an Illusion. This illusion, however, is often cited for polemic purposes in order to demonstrate in general the pointlessness of any attempt to formulate acceptability criteria.

In all of this, the fact is ignored that it is indeed possible to formulate *hypothetical* imperatives whereby in nearly all action contexts hypothetical imperatives are sufficient

for the purpose of establishing an orientational basis for action. To say it in terms of the example already given, anyone who is prepared to drive a car should also accept the risk of flying as an airline passenger since the risk related to any kind of measurable value, such as mortality or morbidity is widely known to be far smaller. The formulation of such hypothetical prescriptions for action is in principle possible without further ado and in everyday world, in science and technology we make constant use of this possibility. Prescriptions of this nature, however, are only justifiable if the individual for himself and society as a whole is prepared to recognise and presuppose a principle that I have called *the principle pragmatic consistency.* It says that if you are prepared to accept one kind of risk then you must also be prepared to accept an other risk (in the same risk category) which is smaller or at most of equal magnitude (the benefit is initially equated as a ceteris-paribus condition). This principle demands that everyone should strive to be consistent in his mode of action. This applies both to the individual as well as, and above all, to society as quasi-player - the latter aspect bearing particularly significant consequences.

The demand for pragmatic consistency results in the presupposition that someone who by virtue of his chosen life form accepts a certain degree of risk may also be expected to accept this degree of risk for other actions under debate with the same or greater benefit. In principle this means that it can be demanded from members of modern societies - in so far as they wish to profit from the achievements of said societies that when the Situation requires it, they should accordingly demonstrate to the world a well-considered willingness to accept risk.

III. TECHNICAL SAFETY

On the basis of the principle of pragmatic consistency it is possible to make a contribution to substantiating the term "Safety", which is gaining ever increasing importance in the discussion about modern technology. Here, however, the frequently met use of the word involving the presupposition that safety can be defined as equivalent to trouble-free or accident-free must be rejected, for a course of action may very well be

factually trouble-free or accident-free and yet still involve high risk. When, for example, we refer to technical plant as safe, we are not saying anything about its condition, what it is like but rather what it *should be like*. Safety is first and foremost a *normative* term namely in the way that the state of affairs to which it refers are comparatively well ordered. For this reason one should begin characterising the meaning of "Safety" by examining the conditions under which something is safer than something else. If we once presuppose that something is safer than something else when it bears less risk, then the suggested explication of the concept of "risk" should also contribute to clarifying more precisely the concept of "safety".

Without being able to justify each one individually at this point, the following "four postulations" seem suitable and sufficient for the explication of the principle of pragmatic consistency in order to define the concept of safety.

A. The postulation of limitability

"Reject those actions whose scope of consequences is principally illimitable!" Logically it should be easy to accept the idea that a principally illimitable scope of consequences resulting from an action will principally always involve limitless danger thus rendering it imperative to reject such a course of action. This is now a general guiding principle which still requires some clarification; e.g. it should be clarified how the scope of consequences resulting from an action should be defined in the first place, since, under suitable reconstruction, every action involves an endless scope of consequences. Three further postulations shall serve to clarify questions of this sort as follows:

B. The postulation of "overlook ability" (Überschaubarkeit)

"Given the choice of two possibilities for action, select the one that has the smaller scope of consequences (with the same chances)!"

In order to determine the consequences of our actions it is, of course, necessary to possess a certain level of knowledge. We must know the causalities or at least the circumstantial conditions that exist or do not exist pertaining to the consequences of our actions. And this can only be achieved if the sciences provide us with a corresponding

reconstruction of the causalities involved. Thus from the postulation of observability it immediately follows that there is something like a corresponding *call for research.* Risk minimisation and the increase of safety need scientific research. Anyone who demands risk minimisation but hampers corresponding research becomes entangled in self-contradiction.

C. The postulation of controllability

"Given the choice of two possible actions each with an observable scope of consequences select the one whose consequences are more easily controllable!" In this case we are referring to technical controllability, i.e. it is a matter of enabling those risks that are possibly caused by technical implementation to be controlled by technical means. 1t may be assumed that in the meantime the consequences of using propellent gas in spray cans are well observable and yet they are indeed not controllable, which is the reason that we should use mechanical spray cans instead.

D. The postulation of reversibility

"Given the choice of two actions each with an observable and controllable scope of consequences chose the one whose consequences can be more easily or more quickly revised up to and including the possibility to restore the Status quo ante!" I now propose that one course of action be regarded as safer than an other when it fulfils the criteria (a) - (d) above. This understanding of "safety" results in the conclusion that the comparative relation implicit in the safety criteria must always be made clear. "Making something safer" tends to be an endless task. There is no such thing as *the* safe condition. Every step towards greater safety must be examined in the framework of risk comparison as to whether the costs involved in a specific case could not be used more effectively somewhere else. After all, our possibilities to act depend on the state of the art of scientific and technological development: anyone who wants more safety has to invest more in scientific research and technological development. The fact that the proposed definition of "safety" is not trivial may be shown by a look at some other postulations, which I explicitly exclude from my definition. To this category belongs the *postulate of voluntary option.* The voluntary aspect of a course of action has nothing whatever to do with degree of risk involved and therefore nothing to do with the

question of safety. As already stated, there are many cases in which we have to renounce our voluntary consent: we are not acting voluntarily concerning the way in which waste is disposed of, we also have general compulsory education, which, though it is not voluntary at all, everyone accepts. A further criterion that should not be linked with the concept of safety is the *postulation of familiarity.* Also unfamiliar technology can quite easily involve less risk and be safer than an other. The introduction of the potato was very unfamiliar to the Prussians yet it did not bring forth any big risks, and the same goes for the invention of the lightning conductor. In the history of technology we have never regarded the criterion of familiarity as the criterion for introducing a new technology. Apart from which, this criterion would be inexpedient and anti-innovative. We are experiencing in these days, however, that the hampering of Innovation in this manner is increasing and that we are losing chances because of publicly expressed insistence on adopting familiar options for our actions.

References:

[1] U. Beck, Risikogesellschaft. Auf dem Weg in eine andere Moderne, Frankfurt a.M.: suhrkamp 1986 [2] D. Bimbacher, „Ethische Dimensionen bei der Bewertung technischer Risiken", in: H. Lenk, M. Maring (eds.), Technikverantwortung. Güterabwägung - Risikobewertung - Verhaltenskodizes, Frankfurt a.M.: Campus 1991 [3] W. Buche): „Philosophie des Risikos", in: O.H. Peters and A. Meyna, Handbuch der Sicherheitstechnik.
Vol. 2, München: Hanserl986,115 - 127 [4] Gethmann, Carl Friedrich: "Zur Ethik des Handelns unter Risiko im Umweltstaat", in: C.F. Gcthmann / M. Kloepfer (eds.), Handeln unter Risiko im Umweltstaat, Berlin 1993, l - 54
[5] Rescher, Nicolas: Risk. A philosophical Introduction, Washington: University Press of America 1983 [6] C. Starr, R. Rudmann and C. Whipple, „Philosophcal Basisi for Risk Analyst s", in: Annual Rev Energ l (1976) 629 - 662