

Accidents with Russian aircraft stationed in the Netherlands

the accident with the Yakolev 52, RA02080, near Heten on March 9th, 2001 and the accident with the Sukhoi 29, RA01276, at naval air station 'de Kooy' on June 7th, 2002

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The Dutch Safety Board is the legal successor to the Dutch Transport Safety Board. The present investigation is initiated and partly carried out by the Transport Safety Board but published under the auspices of the Dutch Safety Board.

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In accordance with Annex 13 to the Convention of Chicago as well as Directive No.94/56/EC of the Council for the European Communities, which established the fundamental principles governing the investigation of civil aviation accidents and incidents, the investigation of the Dutch Safety Board is not intended to apportion blame or liability.

N.B:

This report is published in the Dutch and English languages.

In the event of conflict in interpretation, the Dutch text will be deemed binding.

CONSIDERATION

INTRODUCTION

Following you will find the report of the Dutch Safety Board concerning the investigation of two accidents involving two General Aviation aircraft¹ having a foreign registration. In the course of the investigation of the first accident, with a Yakovlev 52 (Yak-52) that occurred in the vicinity of Heeten on 9 March 2001, another accident took place, with a Sukhoi 29 (Su-29), at the Naval Air Station 'De Kooy' on 7 June 2002.

Initially the investigation was conducted by the Dutch Transport Safety Board. The report was published at 27 January 2005. It appeared afterwards that the English supplier of the two Russian registered aircraft that were involved in the accidents, had not been considered as being a party involved, at the time. Consequently the supplier was not given the opportunity to deliver his comments on the draft report and, erroneously, his view on the subject matter was not taken into consideration. The decision not to send the draft report to the supplier was, in hindsight, not correct. Therefore, in August 2005, the Dutch Safety Board, since 1 February 2005 the legal successor of the Transport Safety Board, removed the report from its web site.

Subsequently the Safety Board reopened the investigation. The report was translated into the English language and sent to the English supplier for perusal. From his comments several contradictions emerged concerning evidence with regard to the accident of the Yak-52, provided by the other parties involved. The emerging inconsistencies in the report were corrected by incorporating statements from both parties and subsequently it was presented again to all the parties involved in the Yak-52 accident, for further perusal. Furthermore the report was presented to the English Air Accidents Investigation Branch (AAIB) for comment as well. Comment resulting from the second perusal and from the AAIB, brought the Board to a change in point of view with regard to the Yak-52 aircraft (ex military and not certificated according the international civil aviation standards), and the role of the supplier. This resulted in some significant amendments in the report compared to the original report. In this consideration these amendments are further elucidated.

HISTORY

The accident concerning the Yak-52 occurred in the course of a private training flight, while practicing an aerobatic flying manoeuvre. The accident with the SU-29 occurred during an aerobatic flying display under the authority of Red Star Flying Circus. It was the intention that in the near future the Yak-52 also would be operated in charge of Red Star Flying Circus. The activities of Red Star Flying Circus concerned i.a. commercially operated aerobatics, flight training, leisure flights and flying displays. Both accident aircraft were Russian registered. The investigation revealed that the certificate of airworthiness concerning both aircraft exclusively were applicable in Russia. This information was disclosed only after the accidents had occurred.

ACCIDENT CONCERNING THE YAK-52

In the course of practicing aerobatic flying manoeuvres with the Yak-52, by a pilot and an instructor, the aircraft entered a flat spin. The investigation could not reveal if this was caused accidentally or on purpose. The occupants did not succeed in recovering the situation in time. The aircraft therefore came to the ground with a high vertical speed, in an almost horizontal attitude. Both occupants deceased as a result of the impact. The aircraft was damaged beyond repair.

The investigation revealed that both occupants were not familiar with the special technique required to recover from a flat spin of a Yak-52 aircraft. Also it appeared that the instructor probably was not very experienced on this type of aircraft. The flat spin characteristics of a Yak-52

¹ General Aviation is the category of aircraft which includes sport- and business aviation aircraft with a take off mass of 5.700 kg or less. (Motor)Gliders, airships and balloons, helicopters en micro light aeroplanes are excluded. *Veiligheidsstatistieken luchtvaart 1989-2003 p.21, Inspectie Verkeer en Waterstaat.*

aircraft requires practicing of this maneuver with an instructor who is very experienced in flying the aircraft and flat spins in particular.

The Yak-52 is a Russian, ex-military aircraft that is operated as a civil aviation airplane. From its originally military operational environment it is now utilized in a civil environment without the internationally required civil aviation certifications. As a consequence no Aircraft Operations Manual, stipulating all operational limitations, is officially available, as is common for civil operated (certified) aircraft.

The above mentioned situation is not unusual for not-certified (ex military) aircraft when appreciating the widely used ex-military aircraft originating from the Second World War, the so called 'War-Birds'. In essence the Yak-52 stems from the same background as these war birds. As these aircraft are not certified according to the international civil aviation standards, operators must be duly aware of existing operational limitations accordingly. With regard to the Yak-52, different manuals are circulating, each with a varying content. The manual of the accident aircraft contained several subjects that were discussed rather extensively, while other subjects were ignored. The latter included the spin characteristics, weight and balance information and climb- and cruise performance data.

It is the Boards opinion that deviations, as described above, from the usual civil aviation standards, operators and in particular commercial pilots must be alarmed. With regard to uncertified aircraft, in general, a system regarding airworthiness assurance is absent. A similar system which utilizes Service Bulletins and/or Airworthiness Directives, provides for information regarding operational limitations and additional operational instructions. Such a system is implemented by the government authorities and the manufacturer. Consequently the owner, the holder and the operator of a similar aircraft is, with regard to possible operational limitations, dependant upon the experience and information derived from third parties. This emphasizes a persons own responsibility to an even greater extend.

A principle, generally accepted in civil aviation, with a view to the safe operation of this kind of aero planes is to utilize knowledge derived from professionals and the experience with the aircraft gained over the years. Therefore it is essential that operators are informed and trained by persons who are well experienced on type. The information derived from manuals and other available documents is of a secondary interest.

The investigation revealed that the Czech instructor, the owners and the pilots were insufficiently aware of the importance of the required Yak-52 flying experience an instructor should have, in particular in spin-maneuver. The owners nor the operators did verify the instructors experience. Furthermore it appeared that in the Netherlands a satisfactory system of supervision with regard to these Russian registered aircraft is absent. This will be further elucidated below.

ACCIDENT CONCERNING THE SU-29

In the course of the aerobatics display with the Su-29, the aircraft lost considerable altitude and speed. The pilot did not succeed to regain control of the aircraft in time. The aircraft hit the ground under a small angle and caught fire. The pilot was relatively lightly wounded and freed from the wreckage by the fire brigade. The aircraft was damaged beyond repair.

The investigation revealed that the next elements were a contributory factor to the cause of the accident: the pilots limited experience flying the aircraft type; the cloud base being too low to allow for such a flying show and the absence of adequate legislation concerning flying displays.

In Januari 2004 the 'Regeling Luchtvaartvertoningen' was implemented. This regulation establishes the responsibilities and requirements for a.o. the participants in flying shows. It is aimed at reducing the hazards existing during air shows for the benefit of the pilots as well as the public and third parties on the ground. If the regulation would have been applicable at the time of the air show in 2002, most probably the accident would not have occurred since the new rule requires a.o. more experience on type of aircraft.

LEGISLATION

The Board limited its investigation to the extend of the General Aviation sector only. Worldwide, the Standards and Recommended practices of the International Civil Aviation Organization (ICAO) are directive in determining the aviation legislation at national level. In general, the rules and regulations applicable to the operation of the aircraft are those that are in force in the state of its registration. Within Europe the Joint Aviation Authorities (JAA) contributed to the harmonization of legislation between the JAA member states to an important extend. This tendency is continued within the European Aviation Safety Agency by the EU member states joined in the JAA. (EASA since 2003)². This resulted in uniform JAA and/or EASA regulations a.o. applicable to aircraft registered in a Member State. At the time the two accidents occurred, JAA regulations were applicable. For the record it is emphasized that Russia is not a JAA Member State.

The certificate of registration and the certificate of airworthiness are issued by the state of registration. Furthermore applies, that a maintenance organization must have an approval from the state of registration of the aircraft in order to be allowed to perform maintenance actions to the aircraft as well as to perform the inspection prior to the extension of its certificate of airworthiness (during this inspection the technical state of the aircraft is assessed and it is verified if the aircraft's maintenance has been performed according to the applicable regulations). In this connection it will suffice if the organization operates with personnel that is in the possession of a maintenance engineers license from the state of registration of the aircraft.

An aircraft registered in one of the JAA Member States may be maintained by any JAA approved maintenance organisation authorised to perform maintenance to the applicable type of aircraft. In the near future, apart from being maintained, an aircraft registered in one JAA Member State may also be inspected in another member state by a JAA approved organisation.

It is the aircraft owners responsibility to present the aircraft in time for the next yearly inspection.

SUPERVISION

The complete quality system in civil aviation including the issuance of authorizations in the form of, certificates, qualifications and licenses, is footed on the above mentioned (international) legislation. Quality assurance of this system is realized by means of supervision of implementation of and compliance with aviation policy and legislation. This concerns a responsibility of the governmental authorities of the State of registration. Next to that, citizens and operators have their own responsibility with respect to safety with, as a minimum, compliance to legislation; this is supposed to be included in the personal responsibility.³

In general the state of registration of the aircraft is responsible for the supervision regarding the airworthiness c.q. maintenance of the aircraft. This means that, within The Netherlands, the state of registration is responsible for the surveillance of maintenance organizations or persons, providing maintenance to foreign registered aircraft. In The Netherlands, after each completion of an inspection for the extension of the certificate of airworthiness of a Dutch registered aircraft, performed by an approved maintenance organization, Inspectie Verkeer en waterstaat (IVW, the Civil Aviation Authority) must be given the opportunity to perform a random check. Parallel to the random checks performed by the RDW (State road traffic department) at approved APK-stations (prior issuance of the yearly periodical inspection-certificate of a motor car).

As a consequence of the mandatory licensing, supervision of aircraft operations such as commercial air transport and -sightseeing flights is covered directly by the inspection of the Netherlands Civil Aviation Authority. Supervision of the remaining aircraft operations, leisure flights included, is performed by the authorities by executing random checks. With regard to the accidents in 2001 and 2002, that were investigated: no license was, nor is required for aerobatics. At the time of the accident with the Su-29, a license to perform flying displays during air shows was not required (legislation to that effect was implemented in 2004 ('Regeling Luchtvaartvertoningen')).

² Not all JAA member states are yet included in the EASA. JAA is constituted out of 25 EU member states and 13 other European states.

³ The 'Nota Toezicht in beweging' (mei 2004) composed by the Inspection of Transport and Water works tends to allow for a bigger role of the personal responsibility of civilians and operators.

In what way is supervision of the operation of foreign registered aircraft completed within The Netherlands, in addition to supervision of maintenance organizations that are located in The Netherlands?

To that end the Civil Aviation Authority (Inspectie Verkeer en Waterstaat, IVW) performs random checks at airports in The Netherlands.⁴ Foreign registered aircraft that are located on the airfield at the time of the random check, may be subject to an inspection. This concerns a cursory inspection. It is checked if the required documents (by ICAO) that must be available are still current. With regard to the pilots, a pilot's license and a medical certificate is required. With regard to the aircraft, the certificate of registration and the certificate of airworthiness are checked as the technical status of the aircraft. Furthermore the flight preparation performed by the commander, such as weight and balance calculations etc. is reviewed. This inspection system is not watertight however, as can be illustrated by the occurrence with a Dutch registered aircraft abroad, performing a tour around the world, while its registration was deleted from the register, without any authority requiring the submission of current aircraft documents.⁵

Both accident aircraft were Russian registered and carried a certificate of registration and a certificate of airworthiness issued by the Federation of Amateur Aviators of Russia (FLA). The FLA is an organization that, since December 1988, is recognized by the Russian Civil Aviation Authorities as being the association to promote the private pilots interests in Russia. The FLA issues certificates of airworthiness and of registration with regard to Russian aircraft, performs inspections and issues flying licenses.

In the course of its investigation the Board came across the "Direction to prevent flying of certain Russian registered aircraft" that was issued by the English Civil Aviation Authorities on 13 May 2002. It was learned from the English authorities that until issuance of this "Direction", Russian registered aircraft were accepted in England. These aircraft were utilized for recreational purposes (aerobatics) and were not regarded by the CAA as subject to special attention. At the time some of these Russian aircraft were flying in England and other European states. Only after these Russian aircraft were involved in some accidents in England, the CAA inquired further information from the Russian Civil Aviation Authorities with regard to the issuance of certificates by the FLA (including the certificate of airworthiness). The reply that was received revealed that the FLA was authorized to issue certificates exclusively within Russia. In order to allow these Russian (ex-military, not civil aviation certified) aircraft to be operated within the civil aviation regime in Great Britain, the English CAA hooked up to its existing so called 'Permit to Fly-system'.

Under this system the ex-military aircraft from the Second World War, which originally are having the same background as these Russian aircraft, are operated. This system is applicable in England.

In order to be allowed to fly in France, the French authorities introduced an extra inspection for these Russian aircraft. In The Netherlands the Transport Safety Board informed the IVW, on 1 September 2003, with respect to the outcome of the investigation regarding the FLA and the 'English Direction'. (The existence of the French direction was then unknown to the Board at that time). Until then the IVW had not been familiar with the existence of the FLA nor the 'English Direction'. After the accident with the Yak-52 the IVW did not implement further legislation, by analogy of English or French legislation, with regard to Russian registered aircraft in The Netherlands. The IVW explained during the perusal of the draft report that it did not have the intention to react prematurely but would await the conclusions of the Board.

From the Russian Investigation Authorities it was learned that the Russian Governmental Authorities terminated the activities of the FLA, as from August 2004. However it appears that the

⁴ Performed by the so called SAGA-teams (Safety Assessment General Aviation).

⁵ On 22 July 2003 a Piper Cherokee aircraft with registration PH-SMD during the landing at Brittas Airfield (Ireland) ran over the edge of the runway. After the request of the Irish Air Accident Investigation Unit the Transport Safety Board requested further information from the IVW about the particular aircraft. It appeared that ultimo 2002 no extension of the certificate of airworthiness was established. The owners of the aircraft had expressed their intention to report the aircraft for registration in the Irish civil aviation register. To allow for transportation of the aircraft to Ireland IVW extended the already expired certificate at 5 April 2003 for 30 days. On 5 June 2003 the registration of PH-SMD was deleted out of the Dutch register. From 29 April 2003 until 10 July 2003 the PH-SMD was engaged in a flight around the world. During this trip it landed at 30 different airfields in 16 countries. During this journey that lasted for 70 days over a distance of 23.000 nm not any authority requested for the validity of the aircraft documents.

FLA still is active within Europe as can be concluded from the various Russian registered aircraft still flying around within Europe, The Netherlands included.

Approximately 100 foreign registered General Aviation aircraft are located permanently in The Netherlands⁶, besides approximately 700 Dutch registered General Aviation aircraft. Approximately half the number of foreign registered aircraft are registered outside JAA states. No exact historical data are available with regard to the number of foreign registered aircraft⁷ within The Netherlands, however it is a well known fact that the numbers are increasing.

For IVW inspectors it is not always possible to conclude if foreign registered aircraft are operated conform the legislation that is in force in the state of its registration. Mentioned below are the causes that are instrumental in this:

- Within ICAO six different standard languages are utilized resulting in documents composed in a language that is not always legible to the inspector. Aircraft documents preferably are composed in the English language however deviations are allowed.
- after the accidents had occurred it was learned that the certificate of airworthiness of the Yak-52 and the Su-29 exclusively were valid for use within Russia, this information was not recorded anywhere.
- National (allowed) deviations from JAA regulation. In May 2002 the English Civil Aviation Authorities implemented operational limitations for a.o. the Yak-52 and the Su-29 (Direction to prevent flying of Russian aircraft). The IVW was not familiar with this 'Direction'.

Furthermore it appeared from the investigation that:

- it is not clear if and to what extend foreign inspection bodies discharge their responsibility with regard to supervision concerning aircraft that are registered outside the JAA states and are located in The Netherlands.
- IVW is not acquainted with the number and type of foreign registered aircraft that are (permanently) located in The Netherlands
- for aircraft of which it cannot be demonstrated that they are certified conform ICAO-standards, like the Yak-52 and (possibly not) the Su-29, it is a very costly and time consuming procedure to acquire a Dutch certificate of airworthiness and subsequently that of registration. In order to achieve this, the owner of the aircraft design must demonstrate conformity with the airworthiness requirements of the state of origin (with regard to design and/or manufacturing process) as well as the JAA requirements. Furthermore a bilateral treaty is required between the state of design and/or manufacturing and The Netherlands.
- the options applied in other states like f.i. utilizing a so called 'Permit to Fly' (a kind of special certificate of airworthiness including various operating restrictions and flying restrictions) are not utilized by the IVW in The Netherlands.
- After the accident with the Yak-52 as well as the accident with the Su-29 the IVW, until now, did not implement any further legislation with regard to similar foreign registered aircraft of this category, located in The Netherlands in general, nor for (some) Russian registered aircraft located in The Netherlands in particular. The IVW indicated to await the conclusions of the Boards investigation.

As indicated before, the supervision of a civil aviation aircraft is assigned to the State of registration. No comprehensive investigation has been conducted with regard to the functioning of the Quality System regarding foreign registered aircraft located (permanently) in The Netherlands. With regard to JAA-registered aircraft the system seems to work well. This is assured by the National Authorities inspecting JAA approved maintenance organizations. The intended further harmonization of legislation via EASA will be a contribution to the improvement of the quality system and quality assurance within Europe.

This can not always be said for the quality (assurance) system for oversight of aircraft registered outside the JAA states that are located within The Netherlands, often because of the absence of (any form of) supervision. Indicative in this connection is for instance the absence of a system of random checks of renewal inspections. As a consequence an even more extensive role is reserved for personal responsibility, as appeared with regard to the Russian registered aircraft involved in this investigation.

⁶ According to information derived from airport managers Dutch airports, 1 July 2004.

⁷ www.ivw.nl, 1 January 2004.

The increase in the number of foreign registered aircraft that are permanently located in The Netherlands, has a direct effect on the IVW losing its oversight regarding the state of airworthiness c.q. maintenance of all civil aircraft that are mainly operated within The Netherlands.⁸

PERSONAL RESPONSIBILITY

Both accident aircraft originated from the same English supplier.

With a view to the nature of the Yak-52, being a 'high performance' single engined aircraft, not certified according to international civil aviation standards, without the existence of a complete Flight Manual, the primary source of knowledge regarding the flying characteristics is flight training and secondary the Flight Manuals.

The supplier did teach the future owners how to fly the Yak-52 aircraft and, on request, demonstrated some aerobatics. The supplier informed the buyers where to obtain aerobatic flying instruction. In the publication of 13 March 2001, on the supplier's web site, he indicated that he had been too casual regarding the flight characteristics of the Yak-52. In particular so with regard to the flat spin. The Board requested the AAIB's opinion on this subject matter. The AAIB replied that in its opinion the suppliers actions came up to what within Great Brittan reasonably could be expected from him. The Board concurs with this opinion.

The investigation revealed that the Czech instructor, the owner(s) as well as de operators were insufficiently aware of the consequences of flying an aircraft that is not certified according to international civil aviation standards. This is evident from their lack of awareness regarding the required flying experience on the Yak-52 the instructor should have had for giving aerobatics training. The owners as well as the pilots did not verify this experience.

Furthermore it is the Boards opinion that the owners, being commercial pilots, as well as the holder of the Yak-52, should have been able to recognize that the documentation that was provided with the Yak-52 could not be considered a Flight Manual complying with the international civil aviation standards.

It is also the Boards opinion that persons as well as organizations that are engaged in flying displays and aerobatic flying activities on a professional level must be aware of the inherent risks. Therefore it is important that apart from the requirements laid down in the 'Regeling Luchtvaartvertoningen', extensive attention is paid to flight preparation, training, and the execution of these displays and that these are laid down in manuals and (emergency) procedures. This is considered to be included in the personal responsibility. The Board concludes that the pilots who are united under the name Red Star Flying Circus were insufficiently prepared to be able to perform aerobatics and display flights on this high level. No recommendation to this extend was directed to Red Star Flying Circus because the organization ceased to exist.

SIMILARITIES IN BOTH ACCIDENTS

Though both accidents occurred under different circumstances, the investigations are combined in one report. Though the reason and the primary cause of these accidents differ, the similar aspects as mentioned below brought the Board to its decision to combine both investigations:

- on both occasions a Russian certificate of airworthiness was involved that after the accidents appeared not to be valid outside Russia
- both aircraft were stationed permanently within The Netherlands
- the Yak-52 is 'not' and the Su-29⁹ 'may not be', certified according to international civil aviation standards (ICAO)
- both aircraft were acquired in order to perform aerobatic maneuvers
- both aircraft came from the same supplier
- the connection with the Dutch organization Red Star Flying Circus

⁸ F.i. With regard to American registered aircraft the personal responsibility is much more incorporated in the United States legislation. Enforcement by the American FAA takes place by imposing fines to FAA inspectors if the regulations were not properly followed.

⁹ Medio 2004 the Su-29 received a type certificate from the Hungarian civil aviation authorities. It is not yet clear if this document will be adopted without further restrictions by the other JAA/EASA-member states.

- Insufficient assurance of supervision of foreign registered aircraft
- The role of personal responsibility

The combination of both investigations extended the scope of investigation, which indeed caused an extension to the time of completion, but was a contribution to find the underlying factors to the causes and consequently in outlining the structural safety problem.

CONCLUSIONS AND RECOMMENDATIONS

As far as is investigated, it can be concluded that with respect to aircraft registered in JAA Member States, the Quality Assurance System of the JAA approved maintenance organizations in The Netherlands, with random checks performed by the authorities, in general, functions properly.

With regard to aircraft that are not registered in a JAA Member State, the quality system basically functions in the same manner, however quality assurance by adequate supervision is often absent. As a result of the above indicated restrictions, supervision of these aircraft by random check inspections did not reach the required scope or is absent. Thus it appeared from the investigation regarding the two Russian registered aircraft that establishing the airworthiness can be a problem. In the light of the recent expansion of the European Union with some Eastern European states, some vigilance with regard to supervision of aircraft registered in these states is required as well.

Many owners and/or holders of foreign registered aircraft opted for a foreign registration rather than a registration in The Netherlands because in general this is easier and less expensive.¹⁰

Because a special certificate of airworthiness with (as a consequence) a Dutch registration is no option, in The Netherlands a tough procedure applies for the entry of the Yak-52 and the Su-29. The reason for this is that aviation safety in The Netherlands must be assured. As a consequence of this policy, aircraft are operated within The Netherlands that are largely withdrawn from Dutch supervision.

To summarize: because only restricted supervision is performed with regard to the discharge of personal responsibility, there are aircraft located on Dutch soil, registered outside the JAA member states with an airworthiness which is not beyond dispute. It is the Board's opinion that this situation must not be allowed to be continued. As, in addition, it appears that these aircraft are located in the Netherlands for a longer period of time, are operated within The Netherlands, and are piloted by Dutch operators and from time to time are utilized for commercial purposes, the Board must conclude that the safety system as applied in the General Aviation sector does not result in sufficient safety assurance.

With regard to foreign registered aircraft f.i. it could be taken into consideration to investigate the possibility to establish a maximum length of stay within The Netherlands or to declare Dutch legislation also being applicable to these aircraft as soon as a continuous period of time of stay within The Netherlands is exceeded. Therefore the Board directed the next recommendations to the Minister of Transport and Public works.

The Dutch Minister of Transport, Public Works and Water Management is advised to take measures in order to improve the supervision in the Netherlands on the airworthiness and operations with:

- aircraft of the category General Aviation not registered in a Member State of the EASA (JAA), and:
- aircraft that due to their military design history have no type certificate according ICAO directives

With this, among other things, clarity regarding the status and the authority of the Federation of Aviation Amateurs has to be given. If additional regulations are necessary to that end, these should preferably be laid down in a European context.

¹⁰ For example a licensed maintenance technician is allowed to overhaul aircraft components (starter motor, carburettor etc) himself while under JAA-legislation this only may be accomplished by persons with a special licence.

The investigation revealed that the available flight manuals of the Yak-52 contain incomplete information regarding the following subjects:

- spinning, flat spins and the special recovery technique to redress a flat spin
- the weight and balance calculation methods
- Weight limitations of occupants

Within Europe the number of flying Yak-52 aircraft is increasing and aerobatic flights with Yak-52's are performed to an increasing degree. In spite of this the Board wishes to point out that as a result of absence of the above mentioned information, operators of Yak-52 aircraft are exposed to extra risks. This is in particular so when pilots did not complete any spin training. Therefore a recommendation to that end is directed to the Minister of Transport and Public Works:

The minister of Transport, Public Works and Water Management is recommended to take appropriate measures, in order to decrease the risk associated with the use of the Yak-52 to an acceptable level according to the ALARP principle (As Low As Reasonably Practicable).

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mr. M. Visser
General Secretary

SYNOPSIS

This report comprises the investigation of two accidents with aircraft with Russian registrations. Both wrecked aircraft had a Russian registration and were among others used by a group of pilots flying together under the name of Red Star Flying Circus. The first aircraft was wrecked during practising an aerobatic figure, and the second aircraft was wrecked when carrying out a display of aerobatics. Although both accidents took place under different circumstances and some of the persons involved in the first accident were not involved in the second accident, both investigations have been combined in one report. By combining both investigations, the underlying causal factors could be pursued more deeply.

During the performance of aerobatic figures with a Yakovlev 52 (Yak-52) with Russian registration RA02080 by a pilot and an instructor, the aircraft entered a flat spin. The occupants of the aircraft did not succeed in recovering from this situation in time. As a result, the aircraft hit the ground with a high vertical velocity in a more or less horizontal position. As a consequence of the collision with the ground, both occupants lost their lives. The aircraft was damaged beyond repair.

During an air display with a Sukhoi Su-29 with Russian registration RA01276, the aircraft lost much height and speed. The pilot was unable to get control of the aircraft in time. The aircraft hit the ground at a small angle and caught fire. The pilot was freed from the wreck with relatively light injuries by the fire service. The aircraft was irreparably damaged.

LIST OF ABBREVIATIONS

AAIB	Air Accident Investigation Branch
AC	aerobatic competency
ACAS	airborne collision avoidance system
ACE	aerobatic competency evaluation
ACR	acrobatic
AD's	airworthiness directives
AGL	above ground level
ALARP	As Low As Reasonably Practicable
AOC	air operator certificate
ATPL(A)	airline transport pilot license (aero planes)
AVGAS	aviation gasoline
BKN	broken [5/8 to 7/8 cloud coverage]
CAA	civil aviation authority
CAP	civil aviation publication
CofA	certificate of airworthiness
CPL(A)	commercial pilot license]
DA	display authorization
EASA	European Aviation Safety Agency
ECAC	European Civil Aviation Conference
FAA	Federal Aviation Administration
FAI	Fédération Aéronautique Internationale [International aviation sports federation]
FEW	few [1/8 to 2/8 cloud coverage]
FI(A)	flight instructor (aero planes)
FL	flight level
FLA	Federation of Aviation Amateurs
GPS	global positioning system
hPa	hectopascal
ICAO	International Civil Aviation Organization
ILS	instrument landing system
IVW-DL	Transport and Water Management Inspectorate, Aviation Division (Dutch)
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirements
kg	kilogram
km	kilometer
KNMI	Koninklijk Nederlands Meteorologisch Instituut [Royal Dutch Meteorological institute]
LL	low lead
MAC	mean aerodynamic cord
MPD's	mandatory permit directives
MTOW	maximum take-off weight
MVK	marinevliegkamp [naval airbase]
NFI	Nederland Forensisch Instituut [Dutch Forensic Institute]
PIC	pilot in command
PPL	private pilot license

QNH	atmospheric pressure on the earth surface, in relation to the mean sea level in the ICAO-standard atmosphere.
RT	radiotelephony
RvTV	Raad voor de Transportveiligheid [Dutch transport safety board]
SAGA	safety assessment general aviation
SEP	single -engine piston
SC	strato cumulus clouds
SCT	scattered [3/8 to 4/8 cloud coverage]
ST	stratus clouds
TC	type certificate
TOW	towing [sleepvluchten]
UTC	universal time coordinated

1 FACTUAL INFORMATION

1.1 THE ACCIDENT WITH THE YAK-52

1.1.1 General information

Location : near Heeten, Municipality of Raalte
Day and hour : 9 March 2001, 10:25 hours¹¹
Aircraft : RAO2080, Yakovlev Yak-52, irreparably damaged
Owner : two private persons and Aero-Materials Association Holland B.V (in two equal parts).
Occupants : two, both killed
Passengers : none
Sort of flight : instruction flight aerobatics
Stage of the flight : aerobatics
Type of accident : no timely recovery from a flat spin

Pilot : a 31-year-old Dutchman, pilot licence ATPL(A) valid until 1 January 2002, ratings SEP (land), PIC MD-11. Valid Russian equivalent (for the pilot licence SEP). Flight experience about 5000 hours, of which about 300 hours with single-engine aircraft and about 12:15 hours of type experience with Yak-52.

Instructor : a 38-year-old Czech male, Czech pilot licence CPL(A), valid until 31 October 2001, ratings SEP (land), FI(A), ACR, TOW. Flight experience about 2330 hours, of which about 1090 hours aerobatics. Experience with the Yak-52 actually unknown, probably limited.

Data obtained from the Royal Dutch Meteorological Institute with regard to the weather conditions around Teuge Airfield between 09:00 and 12:00 hours.

General situation : a south-west current brought maritime polar air which was quite damp at the lowest levels. A weak trough moved over the country from the south-west to the north-east.

Weather conditions near Heeten:

Wind : near the ground: 180-190 degrees, 10-15 knots +9° Celsius
at 1,000 feet: 200 degrees, 20-25 knots +7° Celsius

Natural light conditions : daylight, clear

Sight : decreasing from 10 km to 3 km at about 12:00 hours

Clouds : BKN ST/SC 1,200-1,500 feet, tops exceeding 3,000 feet,
Dropping to BKN ST/SC 500 feet at about 12:00 hours

0° Celsius level : 5,000 feet

Turbulence : light

Thermal : none

QNH : 1,000 hPa

¹¹ All hours mentioned are local times (in relation to the Yak-52 incident UTC+1, in relation to the Su-29 incident UTC+2).

It is shown by photos taken by the regional police at the accident location shortly after the accident that the sun shone dimly at that moment. The degree of cloud cover seems to be no more than 4/8 (SCT: scattered) at that moment. The photos show cumulus and stratus clouds. The cloud basis cannot be determined well based on the photos.

1.1.2 The flight and the accident

On Friday, 9 March 2001, at about 10:07 hours, the Yak-52 with the registration RA02080 left Teuge airfield with two occupants for a local instruction flight of aerobatics. In the cockpit of the Yak-52, there is room for two persons sitting one behind the other. During the fatal flight, the pilot¹² sat in the front and the instructor behind him.

After the aircraft had taken off, the occupants flew in a north-eastern direction in order to carry out aerobatics in the vicinity of Raalte/Heeten. Between 10:00 and 11:00 hours, a witness saw a similar aircraft in this vicinity which made a steep climb, disappeared behind the clouds and subsequently flew steeply downwards. Thereupon, the aircraft again made a steep climb and again disappeared behind the clouds.

Between 10:15 and 10:20 hours, four other witnesses saw and heard the aircraft while spinning around its normal axis with a changing rotational speed fly in the direction of the ground. The statements vary with regard to the position of the aircraft. According to two of these witnesses, the position was with the nose towards the ground, the two other witnesses stated that the aircraft whirled downwards more or less horizontally. However, all stated that the aircraft spun around its normal axis.

About this same time, a number of persons at Teuge airfield hear some fragments of conversation via the aeronautical radio at the frequency of said airfield, which fragments apparently came from the aircraft in question. The texts: "That was good, that didn't hurt" or "that did hurt", "I cannot hold it", "I cannot get it out of it" or similar words, were heard. They also heard a person breathing heavily. According to one of the witnesses, who exactly kept tally of the time, this was at 10:24 and 10:25 hours.

After witnesses had seen and heard that the aircraft had hit the ground, the emergency services were alerted, after which assistance was given. It turned out that the occupants of the aircraft were dead. Both occupants were wearing parachutes and the fasteners of their seat belts were closed.



Picture 1: The wreck of the Yak-52 after the impact

¹² For the sake of readability, the term pilot was chosen for the foremost occupant, because he was formally authorised to do so. The hindmost occupant is referred to as the instructor.

1.1.3 The aircraft

General

The Yak-52 is a metal two-seater aircraft of the type low-wing aircraft. The aircraft is derived from the Yak-50 which was designed as a military training aircraft in the former Soviet Union in 1970. The Yak-52 is now used in the former Soviet Union for both air force and civil aviation training. The pilots flying sit one behind the other in the aircraft. The aircraft has a main undercarriage and a nose wheel that are both retractable. All the figures from the official 'Aresti Aerobatic Catalogue'¹³ can be flown. Up to now, approximately 1,800 aircrafts of this type have been built, of which now approximately 300 are flying in the United States and Europe. At the time of the accident, in the Netherlands one owner having a Yak-52 was known. This aircraft was registered in the Russian aircraft register and was stationed in Belgium.



Picture 2: A Yak-52

Length	7,745 meters
Height	2,70 meters
Wingspan	9,30 meters
Engine	14P, 9 cylinder star engine, four-stroke, petrol, air-cooled
Power	360 horsepower
Fuel	100 LL (AVGAS)
Empty weight	1,035 kg
Maximum weight aerobatics	1,315 kg
Maximum starting weight	1,315 kg
Purchase price (overhauled)	approximately € 55,000

History

The RA02080 was built in 1990 and registered in the Russian aircraft register on 12 March 1990. As from this date, 41 flying hours had been performed with the aircraft according to the log. These hours had been made distributed over the years 1990, 1991, 1993, 1994 and 1995. After 1995, the aircraft stood still in Russia for some years. In 1999, the aircraft was transported to England and fully inspected, after which again a Russian certificate of airworthiness was issued on 14 March 2000. On 25 September 2000, a flight was made with the aircraft for the first time since the inspection. As from 25 September up to and including 9 January 2001, flights were made with the aircraft for 17:30 hours. After the purchase and the official transfer, the aircraft was flown to the Netherlands on 10 January 2001. As from this date, flights were made with the aircraft in the Netherlands.

Aircraft documents

The aircraft was provided with a Russian certificate of airworthiness and was in the name of the Federation of Aviation Amateurs (FLA) in Moscow. The aircraft category mentioned in the certificate of airworthiness is: educational-training [translated]. On the certificate of airworthiness the common reference is made that the document is issued pursuant to the Convention of International

³ List of the international air sports federation, Fédération Aéronautique Internationale (FAI), in which all official aerobatics figures are listed that are flown during contests.

Civil Aviation Organisation (dated 7 December 1944) and regulations there under with respect to this aircraft. No reference is made to any Russian legislation.

The (English) supplier of the Yak-52 has stated that at the time of the delivery he had supplied all the documents at his disposal with the aircraft. Apart from a handbook in English with the title "Yak-52 Flight handbook", a number of original logbooks had been supplied with the aircraft. These logbooks are all in Russian. Of these logbooks, only the log of the aircraft had partially been kept by the new owners. The supplier of the aircraft has stated that he had instructed the buyers how the airframe and engine logbooks were to be completed. According to the Dutch owner, the supplier had stated that all the 'official' documents had been supplied with the aircraft.

Agreements have been made internationally with regard to the content of a flight manual. These agreements have been laid down in the so-called ICAO¹⁴ Annex 8 (Airworthiness of Aircraft). Chapter 9 of this Annex sets out which information the flight manual has to contain in any case. These are the chapters: General, Limits, Emergency Procedures, Normal Procedures, Capacity, and Mass Location and Centre of Gravity.

Because the Yak-52 was designed as a military training aircraft, this aircraft has no official ICAO flight manual written by the manufacturer and approved by the authorities. For the Yak-52 a manual was written by the military authorities. In addition, there also exist other handbooks and documents which have been written by other Yak-52 users at a later stage. One of these handbooks was supplied with the delivery of the RA02080. This is a book in English with the title "Yak-52 Flight handbook." This concerns a translation of the Russian instruction book "Yak-52, instruction of flight operation", written by G. Kotchurova and A. Smylshliaev. This "Yak-52 Flight handbook" refers to the general description, performance and normal and emergency procedures. This handbook does not contain the standard subjects as prescribed in the ICAO Annex 8. In the "Yak-52 Flight handbook", information about the mass and centre of gravity locations and their calculation is lacking. Nor is the aircraft performance during climb and cruise flight described. In addition, this handbook only contains limited information regarding the required runway length for take-off and landing, which is an obligatory part of the chapter Performance. As far as the performance of aerobatics is concerned, a limited number of figures are described in the handbook, such as some looping forms and rolls. There is also a chapter on leaving the aircraft with the aid of a parachute included in the handbook. In contrast to the Russian "Yak-52 pilots operating manual"¹⁵ this handbook does not mention how to carry out a spin and the recovery from it.

Weight and centre of gravity

At the inspection before the issuing of the first certificate of airworthiness in 1990, the RA02080 was weighed and the centre of gravity location was determined. These data are mentioned in Russian in the aircraft logbook. The mass and centre of gravity locations permitted as well as the measured values are stated in a table. The table listing the data (translated from the Russian) looks as follows:

	<i>Design of the aircraft</i>	<i>Weight (kg)</i>		<i>Centre of gravity location (undercarriage out)</i>	
		<i>According to handbook</i>	Actually	<i>CAX according to handbook</i>	Actually
1	<i>Entirely empty aircraft centre of gravity location</i>	1035 +/-1%	1038.5	19.00 +/- 0,5	19.04
2	<i>MTOW and centre of gravity location for use of the aircraft with two airmen</i>	1315	1315	23 - 27	24.69

Table 1: Data with regard to the centre of gravity location Yak-52

¹⁴ ICAO: International Civil Aviation Organization. In chapter 1.4 *Legal context*, a further explanation is given with regard to the ICAO.

¹⁵ Yak-52 manual written by the military authorities.

The centre of gravity location is calculated in percent of the average aerodynamic cord (MAC, or, in Russian, CAX). The centre of gravity of the aircraft with the maximal start mass should according to the regulations lie between 23% and 27% of the MAC.

None of the books supplied with the aircraft mention how the weight and centre of gravity are to be calculated. One of the owners stated that during the delivery of the aircraft this was not mentioned. The supplier, however stated, that the buyers were directed to the internet site of the English Yak-52 club¹⁶ where a programme is available with which it is possible to calculate the mass and corresponding centre of gravity location. With the aid of this programme, the start weight of the aircraft must have been 1,284.5 kilos. The arm of the centre of gravity (with the undercarriage out) is, according to this table, at -20.2 cm of the point of reference (the main beam Fr5 in the wing). This corresponds to 24.8% of the MAC. This is within the limits as mentioned in the aircraft logbook. Using the calculation programme of an experienced Russian Yak-52 pilot, it has been calculated that the centre of gravity of the RA02080 (with a retracted undercarriage) was at 25.05% of the MAC. This value is also within the limits of the aircraft logbook. (See appendix B for both calculations).

It is standard that some equipment (weighing approximately 3 kg) is mounted in the aircraft behind the hindmost seating place, therefore behind the centre of gravity. Part of this equipment has been removed by the supplier, because it was not used and was not necessary for the flight execution¹⁷. An adaptation of the weight and the centre of gravity location in the aircraft documents did not take place. The supplier stated that the buyers were told that the aircraft had a slightly favourable centre of gravity position due to the removal of the equipment. The brother of the pilot stated that the before mentioned was not known to him.

The fuel consumption during the flight and retracting the undercarriage result in the centre of gravity moving somewhat to the rear of the aircraft.

It became known from information of the Russian authorities that the official technical description of each aircraft that was designed in Russia and may be used for aerobatics mentions that the joint mass of the occupants with parachutes may not exceed 180 kilos. The Yak-52 Flight handbook supplied with the aircraft does not mention this weight limit. The Dutch users stated they were not informed of this rule. The supplier of the aircraft has indicated that this subject had been discussed during the briefing given to the pilots with regard to the centre of gravity and the calculation thereof.

Upon inquiry with a number of Yak-52 pilots, it turned out that regular users of this aircraft do not calculate the weight and the centre of gravity. They assume that if the occupants of the aircraft, including the parachutes, each do not exceed the 90 kilos prescribed for aerobatics and the aircraft is not more heavily loaded than the maximal start weight, the aircraft will always operate within the operating limits. This is caused by the fact that the Yak-52 is a military training aircraft, in which context there are no variables in loading, except for the amount of fuel and the weight of the pilot(s).

Information from the English aviation authorities also showed that if a Yak-52 operates under Russian military rules and regulations, a weighing report and a calculation of the weight and centre of gravity location are not required.

According to the statements of their relatives, the weight of the pilot was approximately 75 kilos and that of the instructor 95 kilos.

Safety measures

It is standard that the Yak-52 is provided with two parachutes. These are of the type S-4U and weigh 10 kilos each. The parachutes also serve as sitting cushions for the pilots. In the paragraph of the Yak-52 Flight handbook about the use of the parachutes during a spin¹⁸, it is stated that the minimal altitude for a safe use of the parachute is 350-500 metres.

¹⁶ <http://www.yakuk.com/weight.xls>.

¹⁷ In view of the limited weight of the removed equipment the Board is of the opinion that this had no influence on the accident.

¹⁸ A spin is a flight movement whereby an aircraft moves with a low nose position (aircraft nose below the horizon), while the aircraft spins around its vertical axis. The aircraft makes a corkscrew movement, as it were. A considerable loss of height is caused by this within a short period of time.

The English company Skytrace that gives conversion and safety trainings with the Yak-52 has distributed a number of data and documents via the internet. In one of these documents, called 'Yak-52 emergency procedures', reasons are given for leaving the aircraft by parachute. Not recovering or not recovering in time from a spin or another sort of rotation is specifically indicated as one of these reasons. According to the instructor of Skytrace, the minimal altitude to leave the aircraft when there is no recovery from a spin is 1,000 metres.

In the past there had been problems with the seat belts of the Yak-52. The bolting of the brake handle mounted on the control stick could be caught behind the seat belt and the fastener of the belt could unintentionally snap loose if the aircraft was flown upside down. The RA02080 was provided with a new type of brake handle and a new type of fastener of the seat belts. In spite of this, the Dutch Forensic Institute (*Nederlands Forensisch Instituut, NFI*) has performed an investigation of traces in order to determine whether it has been possible that one of the control sticks could have been caught behind the straps of the seat belts. This investigation could not confirm the problem mentioned above. The fasteners of both belts were closed at the moment that the rescue workers arrived at the wreck.

1.1.4 The crew

The pilot

It had been the intention that the afore-mentioned pilot, his brother and a third person would become the regular pilots on this aircraft. After the purchase had been concluded, the aircraft was made ready for flight by the selling company. As a preparation for flying a Yak-52, the pilot concerned and his brother made a number of check flights with this type of aircraft in England. The flights were mainly made with another Yak-52, because small defects of their own aircraft had to be remedied. Each of them flew under the guidance of an experienced Yak pilot for approximately five hours in order to become familiar with the aircraft. According to the supplier of the aircraft the buyers were given twice as much time conversion training as he would normally give for such a familiarisation training.

Thereupon, the Russian authorities issued a Russian recognition on the basis of a recommendation of the English supplier and the licence they already possessed.

On 10 January 2001, the aircraft was flown to the Netherlands. One of the owners of the Yak-52 indicated that at first it had been considered to have the aircraft entered in the Dutch Aircraft Register. He stated that this intention was abandoned in connection with the many formalities and the long period of time this registration would demand.

The pilot concerned was an experienced pilot of passenger aircraft with approximately 5,000 flying hours, 300 hours of which with single-engine aircrafts. The brother of the deceased pilot stated that, in the four months prior to the accident, the pilot had flown approximately 20 hours on the Yak-52 of which 15 hours were spent on aerobatic training. The exact number of flying hours in single-engine aircraft up to the time of the accident is not known. The pilot's logbook¹⁹ could not be used and the aircraft's journal was only completed partially. When his Dutch pilot licence was renewed, he had informed the Dutch aviation authorities that between December 1999 and December 2000, he had flown with single-engine aircrafts for 12 hours²⁰.

In November 2000, during the familiarisation training in Great Britain the pilot flew a Yak-52 for the first time. A small part of these hours was spent performing aerobatics. According to his brother's statement, no flat spins had been practised then and there, but a flat spin had been demonstrated by a flight instructor of the supplier's to the pilot concerned during one of these training flights. Thereupon, the aircraft was flown to the Netherlands. From that time on, the pilot flying flew with the aircraft until the day of the accident for approximately 7:15 hours, 3:35 hours of which with three different instructors. Part of these instruction flights, though, was spent on aerobatics, but no flat spins were practised. The remaining hours were spent in flying by the pilot and his brother, whereby the normal flying procedures were practised. They sought a suitable instructor to train them in aerobatics. The supplier of the Yak-52 had advised the buyers to follow additional aerobatics training with the afore-mentioned Skytrace. This company has more than 20 years experience of safety and aerobatics training with the Yak-52. The owners considered this

¹⁹ The relatives of the pilot stated that this had been stolen during a car burglary shortly after the accident.

²⁰ 12 hours is the minimum number of hours required for the yearly extension of the single engine piston rating. If less than 12 hours are flown the rating can only be extended after a proficiently check with an authorized examiner is successfully completed.

advice but later decided on the basis of practical and logistical considerations to choose another instructor for their additional training.

The instructor

The instructor was an experienced pilot with a Czech pilot's licence. He was employed as a flying instructor at a flying school in the Czech Republic. There, he gave both ordinary flying lessons and lessons in aerobatics. In addition, he himself flew demonstrations and he participated in international aerobatics contests. He therein became world champion once in the second highest, 'advanced', class. The instructor was known to some pilots of Red Star Flying Circus (Red Star), as he had given aerobatic instruction to them at an earlier stage. He did this not as a flying instructor of the Czech flying school but in a private capacity. Because this instructor would again come to Teuge airfield in the week in question in order to instruct the other Red Star pilots on other types of aircrafts, it was decided to request him to give aerobatics lessons to the intended pilots of the Yak-52. As a result, the pilot and his brother would not have to travel to England. In view of the instructor's overall experience and capabilities the Red Star pilot who hired the Czech instructor to give Su-29 aerobatic instruction, assumed that he would be sufficiently qualified to also give Yak-52 training. The pilot's brother stated that he had asked the instructor if he had Yak-52 experience and also if the instructor was able to give him and his brother flat spin training²¹. According to the brother of the deceased pilot, the Czech instructor confirmed this.

The other pilots who had flown with this instructor have stated that they found him strict in his actions and indicated that he strictly kept to minimal altitudes. In addition, he was characterised as a very passionate man who was extensive in his briefings and extensively discussed the various recovery methods. That week, it was also discussed during the training on another type of aircraft when and in what way one should get out of the aircraft with the aid of the parachute. They thereby indicated that the instructor did not give spin training below 4,500 feet.

Although the instructor with more than 2,300 flying hours was an experienced pilot, there is no indication that he had any experience on the Yak-52. According to his employer, it is unlikely that he had flown with this type of aircraft in the Czech Republic, because this aircraft is not certified there. Whether he had flown a similar aircraft abroad is unknown. Should he have had any flying experience on the Yak-52, this must have been minimal, according to his employer. His relatives could not report anything on this either. The instructor's recent logbooks in which his flying experience is logged could not be recovered, in spite of requests to that end to his relatives. One logbook has been found of which only a copy of the last page has been faxed; the most recently entered flight was on 10 October 1998. The page from this logbook showed that the instructor had flown with aircraft of the makes and types Zlín 326, Zlín 142 and Extra 200 from September 21st 1998 up to and including October 10th 1998. The total number of flying hours of the instructor has been calculated on the basis of this page and the statement of the director of the flying school. In so far as it has become known, the instructor did not possess a Russian pilot's licence.

1.1.5 Preparation for the flight

The pilot met the instructor for the first time on the Wednesday prior to the accident. The following day, the day before the accident, they flew together in the Yak-52 for the first time. During about 1:20 hours, normal flying procedures, such as taking off and landing and flying curves, and some aerobatics, such as normal and inverted spins,²² were practised. Most spins were carried out from an altitude between 5,000 and 6,000 feet. After this flight, a debriefing took place, whereby the programme for the next day was discussed as well. According to the pilot's brother, who was also present, flat spins would be practised in any case. The instructor would then also demonstrate a flat spin. The (recovery) actions to be performed of the flat spin were thereby discussed in a general sense. The instructor would indicate in the aircraft which figures were to be practised and how to perform these, normal spins would be started at an altitude of 4,500 feet. The pilot's brother said that no specific altitude had been agreed upon for flat spins. Nor was a procedure discussed which was to be followed in case the instructor took over the controls or in case something went wrong. Taking over the controls would take place, as is usual in aviation, with the term "my controls/your controls" or forcefully moving the control stick. Getting out of the aircraft early using the parachute in case of an emergency was not discussed with the instructor either. The statement of the pilot's brother showed that he did discuss this with his brother, and that they had decided in principle not to abandon the aircraft in case of an emergency. They thought that

²¹ Comment on the draft report made on May 8th, 2004.

²² Inverted spin: A spin that is carried out with 'the aircraft flying upside down.'

they would have a better chance of survival if they continued to steer the aircraft than when they jump out of it with parachutes. The communication between the pilot and the instructor took place in English.

The day of the accident, no extensive flight preparation took place prior to the flight as this had already been done the evening before. No weight and centre of gravity calculations were made. According to the brother of the deceased pilot this was not necessary. He stated that based on the information they had received when they bought the aircraft they knew that they would remain within the aircraft's flight envelope. The aircraft had been refuelled with 19 litres of aviation fuel up to the maximal tank content of 120 litres on the day before, and it had not been flown afterwards. After the daily inspection, they took off with the aircraft at about 10.07 hours.

1.1.6 Radar data

The investigation has shown that the transponder of the aircraft had not been switched on during the flight. Therefore only limited radar data are available. At the military air traffic control Dutch Mil, a radar plot has been made of radar echoes which very likely come from the wrecked aircraft. These echoes, however, do not have a unique code, nor is an altitude read-out visible. It can be seen on the radar plot that an aircraft flew from the direction of Teuge airfield to the north-east at 1:09:03 hours. Between 10:11:37 and 10:22:03 hours, the aircraft continued to fly more or less at the location north-east of Teuge, after which no further radar echoes were received. It cannot be traced from the radar plots which flying movements this aircraft made. The Red Star pilots stated that the transponder was intentionally not switched on. The consideration for this was that as a result of the altitude they did not wish to cause trouble for civil passenger aircrafts flying in the vicinity. For the transponder can give rise to the warning in a civil passenger aircraft that there is a risk of collision.²³ Information from other radar stations was of no use. The portable GPS on board of the aircraft turned out to contain no flight data after examination.

1.1.7 Pathological data

Post-mortems were carried out on the bodies of the two occupants. No physical abnormalities or toxicological factors were found that might have affected the ability to perform flights. The nature of the injuries of both occupants is consistent with a large vertical deceleration and a smaller horizontal deceleration, whereby the aircraft had a slight 'nose down' position and a, possibly slight, rotation to the right at the moment of the impact with the ground.

On the basis of the injuries, it could be determined that the instructor was probably steering the aircraft at the time of the impact with the ground, whereby he probably held the control stick with both hands and gave foot steering with his right foot. It was impossible to survive the impact with the ground.

1.1.8 Investigation of the wreck

It could be deduced from the damage to the floor and the pedals of the aircraft that the instructor was steering the aircraft at the moment of the impact.

The engine and its suspension were bent downwards. The front part of the body also bent downwards at the level of the front edge of the wing. The wings were slightly damaged. The fuselage behind the cockpit was torn, and the main rudder had been lifted from both upper pivots. The back of the fuselage was slightly bent to the left as seen in flight direction. Impacts were visible under the engine and under the wheels of the under carriage. The wreck was complete; except for some small parts, no parts were found in the vicinity of the aircraft. After its recovery, the aircraft was subjected to a technical examination.

Control

Due to distortions of the aircraft and the control sticks, it was very difficult to assess the adjustment of the rudders. Investigation showed that these distortions had occurred as a result of the impact with the ground.

The rudders themselves were obstacle-free and, with the exception of a rudder control cable, all rudder connections were still intact. The left cable of the main rudder in the front cockpit was broken, but laboratory and wreck studies showed that this fracture had occurred as a result of the impact with a shift of the aircraft floor during impact.

²³ Here the so-called Airborne Collision Avoidance System (ACAS) is meant. Transponders of aircrafts communicate with each other, whereby a warning and possibly an advice to alter course are given, if the aircrafts come too close to each other.

Engine

Investigation of the engine showed that the engine was in a good condition and had worked properly. This investigation demonstrated that the last part of the flight had probably been performed with little power and a small blade pitch angle of the propeller (fine pitch). Due to the distortion of the aircraft, most of the cables of the engine control organs had become jammed. After the cables had been freed, the various engine components could be freely moved.

Intercom

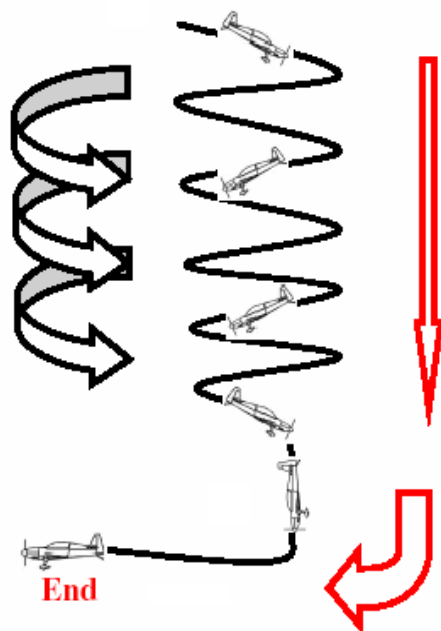
The intercom system was checked for its proper operation. There were some broken wires in the system, but these had been caused by the accident. After these had been repaired, it turned out that the intercom system of the aircraft was operational. The pilot's headset could not be checked entirely; the hearing part did work, but the speaking part has not been found and could therefore not be tested. The speaking part of the instructor's headset was still intact. There was a short circuit in the wire to the hearing part as a result of the impact.

1.1.9 Amount of fuel

At the departure there were approximately 120 litres of fuel in the tank. According to the Yak-52 Flight handbook the consumption amounted to 70% power, whereby 240 horsepower were delivered, 265-300 grams of fuel per horsepower per hour. This is a consumption per hour of approximately 63-72 kilos fuel, which corresponds to approximately 88-100 litres. The aircraft had been flown for approximately 18 minutes.

1.1.10 The flat spin

The flat spin is not an official aerobatic figure included in the Aresti Aerobatic Catalogue of the FAI. This figure is only flown in the unlimited competition, the highest class of aerobatics. Statements of the Red Star pilots have shown that they wanted to practice this figure and the recovery from such a spin, because it might occur that one could unintentionally be confronted with this situation during the performance of aerobatics.



Picture 3: Flat spin

A flat spin is a figure in which the aircraft plunges in a horizontal position (almost without any angle of roll), in any case with a low nose position of less than 45° with respect to the horizon, spinning around its yaw axis, whereby a spiral figure is made. The flat spin is usually initiated starting from a normal spin. During a normal spin the engine power is taken back to the minimum and the nose position is brought upwards with the aid of the elevator.

As a result, the speed is decreased and the pitch angle of the wings is increased to such an extent that both wings become stalled. Subsequently, a yaw motion is initiated around the yaw axis with the aid of the main rudder. The result is that the aircraft rolls away over the side of the direction in which the yaw motion has been started. In order to come from this situation into a flat spin, the

rolling motion of the aircraft is lifted by moving the ailerons against the spin direction. A side effect of this is that the spinning speed of the aircraft around its yaw axis will increase. The spinning speed can be increased further by moving the elevator downwards. Due to the centrifugal forces occurring as a result of the faster spinning, the nose of the aircraft will come up. At the same time, the engine power is increased, after which the nose of the aircraft will come up further due to the gyroscopic effect of the propeller. To what extent the nose will come up depends on, among other things, the engine power and the design and characteristics of the aircraft. For instance, in the case of a long aircraft, whereby the engine is situated relatively far from the centre of gravity, as in the case of the Yak-52, the nose will come up further than in the case of a short aircraft. The height of the aircraft will decrease with this with approximately 50 to 60 metres per rotation. The rotation speed, on the other hand, will further increase to approximately 2 to 1 seconds per full 360° rotation.

With regard to the engine couple, the spin can best be initiated against the rotation direction of the propeller. The propeller of a Yak-52 rotates to the left, so the pilot flying the aircraft will preferably make the spin to the right. It is also known about the Yak-52 that the aircraft can easily end up in a flat spin as a result of an incorrectly performed stall-turn²⁴.

Recovering well from a flat spin requires a good knowledge of the flying characteristics of the aircraft in question. There are various possibilities to recover aircraft from a flat spin. With the majority of aircraft types, the conventional recovery is used. The power is thereby decreased, the foot control is kicked down against the rotation direction, the aileron is moved in the direction of the lower wing, and the nose of the aircraft is moved downwards. Statements of experienced Yak pilots and literature show that the Yak-52 can recover from a flat spin in this conventional way. There are also experienced Yak-52 pilots who do not endorse this but recommend other actions to recover from a flat spin. Due to its mass, its weight distribution and the rotation energy, the Yak-52 will need considerably more time to recover than most aircraft. The supplier of the Yak-52 published a publication on the internet site about the particular recovery techniques in case of a flat spin on 13 March 2001, shortly after the accident (see Appendix C).

The technique that can be used in emergency situations, the so-called Beggs/Müller Technique, is not effective in the Yak-52. In this technique, the engine power is decreased to stationary, after which one lets go of the control stick and the foot control. The aircraft will then seek a balance as a result of the blowing of the wind stream along the steering and stabilisation plane, after which the aircraft will return to a normal spin which can be simply remedied.

Literature and post accident discussions with experienced Yak-52 pilots show that the following difficulties occur when recovering from a flat spin:

- due to the high rotation speed of the Yak-52 in a flat spin, whereby a large part of the total mass is situated both far before and far behind the centre of gravity, the aircraft has much rotation energy. That is why it takes considerable time before the rotational movement stops. It can take up to four rotations before the aircraft noticeably reacts on the control movements, whereby a considerable amount of height is meanwhile lost;
- when the aircraft responds to the control movements, precise actions are required to stop the rotating and to get the aircraft in a stable position. When these actions are not carried out properly, there is a chance that the aircraft will turn 180° upside down with a so-called flick-roll;
- the powers that have to be exerted on the control stick and the foot control are so extensive that it seems as if they are blocked. A power of 40 kilos on the control stick and a power of 100 kilos on the foot control are mentioned;
- the recovery is negatively influenced and will take longer if a light person sits in the front of the aircraft and a heavier person sits in the back of the aircraft.

In view of the above, it is therefore advised in the literature and by experienced instructors on the Yak-52 only to practise a flat spin with an experienced flying instructor who is very familiar with the flying characteristics of the Yak-52 and to start the flat spin at an altitude of 6,000 feet and to initiate the recovery at 5,000 feet. According to the pilot's brother, the information about the flat spin and the particular recovery techniques for the Yak-52 were not known to them on the day of

²⁴ A stall-turn is an aerobatic figure, whereby the aircraft flies vertically upwards and, shortly before the speed is zero, a 180° rotation is made around its yaw axis, after which the aircraft flies downwards again vertically.

the accident. There are no clear indications that indicate at which altitude the spin started and whether or not it was initiated intentionally.

1.2 THE ACCIDENT WITH THE SU-29

1.2.1 General data

Place : Naval air field De Kooy
Day and hour : 7 June 2002, 15:58 hours
Aircraft : RA01276, Sukhoi Su-29, entirely destroyed
Owner : Aero-Materials Association Holland B.V.
Crew : one, wounded
Passengers : none
Sort of flight : demonstration flight
Stage of the flight : aerobatics
Type of accident : loss of control over the aircraft
Pilot flying : a 48-year old man, with a military pilot certificate for large aircraft and a civilian pilot certificate CPL(A) with the licences RT and FI(A). Total number of flying hours 7,700, of which approximately 6,650 flying hours in military aircraft.

Weather conditions received from the Royal Dutch Meteorological Institute:

General situation : a frontal zone above the northern part of the Netherlands slowly moved northward and passed 'De Kooy' at 16:00 hours. South of this front, the current was south-western and there was a lot of mist. From time to time, the clouds produced a light rain.

Weather conditions in the vicinity of De Kooy:

Wind	:	500 feet	260 degrees	10-15 knots	+18° Celsius
		3,000 feet	260 degrees	15 knots	+11° Celsius
		5,000 feet	250 degrees	15 knots	+08° Celsius

Natural conditions : daylight
Sight : 10 kilometres or more
Clouds : FEW, ST, basis 008 (few stratus clouds with a basis at 800 feet)
0° Celsius level : FL095
Turbulence : none
Thermals : moderate
QNH : 1,004 hPa

1.2.2 The flight and the accident

During an open day of the Navel Airfield De Kooy on 7 June 2002 on the occasion of the 85th anniversary of the Naval Air Force, an aviation show had been organised. This aviation show consisted of, among other things, a number of demonstration flights which were to be performed by various types of aircraft. One of these aircraft was a Sukhoi Su-20 of Red Star Flying Circus.

The demonstration flight with a duration of six minutes of the Su-29 had originally been planned at about 13:50 hours. The demonstration flight of the Su-29 encompassed a number of aerobatics figures, which would be carried out while flying horizontally, and some figures which were to be carried out in the vertical plane, whereby a maximal altitude of 1,500 feet would be reached. In order to remain free from the clouds during the demonstration, the pilot flying the Su-29 needed a cloud basis of at least 1,500 feet. In view of the sight and the cloud basis at the time of the briefing prior to the aviation show (11:30 hours), the pilot of the Su-29 requested the managers of the aviation show to move his demonstration to a later moment. The weather forecast indicated that the cloud basis would reach this altitude in the course of the afternoon. The management of the aviation show complied with the request, and the Su-29 was assigned a new starting time of 15:55 hours and the name 'Display 8'.

Shortly before the flight, the airman visually inspected the aircraft; he thereby paid additional attention to the amount of fuel in the wing tanks. This is in particular important for the weight and the location of the centre of gravity of the aircraft. Before the start of the flight, the pilot set both

altimeters at -30 feet. The pilot stated that this had become a habit of his, because it gives him a 30-foot margin above his minimum altitude. When the altimeter indicated 200 feet, this was actually 230 feet with such an adjustment.

Subsequently, he started the engine at about 15:40 hours. This type of aircraft has a nine cylinder star engine that has to be properly warmed up before it can be operated with full power. When the engine had been warmed up, the airman checked the ignition magneto and the governor²⁵. At 15:55 hours, the pilot flying the SU-29 was granted permission to taxi to runway no. 22 and subsequently to start his demonstration flight. The first part of the demonstration passed without problems. The sixth manoeuvre of the flight was a looping, a vertical aerobatics figure. It is possible that this has not been fully carried out, so that the aircraft started the following aerobatics figure, a so-called tumble,²⁶ with insufficient speed. It is also possible that during the performance of this fifth aerobatics figure the aircraft lost too much energy (altitude and speed). The consequence was that the altitude remaining after the performance of the tumble was insufficient for the aircraft to accelerate to a speed with which the aircraft would be able to fly horizontally again or to climb. While the pilot tried to regain control over the aircraft, the aircraft missed an ILS antenna at short distance, subsequently hit the ground and broke into pieces. Thereby the fuel and oil that had escaped caught fire. The fire service that was almost immediately present on the scene quickly had the fire under control. The pilot was rescued from the wreck with relatively light injuries by the firemen



Picture 4: The wreck of the Su-29 after impact

The aircraft touched the ground at the level of the display line laid down for the aviation show. This is a marked line on the show area which often runs parallel to one of the runways and which is used by the demonstration pilots as orientation line. By flying along this line, they prevent flying above the audience during demonstrations, and that in case of an accident, the aircrafts stay away from the audience (see picture 6).

1.2.3 The aircraft

General

The Sukhoi Su-29 is an aircraft manufactured in Russia sitting two persons in tandem (behind each other). The aircraft has been especially designed with the aim of carrying out (instruction) aerobatics. This aircraft is considered unique in its class as far as performance and manoeuvrability are concerned. The front part of the fuselage is built of stainless steel, whereas the rear part of the

²⁵ A part of the mechanism, with which the blade pitch angle of the propeller is regulated.

²⁶ A horizontal aerobatics figure, whereby the gyroscopic effects of the engine and the propeller are used. The aircraft somersaults as it where with its tail over its engine (flip).

fuselage, the tail and the wings are made of composite materials. Up to now, approximately 65 aircraft of this type have been built, most of which have been sold in the United States and Europe.



Picture 5: The Sukhoi Su-29, RA01276

Length	:	7.285 meters
Height	:	2.855 meters
Wingspan	:	8.20 meters
Engine	:	M14P, 9 cylinder star engine, four-stroke, petrol, air-cooled
Power	:	360 horsepower
Fuel	:	100 LL (AVGAS)
Empty weight	:	782 kg
Maximal weight aerobatics	:	945 kg
Maximal starting weight	:	1,220 kg
Purchase price (new)	:	approximately € 250,000

History

The RA1276 was built in 1999 and registered in the Russian aircraft register as from 26 June 1999. On 22 April 2000, the aircraft was flown to the Netherlands. As from this date, the aircraft has been flown for a total of 69 hours and 20 minutes and it had once undergone a 50-hours inspection at Star Airservice, a maintenance company at Teuge airfield.

Aircraft documents

A Russian certificate of registration and Russian certificate of airworthiness had been issued for the RA01276.

The supplier had supplied a complete set of handbooks with the aircraft, which was drawn up in English.

Weight and centre of gravity position

During the fatal flight, the weight and the centre of gravity were within the limits set.

1.2.4 The crew

The pilot flying the Sukhoi Su-29 was employed as a military pilot at the moment of the accident and flew for the Royal Dutch Air force in an F-16. He also gave lessons in stunt flights for the Air Force, in the past in a Beech Bonanza and later on in the Pilatus PC-7. He has experience in more than 20 different aircraft types in civilian aviation. From March 2001 he (the pilot involved in the Su-29 accident) flew the Sukhoi Su-29. At the day of the accident he had accumulated approximately 20 flying hours on this type of aircraft. His initial training on the Su-29 had been carried out with the help of one of the pilots from Red Star. The latter had received his initial training from the supplier of the aircraft in Great-Britain, Richard Goode Aerobatics.

Various Red Star pilots have stated the following about the aerobatics training. Aerobatics training was given within the Red Star Flying Circus. Before that, the pilots who would fly the Sukhoi

demonstrations had started by discussing experiences with a Czech instructor.²⁷ Here the behaviour of the aircraft during landings was discussed, the torque of the engine and the effect of this on the aircraft. They also discussed their own experiences with regard to carrying out aerobatics, demonstration flights in general and the aerobatic figures to be flown with the Su-29 on the basis of the flight handbook. They discussed theory until they knew all aerobatic figures to be flown by heart and were well-informed of what the consequences might be if steering errors were unexpectedly made. Subsequently, they started to fly the Su-29. They started with simple manoeuvres, first separately and later in combination with other figures. Then they organised a trainings week in France, where the group of Sukhoi pilots developed and practised the final demonstration flight.

On 26 May 2002, the pilot also took part in an aviation show with the Su-29 at Volkel air base. The pilot flew the same demonstration here (figures and order) as the demonstration on 7 June 2002. Statements show that during this demonstration the Su-29 was pushed above the audience area by the current wind. This was the reason why the display director,²⁸ who had already given two warnings to the pilot flying the Su-29 during the demonstration flight for becoming too far removed from the display line and not complying with the minimum altitude of 200 feet, stopped the demonstration with the Su-29.

The pilot stated that a colleague pilot had also been affected by the strong cross wind during a demonstration with an F-16 fighter of the Dutch Royal Air Force which had been flown that same day. The pilot stated that on 6 June 2002 he had flown the demonstration with the Su-29 entirely without problems during the rehearsal for the aviation show on naval air base De Kooy.

1.2.5 Investigation of the wreck

A technical investigation of the wreck was performed by a ground staff engineer of the aviation police. In this context the control organs of the Su-29 were studied, among other things. This investigation showed that the control cables of the main rudder were intact and functioned properly. The control bars of both ailerons had snapped. On 5 August 2002, the wreck of the Sukhoi was released and delivered to Red Star by the aviation police in consultation with the Board. On 19 October 2002, about four months after the accident, the pilot indicated that he was acquainted with an incident in which a faulty sparking plug had resulted in a considerable loss of power. Further investigation of this scenario turned out to be no longer possible as this material had already been destroyed.

1.2.6 Fire

During the crash of the Su-29, the fuel and oil that had been released immediately caught fire. The Naval Fire Brigade of De Kooy air base was at the scene within 20 seconds and indicated that they had 90% of the fire in hand within the first minute. The plastic parts of the aircraft had not yet caught fire at that moment. Six minutes after the accident the fire service was able to hand over the pilot to the medical team that had meanwhile arrived.

1.2.7 Survival factors

During the demonstration, the pilot sat in the rear part of the cockpit. During the crash, the aircraft hit a concrete footpath. A large part of the forces exerted on the aircraft was caught by the right wing, the engine and the steel construction between the pilot and the engine. The foremost part of the cockpit was thereby entirely destroyed. The fact that the accident took place while the aircraft was flying with a tail wind ensured that during the fire that occurred immediately after the crash the flames were blown away from the pilot.

1.2.8 Open day at naval airfield De Kooy

Naval airfield De Kooy is situated near Den Helder and is the home base of the group of helicopters of the Dutch Royal Navy.

The airfield is also used for civilian purposes, the most important of which are the repairs of helicopters for the off-shore oil and gas extraction industry. The airfield has one runway 04/22 of 1,275 meters in length and a width of 30 meters.

²⁷ The same Czech instructor who died during the accident with the Yak-52 shortly after the start of this Sukhoi training.

²⁸ Display director is the person responsible for the display aspects of the show.

FLA. After acceptance the FLA will issue a Russian licence that is validated on the basis of another current licence already in possession of the pilot concerned.

On March 13th 2001, shortly after the Yak-52 accident, the supplier issued a publication via the Internet regarding the distinct flat spin recovery techniques of the Yak-52, see appendix C.

Information from the Application and Certification division of the British Civil Aviation Authorities (CAA) learnt that companies which maintain and sell British registered aircraft require CAA certification. Such certification is needed for (the conduct of) maintenance activities and (assignment of) competences for the staff involved. Once a year certified companies are inspected by the CAA.²⁹

Richard Goode Aerobatics was not CAA certified. Certification was not required because the company was not involved in activities related to British registered aircraft.

1.3.2 Red Star Flying Circus

Both the Yak-52 and the Su-29 were used by Red Star Flying Circus. However, the Yak-52 had not yet been put into action in the activities of Red Star, because the aircraft was used for the training of the pilot and his brother. When this aircraft was to be used, it would in principle be flown by the pilot, his brother and a third airman, the latter from Red Star. The Su-29 would be flown by other pilots.

The activities of Red Star consisted, among other things, of performing aerobatics, giving flying lessons, round trips and flying demonstrations. To that end, Red Star had at its disposal, apart from the Su-29 and the Yak-52 bought in November 2000, an Aviat S-2b registered in the Netherlands. According to the certificates of registration of the Su-29 (RA01276) and the Yak-52 (RA02080), both aircraft were in the name of the Federation of Aviation Amateurs (FLA) with registered office in Moscow.

Information of the Chamber of Commerce revealed that the name Red Star is one of the trading names of the company Aero -Materials Association Holland B.V. at Schagen (name of Dutch town). The trading names of this B.V. are Aeromatas Holland and Red Star Flying Circus. This B.V. is a company for aircraft rental, commercial banner-towing assignments, aerobatic flights, aerobatic training, sightseeing flights and demonstrations. The general manager and only stockholder of Aero -Materials Association Holland B.V. is S.N.Z. Holding B.V. The general manager and only stockholder of this holding is a 'natural person', who was not part of the group of Red Star pilots. The purchase of the Yak-52 has been financed in equal shares by the general manager, the pilot and his brother and the company Aero -Materials Association Holland B.V. The purchase of the Su-29 has been financed by Aero -Materials Association Holland B.V. The role of this B.V. within Red Star was especially limited to (co)financer of the aircraft.

Dutch regulation distinguishes between the owner, holder and user of an aircraft. It has not been investigated what the Russian regulation is with regard to the responsibilities of the aircraft's owner. The maintenance of the Sukhoi was performed by the maintenance facility Star Air service on Teuge Airfield (in The Netherlands). The same facility would maintain the Yak-52.

For flight execution the checklists, delivered with the aircraft, the English 'Flight Manual', the Flight handbook and other general literature regarding aerobatics were used. It must be noted here that the Flight handbook of the Su-29 contained detailed descriptions of a large number of aerobatic manoeuvres.

Statements of the pilots concerned showed that there was hardly any or no experience within Red Star with carrying out aerobatics at "competition level." Some pilots of Red Star stated that they looked and assessed on the ground when one of the other pilots was flying a demonstration. This was not the case for the pilots of the Yak-52 who had not yet flown a demonstration and were still being trained. The investigation has shown that Red Star had no training workbooks in which programmes and procedures with regard to flight operations in general and aerobatics in particular

²⁹ The owner of a Dutch registered aircraft is responsible that an approved maintenance programme of the aircraft is made, maintained and executed. The holder is responsible for the airworthiness of the aircraft. The user is responsible for adherence to the manufacturer's guidelines and limitations of the aircraft, as laid down in the by the appropriate authority approved flight manual.

had been laid down. Nor had the (minimal) requirements of experience of pilots, among other things, been laid down.

After the accident with the Yak-52, no improvements have been undertaken within Red Star. Nor did the fact that the Su-29 had been removed from the show by the display director at Volkel on 26 May 2002 result in any concrete measures. After the accident with the Su-29, the activities of Red Star were terminated, as far as it could be ascertained.

1.3.3 *Star Airservice*

Before delivery of the Yak-52 to Red Star, the supplier of the aircraft had taken care of its maintenance. The supplier stated that these maintenance activities were conducted under official recognition of the FLA. After delivery of the aircraft no scheduled maintenance actions have been performed, since on the day of the accident the applicable flying hours limit had not yet been reached. The owners of the Yak-52 had agreed that Aero -Materials Association Holland B.V. would take care of maintenance, aircraft storage, documentation and licensing. Star Airservice, based at the airport of Teuge, performed minor (maintenance and servicing) activities. Although Star Airservice had not yet acquired experience in Yak-52 maintenance, the company had the disposal of a maintenance manual in the English language and type specific tools. Future maintenance activities (by Star Airservice) were to be performed in close consultation with the English company that delivered the aircraft. Because no staff member with a Russian licence for Yak-52 maintenance was available (in The Netherlands), technical activities were to be conducted under responsibility of the English company that employed a licensed staff member. It was agreed that this licensed technician would give instructions and would answer questions with regard to maintenance (of the Yak-52). For inspections and signing of the required documents, the technician would travel to the (Dutch) maintenance company or the aircraft would be flown to the maintenance facility in England.

On July 20th 2001 Star Airservice on Teuge airfield performed a 50 hours inspection on the Su-29. This inspection was carried out by one of the technicians who had obtained a Russian licence especially for the Su-29 at Richard Goode Aerobatics.

1.4 LEGAL CONTEXT

This chapter describes the legal context. The realisation of the (international) legislation and its implementation in current legislation are extensively discussed. This is the basis of the (quality) system used in aviation with regard to certification, certificate of registration, issuing a certificate of airworthiness and a pilot's licence.

1.4.1 *General*

Various rule-making organisations determine the operational and technical rules with which international civil aviation has to comply. The largest and internationally most important is the International Civil Aviation Organisation (ICAO), established in 1945, which currently has 189 Member States. The aim of this organisation is to promote the planning and development of principles and techniques in the field of international aviation in order to:

- Ensure that international civil aviation all over the world develops in a safe and orderly way.
- Stimulate the design of aircraft for peaceful purposes.
- Stimulate the development of airways, airports and aviation facilities.
- Meet the need of the peoples of the world for safe, regular, practical and economical air transport.
- Prevent economic wasting as a result of unreasonable competition.
- Ensure that the rights of the Member States are fully respected and that each Member State gets a fair chance to operate international air services.
- Prevent discrimination between Member States.
- Stimulate safe flight performances.
- To stimulate in general the development of all aspects of international civil aviation.

In order to attain the above aims, the Member States have developed Annexes containing those rules that are considered as standards or recommended procedures. When a Member State deviates from the standard, it is held to inform the ICAO thereof by way of a Notification of Differences. In this context, Annex 1: Personal Licensing, and Annex 8: Airworthiness of Aircraft, are in particular relevant. The procedures and legislation described herein are the basis of the legislation and rules of the Member States. In so far as we could ascertain, the Russian legislation

with regard to pilots' licences and requirements of airworthiness are in accordance with the ICAO Annexes mentioned above.

So as to tackle specific problems and circumstances in the European region, the European Civil Aviation Conference (ECAC) was established within the ICAO in 1955. The most important purpose of this organisation is to implement in a uniform manner the ICAO agreements within the region (both in Western Europe and Eastern Europe).

In 1970, a number of European countries met in order to arrive at agreements intended to facilitate the assessment of the airworthiness of jointly built aircraft as well as their import and export in Europe. As a result thereof, a number of requirements of airworthiness, then still called Joint Airworthiness Requirements (JAR), were formulated and accepted as a directive. This JAR system did not have formal status as yet, however, at the same time the need was felt to develop joint European requirements in the field of flight operations apart from requirements with regard to airworthiness and maintenance. This resulted in the decision to convert the old JAR system into the more extensive system of Joint Aviation Requirements in 1990. The old abbreviation was adopted for this new system.

At the same time, the Joint Aviation Authorities (JAA) was established, on which the Directors General of the cooperating countries have seats. The technical rules drawn up within the JAA context only acquire legal force once they are incorporated into the national legislations of the Member States. As a first step towards full integration in the ECAC, the JAA has been recognised as an associated organisation. It has been agreed that the activities of the JAA will not violate other obligations entered into, such as those within the ICAO.

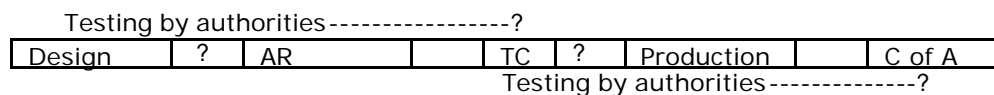
Resolutions, recommendations and other decisions of the ICAO, ECAC and JAA, in so far as accepted by the Member States, are the basis of national legislation and regulation. JAA standards are in accordance with the ICAO standards but are much more stringent. In September 2003, the successor of the JAA, the European Aviation Safety Agency started its activities. The Dutch legislation and regulation of aviation is determined to a considerable extent by the afore-mentioned rule-making organisations. In this report, reference is made to the JAA regulations as these were applicable at the time of the accidents.

1.4.2 Certification, Certificate of Registration and Certificate of Airworthiness

The Regulation Type Certification Airworthiness, Regulation Standard Certificate of Airworthiness, Airworthiness Order, in Chapter 3 of the Dutch Aviation Act states that the requirements and actions mentioned below have to be met for the certification and registration of an aircraft.

General

The development of an aircraft starts with a design. He who is responsible for this design should ensure that the design meets the Airworthiness Requirements³⁰ (AR) of the country where the aircraft will be built and/or registered. The authorities of this country will test the design against the AR and when the design suffices, the authorities will issue a Type Certificate (TC). Subsequently a recognised company can proceed to build the aircraft in question (in the case of the JAA, this is a JAR-21³¹ certified organisation). After one aircraft has been produced, this is tested against and compared with the TC. It is considered whether the product and the design are in accordance. When all this is in order, a Certificate of Airworthiness is issued. This applies to all new types of aircraft.



Picture 7: Schematic illustration of acquiring a Certificate of Airworthiness (C of A)

Certificate of Airworthiness and Certificate of Registration

It applies in general that a Certificate of Airworthiness is only issued after the registration of the aircraft in the civilian aviation register. The requirements for issuing a Certificate of Airworthiness

³⁰ The AR also determines which documents and handbooks belong to the aircraft and have to be present. These documents and handbooks must contain a maintenance programme in order to keep the aircraft in an airworthy condition.

³¹ Joint Aviation Requirements 21 contains the certification procedures for aircraft and aircraft components.

are laid down in Article 16 of the Dutch Airworthiness Order. The (relevant) content of this Article reads in summary:

*Our Minister shall issue (...) a **standard Certificate of Airworthiness** if the aircraft is able to operate flights in a safe way, and:*

a: (...)

b: the aircraft complies with the type certificate issued by Our Minister on the basis of a certification procedure performed by the JAA (...)

c: the aircraft has been produced in and originates from a country with which Our Minister has concluded an agreement (...) and the aircraft meets a type certificate issued by Our Minister or an approved type design (...)

d: the aircraft originates from a country with which Our Minister has not concluded an agreement (...) and if the aircraft meets a type design approved by Our Minister.

If the owner of an aircraft that is registered in another Member State of JAA or in a country that is no such Member State with which a bilateral treaty has been concluded wishes to enter the aircraft in the Dutch Aircraft Register, a number of documents have to be submitted and the requirements with regard to airworthiness as defined in JAR-23³² have to be complied with. In case of registration, the following documents have to be submitted in English or Dutch:

- a proof of ownership;
- a so-called export certificate of airworthiness;
- certification documents, one of which is the flying handbook;
- a proof of deregistration in the aircraft register in which the aircraft had been registered.

Aircraft originating from the United States (USA) are examples of (c). The Netherlands has concluded such a bilateral treaty with the USA.

In the cases of the Russian aircraft in question, a Dutch Certificate of Airworthiness can only be issued when the Minister of Transport, Public Works and Water Management has also issued a Dutch TC. Because these are already existing aircraft, a request for a Dutch TC has to be submitted by the person who has designed the aircraft.³³ In these cases, the TC will have to first comply with the Russian airworthiness requirements and then the JAR 23 (European airworthiness requirements). In order to acquire a Dutch Certificate of Airworthiness, the afore-mentioned rules are in force, whereby it is important that the designing and/or producing country has a bilateral treaty with the country in which the aircraft has to be registered. Russia is not a member of the JAA, and upon inquiry at the Inspection Transport, Public Works and Water Management, Aviation Division ('IVW-DL'), it turned out that Russia has not concluded a bilateral treaty with the Netherlands either (Article 16, sub c, Airworthiness Order). Nor is there a type design approved by the Minister of Transport, Public Works and Water Management (Article 16, sub d, Airworthiness Order). As a consequence, the Minister of Transport, Public Works and Water Management was unable to issue TCs for the Russian aircraft.

1.4.3 Maintenance

By using the system that aircraft maintenance companies need to be approved by the aviation authorities in question, before they are allowed to maintain a specific type of aircraft or employ personnel with the qualification of maintenance engineer of the country in which the aircraft is registered, this aspect of the airworthiness of aircraft is guaranteed as much as possible. In general, the supervision on aircraft maintenance is borne by the country of registration. Countries that are members of the JAA issue approvals to companies that meet the requirements of the JAA.³⁴ This approval is acknowledged by the other Member States of the JAA, with which types of aircraft registered in one Member State of the JAA may be maintained by an approved company in another Member State of the JAA.

A Certificate of Airworthiness for Dutch aircraft is valid for one year and is annually extended by the authorities after a positive assessment of the technical state of the aircraft and after it has been demonstrated that the aircraft maintenance has been performed according to the rules in

³² Joint Aviation Requirements 23 defines the European airworthiness requirements to be complied with by aircraft used in private and commercial aviation that come within the categories 'normal', 'utility', 'aerobatic' and 'commuter'.

³³ The design agency (the owner of the design) has to prove that the design complies with the airworthiness requirements. In this case the Dutch airworthiness requirements.

³⁴ JAA approved maintenance organisation.

force. The holder of the aircraft has to (timely) apply with a maintenance company approved for this type of aircraft for the (renewed) issuing of the Certificate of Airworthiness. Other countries use the system that a Certificate of Airworthiness is issued only once. In this case too, the aircraft has to be maintained according to the rules of the manufacturer. The holder of the aircraft has (timely) apply the aircraft with a maintenance company approved for this type of aircraft for the extension of the Certificate of Airworthiness. In the case of (renewed) issuing or extension of the Certificate of Airworthiness, the maintenance carried out, the general state of the aircraft and the corresponding documents and handbooks are checked, among other things.

Maintaining airworthiness implies that users keep to the instructions with regard to limitations of use, to maintenance and modification that are (imperatively) prescribed by the manufacturer or the government. These are made known in civil aviation by way of the so-called Service Bulletins coming from the manufacturer and 'Bijzondere Luchtwaardigheids-aanwijzingen' ('BLA's') or Airworthiness Directives (ADs) both originating from the (Dutch) government.

In Russia Service Bulletins are issued by the design agencies of both the Yak-52 and the Su-29. Because the Russian aviation legislation and regulation do not (yet) provide that aircraft might be owned by private persons, these bulletins are only issued to the government. At the time of the accidents there was no system that ensured the further distribution of this information to private owners in Russia or abroad.

1.4.4 Pilot's licence ('Bewijs van Bevoegdheid')

In order to be allowed to operate an aircraft, the pilot has to hold a pilot's licence (PL).

In international legislation the following has been laid down:

ICAO Annex 1 – personal licensing

1.2.1 Authority to act as a flight crew member

A person shall not act as a flight crew member of an aircraft unless a valid license is held showing compliance with the specifications of this Annex and appropriate to the duties to be performed by that person. The license shall have been issued by the State of Registry of that aircraft or by any other Contracting State and rendered valid by the State of Registry of that aircraft.

Dutch legislation and regulations with regard to pilots' licences can be found in the Dutch Aviation Act. Here the requirements are incorporated with regard to the authority to fly an aircraft.

Aviation Act, Chapter 2:

2.1. Pilots' licences

Art. 2.1

1. *It is prohibited to operate an aircraft without holding the pilot's licence applicable or a valid certificate of recognition applicable thereto.*

This Act does not link the registration of the aircraft to the 'nationality' of the licence and provides the possibility to fly aircraft registered abroad within Dutch airspace. In such cases, however, the pilot has to comply with the requirements of the country in which the aircraft is registered. With the applicability of the licence it is meant in the Act that the holder of the licence is authorised to fly the type and category of aircraft and that he or she has the necessary medical certificate.

Russia has made known no deviating legislation with regard to Annex 1 paragraph 1.2.1 of the ICAO. It is not known to the Board if provisions have been incorporated in Russian legislation that deviate from it.

1.4.5 Aviation shows

Aviation shows abroad

Since 1978, Great Britain has worked with the Civil Aviation Publication (CAP) 403, Flying displays and special events: A guide to Safety and Administrative Arrangements. Among other things, the rules and requirements for acquiring and holding a so-called Display Authorization (DA) are laid down in this regulation. This is a licence demonstration pilots acquire after they have flown their demonstration programme and this has been assessed by a number of experts. Depending on this assessment, restrictions are imposed or not with regard to the manoeuvres to be performed and to

minimal altitudes. At each following demonstration, the pilots are assessed again, and on this basis their licence is maintained, extended, limited or withdrawn.

In North America, a similar system is used called ACE program (Aerobatic Competency Evaluation). The American aerobatics world indicates the following in the aim of these regulations:

“The ACE program represents the acknowledgment by the industry of the need for an effective method for safeguarding the public at air shows. The ACE program standards are a basis by which the competency/safety of air show pilots are evaluated and recommendations made to FAA and Transport Canada for the issuance of the appropriate aerobatic competency/safety credentials.”

The ACE Committee states that there have been no fatalities among the audience in its 50-year existence. In the period 1990 – 2000, 42 pilots were killed during thousands of aviation shows in the United States and Canada. Each year, between 15 and 18 million persons come to watch air shows in North America.

By way of the CAP 403 of the ACE program, quality systems for demonstration flights have been created which are broadly supported within the British and North American aerobatics community. These systems give an indication of the level of the demonstration pilots. This is in particular considered important for the classification of pilots who are unknown to the display director responsible.

In the ACE handbook, the Yak-52 and the Su-29 are both classified in a category of aircraft to which a minimum altitude applies of 800 to 500 feet during demonstrations. For the Su-29, there is the possibility to decrease the minimum altitude from 800 feet to 500 feet and then to 250 feet. In that case, the pilot has to have participated in 20 air shows at six different locations at least within a period of 24 months.

Aviation shows in the Netherlands

In Europe, the legislation in the field of aviation shows has not been harmonised. IVW-DL grants a permit for an aviation show per event. The permit is an administrative decision with a number of annexes in which the conditions are incorporated, such as:

- appointment of the display director responsible;
- dispensation of articles of the Aviation Act and the Air Traffic Regulation;
- date and possible alternative date and hours of the show;
- programme with the participants;
- minimal altitudes for the various types of aircraft;
- distance to the audience to be maintained;
- markings on the landing field;
- locations of the areas for the audience;
- position of the display line;

Contrary to the requirements for regular pilots' licences, no separate requirements were asked in the Dutch legislation regarding the aerobatics experience and capabilities of participants in aviation shows at the time of the accident with the Su-29.

By order of the then Dutch Civil Aviation Authority,³⁵ a working party was involved in drawing up an aviation shows regulation since the mid 1990s. Various individuals from the aerobatics sector, including pilots of Red Star, IVW-DL and the Dutch Ministry of Defence were represented in this working party. IVW's order had initially originated from a recommendation drawn up by the JAA as a result of a serious accident during an aviation show at Ramstein air base in Germany on 28 August 1988 (see also paragraph 1.6.2). A number of matters were then immediately arranged in the administrative decisions that are issued per aviation show, as described above.

The aviation show regulation to be drawn up should apply to both military and civil shows. Part of this aviation show regulation was the so-called “Display Authorisation”, in which matters such as the quality of the demonstration pilots, minimal experience requirements, individual altitude restrictions and the like were regulated.

³⁵ Nowadays the ‘Transport and Water Management Inspectorate’, Aviation Division (‘IVW-DL’).

On 28 January 2004, the Aviation Show Regulation came into force. When drawing up this Regulation, the IVW adopted the British CAP 403 to some extent. Both regulations provide the acquiring of a display authorisation. According to the British regulation, these display authorisations are issued by the CAA; in the Dutch regulation it has been laid down that this authorisation is issued by the Dutch Air Display Association, Article 18, Annex E.

1.5 THE ROLE OF THE GOVERNMENT

1.5.1 Supervision

The former system of the Soviet Union contained no possibilities whereby aircraft were owned by private persons. An aircraft was either military or owned by the only airline Aeroflot. That is the reason why until recently there was no central government system that regulated the registration and supervision of small aircraft (the so-called General Aviation).

Since December 1988, the Federation of Aviation Amateurs is an organisation which was recognized by the Russian aviation authorities as an association which serves the interests of national private aviators in Russia. For Russian aircraft and Russian pilots the FLA issued pilot licences, certificates of airworthiness and certificates of registration and carried out aircraft inspections. The FLA had personnel at its disposal that had the administrative and technical capabilities to issue registrations and carry out inspections. When issuing an extension for a certificate of airworthiness of an aircraft registered with the FLA, the aircraft in question was inspected by a technical expert of the FLA.

The UK Civil Aviation Authority (CAA) informed the Board that in the past, Russian registered aircraft were accepted in Great Britain without any restrictions (before the "Direction to prevent flying of Russian aircraft" mentioned in paragraph 1.5.3 was issued). A number of these aircraft were operated in the UK and also in other European countries. Only after a few occurrences had taken place with these aircraft in the UK, the CAA contacted the Russian civil aviation authorities to seek information regarding these Russian registered aircraft. The reason for this was the fact that these were former military aircraft which were now operated as civil aircraft. These aircraft were taken from their military environment and were now operated in civilian environment, while they are not certified for this purpose.

From the information that subsequently was provided by the Russian aviation authorities it became apparent to the UK-CAA that the certificates of airworthiness provided with these aircraft were not issued by the Russian aviation authorities. This does not say anything regarding the technical- and operational quality of these aircraft.

It turned out that the FLA was only allowed to operate within the Russian borders. This information only came available well after the accident with the Yak-52.

During the investigation it turned out that the Transport and Water Management Inspectorate, Aviation Division, was not acquainted with the existence of the FLA. Upon being asked, the Board informed the IVW-DL to that end on 1 September 2003. After two aircraft crashed in Russia in the summer of 2004 the Russian aviation authorities have terminated all activities of the FLA as of August 2004.

In 2005 the Board asked the Air Accidents Investigation Scientific and Technical Support Commission for an update on the status of the FLA. They indicated that the FLA was not officially accredited and authorized to issue pilot licences, certificates of airworthiness and registration. They also indicated that the FLA activities were tolerated for years due to insufficient national regulations. All the flights which are not licensed by the Federal Authority for Transport Oversight of the Ministry of Transport of the Russian Federation were stopped half way 2004. In conclusion the Russian (civil) Air Accidents Investigation Scientific and Technical Support Commission indicates: *"Thus all the certificates and licenses signed by the FLA people were not valid and are not valid now"*.

Despite this information there are indications that the FLA is still active, see paragraph 1.5.3.

The international regulations mainly form the basis of the so-called internal safety. The internal safety concerns the safety of the occupants of an aircraft, whereas the external safety concerns the safety of the people on the ground. The entire aviation quality system, with the issue of licences in the form of recognitions or otherwise, approvals, licences and pilots' licences is based on the (international) regulations mentioned above. Monitoring this quality system is effected by way of supervision of the performance and maintenance of the aviation policy and the aviation legislation and is part of the competence of the (national) government. In addition, civilians and entrepreneurs themselves are responsible for safety, with as a minimum the compliance with the

law; this is part of a person's own responsibility.³⁶ That is why a person's own responsibility is part of the quality system.

In the case of aircraft registered abroad, the owner's, holder's and pilot's own responsibilities are stressed,³⁷ due to the lack of supervision by the Dutch Inspection and in many cases because of a limited or lacking supervision of the country of registration.

The Member States of the ECAC, including the Netherlands, have SAFA (Safety Assessment of Foreign Aircraft) inspections for traffic aviation. These are safety inspections specifically aimed at foreign visiting companies. The SAFA team inspects the compliance with obligatory safety requirements drawn up by the ICAO and that apply to operational areas, technical aspects and the safety of passengers. The SAFA team inspects the aircraft, the flight preparation and the flight documents.

In the Netherlands the inspection of General Aviation is performed by SAGA³⁸ teams. These inspections are randomly carried out during visits to Dutch airfields. If there are aircraft registered abroad present at a Dutch airfield at the moment of inspection, these can also be subjected to an inspection. The SAGA team inspects the documents, licences and the technical state of the aircraft. The flight planning is also assessed; including the weight and centre of gravity calculations, the planned route, the fuel consumption expected, etc. are assessed. The flight performance of the General Aviation is not inspected by the SAGA teams. The ICAO minimum (presence of certificate of registration, certificate of airworthiness, and pilot's licence) applies to aircraft registered abroad. The SAGA team is not always able to determine whether an aircraft registered abroad complies with the laws and regulations in force in the country of registration. The SAFA and SAGA inspectors are not able to read all six ICAO languages (including Russian), in which the documents have been drawn up. In addition, they may not be acquainted with all the different national laws and regulations. The Inspection of Transport, Public Works and Water Management, Aviation Division (IVW-DL) hereby indicates that there is no regulation of the supervision of airworthiness of aircraft registered abroad on Dutch airfields. Thereby the distinction between the countries of registration (whether or not a Member State of the JAA) is irrelevant. The country of registration is formally charged with the supervision of the airworthiness.

As far as the use of Dutch airports and Dutch airspace is concerned, such as minimal altitude, sound limitations and right-of-way rules, Dutch laws and regulations also apply to aircraft registered abroad. The supervision of this is mainly carried out by the Dutch Aviation Police.

The IVW-DL has indicated that it was not aware which aircraft registered abroad are stationed in the Netherlands. After the accident with the Yak-52 on 9 March 2001, the IVW-DL has taken no measures to prevent such accidents. Nor has action been taken with regard to aircraft registered in Russia in general or towards the owner or the Red Star pilots. The Aviation Division has indicated it will perhaps only come into action after having formed a judgement. According to itself, the IVW-DL has too little information at the moment and it will await the findings of the Transport Safety Board. IVW-DL has indicated that the Unit Enforcement checked all Dutch airfields for the presence of aircraft registered in Russia two weeks after the accident with the Su-29. It appeared there were none.

After the accident with the Su-29 on 7 June 2002, the Aviation Show Regulation came into force on 28 January 2004. This Regulation is intended to decrease the risk and consequences of such accidents (see Annex E).

³⁶ The policy document *Supervision on the Go* ('Toezicht in beweging') (May 2004) of the Transport and Water Management Inspectorate demonstrates the tendency to extend the responsibility of civilians and entrepreneurs.

³⁷ Dutch legislation and regulations distinguish between the owner, the holder and the user. The owner of an aircraft registered in the Netherlands is responsible for a maintenance programme being drawn up, kept up to date and carried out for the aircraft. The holder is responsible for the airworthiness of the aircraft. The user is responsible for complying with the instructions of the manufacturer and the limitations of use of the aircraft, as laid down in the flying handbook approved by the competent authority.

³⁸ Safety Assessment General Aviation.

1.5.2 Aircraft registered abroad in the Netherlands

Approximately 100 General Aviation motor aircraft registered abroad are permanently present in the Netherlands,³⁹ in addition to approximately 700 General Aviation motor aircraft registered in the Netherlands.⁴⁰ About half of the motor aircraft registered abroad concern non-JAA registrations. There are no exact historical data known of the number of aircraft registered abroad in the Netherlands, but it is known that this number increases each year.

1.5.3 Registration abroad

As mentioned in paragraph 1.5.1 the CAA has tried to retrieve if the Russian registered aircraft operating in the UK had type certificates which were issued according international requirements. The Russian civilian aviation authorities indicated that the Yak-52 does "not" comply with the requirements for a civilian type certificate. They also indicated that the Su-29 "may" not comply with these requirements either⁴¹. The Russian civil aviation authorities also pointed out to the CAA that the FLA was not authorised to operate outside Russia. As a result of this information, the CAA in its turn issued a Direction to Prevent Flying of Russian Aircraft in May 2002 (see Annex D). The issuing of the Direction took place after the accident with the Yak-52 and could therefore not be known to the pilot, his brother or the supplier of the aircraft at the time of the accident.

During the investigation it became clear that the IVW -DL was not aware of the existence of the Direction to Prevent Flying of Russian Aircraft issued by the CAA. Upon being asked, the Transport Safety Board informed the IVW -DL thereof on 1 September 2003.

The Direction is aimed at owners of or pilots flying aircraft registered in Russia in the United Kingdom provided with registrations starting with RA-01..., RA-02... or RA-04... The CAA indicated in the Direction that the aircraft mentioned may be flown under circumstances that are contrary to the British requirements on the registration of an aircraft and the certificate of airworthiness. The CAA orders by way of this Direction the owners of and pilots of such aircraft not to fly these aircraft or to have these flown. These possibilities are limited to leaving the United Kingdom or having the aircraft registered in Great Britain.

The Direction as drawn up by the British CAA has not been made known outside the United Kingdom, because the CAA assumed that it was solely a national matter. For it was the intention to provide aircraft registered in Russia with a British registration.

In order to make it possible to operate these Russian aircraft within the civilian aviation regime the UK-CAA has linked the 'Direction to prevent flying of Russian aircraft' to their 'Permit to Fly'-system. This system also allows former military Second World War aircraft to fly with a civil registration, the origin of these types of aircraft is more or less the same as these Russian aircraft.

The afore-mentioned aircraft registered in Russia are not considered by the CAA as a group of aircraft complying with the standard certification requirements for which a type certificate can be issued. There are no generally approved flight manuals for these aircraft. Each handbook that is considered sufficient by the owner/pilot is regarded as a flying handbook (linked to the registration of the aircraft). As a result, these aircraft are treated as individual aircraft. Each aircraft is inspected as to airworthiness. Because no type certificate is issued for this type of aircraft, these aircraft have a special certificate of airworthiness, a so-called permit to fly.

Before a Yak-52 can be entered into the British aircraft register, a number of adaptations have to be effected on the aircraft, the so-called Mandatory Permit Directives (MPDs). Examples of these adaptations are: checking and if necessary replacement of the upholstery of the control areas, replacement of the old model safety belt and replacement of the parking break handle. These MPDs only apply to aircraft registered in the British aircraft register. There is also a special certificate of airworthiness in the Netherlands, but this is only issued to self-built and microlight aircraft.

The UK-CAA indicated that after the 'Direction to prevent flying Russian aircraft' was published the owners of all the Yak-50's and Yak-52's stationed in Great Brittan applied for a registration according the 'Permit to Fly'-system. All these aircraft were re-registered.

³⁹ According to statements of the airport masters of the Dutch airfields, 1 July 2004.

⁴⁰ www.ivw.nl, 1 January 2004.

⁴¹ Mid 2004 the Su-29 received a type certificate from the Hungarian civil aviation authorities. It is not clear if this type certificate will be accepted by the other JAA/EASA member states just like that.

The French authorities (DGAC) issued a similar direction in February 2002. This direction also prohibited these FLA registered aircraft to fly over French territory. On April 28th 2004 the DGAC received a letter from the FLA referring to a letter from the Russian Aviation authorities. It describes the procedure which has to be adhered to in order accept the FLA aircraft. They accept aircraft from the FLA on the condition that these have been inspected and found in order by an inspector licensed by the Russian authorities. After such an inspection, a new registration is issued for the aircraft in question consisting of the letters RA followed by 4 figures in combination with the letter 'K'. Due to this letter 'K' the aircraft is recognisable as an aircraft with a certificate of airworthiness approved by the Russian authorities. After the above mentioned conditions are met these aircrafts may resume their flights. In Europe, also in the Netherlands, Russian aircraft are flying with registrations according the above mentioned system.

1.5.4 Permits

Various aviation operations require certain permits. IVW-DL issues the following permits:

- Transport permit (Article 16, Dutch Aviation Act).
- Commercial air transport, Air Operator Certificate (AOC), RTL Article 102.
- Round trips (Article 16, Dutch Aviation Act).

Red Star was engaged in demonstration flights and aerobatics lessons with the Su-29 and intended to do so with the Yak-52. At the time of the accident, there was no separate permit needed for demonstration flights or for aerobatics lessons for pilots flying aircraft,⁴² according to Dutch aviation legislation and regulations, other than the pilot's licence for the type of aircraft in question. Since the introduction of the Aviation Show Regulation on 28 January 2004, a pilot has to hold a demonstration licence for participation in aviation shows.

1.6 RELEVANT ACCIDENTS

1.6.1 Accidents with the Yak-52

On 24 July 2001, an accident with a Yak-52 took place in Ireland, whereby a landing was made with the landing gear pulled up. This Yak-52 was registered in Lithuania. Two of the recommendations formulated by the Irish Air Accident Investigation read:

- The Lithuanian authorities should issue a limited or experimental certificate of airworthiness for the aircraft, because it does not meet the airworthiness requirements of Annex 8 of the ICAO;
- The Lithuanian authorities should argue for the pilots flying a Yak-52 to follow an introduction course given by experienced Yak-52 instructors.

On 11 August 2001, an accident with a Yak-52 took place in Great Britain, whereby the pilot was killed. The pilot ended up in a flat spin with the aircraft after an incorrectly performed stall-turn. In view of the altitude of 1,500 feet where this took place, he did not succeed in time to recover from the flat spin. According to the report of the British Air Accident Investigation Branch, the spin characteristics of the Yak-52 are such that it can be difficult to recover the aircraft from a flat spin, which leads to a considerable loss of altitude. The recovery was even delayed, because it took some time before the pilot recognised the situation and responded to it.

On 10 November 2001, an accident with a Yak-52 took place in France. The investigation was carried out by the French Bureau d'Enquête et d'Analyses pour la Sécurité de l'Aviation Civile. The accident was caused by insufficient maintenance of the landing gear. Although the nature of the accident was different, one of the underlying causes was that the original Russian handbooks had been translated into English without these handbooks having been approved by the Russian authorities. In addition, it was found that it is difficult to communicate with the authorities concerned and to acquire the correct information for properly maintaining the aircraft.

1.6.2 Accidents during aviation shows

In Ramstein, Germany, a collision took place in the air during an aviation show on 28 August 1988. One of the severely damaged aircraft of the Italian demonstration team then ended up on the audience. This caused the deaths of 70 persons and hundreds were injured. During this aviation show, a display line was used, but it was not prohibited to make flying movements at right angles

⁴² Aerobatics lessons are not part of the flying training as given by flying schools approved to that end and have to be considered as a proficiency training

to the display line; in addition, it was permitted to fly above the audience. Holding a DA or a similar licence for the demonstration pilots was not required at this aviation show.

On 26 July 1997, an accident took place in Ostend, Belgium. On the occasion of this accident, the pilot performed an aerobatic figure at too low an altitude, so that the pilot was unable to get control over the aircraft in time. The aircraft crashed in an area that had been reserved for the audience. This accident killed 10 persons and 50 persons were injured. During this aviation show, a display line was used and it was prohibited to fly above the audience. Holding a DA or a similar licence for demonstration pilots was not required for this aviation show.

On 27 July 2002, an accident took place during an aviation show in Ukraine. Thereby the crew of a Russian fighter lost control over the aircraft and it crashed in an area that had been reserved for the audience. This accident killed 87 persons and 115 persons were injured. It is not clear which rules were in force during this aviation show and whether these were complied with.

2 ANALYSIS

2.1 THE ACCIDENT WITH THE YAK-52 ON 9 MARCH 2001

2.1.1 *The accident*

In the surroundings of Raalte the plane was seen flying steeply upwards and subsequently steeply downwards a number of times. These movements correspond to the execution of a stall-turn.

Later, the plane was seen flying towards the ground whilst revolving on its (vertical) axis. The plane kept turning till it hit the ground. The statements about the position of the aircraft's nose vary; two witnesses refer to a virtually horizontal aircraft attitude, which can point to a flat spin that was not recovered. Two other witnesses refer to a low position of the aircraft's nose, which could point to a flat spin condition from which the beginning of a recovery had been made. The difference in perception might be due to the fact that the witnesses were standing on different locations and thus may have seen different stages of the flight.

Through the aviation radio (frequency), other witnesses heard conversations that apparently took place between the occupants of the Yak-52. It could be derived from the words "*That was good, that didn't hurt*" or "*that did hurt*" that an aerobatic figure was successfully initiated after which the exercise developed not in the way it should, at first without serious consequences. The words that were heard later indicate that the pilot flying was unable to remedy to the situation in which the plane was at that moment, probably a flat spin. Those words were expressed in Dutch and thus were probably not understood by the instructor. It is also plausible that the use of the Dutch language points to the fact that the flying pilot was under pressure at that time; otherwise he probably would have used the English language. It is remarkable that these words were broadcasted on the radio frequency of the Teuge airfield. Usually the intercom is used for internal communication. Given the position of the controls of the aviation radio and the intercom, beneath one another on the throttle it is likely that the occupants either pressed both buttons simultaneously or pressed the wrong button.

The aircraft damage after the accident matches a horizontal or virtually horizontal position of the plane at the time it hit the ground. Given the aircraft damage and the statements made by the eyewitnesses, it is likely that the plane got into a flat spin and did not recover from this condition. This investigation could not determine whether or not the aircraft had entered the flat spin intentionally.

It appears from the pathologic data and investigation of the wreckage that the instructor probably flew the aircraft at the time it hit the ground. From the fact that at first one heard, in Dutch: "*Ik krijg hem er niet uit*" ("*I can't get it out*") and "*Ik hou het niet*" ("*I can't hold it*") or words to that effect it can be deduced that the pilot flying tried to recover the aircraft from the flat spin and, when he did not manage to do so, the instructor took over the controls.

On the basis of the available weather report from the KNMI [*Royal Dutch Meteorological Institute*] and on the basis of the photographs taken quite shortly after the accident, it appears that visibility was excellent; see picture 1 on page 16 of this report. The broken clouds at 1,200 up to 1,500 feet, as indicated on the KNMI weather report, point to a level of coverage of 5/8 up to and including 7/8. At noon, i.e. well after 10:25 a.m., the time of the accident, flying conditions worsen. On the basis of the aforementioned photographs the level of coverage does not seem to exceed 4/8. Depending on the direction in which the photographs were taken even a coverage level of 2/8 (FEW) can not be excluded. It is therefore likely that at the time of the accident the cloud coverage was rather at most 4/8 (and probably less) than the value of 5/8 up to 7/8 as indicated in the KNMI report. The cloud base will not have been less than the 1,200 up to 1,500 feet as mentioned in the weather report, the eventually lowest cloud base as a consequence of the worsening weather conditions starting at about noon. It seems justified to conclude that, at the time of the accident, the visibility and the cloud base were sufficient to be able to carry out aerobatic figures free of clouds and whilst keeping sight of the horizon.

2.1.2 *The crew and the preparation for the flight*

The number of flight hours as specified by the brother of the deceased pilot could not be confirmed, because the pilot's logbook had been stolen and the aircraft's journal was only partially completed. Investigation of the data provided when the licence was extended revealed that, in the last year, the pilot flying had not flown more than the minimum of 12 hours required under Dutch law. In

England he had obtained the Russian licence for a Yak-52 at the company from which he bought the aircraft, but the experience he had acquired there on the aircraft type that was new to him, was limited to about 5 hours. After that he flew over 7 hours in the aircraft within The Netherlands, either with or without an instructor or experienced pilot. His total experience with this type of aircraft was over 12 hours, of which only a small part consisted of aerobatic flights. A flat spin had not been practised. It had however been demonstrated during the initial training given by the supplier. Due to his lack of aerobatic experience and his limited experience on the Yak-52 he was largely dependent on an experienced instructor familiar with this type of aircraft, aware of the flying characteristics of the aircraft and who had ample experience with aerobatics.

The pilot flying and his brother had at first considered to act on the supplier's advice and to go to England for aerobatic flight training. There, an experienced Yak-52 instructor, with a good track record and experience with the type, would provide them with a training. Due to the fact that the Czech instructor was coming to (the airfield of) Teuge (in The Netherlands) to give training on the Su-29, the choice was made to ask this instructor to give the flight instruction on the Yak-52 also. As this instructor was an experienced aerobatic pilot and as furthermore he had already given an instruction at Red Star a year earlier, the Redstar pilots assumed he was able to provide instruction on aerobatics with the Yak-52. It is possible that, when asked, the instructor confirmed that he had experience on the Yak-52, without mentioning the level of experience. Given the previous experiences they had had with him and the fact that he had been a world champion in one of the categories of aerobatic flight, his skills were not questioned. Given the owners and Red Star's aspiration towards a professional approach, it is remarkable that the instructor's experience with the Yak-52 had not been established clearly.

The pilot flying and the instructor did not know one another. They met two days before the accident and they flew together for the first time one day before the accident. According to the statement made by the brother of the pilot flying it was not exactly known which aerobatic figures they were going to carry out. At any rate a flat spin was going to be carried out. The (recovery) actions of the flat spin were discussed in general terms. The specific recovery technique of the flat spin was not discussed. This item, however, is an essential aspect for safe operation with the Yak-52. Because other Red Star pilots declared that the instructor dealt with recovery techniques extensively in their case, this is an indication the instructor was probably unaware of the specific recovery technique (on the Yak-52). This indicates that he had little experience on the Yak-52. Investigation of the aircraft wreckage did not reveal evidence that indicated that attempts were made to abandon the aircraft during the accident flight. According to the brother of the pilot flying no clear agreements were made between the pilot flying and the instructor regarding the use of parachutes whilst spinning. This is considered remarkable because the forces on the body and the disorientation that occur whilst spinning can complicate the evacuation of the aircraft. Normally a minimum altitude is agreed upon where the aircraft will be abandoned if control is not timely regained. Other Red Star pilots have stated that the instructor normally did discuss the aforementioned matters before the beginning of a flight. The above mentioned may indicate that the instructor was unaware of the violent spinning characteristics (high turn rate) of the Yak-52. Although the instructor was an experienced flight instructor and aerobatic pilot, it could not be established whether the instructor had any flight experience on the Yak-52 because the logbooks could not be retrieved during the investigation. During his normal work as instructor in the Czech Republic he most probably did not fly a Yak-52. It is possible, however, that he gained some experience with this type of aircraft in another country. The investigation has given no clarity with regard to the instructor's flight experience on the Yak-52. If the instructor had had any flight experience on the Yak-52, the Board deems it plausible that this experience must have been limited.

In actual fact this led to the following: there were two persons on board the aircraft of which one had no experience with carrying out a flat spin while the other had that experience, but was not familiar with the specific recovery technique from a flat spin for the Yak-52. Given the fact that only the pilot flying had a Russian pilot licence he was the captain of the aircraft and therefore responsible for the manner in which the flight was carried out. As far as the skills for aerobatic figures were concerned, however, he was totally dependent on the instructor's presumed experience.

Given the flying experience of the instructor, the Board holds the view that the lack of a valid pilot licence did not have an impact on the accident. What did have an impact was his limited experience on the Yak-52.

Before the beginning of the flight the fuel tank of the aircraft was entirely filled, according to the manual this entails a quantity of 120 litres of fuel. It appears from calculations that the consumption during the flight of half an hour was around 44 to 50 litres. The aircraft thus contained ample fuel.

2.1.3 *The aircraft and the documents*

The Yak-52 was bought by the pilot flying, his brother and the company Aero -Materials Association Holland B.V. The aircraft was partly purchased to complement the two aircraft of the Red Star Flying Circus (Red Star). In the event the Yak-52 was to be used on behalf of Red Star the aircraft would be flown by the two brothers and a third person, the latter from Red Star. Because at the time of the accident only one specimen of this aircraft flew in the Netherlands, there was virtually no experience with this aircraft. According to the supplier all the necessary documents available to him were provided with the aircraft when the transfer took place. It appeared that a large number of these documents were composed in the Russian language. As the pilots of Red Star had no command of that language, they were unable to read these documents. Only the Yak-52 flight handbook was in English. This was a translated (non ICAO standard) Russian training manual for the Yak-52 (see paragraph 1.1.3 *The aircraft, Aircraft documents*). The buyers stated that the supplier had assured them that this Yak-52 flight handbook was the 'flight manual' pertaining to the Yak-52. Although the Yak-52 flight handbook that was provided was drafted in English, it did not correspond to the "Yak-52 pilots operating manual" as issued by the military authorities. Red Star, which had participated in the purchase of the aircraft, accepted the Yak-52 flight handbook as the manual pertaining to the aircraft.

The certificate of airworthiness as issued by the FLA stated that it was issued pursuant to the convention of the International Civil Aviation Organization. No reference is made to the applicable Russian regulations, which is common on a certificate of airworthiness. Certificates of registration and airworthiness are issued on the basis of national regulations. On the certificate under the heading of aircraft category it states; "educational-training". According to the international civil aviation standards the category 'aerobatic' would be more appropriate.

The Yak-52 is an aircraft which is not certified according the international civil aviation standards. As a result there is no official aircraft manual. There are various Yak-52 handbooks available of which the content varies from book to book⁴³. The subjects covered in the Yak-52 flight handbook as issued to the buyers were dealt with fairly extensive, whereas other subjects, such as spin characteristics, weight and balance and performance during climb and cruise, were not covered at all. This should automatically 'alarm' aircraft users, especially professional pilots and this should result in efforts to seek more information elsewhere. The absence of these subject matters is not uncommon with non certified (ex-military) aircraft handbooks, this is also the case with the before mentioned Second World War aircraft. Because not all the information is available it is of primary importance that pilots of these aircraft receive instruction from flight instructors who are experienced on the specific aircraft type. Information from handbooks and other publications comes secondary to proper training.

Since the Yak-52 has no ICAO type certificate, there is no requirement that the Yak-52 flight handbook layout and contents have to be conform ICAO Annex 8. Examples of issues that were not in the Yak-52 flight handbook are a method to determine the mass and centre of gravity and the missing regulation that a maximum weight for occupants of 90 kilograms (including parachute) applies for Russian aircraft used for aerobatic flights. In the 'flight handbook' provided, there was also only a concise description on the conduct of aerobatic flights with the Yak-52; information on carrying out a flat spin was totally absent. Because this information is lacking, pilots with no or little experience with this aircraft, such as the users of the crashed plane, have to rely on Yak-52 instructors and other experienced Yak-52 pilots and on information that might be published on the Internet or in literature. For operation of this type of aircraft outside Russia, a system for assuring (continued) airworthiness is lacking. It is therefore difficult for users to acquaint themselves with possible operational limitations and additional regulations for use. An indication of this is the publication the supplier placed on the Internet site shortly after the accident, in which the particular recovery technique of the flat spin is described.

⁴³ The supplier stated that at the time of the sale and the accident only a few handbooks on the Yak-52 were available. Nowadays at least 6 handbooks are available, four of which do not contain any information regarding spinning.

The Yak-52 flight handbook is accepted by the civil aviation authorities within the 'Permit to Fly'-system for these type of aircraft with a military background. It is likely that this gave the buyers the impression that the supplied Yak-52 handbook was a handbook which was approved by the civil aviation authorities. The board however is of the opinion that in view of the absence of operational and aircraft subject matters in the flight handbook, weight and balance issues in particular, a more sceptical attitude of the holder of the aircraft, the aircraft users and especially professional pilots, might have been expected..

2.1.4 *Carrying out and recovery from the flat spin*

It has appeared that the Yak-52 requires specific recovery techniques regarding the flat spin. The flat spin is a aerobatic figure that is not a standard figure during competitions, but that is nevertheless frequently carried out, notably in the highest, 'unlimited', category of aerobatic flight. It has appeared from the investigation that experienced Yak-52 airmen are not univocal about the manner in which a flat spin can best be recovered. On the one hand there is the opinion that the Yak-52 is a standard aircraft that does not require specific actions to recover from a flat spin. On the other hand there are instructors holding the view that the Yak-52 does have other flying characteristics requiring different actions. The latter view is confirmed by the supplier's publication (see appendix C). For the Yak-52 spin these are:

- The large rotation-energy because of the distribution of the weight;
- The high control forces, which may give the impression that the controls are blocked or have reached there most extreme positions;
- The long recovery period (3-4 turns);
- The loss of height that can amount to over 2,000 feet.

Furthermore, the recovery actions have to be carried out carefully, because otherwise there is the risk that the aircraft makes a turn of 180 degrees around the longitudinal axis. In that case, the required recovery height becomes even higher.

As regards the distribution of weight it is noted that the pilot flying, in front, including parachute, weighed about 85 kilograms and the instructor, who was seated behind, weighed about 105 kilograms. This led to a distribution of weight that was detrimental to a speedy recovery from the flat spin.

Because of the aforementioned properties it is essential that these aerobatic figures in a Yak-52 are practised with an experienced instructor on the Yak-52 and are not carried out below 6,000 feet. This is also mentioned in literature and is described by experienced Yak-52-airmen. The pilot's brother stated that none of them were acquainted with this information at the time of the accident. The flat spin had been demonstrated, however, during the familiarisation flights they had made as part of the buying process.

Due to the lack of precise information it is not possible to indicate at what height the occupants of the Yak-52 involved in this accident started their exercise.

The investigation revealed that none of the following subjects were covered sufficiently in the available Yak-52 documents.

- Spinning, flat spins and the particular recovery technique of the flat spin.
- The correct method for the assessment of the weight and centre of gravity.
- The weight limits of the occupants.

Within Europe the number of Yak-52s is increasing and more aerobatic flights are performed by Yak-52s. The Board is of the opinion that the owners and users of Yak-52s, particularly if they have not undergone spin training, are exposed to an increased risk, because of the lack of the above mentioned information. The Board therefore deems it important that the Dutch minister of Transport and Water Management takes appropriate measures, in order to decrease the risk associated with the use of this aircraft to an acceptable level according to the ALARP principle (As Low As Reasonably Practicable).

2.2 THE ACCIDENT WITH THE SU-29 ON 7 JUNE 2002

2.2.1 *The aircraft and the documents*

The Sukhoi Su-29 is an aircraft that has mainly been built for the conduct of and training in aerobatic flights. Already from the development phase of the Su-29, the manufacturer aimed at the

foreign market. This is also the main reason why most of the documents and manuals provided with the aircraft were drafted in English.

2.2.2 *The accident*

The pilot flying of the Su-29 stated that for his display he needed a minimum cloudbase of 1,500 feet, as it mainly consisted of vertical manoeuvres. Initially, the current weather conditions of that day were too bad to carry out the show. When the cloudbase moved up to 1,500 feet, the Su-29 was able to start its display. The pilot flying has also declared that during the show that was to be carried out he was to reach a maximum height of 1,500 feet.

On the video images one can see that the Su-29, whilst carrying out its demonstration flight, sometimes touches the cloud base or just enters into the cloud layer. There were probably some fluctuations in the cloud base between the moment of the weather observation and the moment at which the show was carried out. The KNMI weather report for De Kooy on 7 June 2002 at 4 p.m. shows a cloud base of 800 feet. It is probable that the pilot flying, in an attempt to avoid getting into the clouds, 'flattened' the looping prior to the tumble to a certain extent. As a result, the minimum height required for the next figure was not reached. The consequence was that there was less height available to accelerate to the speed required for the tumble.

In the view of both Red Star airmen and other experienced aerobatic pilots, in the event of such a tumble, the manoeuvre must be initiated from a moderately climbing line. It appears from the video images that this did not happen in the case at hand. This can notably be seen clearly because of the smoke generated by the aircraft throughout the entire demonstration, by injecting oil in the exhaust system. The video images also show that the manoeuvre was started somewhat hesitantly. One of the experts indicated that a minor steering error (control error) when starting the tumble could not be excluded.

During the dive immediately after the last aerobatic figure one can see that the aircraft banks twice aggressively, once towards the left and once towards the right. This rolling motion was caused by stalling of respectively the left and the right wing. In jargon this is sometimes also called an 'accelerated stall'⁴⁴. This was caused because the pilot flying tried to raise the aircraft from the dive.

The aircraft touched the ground at an angle of about 20 degrees; the first contact of the aircraft with the ground was with a pavement in concrete. This prevented the aircraft from sinking into soft soil and stopped the vertical component of its movement. Probably this aspect, in combination with the sturdiness of the aircraft, played an important role in the survivability of the accident. After the first contact with the ground the aircraft continued to move forward for about 70 metres.

The prevailing wind at the time and the manner in which the remains of the aircraft had come to a standstill led to the fact that the cockpit part, in which the pilot flying was seated, was on the upwind side, thus the flames were blown away from him. The combination of airman's position, the wind prevailing at the time, the swift actions taken by the fire brigade and the (sturdy) construction of the aircraft have certainly contributed to the fact that the pilot flying only suffered relatively minor injuries from the accident.

2.3 THE ROLE OF THE GOVERNMENT

2.3.1 *The supervision*

Legislation and rules are increasingly created in an international context. The standards and provisions from the International Civil Aviation Organisation (ICAO) apply world-wide. For the EU Member States the rules of the JAA [*Joint Aviation Authorities*] are important. Apart from the JAA rules, it applies to all ICAO Member States that the government of the country of registration is responsible for supervision of the airworthiness and the flight operations.

Red Star Flying Circus had indicated that it intended to register the Russian registered aircraft in the Dutch aircraft registry. However, this turned out not to be possible under the current

⁴⁴ Accelerated stall means that the stalling speed of the aircraft increases as a consequence of the increase of the so-called g-factor. The effect hereof is that the aircraft stalls at a higher speed than anticipated.

legislation. As this was not contrary to Dutch legislation, Red Star chose to uphold the Russian aircraft registration.

The Russian authorities have indicated that the Yak-52 does not and the Su-29 “may” not comply with the ICAO requirements for airworthiness. The Federation of Aviation Amateurs (FLA) issued the certificates of airworthiness and registration. The validity of these certificates is limited to use within the Russian national borders.

On September 1st, 2003 the Board informed the ‘Transport and Water Management Inspectorate’, Aviation Division (IVW-DL) about the investigation results concerning the existence of the FLA and the UK-CAA ‘Direction’ (Later the Board also became aware of the existence of the French ‘Direction’). IVW-DL was unaware of this information at that time. IVW-DL did not introduce any regulations conform the UK-CAA or French civil aviation authorities with regard to Russian registered aircraft. When the draft report was submitted to them for their inspection, IVW-DL stated that they would not take any intermediate actions and would await the findings of the Board.

From the above mentioned it can be concluded that the Yak-52 involved in the accident had an (by the involved ICAO-member states) accepted certificate of airworthiness at the time of the accident. Furthermore, during the inspection of the aircraft wreckage after the accident no technical failures were found which could give any indication to doubt the airworthiness of the aircraft. The accident with the Su-29 occurred one month after the UK-CAA ‘direction’ was issued (more than three months after the French civil aviation authorities had issued a similar ‘direction’ for France). Because IVW-DL had not introduced any specific regulation after the Yak-52 accident for (the few) Russian registered aircraft in the Netherlands and indicated they would await the findings of the Board, it can be concluded that the certificate of airworthiness of the Su-29 involved in the accident was accepted by IVW-DL too.

Given the fact that the aforementioned aircraft types do not meet the ICAO airworthiness requirements, the English government created a possibility for flying with such aircraft by providing a ‘permit to fly’.⁴⁵ In this manner, the English government can supervise these aircraft. These aircraft carry a British registration, are provided with English documents while maintenance must be carried out by aircraft technicians with a licence for maintenance delivered by the (British) CAA [*Civil Aviation Authority*]. Here too, national rules are at stake, which exist apart from prevailing international agreements.

During the investigation it was found that IVW-DL was neither aware of FLA's activities, nor of its limited scope of competence. It has also become known that the IVW-DL was not aware of the Regulation *Direction to prevent flying of Russian aircraft* (including the ‘permit to fly’ arrangement) issued by the English Authorities. The Board concludes that in this respect there is insufficient harmonisation of data between the Member States of JAA.

2.3.2 Internal and external safety

It is known that there are foreign airlines and owners of aircraft that do not comply with the prevailing ICAO-standards. This can lead to a situation in which the safety level aimed at by the ICAO-treaty is not achieved. This is the reason why in commercial aviation the ‘safety assessment of foreign aircraft’ (SAFA) platform inspections are carried out. For General Aviation comparable SAGA-inspections exist. In both cases (additional) supervision from the government is effectuated. Naturally, a larger degree of oversight is beneficial to safety.

The present investigation from the Dutch Transport Safety Board is aimed at Russian registered General Aviation aircraft located in the Netherlands. It was not possible to establish unequivocally whether these aircraft comply with the ICAO-airworthiness requirements. In such cases one can expect the government to provide alternatives or to take actions to guarantee the desired level of safety. Hereafter, we will deal in more detail with some of the possible alternatives:

⁴⁵ A number of JAA member states have a similar option. Most of the JAA-member states, as is the case in The Netherlands, only has a special Certificate of Airworthiness (CoA) for home built aircraft and micro light aircraft. The aviation Division has no CoA class under which these types of aircraft can be entered into the Dutch Registry.

- Issuing a so-called special CoA with Dutch registration.
- Using the expertise of other JAA Member States.
- Supervision by means of SAGA-platform inspections.
- Not admitting the aircraft type.

Naturally, issuing a special CoA provides the highest level of supervision of the airworthiness of the aircraft. The lowest level of supervision is the level by means of SAGA-inspections.

It appeared from the investigation that in The Netherlands there is no policy for issuing a special CoA for such (foreign registered) aircraft. Neither have any steps been taken to use the expertise of other JAA Member States, which do have experience with a specific type of aircraft, such as the national regulation in England or France concerning the Yak-52.

With the 'system' that is accepted by the French civil aviation authorities the status and the authority of the FLA remains unclear.

Contrary to the situation in commercial aviation, where the SAFA-platform inspections have a corrective effect towards airlines that do not strictly comply with the ICAO standards, the SAGA-inspections do not seem to lead to the same result. It appears from practice that the SAGA-inspections can not fulfil this role, notably not with aircraft that have no authorised and accessible English or Dutch documents.

The prerequisite for SAGA and SAFA inspections is that the ICAO Member States comply with the agreements concerning the issuance of a CoA. This is also the basis for Dutch legislation. Dutch law does not provide for cases in which an aircraft does not comply with the ICAO airworthiness requirements and in which nevertheless a CoA is issued by the country of registration.

In the event the aforementioned options and/or measures do not lead to the result aimed at, the government should not admit the aircraft in question or possibly the applicable type of aircraft – depending on the prevailing regulations- in Dutch airspace.

It appears from the above that, due to the lack of a clear policy, the following situation has arisen in The Netherlands: owners of aircraft registered in The Netherlands must comply with all the laws and rules, whereas the implementation and enforcement system for aircraft registered abroad is considerably less strict or is even totally absent. The Board holds the view that improvements need to be made in the area of external safety.

The Board also deems improvements necessary in the area of internal safety. It appears that flying this type of aircraft, which is not certified according to international civil aviation standards and which is relatively cheap to purchase, entails additional risks. Users and passengers should be informed that flying with General Aviation aircraft that are not registered in a JAA Member State can entail additional risks. Similar to the operation of historical aircraft, where it is usual to warn users and passengers that larger risks are involved due to the limited airworthiness because of the age of the aircraft, arrangements could be made for non JAA registered General Aviation aircraft, if their airworthiness can not unequivocally be determined.

As regards external safety, the Dutch CAA did not take any demonstrable action after the accident with the Yak-52. After the accident with the Su-29, the CAA checked all Dutch airports to see whether aircraft registered in Russia were stationed. No action was taken with regard to Red Star. The fact that Aero-Materials Association Holland B.V., trading under the name Red Star Flying Circus, is a Dutch company that operates from a Dutch airport with Dutch airmen and develops its activities in The Netherlands should have given cause to actions from the Dutch CAA. The CAA declared that measures in that respect were not possible without a sound judgment and that one wished to await the publication of the report from the Dutch Transport Safety Board before making that judgment. The Board disapproves of this. What applies to each company or owner, that he has to learn from incidents and accidents and must take measures to prevent them on his own accord, also strongly applies to the government authorities concerned.

It appears from the above that, for the category of foreign registered aircraft in General Aviation, the Dutch CAA does not sufficiently take its responsibility as regards internal and external safety. The Board deems it unsatisfactorily that the Dutch government only incidentally supervises General Aviation aircraft, registered outside of the JAA member states, flying in the Netherlands and operated by Dutch airmen. This particularly applies when these aircraft are used for commercial purposes by Dutch owners in The Netherlands. The Board holds the view that the CAA has

insufficiently defined the dangers and risks involved in the operation of these aircraft within The Netherlands. Therefore measures are necessary to improve the inspection of General Aviation aircraft that are not registered in JAA Member States and aircraft that due to their military design history have no type certificate according ICAO directives, which are used for private and/or commercial purposes in The Netherlands. Should this require additional regulations, such directives should preferably be set out in a European framework.

2.3.3 Air displays

Air displays have taken place from the moment aircraft were invented onwards. At some of these, accidents happened. In the course of time aircraft have become increasingly safe, thereby the supervision and organisation of air displays has improved as well. The public, which generally visits air displays in great numbers, wishes to see a spectacular show. To comply with this wish aircraft are generally flown quite low and operated up to their performance limitations. This means there is little or no margin for mistakes, a small steering error may lead to loss of control or an unacceptable deviation from the display line. Additionally the low height gives the pilot flying little margin for corrective actions.

This appears to be a recurrent scenario for many accidents during air displays: the pilot flying loses control of the aircraft and has insufficient margin to correct the failed manoeuvre within the time available. The introduction and use of the display line during air displays has contributed to the fact that aircraft accidents during air displays remained outside of the public areas. However, there are examples in which the pilot flying, due to lack of control of the aircraft, could not prevent landing in an area open to the public. The display line is a part of the safety system at air displays, the skills of the participants forms another essential element.

At the moment of the accident in 2002 a working group, commissioned by the Dutch CAA, was engaged in drafting a regulation for air displays (see appendix E). The Board approves of the (resulting) Regulation for air displays that came into force in 2004.

With the aim of limiting as much as possible the risks for the pilots flying demonstration aircraft, as well as for the public and third parties on the ground, obligations and requirements for amongst others the participants to air displays have been defined and set out in the Regulation for air displays. These concern minimum requirements regarding flight experience (amount of demonstrations and related flying hours), minimum flying height and an independent assessment of the conducted demonstrations. After adequate proficiency has been established after a test, the pilot receives a so-called air display licence. Subsequently, the pilot is assessed each time he carries out a demonstration at an air display.

During the air display on 26 May 2002 in Volkel the Su-29 pilot was removed from the air display after having been warned by the display director because of deviating from the display line, deviating from the minimum height of 200 feet and flying over the public. According to the pilot's statement, he had problems with the strong wind across the display line. If the Regulation for air displays had been applicable, this error would certainly have had an impact on the flight for the demonstration at De Kooy. Such consequences may vary from a 'red card' (grounding of the pilot concerned) to an increase of the minimum flying height or a mere warning.

Moreover, pursuant to the new regulation, the pilot flying would not have complied with the minimum experience requirements for an air display licence. At the date of the accident the pilot flying had about 20 hours of experience with this aircraft, the new regulation prescribes a minimum experience of 100 hours on the aircraft used for the demonstration or on an aircraft of comparable class or type.

2.4 OWN RESPONSIBILITY

Apart from the supervision on airworthiness and flight operations of aircraft, pilots flying aircraft and entrepreneurs with aviation companies have their own responsibility as regards compliance with rules and procedures pertaining to flight safety. This element, the own responsibility, is part of the safety quality system in aviation.

The Board holds the view that the own responsibility of the 'participants' in the aviation sector and the enforcement of governmental supervision complement one another. This relation has an influence on the safety level. When the government steps back, this means the responsibility of the aviation sector and those concerned increases.

It appears in this report that for the accident flights in question the following parties played a role as far as the own responsibility is concerned:

Richard Goode Aerobatics

The supplier has delivered the Yak-52 with the documents available to him. It has become apparent from the investigation that these did not comprise essential subjects, such as the calculation of weight and centre of gravity and the particular recovery technique from the flat spin. The supplier was acquainted with the absence of the afore-mentioned essential subjects and had stated that he directed the buyers to the places where this information was available. The supplier and the buyer/owner contradict each other about whether or not this information has been given to them. It has become apparent from the investigation that this information exchange has not demonstrably been laid down by the supplier at that time. The supplier was aware of the background and the flight experience of the buyers. He knew that the buyers intended to perform demonstrations with the aircraft. The supplier of the aircraft gave the buyers twice as much time on the aircraft as he would normally give for such familiarisation training. The supplier advised the buyers to take additional aerobatics training at the company Skytrace, where the knowledge regarding the particular recovery techniques is present. In the publication that the supplier put on his internet site on march 13, 2001, he indicated that he had been too casual about the characteristics of the Yak-52, very particularly during spinning.

In view of the nature of the aircraft, a 'high performance' single engine aircraft, which is not certified according international civil aviation standards and which has no 'complete' flight handbook, the skill of flying the aircraft is learned primarily from flight instruction and from manuals and book second. The supplier instructed the future owners how to operate the Yak-52 and on their request he also demonstrated some aerobatics. The supplier indicated where aerobatic instruction could be obtained. The Board asked the UK Air Accident Investigation Branch (AAIB) to give their opinion regarding the above mentioned. The AAIB indicated that in their view the supplier did what in Great-Brittan reasonably could be expected from the supplier. The Board concurs with this conclusion.

Aero-Materials Association Holland B.V.

The owner of the Su-29 and partial owner of the Yak-52 took his responsibility as regards the maintenance of the aircraft by having the maintenance done by Star Airservice. Aero-Materials Association Holland, the co-owner of the Yak-52, has accepted the "Yak-52 flight handbook" and all other documents that came with the aircraft as the manual pertaining to the aircraft. The Board holds the view that the holder of an aircraft, next to legal obligations, has a duty of care towards the users and people renting the aircraft, in view of the aircraft type. Hereby the Board refers to elements such as giving more attention to the collection of information in order to assure a safe flight execution.

The pilots involved

The pilots involved with the Yak-52 carried out the following activities:

- Acquiring a Russian licence of validation
- Carrying out a number of test flights with the Yak-52 in Britain.
- Training on the Yak-52 with a number of different instructors.
- Calling in an experienced aerobatic pilot, ex-world champion aerobatic flying, to provide their arobatic training.

The accident with the Yak-52 concerned a private training flight. Practising the various forms of spinning was part of the safety training. It is probable that neither the pilot flying nor the instructor was aware or could be aware of the specific recovery technique from the flat spin of the Yak-52. Information about this matter was given to the owners of the aircraft in question only after the accident. Because of the Yak-52 flight characteristics in a flat spin it is necessary that this figure is practised with an instructor who has considerable experience with this aircraft type and with the execution of flat spins in particular.

The Board is of the opinion that the Czech instructor, the owners and the pilots have underestimated this aspect. The aircraft owners and pilots have not confirmed the instructor's experience on the Yak-52.

The pilot(s) involved with the Su-29 from Red Star carried out the following activities:

- Attracting an experienced pilot, ex-world champion in aerobatic flying to provide their training.
- Talking through manoeuvres until one knew them by heart.

- Organising a training week in France in which the airmen involved watched each other's demonstration flights and assessed them.

The accident with the Su-29 concerned a demonstration flight. There were no official rules for demonstration flights in the Netherlands at the time of the accidents with the Su-29 and the Yak-52

The Board holds the view that individuals and organisations that (want to) occupy themselves with demonstration and aerobatic flying activities at expert level should be aware of the additional risks involved. That is why it is important that next to the requirements provided in the Regulation on air displays (see chapter 2.3.3 as well), elaborate attention is given to the preparation, training, operation and the documenting of these subjects in manuals and (emergency) procedures. This is part of the own responsibility. The Board concludes from this that the airmen united under the name Red Star Flying Circus were not sufficiently fitted to carry out aerobatic flights and flight demonstrations at expert level. A recommendation to that effect has not been made because Red Star Flying Circus no longer exists.

Besides the above, the choice of the aircraft type must be made carefully. Does it match the level of aerobatic, demonstration and competition flights that is foreseen and does it match the experience and skill of the intended pilots flying?

The Yak-52 is relatively cheap compared to other comparable aircraft but lacks an internationally recognised certificate of airworthiness or a system in which the airworthiness is (continuously) warranted. As a result, as regards limitations to the use one is often dependent on third parties' experience and information, which implicates that the own responsibility plays a more significant role.

3 CONCLUSIONS

3.1 THE ACCIDENT WITH THE YAK-52

3.1.1 Findings

1. The weather was not a limiting factor for the execution of aerobatic flight.
2. The pilot was authorized to fly this type of aircraft.
3. Although the pilot was an experienced air transport pilot, he had little recent flight experience with single engine aircraft. He had never practiced a flat spin.
4. The instructor had a valid Czech licence and was probably not in the possession of a Russian licence. He was an experienced flight instructor with considerable (competition) aerobatic flight experience and was the late world champion in the 'advanced' class.
5. It is likely that the instructor had little experience on the Yak-52.
6. The pilot and the instructor had, as far as could be checked, no physical and psychological limitations that could have influenced their flying capabilities.
7. During the briefing prior to the flight the particular recovery technique from the flat spin was not discussed. Nor were clear agreements made between the pilot and the instructor with regard to the use of parachutes whilst spinning.
8. The investigation did not reveal any causal technical failure of any kind.
9. The Yak-52 with the registration RA02080 was properly maintained and had a certificate of airworthiness issued by the Federation of Amateurs (FLA). During this investigation it became apparent that this certificate of airworthiness was only valid in Russia.
10. The weight and balance were within the approved limits. However, the weight distribution of the occupants had an unfavourable influence on the recovery from the flat spin.
11. During the flight the aircraft entered a flat spin.
12. It could not be established whether the aircraft entered a flat spin on purpose or not.
13. Shortly before the impact the instructor probably flew the aircraft and probably held the control stick with both hands.
14. The aircraft hit the ground while turning around the vertical axis in a more or less horizontal attitude. Because of the high vertical speed during the impact the accident was not survivable.
15. The Yak-52 requires a particular flat spin recovery technique.
16. During the conversion training on the Yak-52 given by the supplier, the flat spin and the particular recovery technique had not been practised, but these were demonstrated.
17. The particular recovery technique for the flat spin was not known to the pilot and probably not known to the instructor.
18. Because of the mass distribution of the Yak-52 the aircraft's rotation energy during the execution of a flat spin is high, consequently it will take considerable time before the rotation can be stopped. Therefore much height is needed.
19. In the Yak-52 the (flight) control forces can be of exceptional magnitude during a flat spin, hence an inexperienced pilot with this type of aircraft will have the impression that the (flight) controls are jammed or that it appears that the flight controls have reached maximum deflection, while this is not the case.

20. Because of the Yak-52 flight characteristics in a flat spin it is necessary that this manoeuvre is practised with an instructor who has considerable experience with this aircraft type and with the execution of flat spins in particular.
21. The Yak-52 is designed as a military trainer and does not meet the certification requirements as laid down by the International Civil Aviation Organization (ICAO). Because of this the handbooks and documents that came with the aircraft deviate from the international standard and there is no guarantee that all applicable information is available.
22. The "Yak-52 flight hand book" which came with the aircraft was an English translation of an instruction manual. In this book, among other things, information regarding the aerodynamic properties, spin characteristics, performance, and weight and balance calculation was missing.
23. Commercial pilots and the Dutch holder of the aircraft should be able to recognize that the handbooks and documents provided with the Yak-52 did not adhere to the internationally accepted standards for civil aircraft.
24. Because not all the information always is available it is of primary importance that pilots of these aircraft receive instruction from flight instructors who are experienced on the specific aircraft type. Information from handbooks and other publications comes secondary to proper training.
25. The Czech instructor, the owners and pilots have not sufficiently realized the importance of the type experience on the Yak-52 of an instructor pilot. The aircraft owners and pilots have not confirmed this experience.
26. In the publication that the supplier put on his internet site on March 13, 2001, the supplier indicated that he had been too casual about the characteristics of the Yak-52, very particularly during spinning.
27. The supplier instructed the future owners how to operate the Yak-52 and on their request he also demonstrated some aerobatics. The supplier indicated where aerobatic instruction could be obtained. The supplier has not demonstrably laid down the exchange of information regarding spinning and aerobatic flight instruction. The AAIB is of the opinion that the supplier did what in Great-Brittan reasonably could be expected from him. The Dutch Safety Board concurs with this opinion.
28. The Board is of the opinion that the absence of operational and aircraft subject matters in the Yak-52 flight handbook which came with the aircraft, weight and balance issues in particular, a more sceptical attitude of the Dutch aircraft holder, the aircraft users and professional pilots in particular, might have been expected.
29. The Duty of care of the Dutch aircraft holder towards the aircraft users was, in view of the absence of a type certificate for the aircraft, lacking. From the holder more effort to obtain sufficient information for a safe flight execution might have been expected.

3.1.2 Causes

The cause of the accident was the inability of the pilot and the instructor of the Yak-52 to recover timely from the flat spin.

Contributing factors

- The aircraft characteristics which make the recovery from a flat spin more time consuming and more difficult compared to most other aircraft.
- Unfamiliarity with the required flat spin recovery technique.
- Insufficient awareness of the importance of the type experience on the Yak-52 required for aerobatic instruction on this aircraft.

3.2 THE ACCIDENT WITH THE SU-29

3.2.1 Findings

1. The pilot was authorised to fly the aircraft in question in the Netherlands.
2. The pilot held a valid Dutch licence and did not hold a Russian licence.
3. Although the pilot was an experienced pilot, he had little flying experience with the Su-29.
4. The pilot had much aerobatics experience.
5. The pilot had no physical or psychological limitations that might have affected his ability to fly.
6. It may be that the weather was a hindrance to the performance of the demonstration flight; the cloud base may have played a role in the arising of this accident.
7. The Sukhoi Su-29 was well-maintained and had a certificate of airworthiness issued by the Federation of Aviation Amateurs (FLA). During this investigation it became apparent that this certificate of airworthiness was only valid in Russia.
8. Technical investigation has not shown that any technical failure can have been the initiation or a factor for the accident arising.
9. The weight and the centre of gravity were within the boundaries permitted.
10. The aircraft was suitable for the performance of the highest category of aerobatics.
11. On 26 May 2002, the display director of the aviation show in Volkel stopped the demonstration flight of the Su-29 with the same pilot as during the accident flight.
12. At the time of the accident, the Dutch laws and regulations did not provide a system and/or direction concerning separate demonstration licences for pilots.
13. Red Star did not use an aerobatics training workbook.
14. Red Star did not use a system for the evaluation of flown demonstrations.
15. The pilots joined under the name of Red Star Flying Circus were insufficiently equipped for performing high-level aerobatics and flying demonstrations.
16. After the accident, the activities of the Red Star Flying Circus were terminated.

3.2.2 Causes

During the demonstration flight (air display flight) the aircraft lost too much altitude and speed; the remaining altitude was insufficient to regain control of the aircraft in time.

Contributing factors

- The little experience of the pilot with this aircraft type.
- The marginal cloud base for this demonstration.
- Insufficient feedback of former flown demonstrations.
- The absence of a system and/or regulation with regard to flying display authorizations.

3.3 COMMON FACTORS

3.3.1 Findings

1. Within the (Dutch) regulations in force it was not possible to change the Russian registration into a Dutch registration.
2. The oversight of the Dutch Authorities on foreign registered General Aviation aircraft which are stationed in The Netherlands is limited. Necessary follow-up actions stay away because of inadequate legal possibilities.
3. The Federation of Aviation Amateurs (FLA) issued Russian certificates of airworthiness and registration.
4. In August 2004, the Russian civil aviation authorities terminated all activities of the Federation of Aviation Amateurs. Despite this the FLA still issues various certificates. Hence the status and authority of the FLA is unclear.
5. Various European civilian aviation authorities accepted certificates of airworthiness and registration which came with the Yak-52 and Su-29. Both accidents occurred in the Netherlands. The IVW did not issue any specific regulations for Russian registered aircraft operating in the Netherlands, therefore these aircraft were accepted by the Dutch civil aviation authorities..
6. In May 2002 (after the sale of both aircraft) the British Civil Aviation Authorities indicated that the Russian authorities informed them of the fact that Russian registered aircraft starting with RA01, RA02 or RA44 may only be operated in Russia.
7. English regulations give the possibility to accept an FLA registered aircraft in the English civil aviation register with a 'permit to fly'. This gives the English aviation authorities the possibility to exercise oversight on these aircraft.
8. Dutch regulations do not have the possibility to provide aircraft as the Yak-52 and the Su-29 with a 'permit to fly'.
9. The Civil Aviation Inspectorate (Dutch CAA) was not aware of the activities of the FLA, nor from the Direction (Direction to prevent flying of Russian aircraft) issued by the CAA UK with regard to Russian aircraft as the Yak-52 and the Su-29.
10. After the accident with the Su-29 the Civil Aviation Inspectorate checked Dutch airfields on the presence of (permanently) stationed Russian registered aircraft. Because these were not found, follow-up actions were not taken.
11. The Civil Aviation Inspectorate were passive in taking precautions with reference to the accidents with the Yak-52 and the Su-29.
12. The Civil Aviation Inspectorate did not take sufficient actions in order to fulfil its duties with regard to internal and external safety (third risk party). Consequently an even larger role is given to self regulation with regard to the (permanent) stationed aircraft in The Netherlands that are not registered in a JAA member state.
13. As of 28 January 2004 the (Dutch) Air Display Regulation has come into force. In the regulation among others requirements are imposed to the location and the organization and obligations are put in place for the display director and the participant of an air display.

3.3.2 *Underlying causal factors*

- Insufficient compliance to the internal and external safety of the governmental authorities.
- Too large a role of own responsibility.
- Underestimation of the risks involved with professional aerobatic flying.
- Underestimation of the risks involved with the use of non-ICAO certificated aircraft.

4 RECOMMENDATIONS

The Board considers it unsatisfactory that the Dutch government only incidentally supervises aircraft from the category General Aviation that are not registered in a Member State of JAA (or EASA in the future), that fly in the Netherlands and are flown by Dutch pilots. The more so when these aircraft are used for commercial purposes by Dutch owners or in the Netherlands.

The Dutch Minister of Transport, Public Works and Water Management is advised to take measures in order to improve the supervision in the Netherlands on the airworthiness and operations with:

- aircraft of the category General Aviation not registered in a Member State of the EASA (JAA), and:
- aircraft that due to their military design history have no type certificate according ICAO directives

With this, among other things, clarity regarding the status and the authority of the Federation of Aviation Amateurs has to be given. If additional regulations are necessary to that end, these should preferably be laid down in a European context.

The minister of Transport, Public Works and Water Management is recommended to take appropriate measures, in order to decrease the risk associated with the use of the Yak-52 to an acceptable level according to the ALARP principle (As Low As Reasonably Practicable).

N.B.:

The number of recommendations is limited, because the Aviation Shows Regulations introduced on 28 January 2004 provides for the limitation of risks at aviation shows.

The governmental bodies towards which a recommendation has been issued must take a stance regarding the follow-up of this recommendation within 6 months of publication of this report to the minister concerned. Non-governmental bodies or individuals towards which a recommendation has been issued must take a stance regarding the follow-up of this recommendation within a year of publication of this report to the minister concerned. A copy of this reaction must simultaneously be sent to the Chairman of the Dutch Safety Board and to the Minister of the Interior and Kingdom Affairs of the Netherlands.

APPENDIX A - JUSTIFICATION OF THE INVESTIGATION

Initially the investigation was conducted by investigators of the Transport Safety Board under supervision of the Aviation Chamber. The Board is ultimately responsible for the investigation and stipulated a safety recommendation. The report was published at 27 January 2005.

It appeared afterwards that the English supplier of both, Russian registered, accident aircraft had not been considered as being a party involved. Consequently the draft report had not been presented to the supplier for perusal. The decision not to send the draft report to the supplier was, on hind sight, not correct. In august 2005 the published report was removed from the web site by the Dutch Safety Board, since 1 February 2005 the legal successor of the Board of Transport Safety.

Subsequently the Safety Board reopened the investigation, appointed a project manager and established an advisory committee. On the proposal of the project manager, supported by the advisory committee, some amendments were introduced in the report. This resulted in the decision of the Safety Board, being responsible for the investigation, to accept the amendments that were introduced in the report and to attach a second safety recommendation. In December 2006, the amended report has been inserted on the web site of the Safety Board. A copy has been sent to all parties involved in the accident.

The accident that occurred to the Yakovlev 52 was reported to the investigator on duty on March 9th, 2001. An investigation was started at the accident site on the same day. After arrival at the accident site removal of the mortal remains was started. A Dutch Yak-52 pilot participated in the investigation of the accident and information derived from aerobatic specialists was utilized. Furthermore evidence from witnesses, knowledge of foreign YAK-52 pilots, literature with respect to aerobatic flying and information from the internet was utilized.

The accident with the Sukhoi 29 was reported to the investigator on duty on June 7th, 2002. An investigation was started at the accident site on the same day. In the investigation regarding the accident with the Su-29, apart from the knowledge of experienced aerobatic pilots, video-recordings taped by the Audiovisual Services of the Dutch Navy and video-recordings taped by spectators of the air show at Naval Air Station 'De Kooy' were utilized.

Following the accident with the Yak-52 an investigation team was composed, managed by the RvTV-'Investigator in Charge'. After occurrence of the accident with the Su-29 it was decided to combine the investigation of both accidents in one report of investigation. Both accident aircraft came from the same supplier, both were registered in Russia and both crashed in the course of training respectively performing an aerobatic manoeuvre. Combining both investigations resulted in extending the scope of the investigation with respect to the role of the authorities as well as the personal responsibility.

The investigation has been conducted according to European and ICAO Annex 13-standards⁴⁶ applicable to the investigation of aviation accidents. All parties, the relatives of the deceased occupants of the Yak-52, the pilot of the Su-29, Red Star Flying Circus, Inspectorate of the Ministry of Transport and Waterworks Division Aviation⁴⁷, as well as the English supplier, Richard Goode Aerobatics, have been involved in the investigation.

Statements from witnesses were derived from the Aviation Police. Investigators of the RvTV interviewed various witnesses and the relatives of the deceased. The Air Traffic Control Agency of The Netherlands provided information regarding available radio communication records and available radar data records. The Netherlands Royal Meteorological Institute provided information with regard to the metrological conditions.

⁴⁶ Directive 94/56/EG of the Council of the European Union of 21 November 1994 "establishing fundamental principles for the investigation of accidents and incidents in civil aviation" and the International Standards and Recommended Practices of Annex 13 "Aircraft Accident and Incident Investigation" of the International Civil Aviation Organization (ICAO).

⁴⁷ Formerly successively the Government Civil Aviation Authority, directorate Inspection of Aviation and the Netherlands Aviation Authority.

As a result of the accident the Inspectorate of Transport and Waterworks Division Aviation was requested to provide further information regarding supervision of foreign registered aircraft, the certification and registration of aircraft and information with respect to aviation displays.

Based on the information received regarding facts, causes and underlying factors with respect to the accidents that occurred on 9 March 2001 and 7 June 2002 the Aviation Chamber completed the draft investigation report. In the month of July 2004 this draft report has been presented to Red Star, IVW Division Aviation, the pilot of the Su-29 and the relatives of the deceased occupants of the Yak-52 (by reason of the principle to hear both sides) without attachment of the recommendations laid down in Chapter 4. At 3 August 2004 the relatives of the deceased pilot of the Yak-52 provided further elucidation on their comment.

The report was translated into the English language and still sent to the English supplier of the aircraft. From his comment several contradictions emerged concerning the evidence provided by the remaining parties involved with respect to the accident with the Yak-52, which could not, or only partly, be verified. Subsequently it was decided to verify the complete report regarding the accident with the Yak-52 on possible further contradictions and its consistency with a view to all evidence provided by all parties involved. This resulted in amending both, the Dutch as well as the English report and, again, at 13 March 2006, presentation to the parties involved in the Yak-52 accident for further perusal.

The English supplier of the aircraft had announced to appreciate giving a verbal elucidation on the matter. Since the relatives of the deceased pilot of the Yak-52 were given that opportunity as well, it was decided to agree to this request of the supplier.

Before inviting the supplier, the report in the English language was presented to the English Air Accidents Investigation Branch (AAIB). At 20 July 2006 an interview with regard to the contents of the report was held by the Safety Board with an inspector of the AAIB.

At 19 October 2006 the English supplier was given the opportunity to further elucidate on his comment. The above mentioned inspector of the AAIB was invited to be present at that occasion as well.

The comments received as a result of the second perusal and the comments received from the AAIB resulted in new facts and resulted in different insights from the Board regarding the Yak-52 accident and the role of the aircraft supplier. These insights have subsequently lead to some significant changes in comparison to the original report.

Finally the Dutch Safety Board drafted a second recommendation in order to prevent the occurrence of similar accidents in the future.

APPENDIX B CENTRE OF GRAVITY CALCULATION RA02080

Gewicht- (boven) en zwaartepuntberekening (onder) met behulp van het programma van de Russische Yak-vlieger. Het zwaartepunt is berekend op 25,05% van de MAC en ligt daarmee binnen de grenzen zoals gesteld in het vliegtuiglogboek.

Weight & Balanse Yak-52 R02080

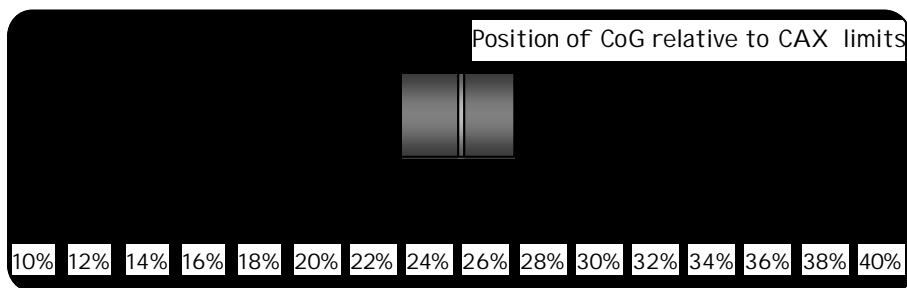
Item	Value	Units	Weight (kG)	Arm from Fr5 (cm)
Basic Empty Weight	1038,50	kG	1038,5 kg	-29,43
Front parachute	10,00	kG	10,0 kg	-20,00
Rear parachute	10,00	kG	10,0 kg	106,00
Front Pilot	75,00	kG	75,0 kg	-20,00
Instructor/ Passenger	90,00	kG	90,0 kg	106,00
Fuel	70,00	Ltrs	49,7 kg	-27,00
Engine oil	12,00	Ltrs	11,3 kg	-130,00
Smoke oil/ baggage		kG		177,00

Gear up

Results for: R02080

All Up Weight 1284,5 kg -30,5 kg OK

	cm from Fr5:	in %CAX:	
Actual CoG Arm	-19,8	25,05%	CoG In range
CoG Range forward limit	-23,1	23,00%	
CoG Range aft limit	-16,7	27,00%	



This calculation is courtesy of YAK UK Ltd www.yakuk.co.uk and Leonas "Levas" Jonys, its use is entirely at the users risk.

Frame 5 (Fr5), or main spar is datum you will need to calc back to this if you use another datum.

Insert a/c weight and arm variab

Gewicht en zwaartepuntberekening met behulp van het programma van de Engelse

Yak-52 club

Item	Units	Value	Metric unit	Metric Unit Value	Arm	Moment
Basic Empty Weight	kg	1038.50	kg	1038,5 kg	-30,91	-32100,04
Front Pilot	kg	85.00	kg	85,0 kg	-20,00	-1700,00
Rear Passenger	kg	100.00	kg	100,0 kg	106,00	10600,00
Fuel	Ltrs	70.00	kg	49,7 kg	-27,00	-1341,90
Engine oil	Ltrs	12.00	kg	11,3 kg	-130,00	-1466,40
Smoke oil/ baggage	kg		kg		177,00	
		Gear		<input type="radio"/> Up <input checked="" type="radio"/> Down		

		Single Pilot	Two Pilot		
All Up Weight	1284,5	Out of wgt	OK		
Total Moment	-26008,3	+69,5 kg	-30,5 kg	Relative to MAUW	89,9
C of G	20,2	OK	OK		
C of G Range		17.2-23.78	17.2-32.8		

Frame 5, main spar is datum you will need to calc back to this if you use another datum.

This calculation is courtesy of YAK UK Ltd www.yakuk.co.uk its use is entirely at the users risk.

Instructions, insert a/c weight and arm + variable weights in appropriate box's calculation is automatic

Note : For single pilot opps insert "0" for rear passenger

APPENDIX C PUBLICATION FLAT SPIN RECOVERY TECHNIQUE YAK-52

RICHARD GOODE AEROBATICS

Head Office: NEWPORT HOUSE, ALMELEY, HEREFORD HR3 6LL

TEL: 44 (0) 1544 322200 FAX: 44(0) 1544 322208 MOBILE: 44 (0) 7768 610389

e-mail: richard.goode@russianaeros.com

Operations: WHITE WALTHAM, MAIDENHEAD, BERKS SL6 3NJ

TEL: 44 (0)1628 660 430 FAX: (0)1628 666 768 MOBILE: 44(0) 7860 802451

WORLD LEADERS IN RUSSIAN SPORTING AIRCRAFT

Aerobatics and Spinning in the Yak-52

I am writing this because I feel that many of us – and I include myself - have been too casual about the characteristics of the Yak-52, very particularly during spinning.

The Yak-52 is a delightful aeroplane, offering great aerobatic ability and 'fun to fly' characteristics with military-build quality for unbelievably little money.

Nevertheless, its spin recovery can be difficult and particularly after a recent accident involving a highly experienced aerobatics pilot I am concerned that too many people are flying Yak-52 in aerobatics, which can intrinsically lead to spins through mishandling, or indeed deliberately spinning without sufficient training to be absolutely certain of recovery.

To be specific:

- It is not difficult to get into a flat spin through a mishandled stall turn – particularly, as is normally the case, power is kept on. Therefore one should not think that because one is not deliberately spinning that one would never get into a spin.
- The 52 is a heavy aircraft with a significant amount of rotational inertia in a flat spin. This is because there is heavy engine in the front and a heavy radio and other equipment behind the rear seat and therefore once the aeroplane begins spinning, it will take time for that inertia to be destroyed and for the aircraft then to recover from the spin.
- In particular, if the spin is allowed to fully develop into a power-on flat spin, the rate of rotation can be rapid and disorientating, and importantly, the more rapid the spin, the greater the rotational energy to be stopped before the spin slows down and therefore the longer the spin recovery.
- Closing the throttle will not in itself cause any recovery.
- Once the flat spin has fully developed it can take up to four complete revolutions for recovery to be made and of course much more if the absolutely correct control movements are not used. Additionally there will be further height loss during the return to level flight.
- It is also possible while recovering from a spin with a lot of in-spin aileron and forward stick, for the rotation to convert rapidly into an inverted spin. Again, this must only be demonstrated with an appropriate instructor.
- Stick forces on both elevator and rudder in order to move the stick forward and to obtain opposite rudder can be extremely high – requiring a great deal of strength. This can give the impression of jammed controls if one is not used to it and this can only be achieved through

practice with an appropriate instructor. It is interesting to note that the Russian manual says that the rudder forces can be as high as 100 kilos (220 lbs) and stick forces 40 kilos (90 lbs), and says that two hands maybe necessary to move the stick forward.

- We know of at least two Yak-52 aircraft that after a fully developed flat spin (ie four or so turns) will NOT recover with the conventional spin recovery of full opposite rudder and full forward stick, but need in-spin aileron to recover. Again, this should not be experimented but practised with an instructor.
- If practising spinning, total height loss can be dramatic and even with absolutely correct recovery procedures, height loss can be in excess of 2000 ft and a bit more to level regain flight. For this reason spin practice of this sort should be commenced at a minimum of 6000 ft and recovery initiated by 5000 ft.
- Several 52 accidents have been attributed to one of the pilots harnesses catching the brake lock on the stick. This obviously varies with pilots, but before any aerobatic flight is commenced, a very complete 'full and free' check should be made to ensure that this cannot happen. Specifically there are two types of brake catch (the new one dating from approximately 1989) and two types of harness, the early buckle type and the later pin type. Apart from anything else the old 'buckle type' should never be used today, but the newer 'pin type' can catch with the old model brake catch.
- Finally, there is the potential problem by virtue of being a tandem cockpit aeroplane that there is misunderstanding between the two cockpits. This is common to all such aircraft, but it emphasises the need for a thorough briefing on all procedures before any aerobatic flight. This should also cover all emergency procedures, and a formal understanding about a bottom height during spinning at which the occupants will jump clear of the aircraft if the spin has not stopped. In Russia this is 1000m / 3300 ft.

In conclusion, **any** Yak-52 pilot who intends to do anything more than pure straight and level flight **must** undertake proper instruction with an instructor who is completely familiar with all aspects of the aircraft's behaviour, particularly during fully developed spin recovery.

None of the above should deter a potential purchaser or pilot of a Yak-52. The aircraft has a superb safety record despite being used by a huge variety of organizations and people throughout the world. However like any aircraft it must be flown correctly. Recovery from simple power-off 'competition-type' one or two turn spins is conventional and rapid. All the above only refers to established flat spins and is why proper instruction should be mandatory for any aerobatic pilots on Yak-52s.

13th March 2001

APPENDIX TO DIRECTION TO PREVENT FLYING OF CERTAIN RUSSIAN REGISTERED AIRCRAFT

This Appendix is issued to provide additional information in support of the Direction to Prevent Flying; reference DIR/05/2002/RA dated 13 May 2002.

The State Civil Aviation Authority of the Russian Federation (SCAAR) has advised the Civil Aviation Authority (CAA) that some Russian registered aircraft may be operating in the United Kingdom on documentation intended to be used purely for internal flights and operations within Russia. The Russian Federation operates some internal registers for aircraft for such purposes and has delegated the responsibility for such operations to the Federation of Amateur Aviators of Russia (FLA) and specified aircraft factories. These aircraft registers appear to be those that commence RA-01xxx, RA-02xxx and RA-44xxx. These do not represent allocations under the State Register of the Russian Federation managed directly by SCAAR and have no international acceptability. SCAAR have additionally advised the CAA that the Yakovlev 50 and 52 aircraft types do not meet the full requirements for civil certification, largely reflecting their original roots as an aircraft of military design. This may also apply to other types of aircraft such as the Yakovlev 12, Yakovlev 18, Yakovlev 55, and the Sukhoi 26, Sukhoi 29 and Sukhoi 31 where the basis for civil certification cannot be determined. This is supported by the CAA's current policy for these aircraft, where they would be considered as only being eligible for a UK Permit to Fly. The Certificates of Airworthiness for these aircraft issued by the FLA and the Smolensk aircraft factory however purport to be issued pursuant to Article 33 of the ICAO Convention and therefore acceptable for international recognition by other ICAO Contracting States. It is understood from the SCAAR that the responsibilities devolved to FLA and specified aircraft factories are limited to aircraft operations within the Russia Federation. The documents that have been issued by FLA therefore do not meet internationally recognised requirements. Accordingly the CAA can only consider these Certificates of Airworthiness to be equivalent in status to the Permit to Fly system in use within the UK.

In view of this it appears to the CAA that these aircraft when operating in UK airspace are in breach of Articles 3 and 8 of the Air Navigation Order 2000 relating respectively to the requirements for an aircraft to be registered in an ICAO contracting State and the associated need to hold an appropriate Standard Certificate of Airworthiness. It is the CAA's normal policy to require that operators of aircraft without a Standard Certificate of Airworthiness apply to the CAA for an Exemption against the requirements to hold a Standard Certificate of Airworthiness in order to permit flight within UK airspace. The CAA is adopting the same approach in this case. It should be noted that where the CAA issues such an exemption it will normally be limited to a period of one month. It is not CAA policy to extend such exemptions beyond that duration unless the owner has made application to the CAA for the aircraft to be registered in the UK and for the issue of a UK Permit to Fly. Where such application has been made and the aircraft is eligible for a UK Permit to Fly the CAA may consider extending such exemptions to facilitate the progression of the associated investigation and to accommodate delays in the subsequent issue of the Permit to Fly. Where the aircraft is not eligible for a Permit to Fly the initial exemption will not be extended and the aircraft will be grounded, except that in such cases the CAA will consider the issue of an exemption only to allow the aircraft to leave the UK.

Applications for exemptions for the above referenced Russian registered aircraft should be made in writing to the CAA and should include the following information:

- Copy of the registration document for the aircraft.
- Copy of the current 'certificate of airworthiness' for the aircraft issued by the NAA of the State of registration.
- Copy of the limitations or conditions associated with such Certificates of Airworthiness.
- Copy of the application for UK Permit to Fly and allocation of registration (for extended exemptions)

Any applications for exemptions or queries regarding this subject should be addressed in writing to Applications and Certification Section, Civil Aviation Authority, Safety Regulation Group, Aviation House, Gatwick Airport South, West Sussex, RH6 0YR. Tel: 01293 768374 Fax: 01293 573860

J C McKenna
Manager
Applications and Certifications

13 May 2002

APPENDIX E REGELING LUCHTVAARTVERTONINGEN

Datum 23 december 2003

Nummer

HOOFDDIRECTIE JURIDISCHE ZAKEN

HDJZ/LUV/2003-3000

Onderwerp

Regeling van de Staatssecretaris van Verkeer en Waterstaat houdende regels inzake luchtvaartvertoningen (Regeling luchtvaartvertoningen)

DE STAATSSECRETARIS VAN VERKEER EN WATERSTAAT,

Gelet op artikel 158, tweede lid, van de Regeling Toezicht Luchtvaart;

BESLUIT:

§ 1. Algemene bepalingen

Artikel 1

1. De begripsbepalingen van de Wet luchtvaart en de daarop berustende bepalingen zijn van toepassing op deze regeling.

2. Voorts wordt in deze regeling verstaan onder:

a. *baan*: een al dan niet verhard gedeelte van het terrein, waar de luchtvaartvertoning wordt gehouden, bestemd voor het opstijgen en landen van demonstratietoestellen;

b. *BVG*: een krachtens artikel 8 van het Luchtverkeersreglement door de minister aangewezen bijzonder luchtverkeersgebied;

c. *beoordelaar*: een door de Nederlandse Air Display Association aangewezen persoon, die bedreven is in het uitvoeren van kunstvluchten;

d. *deelnemer*: een persoon die op basis van artikel 18, eerste lid, als deelnemer tot de luchtvaartvertoning is toegelaten;

e. *demonstratietoestel*: een luchtvaartuig dat onderdeel uitmaakt van de luchtvaartvertoning, onderverdeeld in de volgende categorieën:

1°. categorie A: vliegtuig, zweefvliegtuig, helikopter, luchtschip;

2°. categorie B: vrije ballon;

3°. categorie C: zeilvliegtuig, schermvliegtuig, valschermscherm, valschermscherm, modelvliegtuig, kabelvlieger en kleine ballon;

f. *langsvlucht*: een vlucht waarbij een demonstratietoestel in een éénparige en rechte lijn boven het vertoningsterrein vliegt;

g. *luchtvaartterreininformatieverstrekker*: een persoon met een bewijs van bevoegdheid als bedoeld in artikel 17, onderdeel d, van het Besluit bewijzen van bevoegdheid voor de luchtvaart, dat geldig is voor de luchtvaartvertoning;

h. *luchtvaartvertoning*: een evenement met één of meer demonstratietoestellen in de lucht, georganiseerd om aan publiek amusement te verschaffen, behoudens:

1°. evenementen die uitsluitend bestaan uit maximaal vijf vrije ballonnen;

2°. evenementen die uitsluitend bestaan uit de demonstratietoestellen: zeilvliegtuigen, schermvliegtuigen, valschermscherm, modelvliegtuigen, kabelvliegers of kleine ballons;

3°. evenementen die bestaan uit een combinatie van de onder 2° bedoelde demonstratietoestellen mits deze niet in een onderdeel worden samengevoegd;

i. *minister*: de Minister van Verkeer en Waterstaat;

j. *obstakel*: een roerende of onroerende zaak, zowel tijdelijk als permanent, of een deel daarvan, die een belemmering vormt voor een luchtvaartuig, in een gebied bestemd voor bewegingen van een luchtvaartuig op de grond dan wel uitsteekt boven een omschreven vlak ter bescherming van een luchtvaartuig in zijn vlucht;

k. *onderdeel*: een afzonderlijk punt van het vertoningprogramma bestaande uit één demonstratietoestel of meer demonstratietoestellen die gelijktijdig optreden, waarbij de deelnemers onderlinge afspraken hebben gemaakt over de uitvoering van het onderdeel;

l. *organisator*: de natuurlijke persoon of rechtspersoon die de houder is van de vergunning;

m. *plaatselijke vlucht*: iedere vlucht die vertrekt van of aankomt op het vertoningsterrein en die geen deel uitmaakt van de luchtvaartvertoning;

- n. *publiekgebied*: het gebied, waaronder begrepen het parkeerterrein, gereserveerd voor toeschouwers;
 - o. *publieklijn*: de voorste rand van gebieden die toegankelijk zijn voor toeschouwers voor wie de luchtvaartvertoning of een onderdeel van de luchtvaartvertoning plaatsvindt;
 - p. *vergunning*: de vergunning als bedoeld in artikel 17 van de Luchtvaartwet afgegeven door de minister;
 - q. *vertoningdirecteur*: de persoon die namens de organisator belast is met de leiding en veilige uitvoering van een luchtvaartvertoning;
 - r. *vertoninggebied*: de luchtruimte waarbinnen de luchtvaartvertoning plaatsvindt;
 - s. *vertoninglicentie*: schriftelijke verklaring van bekwaamheid voor het vliegen tijdens luchtvaartvertoningen;
 - t. *vertoninglijn*: een lijn die aangeeft tot hoever een demonstratietoestel de publieklijn mag naderen;
 - u. *vertoningprogramma*: het samenstel van onderdelen van de luchtvaartvertoning;
 - v. *vertoningsterrein*: het water- dan wel landoppervlak waarboven de luchtvaartvertoning hoofdzakelijk plaatsvindt;
 - w. *vertoningvlucht*: iedere vlucht met een demonstratietoestel die wordt uitgevoerd in het kader van een luchtvaartvertoning.
3. Onder luchtvaartvertoning wordt mede verstaan een luchtvaartwedstrijd, georganiseerd om aan publiek amusement te verschaffen.
4. Voor de toepassing van deze regeling wordt onder luchtvaartwedstrijd als bedoeld in het derde lid, verstaan elk binnen het vertoninggebied uitgevoerd onderdeel met een of meer demonstratietoestellen in de lucht ter vaststelling of vergelijking van prestaties hetzij van de deelnemers, hetzij van de demonstratietoestellen.

Artikel 2

Deze regeling is niet van toepassing op militaire deelnemers en militaire demonstratietoestellen.

Artikel 3

1. Indien bij een luchtvaartvertoning waarvoor door de minister de vergunning wordt verleend, militaire deelnemers of militaire demonstratietoestellen zijn betrokken, wordt de beslissing over de vergunning genomen in overeenstemming met de Minister van Defensie.
2. Met uitzondering van de artikelen 32 tot en met 36, en 39, is deze regeling niet van toepassing op een deelnemer aan een luchtvaartvertoning waarvoor door de Minister van Defensie de vergunning wordt verleend.

§ 2. Locatie van een luchtvaartvertoning

Artikel 4

De minister kan een vergunning verlenen voor het houden van een luchtvaartvertoning op een luchtvaartterrein aangewezen krachtens artikel 18 van de Luchtvaartwet, indien gedurende de luchtvaartvertoning luchtverkeersleiding wordt verzorgd door een van de in de artikelen 5.13 of 5.14 van de Wet luchtvaart genoemde bestuursorganen.

Artikel 5

1. De minister kan een vergunning verlenen voor het houden van een luchtvaartvertoning op een luchtvaartterrein aangewezen krachtens artikel 18 van de Luchtvaartwet, indien aan de volgende voorwaarden wordt voldaan:
 - a. demonstratietoestellen naderen en verlaten het vertoninggebied uitsluitend via een van tevoren vastgestelde procedure, en
 - b. er is een luchtvaartterreininformatieverstrekker.
2. Het eerste lid is niet van toepassing op luchtvaartvertoningen waaraan alleen vrije ballonnen deelnemen.

Artikel 6

1. De minister kan een vergunning verlenen voor het houden van een luchtvaartvertoning op een terrein, niet zijnde luchtvaartterrein, waarvoor krachtens artikel 14, tweede lid, onderdeel b, van de Luchtvaartwet ontheffing is verleend, indien aan de volgende voorwaarden is voldaan:
 - a. de grootte van het vertoninggebied, gerekend vanuit het centrum van en parallel aan de vertoninglijn alsmede gerekend vanaf de vertoninglijn richting de zijde van het gebied waar zich geen toeschouwers bevinden, wordt aan de hand van tabel 1 van de bijlage, behorend bij deze regeling, vastgelegd in de vergunning;

b. bij het bepalen van het vertoninggebied stelt de vertoningdirecteur vast of zich daarbinnen gronden bevinden die gebruikt worden ten behoeve van:

- 1°. luchtvaartterreinen,
- 2°. milieubeschermingsgebieden,
- 3°. vogelconcentratiegebieden, zoals gepubliceerd in de luchtvaartgids, bedoeld in artikel 60, onderdeel a, onder 1, van het Luchtverkeersreglement,
- 4°. chemische industrieën,
- 5°. kerncentrales,
- 6°. spoorwegemplacements,
- 7°. brandstofopslagplaatsen,
- 8°. aaneengesloten bebouwing;

c. indien binnen het vertoninggebied gronden als bedoeld onder onderdeel b, dan wel obstakels met een verticale hoogte van ten minste 45 meter zijn gelegen, geeft de vertoningdirecteur aan welke maatregelen worden genomen met betrekking tot die gronden dan wel obstakels in verband met de veilige uitvoering van de luchtvaartvertoning.

2. Aan de vergunning, bedoeld in het eerste lid, worden in ieder geval de volgende voorwaarden verbonden:

- a. op het vertoningsterrein is een baan aanwezig die:
 - 1°. voldoet aan de afmetingen genoemd in tabel 1 van de bijlage, behorend bij deze regeling,
 - 2°. voldoende draagkracht bezit voor de te gebruiken demonstratietoestellen, en
 - 3°. voorzien is van een voor dit doel geschikte markering;
 - b. nabij de baan wordt bij gebruik de windrichting aangegeven door een windzak of een ander gelijkwaardige voorziening;
 - c. bij het gelijktijdig gebruik voor het taxiën en starten of landen op het vertoningsterrein is de afstand tussen de hartlijn van de taxibaan en de hartlijn van de start en landingsbaan ten minste 37,5 meter, waarbij het wachtpunt voor de startbaan tenminste 30 meter van de hartlijn van de start en landingsbaan ligt. Afhankelijk van de afmetingen van het grootste demonstratietoestel kunnen er nadere voorwaarden worden gesteld;
 - d. in de invliegsector en de uitvliegsector van de baan steken geen obstakels door een denkbeeldig vlak, dat met de korte zijde van de obstakelvrije strook als basis oploopt onder een hoek van 1:20 (hoogte:afstand) en een divergentie van 10% tot een afstand van 300 meter. Ter weerszijde van de baan en van de in- en uitvliegsector steken geen obstakels door een denkbeeldig vlak onder een hoek van 1:5 (hoogte:afstand) tot een afstand van 75 meter;
 - e. demonstratietoestellen naderen en verlaten het vertoninggebied uitsluitend via een van tevoren vastgestelde procedure;
 - f. er is een luchtvaartterreininformatieverstrekker;
3. De artikelen 4, 5, 6, 11, 12, 13, 15, 16, 18, 19, en 26a van het Algemeen luchthavenreglement zijn ten aanzien van het vertoningsterrein van overeenkomstige toepassing.
4. Indien niet op het vertoningsterrein wordt gestart of geland, toont de aanvrager aan dat het terrein voldoet aan de afmetingen genoemd in tabel 1 van de bijlage, behorend bij deze regeling, voor de te gebruiken demonstratietoestellen en dat het vrij is van obstakels. In dat geval hoeft het vertoningsterrein niet geschikt te zijn om te landen.
5. Het eerste tot en met het vierde lid, zijn niet van toepassing op luchtvaartvertoningen waaraan alleen vrije ballonnen deelnemen.

Artikel 7

1. De minister kan een vergunning verlenen voor het houden van een luchtvaartvertoning boven water- of landoppervlak, waarbij niet wordt gestart van en geland op het vertoningsterrein, indien aan de voorwaarden, bedoeld in artikel 6, eerste lid, onderdelen a tot en met c, en tweede lid, onderdelen e en f, is voldaan.
2. In afwijking van het eerste lid, mag een watervliegtuig starten van en landen op het wateroppervlak.

Artikel 8

1. De minister kan een vergunning verlenen voor een periode van ten hoogste één jaar, indien het vertoningprogramma uitsluitend bestaat uit één gestandaardiseerd onderdeel.
2. De houder van een krachtens het eerste lid verleende vergunning dient telkens ten minste één week vóór het houden van een luchtvaartvertoning de bescheiden, bedoeld in artikel 158, eerste lid, onderdelen a en c, van de Regeling Toezicht Luchtvaart aan de minister te overleggen.
3. Artikel 9, vijfde lid, is niet van toepassing.

§ 3. Organisatie van een luchtvaartvertoning

Artikel 9

1. Voor iedere luchtvaartvertoning wordt door de organisator van de luchtvaartvertoning een vertoningdirecteur aangewezen.
2. De vertoningdirecteur, bedoeld in het eerste lid, heeft de vereiste ervaring behorend bij de categorie waarin de desbetreffende luchtvaartvertoning overeenkomstig tabel 2 van de bijlage behorend, bij deze regeling, wordt ingedeeld.
3. Indien de organisator een vertoningdirecteur aanwijst die bij eerdere luchtvaartvertoningen aantoonbaar in strijd heeft gehandeld met bepalingen van paragraaf 4 die in artikel 39 als strafbaar feit zijn aangemerkt, kan de minister besluiten de aanvraag van een vergunning af te wijzen.
4. Indien de vertoningdirecteur gedurende drie kalenderjaren niet belast is met de leiding van een luchtvaartvertoning in de in tabel 2 van de bijlage, behorend bij deze regeling, vermelde hoogste categorie waarvoor hij de vereiste ervaring had, wordt hij één categorie lager ingedeeld.
5. De vertoningdirecteur is niet tegelijkertijd deelnemer aan de luchtvaartvertoning waarvoor hij krachtens het eerste lid is aangewezen.

Artikel 10

De organisator dient zich voor het houden van een luchtvaartvertoning te verzekeren voor aansprakelijkheid jegens derden.

Artikel 11

1. In de vergunning voor een luchtvaartvertoning kan in bijzondere gevallen de voorwaarde worden opgenomen dat de vertoningdirecteur een veiligheidscommissie instelt.
2. De veiligheidscommissie bestaat uit ten minste twee leden met aantoonbaar relevante ervaring om de diverse onderdelen van het vertoningprogramma te kunnen beoordelen.
3. De veiligheidscommissie adviseert de vertoningdirecteur gevraagd en ongevraagd ten aanzien van veiligheidsaspecten bij de voorbereiding en uitvoering van een luchtvaartvertoning.
4. Indien een veiligheidscommissie is ingesteld, wordt het verslag, bedoeld in artikel 29, mede ondertekend door de voorzitter van de veiligheidscommissie.

§ 4. Verplichtingen voor de vertoningdirecteur

Artikel 12

De vertoningdirecteur houdt bij de vaststelling van publiekgebied, publieklijn, vertoninglijn, vertoningsterrein en vertoninggebied ten minste rekening met:

- a. de nabijheid van luchtvaartterreinen, luchtvaartlocaties dan wel andere evenementen in de lucht;
- b. stedelijke gebieden;
- c. de kwalificatie van het luchtruim, ingevolge de door de Luchtverkeersleiding Nederland uitgegeven luchtvaartkaarten;
- d. de gesteldheid en de afmetingen van het gedeelte van het vertoningsterrein dat wordt gebruikt wanneer demonstratietoestellen op het vertoningsterrein zullen starten of landen, en
- e. de toegankelijkheid van het vertoningsterrein, met name voor voertuigen van de hulpdiensten.

Artikel 13

De vertoningdirecteur draagt er zorg voor dat:

- a. de publiekgebieden worden beperkt tot één zijde van het vertoningsterrein en dat deze niet worden gelokaliseerd onder de in- en uitvliegsector van het vertoningsterrein;
- b. voorafgaand en tijdens de vertoningvluchten doeltreffende afzettingen worden geplaatst om te voorkomen dat het publiek toegang krijgt tot het vertoningsterrein;
- c. uitsluitend de daartoe bevoegde personen worden toegelaten tot het vertoningsterrein en de gebieden die zijn aangewezen voor het tanken en vullen van demonstratietoestellen;
- d. toeschouwers alleen worden toegelaten tot het publiekgebied;
- e. demonstratietoestellen en andere apparatuur, wanneer deze worden bijgetankt, ten minste 15 meter van het publiek verwijderd zijn. Indien ballonnen, luchtschepen of balloncilinders worden gevuld met waterstofgas, wordt deze afstand verhoogd tot ten minste 40 meter;
- f. de vertoninglijn herkenbaar is vanuit de lucht.

Artikel 14

De vertoningdirecteur draagt er zorg voor dat:

- a. hulpdiensten beschikbaar zijn, en
- b. een bij de in onderdeel a bedoelde hulpdiensten bekend plan voor noodsituaties beschikbaar is, afgestemd op de luchtvaartvertoning en de daaraan deelnemende demonstratietoestellen.

Artikel 15

De vertoningdirecteur draagt er zorg voor dat:

- a. een centrale post voor communicatie is ingericht, waarbij is voorzien in verbindingen naar in ieder geval de vertoningdirecteur en, voor zover aanwezig, de luchtverkeersleider dan wel de luchtvaartterreininformatieverstrekker;
- b. hij bereikbaar is voor alle bij de luchtvaartvertoning betrokken instanties;
- c. een doeltreffende geluidsinstallatie aanwezig is om het publiek toe te spreken;
- d. indien een luchtvaartvertoning wordt gehouden ingevolge een vergunning op grond van artikel 5 onderscheidenlijk artikel 6, een luchtvaartgrondstation onderscheidenlijk een mobiel luchtvaartstation beschikbaar is voor de luchtvaartterreininformatieverstrekker.

Artikel 16

De vertoningdirecteur zorgt ervoor dat:

- a. een op de locatie van de luchtvaartvertoning toegesneden vertoningprogramma wordt samengesteld;
- b. de onderdelen van het vertoningprogramma tijdens de luchtvaartvertoning te allen tijde van elkaar gescheiden blijven.

Artikel 17

1. De vertoningdirecteur stemt de vertoningvluchten en de plaatselijke vluchten af met, voor zover aanwezig, de plaatselijke luchtverkeersleidingdienst, de luchtvaartterreininformatieverstrekker en de havenmeester.
2. De vertoningdirecteur draagt er zorg voor dat plaatselijke vluchten en vertoningvluchten niet gelijktijdig plaatsvinden binnen het vertoninggebied.

Artikel 18

1. De vertoningdirecteur laat als deelnemer aan een luchtvaartvertoning slechts toe een persoon die beschikt over een geldige vertoninglicentie, afgegeven door de Nederlandse Air Display Association op basis van de eisen van tabel 3 van de bijlage, behorend bij deze regeling, of van een daarmee gelijk te stellen licentie, afgegeven door de bevoegde autoriteit van een Staat dan wel door een door die autoriteit erkende organisatie.
2. De vertoningdirecteur kan van een persoon ten aanzien van wie twijfel bestaat omtrent de nodige vaardigheid om zijn onderdeel op veilige wijze uit te voeren, eisen dat die persoon zijn onderdeel voorvliegt voor een beoordelaar.

Artikel 19

De vertoningdirecteur zorgt ervoor dat uitsluitend:

- a. deelnemers en demonstratietoestellen tot de luchtvaartvertoning worden toegelaten die vermeld zijn in het vertoningprogramma, of deelnemers of demonstratietoestellen van gelijke soort en kwaliteit ter vervanging daarvan;
- b. het vertoningprogramma wordt uitgevoerd, behoudens bijzondere omstandigheden die de vertoningdirecteur noodzaken de volgorde van het vertoningprogramma te wijzigen of onderdelen daarvan te laten vervallen mits een veilige uitvoering van de luchtvaartvertoning gewaarborgd blijft.

Artikel 20

1. De vertoningdirecteur stelt een schriftelijke instructie op die op een zodanig tijdstip aan de deelnemers wordt toegezonden, dat deze hiervan genoegzaam kennis kunnen nemen. Deze schriftelijke instructie bevat ten minste:
 - a. de plaats, de datum, de tijd en de duur van de luchtvaartvertoning;
 - b. het vertoningprogramma;
 - c. het tijdstip van de mondelinge instructie(s);
 - d. een kaart van de locatie waarop zijn aangegeven de ligging van de publieklijn, de vertoninglijn, het vertoningterrein, het vertoninggebied, de wachtgebieden en het BVG, voor zover van kracht;
 - e. informatie betreffende:
 - 1°. aankomst en vertrek van de deelnemers,
 - 2°. van belang zijnde radiofrequentie(s),
 - 3°. procedures tijdens de luchtvaartvertoning,
 - 4°. voor de luchtvaartvertoning van belang zijnde bijzonderheden;
 - f. de plaatselijke vluchten, en
 - g. procedures voor behandeling van de demonstratietoestellen op de grond, taxiën, parkeren en tanken, uitsluitend indien deze anders zijn dan de gebruikelijke.
2. De vertoningdirecteur heeft een kopie van de vergunning ter inzage voor de deelnemers.
3. De vertoningdirecteur draagt er zorg voor dat op iedere dag van de luchtvaartvertoning ten behoeve van de uitvoering van de onderdelen onder zijn leiding een mondelinge instructie, onder

meer bevattend de meest recente informatie, aan de deelnemers wordt gegeven. Tijdens deze mondelinge instructie worden ten minste besproken:

- a. paragraaf 5 van deze regeling;
- b. de plaatselijke vluchten;
- c. de weersomstandigheden, zowel de actuele als de voor de duur van de vertoning verwachte;
- d. een gedetailleerd vertoningprogramma met inbegrip van radio-oproepnamen en vliegactiviteiten voor en na de luchtvaartvertoning;
- e. informatie betreffende:
 - 1° . bij de luchtvaartvertoning te gebruiken radiofrequentie(s),
 - 2° . procedures tijdens de luchtvaartvertoning, en
 - 3° . voor de luchtvaartvertoning van belang zijnde bijzonderheden;
- f. de ligging van de publieklijn, de vertoninglijn, het vertoningsterrein, het vertoninggebied, de wachtgebieden en het BVG, voor zover van kracht.

Artikel 21

1. De vertoningdirecteur laat vertoningvluchten plaatsvinden onder weersomstandigheden die gelijk aan of gunstiger zijn dan de minimum weersomstandigheden vermeld in tabel 4 van de bijlage, behorend bij deze regeling. Indien restrictievere eisen ten aanzien van weersomstandigheden zijn gesteld op grond van de luchtverkeersdienstverleningsklasse, vastgesteld ingevolge artikel 18 van de Regeling luchtverkeersdienstverlening, ter plaatse of in de aanwijzing van een BVG, dan gelden die in plaats van tabel 4 van de bijlage, behorend bij deze regeling.
2. De vertoningdirecteur draagt er zorg voor dat vooraf en tijdens de luchtvaartvertoning rekening wordt gehouden met meteorologische variabelen, waaronder in ieder geval windsnelheid en neerslag.

Artikel 22

Indien met categorie A demonstratietoestellen langs- en kunstvluchten worden uitgevoerd, draagt de vertoningdirecteur er zorg voor dat:

- a. de minimum scheidingsafstanden tussen de vertoninglijn en de publieklijn bedoeld in tabel 5 van de bijlage, behorend bij deze regeling, in acht worden genomen;
- b. de hartlijn van de baan zich ten minste 75 meter van de publieklijn bevindt, en
- c. tussen enig onderdeel van een taxiënd demonstratietoestel en het publiek zich een afstand van 15 meter plus de halve spanwijdte dan wel de halve rotordiameter bevindt.

Artikel 23

1. Indien met categorie B demonstratietoestellen wordt gevaren, draagt de vertoningdirecteur er zorg voor dat:
 - a. de minimum scheidingscriteria, bedoeld in tabel 6 van de bijlage, behorend bij deze regeling, tussen de publieklijn en enig deel van demonstratietoestellen of hun verankeringspunten in acht worden genomen;
 - b. ballonvaarten in plaats of tijd afdoende zijn gescheiden van andere vliegactiviteiten;
 - c. maximaal 35 van deze demonstratietoestellen tegelijkertijd opstijgen;
 - d. per etmaal niet meer dan 70 van deze demonstratietoestellen opstijgen.
2. In afwijking van artikel 13, onderdelen c en d, mogen bemanningleden en passagiers van deze demonstratietoestellen zich bevinden op het vertoningsterrein.

Artikel 24

1. Indien een onderdeel bestaat uit het valschermspringen of dit mede omvat, vindt dat onderdeel plaats in overeenstemming met de Regeling valschermspringen, met dien verstande dat de vertoningdirecteur ervoor zorg draagt dat:
 - a. het landingsgebied niet dichterbij dan 15 meter bij de publieklijn ligt;
 - b. het landingsterrein zodanig wordt gemarkeerd dat het voor iedere valschermspringer duidelijk herkenbaar is vanaf de hoogte waarop wordt gesprongen;
 - c. radiocontact wordt onderhouden met het toestel waaruit de afsprong plaatsvindt, en
 - d. de afsprong niet plaatsvindt alvorens hij daarmee heeft ingestemd.
2. De vertoningdirecteur draagt er zorg voor dat van de demonstratietoestellen aan de grond geen propellers, straalmotoren of rotorbladen ronddraaien of aanstaan binnen 250 meter van het doelgebied, zolang een valschermspringer met zijn afdaling bezig is.
3. Indien vluchten met modelvliegtuigen plaatsvinden, draagt de vertoningdirecteur er zorg voor dat:
 - a. deze plaatsvinden in overeenstemming met de Regeling modelvliegtuigen;
 - b. niet wordt gevlogen met niet bestuurbare modelvliegtuigen;
 - c. zenders en frequenties correct worden gebruikt.

4. Indien met zeilvliegtuigen vluchten worden uitgevoerd, draagt de vertoningdirecteur er zorg voor dat deze plaatsvinden in overeenstemming met de Regeling zeilvliegen.

5. Indien kabelvliegers en kleine ballons worden opgelaten, draagt de vertoningdirecteur er zorg voor dat deze worden opgelaten in overeenstemming met de Regeling kabelvliegers en kleine ballons.

Artikel 25

De vertoningdirecteur draagt er zorg voor dat:

- a. bij de start van een schermvliegtuig of zeilvliegtuig met een lierinstallatie in geen geval inbreuk wordt gemaakt op de scheidingsafstanden tussen het publiek en de lierinstallatie, de lierkabel en de schermvliegtuigen of zeilvliegtuigen;
- b. het opstijgen en doen opstijgen van schermvliegtuigen of zeilvliegtuigen door middel van een lier zodanig geschiedt dat de lierkabel niet in het publiekgebied valt;
- c. de valschermszweeftoestellen, schermvliegtuigen of zeilvliegtuigen niet vliegen boven het publiek en niet landen in het publiek;
- d. de minimale afstand tussen enerzijds publiek en anderzijds valschermszweeftoestellen, schermvliegtuigen, zeilvliegtuig, sleepkabel, lier of uitgevierde lierkabel ten minste 30 meter bedraagt.

Artikel 26

De vertoningdirecteur draagt er zorg voor dat de deelnemer paragraaf 5 van deze regeling in acht neemt.

Artikel 27

Indien een veiligheidscommissie is ingesteld, houdt de vertoningdirecteur rekening met de adviezen van de commissie.

Artikel 28

De vertoningdirecteur is tot één uur na de uitvoering van het laatste onderdeel bereikbaar en oproepbaar.

Artikel 29

De vertoningdirecteur brengt binnen dertig dagen na het houden van een luchtvaartvertoning daarvan verslag uit aan de minister. In het verslag worden in het bijzonder afwijkingen tijdens de luchtvaartvertoning ten opzichte van de vergunning en deze regeling opgenomen.

§ 5. Verplichtingen voor de deelnemer

Artikel 30

1. Een deelnemer voert geen vertoningvlucht uit, indien hij niet een mondelinge instructie als bedoeld in artikel 20, derde lid, heeft ontvangen.
2. Een deelnemer die niet in staat is te voldoen aan het eerste lid, neemt voor de aanvang van de luchtvaartvertoning contact op met de vertoningdirecteur om de mondelinge instructie als bedoeld in artikel 20, derde lid, te ontvangen.

Artikel 31

Indien bij een luchtvaartvertoning een luchtvaartterreininformatieverstrekker aanwezig is, is de deelnemer verplicht:

- a. voor aanvang van zijn onderdeel contact op te nemen met de luchtvaartterreininformatieverstrekker om zich te laten informeren over de juistheid van het tijdstip van zijn vertoningvlucht en over de situatie in het vertoninggebied;
- b. voor aanvang van zijn onderdeel voortdurend op de aangewezen radiofrequentie(s) te luisteren en een tweezijdige radioverbinding tot stand te brengen met de luchtvaartterreininformatieverstrekker;
- c. naar aanleiding van door de luchtvaartterreininformatieverstrekker verkregen inlichtingen zodanige actie te ondernemen dat bij de uitvoering van zijn vertoningvlucht personen of zaken niet in gevaar worden of kunnen worden gebracht;
- d. de luchtvaartterreininformatieverstrekker op de hoogte te brengen van de afronding van de uitvoering van zijn vertoningvlucht.

Artikel 32

1. De deelnemer zorgt ervoor dat zich, buiten de bemanningsleden die essentieel zijn voor de vertoningvlucht, geen andere personen aan boord van een demonstratietoestel bevinden.
2. Het eerste lid is niet van toepassing op een vertoningvlucht met een ballon of valschermscherm.
3. Het eerste lid is niet van toepassing ten aanzien van personen die zich aan boord van het demonstratietoestel bevinden teneinde ervaring als deelnemer op te doen, op voorwaarde, dat de vertoningdirecteur dit heeft aangegeven bij de aanvraag om vergunning.

Artikel 33

De deelnemer vliegt niet met het demonstratietoestel boven het publiekgebied, tenzij het betreft:

- a. kabelvliegers;
- b. valschermschermen, waarbij niet beneden een hoogte van 15 meter over een publiekgebied wordt gevlogen;
- c. een vliegtuig dat een groep valschermspringers aan boord heeft en dat bezig is om in een positie te komen voor het afwerpen van de groep, maar niet beneden een hoogte van 450 meter boven de grond;
- d. vrije ballonnen, maar niet beneden de hoogten, bedoeld in tabel 6 van de bijlage, behorend bij deze regeling.

Artikel 34

1. De deelnemer met een categorie A demonstratietoestel, zeilvliegtuig of valschermschermzweeftoestel zorgt ervoor dat ten aanzien van de vertoningvlucht:

- a. de vertoninglijn en de minimum scheidingsafstanden zoals weergegeven in tabel 5 van de bijlage, behorend bij deze regeling, in acht worden genomen;
- b. de vastgestelde minimum vlieghoogte in acht wordt genomen;
- c. de uitvoering van het onderdeel niet eerder begint dan na het bereiken van de vastgestelde minimum vlieghoogte en de minimum scheidingsafstanden zoals weergegeven in tabel 5 van de bijlage, behorend bij deze regeling, in acht worden genomen ;
- d. manoeuvres zodanig worden uitgevoerd dat de vertoninglijn niet wordt overschreden;
- e. geen convergerende vluchten in de richting van de vertoninglijn worden uitgevoerd;
- f. in een luchtverkeersdienstverleningsgebied klasse C tot en met G niet wordt gevlogen met een snelheid groter dan 250 knopen, tenzij in de vergunning dan wel bij de aanwijzing van een BVG een grotere snelheid is vastgesteld;
- g. de minimum zichtweersomstandigheden zoals vastgesteld in tabel 4 van de bijlage, behorend bij deze regeling, in acht worden genomen, onverminderd het bepaalde in artikel 20.

2. Het eerste lid, onderdelen a en b, is niet van toepassing indien:

- a. het demonstratietoestel na de start een van het publiek af gerichte bocht maakt teneinde naar de vertoninglijn en de minimum hoogte te worden gemanoeuvreed;
- b. na het beëindigen van de vertoning het demonstratietoestel naar de baan wordt gestuurd, waarbij de hartlijn van de baan niet richting het publiek overschreden wordt.

Artikel 35

Een deelnemer met een demonstratietoestel aan de grond dat voorzien is van propellers, straalmotoren of rotors, zorgt ervoor dat deze worden stilgezet indien:

- a. dit zich bevindt binnen 250 meter van het doelgebied van een valschermspringer tijdens diens demonstratie, en
- b. een valschermspringer in de richting van zijn toestel zweeft.

Artikel 36

1. De deelnemer die gebruik maakt van een valschermscherm, zorgt ervoor dat het hoofdvalschermscherm op een hoogte van ten minste 450 meter boven de grond volledig geopend is. Anders dan in geval van nood wordt het reservevalschermscherm niet gebruikt.

2. De deelnemer zorgt ervoor dat, indien hij met een valschermschermzweeftoestel, schermvliegtuig of zeilvliegtuig vliegt, het toestel geen inbreuk maakt op de scheidingsafstand die ten minste gelijk is aan de lengte van de uitgevierde lijn tussen een lierinstallatie of ander hulpmiddel en het toestel met dien verstande dat de horizontale afstand niet minder is dan 30 meter.

§ 6. Luchtvaartterreininformatieverstrekker

Artikel 37

De luchtvaartterreininformatieverstrekker heeft de vereiste ervaring behorend bij de categorie waarin de desbetreffende luchtvaartvertoning op grond van tabel 2 van de bijlage, behorend bij deze regeling, is ingedeeld.

Artikel 38

De luchtvaartterreininformatieverstrekker geeft in het kader van de luchtvaartvertoning aan de deelnemer informatie over:

- a. luchtverkeersactiviteiten op het vertoningsterrein, in het vertoninggebied en eventueel aangewezen BVG;
- b. het precieze tijdstip van vertrek van een vertoningvlucht in het kader van een onderdeel van het vertoningprogramma, alsmede de situatie in het vertoninggebied onmiddellijk voorafgaand aan de uitvoering van een onderdeel;
- c. krachtens artikel 19 onderdeel b, door de vertoningdirecteur aangebrachte wijzigingen in de vertrektijd van een vertoningvlucht in het kader van een onderdeel van het vertoningprogramma;
- d. eventuele calamiteiten op de grond of in de lucht die voor een veilige uitvoering van een onderdeel van belang kunnen zijn;
- e. aanwijzingen van de vertoningdirecteur in het kader van de luchtvaartvertoning.

§ 7. Overige bepalingen

Artikel 39

Overtreding van de artikelen 9, vijfde lid, 13, onderdelen a tot en met e, 16, onderdeel b, 17, tweede lid, 18, eerste lid, 19, 20, eerste en derde lid, 21 tot en met 26, 28 en 30 tot en met 38 wordt aangemerkt als een strafbaar feit.

Artikel 40

Deze regeling treedt in werking met ingang van de tweede dag na de dagtekening van de Staatscourant waarin zij wordt geplaatst.

Artikel 41

Deze regeling wordt aangehaald als: Regeling luchtvaartvertoningen.

Deze regeling zal met de toelichting in de Staatscourant worden geplaatst.

De Staatssecretaris van Verkeer en Waterstaat,

mw drs M.H. Schultz van Haegen

Toelichting

1. Inleiding.

Luchtvaartvertoningen vormen een spectaculair onderdeel van de luchtvaart. Met het oog op een zo groot mogelijke risicobeperking voor zowel de bestuurders van demonstratietoestellen als voor het publiek en derden op de grond dient een luchtvaartvertoning met de nodige voorzorgsmaatregelen plaats te vinden. Deze regeling voorziet hierin door eisen te stellen aan de locatie en de organisatie van een luchtvaartvertoning. Voorts zijn verplichtingen voor vertoningdirecteur en deelnemer aan een luchtvaartvertoning in de regeling neergelegd. Tot slot is de rol van de luchtvaarterreininformatieverstrekker bij een luchtvaartvertoning ingevuld.

2. Locaties voor luchtvaartvertoningen.

Voor het houden van een luchtvaartvertoning is met het oog op de risicobeperking de locatie van groot belang. In deze regeling worden eisen gesteld aan de locaties en de voorwaarden waaronder luchtvaartvertoningen daar kunnen worden gehouden. Aan deze eisen dient te worden voldaan ter verkrijging van een vergunning voor het houden van een luchtvaartvertoning. Er wordt onderscheid gemaakt tussen het verlenen van vergunningen voor een luchtvaartvertoning:

- A. op een aangewezen luchtvaarterrein, met of zonder luchtverkeersleiding;
- B. op een terrein, niet zijnde luchtvaarterrein;
- C. boven water- of landoppervlakken, waarbij op die oppervlakken niet wordt gestart of geland.

Als uitgangspunt geldt dat luchtvaartvertoningen zonder beperkingen alleen mogelijk zijn op een aangewezen luchtvaarterrein indien luchtverkeersleiding gegeven wordt (artikel 4). Onder bepaalde voorwaarden zijn luchtvaartvertoningen mogelijk op een aangewezen luchtvaarterrein waar geen luchtverkeersleiding gegeven wordt (artikel 5). Voorts kunnen onder meer stringente voorwaarden luchtvaartvertoningen worden gehouden op een terrein, niet zijnde luchtvaarterrein (artikel 6). Tot slot kunnen luchtvaartvertoningen onder voorwaarden worden toegestaan op locaties boven wateroppervlakken dan wel boven land waar niet wordt gestart of geland (artikel 7).

Ad A. Luchtvaartvertoning op een aangewezen luchtvaarterrein.

Aangewezen luchtvaarterreinen beschikken standaard over de noodzakelijke infrastructuur en hebben vaste protocollen met betrekking tot op de luchtvaartvertoning toegesneden rampenbestrijding, waarmee geregeld wordt geïnfund. Een aangewezen luchtvaarterrein is, compleet met de omgeving tot binnen een straal van circa zes kilometer rondom het terrein, volledig in kaart gebracht. Eventuele obstakels en industrie binnen dit gebied zijn bekend en de risico's die deze obstakels en industrie met zich brengen zijn inzichtelijk. Voorts waarborgt de aanwijzing van een luchtvaarterrein een zodanig ruimtebeslag dat een vrije ruimte aanwezig is waar het publiek geen toegang heeft. Een vertoning zal boven deze vrije ruimte plaatsvinden.

Bij aanwezigheid van een luchtverkeersleider die het luchtverkeer kan separeren en aanwijzingen kan geven aan de deelnemers, is een luchtvaartvertoning op een aangewezen luchtvaarterrein mogelijk waaraan nagenoeg geen beperkingen worden opgelegd. Aan een luchtvaartvertoning op een aangewezen luchtvaarterrein zonder luchtverkeersleiding worden in artikel 5 van de regeling extra eisen gesteld ten aanzien van de veilige uitvoering van een luchtvaartvertoning.

Ad B. Luchtvaartvertoning op een terrein, niet zijnde luchtvaarterrein.

Een luchtvaartvertoning op een terrein, niet zijnde luchtvaarterrein (hierna: niet-luchtvaarterrein) wordt verantwoord geacht, indien aan nog een aantal stringente eisen zoals vastgelegd in artikel 6, is voldaan. Dit houdt verband met de locatiekeuze voor alsmede de afwezigheid van luchtverkeersleiding bij een luchtvaartvertoning. Direct hieraan gerelateerd zijn de in artikel 6 opgenomen beperkende voorwaarden. Deze strekken alle tot beperking van de risico's die met een luchtvaartvertoning kunnen samenhangen.

Een niet-luchtvaarterrein heeft (anders dan een aangewezen luchtvaarterrein) namelijk niet per definitie een ruimtebeslag met een gewaarborgde vrije ruimte. Indien op zo'n terrein een vertoning wordt gehouden, zal ad hoc een scheiding worden aangebracht tussen de luchtvaartuigen en het publiek op het (redelijk beperkte) vertoningsterrein zelf, maar deze scheiding zal zich niet uitstrekken buiten het vertoningsterrein. Voorts is niet inzichtelijk of zich net buiten het vertoningsterrein zelf, op plekken waar dus wel boven wordt gevlogen, of soms zelfs op locaties die zich bevinden op het vertoningsterrein, geen onbekende obstakels of gevaarlijke industrie bevinden. Daarom is in artikel 6, eerste lid, bepaald dat het vertoninggebied niet alleen wordt vastgesteld aan de hand van tabel 1 van de bijlage, maar ook dat het gebied in kaart wordt

gebracht met betrekking tot bepaalde vormen van grondgebruik en obstakels hoger dan 45 meter waarbij de vertoningdirecteur dient aan te geven welke maatregelen hij heeft getroffen om een veilige uitvoering van de luchtvaartvertoning te garanderen.

Ad C. Luchtvaartvertoning boven water- dan wel landoppervlakken

Een luchtvaartvertoning boven water- dan wel landoppervlakken waarbij niet wordt gestart of geland, zal dienen te voldoen aan de eisen ten aanzien van inrichting van het vertoninggebied zoals vastgelegd in artikel 6, eerste lid, onderdelen a tot en met c, en tweede lid, onderdelen e en f. Bij een waterlocatie is sprake van een natuurlijke afscheiding tussen het publiek en de deelnemers aan de luchtvaartvertoning. Daarnaast zijn de waterlijn en de vertoninglijn voor de deelnemers ten behoeve van de navigatie een makkelijk te herkennen en duidelijk identificatie punt. Vanaf het strand of de zeewering is de vertoning goed te zien, aangezien er onder meer geen bomen en gebouwen zijn die het zicht belemmeren. De kans dat er iets gebeurt voorbij de vertoninglijn – een lijn die aangeeft tot hoever een demonstratietoestel de publieklijn mag naderen – in de richting van het publiek is uitermate gering. Verder zijn op of boven zee en grote wateroppervlakken vrijwel geen voor de luchtvaartvertoningen risicoverhogende obstakels. Boven zee is sprake van een groot gebied waar vliegtuigen kunnen herformeren, zonder dat derden daarbij risico lopen of overlast ondervinden. Voorts dienen alle demonstratietoestellen in en uit te vliegen en mogen er geen landingen plaatsvinden op het strand. Waterlandingen door watervliegtuigen mogen wel worden uitgevoerd.

3. Organisatie van een luchtvaartvertoning en verplichtingen voor vertoningdirecteur en deelnemer

In de paragrafen 3 tot en met 5 van deze regeling zijn bepalingen opgenomen in verband met de organisatie van een luchtvaartvertoning en verplichtingen voor de vertoningdirecteur en de deelnemer. De bepalingen in de paragrafen 3 tot en met 5 betreffen voorschriften die in acht moeten worden genomen bij het gebruik van de vergunning voor de luchtvaartvertoning. Die bepalingen zijn in belangrijke mate geënt op de voorschriften die voorheen aan vergunningen voor luchtvaartvertoningen werden verbonden. Die voorschriften zijn ontleend aan op internationaal niveau tot stand gekomen richtlijnen zoals de Information Leaflet no. 5 (The Organisation and Conduct of Flying Displays) van de Joint Aviation Authorities en de Engelse CAP 403 (Flying Displays and Special Events: A guide to Safety and Administrative Arrangements). De organisator van een luchtvaartvertoning hoeft niet per se affiniteit te hebben met de luchtvaart. Mede in verband hiermee is in paragraaf 3 van deze regeling bepaald dat de organisator een persoon aanwijst die namens hem belast is met de leiding en veilige uitvoering van een luchtvaartvertoning waarvoor een vergunning is verleend: de vertoningdirecteur. De vertoningdirecteur bekleedt de centrale functie bij een luchtvaartvertoning. In paragraaf 4 van deze regeling zijn de verantwoordelijkheden van de vertoningdirecteur neergelegd. Verder zijn in paragraaf 5 verplichtingen voor deelnemers opgenomen die betrekking hebben op de uitvoering van een onderdeel met een specifiek demonstratietoestel.

4. Luchtvaartterreininformatieverstrekker

Bij luchtvaartvertoningen is belangrijk dat gerichte informatie wordt verstrekt aan de deelnemers over de omstandigheden die van belang zijn voor de uitvoering van hun demonstratie. Belangrijke informatie voor de deelnemer betreft onder meer het juiste tijdstip van het onderdeel en de aan- of afwezigheid van overig luchtverkeer in het vertoninggebied. Een luchtvaartterreininformatieverstrekker kan deze informatie geven. Zijn taken zijn neergelegd in paragraaf 6 van deze regeling. Waar een luchtverkeersleider actief dirigerend optreedt door separatie in het luchtverkeer aan te brengen en aanwijzingen te geven aan de deelnemers over het tijdstip en volgorde van optreden, heeft een luchtvaartterreininformatieverstrekker tijdens een luchtvaartvertoning meer een passieve rol. Een luchtvaartterreininformatieverstrekker heeft immers niet de bevoegdheid om separatie in het luchtverkeer aan te brengen en aanwijzingen en klaringen te geven. Ten behoeve van een luchtvaartvertoning kan een bijzonder luchtverkeersgebied (BVG) worden aangewezen waarbinnen de demonstraties plaatsvinden. Het is de verantwoordelijkheid van de vertoningdirecteur van een luchtvaartvertoning het vertoningprogramma zodanig samen te stellen dat de diverse onderdelen op verantwoorde wijze na elkaar plaatsvinden. Het is de taak van de luchtvaartterreininformatieverstrekker om informatie te geven over het precieze tijdstip van vertrek van ieder onderdeel van het vertoningprogramma alsmede de situatie in het vertoninggebied onmiddellijk voorafgaand aan de uitvoering van een onderdeel (zie artikel 37). Pendant hiervan is de taak van de deelnemer alvorens te starten met zijn demonstratie contact op te nemen met de luchtvaartterreininformatieverstrekker om zich te laten informeren over het tijdstip waarop zijn onderdeel gepland is en over de situatie in het vertoninggebied (zie artikel 30). Daarna zal de deelnemer zijn onderdeel kunnen uitvoeren waarbij de voorgeschreven procedure voor het naderen en verlaten van het vertoninggebied in acht wordt

genomen. Voorts is van belang dat de deelnemer de luchtvaartterreininformatieverstrekker op de hoogte brengt van wijzigingen in en afronding van de uitvoering van zijn vertoningvlucht. In geval van onvoorziene omstandigheden die de veiligheid van de luchtvaartvertoning in gevaar kunnen brengen kan de luchtvaartterreininformatieverstrekker informatie hierover verstrekken. Het is aan de deelnemer en de vertoningdirecteur om adequate actie te ondernemen. Hoewel daartoe niet bevoegd, zal de luchtvaartterreininformatieverstrekker in uitzonderlijke omstandigheden - zoals een luchtvaartuig dat tijdens de uitvoering van een onderdeel het vertoninggebied invliegt - een aanwijzing dienen te geven aan de deelnemer juist om de veiligheid van de luchtvaartvertoning te waarborgen. Ook dient de luchtvaartterreininformatieverstrekker aanwijzingen die hij van de vertoningdirecteur ontvangt als informatie door te geven aan de deelnemers. Nadrukkelijk zij vermeld dat de luchtvaartterreininformatieverstrekker geen enkele bemoeienis heeft met de wijze van uitvoering van de vertoningvlucht. Nadat de luchtvaartterreininformatieverstrekker de nodige informatie heeft gegeven die voor de deelnemer van belang is voor de aanvang van zijn vertoningvlucht, is de verdere uitvoering van de vertoningvlucht volledig in handen van de deelnemer, waarbij wordt aangetekend dat de deelnemer altijd primair verantwoordelijk is voor de uitvoering van zijn vlucht.

5. Totstandkoming van de regeling

De onderhavige regeling is voorbereid in een breed samengestelde interdepartementale werkgroep bestaande uit: de Hoofddirectie Juridische Zaken van het ministerie van Verkeer en Waterstaat, de divisie Luchtvaart van de Inspectie Verkeer en Waterstaat, de Koninklijke Luchtmacht, de Koninklijke Marine, het ministerie van Defensie, de Luchtverkeersleiding Nederland, het Openbaar Ministerie, en het Korps Landelijke Politie Diensten, Politie Luchtvaartdienst. De luchtvaartvertoningsector is in de gelegenheid gesteld commentaar te leveren op de conceptregeling. Het Platform Nederlandse Luchtvaart (PNL) heeft namens de luchtvaartvertoningsector die inbreng geleverd. Van de kennis en expertise van de in het PNL verenigde vertegenwoordigers van organisatoren van, deelnemers aan en vertoningdirecteuren bij luchtvaartvertoningen, is dankbaar en nuttig gebruik gemaakt. Het ligt in het voornemen om na twee jaren de werking en doeltreffendheid van de onderhavige regeling tegen het licht te houden.

6. Artikelen

Artikel 2

Op grond van artikel 2 van de R.T.L. gelden de bepalingen van de R.T.L. niet ten aanzien van militaire luchtvaartuigen, de leden van het boordpersoneel, passagiers en lading van deze luchtvaartuigen alsmede ten aanzien van militaire luchtvaartterreinen. Bij een luchtvaartvertoning waarvoor ingevolge artikel 158 R.T.L. een vergunning wordt verleend, gelden de bepalingen van de R.T.L. ten aanzien van de door artikel 2 R.T.L. uitgezonderde groep evenmin. In artikel 2 van deze regeling zijn militaire deelnemers en militaire demonstratietoestellen dan ook uitgezonderd.

Artikel 3

In het eerste lid is een voorziening getroffen voor het geval dat militaire deelnemers of militaire demonstratietoestellen deelnemen aan een civiele luchtvaartvertoning. Er vindt dan afstemming plaats tussen het ministerie van Verkeer en Waterstaat en het ministerie van Defensie waarna in de vergunning wordt vastgelegd welke regels door het ministerie van Defensie worden voorgeschreven ten aanzien van die militaire deelnemers of militaire demonstratietoestellen. Wat betreft een luchtvaartvertoning waarvoor door de Minister van Defensie een vergunning is verleend, waaraan naast militairen burgerdeelnemers meedoen, wordt in het tweede lid bepaald dat de artikelen 32 tot en met 36 en 39 van deze regeling op hen van toepassing zijn. Deze artikelen hebben betrekking op de verplichtingen van een deelnemer. Met deze voorziening wordt gewaarborgd dat ook bij een militaire luchtvaartvertoning de bovengenoemde regels van toepassing zijn op burgerdeelnemers aan een dergelijke luchtvaartvertoning.

Artikel 4

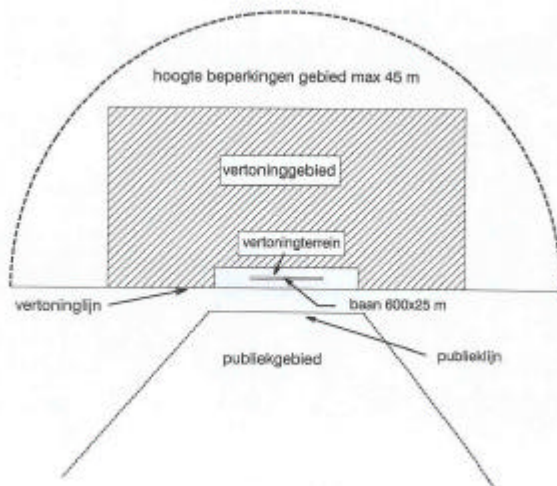
Voor aangewezen luchtvaartterreinen geldt (met uitzondering van terreinen die uitsluitend ingericht zijn voor het gebruik van hetschroefvliegtuigen) de Brandweerregeling Burgerluchtvaartterreinen, waarin specifieke eisen aan de brandweer ter plaatse zijn gesteld. Op grond hiervan is er op aangewezen luchtvaartterreinen standaard een veelheid van voorzieningen aanwezig ter risicobeheersing in geval van eventuele calamiteiten en rampen. Verder zijn gemeenten, waarbinnen een aangewezen luchtvaartterrein ligt, verplicht een rampenplan te hebben dat (mede) is toegesneden op het desbetreffende luchtvaartterrein. Dit betekent dat bij vertoningen op luchtvaartterreinen altijd een op de luchtvaart toegesneden rampenplan aanwezig is. In die gemeenten zijn standaard ook rampenbestrijders beschikbaar die geoefend zijn in het bestrijden van luchtvaartgerelateerde rampen. Verder heeft een aangewezen luchtvaartterrein standaard de beschikking over een meteorologische dienst. Zo'n dienst kan op zeer korte termijn informatie geven over weersomstandigheden die van invloed kunnen zijn op de veiligheid tijdens

een luchtvaartvertoning. Vergelijkbare voorzieningen ontbreken op een niet-aangewezen luchtvaartterrein.

Artikel 5

Indien een van de in artikel 4 genoemde organisaties geen luchtverkeersleiding geeft, dan kan ingevolge deze bepaling toch een luchtvaartvertoning op een aangewezen luchtvaartterrein worden gehouden, mits voldaan wordt aan de eis dat er een procedure wordt vastgesteld voor het naderen en verlaten van het vertoninggebied door demonstratietoestellen en er een luchtvaartterreininformatieverstrekker is. Naleving van deze procedure ondervangt het ontbreken van luchtverkeersleiding.

Artikel 6



Bijgaande tekening geeft een visualisatie van een gebied waarboven en waarin een luchtvaartvertoning plaatsvindt. Tabel 1 van de regeling geeft de minimum afmetingen aan benodigd luchtruim voor demonstratietoestellen gerelateerd aan de snelheid en het type demonstratie. Om de veiligheid van zowel de deelnemers als de mensen en de zaken op de grond zoveel mogelijk te waarborgen is voor het berekenen van de afmetingen en de hoogten zoveel mogelijk uitgegaan van de richtlijnen en de aanbevelingen (onder andere van het Aerodrome design manual) van Annex 14 van het ICAO-verdrag. De

vertoningslijn is de lijn die aangeeft tot hoever een demonstratietoestel de publieklijn mag naderen. Dit is veelal ook de lijn die gebruikt wordt om het demonstratietoestel te positioneren voor de demonstratie. Wat inhoudt dat men hierboven naar een minimum vlieghoogte kan vliegen, om boven het vertoningsterrein in de juiste positie te zijn voor de demonstratie. Indien er op het vertoningsterrein niet wordt geland, moet het vertoningsterrein een geprojecteerd gebied, vrij van obstakels, bevatten waar demonstratietoestellen met voortstuwingsinrichting in noodgevallen een noodlanding kunnen maken zonder het publiek in gevaar te brengen. De afmetingen van het vertoningsterrein zijn afhankelijk van de gebruikte demonstratietoestellen, zie hiervoor tabel 1 van de regeling.

Als een ontheffing wordt verleend van artikel 14 van de Luchtvaartwet en er daadwerkelijk wordt geland, moet de landingbaan voldoen aan de afmetingen genoemd in tabel 1. In dit gebied mogen geen obstakels aanwezig zijn, daarnaast mogen er geen obstakels steken door een denkbeeldig vlak van de in- en uitvliegsector die oploopt onder een hoek van 1:20 (hoogte:afstand). Ter weerszijde van het vertoninggebied en de landingbaan en van de in- en uitvliegsector mogen geen hindernissen steken door een denkbeeldig vlak onder een hoek van 1:5 (hoogte:afstand) tot een afstand van 75 meter. In de tekening is dit geïntegreerd in het vertoningsterrein. Voor de afmetingen van het vertoninggebied is gebruik gemaakt van de ruimte die het demonstratietoestel gemiddeld nodig zou hebben bij een normale operatie volgens het vlieghandboek om van 150 meter naar 60 meter te vliegen en omgekeerd. Voorts is de ruimte van belang die benodigd is voor het vliegen van een normaal patroon voor het landen en opstijgen. Dit is ook het gebied waarboven lager wordt gevlogen dan de minimumvlieghoogte en waarbij kunstvluchten worden uitgevoerd. Vanwege het kwetsbare karakter, het verhoogde risico als gevolg van de aanwezigheid van als gevaarlijk gekwalificeerde stoffen en de ongewenstheid om boven bepaalde bebouwing te vliegen, zouden er in het vertoninggebied in beginsel geen gebieden mogen liggen met het in artikel 6, eerste lid, onderdeel b genoemde grondgebruik. De vertoningdirecteur dient het in artikel 6, eerste lid, onderdeel b, genoemde grondgebruik aan de minister bekend te maken bij de aanvraag van een vergunning waarbij wordt aangegeven wat voor maatregelen zullen worden genomen ter bescherming van die gebieden. Daarnaast is er een gebied aangeduid door een halve cirkel waarbinnen, met uitzondering van het vertoningsterrein, obstakels van 45 meter of hoger moeten worden getraceerd, opdat daaromtrent zonodig voorwaarden kunnen worden opgelegd (het aanbrengen van obstakelverlichting, specifieke briefing etc.). Gekozen is voor een halve cirkel omdat niet over het publiek mag worden gevlogen en de ontheffing van de minimum vlieghoogte voornamelijk wordt gebruikt in het vertoninggebied. Mocht het positioneren van een onderdeel of

onderdelen achter of naast het publiekgebied plaatsvinden dan wordt er vanuit gegaan dat deelnemers zoveel mogelijk de gebruikelijke minimum vlieghoogte in acht nemen en rekening houden met obstakels zoals bij een normale vlucht.

Artikel 8

In verband met de duur van de behandeling van de aanvraag van een vergunning voor een luchtvaartvertoning en gelet op de hoge kosten voor het veelvuldig afgeven van dezelfde vergunning, is in dit artikel bepaald dat een jaarvergunning kan worden verleend. Als doelgroep wordt vooral gedacht aan personen of bedrijven die regelmatig een vertoningprogramma met uitsluitend een gestandaardiseerd onderdeel uitvoeren. Bij het houden van een luchtvaartvertoning op basis van dit artikel, zal voldaan moeten worden aan alle relevante toepasselijke bepalingen van de onderhavige regeling.

Artikel 9

De verantwoordelijkheid van de vertoningdirecteur is tot uiting gebracht in de in paragraaf 4 opgenomen bepalingen. Alvorens de organisator een persoon als zodanig kan aanwijzen, dient derhalve op objectieve wijze te worden vastgesteld dat die persoon, afhankelijk van de aard en omvang van de te houden vertoning, terzake kundig is. Die kundigheid vloeit voort uit en wordt bepaald door de mate van ervaring. Aldus zijn in tabel 2 minimum ervaringseisen geformuleerd voor de vertoningdirecteur. Deze bepaling en de in paragraaf 4 opgenomen bepalingen betreffen voorwaarden voor het gebruik van de vergunning.

Artikel 10

Ondanks alle maatregelen ter beperking van risico's bij een luchtvaartvertoning, is het niet ondenkbaar dat schade ontstaat. In dat verband is het van belang dat er een verzekering is voor de luchtvaartvertoning. Aangezien de organisator de houder is van de vergunning voor het houden van een luchtvaartvertoning, ligt het in de rede de verzekeringsplicht bij hem neer te leggen. Onverlet blijft dat bij eventuele aansprakelijkheid de organisator, vertoningdirecteur en deelnemer en eventueel andere partijen onderling regres kunnen halen.

Artikel 11

Bij de afweging of een veiligheidscommissie moet worden ingesteld, kunnen onder meer de aard, omvang en intensiteit van de luchtvaartvertoning dan wel van een onderdeel daarvan alsook de locatie van de luchtvaartvertoning worden betrokken. In een dergelijke situatie zal het in de rede liggen dat bij de vergunningverlening de voorwaarde wordt opgenomen dat de vertoningdirecteur een veiligheidscommissie instelt. De vertoningdirecteur zal slechts terzake kundige personen in die commissie dienen te benoemen.

Artikel 14

De inhoud en reikwijdte van een noodplan voor een vertoning dienen te worden afgestemd op de aard en omvang van de vertoning gelet op de betrokken demonstratietoestellen. Aangezien veelal de lokale hulpdiensten zullen worden ingeschakeld bij mogelijke calamiteiten tijdens een vertoning en zij ook de nodige kennis en expertise hebben wat betreft het grondgebied onderscheidenlijk de organisatie van grote evenementen, dient het calamiteitenplan in overleg met die hulpdiensten tot stand te komen.

In het plan voor noodsituaties staat aangegeven hoe de lokale autoriteiten en de verschillende hulpdiensten hebben te handelen indien een ongeval of incident met een demonstratietoestel, dan wel een andere noodsituatie plaatsvindt. Elementen die onder meer geregeld worden in het plan voor noodsituaties zijn:

- het type noodsituatie, in de lucht of op de grond;
- de instanties die bij het plan betrokken zijn, inzichtelijk gemaakt door een schema met betrekking tot de leiding over en de gecoördineerde inzet van diensten en organisaties die betrokken zijn;
- de verantwoordelijkheden en de taken van elke instantie;
- een kaart met coördinaten van het vertoningsterrein waarop alle locaties van hulpdiensten, toegangswegen en controlecentra zijn aangegeven;
- naam, aanduidingen, communicatiemiddelen en locatie van verantwoordelijke functionarissen;
- een overzicht van aan- en afvoerwegen toereikend om in het geval van calamiteiten aan- en afvoer van hulpdiensten gelijktijdig met vertrekkend publiek in goede banen te geleiden.

Artikel 16

Nadat voldaan is aan de voorwaarden voor het verkrijgen van de vergunning, te weten een van de artikelen 4,, 5, 6, 7 of 8, dient te worden voldaan aan de eisen voor het gebruik van de vergunning. De onderhavige bepaling is een essentiële voorwaarde bij het gebruik van de vergunning. Een belangrijke taak van de vertoningdirecteur is namelijk om een op de locatie van de luchtvaartvertoning toegesneden vertoningprogramma samen te stellen. Er is maatwerk nodig voor de samenstelling van een vertoningprogramma op de verschillende locaties zoals aangewezen luchtvaartterreinen (met of zonder luchtverkeersleiding), niet aangewezen luchtvaartterreinen en boven wateroppervlakken. Voorts is van belang het aantal en soort demonstratietoestellen.

Afhankelijk van het aantal demonstratietoestellen en de mix van soorten demonstratietoestellen, zal de vertoningdirecteur een voor de locatie passende vertoningprogramma dienen samen te stellen. Waar het vertoningprogramma een scheiding aanbrengt tussen de onderdelen, is het van belang dat bij de daadwerkelijke uitvoering deze scheiding wordt gehandhaafd. De vertoningdirecteur is hiervoor verantwoordelijk.

Artikel 18

Voor de verlening van vertoninglicenties is gekozen voor zelfregulering door de luchtvaartvertoningsector, mede op aandringen van de Nederlandse Air Display Association en ook omdat de noodzaak van overheidsbemoeienis uit oogpunt van veiligheid niet is gebleken. De Nederlandse Air Display Association verenigt de bij de luchtvaartvertoningen betrokken organisatoren, directeuren, deelnemers en luchtvaartterreininformatieverstrekters. Voorts is in het tweede lid de mogelijkheid geschapen om een persoon ten aanzien van wie bij de vertoningdirecteur twijfel is gerezen omtrent diens bekwaamheid om het desbetreffende onderdeel op een verantwoorde en veilige wijze uit te voeren, te laten voorvliegen alvorens hem als deelnemer aan de luchtvaartvertoning toe te laten, ook als die persoon beschikt over een vertoninglicentie.

Artikel 19

Deelname aan een luchtvaartvertoning staat alleen open voor deelnemers die zijn toegelaten tot de luchtvaartvertoning. Aangezien de praktijk leert dat er op het laatste moment veranderingen in het programma optreden, is in onderdeel a bepaald dat substitutie kan plaatsvinden van deelnemers of demonstratietoestellen van gelijke soort en kwaliteit. Staat het vertoningprogramma aldus vast dan kunnen bij de uitvoering bijzondere omstandigheden de vertoningdirecteur evenwel noodzaken de volgorde van het vertoningprogramma te wijzigen of onderdelen daarvan te laten vervallen. Onderdeel b biedt de vertoningdirecteur daarvoor de bevoegdheid. Bij bijzondere omstandigheden kan worden gedacht aan: wijzigingen in de weersgesteldheid en het uitvallen van deelnemers vanwege een defect demonstratietoestel. Uitbreiding van het vertoningprogramma met een ander programmaonderdeel is niet toegestaan.

Artikel 20

Het houden van een mondelinge instructie, ook wel briefing genoemd, vóór de aanvang van elke luchtvaartvertoning, is van het grootste belang. Daarom is in artikel 30 bepaald dat een deelnemer geen vertoningvlucht uitvoert indien hij niet de mondelinge instructie heeft ontvangen. Elke deelnemer dient bij iedere mondelinge instructie (derhalve ook die voor eventuele oefenvluchten) aanwezig te zijn. De deelnemer die slechts invliegt en daarom niet lijfelijk bij de briefing aanwezig kan zijn, dient voorafgaand aan zijn vlucht contact op te nemen met de vertoningdirecteur teneinde aldus te worden geïnstrueerd.

Artikel 21

De actuele weersomstandigheden op de dag waarop de luchtvaartvertoning wordt gehouden, zijn van groot belang voor het verloop van het vertoningprogramma. Naast de in het eerste lid geldende minimum weersomstandigheden, is van belang dat de vertoningdirecteur rekening houdt met meteorologische variabelen, waaronder in ieder geval windsnelheid en neerslag. De vertoningdirecteur zal dus adequate maatregelen dienen te treffen indien de weersomstandigheden hem daartoe nopen, teneinde te allen tijde een veilige uitvoering van de luchtvaartvertoning te kunnen waarborgen.

Artikel 26

Naast de eigen verantwoordelijkheid van de deelnemer om de voor hem geldende verplichtingen na te leven, is hier uitdrukkelijk ook een verantwoordelijkheid bij de vertoningdirecteur gelegd.

Artikel 27 en 29

De veiligheidscommissie heeft geen zelfstandige bevoegdheden. De veiligheidscommissie heeft tot taak de vertoningdirecteur, gevraagd dan wel ongevraagd, met raad bij te staan. Voor de hand ligt dat de vertoningdirecteur de adviezen van de commissie ter harte neemt. Waar hij afwijkt van een advies van de veiligheidscommissie, zal hij dat deugdelijk gemotiveerd dienen te vermelden in het verslag van de luchtvaartvertoning.

Artikel 28

De ratio van deze bepaling is gelegen in het feit dat na de uitvoering van het vertoningprogramma nog diverse activiteiten plaatsvinden op de locatie van de luchtvaartvertoning. Ook is sprake van vliegbewegingen van vertrekkende demonstratietoestellen en van vertrekkende mensen en vervoersmiddelen. Hoewel de vertoningdirecteur de afhandeling hiervan kan hebben gedelegeerd aan derden, wordt met het oog op zijn verantwoordelijkheid het belang onderstreept van zijn aanwezigheid enige tijd na afloop van het vertoningprogramma.

Artikel 30

De aanwezigheid bij de mondelinge instructie is van wezenlijk belang voor een deelnemer in verband met de goede uitvoering van zijn onderdeel. De deelnemer zal namelijk bij de mondelinge instructie de meest recente informatie aangereikt krijgen die van belang is voor de uitvoering van

zijn onderdeel, zoals het onderdeel dat onmiddellijk vóór en ná zijn onderdeel plaatsvindt. Bovendien worden de regels die voor de desbetreffende luchtvaartvertoning gelden nog eens op een rijtje gezet door de vertoningdirecteur. Voorts zal de meest actuele weersgesteldheid worden meegedeeld waarbij eventuele verwachtingen voor het verloop van de luchtvaartvertoning aan de orde komen.

Artikel 34

De minimum vlieghoogte waarvan in deze bepaling melding wordt gemaakt, wordt vastgesteld volgens de procedure van artikel 45 van het Luchtverkeersreglement. Deze ontheffing wordt verleend tegelijk met de verlening van de vergunning voor de luchtvaartvertoning. Voor luchtvaartvertoningen boven land dan wel boven een wateroppervlak wordt internationaal een minimumhoogte van 200 ft (60 m) onderscheidenlijk 100 ft (30 m) acceptabel geacht. Omdat lagere waarden meer risico's voor de deelnemers met zich brengen, zal slechts bij hoge uitzondering (als de uitvoering van een onderdeel van het vertoningprogramma dat vereist) van vorengemelde waarden kunnen worden afgeweken. Wanneer in de vertoninglicentie van een deelnemer een specifieke minimum vlieghoogte is vermeld, zal dat bij de aanvraag van de vergunning dienen te worden vermeld, zodat dit bij de vergunningverlening kan worden meegenomen.

Artikel 37

Een luchtvaartterreininformatieverstrekker dient te beschikken over een bewijs van bevoegdheid dat geldig is voor de luchtvaartvertoning. Ingevolge artikel 18, derde lid, aanhef, van het Besluit bewijzen van bevoegdheid voor de luchtvaart wordt het bewijs van bevoegdheid afgegeven al dan niet onder beperking naar deelfunctie, gebied of tijd. Aldus kan bijvoorbeeld een bewijs van bevoegdheid worden verstrekt aan een luchtvaartterreininformatieverstrekker voor luchtvaartvertoningen in geheel Nederland of alleen voor luchtvaartvertoningen op bepaalde locaties in Nederland.

Artikel 39

De artikelen 9, vijfde lid, 13, onderdelen a tot en met e, 16, onderdeel b, 17, tweede lid, 18, eerste lid, 19, 20, eerste en derde lid, 21 tot en met 26 en 28 hebben betrekking op de vertoningdirecteur. De artikelen 30 tot en met 36 betreffen de deelnemer. De artikelen 37 en 38 zien op de luchtvaartterreininformatieverstrekker. Deze bepalingen vormen de essentie bij het houden van een luchtvaartvertoning. Zouden deze bepalingen niet worden nageleefd, dan zou de veilige uitvoering van het vertoningprogramma in een kritische situatie terecht kunnen komen. Hoewel de meest betrokkenen doordrongen zijn van het belang van het naleven van deze kernbepalingen, is het vanuit het oogpunt van handhaving van belang overtreding van die bepalingen strafbaar te stellen. Artikel 62, derde lid, van de Luchtvaartwet biedt daarvoor de grondslag. Overigens verbiedt artikel 17 van de Luchtvaartwet het houden van een luchtvaartvertoning zonder een vergunning daarvoor te hebben. Indien een luchtvaartvertoning wordt gehouden zonder een vergunning daarvoor te hebben, kan strafrechtelijk worden opgetreden middels artikel 62, eerste en tweede lid, van de Luchtvaartwet waar overtreding van artikel 17, eerste en tweede lid, van de Luchtvaartwet strafbaar is gesteld.

DE STAATSSECRETARIS VAN VERKEER EN WATERSTAAT,

mw drs M.H. Schultz van Haegen