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Study on the Third-Party Liability and Insurance Requirements of Remotely Piloted Aircraft Systems (RPAS)

Final Report November 2014 European Commission

22603201 SI2.661592



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Steer Davies Gleave has prepared this work using professional practices and procedures using information available to it at the time and as such any new information could alter the validity of the results and conclusions made.

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Glossary

Accident	An occurrence associated with the operation of an aircraft which (1) a person is fatally or seriously injured as a result of being in the aircraft or direct contact with any part of the aircraft, including parts which have become detached from the aircraft, (2) the aircraft sustains damage or structural failure or (3) the aircraft is missing or is completely inaccessible.
Aircraft	Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface
Autonomous aircraft	An unmanned aircraft that does not allow pilot intervention in the management of the flight
Beyond Visual Line-of- Sight (BVLOS) operation	An operation beyond a distance where the Remote Pilot is able to respond to or avoid other airspace users by visual means is considered to be a BVLOS operation
Catastrophic event	Event resulting in the destruction of the equipment, with one or more fatalities
Commercial Operation	An aircraft operation conducted for business purposes (mapping, security surveillance, wildlife survey, aerial application, etc.) other than commercial air transport, for remuneration or hire
Controlled Airspace	An airspace of defined dimensions within which air traffic control service is provided in accordance with the airspace classification
Drone	A remote-controlled pilotless aircraft (obsolete term)
EASA	European Aviation Safety Agency
Extended Visual Line-of- Sight (E-VLOS) operation	An operation where the pilot is supported by observers beyond 500m who maintain direct unaided visual contact
ICAO	International Civil Aviation Organization
Incident	An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operations
Maximum Take-Off Mass (MTOM)	The maximum mass at which the pilot of an aircraft is allowed to attempt to take off, due to structural or other limits
Operator	A person, organisation or enterprise engaged in or offering to engage in an aircraft operation
Payload	Elements of a remotely piloted aircraft that are not necessary for flight but are carried for the purpose of fulfilling specific mission objectives (such as photography equipment, etc)
Pilot-in-Command	The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.
Radio Line of Sight (RLOS)	Radio transmission path. Other communication devices such as satellites may be used for longer range services such as Beyond Radio Line of Sight (B-RLOS)
Remote Pilot	The person who manipulates the flight controls of a remotely piloted aircraft during flight time
Remotely Piloted Aircraft	An aircraft where the flying pilot is not on board the aircraft
Remotely Piloted Aircraft System (RPAS)	A set of configurable elements consisting of a remotely-piloted aircraft, its associated remote pilot station(s), the required command and control links and any other system elements as may be required, at any point during flight operation. Other features may include, inter alia, software, health monitoring, ATC communications equipment, a flight termination system, and launch and recovery elements.

Unmanned Aircraft (UA)	An aircraft which is intended to operate with no pilot on board.
Unmanned Aircraft System (UAS)	An aircraft and its associated elements (such as the remote pilot station, communication link and launch and recovery element) which are operated with no pilot on board
Unmanned Aircraft Vehicle (UAV)	Unmanned aerial vehicle (obsolete term)
Visual Line-of-Sight (VLOS) operation	An operation in which the remote pilot or RPA observer maintains direct unaided visual contact with the remotely-piloted aircraft

Disclaimer

"This study has been carried out by Steer Davies Gleave for the European Commission and expresses the opinions of the organisation having undertaken it. The views have not been adopted or in any way approved by the European Commission and should not be relied upon as a statement of the European Commission's views. The European Commission does not guarantee the accuracy of the information given in the studies, nor does it accept responsibility for any use made thereof.

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Executive Summary

Background

- 1. A key requirement for the development of civilian RPAS operations is that they are as safe as manned aircraft, insofar as they must not present or create a greater hazard whilst on the air or on the ground.
- 2. Nonetheless, accidents may happen and victims (which could include other airspace users or third-parties on the ground) need to be adequately compensated for any injury or damage caused by the operation of an RPAS.
- 3. The purpose of the study is to analyse the liability regimes and the legal requirements for third-party liability insurance existing today in Europe, as well as the current industry practices and insurance market, and (when appropriate) to make recommendations. In making recommendations, the primary objective is to ensure that third parties are adequately protected, but subject to this, there is also an objective of supporting the development of the EU RPAS sector, by facilitating the availability of adequate coverage at affordable price.

Methodology

- 4. The methodology for the study was based on two elements. We collected publicly available data on a number of issues including the RPAS market and the risk profile of RPAS operations and in parallel, we conducted a large programme of stakeholder interviews and consultation, both for the purposes of collecting data, and to discuss issues and options.
- 5. We engaged with three different categories of stakeholders: RPAS regulators; the RPAS industry (RPAS manufacturers, operators and their representatives and qualified entities); and the RPAS insurance industry. We also obtained some contributions from a legal practitioner operating in this sector, in addition to receiving input from Clyde & Co, the legal advisors of the project team.
- 6. The stakeholder consultation was based on a programme of bilateral consultation based on responses to our questionnaires and/or face-to-face discussions. In addition, two public workshops were organised in Brussels during key stages of the study, in order to present first findings and discuss key issues.

Conclusions

Liability

- 7. At present, there is no harmonised regime, either in the EU or internationally, for liability for damage to third parties caused by RPAS (or manned aviation). Provisions therefore depend on national law and vary between Member States. In the majority of EU Member States, but not all, national law defines that the liability regime for RPAS is strict (meaning that the defined party is automatically liable for damage, without there being any need to attribute fault).
- 8. We have also established that in Member States with a strict liability regime, the party liable for damage is generally the operator. As RPAS are aircraft, operators are required by Regulation 785/2004 to have insurance for third-party liability, which as a minimum must be at the levels defined in the Regulation. Failing this, their assets would be liquidated to compensate the victims.
- 9. In practice, we have identified that even where national law defines strict liability and it is readily possible to identify the operator, the process to obtain compensation for the

victims may be lengthy and complex, involving in some cases a court case. However this would depend on the specific circumstances, for example the extent of the damage to third parties caused by the RPAS and whether this is disputed.

Insurance requirements

- 10. Even though the RPAS industry is in its infancy, we clarified that, as a result of Regulation 785/2004, there is already a well-established and functioning framework defining third-party liability insurance requirements for RPAS, applicable in the whole of the European Union, which defines requirements for aircraft operators to have third-party liability insurance. The Regulation fulfils its objective and acts as an incentive for operators to obtain appropriate coverage, and for brokers and insurers to offer coverage that is at least in line with the minima that the Regulation requires.
- 11. Other than Regulation 785/2004, we have not identified any other national rules that define third-party liability insurance requirements within the EU.
- 12. The insurance requirements for third-party liability coverage for RPAS and all other aircraft as set in Regulation 785/2004 are based on the mass (MTOM) of the RPAS only. Other factors which might influence the degree of damage caused in an accident, such as the area overflown, the type of operations, pilot training, etc, are not taken into consideration in the Regulation.
- 13. We found that at present there is almost no data available for the damage that can be caused by RPAS during incidents. In the absence of such data, it is not possible to reach definitive conclusions as to whether the current minimum requirements for third-party liability insurance for RPAS are sufficient. However, there are some indications that the requirements are relatively low.
- 14. On the basis of the limited information available, we have found that third-party liability insurance is available in most Member States, and that the cost is not at a level which would appear likely to threaten the economic viability of the sector. However, the there is a relatively small number of providers, and whilst insurance is affordable for operators who tend to purchase more than they are required to obtain, there is limited price competition between insurers.

Compliance and enforcement

- 15. Enforcement of RPAS regulatory requirements is challenging and there is a much greater risk of illegal, uninsured operations in the RPAS sector, compared to the manned aviation sector. It is not possible to estimate what proportion of current RPAS operations is illegal but stakeholders confirmed that this was a material issue. In the event of an accident involving an uninsured operator, any third party suffering damage will (at most) be able to obtain compensation up to the value of the assets of the operator. This raises the issue as to whether there needs to be some sort of mechanism to ensure compensation for victims of uninsured operators, as there is for example in the motor vehicle sector.
- 16. At present, given the limited data on the state of the RPAS market and operations, and the lack of information on the proportion of operators which are insured, it is impossible to determine whether a compensation scheme would be feasible for victims of uninsured operators or victims of illegal operations and how it could work. A further issue is that such schemes are unlikely to be feasible until there is a larger volume of operations than now.

Other issues

- 17. This report has identified that a key issue is the lack of information on RPAS operations, accidents and incidents. This impacts multiple industry stakeholders: insurers, national authorities and policy makers. We discuss below options to improve the availability of information.
- 18. We also identified some issues with respect to the scope of the Regulation. The Regulation does not apply to model aircraft under 20kg. However, in some cases, there may be no difference between a model aircraft and a light RPAS, apart from the usage that is made of it. Similarly, the Regulation does not apply to State aircraft. The status of RPAS operated by local police forces, ambulances services, etc. in unclear in some States. It is important that victims of State RPAS are indemnified in similar terms to victims of private market RPAS.

Recommendations

Liability

19. We have not found any evidence that variation in third-party liability regimes across the EU has hindered the development of the market for RPAS, or created significant problems in ensuring the adequate compensation of victims, although it does complicate the work of RPAS insurance brokers and may add legal uncertainty for operators. There is also clear evidence from manned aviation that there is no appetite for harmonisation at an international and European level. Therefore we recommend that there should not be any attempt to harmonise third-party liability regimes across the EU.

Insurance

- 20. We do not recommend that more precise criteria are considered for minimum insurance requirements as there is not sufficient data on the actual damage caused by RPAS in incidents, and no clear reason why RPAS should be treated differently from manned aircraft.
- 21. We also recommend that when data availability improves, consideration should be given as to whether it is appropriate to increase the minimum insurance requirement for RPAS or it is best left to the insurance market to advise operators of what level of coverage they should purchase (as is currently the case for manned aviation).
- 22. We have identified a number of circumstances in which victims may not be adequately compensated for the damage caused in an incident. We recommend that the European Commission or national regulators consider how to address these circumstances. The circumstances we have identified are:
 - It may not always be possible to identify the operator: We recommend that Member States should require RPAS to be fitted with a fire-proof plate identifying the operator and/or the manufacturer, and this should include a serial number for the RPAS.
 - The operator may not be insured or the insurance may not be valid: This issue needs to be better publicised, given the potential financial implications for both operators and victims.
 - The timescale for payment of compensation may be long: This is a general issue not specific to the RPAS sector, and therefore we have not made specific recommendations in this area.

23. Even with improved enforcement, the low barriers to entry in the RPAS sector mean there is a risk that a proportion of operators may be uninsured, and therefore if the sector expands as expected it is necessary to consider how to ensure adequate compensation for any victims of damage. This could be achieved through a compensation fund, as used in the motor insurance sector. We recommend that the issue of whether a compensation fund is necessary and how it could work should be reviewed by the European Commission as soon as greater evidence becomes available on the scale of the RPAS market and the damage caused in incidents. It is not clear how soon this will be but we would expect within 3-5 years.

Compliance and enforcement

- 24. As noted above, due to low barriers to entry in the RPAS sector, there is a risk that (in contrast to the manned aviation sector) there could be a significant number of uninsured and illegal operations. This means that, if the RPAS sector grows as projected, there could be a need for considerably increased action by national authorities to enforce the existing insurance requirements, as well as other regulatory requirements. This may require an increase in the resources available to national authorities.
- 25. In the short term we recommend that the approach to enforcement is discussed with national authorities and EASA, in order to enable them to share best practice, so that in the longer term, enforcement can be improved.

Other issues

- 26. We recommend that the scope of the exemptions from Regulation 785/2004 should be clarified. We recommend that a common definition of model aircraft should be agreed, or that Regulation 785/2004 should be amended to define the type of unmanned model aircraft excluded from its scope. We also recommend that Member States should better clarify what they consider a State RPAS as there is some uncertainty about this. Member States should also clarify the arrangements for compensation that they will apply for State RPAS.
- 27. We recommend that national authorities should take measures to improve awareness amongst RPAS operators of the existing regulatory requirements that apply to them, including the requirement to have third-party liability insurance. This would be facilitated by introducing a requirement to record sales and imports of RPAS and model aircraft within the EU.
- 28. We recommend that the collection of information on operational data and occurrences by national regulators should be improved, the existing regulatory requirements to disclose information on occurrences should be better published to operators. Information collected on occurrences, and operational data, should be made more widely available by the national regulators, including to insurers, but also to operators and their representative associations.

1 Introduction

The need for this study

- 1.1 A key requirement for the development of civil RPAS operations is that they are as safe as manned aircraft, insofar as they must not present or create a greater hazard whilst on the air or on the ground.
- 1.2 Nonetheless, accidents may happen and victims (which could include other airspace users or third-parties on the ground) need to be adequately compensated for any injury or damage caused by the operation of an RPAS.
- 1.3 As a result, it must be possible to identify the party that is liable towards the third-party, and this party must be able to meet its financial obligations. This requires a clear liability regime and that the third party has adequate insurance. However, subject to this overriding objective, any compulsory insurance regime should not unnecessarily hamper the development of the RPAS sector, which in turn requires the development of an appropriate, competitive, insurance market.
- 1.4 The purpose of the study is to analyse the liability regimes and the legal requirements for third-party liability insurance existing today in Europe, as well as the current industry practices and insurance market, and (when appropriate) to make recommendations. In making recommendations, the primary objective is to ensure that third parties are adequately protected, but subject to this, there is also an objective to support the development of the EU RPAS sector, by facilitating the availability of adequate coverage at affordable price.

Structure of this document

- 1.5 This document is the Final Report for the study on third-party liability and insurance requirements for Remotely Piloted Aircraft Systems and summarises all the findings and conclusions of the study.
- 1.6 The remainder of this document is structured as follows:
 - Chapter 2 provides a description of the methodology used for the study;
 - Chapter 3 offers some background information on the state of the civilian market for RPAS in the EU;
 - Chapter 4 presents the current liability framework for RPAS in Europe;
 - Chapter 5 identifies and assesses the insurance requirements for RPAS;
 - Chapter 6 presents the state of the third-party liability insurance market for RPAS;
 - Chapter 7 details the information needs for the RPAS industry; and
 - Chapter 8 presents our conclusions and recommendations.

2 Methodology

Introduction

- 2.1 This section provides a summary of the methodology used for the study. The methodology was based on two elements:
 - **Collection and analysis of public information**: We sought to collect publicly available data on a number of issues including the RPAS market and the risk profile of RPAS operations.
 - **Stakeholder engagement**: We conducted a large programme of stakeholder interviews and consultation, both for the purposes of collecting data, and to discuss issues and options.
- 2.2 We provide further details below on the information collected and the sources.

Sources of information

Data collection and review of documentation

- 2.3 We carried out desk research to collect relevant information. The desk research allowed us to:
 - identify data sources and identify stakeholders to approach individually;
 - review key issues affecting third-party liability of RPAS;
 - understand the context of the RPAS market;
 - collect, where possible, information on the safety record of RPAS; and
 - further understand the views and opinions of stakeholders.
- 2.4 The data we collected for the study and the source of this data is summarised in Table 2.1: below.

Table 2.1: Information sources

Source	Name	
European Commission	European Commission, SWD(2012) 259 final Working Document on RPAS, 2012	
ICAO	ICAO, Integration of remotely piloted aircraft systems in civil aviation in Europe, 2012	
ICAO	UAS Study Group, International Regulatory Framework for RPAS, 2013	
ICAO	ICAO, Unmanned Aircraft Systems (UAS) Cir 328 AN/190, 2011	
Industry	Roadmap for the integration of civil RPAS, 2013	
Industry	UVS International, RPAS - The Global Perspective, 2013	
Industry	Insurance Convention, Aviation Underwriting, 1996	

Source	Name
Industry	AUVSI, The economic impact of UAS integration in the United States, 2013
Industry	F&S, Study analysing the current activities in the field of UAVs, 2007
Industry	Griffiths & Armour, UAS - Typical risks and insurance issues for commercial activities, 2012
Industry	UIB Group Aviation, Airline hull and liability insurance market review, 2012
Industry	Rango-Laliberte, Impact of flight regulations on effective use of unmanned aircraft systems for natural resources applications, 2010
Industry	Goldberg-Corcoran-Picard, Remotely Piloted Aircraft Systems & Journalism, 2013
Industry	Moire' Inc., Cost & Business Model Analysis for Civilian UAV Missions, 2004
Industry	Project ULTRA Unmanned Aerial Systems in European Airspace, 2013
Industry	Clothier-Walker, The Safety Risk Management of Unmanned Aircraft Systems, 2013
Industry	Civil Liability Concerns Arising from Domestic Law Enforcement Employment of Unmanned Aerial Systems, USA, 2009
Academia	Anna Masutti, Liability aspects of the operation of RPAS, 2013
Academia	Law Business Research Ltd, The Aviation Law Review, 2013

2.5 The RPAS sector is not a mature industry as yet, and to the extent that there are RPAS operations in EU Member States, these are in most cases at a development stage. It was therefore difficult to find information from public sources which related specifically to the issues covered by this study. As a result, it has been necessary to rely on information provided by stakeholders to a greater extent that we had envisaged at the start of the study.

Stakeholder engagement

- 2.6 In agreement with the Commission, we defined a programme of stakeholder engagement, with the following objectives:
 - Collect stakeholder views on the issues raised by the study;
 - Understand current RPAS industry practices with respect to third-party liability insurance;
 - Assess whether Regulation 785/2004, which defines minimum requirements for thirdparty liability insurance for aircraft operators (and which, whilst not designed for RPAS, nonetheless applies as RPAS are defined as 'aircraft'), is suitable for the RPAS sector and whether the application of this Regulation generates any issues;
 - Understand the relationship between the amount of insurance operators acquire (and that brokers recommend) and the potential damage caused by the type of operation;
 - Understand the cost of RPAS insurance; and
 - Obtain information relevant to the analysis of the market for third party liability insurance for RPAS.

Stakeholder engagement methodology

- 2.7 The graphic below summarises the approach to the engagement with stakeholders. The programme consists of a combined approach based on:
 - One-to-one bilateral discussions between our team and selected organisations from the three communities of stakeholders described in paragraph 2.8 below; and
 - Public stakeholders' workshops, in order to disseminate the initial results from our study, and collect views from a broader range of stakeholders. The first public workshop

was held in Brussels on March 5th 2014, and the second workshop took place in Brussels on June 25th 2014.





Stakeholder selection process

- 2.8 The Commission identified three broad communities of stakeholders:
 - **Regulators**, represented through national Civil Aviation Authorities, who are responsible for enforcing Regulation 785/2004 and determining and enforcing other rules in relation to RPAS and third-party liability. EASA and JARUS (Joint Authorities for Rulemaking on Unmanned Systems) were also consulted because of their interest and involvement in the RPAS market and regulatory framework.
 - **The RPAS industry**, including RPAS operators and manufacturers. Operators are obliged to obtain insurance in accordance with Regulation 785/2004, and both operators and manufacturers have to ensure that they have adequate coverage for their liabilities under national and international law.
 - **Insurers**, who provide (or choose not to provide) insurance products for RPAS operators. These include brokers, insurers and re-insurers.

Bilateral engagement

- 2.9 Our general approach was to:
 - Contact the organisation to invite them to participate in the study;
 - Send a questionnaire to the organisation;
 - Indicate a timescale of one to two months for their written response, asking the organisation to confirm that this could be achieved; and
 - Allow for follow-up by telephone and/or face-to-face interviews to clarify and explore any key issue.

Questionnaires

2.10 In order to collect the views of the stakeholders, to answer the questions raised in the Terms of Reference, and to facilitate comparison of responses from different stakeholders, we developed a standard list of questions to be used during the interviews.

- 2.11 The questionnaires aimed at collecting information on:
 - General description of the RPAS activities of the respondent;
 - Information on the state of the RPAS industry;
 - Questions on the liability framework for RPAS operations;
 - Questions on the provision of insurance for RPAS operations, the price and availability of insurance products;
 - Questions on the relevance of Regulation 785/2004 for RPAS operations; and
 - Any other comments.
- 2.12 Tailored question lists were developed for each of the categories of respondents in Table 2.2: below. Some questionnaires were further refined to address specific issues relating to individual respondents when we were aware of any before the list of questions was sent.

Table 2.2: Key themes addressed by stakeholder category

Stakeholder Group	Specific information required
National authorities	Legal basis for current liability regimes The identification of the responsible parties Particularities of, and differences between, national liability regimes Whether there is any need for harmonisation of liability regimes at EU level
RPAS operators, representative bodies and manufacturers	Current insurance practices Correlation between the potential damage caused by different categories of RPAS operation and insurance practices Any impact of the requirements of Regulation 785/2004 on the business The existing insurance offer and affordability
Insurers , brokers and representative bodies	The existing insurance offer and market trends The approach to risk assessment Whether there is any need for measures to support the development of the insurance market
Other interested parties	Whether there is any need for harmonisation of liability regimes or insurance requirements at EU level

Participation in bilateral stakeholder consultation

2.13 In total we contacted 110 stakeholders, of which more than 60% agreed to respond to our questions. The stakeholder engagement started in November 2013 and ran throughout the duration of the project. In general, we found that we were able to get responses from most of the Member States' regulatory authorities, and we also received extensive engagement from key stakeholders in the insurance industry. However, we found it harder to get responses from operators and manufacturers (which in many cases are small enterprises), and therefore we have relied extensively on their national associations to disseminate our questions and, in some cases, to collate their members' responses on our behalf.

Regulators

2.14 We present in Table 2.3: below the status of stakeholder engagement with regulatory authorities.

Member State	Organisation	Consultation status
France	Direction Générale de l'Aviation Civile	Responses received
Germany	German Ministry of Transport	Responses received
Netherlands	Inspectie Verkeer en Waterstaat	Responses received
Italy	ENAC	Responses received
UK	Department for Transport; Civil Aviation Division	Responses received
Spain	Dirección General de Aviación Civil	Responses received
Sweden	Trafikstyrelsen	Responses received
Czech Republic	MDCR	Responses received
Belgium	Federal Public Service Mobility and Transport	Responses received
Latvia	Ministry of Transport	No responses received
Romania	Ministry of Transport; Directorate General of Civil Aviation	Responses received
Austria	BMVIT	No responses received
Denmark	Trafikstyrelsen	Responses received
Finland	Trafi	No responses received
Ireland	IAA	No responses received
European	EASA	Responses received
International	JARUS (Joint Authorities for Rulemaking on Unmanned Systems)	Responses received
Brazil	ANAC	Responses received
	CASA	Responses received
Australia	Trade & Aviation Market Policy, Department of Infrastructure and Regional Development	Responses received
Qualified Entities	Resource UAS	Responses received
Qualified Entities	EuroUSC	Interview held

Table 2.3: Stakeholder engagement status: regulate	able 2.3:	Stakeholder engagement status: regulators
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RPAS Industry

2.15 We present in Table 2.4: below the status of stakeholder engagement with the RPAS industry, both directly and through industry representative bodies.

Table 2.4:	Stakeholder	engagement	status:	RPAS	industry
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Stakeholder Group	Specific organisation(s)	Consultation status
RPAS operators and manufacturers	SKY Futures, UK	Responses received
	Microdrones, DE	Responses received
	Nitrofirex, ES	Responses received
	CybAero, SE	Responses received
	Baseline Surveys, IE	Responses received
	CATEC, ES	Responses received
	Budapest University of Technology and Economics, HU	Responses received

Stakeholder Group	Specific organisation(s)	Consultation status	
	Kingfisher, UK	Responses received	
	Vulcan UAV, UK	Responses received	
	BB Stratus, UK	Responses received	
	Rogue State Media, UK	Responses received	
	Advanced Aviation Technology, IT	Responses received	
	University of Copenhagen, DK	Responses received	
	Robot Aviation, NO	Responses received	
	Horizon AP, UK	Responses received	
	Aibotix GmbH, DE	Responses received	
	The Drone Guys, UK	Responses received	
	FORCE Technology, DE	Responses received	
	MASA, UK	Responses received	
	Thomas Haywood Photography, UK	Responses received	
	Trigger Air, UK	Responses received	
	Up and Drone, FR	Responses received	
	Geosenses/Ursus, NL	Responses received	
	Aerialtronics, NL	Responses received	
	Delair-Tech, FR	Responses received	
	AJS – POC, FR	Responses received	
	Two Birds (Legal), UK	Responses received	
	Thales, UK	No responses received	
	NLR	No responses received	
	UVS International	No formal response submitted but contributed to workshop	
	UAV DACH (Germany, Austria, Netherlands, Switzerland)	No formal response submitted but contributed to workshop	
	AssoRpas (Italy)	Contributed to workshop	
	UAVS Association (UK)	No responses received	
	Sub20 (UK)	Responses received	
	AVBS (Czech Republic)	No responses received	
	Hungarian Aviation Industry Foundation	Responses received	
RPAS representative	DARPAS (NL)	Responses received	
bodies and industry	UAS Denmark	Responses received	
	BeUAS (BE)	No responses received	
	Fédération Professionnelle du Drone Civil, FR	No responses received	
	AAIG, Austrian aeronautics industries group	Responses received	
	ARPAS UK	Responses received	
	AerospaceValley (FR)	Responses received	
	ACUO, Australian Certified UAV Operators (Australia)	Responses received	

Note: this table does not show the 29 operators and manufacturers contacted who did not agree to respond.

Insurers

- 2.16 We engaged with insurers both through:
 - Insurer associations and representatives who can reflect their members' views on the general issues raised in the study; and
 - **Directly**, with insurance brokers and re-insurers that currently provide RPAS products; we have also sought to make contact with some who do not.
- 2.17 We present in Table 2.5: below the status of stakeholder engagement with the insurance industry.

Stakeholder Group	Specific organisation(s)	Consultation status
	International Underwriting Association of London (IUA)	Responses received
	IUAI	Responses received
	ANIA - Associazione Nazionale fra le Imprese Assicuratrici	Responses received
	Insurance Europe	Responses received
Insurers and representative	Fédération Française des Sociétés d'Assurances (FFSA)	No responses received
bodies	Polish Insurers Association	Responses received
	Swedish Insurers Association	Responses received
	GDV - Gesamtverband der Deutschen Versicherungswirtschaft	No responses received
	Global Aerospace Underwriting Managers	Responses received
	Mitsui Sumitomo Insurance at Lloyd's	No responses received
	QBE Nordic Aviation Insurance	No responses received
Insurance brokers	Kiln	Responses received
	Lloyd's Market Association	Responses received
	Willis	Contributed to workshop
	Marsh Ltd., Aviation & Aerospace Practice	No responses received
	John Heath LLP	No responses received
	Haywards	No responses received
	Overwatch	No responses received

 Table 2.5:
 Stakeholder consultation status of insurance contacts

Others

2.18 We also consulted with one other organisation (Table 2.6: below).

Table 2.6: Stakeholder engagement status: others

Stakeholder Group	Specific organisation(s)	Consultation status
Legal	Bird & Bird	Responses received

Stakeholder face-to-face interviews

2.19 Most of the stakeholder engagement described above was undertaken through review of written responses to the questionnaire, followed up with telephone or email contact where

necessary for clarification. However, we also held face-to-face interviews with a sample of the most significant stakeholders:

- EASA;
- UK CAA;
- Global Aerospace;
- Lloyd's Market Association;
- International Union of Aerospace Insurers;
- International Underwriting Association;
- Kiln;
- EuroUSC; and
- ARPAS UK.

Stakeholder workshops

First stakeholder workshop

- 2.20 The first stakeholder workshop took place on 5 March 2014 at the Eurocontrol Headquarters in Brussels. The purpose of this workshop was to present the information collected up to that point, and to discuss the initial findings of the study. Attendance at the workshop was free of charge, and participants who met certain criteria (such as making a presentation, or representing small-medium businesses not located in Belgium) received financial support from the Commission to attend.
- 2.21 The workshop was attended by more than 60 individuals from the different sectors of the RPAS industry, insurance industry and regulators. The graphic below presents the segmentation of attendees at the workshop.





Source: Steer Davies Gleave

2.22 The table below lists the attendees of the workshop.

Category	Country	Organisation name	
EC and Eurocontrol	International	Eurocontrol	
	European	European Commission	
	France	DGAC	
	Netherlands	CAA /JARUS	
	Italy	CAA	
Pogulatory Authorities	Czech Republic	CAD	
Regulatory Authonties	Belgium	CAA	
	United Kingdom	CAA	
	Denmark	САА	
	Europe	EASA	
Qualified Entity	International	EuroUSC	
	Italy	ANIA	
	Italy	Generali Italia	
	International	Insurance Europe	
Insurance and brokers	France	Global Aerospace	
insurance and brokers	United Kingdom	Lloyds's Market Association	
	United Kingdom	Willis	
	United Kingdom	Kiln	
	Belgium	Aviabel	
Logal	Italy	LS LexJus	
Legal	United Kingdom	Bird&Bird	
	United Kingdom	Horizon/ARPAS	
	United Kingdom Masa		
	United Kingdom	HexCam	
	France	Up & Drone	
	Netherlands	Aerialtronics	
	Italy	Aermatica	
	Netherlands	DARPAS	
Operators/Manufacturers	Netherlands	High Eye B.V	
	Norway	UAS Norway	
	Germany	UAV DACH	
	Belgium	Thales Group	
	Belgium	SAAB	
	Germany	AIRBUS Defence and Space /Cassidian	
	Belgium	Gatewing NV	
	International	UVS-International	
	United Kingdom	Ascend World Wide Ltd	
Others	Belgium	Cambre Associates	
Others	Belgium	Security Europe	
	Belgium	Private Consultant	

Category	Country	Organisation name
	Spain	BBVA
	Germany	Institute of Air Transportation Systems German Aerospace Center
	Netherlands	NLR, National Aerospace Laboratory
	France	Onera
	Netherlands	Hogeschool van Amsterdam
	Netherlands	Now Holding BV
	Netherlands	Jan Verhagen b.v
	Netherlands	Gielissen

Source: Steer Davies Gleave

2.23 The workshop lasted for a day and covered 3 key themes: liability, existing legislation, and the insurance market. For each theme, the project team presented the initial findings, 2-3 other entities made presentations, and there was then a discussion of key issues arising from this. The full agenda of the workshop is provided in Appendix A. Where speakers agreed, the presentations were circulated to all attendees.

Final stakeholder workshop

2.24 A second workshop was held towards the end of the study. It took place on 25 June 2014 at the Royal Military Academy in Brussels. Attendance was free of charge. The objective of this final workshop was to validate our findings and potential recommendations with key stakeholders. The workshop was tailored to be a focus session which lasted two hours with a presentation by Steer Davies Gleave followed by a discussion with all the attendees.

Category	Country	Organisation name
	Europe	European Commission
Regulatory Authorities	Czech Republic	CAA
	France	DGAC
Qualified Entity	United Kingdom	EuroUSc
Operator and representatives	Italy	Assorpas
	France	Global Aerospace
Insurers	United Kingdom	Kiln
	United Kingdom	Willis
Legal	United Kingdom	Bird & Bird

Table 2.8: Final workshop attendees

Source: Steer Davies Gleave

3 Background: the market for civil use of RPAS

Introduction

3.1 Whilst it is not an objective of this study to undertake a detailed analysis of the potential civil market for RPAS, this section provides a brief summary, in order to provide context for the analysis of RPAS liability and insurance issues set out in the following chapters. This section draws on data from public sources as well as information provided by stakeholders through the engagement process summarised in Chapter 2.

Civilian RPAS products in use

3.2 Whilst the military market for RPAS is already well developed, the civilian RPAS market in Europe is in its infancy. The Communication from the European Commission of 8 April 2014 recognised that "the precise scale of the potential RPAS market is difficult to predict" but it highlighted the potential for significant growth of the RPAS market in Europe. Some limited data is available which indicates that there has recently been a very rapid growth in RPAS operations, albeit from very low levels (see for example Figure 3.1: below).



Figure 3.1: Permissions issued by the UK CAA for operations with UAS of up to 20 kg

Source: UK CAA

3.3 The development of commercial applications is closely linked to the adoption of national regulations without which no commercial operations are allowed to take place. Many

European countries have adopted, or are in the process of adopting, national regulations allowing limited operations.

- 3.4 Based on data collected from RPAS associations and other sources, we understand that, in 2014 in Europe, the vast majority of commercial RPAS operations use light RPAS (under 25kg) or ultra-light RPAS (under 7kg). Whilst there are also civilian operations with larger and heavier RPAS, these are less frequent in Europe.
- 3.5 The technology for larger civilian RPAS is frequently derived from military RPAS, but stakeholders informed us that light and ultra-light RPAS are also being built by small companies (SMEs), and in some cases individuals, without a background in the military, defence or manned-aviation sectors.
- 3.6 It is expected that the range of potential RPAS applications will increase, as the market expands and legislation becomes more mature. However, at present, the purposes of RPAS operations in the EU are typically:
 - "State" activities, such as border control, police work, search and rescue operations and air ambulance operations; in some cases these activities are carried out by contractors on behalf of the relevant State authorities.
 - Commercial activities, which at present are most commonly photography and filming on behalf of the media, and mapping and infrastructure monitoring.
- 3.7 Civilian RPAS come in a variety of formats, but there are two broad categories: fixed wing and rotary wing. Our research shows that, in Europe, most light and ultra-light RPAS are rotary wings, with either four (quadcopter), six (hexacopter) or eight (octocopter) sets of wings. It also appears that most of the RPAS operated are of the very-light category (below 7kg). The table below presents the features of example common civilian RPAS models.

Model	Ť			
Туре	Rotary wing (hexacopter)	Rotary wing (quadricopter)	Fixed wing	Rotary wing (bicopter)
Total weight*	2.6 kg	0.8 kg	2.2 kg	200 kg
Speed	6 m/s	8 m/s	22 m/s	33 m/s
Autonomy (maximum)	16 minutes	30 minutes	45 minutes	6 hrs
Range (km)	0.5	0.5	50	180 km
Altitude (feet)	Approx 3,300	3,300	8,200	18,000
Unit price (€)	1,800 - 2,200	20,000	40 - 50,000	2,500,000

Table 3.1: Some common RPAS (under 7kg)

Source: Steer Davies Gleave analysis

Note (*): Total weight includes batteries and all components required for flying but does not include any payload.

- 3.8 As can be seen in the table above, the price range varies between around €1,500 for the cheapest models (mostly used by hobbyists and small businesses) to around €50,000 for more advanced models under 7kg.
- 3.9 The typical speed of rotary-wing aircraft under 7kg ranges between 6 and 10m/s and it appears that the maximum flight time possible does not exceed 30 minutes, with the limiting

factor being the capacity of the batteries powering the aircraft. The maximum range and altitude declared by the manufacturers is respectively around 0.5km and 3,300 feet.

- 3.10 Whilst most of these RPAS can monitor and store key operational data (for example on battery voltage, position, altitude, flight duration, velocity, flight path, distance from point of origin, ambient temperature and motor revolutions), only the more advanced models are fitted with programs that allow the RPAS to execute operations in accordance with a pre-programmed flight-plan (under the control of the pilot in command), in the same way as for most manned aircraft. For example, some high-specification fixed wing RPAS (under 7kg) can be flown in an automated manner, from launch to landing, with the pilot nonetheless facilitating the aircraft's operation, selecting the area to be covered, and determining the position for take-off and landing.
- 3.11 Larger, heavier RPAS operated in Europe have significantly different operational characteristics. A rotary-wing RPAS developed with a focus on "hostile area" surveillance (anti-terrorism, border surveillance, relay of communications, search and rescue support and other military usage) weighs around 180kg and can fly at a speed of up to 150km/h for approximately 6 hours. The catalogue price for this aircraft is approximately €650,000.

State of the civilian RPAS market in Europe (as of April 2014)

- 3.12 In contrast to the market for manned commercial air operations, for which there is extensive data available from both public and commercial sources, there are no EU or European-wide databases available relating to RPAS operations. This section provides a brief summary of the market based on information provided by individual stakeholders (in most cases national operator associations), as well as UVS International.
- 3.13 DGAC estimates that, in France, there are 438 active RPAS operators, and that less than 10% of the aircraft weigh more than 4kg. According to the French association of operators and manufacturers (Fédération Professionnelle du Drone Civil), the number of RPAS operators in the market has increased by 350% in the last year. 83% of the operators are in the media sector (such as broadcast, communications and events), while the rest are involved in industrial operations (such as construction, agriculture and inspections). 75% of French operators use rotary wing RPAS, and 20% use both types of systems.
- 3.14 The Italian association AssoRPAS informed us that very few experimental permits to fly have been accorded by the Italian CAA (ENAC), and that most operations would therefore not be legal. The most common types of operations carried out in Italy are aerial photo/video, surveys, cartography and remote sensing.
- 3.15 We were informed that a similar situation is occurring in Belgium where, according to the Belgian association (BeUAS), 90% of operations are illegal. Belgium has not yet passed legislation that authorises RPAS activities and has only issued 5 exemptions allowing an RPAS operation. It also stated that there had been several near misses and crashes, with only one official report. It is estimated that 99% of the operators use RPAS below 2kg.
- 3.16 In the Netherlands, the Dutch association (DARPAS) estimates that around 150 small and medium enterprises (SME) are active in the civilian market with most of the aircraft weighing less than 10kg. Out of approximately 150 RPAS operated by members of DARPAS, 82% are multi-copters. Currently, professional use of RPAS is prohibited in the Netherlands unless flight-by-flight exemptions are granted by the authorities (80 current exemptions have been

issued). The association described the process to obtain an exemption as being long (taking up to 6 months), and that as a result, many illegal flights also took place. There have been 19 reported cases of the operators of these flights being fined, which is perceived as being a low rate compared to the estimated number of illegal operations. In 2013, there was a sharp increase in the number of operations with high-end aircraft such as the DJI Phantom, with more than 7,000 units sold in the Netherlands. These appear to be increasingly used in real estate, roof inspections, farming, photographing and by the media.

- 3.17 AAIG, the Austrian RPAS association, informed us that that 90% of the UAS used by its members weigh under 25kg. Most of these aircraft are multi-copters and almost all operations are for commercial purposes.
- 3.18 The Danish CAA stated that a permit is not required for commercial or non-commercial operations with RPAS below 7kg, and if the flight is performed in compliance with national *Regulations on Unmanned Aircraft not weighing more 25kg*. Exemptions are required only in specific cases. The CAA has granted approval for 12 operators to date, and it has received approximately 30 additional requests. However, the national industry association (UAS Denmark) estimates that the number of active operators is much greater than this, since no permit is required to operate. It stated that the majority of Danish operations involve aerial measurements, aerial photography, media and environmental protection. At present, all operations are conducted within the visual line of sight (VLOS).
- 3.19 According to the UK CAA, there are currently 212 RPAS operators in the UK. According to the industry association (ARPAS-UK), most operations are for aerial filming and photography.
- 3.20 UAS Norway informed us that, in Norway, 90% of all VLOS operations are being performed with multi-rotor very light RPAS below 6kg. 80% of the operations are defined as being for commercial purposes.

The Regulatory context for RPAS operations across Europe

RPAS regulations in the EU

- 3.21 EU Regulation 216/2008 (establishing the European Aviation Safety Authority) creates a divide in responsibility in regulating RPAS: EASA's responsibility is defined by the Regulation but, in accordance with Article 4(4) and Annex II, this responsibility does not extend to unmanned aircraft with an operating mass of no more than 150kg. National authorities are therefore responsible for regulation of RPAS equal to or less than 150kg which, as noted above, covers almost the entire civil market at present.
- 3.22 Several Member States have introduced national regulations with respect to RPAS under 150kg in recent years. These regulations have established operational and certification requirements for RPAS operators, including requirements with respect to airworthiness, airspace segregation, pilot training and data reporting.

RPAS regulations in EU Member States

3.23 In some Member States, legislation has been drafted in the form of notices that are directly enforceable by the relevant Ministries and/or Civil Aviation Authorities (CAAs), while in other Member States, Aviation Acts have been amended to make specific provisions with respect to RPAS. In a majority of cases, there are also specific provisions with respect to model

aircraft defined within the same regulations. Table 3.2: summarises when RPAS legislation has entered into force in those Member States where it exists.

Table 3.2: Entry into force of current RPAS requirements

Member State	Entry into force
Austria	2014
Czech Republic	2013
Denmark	2004
France	2012
Germany	2010
Ireland	2014
Italy	2014
Netherlands	2013
Romania	2014
Sweden	2009
UK	2009

Source: SDG analysis of national regulations

Note: in Belgium, draft RPAS legislation is available but has not yet entered into force

- 3.24 In most Member States, RPAS legislation distinguishes between two to four different categories of operation, with the complexity of the operational rules typically increasing with the weight of the aircraft. For example, in Ireland there are two categories (for RPAS above and below 20kg), and in France there are four (below 2kg, 2-4 kg, 4-25kg, and above 25kg). In addition, requirements in several Member States, including Austria, France and Sweden, vary with the operational characteristics of the flight (for example, for BVLOS operations, and for operations over populated areas). These categories vary between States but most have a threshold of 20-25kg above which stricter requirements are in place.
- 3.25 BVLOS operations are prohibited in the majority of Member States, however national authorities can grant derogations for specific operations. Similarly, operations over populated and congested areas are prohibited in most Member States unless a derogation is obtained. Most regulations also specify a minimum distance from airports and airfields (for example, this is 8km in Italy), as well as limitations on altitude (between 50m in France and 120m in the UK).

4 Liability

Introduction

4.1 This section provides an overview of the framework for third party liability applicable to RPAS in the EU, assesses its efficiency and sets out an analysis of options for improving the system of liability.

Some notions of liability

Liability

- 4.2 Liability is generally defined as the state of being legally responsible for something.
- 4.3 A key difference between liability regimes is that liability can be strict or based on fault(s). In a strict liability regime, the party is liable without any proof of negligence or fault, whereas in a fault-based liability regime, depending on the specific regime, an entity may only be liable if some form of negligence is established, or it may be able to avoid liability if it can prove that it was not at fault.
- 4.4 Liability can also be limited, meaning that there is a cap on the potential level of compensation, or unlimited, in which case there is no theoretical cap on the amount of damages for which defendants are potentially liable. In practice, compensation will be limited to the value of the insurance policy purchased for third-party liability (if any), combined with the entity's total liquidated assets.

Difference between liability and insurance

- 4.5 It is important to understand the difference between liability and insurance: insurance provides financial coverage against the costs arising from a liability, but does not exempt the liable party from that legal responsibility. We illustrate below liability and insurance in the context of RPAS operations.
- 4.6 If an incident occurs and an RPAS operator is liable, then this operator must indemnify the parties that have suffered damage. If the operator had purchased insurance for third-party liability, it could claim on its insurance policy. Figure 4.1: below shows two example situations:
 - Case A: Where the amount of liability is lower than the amount covered by the applicable insurance policy, then there is no further cost for the RPAS operator (except any excess due in accordance with the policy terms).
 - Case B: In this case, the RPAS operator is required to indemnify the parties for more than the amount covered by its insurance policy, and it will therefore have to pay the difference itself, through liquidation of its assets if required.

If the operator did not have third-party liability insurance or operated in conditions
outside its insurance terms (meaning that its insurance policy would be void) then the
operator would be required to pay the full extent of the liability itself, again including
through liquidation of its assets if required.



Figure 4.1: Financial implications of liability and insurance

Source: Steer Davies Gleave analysis

Liability regimes applicable to RPAS in Europe

Table 4.1: Third-party liability regimes for RPAS

Member State	Strict or fault based	Applicable limits
Belgium	Strict	Unclear
Czech Republic	Expected to be strict (subject to case law)	Unlimited
Denmark	Strict	Unlimited
France	Strict for ground and mid-air	Unlimited
Germany	Strict	Limited except where the operator is negligent
Italy	Strict	Limited except where the operator is negligent
Netherlands	Fault-based	Unclear
Romania	Strict	Unlimited
Spain	Unclear	Unclear
Sweden	Unclear	Unclear

Source: SDG analysis

- 4.7 There is no international framework for third-party liability for aviation (manned or unmanned) agreed between the States with major aviation industries. As discussed further below, international instruments (such as the Rome Convention) dealing with third-party liability are of little importance as they are ratified by few States. As a result, the rules governing liability for third-party damage are primarily to be found in domestic law. There is no uniformity across Europe or in the rest of the world with respect to third-party liability for aviation (whether the aircraft are manned or unmanned).
- 4.8 This section describes the liability regimes currently defined in national law in Europe for RPAS, and summarises how these differ from manned aviation.

Current liability rules in Member States for RPAS

- 4.9 Table 4.1: below summarises the different third-party liability regimes that exist in the Member States for RPAS, on the basis of the information obtained through our research. It should be noted that it was particularly difficult to obtain this information from the regulatory authorities of the Member States and in some cases we had to rely on information from other sources such as legal practitioners or insurers. We have found that some authorities were not aware of the liability framework in their Member State or did not appear to have access to legal specialists who could inform them.
- 4.10 We observe from the table above that there is no common regime in the EU for liability for damage caused by RPAS. Although the majority of Member States have strict liability regimes for ground damage, not all do (for example the Netherlands is fault-based). In the Czech Republic, the authority explained that the regime is very likely to be strict but that a number of legal tests would have to be performed to validate this assumption; this will be done as soon as required which would most probably be during an RPAS court case.
- 4.11 There are different legal basis for the liability regimes of the Member States. In some Member States this is defined in the Civil Code (France, Romania, Czech Republic) and in others the Aviation Act for example Denmark (Air Navigation Act, Section 127), Germany (Section 33 of the Civil Aviation Act (LuftVG)) and the United Kingdom (Section 76(2) of the Civil Aviation Act 1982). The Italian Navigation Law, Article 971 provides the legal basis for the liability regime of Italy and was extended to RPAS in Dec 2013 through a rule on *Mezzi Aerei a Pilotaggio Remoto*. The regulatory authorities for Belgium, the Netherlands, Spain and Sweden were unable to explain the legal basis for the RPAS liability regime in their Member State.
- 4.12 Of the Member States in which strict liability regimes are known to be applied, four Member States (UK, France, Romania and Denmark) confirm that liability is unlimited. Germany applies limits of liability equivalent to the minimum insurance limits pursuant to Regulation 785/2004, however a fault-based regime may allow recovery in excess of those limits.
- 4.13 Regimes imposing strict liability can be combined with provisions on fault-based liability in certain circumstances. In the United Kingdom, strict liability applies to damages sustained on the surface while a fault based approach governs damage occasioned in the air (if there is a mid-air collision it is difficult to see how there can be strict liability for both parties, although this is specifically the case in France).

4.14 In many Member States, the legal requirements on third-party liability do not distinguish between unmanned (on the ground) and manned aviation as can be observed in Table 4.2: below for the Member States for which we have the information.

Member State	Strict or fault based	Applicable limits
France	Strict	Unlimited
Germany	Strict	Limited except where the carrier is negligent
Italy	Strict	Limited except where the carrier is negligent
Romania	Strict	Unlimited
United Kingdom	Strict	Unlimited

Table 4.2: Third-party liability regimes for manned aviation

Source: Mid-term evaluation of Regulation 785/2004

Note: In the case of Poland, the CAA indicated that it is difficult to summarise the Polish third party liability regime in a one-word expression as the system is unique, complex and every case is individually investigated (among others it can be fault-based or risk-based liability). Similarly, whether the liability is limited or unlimited cannot be determined in general terms.

Definition of the liable party

- 4.15 One of the key questions when damage occurs is the identity of the liable party. In States with fault-based liability regimes, there is no automatic provision for the liable party, meaning that fault has to be established first before the liable party can be identified. This is different in strict liability Member States where the liability is allocated automatically and it is defined in law which party is liable.
- 4.16 Table 4.3: below summarises the responses received from national authorities as to the identity of the liable party.

Member State	The liable party	Comments
Belgium	Unclear	
Czech Republic	The RPAS operator is liable	Operator is not explicitly defined in law for purposes of liability. Civil law case-law understands operator as a person legally entitled and actually capable to dispose with a vehicle (aircraft) on a long term basis (most typically an owner)
Denmark	The owner. If the owner entrusted the use of the aircraft to an autonomous user who has assumed full responsibility for the aircraft operation and maintenance, then his obligation instead falls upon the user	
France	The operator, and where applicable (in case of leasing) the owner	

Table 4.3: Identify of the liable party (civil law only)

Member State	The liable party	Comments
Germany	The operator is liable for third- party damage	The operator is not legally defined by domestic law but interpreted by the national courts: the operator is the person or the entity who uses the aircraft for his own profit and who has the actual power over the aircraft irrespective of the ownership, possession
Italy	Unclear	Unclear
Netherlands	Unclear	Unclear
Romania	Unclear	
Spain	Unclear	Unclear
Sweden	The accountable manager of the operator	
UK	Small RPAS: "person in charge"; Other RPAS: operator	The "operator" is not the only body on whom liability might be imposed. Under Section 76 of the UK Civil Aviation Act 1982, the liable party is the owner of the aircraft

Source: SDG analysis

4.17 The information in this table relates to civil liability only. In some circumstances the operator or other parties deemed responsible for an incident may also be liable to criminal penalties, and the provisions in relation to this may differ.

Analysis of the efficiency of the framework for RPAS third-party liability

Type of liability

4.18 For victims or claimants of incidents or accidents, the process to obtain compensation is slightly simpler under a strict liability regime than in a fault-based one, provided that the RPAS operation is legal and that the operator is identifiable and properly insured (Figure 4.2: below). The great advantage of a "strict" based liability regime over a fault-based one is to remove the need to establish fault(s). As explained by our legal advisor Clyde & Co, establishing fault in aviation can be technically complex, and as a result may take a long time.





Source: Steer Davies Gleave analysis

- 4.19 As illustrated above, in strict regimes the victim will be compensated by the operator (assuming the operator is the party defined in law as being strictly liable, and that it can be identified and it has sufficient insurance or assets). The principle of the operator having strict liability to the victim does not preclude either it or the victim from making a claim against other parties, such as a manufacturer, if liability can be made out under, for instance, established principles of tort or product liability. So far as liabilities of manufacturers are concerned, the European Product Liability Directive (1999/34/EC) applies to manufacturers and importers of RPAS. This Directive establishes the principle of liability without fault applicable to European producers. Where a defective product causes damage to a consumer, the producer may be liable.
- 4.20 In fault-based regimes, first of all responsibility needs to be established, which is likely to be a lengthy process with every party trying to minimise its responsibilities. The victim can only be compensated when this process is completed. Parties that are not the operator are unlikely to have a mandatory requirement for third party liability insurance equivalent to that in Regulation 785/2004, but nonetheless we would expect most businesses to have third party liability insurance as part of their normal operations. If this was not the case, then this would require assets of the party liable to be liquidated.
- 4.21 Therefore in a strict based regime, there is more legal certainty because it is clear which party (which in most cases is the operator) is liable towards the victim. This means a time saving in the damage compensation procedure compared to fault-based regimes. However a strict based regime does not necessarily mean that the victim/claimant is compensated quickly: depending on the circumstances, the legal process can be long and complex. We discuss in paragraph 4.30 the processes involved for compensation of the victim/claimant. From a victim point of view, a strict liability system is likely to be preferable. However,

operators might consider it unreasonable that they would be deemed liable even when not at fault. We discuss in paragraph 4.70 the potential for harmonisation of the liability framework.

Applicable limits

- 4.22 In "unlimited" liability regimes, there is no limit defined in law to the financial responsibility of the liable party. It is left to the judicial system to determine, on a case by case basis, the precise indemnification amounts to be paid to each party. As discussed above, in practice compensation will in any case be limited to the insured amount plus liquidated assets.
- 4.23 This differs in countries with a limit to liability (such as Italy and Germany). However in both these countries, if the operator is found negligent, the limit on liability is removed, and in that case the regime becomes "unlimited". Establishing whether the operator is negligent is therefore a crucial legal matter in these countries that may impact the indemnification of the victims.

Identification of the liable party

4.24 Where national law defines liability as being strict, it is particularly important that it also clearly defines what that party is, as the obligation to compensate the victim will automatically fall on it, regardless of contributing factors and actions that may have led to damages or injury. In the case of RPAS, identifying the party that is at fault may be less straightforward than in the case of manned aviation, due to the complexity of the RPA system, as illustrated below.





Source: Steer Davies Gleave. For illustration only

- 4.25 Table 4.3: above showed that, where there is a strict liability regime for RPAS, the party that is liable is likely to be the operator. Therefore, it is also important that the party that is the operator is clearly defined, and again this may be less simple in the case of RPAS than for manned aviation.
- 4.26 Where registration and/or granting of permissions is required for an RPAS operation, the person/entity named on the registration or permit is usually designated as the "operator". In the regulatory context, the notion of operator is well defined, for instance in the EASA Basic
Study on the Third-Party Liability and Insurance Requirements of Remotely Piloted Aircraft Systems (RPAS) | Final Report

Regulation (216/2008). However there may also be some degree of variance in how the term "operator" is assessed by a court. In certain Member States, the question of who is liable (whether expressed as the "operator" or not) is assessed by reference to a codified mechanism/definition; in other Member States it appears that it may be assessed by reference to case law. In Rome Convention, the "operator" is defined as the person making use of the aircraft at the time damage was caused, with a focus on who has navigational control, which will generally be the pilot so that in a wet lessee¹ situation the liable party is the lessor. The owner is presumed to be the operator unless it proves that another party was the operator.

- 4.27 Claims may be brought against an individual but in the context of manned aviation this has been extremely rare: claims are generally brought against the organisation for whom the individual works and the law firm Bird & Bird commented that it did not see why this would be different in the RPAS context.
- 4.28 We have also been asked to comment on the scope for a European regulatory body defining the operator as being the liable party. We do not believe that this would be possible in Member States where liability is fault based, as in these States, by definition, liability depends on the specific circumstances. Therefore, if the Commission were to seek to introduce such a requirement, it would also have to require Member States with fault-based liability regimes to adopt strict liability; as discussed below, we expect this would be particularly difficult to achieve. In addition, even in States with strict liability, there are different provisions as to whether the owner is presumed to be the operator, and this would also need to be harmonised; therefore a requirement that the liable party is the operator would create a problem in these Member States too.
- 4.29 In conclusion, we do not recommend that any requirement to define the operator as the liable party should be brought forward by the Commission.

Efficiency of the framework in processing RPAS claims

- 4.30 The Commission has noted that it is possible that RPAS operations may lead to frequent small claims for damages to third-parties, and as a result we have been asked to assess if the regime in place appears to be able to efficiently address this type of claims.
- 4.31 The processes that claimants might encounter as they seek to obtain compensation for damages are presented in Figure 4.4:. As explained in the rest of this document, as of October 2014 we are not aware of any third-party claims involving RPAS. Therefore this diagram is not based on evidence, but on our understanding of what might happen, drawing where possible a parallel with the claims for general aviation.

¹ Wet lease: a lease in which the lessor provides both the aircraft and the crew. Leasing of an aircraft without crew is considered to be a dry lease.

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4.32 This figure illustrates that:

- RPAS claims involving third-parties have the potential to be lengthy and complex. However this is very much dependent on the circumstances surrounding the damages and the extent of the damages, and whether third parties have suffered deaths or bodily injuries. Any case in which there have been serious bodily injuries or there is a dispute about the assessment of the loss that the claimants have suffered is likely to be lengthy and there is a high chance that a court case may be necessary to settle the responsibilities and financial compensation.
- However, a court case is not a requirement and in most cases for small damages there is less chance that the parties will be willing to incur the time and costs of using the judicial system for the claim(s).
- At the moment, there are a number of potential circumstances in which claimants may find it difficult or impossible to obtain compensation. These circumstances include where it is not possible to identify the operator after an incident; where it is not possible for the claimant to identify the insurer if the operator is reluctant to do so; exclusions written in insurance contracts; and the timeline for the victim to obtain compensation. We have highlighted these with a star on the diagram and indicated that, in principle, these are issues that could be addressed by the regulator(s) in order to offer a more efficient claims regime.

Identification of the RPAS

- 4.33 First of all, it is important to point out that without proper identification of the RPAS operator there is no possibility for third-parties to obtain compensation. There could very well be some cases where the operator cannot easily be identified. This could occur (for example) if the RPAS flew away from the control of its operator, or if it was totally destroyed in a crash or a fire. There could also be instances where the responsible operator might not be willing to be identified. Therefore it is important that the operator can be identified based on physical information which can be retrieved from the RPAS, in the same way that car owners can be traced from their car registration plates.
- 4.34 We have examined what physical identification or registration arrangements exist across the EU for RPAS. The table below provides an overview of the requirements in each Member State. In several, but not all, Member States there is a requirement for a physical identification number on each vehicle.

Member State	ID plate on RPAS	Register of IDs kept	Additional comments
Belgium	Unclear	Unclear	The Belgium legislation is at a draft stage at present.
Czech Rep.	Yes	Yes	-
Denmark	No	No. Only a register of operators is kept by the CAA	No requirement for ID on the RPAS - professional RPAS operators must have a permit from the Danish Transport Authority.
France	Yes	Unclear	A 10x5 cm ID plate must be fitted on the RPAS with operator name and telephone number.
Germany	Unclear	Unclear	-

Table 4.4: Physical identification of RPAS

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Member State	ID plate on RPAS	Register of IDs kept	Additional comments
Italy	Yes	Yes	Identification and registration of the RPAS and operator required
Netherlands	Yes	Yes	Fire resistant plate (ICAO Annex 7) is required with contact information of owner or operator. Registration in the aircraft register and for flights (which are currently only allowed with exemption by Dutch CAA).
Romania	Unclear	Unclear	-
Sweden	Yes	Yes	There is a requirement to mark the aircraft with a unique approval number as well as contact information.
			Spain should impose operators the obligation to notify the Agency which RPAS they operate at each time.
Spain	Envisaged	Envisaged	Spain should require operators to put an identification plate on each RPAS it operates that would identify the operator
			Spain also commented that if operators did not comply with the ID requirement, it would be difficult to identify the operator
UK	Unclear	Unclear	

Source: Steer Davies Gleave analysis

- 4.35 We recommend that the European Commission and/or the Member States make a it a compulsory requirement that all RPAS licensed to operate are fitted with a fire-proof ID that would include the contact details of the operator. This should be an immediate requirement for all RPAS (and ideally also for model aircraft) whether operated by or on behalf of the State, by a commercial entity, or any other party.
- 4.36 With no significant barriers to entry, operator representatives have shared their views (in Chapter 3) about the illegal market. For claimants to be able to identify RPAS whether operating legally or illegally would require all RPAS to be fitted by their manufacturer with a fireproof ID, for example in the form of a unique serial number. Manufacturers and importers of RPAS would need to be required to maintain a register of buyers and share this register with authorities when required. We further discuss the RPAS registration in paragraph 7.15.

Identification of the insurer

4.37 A stakeholder pointed out that an RPAS operator may be unwilling to disclose the name of its insurer and that this may slow down the claim process. By comparison, in the car industry, there is an updated registry of vehicles and their respective insurers, so that the insurers of all parties involved can easily be identified and can get in touch with one another. We recommend that the regulator(s) consider now this possibility for RPAS.

Exclusions

4.38 We explain in paragraph 5.52 that in aviation insurance exclusions can be opposed to the victims, potentially leaving them without compensation if an incident happened outside the perimeter of insured usage. We also note that in the car industry, the scope of exclusions is

very reduced, and that as a result there are not many instances where victims would not be compensated.

- 4.39 Article 13 of the Motor Insurance Directive (2009/103) requires each Member State to "take all appropriate measures to ensure that any statutory provision or any contractual clause contained in an insurance policy shall be deemed to be void in respect of claims by third parties who have been victims of an accident where that statutory provision or contractual clause excludes from insurance the use or driving of vehicles by:
 - (a) persons who do not have express or implied authorisation to do so;
 - (b) persons who do not hold a licence permitting them to drive the vehicle concerned;
 - (c) persons who are in breach of the statutory technical requirements concerning the condition and safety of the vehicle concerned
- 4.40 We recommend that the Commission considers and discuss with the insurance industry now whether prohibiting exclusions in RPAS insurance contracts may be feasible, and if so at which cost for the RPAS and the insurance industries. It should be noted that this is potentially an issue for manned aviation as well.

The timeline for the victim to obtain compensation

- 4.41 Figure 4.4: shows that the processes to compensate the claimants of RPAS third-party damages can be complex. Even in strict liability regimes where there is a designated party to compensate the victim, in practice it may take some time before the claimants obtain some compensation.
- 4.42 Article 28 of the Montreal Convention (convention on the rules relating to the international carriage of passengers, baggage and cargo) foresees advance payments in the case of aircraft accidents resulting in death or injury of passengers. In that case, "the carrier shall, if required by its national law, make advance payments without delay to a natural person or persons who are entitled to claim compensation in order to meet the immediate economic needs of such persons. Such advance payments shall not constitute a recognition of liability and may be offset against any amount s subsequently paid as damages by the carrier".
- 4.43 There is no corresponding provision in the case of death or injury to third parties caused by manned aviation. We also note that there are no such provisions in the Motor Insurance Directive; however, Article 22 on the compensation procedure does require Member States to ensure that "within three months of the date when the injured party presented his claim for compensation either directly to the insurance undertaking of the person who caused the accident or to its claims representative, the insurance undertaking of the person who caused the accident is required to make a reasoned offer of compensation or where liability is contested or damages have not been quantified provide a reasoned reply to the points made in the claim".

Conclusion on the efficiency of the framework in processing RPAS claims

- 4.44 We therefore recommend that the Commission now starts to consider these approaches in more detail and the impact they may have on the industry.
- 4.45 We would also like to point out that when assessing the regime for the treatment of RPAS claims it is useful to understand what has been agreed in the motor industry over the years. However, cars and other vehicles operate for most parts on defined roads and only within a 2D environment. RPAS operate in 3D environments and do not follow roads or any other form

of defined air navigation corridors; it is therefore inevitable that assessments relating to RPAS will be more complex and difficult than for motor vehicles.

4.46 In addition, it would be useful for all Member States to provide explicit information about their liability frameworks for RPAS for both ground damage and mid-air collisions and whether or not they differ from the rest of aviation. The European Commission should consider an immediate requirement to Member States to make this explicit in their RPAS operating rules for the benefit of the entire industry.

Views of the stakeholders

- 4.47 Stakeholders did not comment as to whether or not the current system of liability worked, since most of them commented that they were not yet aware of any incident or accident involving damage to third parties caused by RPAS. We also investigated for any evidence or information from incidents or accidents caused by RPAS, but did not find anything or any victims. Therefore we are unable to report the views of the victims.
- 4.48 Stakeholders had different views about whether there was any need to harmonise third-party liability across Europe for RPAS. The stakeholders in favour of harmonisation thought that common rules:
 - could encourage cross-border and foreign country RPAS operations due to better awareness of applicable liability rules; and
 - would increase legal certainty for both operators, insurers and the public at present, the issue is often not explicitly regulated by law and is therefore left for interpretation by courts (with little or no existing case-law).
- 4.49 The stakeholders who considered that there was little need to harmonise third-party liability across Europe for RPAS considered that:
 - It would not be logical and/or proportionate to have a harmonised third party liability regime for RPAS whilst not having one for manned aircraft, as a third party suffers damages irrespective of whether the aircraft that causes the damage is manned.
 - It would be probably quite difficult to find a mutually acceptable common regime across EU Member States, because general national liability regimes are based on quite different principles, and the civil law concerning liability is not harmonised within the EU.
 - A harmonised legal framework may be at risk of ignoring national legal conventions and/or national economic realities.

Views of the RPAS Regulators

4.50 Around a third of the RPAS Regulators sampled agreed that there was a need for harmonisation, whilst the other RPAS Regulators were happy to leave the current liability regimes as they are.

View of the operators and insurers

4.51 Among operators and insurers, the majority stated that they would favour a harmonised framework that would help RPAS operators to develop their activities at EU level in a better known and more consistent legal environment, as well as facilitating the implementation of compensation mechanisms. However, they also recognised that this would require all EU

Member States to agree to transfer this competence to EU level, which would take some time and might slow down the development of the industry.

View from a legal practitioner

4.52 A stakeholder commented that it did not seem logical to legislate for liability for third party or surface damage occasioned by RPAS in isolation from manned aircraft.

Liability regimes in other sectors

Manned aviation: attempts to harmonise the liability regime

- 4.53 As discussed above, the liability regime for manned aviation is similar to the regime for RPAS, because RPAS are considered aircraft and national law on third party liability in many Member States does not distinguish between manned and unmanned aircraft.
- 4.54 Since the Warsaw Conference in 1929, several attempts have been made to introduce regimes defining the liability of an aircraft owner or operator to third parties who suffer damage on the surface, but with limited success.
- 4.55 The 1933 Rome Convention Relating to Damage Caused by Aircraft to Third Parties on the Surface (from which flowed the Brussels Insurance Protocol 1938) never came into force and was superseded by the Rome Convention of 7 October 1952, on Damage Caused by Foreign Aircraft to Third Parties on the Surface. This was then amended by the Montreal Protocol in 1978 which aimed to modernise the amounts of limits of liability.
- 4.56 The Rome Convention is the principal international treaty on third-party liability, but it has only been ratified by 49 States, including four EU Member States. Notably absent are some key aviation jurisdictions including Australia, China, Japan, USA and the remaining EU and EFTA² Member States (Canada and Australia previously ratified the Convention but denounced it in 1976 and 2000 respectively). The Convention applies where there is damage caused in the territory of a Contracting State by an aircraft registered in the territory of another Contracting State, and therefore it excludes domestic operations.
- 4.57 Belgium, Italy, Luxembourg and Spain adhere to the Rome Convention and we assume that they apply its provisions, which apply only when the damage in that State is caused by an aircraft registered in another Rome Convention contracting State. Article 7 of the Convention suggests that its provisions also apply to aircraft which collide or interfere in flight.
- 4.58 Key, relevant, provisions of the Rome Convention are:
 - The Convention adopts a strict liability approach: Article 1 defines that any person who suffers damage on the surface caused by an aircraft in flight (and registered in another contracting state) shall be entitled to compensation from the operator of the flight, as provided within the terms of the Convention. This means that there is no need to prove fault. All the claimant must show is that there was a causal connection between the damage suffered and the aircraft in flight.
 - Under Article 11, the limit to liability depends on the weight category of the aircraft. For the lowest weight category (aircraft less than 1,000kg, which would include most RPAS),

² EFTA, the European Free Trade Association, is made of Iceland, Lichtenstein, Norway and Switzerland.

the limit is 500,000 francs3. However, Article 12 defines that there shall be no limit on liability where the damage was caused by a deliberate act or omission of the operator, done with the intent to cause damage. Article 12 also defines that a person making wrongful use of an aircraft without the consent of the person entitled to use it shall face unlimited liability.

- Article 13 protects the limits set notwithstanding that more than one party might be liable. In the events of multiple claims exceeding the limits, Article 14 provides that the amount set by the limit will be distributed proportionally between the claims.
- Article 2 defines that the operator of the aircraft is the liable party. The term "operator" means the person who was making use of the aircraft, provided control of the navigation of the aircraft was retained by the person from whom the right to make use of the aircraft was derived. The registered owner of the aircraft shall be presumed to be the operator.
- Joint and several liability may arise. Article 4 defines that the person entitled to navigational control of an aircraft will be jointly liable with a person using an aircraft without the consent of the person entitled to its navigational control. A further example of joint liability arises in the event of a mid-air collision (Article 7), in which case the applicable limit is the aggregate of the limits applying to each aircraft.
- 4.59 In the aftermath of 9/11, ICAO undertook an initiative to reconsider the Rome Convention, and produced two separate Conventions, known as the General Risks Convention and the Unlawful Interference Convention. These Conventions were opened for signature in 2009 but have not yet come into force on account of lack of sufficient support; no EU Member States, or any of the other countries with the largest aviation markets, have signed either Convention.
- 4.60 More information is provided in the report on the Mid-Term Evaluation of Regulation 785/2004⁴. This report explains that according to experts, it would be very difficult to get Member States to agree a mutually acceptable common position, and that the level of fragmentation is not considered by Member States or the aviation industry to pose a problem.

International comparisons on aviation liability

Australia

- 4.61 In Australia, the Damage by Aircraft Act (DBA) 1999 defines that the aircraft owner and operator have strict and unlimited liability where an aircraft causes damage to third parties on the ground. There are some exceptions to this with respect to owners passive owners such as lessors or financiers are exempt⁵. This applies where a person or property, on or under land or water suffers personal injury, loss of life, material loss, damage or destruction caused by either the impact by an aircraft in flight or something that has fallen from an aircraft in flight⁶.
- 4.62 We discussed this issue with officials at the Trade & Aviation Market Policy Division of the Department of Infrastructure and Regional Development, who advised that RPAS are likely to fall within the scope of the DBA Act. The definition for aircraft under the DBA Act is "any machine or craft that can derive support in the atmosphere from the reactions of the air,

³ For the purpose of the Convention, 'franc' means a unit of currency equivalent to 65.5mg of gold

⁴ http://ec.europa.eu/transport/modes/air/studies/doc/internal_market/2012-07-insurance-requirements.pdf

⁵ s10(saA) DBA Act

⁶ ss10(1)(a)-(d) DBA Act

other than the reactions of the air against the earth's surface". However, the DBA Act does not include model aircraft⁷. The Civil Aviation Safety Regulations 1998 (CASR) defines a model aircraft as "an aircraft that is used for sport or recreation, and cannot carry a person". The scope of the DBA Act is limited to the constitutional reach of the Federal Government (inter-State and international operations), however State legislation, which mostly pre-date the DBA Act, creates similar liability frameworks.

Brazil

4.63 Brazil is a signatory to the Rome Convention 1952 and also one of the 12 countries that have ratified the Montreal Protocol 1978. The third party liability regime applicable to aircraft in Brazil is one in which liability is strict and capped. ANAC clarified for Steer Davies Gleave that RPAS are treated as aircraft, and therefore the same regime applies.

Motor vehicle industry

Liability regimes

- 4.64 We have examined the liability regimes for the motor industry in EU Member States. We have found that there is a wide range of different regimes. These regimes may be strict or fault based, and in turn these are divided as follows:
 - Strict liability:
 - Strict (almost absolute): the injurer has to compensate the injured for the damage caused irrespective of any carelessness on their part;
 - Strict (relative): the liability of the injurer is presumed unless the latter proves that the accident did not occur as a result of negligent behaviour;
 - Strict with comparative negligence: where strict liability applies to both the injurer and the injured; and
 - Strict with contributory negligence: where the injurer is liable for the accident losses unless the victim's level of care was less than their due level of care.
 - Fault-based is divided into:
 - Fault-based: where the claimant has to prove the injurer's fault; and
 - Fault-based with reverse burden of proof: where the defendant has to disprove the victim's claim of negligence.

Table 4.5: Motor liability regimes across Europe

Member States	Motor liability regimes
Belgium	Fault-based with reverse burden of proof
Czech Republic	Strict (relative)
Denmark	Strict (relative)
France	Strict (almost absolute)
Germany	Strict and comparative negligence
Italy	Strict (relative)
Netherlands	Strict (relative)
Romania	Fault-based
Spain	Strict and contributory negligence

⁷ s4 DBA Act, and s3 Civil Aviation Act 1988

Member States	Motor liability regimes
Sweden	Strict
United Kingdom	Fault-based

Source: Steer Davies Gleave analysis of 2009 Retail Insurance Market Study by Europe Economics for DG MARKT

4.65 The table shows that there is no harmonised liability regime for the motor industry. However, this does not prevent a functioning market with many cross-border operations.

How liability is apportioned

- 4.66 Insurers are the main source of compensation in road traffic accidents and they are also one of the main settlers of claims. Motor vehicle accidents often involve multiple parties who have third-party liability insurance with different insurance companies, and who may be liable in different proportions for the same incident. In the case of a road accident between two vehicles, for instance, there may be many parties involved:
 - the (compulsory) third party liability insurers of both owners or drivers;
 - possibly their own damage insurers;
 - in the case of bodily injury, accident insurers; and
 - social security institutions (health, disability, pension insurers, etc).
- 4.67 As a result, several insurance companies will often be involved in the settlement of each claim. Insurance companies have developed a number of agreements about how they will deal with each other to facilitate swift settlement of claims:
 - Direct settlement agreements: According to these agreements, the non-liable driver's insurance company is allowed to proceed to his/her refund, on behalf of the liable driver's insurance company;
 - Knock-for-knock agreements between third party liability insurers: this is in the case where third-parties are injured in a collision between motor vehicles. Knock-for-knock agreements prevent the victim from being referred from one insurer to another; and
 - Agreements on the settlement of mass accidents.
- 4.68 Because of the problems faced by victims in the motor industry in enforcing justified claims and by insurers in finding out the actual cause of the accident, such agreements have been found to be very useful by the insurance industry⁸.
- 4.69 As for any other liability claim, the victims of a road accident may take action themselves through the courts, but the extent to which the courts are involved in practice varies across the EU⁹:
 - In some EU jurisdictions, the victim will have a choice to make as to whether they wish to apply to the liable party's insurer or seek compensation from the liable party directly through the court system (Slovakia, Lithuania, Luxembourg and the Czech Republic).
 - In some other EU jurisdictions, recourse to the courts is secondary to claiming directly from insurance companies. For example, in some countries, a victim may apply to the court for any part of compensation not covered by the liable party's insurance (e.g. Latvia)

⁸ Comité européen des assurances, Letter to DG COMP on Block Exemption Regulation, 2002

⁹ Source: Compensation of cross-border victims in the EU, 2009, for DG MARKT

or where the insurer does not present a compensation offer within the specified time frame (Spain).

• In Sweden, compensation for personal injury in road traffic accidents is rarely taken to court. This is because a special body, the Swedish Road Traffic Injuries Commission, exists to settle such claims. The Commission hears major compensation cases and determines the compensation payable to the claimant.

Assessment of the case for harmonisation of liability regimes for RPAS

4.70 As discussed above, in most but not all Member States, liability is strict and unlimited, and the operator is the liable party. This section assesses the case for the EU proposing a specific regime for RPAS liability. We address this by discussing the advantages and disadvantages of adopting a harmonised EU-wide liability regime, in which the operator would always be strictly liable.

The current status quo

- 4.71 For RPAS operators that operate domestically only, there is no impact on their activities because of non-harmonised liability regimes across Europe. Whether they are aware or not of the requirements of Regulation 785/2004 for their third-party liability insurance cover, their insurance brokers will advise them of how much insurance cover they need, taking into account the nature of their operations and national law on liability.
- 4.72 For RPAS operators undertaking cross-border operations, then there are no operational issues with different types of liability between two Member States. However again it would be left to their insurance brokers to advise them of the right level of insurance, based on their operations and the national liability regimes in the countries that they will operate in. The existence of different liability regimes means that any legal issues may be more complex for the parties.
- 4.73 For brokers and insurers, different types of liability regimes across the EU increase legal uncertainty (particularly if it is difficult for them to obtain information on what the regimes are), and may therefore negatively affect their risk assessment. They may also be less willing to offer services in other Member States, where they are not as familiar with the liability regime.
- 4.74 For the victims, the existence of different limits means that they may expect to receive different level of compensation in different Member States. However, this does not impact the compensation process, just the financial outcome.

Advantages of harmonisation

4.75 In comparison to manned aviation, there may be greater potential for claims involving RPAS to have potentially culpable or responsible parties located across several jurisdictions (for example, although this is unlikely to occur at present for most civil RPAS operations, theoretically it is possible that the pilot could be in a different State from the aircraft). This gives rise to issues concerning the liability of, and apportionment of liability between, different entities, and potential for conflicts of law with respect to the applicable jurisdiction, or applicable law. A potential advantage of a harmonised, strict liability regime would be that this might benefit victims by removing some of the complexity involved in pursuing such claims, and indeed the Rome Convention 1952 does this to some extent where it is applicable.

- 4.76 Another benefit of a common liability regime across the EU would be that this would improve legal certainty for all parties involved (including insurers and operators, and also the legal profession).
- 4.77 A harmonised liability framework across Europe (assuming the operator is always strictly liable) would improve protection of third-parties in case of damage/injury as it would mean that in every jurisdiction victims are entitled to compensation from the operator, which is also the party that must be insured. This would be an advantage compared to fault-based regimes, where victims have to wait for fault to be established, and then need to obtain compensation from parties that apart from the operator are not necessarily insured for third-party liability.
- 4.78 If the harmonised regime defined that the liable party was the operator, there would also need to be a precise and unique definition of "operator", so that there was no uncertainty about the identity of the liable party. The key benefit of this for both market participants and victims would be to improve legal certainty.

Disadvantages of harmonisation

- 4.79 The desk research and stakeholder interviews undertaken for this study have not identified substantial problems arising from the lack of a harmonised regime on third party liability for RPAS, although this may in part reflect the fact that the industry is at an early stage of development, and the number of operations is expected to grow rapidly.
- 4.80 As discussed above, there is at present no EU legislation (or international legislation applying in most Member States) defining a common regime for third party or surface damage liability for on-board piloted aircraft. We have identified little reason why there should be a need to legislate for RPAS in isolation from on-board piloted aircraft. Given the relative sizes of the markets for manned and unmanned aviation, it would be a more significant process to agree and implement a common regime for third party liability for all types of aircraft.
- 4.81 The limited take-up of the proposed international conventions on third party liability could suggest that there is little international appetite for a common liability regime. Some national authorities also noted that, due to the different positions that had been taken in discussions on this issue by different Member States for manned aviation, it was likely to be very difficult to achieve agreement on a common regime for RPAS. In the absence of a common regime, strict and unlimited liability for damage to third parties applies in the majority of Member States. If there was to be a common regime, there would be advantages (particularly from the point of view of the victims) in this being a strict liability regime, but it is likely that some Member States would strongly oppose this.
- 4.82 The principle of the operator being strictly liable may be appropriate for ground damage but is unlikely to be appropriate for mid-air collisions, as it is not practical for two operators to be strictly liable. Therefore, in these cases, liability needs to be allocated between the operators. In addition, in the event of a collision between a manned aircraft and an RPAS, it would be inconsistent and increase complexity if the RPAS operator had a different liability framework from the operator of the manned aircraft. Therefore, we would not recommend adoption of a harmonised liability regime for RPAS for mid-air collisions unless there was also a harmonised regime for manned aircraft.

Conclusions on harmonisation of liability regimes for RPAS across Europe

- 4.83 We have not found any evidence that the current variation in third party liability frameworks for RPAS across the EU has hindered the development of the market or creates a problem in ensuring the adequate compensation of victims, although it does complicate the work of the RPAS insurance and legal industry. There is clear evidence from manned aviation that there is no appetite for harmonisation and that this complexity can be worked with. In addition, there could be issues with the operation of different third-party liability regimes for manned and unmanned aviation (particularly in the event of an accident involving both). It should also be noted that there is no harmonised liability framework across the EU for motor vehicles and that this does not stop the Motor Insurance Directive from offering a high level of protection to third-parties.
- 4.84 We also believe, on the basis of the discussions with national authorities, that the chance of reaching an agreement to harmonise the liability regimes for RPAS in the EU is very low. To do this would require extensive work and very difficult negotiations between Member States. On this basis, we recommend that there should not be any attempt to harmonise third-party liability regimes across the EU.

5 Insurance requirements for RPAS

Introduction

5.1 In this chapter we detail the current insurance requirements for RPAS operators. We then examine the adequacy of these requirements, on one hand to check if they are potentially an economic obstacle to the development of the RPAS industry, and on the other to ensure that there is proper compensation for third-parties.

Insurance requirements for RPAS

Regulation 785/2004

5.2 Insurance requirements for air carriers and aircraft operators in Europe are defined in Regulation 785/2004. The Regulation was introduced in the aftermath of 9/11, partly to address the reduced supply of insurance for the risks of war and terrorism, and it came into effect on 30 April 2005. It defines insurance requirements for air carriers operating in the EU in respect of insurance to cover of liabilities for passengers, baggage, cargo and third parties.

Applicability of the Regulation to RPAS

- 5.3 Regulation 785/2004 was drafted before widespread civil use of RPAS was envisaged, and as a result, the Regulation does not mention RPAS, and RPAS-specific issues were not taken into consideration when the Regulation was prepared. However, as discussed above, this Regulation does apply to all aircraft within, to, from and above EU territory. Therefore, if it is clear that RPAS are included within the definition of aircraft, the Regulation applies to RPAS.
- 5.4 In its Global Air Traffic Management Operational Concept (Doc 9854), the International Civil Aviation Organisation (ICAO) states that "an unmanned aerial vehicle is a pilotless aircraft, in the sense of Article 8 of the Convention on International Civil Aviation, which is flown without a pilot-in-command on-board and is either remotely and fully controlled from another place (ground, another aircraft, space) or programmed and fully autonomous". This understanding was endorsed by the 35th Session of the ICAO Assembly.
- 5.5 It also emphasized in its Circular 328 of 2011, that "ICAO recognizes many categories of aircraft, among them balloons, gliders, aeroplanes and rotorcraft. Aircraft can be land, sea or amphibious. Whether the aircraft is manned or unmanned does not affect its status as an aircraft".
- 5.6 Given that ICAO has established that RPAS are aircraft, it is clear that Regulation 785/2004 does apply to all RPAS operations, to, from, above and within the European Union, in the same way as it applies to manned aircraft.
- 5.7 In addition, while the Regulation does not explicitly mention RPAS, there is nothing within the Regulation that indicates that RPAS should not be covered. All national authorities also

confirmed that they only referred to Regulation 785/2004 regarding insurance requirements for RPAS, and that there is no other national requirement in the EU.

The relevant requirements of the Regulation

5.8 As a Regulation, 785/2004 applies directly throughout the EU and does not require transposition into national law, and in accordance with the provisions of the single market for air transport, no Member States have adopted their own separate requirements for aviation insurance. Therefore the Regulation is the only requirement in relation to third party liability insurance for RPAS in the EU, and this section provides a brief summary of its requirements. Member States are responsible for implementing the requirement in Article 8 for enforcement and sanctions.

Scope of the Regulation (Article 2)

- 5.9 The Regulation applies to all air carriers and to all aircraft operators flying within, into, out of, or over the territory of a Member State to which the Treaty applies. Article 2(2) defines exemptions for State aircraft, captive balloons, parachutes and kites, foot-launched flying machines and model aircraft with a MTOM of less than 20kg.
- 5.10 Article 2(2)(g) also defines that aircraft (including gliders) with a MTOM of less than 500kg, and microlights, are exempt from the war and terrorism insurance obligations if they are:
 - used for non-commercial purposes; or
 - used for local flight instruction which does not entail the crossing of international borders.

Principles of the Regulation (Article 4)

- 5.11 The Regulation defines insurance requirements for air carriers and aircraft operators in respect of their liabilities for third-parties as well as passengers, baggage and cargo. In this context, a third party is defined in Article 3 as meaning "any legal or natural person, excluding passengers and on-duty members of flight and cabin crew". In addition, the insured risks must include at least acts of war, terrorism, hijacking, acts of sabotage, unlawful seizure of aircraft and civil commotion. All flights must be covered, whether the flight is operated through a code-share, franchise, any form of lease, etc.
- 5.12 The Regulation defines requirements for insurance, not liability, and applies without prejudice to the rules on liability arising from other Conventions and laws. This means that the Regulation does not change the existing rules on liability as arising from the Montreal Conventions and other relevant laws.

Compliance (Article 5)

5.13 Article 5 requires the "competent authorities" to obtain an insurance certificate (or other evidence of valid insurance) so that air carriers and operators can demonstrate compliance with the insurance requirements.

Minimum coverage requirements (Articles 6 and 7)

5.14 The Regulation sets minimum insurance requirements for air carriers and operators of aircraft within its scope. In respect of liability to third parties, the minimum insurance cover per accident varies depending on the maximum takeoff mass (MTOM) of the aircraft, from 0.75

million SDRs¹⁰ for aircraft with an MTOM of less than 500kg, to 700 million SDRs for aircraft with an MTOM of 500,000kg or more. The minimum applies per accident and per aircraft. Virtually all current commercial RPAS operations would fall within the lowest band, applicable to all aircraft with an MTOM of less than 500kg.

5.15 The graphic below illustrates the weight bands as required by the Regulation.



Figure 5.1: MTOM bands as per Regulation 785/2004

Source: SDG analysis

- 5.16 For the lowest two bands the precise requirements are:
 - Below 500 kg: Minimum insurance requirement of at least 0.75 million SDRs per accident for each and every aircraft. This was equivalent to €856,000 in July 2014.
 - Between 500 and 1,000 kg: Minimum insurance requirement of at least 1.5 million SDRs per accident for each and every aircraft. This was equivalent to €1.75 million in July 2014.
- 5.17 Overflights (flights without a take-off or landing in the EU) by non-EU carriers or operators using aircraft registered outside the EU are only required to comply with the requirements for insurance against liability to third parties.

Enforcement and sanctions

5.18 Article 8 of the Regulation requires Member States to ensure that air carriers and aircraft operators comply with the Regulation and stipulates that sanctions for infringement shall be "effective, proportional and dissuasive".

¹⁰ SDRs are Special Drawing Rights as defined by the International Monetary fund.

Analysis of the Regulation: insurance requirements

- 5.19 As explained in paragraph 5.14, currently RPAS are required to purchase third-party liability insurance based only on their MTOM. The minimum insurance requirements prescribed in the Regulation do not take into account the nature of the RPAS operation (for example, its purpose, the area it overflies, velocity, etc), and are the same as for manned aircraft of equivalent MTOM.
- 5.20 To understand whether these requirements are appropriate for RPAS, we have considered:
 - Whether mass bands are an appropriate basis to define the amount of insurance required by RPAS; and
 - Whether the minimum level of insurance required by the Regulation is sufficient to adequately compensate victims.

Appropriateness of mass bands as a basis for the minimum level of insurance

- 5.21 The extent of surface damage that might be caused by an RPAS in the event of an accident is linked to a number of factors: the place of operations and what it overflies (with the potential surface damage generally greater in an urban area), its kinetic energy (mass and velocity) and to a lesser extent the type of operations undertaken. Other factors that may also contribute to the damage caused include the airframe characteristics, the material used for the airframe, the quality of the pilot training, the autonomous landing procedures (if any), the existence and use of safety devices such as parachutes, the software that controls the RPAS, the payload carried, and other specific characteristics of the incident.
- 5.22 We believe that the objective of the European regulator when setting in law minimum levels of insurance for RPAS should be to ensure that:
 - Levels of insurance required are as reflective as possible of the potential damage caused by RPAS;
 - Levels of insurance required are appropriate now and in the future, especially if the market circumstances change;
 - Insurance requirements are clear to all parties (particularly operators and their insurers), so that there is no scope for legal dispute; and
 - It is practical for the national regulators to enforce the requirements.
- 5.23 A further issue is that, whilst some factors may be relevant to the <u>typical</u> level of damage caused by an incident, a regulatory requirement for insurance should also take into account the <u>maximum potential</u> level of damage, which may be determined by different factors. For example, an accident in a rural area should on average cause less damage than an accident in an urban area, but the maximum potential level of damage may not be materially less for example an RPAS could still crash into a group of people, or a building and therefore this is not necessarily an appropriate factor on which to determine any insurance requirement.
- 5.24 As detailed in paragraph 6.26, there are a large number of factors and individual circumstances which may contribute to the level of damage caused in an accident, and these will vary from case to case. It would not be possible to accurately reflect all of these factors in law and even if they were to do so it would result in a complex regime which was difficult for industry participants to understand and for regulators to enforce. Therefore we believe that insurance requirements should be as simple as possible. This will inevitably mean that levels of insurance required will not always be aligned with actual damage caused by RPAS. However, a simple requirement in law does not prevent insurers from assessing the risks and damages

with much more granularity than ever possible by the regulator. As discussed in paragraph 6.26, insurers take a large number of factors into account when offering quotes to their clients.

- 5.25 Whilst the operating profile of RPAS is different from most of that of manned aviation, we see no significant differences between the factors explaining the damage profile of RPAS and of manned aviation: the damage of both industries is linked to area overflown, to kinetic energy, to the type of operations, to pilot training, etc. The Commission has expressed a concern that the issue of the area overflown is more crucial to RPAS than it to manned aviation because of the ease with which RPAS can fly above densely populated areas. This is indeed a concern however the same situation arises for manned aviation (for example most flights approaching London Heathrow approach over the centre of London).
- 5.26 For many years, manned aviation has used MTOM bands for insurance requirements in the EU but also globally. It is acknowledged that MTOM bands are only a proxy and do not accurately reflect the possible level of damages that an RPAS can cause. However, MTOM is one of the few parameters that is readily available to all parties (regulators and insurers) before, during and after the flight (the number is set when the aircraft is certified and whilst it can be changed later on, it does not vary based on day-to-day operations), and this is the reason why it has been used in manned aviation for more than 50 years.
- 5.27 For these reasons, we believe that RPAS insurance requirements should follow the same approach as manned aviation and use the same metric (mass bands). This conclusion could be reviewed if, once there was enough information available on actual RPAS damages, it appeared that other factors were more relevant to the level of damage caused.
- 5.28 We have been asked in addition to assess if the MTOM system in use today would be at any risks of not being "fit for purpose" going forward. Our answer can only be highly speculative since we are at the infancy of the development of the insurance market for RPAS and there is no known damage by RPAS operations as of today. We can draw a parallel with manned aviation which shows that the principle of basing insurance requirements on MTOM was introduced on an international scale in the original Rome Convention of 1933, remains in use to this day in both international treaties (such as the Rome Convention of 1952, amended in 1978) and European legislation (such as Regulation 785/2004). It should be observed that in the meantime manned aviation has changed in scale, in aircraft type and geographic areas served, but that mass bands remain.

Sufficiency of the current minimum levels of insurance

- 5.29 In order to assess whether the current minimum requirements for third-party liability insurance are sufficient, it is necessary to confirm that these are commensurate with the damage that may be caused by RPAS.
- 5.30 Unfortunately, there is no reliable data on RPAS incidents and accidents available either in the public domain or from commercial sources (we discuss this further in Chapter 7). As a result, it has been very difficult to develop informed insights into the risk profile of RPAS operations; this has been confirmed by the discussions we have held with insurers and a Qualified Entity. In part this reflects the unmanned nature of RPAS operations there is no person on board the aircraft who may be injured in an accident. It also reflects the relatively low cost of RPAS, as well as the fact that many RPAS operations are undertaken by manufacturers or research organisations. In addition, it appeared from the stakeholder responses that not all regulatory authorities had considered this issue in detail at this stage, and in particular that they had not

considered to what extent RPAS operations presented a different risk profile from other aviation operations.

- 5.31 The lack of information on incidents and occurrences means that the assessment of the damage caused by RPAS remains a theoretical exercise at this stage. This is in contrast to the manned aviation sector for which there is an extensive evidence base.
- 5.32 In paragraph 5.21 above, we explain that the capacity to cause damage is determined by the kinetic energy that the RPAS possesses because of its motion. Most regulators have defined restrictions limiting the types of operations that RPAS can undertake based on their mass thus seeking to control at least one of the kinetic energy variables in order to reduce the potential severity of damage that the RPAS could cause. However, we were advised by some stakeholders that, in setting mass/weight thresholds, regulators may unintentionally be limiting the extent to which redundancy can be built into the systems (for example, additional rotors), which could impact the reliability of the systems and thereby increase the risk of accidents.
- 5.33 Some industry commentators have speculated that damage to third-parties caused by RPAS might be more frequent but less severe than that caused by other type of aircraft. It is possible that, given RPAS is a developing industry, there might be expected to be a greater frequency of incidents than for manned aviation, but there is no firm evidence either of this or for the amount of damage caused in individual incidents.
- 5.34 One of the most severe possible incidents would be a mid-air collision between an RPAS and a manned aircraft. Research on the impact of bird strikes on aircraft shows that even small birds weighting 80 grams can cause serious jet engine damage¹¹. In most countries, airspace is currently largely segregated between RPAS and manned aviation (especially under 500ft), but this limitation is expected to be temporary¹². In any case, even in segregated airspace, there remains a risk of a mid-air collision and, all other things being equal, this risk will increase as the number of RPAS operations increases. The risk of a mid-air collision arises due to:
 - the possibility of more than one RPAS operating in segregated airspace;
 - the presence of military or State flights, such as air ambulance, police, or search and rescue, that operate at low altitude; and
 - the risk that, for whatever reason, an RPAS exceeds its normal operational boundaries (referred to in the industry as a "fly-away") and therefore conflicts with other RPAS or manned aircraft. This could arise due to the effects of wind, vortex (a whirling mass of air), or some sort of software or mechanical failure.
- 5.35 Therefore, at this stage, in the absence of data on incidents/accidents, it is not possible to reach a definitive conclusion as to whether the minimum insurance requirements are sufficient.

Third-party liability insurance coverage purchased by operators

5.36 Due to the lack of data on actual damage caused by incidents, we have evaluated how much third-party liability insurance coverage is actually purchased by the RPAS industry and by the model aircraft industry, because of possible parallels with the lighter RPAS. If operators in

¹¹ Flight Operation Briefing Notes, Flight Operation Briefing Notes, Airbus

¹² European Commission's communication, 8/4/2014

practice take out more insurance than the legal requirement, this could indicate that they perceive there to be a risk that the damage caused in an incident may exceed the amount of insurance required by law. We also discuss below the parallels with the motor vehicle industry.

- 5.37 The evidence collected as part of the stakeholder engagement from operators of light and ultra-light RPAS exercise indicates that in 2014 they generally purchased third-party liability between €1-2 million per aircraft, with companies operating in the UK stating that they were insured for sums of up to £5 million (€6 million). This is clearly well above the 750,000 SDR required by Regulation 785/2004 for aircraft under 500kg.
- 5.38 However, we should note that a study like this one has an inherent bias towards the complying stakeholders or the best in class who are more likely to want to participate rather than those who just follow the rules or those who do not. Therefore whilst it appears that most stakeholders go beyond the requirements of the Regulation, we cannot rule out that some do not.
- 5.39 The fact that operators purchase these amounts of coverage indicates that they are advised to do so by their insurance brokers, or (where the RPAS is being used for commercial purposes) that it is a requirement of their clients. This indicates that there is a view that RPAS damage might potentially be of that order, and therefore that it is greater than the amount of insurance required by the Regulation, at least for many types of RPAS operations. However, this view cannot be based on evidence for damage caused, because there is no evidence.

Benchmarking against other sectors

- 5.40 We have examined the level of coverage purchased in other insurance markets, to try to estimate if the minimum requirements are appropriate for RPAS. We focussed on the model aircraft industry and the motor industry.
- 5.41 The amount of insurance coverage purchased by model aircraft operators varies across Member States, with the highest levels we identified in the UK and the lowest levels in the Czech Republic:
 - Germany: the minimum insurance requirement for members of the German model aircraft association is €1.5 million, with members able to opt in for upgrades that insure them against larger sums.
 - Netherlands: Members of KNVvL Modelvliegsport purchase coverage for €1.25 million.
 - UK: Members of the British Flying Model Association (BMFA) tend to insure for sums of up to £10 million (€12 million).
 - Czech Republic: Model aircraft flying at air shows are recommended to be insured for €120,000.
- 5.42 In the motor industry, the minimum requirements for motor vehicles are set by Article 9 of Directive 2009/103/EC, as updated in December 2010. The minimum amounts are:
 - €1.12 million per victim and €5.6 million per claim, whatever the number of victims, in case of personal injury; and
 - €1.12 million per claim, whatever the number of victims, in case of damage to property.
- 5.43 It is notable that the legal requirements for insurance for motor vehicles are higher than those for light RPAS or aircraft; it is not clear how this is consistent with the potential for damage to be caused by RPAS in comparison with cars.

5.44 The graphic below illustrates the insurance that is purchased in the model aircraft and motor vehicle industries.



Figure 5.2: Third party liability insurance cover purchased in different industries

Source: SDG analysis.

Legend: • = purchased, \triangle = minimum requirement, \blacktriangle = minimum requirement (bodily injury)

Note: for the motor vehicle industry, the insurance requirements whilst there are set by EU minimum insurance requirements, it is left to Member States and NOT at EU to set their own level. This is why they have not been presented on this of requirements (which will differ in each Member State). The graphic. only displays EU requirements.

5.45 The analysis we undertook shows that, in other industries where there is a legal requirement to obtain insurance, market participants often buy coverage above the minimum. Third-party liability coverage taken out by RPAS operators appears to be in line with the level for model aircraft. The minimum insurance requirements for RPAS are of a similar order to the minimum insurance requirements for the motor industry for damages to property, but the minimum requirements for bodily injury damage in the motor industry are much higher.

Conclusion on the insurance requirements in the Regulation

- 5.46 Given the limited information currently available on damage caused by RPAS, there is no basis to recommend any change in what the requirements are based on (mass bands). Mass bands should, in principle, be the most convenient proxy for the potential damage an RPAS can cause.
- 5.47 The limited evidence available indicates that third-party liability insurance, in line with the current minimum requirements, is affordable for RPAS operators (as discussed in 6.20) and is considered by stakeholders as a minimum. Amounts of third-party liability purchased also appear to be in line with what is purchased by the model aircraft industry and what is purchased for damage to property in the motor vehicle industry.

5.48 At this stage, given the lack of evidence, we are unable to determine whether the fact that the insurance amounts are considered as a minimum indicates that market participants think that damages could be higher, or if it is because there is not enough evidence on damages. However, the fact that market participants in the RPAS sector (as well as model aircraft operators) tend to purchase more insurance than required does indicate at least that there is no clear case for a reduction in the insurance requirement, for example through introduction of a lower requirement for the smallest RPAS.

Analysis of the Regulation: Enforcement and compliance

- 5.49 The technological development of the RPAS industry has historically been driven by the aeronautical and defence sector, and this remains the case for the technology used for large civilian RPAS. However there are a number of new entrant manufacturers for light and ultra-light products, who may be small businesses with little or no background in the aviation sector.
- 5.50 Manned aviation is an industry with relatively high barriers to entry and an established safety culture, whereas the RPAS industry currently has low barriers to entry due to the relatively low price of light RPAS (as illustrated in Table 3.1: above) and the fact that operators can purchase these 'off the shelf' and operate straight away. This may not always be legal, but it does happen.
- 5.51 The fact that there are low barriers to entry is not a negative factor in itself. However the challenge for the regulation of unmanned aviation compared to manned aviation is that the nature of operators will differ: they do not necessarily share the same knowledge of aviation rules and requirements, and they may be less easy to monitor. This means that the issue of enforcement of insurance requirements, and how to deal with the consequences of illegal uninsured operations, may be significantly more important with respect to RPAS than for manned aviation.

Specificities of aviation insurance

- 5.52 One of the key characteristics of aviation insurance, compared to insurance products in other sectors, is that the insurer will specify how the aircraft can be used. In some other sectors, insurers generally do not insure for specific usage, and the number of exclusions has been described as being "very small" by one of the aviation insurance stakeholders consulted. In contrast, there is a not negligible risk that an aviation operator can find itself outside its perimeter of insured usage.
- 5.53 In addition, in motor insurance, in accordance with Directive 2009/103/EC, exclusions cannot be opposed to the victims, which means that if a victim is injured by a motor vehicle operated outside its perimeter of insured usage (such as drink-driving for illustration), the victim is nonetheless able to obtain compensation from the insurer. In aviation, we have been told by the same source that this is not the case: exclusions can be opposed to the victims, potentially leaving them without compensation if an incident happened outside the perimeter of insured usage. In addition, Directive 2009/103/EC sets rules to compensate victims when the party liable is not insured, whereas the nature of manned aviation (including the certification requirements) has meant that uninsured operations have not been a widespread issue.
- 5.54 This raises some important points to consider:

- How the requirement for third-party liability insurance should be communicated to the operators, and how it can be enforced. This is further discussed in Chapter 7;
- Whether the design of any requirement for RPAS insurance should be based on established practice for aviation insurance, or whether it should be based on other insurance products with better protection for victims; and
- Whether there is a need for a mechanism to ensure that victims can be compensated for RPAS incidents where the operator is not adequately insured (illegal operations).

Victims of uninsured RPAS operations

- 5.55 In all EU Member States, legal RPAS operations require a form of authorisation from the relevant authorities. As part of the certification process, these authorities must check that the operator has a proper third-party liability insurance certificate. This is one of the requirements to obtain the necessary certificate. In addition, any operation without insurance will be illegal because it will infringe the Regulation.
- 5.56 Nonetheless, there is a significant risk that some RPAS operations will be uninsured. In principle, uninsured operations could include:
 - operations that have not been approved by the authorities or that take place outside the rules stated by the authorities;
 - operations where no approval has been sought from the authorities; and
 - operations by registered and insured operators, but where any limits on operations imposed by the insurers are not followed and therefore the insurance is void (as explained in paragraph 5.53 above).
- 5.57 In addition, there could be cases where the RPAS operation was insured, but the victims cannot identify the operator. This risk may be reduced if the RPAS is required to carry an identification number (as discussed above) but would still remain in cases where the RPAS is entirely destroyed or lost in the incident.
- 5.58 A further issue is that many RPAS are 'State' aircraft which may not have to be insured, and therefore it is not clear how victims of incidents involving these aircraft will be compensated. This is discussed in paragraph 5.88.
- 5.59 Therefore, there is a possibility that, due to the risk of uninsured operations, some victims of RPAS incidents may not be adequately compensated. This has not been a significant issue to date, but it may become one if the RPAS market increases as projected. This should also be a concern for the RPAS industry itself, as the public may be unwilling to accept RPAS operations if they are perceived to be threats rather than opportunities.
- 5.60 The most comparable sector in which there is a risk of injury to third parties from uninsured operations is the motor vehicle sector, in which there are compensation funds which ensure that victims are adequately compensated. In some Member States compensation funds also exist in other sectors (for example, to protect victims of terrorism or natural catastrophes; in transport they are also used to compensate consumers in the case of insolvency of tour operators). As it would appear to be necessary to ensure compensation of RPAS victims whatever the state of legality of the RPAS operations, we have examined the possibility of a compensation fund for victims of uninsured RPAS operations.
- 5.61 However, it should also be noted that the fact that compensation funds exist in the motor vehicle sector does not necessarily mean that there should be equivalent arrangements in other sectors, including RPAS. The public are not guaranteed protection against damage from

all potential incidents outside their control (for example, financial protection may be limited for victims of crime, or consumers that lose money due to insolvent suppliers). Whether arrangements should be in a specific case to protect the public in these circumstances depends on a social judgement as to whether it is reasonable and proportionate to impose additional costs on another party (whether operators or taxpayers) to ensure compensation is paid.

Guarantee fund in the car industry

- 5.62 The EU Motor Directive (Directive 2009/103) obliges all vehicles to be covered by third-party insurance and prescribes minimum levels of cover (which may vary in each Member State). There is also a requirement for each Member State to establish a national guarantee fund which pays compensation to the victims if:
 - The insurer of the driver cannot be identified (e.g. where vehicles have false or no registration plates);
 - The vehicle is uninsured;
 - The insurer is unable to pay or bankrupt; or
 - The vehicle is from a non-EEA country.
- 5.63 The Directive requires that guarantee funds must ensure that the injured party can be compensated as quickly as possible, even if the insurer of the person responsible for the accident refuses to cooperate. It also requires Member States to establish national information centres that can identify the insurer of cars from the registration plates.
- 5.64 Guarantee funds are usually set up as non-profit organisations under the control of the insurance supervisory authority and may also fulfil the role of information centres.
- 5.65 It has been commented that "a system of compulsory Third-Party Liability insurance requires cooperation from the insurance industry, policyholders, loss adjusters, and the police. A central database that stores and provides access to the insurance information of policyholders, including claims, is critical to this¹³".
- 5.66 The insurance industry also commented to us that the existence of guarantee funds does not necessarily result in a higher number of operators acting illegally. We would expect this to be because uninsured driving is deterred by criminal sanctions and by the fact that an uninsured driver could face significant civil liability for damage.
- 5.67 The cost of the guarantee funds is borne by the insured drivers on behalf of the victims of uninsured drivers. We have not been able to obtain comprehensive information across all EU Member States on the cost. However, we understand that (for example) in Italy the fund is funded through a levy equal to 2.5% of the insurance premium on all motor insurance policies, and in the UK the cost for insured drivers is around £33 (€40) per year.
- 5.68 These schemes remain acceptable to stakeholders, despite the cost, because:
 - It is considered affordable, as a result of being shared amongst the very high volumes of insured vehicles of each Member State (34 million insured vehicles in the UK, 40 million in France);

¹³ Motor Third-Party Liability Insurance report, 2010, World Bank

- The issue of uninsured vehicles is recognised as being a serious problem despite enforcement there is still a large number of uninsured vehicles (it is estimated that there are between 370,000 and 740,000 in France, and 1.2 million in the UK); and
- There is a clear benefit for victims.

Applicability in the RPAS sector

- 5.69 In principle, a compensation fund could work in the RPAS sector either through a levy on insurance products sold (as in the motor sector) or through a levy on buyers of RPAS at the point of sale. However, in either case, it is not clear that there would be a sufficient volume of transactions at present to enable the fund to build up sufficient reserves to pay potential claims. We consulted with insurance stakeholders regarding the feasibility of such as a fund and whilst all considered this an interesting idea, they advised that the very small volume of current RPAS insurance products was a fundamental concern (compared to what is required for the adequate functioning of the car guarantee fund).
- 5.70 One stakeholder suggested that a solution to this would be to integrate the car and RPAS insurance markets, enabling RPAS to be covered by the guarantee fund for car, as follows:
 - Car insurance providers should be encouraged to cover light RPAS operating in contained environment (for example, RPAS of less than 25kg operating less than 1km from the pilot and at an altitude of less than 500 feet), whilst not preventing aviation insurers from offering products.
 - For any other operations (which would be more complex by nature), RPAS insurance would continue to be provided by aviation insurers.
 - In both cases, a compensation fund for victims of uninsured RPAS incidents/ accidents would be set up based on a levy of car insurance premiums. It was stated that by increasing the premium of car insurance by 10 euro cents in France, a fund of €4 million could be raised for RPAS.
- 5.71 However, whilst this proposal would address the issue of the low volumes of RPAS insurance, there would be significant issues in requiring customers from one industry to pay a levy (however small) towards the uninsured activities of another unrelated industry. It is likely that the motor industry, their insurers, and possibly also the wider public that are required to purchase motor insurance, would strongly oppose such a proposal. It is also not clear how car insurers could be encouraged to provide insurance for the RPAS sector.
- 5.72 Other stakeholders did not believe that it would be feasible at present to create a scheme for RPAS based on insurance contributions, for the following reasons:
 - There are too few RPAS policies to offer a base broad enough for such a scheme, and therefore it would lead to very significant increases per RPAS policy that may be unsustainable. This is also further exacerbated by the limited licensing of RPAS throughout the EU, which probably means that a large number of RPAS are not currently regulated, licensed and insured, therefore outside the scope of a fund.
 - The fact that there is no information on the number of uninsured operations means that it is not possible to quantify the risk of an incident being caused by an untraceable RPAS.
 - The fact that there is no mature or accurate loss history information means that it would be very hard to know the size of the fund that would be required to fund RPAS victims.
- 5.73 For similar reasons, it would be impractical to establish a levy on RPAS at the point of sale, given the current state of the RPAS industry.

- 5.74 In summary, it appears that, at this stage in the development of the sector, we cannot recommend establishment of a fund, because it appears that it is not feasible. Nonetheless, if the RPAS sector grows at the rate projected, we believe that there is a significant likelihood that a compensation fund may be necessary. To work a compensation fund would need to be:
 - Affordable: it cannot become a burden to the industry/society as they will fund it without any direct returns;
 - As minimal as possible: the objective of a compensation fund should never be to replace a lack of enforcement from the authorities.
 - Efficient: it should quickly compensate the victims and be fast to go after operators creating damages uninsured;
 - Transparent: regular reporting of its actions and its fund level would be paramount to ensure public and industry buy-in.
- 5.75 We recommend that this issue is reviewed by the European Commission as soon as enough evidence and data becomes available, as there is a significant possibility that this will be required in the future if the RPAS sector expands as projected. With no information on the number or profile of third-parties not obtaining compensation, we are unable to be definitive as to when the Commission should do this, but we would hope that this matter would be reviewed in three years.

Analysis of the Regulation: scope

- 5.76 For regulatory purposes, civilian unmanned aircraft fall into three categories:
 - Model aircraft, which are a national competence and follow national rules.
 - State aircraft, which are also a national competence of Member States, who each define their scope (i.e. different Member States have different definitions of what State aircraft are). State aircraft follow national rules.
 - Other civil RPAS, regulation of which is a national competence if the MTOM is less than 150kg, and an EU competence (with rules set by EASA) if the MTOM is greater than 150kg. It should be noted that the Commission intends to propose an extension of its competence so that regulation of civil RPAS under 150kg would also be an EU competence.
- 5.77 As discussed above in paragraph 5.9, Regulation 785/2004 does not apply to model aircraft under 20kg, which is important given that, as discussed in Chapter 3, most RPAS currently used in the EU have a MTOM lower than 20kg. There is no EU definition of "model aircraft" and it is left to each Member State to define what should be considered a model aircraft in its territory. Similarly, there are significant differences between Member States in the definition of State aircraft.
- 5.78 We have considered whether the lack of a common definition of model and State aircraft, and consequently the lack of a harmonised insurance regime for those aircraft, poses any issues. Potentially, the model aircraft exemption might allow some RPAS operations to be carried out with reduced levels of third-party liability insurance, and regulatory authorities in a number of Member States confirmed that some operators have tried to exploit this by classifying RPAS as model aircraft. There is also a risk that the same operation by the same equipment and for the same purpose may be classified as a model or State aircraft in one Member State and not in another.

Model aircraft

- 5.79 The only international definition that we have identified for model aircraft is in ICAO Circular 328, which states that "model aircraft, generally recognised as intended for recreational purposes only, fall outside the provisions of the Chicago Convention, being exclusively the subject of relevant national regulations, if any"¹⁴. The RPAS Roadmap 2013, representing the views of the RPAS Industry, stated that RPAS should be considered aircraft, and that "model aircraft used in VLOS exclusively for recreational purposes, and 'flying' toys, should not be considered RPAS"¹⁵.
- 5.80 Not all Member States have a definition of model aircraft in national law or regulations, which may mean that it is difficult for operators and/or the authorities to distinguish when the model aircraft exemption applies.
- 5.81 Where there are national definitions in place, these vary significantly between Member States. Definitions are based either on:
 - weight alone (Denmark with respect to insurance);
 - purpose alone (UK);
 - purpose and pilot's line of sight (Italy);
 - purpose and design (Sweden);
 - a combination of weight and purpose (Czech Republic, France, Netherlands, Romania); and
 - a combination of kinetic energy, radius and purpose (Austria).
- 5.82 Whilst many of the definitions are partly or wholly based on the operations being for recreational purposes, some refer to this being the sole use of the aircraft (Austria, Italy, France, Germany) while others do not (Netherlands, Sweden, UK).
- 5.83 We have also examined the insurance requirements for model aircraft across the EU. Reflecting that this is a competence of Member States, insurance requirements vary significantly between States. Table 5.1: below summarises the definitions of model aircraft and the insurance requirements in Member States.

Member State	Definition	Insurance requirement
Austria	Unmanned devices operated exclusively free of charge for non-commercial purposes in leisure activities or in the public interest, have a maximum kinetic energy of 79 joules, operated in VLOS and in a radius of no more than 500m	Same requirements apply to all RPAS (including model aircraft)
Belgium	Specific regulations currently exist for model aircraft, limited to VLOS	Same requirements should apply to all RPAS (including model aircraft)
Czech Republic	No official definition, but understood to be equipment of up to 20 kg used exclusively for sport/recreational purposes	No requirements for equipment as defined (only recommendation)
Denmark	No official definition – common rules for RPAS and model aircraft	No requirement for model aircraft < 7kg

Table 5.1: Insurance requirements for model aircraft

¹⁴ ICAO Cir 328, Unmanned Aircraft Systems (UAS), paragraph 2.4

¹⁵ Roadmap for the integration of civil RPAS (2013), Final Report, Annex 1, p.10

Member State	Definition	Insurance requirement
France	Aircraft < 25 kg used exclusively for recreational purposes and competitions, driven by remote pilots	Unclear – French law definition is based on purpose, and not MTOM
Germany	Unmanned aerial vehicle operated in VLOS solely for the purpose of sport and leisure	Same requirements apply to all unmanned vehicles (including model aircraft). Group insurance accepted for model aircraft
Italy	Unmanned RPA used exclusively for sport and recreation, not equipped with autonomous flying devices and flying constantly under unaided VLOS	Same requirements apply to all RPAS (including model aircraft)
Netherlands	Aircraft < 25kg used for recreational purposes and in VLOS	No requirements for model aircraft as defined
Romania	Aircraft < 20kg used for recreational purposes and competitions	No requirements for model aircraft as defined
Spain	Forthcoming rules will define model aircraft based on "private" use, as opposed to RPAS used commercially	Rules in preparation
Sweden	All UAS used / designed for activities that are not recreational, are not model aircraft	No requirements for model aircraft as defined, expect when flying BVLOS
United Kingdom	RPAS used for sporting and recreational purposes are model aircraft	Same requirements apply to all RPAS (including model aircraft)

Source: SDG analysis of stakeholder responses

5.84 EASA proposed¹⁶ in July 2014 that that model aircraft are those "exclusively used for recreational, sport or similar purposes (regardless of mass, authorised operations and on-board sensors)" and that RPAS are those used "for 'professional' purposes (commercial, non-commercial, corporate, aerial work)". If this proposal is accepted, this will be beneficial to clarify common rules.

Conclusion

5.85 The lack of an EU-wide binding definition of model aircraft up to now means that some operations may be considered to be model aircraft as opposed to RPAS in some Member States but not others. This would not be a problem in itself for this study if the requirements on third-party liability insurance were the same for RPAS under 20kg and model aircraft under 20kg, but this is not the case.

¹⁶ NPA 2014-09



Figure 5.3: The problem with no common definition of model aircraft

Source: Steer Davies Gleave

5.86 In principle, clarification could either be provided by Member States agreeing a common definition of model aircraft – or by EASA obtaining agreement on a common definition or by the Regulation being amended to define the type of unmanned aircraft which are excluded from its scope. In either case, this could be based on the purpose of the activity being recreational.

State aircraft

- 5.87 We were informed by stakeholders that Member States are making increasing use of RPAS for State functions such as police operations, both through direct ownership, leasing arrangements and contracts with operators. As stated above in paragraph 5.9, Regulation 785/2004 does not apply to State aircraft. Therefore, a significant share of civilian RPAS operations may be excluded from the minimum third party liability requirements.
- 5.88 There are significant variations in the definition of State operations. The status of State aircraft may depend on the purpose of operations or on the ownership of the aircraft. It is also not clear if RPAS operated by or on behalf of regional and local authorities would be considered as 'State' aircraft. Another grey area is the status of private aircraft undertaking State activities as contractors and whether they would be within the scope of Regulation 785/2004 or not.
- 5.89 We have sought to clarify the insurance framework for State aircraft across the EU. We have not obtained information on any national rules on insurance requirements for State aircraft, so it remains unclear at this point what coverage the States would offer to victims. It would therefore appear to be, at best, an uncertain process for any victim to claim compensation and may mean different amounts of compensation than what would be available under Regulation 785/2004. We also sought to clarify whether the State authority would seek to procure insurance in the market, or if it would provide some level of cover itself.
- 5.90 The responses from Member States on the definition of State aircraft and insurance requirements are summarised in Table 5.2: below.

Member State	Definition of State aircraft	Insurance requirement
Belgium	Military and governmental aircraft	Responsibility of the State
Czech Republic	Military, police and custom flights for purposes of defence, training and national security	Responsibility of the State
Denmark	Civil registered aircraft exclusively used for State purposes of a non-commercial nature	Responsibility of the State
France	"As defined in Regulation 785/2004"	Responsibility of the State
Germany	Unclear	Unclear
Italy	Military aircraft, and state-owned aircraft used for police, custom, firefighting, civil protection and other State services.	Responsibility of the State
Netherlands	Military and police flights	Unclear
Romania	Aircraft used by the police, rescue services and firefighters are military aircraft	Responsibility of the State
Spain	Military aircraft, and non-military aircraft used exclusively for State, and not commercial, services	Responsibility of the State
Sweden	Unclear	Responsibility of the State
United Kingdom	Aircraft carrying out military, customs, police, search and rescue, firefighting, coastguard or similar activities or services	Insured in the private market. Only military aircraft fall under responsibility of the State.

Table 5.2: Insurance requirements of state aircraft

Source: SDG analysis of stakeholder responses

- 5.91 In the UK, all State operators other than the military have to purchase third party liability cover on the private insurance market, irrespective of their state aircraft or State operation status, although the UK CAA has confirmed that exceptions may be granted. The UK is the only Member State, of those which responded, that adopts this approach.
- 5.92 A further issue was raised by EASA in relation to those RPAS used by inter-governmental or EU-level agencies such as EMSA (European Maritime Safety Agency, based in Portugal) and FRONTEX (the Agency for the Management of Operational Cooperation at the External Borders, based in Poland). It is not clear whether RPAS used by these agencies should be treated as State aircraft in Portugal and Poland respectively, and therefore whether they would be exempt from insurance requirements on the basis of the Regulation and the Chicago Convention or national definitions of State aircraft.

Conclusion

5.93 There are significant differences between EU Member States in the definitions of State RPAS or State RPAS operations, and in many cases the definitions are not clear. A particularly significant issue is that there are variations as to whether private operators working for the State are included in the definition of State aircraft. This should be clarified by each Member State.

International comparison on insurance requirements

Australia

- 5.94 RPAS certification requirements in Australia are defined in the Civil Aviation Safety Regulations 1998 (CASR) Part 101, which took effect in 2002. Under these Regulations, both small and large RPAS are treated similarly with respect to the approval requirements for operations. Pilots are required to have a Controller's Certificate, and the operating entity has to hold an RPA Operators' Certificate.
- 5.95 There is no explicit insurance requirement stated in these Regulations. The Civil Aviation Safety Authority (CASA) however recommends that third-party liability insurance is obtained for the operation as part of the Operator's Certificate application, although it also recognises that the cost of insurance has occasionally been seen as prohibitive. Qualified entities also include third-party liability insurance in their certification checklists, although in principle it is possible to be certified without insurance.
- 5.96 Specifically, the Advisory Circular to these Regulations states that "while CASA does not require the operator of a UAV to hold insurance cover, CASA would strongly recommend that the operator discusses with an insurance analyst the liability that he or she might incur for any damage to third parties resulting from the operation of the UAV and any procedures for reducing that liability."
- 5.97 Our understanding is that the absence of any third-party liability insurance requirement for RPAS is consistent with the practice under the DBA Act for manned aviation, which does not require carriers to obtain insurance against third-party risks. Similarly, there is currently no insurance requirement under state legislation.
- 5.98 However, whilst third-party insurance is not mandatory under Federal or State legislation, it is often a requirement in relation to local government approvals for small aircraft (such as hot air balloons, and other smaller powered and unpowered aircraft which do not require an airstrip to launch) to launch and land on council property.
- 5.99 Analogously, for commercial/private operations, given that there is no regulatory requirement, the only requirement for third-party liability insurance arises from customers of RPAS operators. The Australian Association of Certified UAV Operators (ACUO) told us that it is "almost impossible" to get work without adequate third-party cover. The minimum level that would be expected would be A\$5 million (approximately €3.4 million) with A\$20 million (approximately €13.5 million) being normal.

Brazil

- 5.100 Brazil is currently drafting a national regulatory framework for RPAS. Until 2014, operators were required to apply for a "certificate of exemption" granted by the Brazilian CAA, ANAC. Only experimental operations were allowed, with the exception of operations by the Federal Police Department for operations in non-urban areas.
- 5.101 However, ANAC has reported that there have been several problems with this case-specific approach. The number of illegal operations is difficult to estimate, given the difficulties in monitoring the activities of small operators over a vast territory. In addition, the industry has been asking for more clear-cut requirements under which it can operate legally.
- 5.102 To this end, new regulations are currently being drafted and define two categories of RPAS (above and below 25kg) and assign specific certification and operational requirements to each

category. The authorities would like to set up a national registry of operators and RPAS models, which ideally would be available for consultation on an online platform.

5.103 In addition, a requirement for compulsory third party liability insurance is being introduced. Enforcement is expected to be enhanced by the requirement for RPAS to be marked with a fire-proof identification plate, containing information on the manufacturer, the operator and the serial number of the RPAS.

6 The RPAS Insurance Market

Introduction

- 6.1 Since it is mandatory to have insurance, the availability and pricing of insurance is a critical issue for the development of the sector. Whilst insurers do not formally have the power that regulators have to limit the type of RPAS operations that can be made, in effect they can have similar powers, because they may restrict what types of operation they are willing to insure, and an uninsured operation will be illegal.
- 6.2 This chapter provides an overview of the market for RPAS insurance. It examines the supply and pricing of insurance, discusses the impact of terrorism and war risks on the market, and identifies possible measures to improve the market.

Overview of the insurance market

- 6.3 The demand for RPAS insurance is expected to increase, particularly as a result of the increased number of operations with RPAS under 25kg. However, there may not be a direct correlation between the rate of growth of RPAS operations and the growth in the RPAS insurance market, as, according to insurers, a significant proportion of RPAS operations are currently carried out by State aircraft, meaning that they may not be commercially insured. Insurers also noted that a significant proportion of the risk that they had written to date was for RPAS operations over populated areas, and that they believed that this proportion was increasing.
- 6.4 Commercial insurance products for RPAS include third-party liability insurance, but also other products such as hull and product liability. It is very common for hull liability insurance to be sold as part of a package which also includes third-party liability insurance, even if stand-alone third-party liability can be purchased in a number of Member States. Insurers informed us that, when third-party liability insurance is sold as part of a package including hull, hull accounts for most of the premiums, with third-party liability representing only around 20%. This is because hull losses are far more frequent than damage to third parties.

Availability of RPAS insurance

- 6.5 We were informed that the availability of RPAS insurance products varies across the EU, and that in some Member States operators may find themselves unable to source RPAS insurance products. Based on the responses received from the stakeholders we have consulted, we understand the situation to be as follows:
 - RPAS insurance products available with some degree of competition:

- Countries with RPAS regulations allowing commercial operations: France, Germany, Italy, United Kingdom, Czech Republic, Denmark, Sweden, Norway, Netherlands17;
- Countries with no RPAS regulations yet or where commercial operations are prohibited: Spain, Belgium;
- RPAS insurance products not available:
 - Countries with RPAS regulations allowing commercial operations: Romania, Poland;
 - Countries with no RPAS regulations yet or where commercial operations are prohibited: Hungary.
- 6.6 The fact that RPAS insurance products are available does not necessarily mean that there is extensive competition in the market. Some operators complained that there were too few alternative providers in the Netherlands and in Denmark, particularly after the withdrawal of an insurer. Insurers also described a situation of under-capacity, meaning that the demand for RPAS insurance exceeds the supply available (this is distinct from the manned insurance aviation sector, where there is currently overcapacity).
- 6.7 The reasons cited for the lack of capacity were:
 - There is uncertainty about the probability of an incident occurring, and potential damage. Some insurers are unlikely to be interested in the market due to the limited data available about RPAS operator reliability profile and damage profiles, and the lack of standardised European operating requirements.
 - Particularly for third-party liability, the total size of the market for insurance is low in comparison to the amounts insured, and so risks cannot be spread within the sector. As a result, it is possible that one large claim could offset an insurer's entire revenue from the sector to date. Insurers may instead decide to focus on other sectors (such as cyber liability) where they believe volumes may be higher and margins more stable.
- 6.8 When we examined the responses received from stakeholders in the States where RPAS insurance is available, we identified two different approaches to insurance products:
 - An approach that we would describe as "tailor-made", where insurance would typically be provided by specialist aviation insurers or reinsurers. These insurers would typically decline to offer insurance except where they were satisfied that the characteristics of the aircraft and the operation provided them with an acceptable risk profile.
 - An approach that we would describe as "off the shelf", where RPAS insurance packages would be quoted to a number of operators at a very similar price, without significant variations based on operating circumstances. Insurers and re-insurers would be less likely to be aviation insurers.
- 6.9 Operators reported that, where they had received quotes from the "tailor-made" group of insurers, these were generally more expensive than the "off the shelf" quotes.

War and terrorism

6.10 Regulation 785/2004 requires RPAS operations (and other air operators) to be insured for risks of war and terrorism. Insurers and RPAS operators did not mention that the requirement for war and terrorism cover was a particular issue for the provision of insurance products for RPAS, and we would not necessarily expect this to represent the same risk for RPAS as for manned aviation in any case. As light RPAS are affordable and easy to procure, it may be easier

¹⁷ As of 2014, commercial operations are subject to individual approval by the CAA

for a party wishing to obtain an RPAS for a terrorist purpose to procure it itself (legally), rather than seek to hijack another RPAS.

- 6.11 However, at certain points in time (prior to the widespread use of RPAS) this has been a significant issue for the manned aviation sector, and in principle it might be a greater issue for RPAS in the future if larger RPAS are more widely used. Therefore, we present below some aspects of the insurance of war and terrorism risks that may be relevant for RPAS.
- 6.12 Standard aviation insurance contracts exclude war risks, under the standard War, Hijacking and Other Perils Exclusion Clause (AVN48B), but write-back clauses are available through AVN52C. New versions of the write-back clauses for liabilities which restrict the cover available for chemical and biological risks have been published but are not generally being used.
- 6.13 Traditionally, war risk coverage is provided under a seven-day notice clause which allows insurers to cancel or review the policies. This happened after 9/11, where insurers limited their liability with respect to non-flying third-parties for war risks, including acts of terrorism, to US\$50 million.
- 6.14 This would have resulted in many operators not having adequate insurance and as a result being grounded. A step-back mechanism was put in place by governments in Europe and the USA, allowing airlines to continue flying. However, whilst the provision of war and terrorism risk insurance is adequate today, there remains a risk of another market failure, particularly in the event of a war or major terrorist incident, as the requirement in Regulation 785/2004 is for operators to obtain insurance, not for the insurance market to provide it.
- 6.15 More information on war and terrorism exclusions, and the corresponding write-back clauses, is available in the report on the Mid-term evaluation of Regulation 785/200418.

Pricing of third-party liability insurance

- 6.16 Alongside the question of the availability of insurance products, it is important to understand the pricing of RPAS third-party insurance. If insurance is not affordable, then this will be a major issue for the development of the industry, potentially slowing down the rate of development of RPAS operations or increasing the risk of uninsured RPAS operations.
- 6.17 As a consequence of the EU RPAS industry being at an early stage of development, there is almost no financial information available publicly on RPAS operators, and in particular on the costs that they incur in obtaining insurance. We have been unable to find annual reports of RPAS businesses; this is a contrast with the manned aviation sector where operators are generally large listed companies and therefore have to report insurance costs in their accounts. Therefore, in assessing the economic impact for operators of the current insurance requirements, we are reliant on information provided by the stakeholders who participated in our study.
- 6.18 Operators were generally not willing to provide data on the premiums that they paid, as this is commercially sensitive, but they did provide us with information on the proportion of their costs accounted for by insurance. Although this ranged from 0.001% to 80% of their operating costs, the majority of respondents quoted a range of 5-15%, covering the cost of all insurance

¹⁸ http://ec.europa.eu/transport/modes/air/studies/doc/internal_market/2012-07-insurance-requirements.pdf

premiums (such as hull or other products), not just third-party liability insurance. It is not possible for operators to isolate the share of third-party liability premiums as this is often purchased as part of a package, as discussed further in paragraph 6.4 below. This information came from operators from Austria, Germany, the Netherlands and the United Kingdom.

- 6.19 We validated these figures at the first workshop that was organised in Brussels as part of this study: no attendees voiced any disagreement and we have not received any other views or comments subsequently. Therefore, we have assumed that the range of 5-15% for insurance costs is reasonably representative.
- 6.20 As discussed in this section, information from insurers indicates that third-party liability normally accounts for 20% of the total cost of RPAS insurance premiums. On this basis, we estimate that third-party liability insurance typically accounts for 1-3% of the operating costs of RPAS operations.
- 6.21 In addition, based on the information we have obtained, we understand that, when thirdparty liability insurance is available, an increase in cover does not lead to a directly proportional increase in the price of insurance. Therefore, an increase in the requirement for insurance would not necessarily have a substantial economic impact on operators.



Figure 6.1: Third-party liability premiums for RPAS

Source: Steer Davies Gleave

- 6.22 The fact that third-party liability insurance remains a relatively low proportion of total operating costs indicates that affordability is not a significant problem for RPAS operators, and therefore that the requirement to obtain this insurance does not have a significant negative economic impact on them. However, as discussed further below, there may be more significant issues arising from the limited availability of this type of insurance in some Member States.
- 6.23 Insurers also said that there had been limited volatility in premiums (in contrast to the long term trend for manned aviation), due to the claim rate being low, and there being no major known RPAS losses to date. This indicates that the pricing of insurance is not, at present, a significant barrier to the development of the RPAS sector.
- 6.24 Information provided by Global Aerospace at the first workshop indicated that the profit margins on third-party liability insurance products for RPAS were low, as well as volumes of insured RPAS being low. They concurred with the view of other insurers that premiums may be expected to be more volatile if circumstances were to change.
- 6.25 Where RPAS operators use insurance brokers (which, in the current state of the RPAS insurance market, would appear to be in the overwhelming majority of cases) rather than purchasing directly an insurance product with an insurer, the broker has a legal obligation to make sure that the insurance product purchased is well adapted to the need of the operator. Brokers do this based on the requirements of Regulation 785/2004, as well as based on the operating rules in the Member States (before they become harmonised within the EU) and of course based on a number of factors specific to the operator and the proposed RPAS operation (detailed below in the risk assessment section).

Risk assessments

- 6.26 Risk assessments are a key input into the pricing of the insurance premiums. Insurers assess the risk of an incident,, the potential for damage and their administrative costs in order to inform their pricing. A number of factors are taken into consideration and it appears that the most important criteria for risk assessment could be:
 - The capability of the operator:
 - Up-to-date loss history;
 - Number of flight-hours;
 - The quality of the pilot and his/her qualifications:
 - The type of aircraft used and its airworthiness:
 - Characteristics;
 - Value of the aircraft:
 - Any specific national requirements (for example any certification requirements);
 - Nature of the operation for which the aircraft is used
 - Type of activity;
 - Whether the operation will overfly populated areas; and
 - The manufacturer and its expertise.
- 6.27 However, some insurers conduct more detailed risk assessments which may use other information. In addition, as their experience grows, insurers may find that the information they need changes.
- 6.28 After undertaking a risk and damage assessment of the operator, insurers may decline to insure if they believe the RPAS operations are too risky for them or they may of course offer to insure. Where insurers decline to provide coverage, operators would need to find other insurers that would be happy to insure not every insurer assesses risks in the same manner.

RPAS are aircraft systems, not just unmanned aircraft

6.29 The safety approach of the manufacturer of an RPAS is an important criteria for insurers. RPAS manufacturers range at present from individuals and small start-up enterprises, to established suppliers of military aerospace equipment that also offer civilian products, and which have significant awareness of risk management and international certification processes.

6.30 A further issue is that there are other elements between the pilot and the aircraft, namely the communication provider, including the presence in some cases of ground or airborne communication stations, as well as the operating software that may assist the pilot during the aerial work or in case of automatic landing, etc. It is necessary for these elements of the chain to be included in full in the risk management process, rather than being considered as secondary functions. For instance a faulty software download could result in an RPAS crash the next time that the RPAS is used. This explains why, from the point of view of the insurance industry, it is important to understand the manufacturer and its expertise, and the other elements of the supply chain, as the choice of software provider.

Risk of insurance market failure

- 6.31 At the moment the RPAS insurance market is fairly small, but we have not found evidence that it is not functioning properly, although as discussed elsewhere in this report there are constraints arising from the relatively small market size, and the lack of information available to insurers.
- 6.32 In principle, we would expect that with better information available, with a better understanding of the RPAS regulatory regimes in Member States and increased RPAS operations (and hence demand for RPAS insurance), more insurers could enter the market and/or current insurers may provide more capacity. This should stimulate greater price competition, and result in operators being offered a more diversified range of products.
- 6.33 However, whilst it is a requirement in European law for RPAS operators to be insured for third party liability, there is no requirement in law for insurers to offer this insurance. In the worst case scenario, this could lead to market failure where there is demand for insurance but an inadequate offer (as happened in Europe immediately after 9/11 where national governments had to step-in at short notice and provided insurance for their airlines).
- 6.34 There are a number of reasons why, in theory, an insurance market could fail although many of these are not applicable to RPAS. We have considered the reasons that could theoretically lead to insurance market failure, and whether these are applicable to RPAS:
 - Insufficient information: If insurers are unable to accurately assess the risks associated with RPAS, due to lack of reliable data, they may not be willing to take risk. We discuss in chapter 7 the data and information requirements needed by the insurance industry for RPAS products and make recommendations. This issue is potentially exacerbated in the RPAS sector by lack of regulation or a lack of enforcement of the regulations that do exist: in manned aviation, insurers partly rely on regulators to check that aircraft operators are complying with applicable legislation and operate safely.
 - Adverse selection: We discuss adverse selection in paragraph 7.8. RPAS insurance is compulsory in the EU, and Regulation 785/2004 requires national authorities to enforce this, so the risk that adverse selection may cause an insurance pool to fail should be less likely to arise. Provisions for insurance enforcement exist too and are left to the national authorities to do when they issue authorisations for RPAS operations. We discuss improvement to enforcement for "illegal" operations in paragraph 8.19.
 - **Moral hazard**: We discuss moral hazard for RPAS in paragraph 7.9 but as discussed in the RPAS sector we would expect any issue would relate primarily to hull insurance, not third party liability. High deductibles are sometimes used in the insurance industry against this risk.

- Insufficient or no market capacity: Insurers may also decide to leave the market altogether because of limited commercial opportunities and high administrative costs compared to more attractive markets in other sectors of activity. This market failure could happen where the RPAS market does not develop as planned, making the market too small for insurers to be operated at a profitable level, or where too complex regulatory requirements would make the market too expensive to operate into. If the market develops as planned and/or gets harmonised at a EU level, this risk is less likely to materialise.
- Inability to spread risks: Insurers rely on being able to spread risks but this is only possible if risks are not correlated between operators. There are many RPAS operators and RPAS aircraft so from that point of view there is no reason why risk-spreading would be an issue. This might theoretically become an issue if in the future a small number of types of RPAS became dominant (for example, if there was a software update which failed, causing all of the RPAS of a specific type to fail simultaneously). However, we do not believe that this is a likely scenario.
- 6.35 In any case, it is important to note that for there to be a functioning RPAS insurance market, insurers must be willing to offer coverage that is at all times at least that of the Regulation, and they may decide to do this at whatever price they wish (low or high). Whilst there is a requirement in Solvency II (Directive 2009/138/EC) for insurers regarding their capital requirement, this applies on a company level, not activity by activity. This means that if insurers are happy to offer low RPAS premia that do not allow them to break-even their RPAS activities, this is allowed since the solvency capital rules apply at a company level and allow internal cross-subsidies between different lines of business.

Other issues

- 6.36 The availability of information is a critical requirement for the market to function well, and this issue is discussed in section 7 below.
- 6.37 From the point of view of insurers, it is important that the regulatory and safety framework for RPAS operations is appropriate to facilitate the expansion of the RPAS industry. Insurers rely significantly on the existence of licensing schemes (such as pilot licenses, airworthiness certificates etc.) to confirm that proposed operations will be safe. They would also expect that regulators would develop appropriate (and if necessary sector-specific) requirements to ensure this.
- 6.38 The industry also believes that the current operational limitations on the use of RPAS in commercial airspace are an important factor impacting the demand for RPAS insurance products.
- 6.39 Some insurance industry stakeholders expressed a concern that the limits on licensing of RPAS across the EU (in some Member States, RPAS legislation is still in draft form and there are Member States without any legislation) contributed to a large but unquantified market of illegal and unregulated RPAS operations.

International comparison

Australia

- 6.40 QBE was the first insurer to provide RPAS cover in 2005. Since then the insurance market has grown, with more insurers now recognising the potential in the industry. Today we understand that there are at least four insurers that provide third-part cover to RPAS operators in Australia:
 - Allianz;
 - AON;
 - Kiln; and
 - QBE Insurance.
- 6.41 As the insurance market has matured, insurers in Australia have come to better understand the difference between CASA-certified RPAS operators and the unauthorised operators, and will not (as far as we understand) cover the latter. At the same time, premiums have fallen from about A\$10,000 (approximately €6,700) to a range of A\$2-5,000 (€1,300 €3,400) per year for A\$10 million (€6.7 million) third-party cover.
- 6.42 ACUO informed us that today's premiums are considered affordable by RPAS operators, but there is still some way to go before the premiums become comparable to conventional aviation insurance for the same type of cover. The Association also told us that, as far as it was aware, no insurer currently offered comprehensive insurance packages that provide all of the basic insurance covers required (such as hull and product liability), resulting in operators having to rely on several insurers (one for third-party liability, another for fire and theft, a third for employee cover, etc).

Brazil

6.43 We sought to collect information on the state of the insurance market for RPAS in Brazil but we not able to find enough solid information.

7 Adequate information needs

The importance of information

7.1 It is important that the RPAS industry can obtain insurance, and that it can do so at a reasonable price. In order for this to be the case, insurers must be able to:

- satisfy themselves that they can undertake robust risk assessments (criteria for risk assessments are discussed in section 6 above);
- offer an appropriate level of coverage (availability of products); and
- offer products at a price that does not cause an excessive financial burden for operators (affordability).
- 7.2 The insurance industry and the London market in particular have traditionally been able to provide innovative solutions to evolving aviation risks and have indeed been providing coverage for the RPAS industry. However, the availability of insurance products is still inadequate in some Member States. This prevents the RPAS industry from developing, and increases the risk of uninsured (and therefore illegal) operations. The insurance industry stated that more in-depth and widely available data on RPAS is necessary to facilitate the operation of the insurance market, both in terms of availability of products and in terms of affordability.
- 7.3 In particular, insurers require, but do not currently have:
 - operational data, such as data on the number of RPAS flown, usage, flight times, weights, etc; and
 - data on the number of incidents, and the damage caused by these incidents.
- 7.4 Even being able to obtain EU-wide information on RPAS registration and certification requirements would help insurers understand the EU market better. Currently each Member State has its own rules for RPAS under 150kg, with different operational requirements, weight bands and operational restrictions. Whilst this information is publicly available, it does require each insurer to research and correctly understand the local requirements for each Member State.
- 7.5 As a result, there is only a small number of insurers providing coverage for RPAS: price competition is low when insurance is available, and insurance provision is not comprehensive across the EU. In addition, the RPAS market is still perceived as a "relatively immature class of business" by the insurance industry, even if it expects the RPAS industry to mature in the next few years as technology and the civilian market uses and demand for RPAS increase.
- 7.6 This contrasts with the rest of the aviation insurance market which, apart for the provision of coverage for terrorism and other perils at certain times, tends to suffer from over-capacity, rather than under-capacity.

7.7 A further issue is that insurers suffer from asymmetric information compared to RPAS operators.

Asymmetry of information

- 7.8 A general issue with insurance products is that there can be asymmetric information between the insurance provider and the insured party. There are two main forms of asymmetric information relating to insurance:
 - Adverse selection, which means that the party that seeks insurance knows more about its
 risks that the insurer does, and that parties that know that they have higher risks are
 more likely to seek insurance; and
 - Moral hazard, which means that the provision of insurance changes the behaviour of the insured party, leading it to increase the risk that it takes.
- 7.9 Whilst adverse selection is less likely to arise in an industry where insurance is compulsory, some insurers told us that they considered moral hazard to be a particular issue with respect to RPAS, compared to manned aviation, due to the lack of any pilot on board the aircraft. It is very unlikely that a pilot would deliberately seek to crash an aircraft on which they were travelling so as to claim on the insurance, whereas an RPAS pilot might be incentivised to do so if the potential insurance claim exceeded the value of the RPAS. This is primarily an issue for hull, rather than third party liability, insurance and insurers have sought to mitigate it by only offering hull insurance up to the current market value of the RPAS, not the original or replacement cost.

Operational data

7.10 The insurance industry has emphasised that it needs operational data in order to be able to assess the risk profile of RPAS. Therefore, we gathered information on the current requirements for submission of operational data to national regulatory authorities, and this section summarises the situation in a sample of Member States. At the moment, only a handful of national authorities collect operational data, and this is not yet available in any form to the insurance industry. Table 7.1: summarises the data collected from Member States who clarified to us their approach to operational data collection. We are unable to report on other Member States.

Information type	CZ	DE	FR	SE
Date of flight	\checkmark	\checkmark		\checkmark
Flight hours	\checkmark	\checkmark	\checkmark	\checkmark
Pilot details	\checkmark	\checkmark		\checkmark
Registration mark	\checkmark			\checkmark
Type of mission	\checkmark			\checkmark
Number of special activities			\checkmark	
Place of take-off and landing	\checkmark	\checkmark		
Number of take-offs and landings		\checkmark		

Table 7.1: Operational information from RPAS operators recorded by Member State

Source: Steer Davies Gleave analysis of stakeholder responses received

- 7.11 In the Czech Republic, operators are requested to submit specific data at several points, and the Czech CAA estimated that under current regulations, this data would have to be provided at least once every two years:
 - during the examination that is part of the administrative proceedings on issuance of RPAS permission to fly;
 - in case of an operator's request for prolongation of the RPAS permission to fly;
 - in case of operator's request for Aerial Works permit; and
 - in case a State supervision is conducted in relation to an individual RPAS/operator.
- 7.12 In France, all authorised operators are required to supply an annual activity declaration in which they have to declare that they are performing their activities in line with the applicable manual of special activities, and specify the number of flying hours performed per special activity.
- 7.13 In Sweden, operators are required to supply operational data when they apply for a renewal of the approval to fly (this can be either annual or biannual).
- 7.14 In Germany, operators are required to record this information in a special log book which they must keep for two years and present to the authority issuing the RPAS permit if requested to do so, including in the case of accidents.

The unknown market

- 7.15 The system discussed above only will only cover RPAS that are registered with the appropriate authorities. Many stakeholders told us that they suspected that there are RPAS operators who are not registered and so do not comply with the national rules. This may be partly because there is limited enforcement action undertaken by national authorities, so owners and operators may not be incentivised to comply. They may also not be aware that they should be complying with these rules.
- 7.16 Whilst national representative associations have given us their views regarding the size of the unknown or illegal market (this is discussed in Chapter 3), these are estimates only and are subject to significant variation. At present, it is not even possible to know whether illegal operations are more or less common than legal operations.
- 7.17 The difficulty mainly comes from the availability of the smaller and lighter RPAS which can easily be purchased and flown, potentially by private individuals. The boundary between light RPAS and model aircraft may be unclear in these cases, but any such operations which do not meet the relevant national criteria to be deemed model aircraft should be registered with national authorities, and insured in accordance with the Regulation. It is likely to be very difficult to identify these RPAS if they cause damage/injury to third-parties, and it is almost impossible to verify that they are appropriately registered and insured.
- 7.18 One way to improve information on the true size of the RPAS market would be to have a register of RPAS purchased or imported into the EU. Although this would not indicate what proportion of actual operations were appropriately authorised, it would at least demonstrate what proportion of RPAS were registered. Such a register might need to include model aircraft as well, as (depending on the definition of a model aircraft) it is possible that some flights with the same aircraft might fall within the definition of model aircraft but others would not. This would be a significant change from how model aircraft are regulated today (it is currently the competency of Member States) and would increase the administrative burden for many stakeholders, so it would require further analysis (including potentially an impact assessment).

- 7.19 The point of sale also represents one of the few opportunities to raise awareness of regulatory and insurance requirements. Retailers could be used to inform purchasers, through targeted material outlining existing regulatory requirements. The Dutch CAA indicated that it is actively considering such a step and is already engaging with the retail standard authorities. They will jointly introduce specific labels for RPAS and model aircraft products. Similarly, online retailers would need to ensure that purchasers read terms and conditions before buying.
- 7.20 Other industries are subject to such a reporting requirement, such as the chemical industry which in Europe must register all chemical products purchased and/or imported in the EU. REACH (Regulation EC 1907/2006) places responsibility on industry to manage the risks from chemicals and to provide safety information on the substances under the principle of "no data no market". Mandatory reporting of sales of products also exists in some markets, for example in some Member States television sales must be reported to a licensing authority.

Occurrence reporting

- 7.21 Reporting of occurrences plays a crucial role in the aviation industry, by helping the safety and regulatory authorities better understand the risks and damages caused by aircraft, and take action to mitigate them. It also provides information that aircraft operators, manufacturers and other industry participants can use to improve safety and reliability. The availability of occurrence data also enables the insurance industry to better estimate the risks associated with aircraft operations. Diligent and factual reporting of occurrences is therefore a key part of the establishment of a safety culture in aviation. EC Regulation 996/2010 requires operators to report "accidents" and "serious incidents¹⁹". As part of the study we also examined the reporting of RPAS occurrences (incidents and accidents) as required by Member States.
- 7.22 In addition to mandatory reporting requirements for accidents, reporting of incidents (whether "serious" or "minor") is required in the Member States that have developed RPAS-specific regulations, but the specific requirements vary. Incidents that do not cause damage to third parties or the aircraft itself (as discussed in the definitions section) are often not subject to this requirement. Reporting requirements apply to all types of RPAS, except in the UK where mandatory occurrence is only in place for RPAS that require either an Operators Certificate or an Airworthiness Certificate (that is RPAS with MTOM <25kg).
- 7.23 In Member States where regulations are being drafted, such as Spain and Belgium, regulators indicated that there would be a requirement to report.

¹⁹ "Serious incidents" are defined in the Annex of the Regulation.

Member State	Accidents	Serious incidents	Incidents
Czech Republic	Yes	Yes	No
France	Yes	Yes	Yes
Germany	Yes	Yes	Yes
Italy	Yes	Yes	No
Netherlands	Yes	Yes	Yes
Sweden	Yes	Yes	Yes, but reported annually only
United Kingdom (*)	Yes	Yes	No

Table 7.2: Occurrence reporting: requirements for operators

Source: Steer Davies Gleave analysis of stakeholder responses and RPAS regulations

Note (*) Mandatory reporting does not apply to aircraft not operated under an Operator's Certificate granted by the CAA, such as some RPAS under 20 kg. However the CAA recommends that all operators report occurrences.

- 7.24 National regulations relating to RPAS usually do not include specific definitions of incidents and accidents for RPAS. Member States explained that they refer to the definitions of Regulation 996/2010 for both the definition of accidents and incidents (Czech Republic, France, Italy, Sweden, United Kingdom) or of ICAO Annex 13 (Netherlands).
- 7.25 Operators are required to report accidents immediately, but requirements for reporting of incidents varies from immediate in some States to annual in others:
 - in France, it is understood that accidents should be reported immediately whereas
 incidents can be reported in an "acceptable" amount of time that would be based on the
 severity of the incident, but not later than when sending the annual activity declaration;
 - in Sweden, accidents and serious incidents shall be reported immediately, while minor occurrences will be reported a long operational statistics when the operational approval is to be renewed (annually);
 - in the Czech Republic, pursuant to Article 55(e) of the Civil Aviation Act, accidents should be reported "without undue delay"; and
 - in Italy, reporting must occur within 72 hours of the occurrence.
- 7.26 Table 7.3 below presents the actual number of RPAS incidents that had been reported to the national authorities in the Member States that responded to the consultation. In most Member States, no incidents had been reported. In the Netherlands, accidents and serious incidents should be reported to CAAs as well as notifying the national Air Accident Investigation Office, but notification to the AAIO generally does not take place.

Member State	Records of RPAS occurrences
Czech Republic	0
France	0
Germany	0
Italy	0
Netherlands	49
Sweden	0
United Kingdom	0

Table 7.3: Records of occurrences (as of April 2014)

Source: Steer Davies Gleave analysis of stakeholder responses and RPAS regulations Note: Records as of April 2014, total number since the registers were established.

7.27 It is not clear why the rate of reporting is so low. Although one possible explanation is that there have been almost no accidents or incidents, we do not believe this is the case. EASA estimates that the occurrence of catastrophic events (per flight-hour) for civil RPAS should, in their view, lie between that for helicopters and that for manned civil aviation, as shown in Figure 7.1: below. However it should be emphasised that this conclusion is highly uncertain in the absence of any reliable data. Safety experts expect that, as for the rest of the aviation industry, the rate of accidents per flight hour of RPAS may decrease as experience increases and more flight hours are accumulated.



Figure 7.1: Accident rates for different aircraft categories

Source: Steer Davies Gleave analysis of stakeholder responses and desktop research

- 7.28 Other possible explanations for why the rate of reporting is so low are:
 - RPAS operators (especially where they have no previous involvement with the aviation industry) may not be aware that they have to report incidents or accidents;
 - RPAS operators may not understand the purpose of occurrence reporting and may decide to ignore the requirement; or
 - The RPAS reporting mechanisms may be seen as cumbersome by RPAS operators.
- 7.29 We evaluated what measures Member States take to incentivise RPAS operators to report RPAS occurrences. We found that, at present, no Member State will impose fines if reporting requirements are not complied with. However, some CAAs (e.g. France and Italy) will revoke permissions to operate if they find that accidents have not been reported, and others (e.g. Sweden and the Netherlands) make the granting of authorisations and certificates conditional upon successful reporting of accidents and serious incidents. This is checked by way of annual auditing of operators (starting in 2015 in the case of the Dutch CAA).

7.30 We also examined how complex it is for operators to report RPAS incidents and accidents. We found that, in most cases, there were no particular barriers that would prevent RPAS operators from reporting, however the forms that are used may not be particularly tailored for RPAS operations – especially light RPAS. This is important, as better availability of reporting forms is a positive step towards better reporting.

Member State	Ease of finding the form online	Form equivalent to manned aviation	Languages form available in
Denmark	Very easy	Yes	Danish & English
France	Easy	Yes	French
Germany	Easy (online form also available)	Yes	German & English
Italy	Not directly available. Portal available to registered users. Other users have to request form	Yes	Italian
Netherlands	Very difficult for non-Dutch speakers, medium otherwise	Yes	Only in English, but only accessible from website in Dutch
Sweden	Very easy	Yes	Swedish & English
United Kingdom	Very easy	Yes	English

Table 7.4:Ease of finding reporting forms and language availability

Source: Steer Davies Gleave analysis of stakeholder responses

- 7.31 Experience from the Netherlands, where the authorities have received a small but increasing number of RPAS incident reports, suggests that there are two broad types and sources of reports:
 - Reports by manned pilots and operators who witness unknown flying objects in flight. These could be RPAS or model aircraft but should nonetheless not be within the vicinity of manned aircraft; and
 - Reports by RPAS operators that other aircraft (usually helicopters) have entered the area of airspace for which they had previously issued a NOTAM.
- 7.32 It is difficult for national authorities to monitor compliance with national rules with respect to RPAS reporting, since RPAS flights can easily happen without the authorities being aware, particularly for short periods of time and in remote locations. It is also possible that some operators may lack a certificate to operate. However, it is important that Member States enforce the rules. In the Netherlands, for instance, there is a specific enforcement body which has started to proactively enforce Regulation 785/2004 for RPAS and issue fines based on the severity of the infringement. The police department of the civil aviation authority has identified several illegal operations by RPAS, with an average of one a week over the past few years.

Sharing of information on occurrences

- 7.33 As discussed above, in the manned aviation industry, extensive information on occurrences is available publicly, and this contributes to the culture of safety. We therefore examined whether this was also the case for the RPAS industry.
- 7.34 We found that it was not possible to obtain information on RPAS occurrences either free of charge or for a fee. National authorities do hold registers of occurrences (where the reporting takes place), but in most Member States third-parties are not permitted to access these

registers, even in anonymised format. In a few Member States CAAs do provide third-parties with a summary of occurrences. The information available is summarised in Table 7.5: below.

Table 7.5: Occurrence registers: details

Member State	Register	Register manager	Permission to access
Czech Republic	Yes	CAA	The CAA may grant access to third parties
France	Yes	DGAC	Not yet accessible to third parties
Germany	Yes	Federal Ministry (BMVI) Lander	Not accessible to third parties
Italy	Yes	CAA	Not accessible to third parties
Netherlands	Yes	САА	Not accessible to third parties. Summary information provided in a biannual Bulletin
Sweden	Not formally	САА	Reports can be made accessible upon request, suitably anonymised
United Kingdom	Only mandatory for commercial RPAS aviation	САА	Not accessible to third parties

Source: SDG analysis of stakeholder responses and RPAS regulations.

Conclusion on RPAS reporting

- 7.35 For manned aviation, extensive information on accidents and incidents is available from Member States and from commercial databases that collate Member State information. In contrast, we have found that reporting of incidents involving RPAS appears to be quite limited in the EU at present, and as a result there is little information available from either public or commercial sources. Whilst national authorities have generally included occurrence reporting requirements in their regulations, the evidence collected for this study indicates that, with the exception of a one or two Member States, operators have not consistently been reporting accidents and incidents.
- 7.36 This represents a significant limitation for the insurance market. Insurers need reliable information in order to be able to assess risk and therefore set prices, and in the absence of such information they are likely to need to increase prices to reflect the greater uncertainty (if they are willing to offer insurance at all).
- 7.37 Insurers explained that a key source of information is from operators themselves, due to disclosure requirements at the point of obtaining quotes for insurance: operators are required to disclose previous and current operations and safety information in order for insurers to understand the risk profile of the operator and its equipment, and hence determine the premium required. Whilst this is a useful means for insurers to obtain information, it will take some time before insurers obtain sufficient data to be able to determine risk with the same level of confidence as for manned aviation.
- 7.38 In addition, the lack of information on incidents and damage means it is difficult to assess whether the current requirements for third party liability insurance in Regulation 785/2004, based on the MTOM bands, are sufficient or appropriate.

International comparison

Raising awareness

Australia

7.39 ACUO highlighted that some steps had been taken to ensure that insurers better understood RPAS certification requirements and that they recognised the difference between Civil Aviation Safety Authority (CASA) certified and uncertified RPAS operators. As a result, according to ACUO, Australian insurers now will only cover certified RPAS operators.

Brazil

7.40 We did not obtain any information on this matter regarding Brazil.

Enforcement issues

Australia

- 7.41 The enforcement of RPAS certification rules in Australia has become increasingly difficult with the growth of the industry. The Australian regulator CASA recognises this and acknowledged that the current regulation (CASR 1998 Part 101) is *"practically unenforceable"*. It is seeking to develop rules that would be able to accommodate the fast pace of growth and which it would be able to enforce properly. There are proposals for the new rules (Part 102) to introduce operating weight bands, where operators of the smallest Group A, weighing 2kg or less, would be able to fill out online authorisation forms and get electronic approval to operate. The 2kg to 7kg and 7kg to 20kg classes would require risk assessments and would be more closely governed, while those above 20kg would also need a safety case. The updated regulation is planned to apply from 2016.
- 7.42 The Australian Certified UAV Operators (ACUO) association, however, has argued that illegal activity is not tolerated in other sectors (of aviation or more generally) and that it is CASA's responsibility to ensure it has enough resources to fulfil its present duties. It has called on the Department for Transport and the Federal Government Aviation Safety Regulation Review to provide additional resources for CASA, to deal specifically with illegal RPAS operations. ACUO expressed concern about the fact that CASA openly admitted that regulatory enforcement in this area was not effective, and questioned how CASA would be able to enforce any new proposed 'more complex' regulations. In its submission (April 2014) to the Aviation Safety Regulation Review, ACUO recommended amongst other things that there would need to be a strong focus on deterrence and getting the message across that penalties for illegal RPAS operations will apply.

Brazil

- 7.43 Enforcement activities are carried out by ANAC (Civil Aviation Authority) and DECEA (Air Traffic Control) in Brazil. The authorities report illegal operations to the Federal Police who can prosecute offenders for "crimes against air safety". Spot checks and investigations have led to several fines being levied on operators who used RPAS for commercial purposes without authorisation. ANAC identified several challenges with enforcement:
 - RPAS usually do not take off from and land from aerodromes, where enforcement authorities are typically based;
 - the great majority of RPAS are much smaller than manned aircraft and difficult to detect;
 - the total number of RPAS operating in the country may be underestimated; and
 - the vast land extension of Brazil.

8 Conclusions and recommendations

Liability for damage to third parties

- 8.1 At present, there is no harmonised regime, either in the EU or internationally, for liability for damage to third parties caused by RPAS (or manned aviation). Provisions therefore depend on national law and vary between Member States. In the majority of EU Member States, but not all, national law defines that the liability regime for RPAS is strict. This means that there is a party which is automatically liable to indemnify the victim(s), without the need to establish fault or negligence as is required in a fault-based regime.
- 8.2 Identifying the current liability regime for RPAS in many Member States has been difficult: many of the national regulatory authorities contacted as part of this study were not aware what the current provisions of national law were, which may partly reflect the early stage of development of the RPAS sector and the relatively limited regulatory activity that has been undertaken to date. Where responses were obtained, we found that the same regime applies for manned aviation and RPAS (for ground damage). Except with respect to France and the UK, we found it particularly difficult to establish the current position with respect to liability for damage in the air (mid-air collisions), for which rules may differ from those for liability for damage on the ground.
- 8.3 We have also established that in Member States with a strict liability regime, it is very likely that this party liable for damage would be the operator. As RPAS are aircraft, operators are required by Regulation 785/2004 to have insurance for third-party liability, which as a minimum must be at the levels defined in the Regulation. Failing this, their assets would be liquidated to compensate the victims.
- 8.4 In practice, we have identified that the process to obtain compensation for the victims may be lengthy and complex, involving in some cases a court case. However this would depend on the specific circumstances, for example the extent of the damage to third parties caused by the RPAS. We would expect claims to be settled more quickly where the damage is relatively small and in Member States with strict liability regimes, but there is no evidence at the moment to confirm this.
- 8.5 We have identified a number of circumstances in which victims may not be adequately compensated for the damage caused in an incident. We recommend that , the European Commission or national regulators consider them. The circumstances we have identified are:
 - It may not be possible to identify the operator: This is an important first step towards claiming compensation, but provisions for identification are patchy across the EU – RPAS do not always have to carry registration details, and even if they do, if the RPAS is completely destroyed in the incident it may still be impossible to identify the operator.

- The operator may not be insured or the insurance may not be valid: It is impossible to quantify the scale of uninsured operations at present but there is a risk that it could be a significant proportion of all RPAS operations. Circumstances where this could arise are discussed below (paragraph 8.25).
- The timescale for payment of compensation may be long: Particularly if there is a dispute about the extent of the damage or which party is liable, there may be a long delay before a victim receives compensation. There are no provisions for advance payments equivalent to those applicable to passengers on manned aircraft who suffer injury, and there are no limits on the time intervals within which claimants can expect their cases considered.
- 8.6 However, we have not found any evidence that variation in third-party liability regimes across the EU has hindered the development of the market for RPAS, or created significant problems in ensuring the adequate compensation of victims, although it does complicate the work of RPAS insurance brokers and may add legal uncertainty for operators.

Conclusion on liability

8.7 There is clear evidence from manned aviation that there is no appetite for harmonisation at an international and European level. There is evidence that this complexity can be worked with and the European motor industry also shows that a fragmented liability framework across Europe does not in itself prevent third-parties from obtaining a high level of protection. In addition, there could be issues with the operation of different third-party liability regimes for manned and unmanned aviation. On this basis, we recommend that there should not be any attempt to harmonise third-party liability regimes across the EU.

Insurance requirements

8.8 In this section, we have examined the insurance framework for RPAS and assessed if it ensures proper third-party insurance coverage. We have also examined if there is a need to improve it.

Identification of the regulatory framework

8.9 Even though the RPAS industry is in its infancy, there is already a well-established and functioning framework defining third-party liability insurance requirements for RPAS, applicable in the whole of the European Union. This framework is Regulation (EC) 785/2004, which defines requirements for aircraft operators (including RPAS operators) to have third-party liability insurance, based on the maximum take-off mass (MTOM) of their RPAS. Other than Regulation 785/2004, we have not identified any other national rules that define third-party liability insurance requirements within the EU.

Assessment of the insurance framework

8.10 A mid-term evaluation of Regulation 785/2004 found in 2012 that the insurance requirements set in that legislative text could be considered as minima, and that most commercial operators purchased more coverage than the Regulation required. The information collected for this study indicates that this is probably also the case in the RPAS sector. In the absence of data for the damage that can be caused by RPAS during incidents, it is not possible to reach definitive conclusions as to whether the current minimum requirements for third-party liability insurance for RPAS are sufficient. However, there are some indications that the requirements are relatively low. The fact that, where RPAS operators (or model aircraft operators) do obtain third-party liability insurance, they tend to obtain more than the minimum legal requirement, could imply that operators and/or brokers believe that the potential liability exceeds the current minimum levels.

- 8.11 The insurance requirements for third-party liability coverage for RPAS and all other aircraft as set in Regulation 785/2004 are based on the mass of the RPAS only, with other factors such as the area overflown, the type of operations, the pilot training, etc not taken into consideration in the Regulation.
- 8.12 Insurance requirements for RPAS in the Regulation effectively use mass bands as a proxy for the damage that may be caused in an incident. It is clearly not perfect, but has the strong advantage of being readily available pre and post occurrence, and simple for all parties to use, with limited scope for dispute. Due to the limited market for RPAS insurance, coupled with the lack of data on the number of incidents and the damage caused, it is not possible at present to determine precisely the extent to which different factors influence the level of damage. In the absence of any such evidence, it is not practical to improve the Regulation by defining more precise criteria for minimum insurance requirements. Doing so would require amending the existing Regulation (if it was intended to change the provisions for both RPAS and manned aviation) or (otherwise) excluding RPAS from the scope of the Regulation. We do not recommend this as there is not sufficient data on the actual damage caused by RPAS in incidents, and no clear reason why RPAS should be treated differently from manned aircraft.
- 8.13 We also recommend that when data availability improves, consideration should be given as to whether it is appropriate to increase the minimum insurance requirement for RPAS or it is best left to the insurance market to advise operators of what level of coverage they should purchase (as is currently the case for manned aviation).

Conclusions

- 8.14 On the basis of our analysis, it appears that the Regulation fulfils its objective and acts as an incentive for operators to obtain appropriate coverage, and for brokers and insurers to offer coverage that is at least in line with the minima that the Regulation requires.
- 8.15 On the basis of the information currently available, we do not recommend any change to the Regulation now, or that RPAS should be excluded from the scope of the Regulation. However, we recommend that another assessment of the application of the Regulation in the RPAS sector is carried out once better information is available. It is impossible to be sure at this stage how soon this is likely to be, as it depends on the development of the sector and on the success of any measures taken to improve information; however, we would expect that a further assessment would be required within 3-5 years.
- 8.16 Although the insurance framework is clearly defined and we do not recommend making any changes to this, there is an issue with application and enforcement of this in the RPAS sector. This is discussed in more detail below.

The RPAS insurance market

- 8.17 On the basis of the limited information available, we have found that third-party liability insurance is available in most Member States, and that the cost is not at a level which would appear likely to threaten the economic viability of the sector. However the market supply is limited to a small number of providers and whilst insurance is affordable for operators who tend to purchase more than what they are required to obtain, there is limited price competition between insurers.
- 8.18 A key concern is the lack of insurance offer in some Member States. This was explained by the insurers as resulting from the lack of information necessary to enable them to price insurance. The primary concern was the lack of information on the number of incidents/accidents and

the damage actually caused, but the lack of operational data was also a concern. The lack of an insurance offer may also be exacerbated by the small current scale of the sector.

Enforcement and compliance

- 8.19 The legislative and enforcement regime for RPAS is based largely on that applicable to manned aviation, but there are significant differences between the sectors, and in particular barriers to entry are much lower in the RPAS sector. It is readily possible to obtain an RPAS and start operations, without any regulatory intervention. As a result, enforcement of regulatory requirements is more challenging and there is a much greater risk of illegal, uninsured operations. It is not possible to estimate what proportion of current RPAS operations is illegal but stakeholders confirmed that this was a material issue.
- 8.20 We recommend that national authorities should take measures to improve awareness amongst RPAS operators of the existing regulatory requirements that apply to them, including the requirement to have third-party liability insurance. This would be facilitated by introducing a requirement to record sales and imports of RPAS and model aircraft within the EU: national authorities could use this data to inform operators of their obligations. The point of sale may be the only opportunity to establish contact with existing and future operators.
- 8.21 It is likely that, if the RPAS sector grows as projected, there will be a need for considerably increased action by national authorities to enforce the existing insurance requirements, as well as other regulatory requirements. This may require an increase in the resources available to national authorities. In the short term we recommend that the approach to enforcement is discussed with national authorities and EASA, in order to enable them to share best practice, so that in the longer term, enforcement can be improved.
- 8.22 We have found that not every Member State requires RPAS airframes to be fitted with an identification plate. Whilst there could be some difficulties because of weight and size of the smallest RPAS, it is important that RPAS operators and/or manufacturers can be easily identified so that victims can be compensated. On this basis we recommend that Member States should require RPAS to be fitted with a fire-proof plate identifying the operator and/or the manufacturer, and including a serial number.
- 8.23 Operators should be aware that insurers may not cover RPAS (or other) damage if the operation was not within the scope of the insurance policy. Nonetheless this issue needs to be better publicised, given the potential financial implications for both operators and victims. We recommend that operator representatives, as well as insurers, circulate this message. In the longer term, if this turns out to be a significant problem as the RPAS sector further develops, there might be a case for prohibiting exclusions which work against the victim (as in the motor insurance sector).
- 8.24 It is difficult to obtain information on national requirements applicable in some Member States, and it is inevitably time-consuming to seek to obtain this data for all 28 States. Until national rules are harmonised by EASA, it could benefit both operators and insurers if links to information on national rules for each Member State were provided in a centralised location (such as the European Commission's website). We also recommend that insurance representatives engage with national authorities of countries with legislation in draft so that they can propose products as soon for RPAS as soon as operations become legal.

Uninsured operations and compensation fund

- 8.25 Even though it is a legal requirement for RPAS operators in the EU to be insured for third-party liability, there is a significant risk that some RPAS operations will be uninsured. There is also the possibility that the RPAS operator or insurer cannot be traced leaving the victims with no party to claim compensation from. These situations may derive from:
 - Operations that have not been approved by the authorities or that take place outside the rules stated by the authorities;
 - Operations where no approval has been sought from the authorities;
 - Operations by registered and insured operators, but where any limits on operations imposed by the insurers are not followed and therefore the insurance is void;
 - The RPAS involved in an incident not carrying a unique and fire-proof registration number;
 - The RPAS being entirely destroyed or lost; and
 - It not being possible to identify the insurer of the RPAS.
- 8.26 Although the issue of uninsured operations will need to be addressed partly through enforcement (as discussed above), it may still be the case that it will be easy to obtain an RPAS and start operations, and therefore there is a risk that there will be some uninsured operations. This raises the question of a compensation scheme for victims of uninsured/unidentified RPAS, similar to those that exist for the victims of uninsured motor vehicles.
- 8.27 At present, given the limited data on the state of the RPAS market and operations, and the lack of information on the proportion of operators which are insured, it is impossible to determine how a compensation scheme would be feasible. A further issue is that such schemes are unlikely to be feasible until there is a larger volume of operations than at present. However we recommend that this issue should be reviewed by the European Commission as soon as enough evidence becomes available, as there is a significant possibility that this will be required in the future if the RPAS sector expands as projected.

Scope of Regulation 785/2004

- 8.28 In some cases there may be no difference between a model aircraft and a light RPAS, apart from the usage that is made of it. The definition of model aircraft should be consistent across the EU, so that all civilian RPAS are required to be insured for third-party liability as required by Regulation 785/2004 and cannot expect to be out of scope by labelled themselves "model aircraft". We recommend that either Member States should agree a common definition of model aircraft (for example, as proposed by EASA in its NPA 2014 09 proposal - demarking the two categories by the purpose for which the aircraft was being used), or that Regulation 785/2004 should be amended to define the type of unmanned model aircraft excluded from its scope.
- 8.29 We recommend that Member States should better clarify what they consider a State RPAS as there is some uncertainty about this: the status of RPAS operated by local police forces, ambulances services, etc. in unclear in some States, as well as the status of private RPAS contractors working on behalf of the State. These definitions should be communicated to the European Commission as well to all other stakeholders as soon as possible.
- 8.30 In addition, it is important that victims of State RPAS are indemnified in similar terms to victims of private market RPAS, and therefore we recommend that Member States should clarify the arrangements for compensation that they will apply for State RPAS. Although the

same issues of definition and lack of a clear compensation mechanism apply to operations with manned State aircraft, the potential for future large-scale use of RPAS for State operations means that this may be a more significant issue than in the past.

Provision of information

- 8.31 This report has identified that lack of information is a key issue, for multiple industry stakeholders. Specifically:
 - Insurers need access to reliable information in order to be able to price insurance;
 - National authorities need information in order to be able to ensure compliance with regulatory requirements; and
 - Policymakers need information in order to assess whether regulatory requirements are appropriate.
- 8.32 We recommend that:
- 8.33 The collection of information on operational data and occurrences by national regulators should be improved. There is currently no consistency between Member States as to what is recorded. EASA could undertake this role in the future if it takes over regulation of RPAS, but in the meantime the data collection undertaken by national authorities could be coordinated and harmonised. National authorities also need to be more proactive in their collection of information.
- 8.34 The existing regulatory requirements to disclose information on occurrences should be better published to operators, so that they can ensure that they comply with all applicable requirements. This could be undertaken, for example, by informing purchasers at the point of sale, and through national associations of operators. Once these requirements have been more widely disseminated, national authorities should improve enforcement and should consider sanctions where appropriate.
- 8.35 Information collected on occurrences, and operational data, should be made more widely available by the national regulators, including to insurers, but also to operators and their representative associations. This could benefit the entire industry by contributing to improved awareness of safety issues and improved RPAS risk assessments. In turn this should improve the availability and affordability of RPAS insurance products.
- 8.36 Given the scope to purchase RPAS readily online, national authorities should also consider what information channels they can use to effectively reach the RPAS operators. They should also consider development of tools which would minimise the administrative burden associated with reporting data and/or occurrences. These tools could include, for example, a simple website or potentially a smartphone application.

Control Sheet

Document Title

Study on the Third-Party Liability and Insurance Requirements of Remotely Piloted Aircraft Systems (RPAS)

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