

2015-2020

European Airport Security: Technologies, Industry & Markets

Think Before You Pack

New EU regulations for carrying liquids
in your Hand Luggage through Security

SECURITY CONTROL

✓ Allowed

- ✓ Liquids up to a maximum size of 100ml each
- ✓ Pack liquids in a transparent re-sealable bag
- ✓ Bag size no larger than 20cm x 20cm
- ✓ One bag per person
- ✓ Sealed bag must be presented separately at security check



Exceptions

- ✓ Essential medicines, baby food/milk must also be presented separately

✗ Not Allowed

- ✗ Liquids, Gels, Pastes and Lotions over 100mls
- ✗ Containers over 100mls even if partially full
- ✗ Overpacked 'open bags'
- ✗ Sharp items

(Source: Shannon Airport 2015)

2 Volumes:

**European Airport Security: Technologies,
Industry & Markets – Volume 1**

**European Airport Security: Technologies,
Industry & Markets – Volume 2**

2015-2020

European Airport Security: Technologies, Industry & Markets

Volume 1

Think Before You Pack

New EU regulations for carrying liquids
in your Hand Luggage through Security

SECURITY CONTROL

✓ Allowed

- ✓ Liquids up to a maximum size of 100ml each
- ✓ Pack liquids in a transparent re-sealable bag
- ✓ Bag size no larger than 20cm x 20cm
- ✓ One bag per person
- ✓ Sealed bag must be presented separately at security check



Exceptions

- ✓ Essential medicines, baby food/milk must also be presented separately

✗ Not Allowed

- ✗ Liquids, Gels, Pastes and Lotions over 100mls
- ✗ Containers over 100mls even if partially full
- ✗ Overpacked 'open bags'
- ✗ Sharp items

(Source: Shannon Airport 2015)

***European Airport Security:
Technologies, Industry &
Markets
2015-2020***

Volume 1

March 2015

Table of Contents

1	Summary	17
2	Extended Summary	19
2.1	Scope.....	19
2.2	Major Findings	20
2.3	Major Conclusions	25
2.4	European Airport Security Market –2015-2020.....	27
EUROPEAN MARKET		30
3	Market Background	30
3.1	European Aviation Terror Threats.....	30
3.2	European Aviation Security Strategy	31
3.3	European Aviation Security Market Demand Side	33
3.3.1	Airports.....	33
3.3.2	Airlines.....	33
3.3.3	Freight Forwarders	33
3.3.4	Customs Services	33
3.3.5	Security Service Providers	34
3.4	EU Aviation Security legislation	34
3.4.1	Introduction.....	34
3.4.2	EU Regulation on Personal Data Protection.....	34
3.4.3	EU Regulation on Biometric Passports and Visas.....	35
3.4.4	Role of the EU National Authorities	36
3.5	Aviation Passenger Screening Technologies Outlook: 2015-2020.....	37
4	European Aviation Security Market Drivers	40
5	European Aviation Security Market Inhibitors	42
6	European Aviation Security: 20 Business Opportunities and Challenges	43
7	European Aviation Security Market: SWOT Analysis.....	45
7.1	Strengths	45
7.2	Weaknesses	46
7.3	Opportunities.....	46
7.4	Threats.....	48
8	European Aviation Security Market Competitive Analysis	49
9	European Airport Security Market – 2011-2014 Data and 2015-2020 Forecast	50
9.1	Consolidated Market – 2015-2020.....	50
9.2	Market Dynamics – 2015-2020	52
9.3	European Market Breakdown – 2015-2020	53

NATIONAL MARKETS.....	55
10 UK Airport Security Market - 2011-2014 Data and 2015-2020 Forecast.....	55
10.1 UK Aviation Market Background	55
10.2 UK Aviation Security Market Background	59
10.3 UK Passenger Screening Data by 38 Airports	62
10.4 UK Airport Security Market	65
10.4.1 Market Size – 2011-2020	65
10.4.2 Market Dynamics – 2012-2020.....	66
10.4.3 Market Breakdown – 2011-2020	67
11 Sweden Airport Security Market - 2011-2014 Data and 2015-2020 Forecast.....	68
11.1 Sweden Aviation Security Market Background	68
11.2 Sweden Passenger Screening Data by 24 Airports	69
11.3 Sweden Airport Security Market.....	70
11.3.1 Market Size – 2011-2020	70
11.3.2 Market Dynamics – 2012-2020.....	71
11.3.3 Market Breakdown – 2011-2020	72
12 Denmark Airport Security Market - 2011-2014 Data and 2015-2020 Forecast.....	73
12.1 Denmark Aviation Security Market Background.....	73
12.2 Denmark Passenger Screening Data by 7 Airports.....	73
12.3 Denmark Airport Security Market.....	74
12.3.1 Market Size – 2011-2020	74
12.3.2 Market Dynamics – 2012-2020.....	75
12.3.3 Market Breakdown – 2011-2020	76
13 Netherlands Airport Security Market - 2011-2014 Data and 2015-2020 Forecast	77
13.1 Netherlands Aviation Security Market Background	77
13.2 Netherlands Passenger Screening Data by 5 Airports	78
13.3 Netherlands Airport Security Market	79
13.3.1 Market Size – 2011-2020	79
13.3.2 Market Dynamics – 2012-2020.....	80
13.3.3 Market Breakdown – 2011-2020	81
14 Belgium Airport Security Market - 2011-2014 Data and 2015-2020 Forecast.....	83
14.1 Belgium Aviation Security Market Background	83
14.2 Belgium Passenger Screening Data	83
14.3 Belgium Airport Security Market.....	84
14.3.1 Market Size – 2011-2020	84
14.3.2 Market Dynamics – 2012-2020.....	85
14.3.3 Market Breakdown – 2011-2020	86

15	Germany Airport Security Market - 2011-2014 Data and 2015-2020 Forecast.....	87
15.1	German Aviation Sector Background.....	87
15.1.1	The German Airports Industry	87
15.1.2	German Aviation Transportation Economic Benefits	88
15.1.2.1	Contribution to German GDP	88
15.1.2.2	Contribution to Public Finances	88
15.2	Germany Air Transport Data – 2005-2013.....	89
15.3	Germany Aviation Security	90
15.3.1	German Aviation Security Strategy	90
15.3.2	German Aviation Security Regulations.....	90
15.3.3	Aviation Security Act (Luftverkehrs-gesetz).....	90
15.3.4	Germany Aviation Passengers Security Tax	92
15.3.5	The German Federal Aviation Office (Luftfahrt-Bundesamt)	92
15.3.6	The German Aviation Supply Chain Security	95
15.4	Germany Passenger Screening Data by 26 Airports	96
15.5	Germany Airport Security Market.....	97
15.5.1	Market Size – 2011-2020	97
15.5.2	Market Dynamics – 2012-2020.....	98
15.5.3	Market Breakdown – 2011-2020	99
16	France Airport Security Market - 2011-2014 Data and 2015-2020 Forecast.....	101
16.1	France Aviation Sector Background.....	101
16.2	France Air Transport Data – 2005-2013	102
16.3	France Aviation Security	103
16.4	France Passenger Screening Data by 57 Airports	104
16.5	France Airport Security Market	106
16.5.1	Market Size – 2011-2020	106
16.5.2	Market Dynamics – 2012-2020.....	107
16.5.3	Market Breakdown – 2011-2020	108
17	Spain Airport Security Market - 2011-2014 Data and 2015-2020 Forecast.....	109
17.1	Spain Aviation Sector Background.....	109
17.2	Spain Air Transport Data – 2005-2013	110
17.3	Spain Aviation Security Background	112
17.4	Spain Passenger Screening Data by 30 Airports	113
17.5	Spain Airport Security Market	114
17.5.1	Market Size – 2011-2020	114
17.5.2	Market Dynamics – 2012-2020.....	115
17.5.3	Market Breakdown – 2011-2020	116
18	Italy Airport Security Market - 2011-2014 Data and 2015-2020 Forecast.....	117
18.1	Italy Aviation Sector Background	117

18.2	Italy Air Transport Data – 2005-2013	117
18.3	Italy Aviation Security	119
18.4	Italy Passenger Screening Data by 31 Airports	120
18.5	Italy Airport Security Market	121
18.5.1	Market Size – 2011-2020	121
18.5.2	Market Dynamics – 2012-2020	122
18.5.3	Market Breakdown – 2011-2020	123
19	Austria Airport Security Market - 2011-2014 Data and 2015-2020 Forecast.....	124
19.1	Austria Aviation Market Background	124
19.2	Austria Aviation Security Market Background	125
19.3	Austria Passenger Screening Data by 40 Airports	125
19.4	Austria Airport Security Market	125
19.4.1	Market Size – 2011-2020	125
19.4.2	Market Dynamics – 2012-2020	127
19.4.3	Market Breakdown – 2011-2020	128
20	Czech Republic Airport Security Market - 2011-2014 Data and 2015-2020 Forecast	129
20.1	Czech Republic Aviation Security Market Background	129
20.2	Czech Republic Passenger Screening Data	129
20.3	Czech Republic Airport Security Market	130
20.3.1	Market Size – 2011-2020	130
20.3.2	Market Dynamics – 2012-2020	132
20.3.3	Market Breakdown – 2011-2020	133
21	Poland Airport Security Market - 2011-2014 Data and 2015-2020 Forecast.....	134
21.1	Poland Aviation Security Market Background	134
21.2	Poland Passenger Screening Data by 11 Airports	137
21.3	Poland Airport Security Market	138
21.3.1	Market Size – 2011-2020	138
21.3.2	Market Dynamics – 2012-2020	139
21.3.3	Market Breakdown – 2011-2020	140
22	Russia Airport Security Market - 2011-2014 Data and 2015-2020 Forecast.....	141
22.1	Russia Aviation Sector Background	141
22.2	Russia Air Transport Data – 2005-2013	141
22.3	Russia Aviation Security	143
22.4	Russia Passenger Screening Data by 58 Airports	145
22.5	Russia Airport Security Market	147
22.5.1	Market Size – 2011-2020	147
22.5.2	Market Dynamics – 2012-2020	148
22.5.3	Market Breakdown – 2011-2020	149

EUROPEAN TECHNOLOGY MARKETS.....	150
23 European Airports Baggage & Cargo X-ray Scanners Airport Security Market – 2011-2014 Data & 2015-2020 Forecast	150
23.1 European Airports Baggage & Cargo X-ray Scanners Market Background.....	150
23.2 Europe Security Related ICT & Cybersecurity Airport Security Market – 2011-2020.....	150
24 European Airports Whole Body Scanners (AIT) Airport Security Market – 2011-2014 Data & 2015-2020 Forecast	152
24.1 European Airports Whole Body Scanners (AIT) Market Background.....	152
24.2 Europe Explosive Detection Systems (EDS) Airport Security Market – 2011-2020.....	152
25 European Security Related Baggage Handling Systems (BHS) Airport Security Market – 2011-2014 Data & 2015-2020 Forecast.....	154
25.1 European Airports Security Related Baggage Handling Systems (BHS) Market Background	154
25.2 Europe Security Related Baggage Handling Systems (BHS) Airport Security Market – 2011-2020	154
26 European Airports Explosives Trace Detectors (ETD) Airport Security Market – 2011-2014 Data & 2015-2020 Forecast	156
26.1 European Airports Explosives Trace Detectors (ETD) Market Background.....	156
26.2 Europe Explosives Trace Detectors (ETD) Airport Security Market – 2011-2020.....	156
27 European Airports Metal Detectors Airport Security Market – 2011-2014 Data & 2015-2020 Forecast	158
27.1 European Airports Metal Detectors Market Background	158
27.2 Europe Metal Detectors Airport Security Market – 2011-2020.....	158
28 European Airports Liquid Explosives Detectors Airport Security Market – 2011-2014 Data & 2015-2020 Forecast	160
28.1 European Airports Liquid Explosives Detectors Market Background.....	160
28.2 Europe Liquid Explosives Detectors Airport Security Market – 2011-2020.....	160
29 European Airports Shoe Scanners Market – 2011-2014 Data & 2015-2020 Forecast.....	162
29.1 European Airports Shoe Scanners Market Background.....	162
29.2 Europe Shoe Scanners Airport Security Market – 2011-2020.....	162

30	European Workforce ID Documents Screening Systems Airport Security Market – 2011-2014 Data & 2015-2020 Forecast.....	164
30.1	European Airports Workforce ID Documents Screening Systems Market Background	164
30.2	Europe Workforce ID Documents Screening Systems Airport Security Market – 2011-2020	164
31	European Airports Automated Border Control Airport Security Market – 2011-2014 Data & 2015-2020 Forecast	166
31.1	European Airports Automated Border Control Market Background.....	166
31.2	Europe Automated Border Control Airport Security Market – 2011-2020.....	166
32	European CCTV & Radar Surveillance Airport Security Market – 2011-2014 Data & 2015-2020 Forecast.....	168
32.1	European Airports CCTV & Radar Surveillance Market Background.....	168
32.2	Europe CCTV & Radar Surveillance Airport Security Market – 2011-2020.....	168
33	European C2/C4ISR Systems Airport Security Market – 2011-2014 Data & 2015-2020 Forecast	170
33.1	European Airports C2/C4ISR Systems Market Background	170
33.2	Europe Airport Perimeter Fencing Market – 2011-2020.....	170
34	European Multi-modal Security Systems and Other Modalities Airport Security Market – 2011-2014 Data & 2015-2020 Forecast.....	172
34.1	European Airports Multi-modal Security Systems and Other Modalities Market Background.....	172
34.2	Europe Multi-modal Security Systems and Other Modalities Airport Security Market – 2011-2020	172
35	Disclaimer & Copyright.....	174

List of Tables

Table 1 - Europe Airport Security Market [\$M] by Technology – 2011-2020.....	18
Table 2 - Europe Airport Security Market [\$M] by Technology – 2011-2020.....	27
Table 3 - Europe Airport Security Market AGR [%] by Technology – 2011- 2020.....	28
Table 4 - Europe Airport Security Market Share [%] by Technology – 2011- 2020.....	29
Table 5 - European Aviation Security Market – Competitive Analysis.....	49
Table 6 - Europe Airport Security Market [\$M] by Technology – 2011-2020.....	50
Table 7 - Europe Airport Security Market AGR [%] by Technology – 2011- 2020.....	52
Table 8 - Europe Airport Security Market Share [%] by Technology – 2011- 2020.....	53
Table 9 - UK Air Transport Data – 2005-2013	56
Table 10 - UK Passenger Screening Data [M] by 38 Airports	62
Table 11 - UK Airport Security Market [\$M] by Revenue Segment – 2011- 2020.....	65
Table 12 - UK Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	66
Table 13 - UK Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	67
Table 14 - Sweden Passenger Screening [M] by 24 Airports.....	69
Table 15 - Sweden Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	70
Table 16 - Sweden Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	71
Table 17 - Sweden Airport Security Market Share [%] by Revenue Segment – 2011-2020	72
Table 18 - Denmark Passenger Screening [M] by 7 Airports	73
Table 19 - Denmark Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	74
Table 20 - Denmark Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	75
Table 21 - Denmark Airport Security Market Share [%] by Revenue Segment – 2011-2020	76
Table 22 - Netherlands Passenger Screening [M] by 5 Airports	78
Table 23 - Netherlands Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	79
Table 24 - Netherlands Airport Security Market AGR [%] by Revenue Segment – 2011-2020	80
Table 25 - Netherlands Airport Security Market Share [%] by Revenue Segment – 2011-2020	81
Table 26 - Belgium Passenger Screening [M] by 5 Airports.....	83

Table 27 - Belgium Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	84
Table 28 - Belgium Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	85
Table 29 - Belgium Airport Security Market Share [%] by Revenue Segment – 2011-2020	86
Table 30 - Germany Air Transport Data – 2005-2013.....	89
Table 31 - Germany Passenger Screening [M] by 26 Airports	96
Table 32 - Germany Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	97
Table 33 - Germany Airport Security Market AGR [%] by Revenue Segment – 2011-2020	98
Table 34 - Germany Airport Security Market Share [%] by Revenue Segment – 2011-2020	99
Table 35 - France Air Transport Data – 2005-2013	102
Table 36 - France Passenger Screening [M] by 57 Airports	104
Table 37 - France Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	106
Table 38 - France Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	107
Table 39 - France Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	108
Table 40 - Spain Air Transport Data – 2005-2013	111
Table 41 - Spain Passenger Screening [M] by 30 Airports	113
Table 42 - Spain Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	114
Table 43 - Spain Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	115
Table 44 - Spain Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	116
Table 45 - Italy Air Transport Data – 2005-2013.....	118
Table 46 - Italy Passenger Screening [M] by 31 Airports	120
Table 47 - Italy Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	121
Table 48 - Italy Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	122
Table 49 - Italy Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	123
Table 50 - Austria Passenger Screening [M] by 40 Airports	125
Table 51 - Austria Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	126
Table 52 - Austria Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	127
Table 53 - Austria Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	128

Table 54 - Prague Passenger Screening [M] – 2011-2014	129
Table 55 - Czech Republic Airport Security Market [\$M] by Revenue Segment – 2011-2020	130
Table 56 - Czech Republic Airport Security Market AGR [%] by Revenue Segment – 2011-2020	132
Table 57 - Czech Republic Airport Security Market Share [%] by Revenue Segment – 2011-2020	133
Table 58 - Poland Passenger Screening [M] by 11 Airports	137
Table 59 - Poland Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	138
Table 60 - Poland Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	139
Table 61 - Poland Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	140
Table 62 - Russia Air Transport Data – 2005-2013.....	142
Table 63 - Russia Passenger Screening [M] by 58 Airports.....	145
Table 64 - Russia Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	147
Table 65 - Russia Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	148
Table 66 - Russia Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	149
Table 67- Europe Security Related ICT & Cybersecurity Airport Security Market [\$M], AGR [%] and Market Share [%] - 2011-2020	150
Table 68 - Europe Explosive Detection Systems (EDS) Airport Security Market [\$M], AGR [%] and Market Share [%] - 2011-2020	152
Table 69 - Europe Security Related Baggage Handling Systems (BHS) Airport Security Market [\$M], AGR [%] and Market Share [%] - 2011-2020.....	154
Table 70 - Europe Explosives Trace Detectors (ETD) Airport Security Market [\$M], AGR [%] and Market Share [%] - 2011-2020	156
Table 71 - Europe Metal Detectors Airport Security Market [\$M], AGR [%] and Market Share [%] - 2011-2020	158
Table 72 - Europe Liquid Explosives Detectors Airport Security Market [\$M], AGR [%] and Market Share [%] - 2011-2020	160
Table 73 - Europe Shoe Scanners Airport Security Market [\$M], AGR [%] and Market Share [%] - 2011-2020	162
Table 74 - Europe Workforce ID Documents Screening Systems Airport Security Market [\$M], AGR [%] and Market Share [%] - 2011- 2020.....	164
Table 75 - Europe Automated Border Control Airport Security Market [\$M], AGR [%] and Market Share [%] - 2011-2020	166
Table 76 - Europe CCTV & Radar Surveillance Airport Security Market [\$M], AGR [%] and Market Share [%] - 2011-2020	168

Table 77 - Europe Airport Perimeter Fencing Market [\$M], AGR [%] and Market Share [%] - 2011-2020.....	170
Table 78 - Europe Multi-modal Security Systems and Other Modalities Airport Security Market [\$M], AGR [%] and Market Share [%] - 2011-2020.....	172

List of Figures

Figure 1- Airport Perimeter Security Infrastructure.....	17
Figure 2 - Airport Perimeter & Terminal Security Areas	21
Figure 3 - A Multi-lane People Screening Site	22
Figure 4 - Airport Security Layers	23
Figure 5 - IATA Outlook of an Airport Passengers Security Screening Infrastructure.....	24
Figure 6 - Future of Aviation Security.....	26
Figure 7 - European Aviation Security Layers of Security.....	32
Figure 8 - Airport Passengers Screening – Segments	38
Figure 9 - Airport Terminal Screening Infrastructure	39
Figure 10 - Europe Airport Security Market [\$M] by Technology – 2011- 2020.....	51
Figure 11 - Europe Airport Security Market Share [%] by Technology – 2011-2020.....	54
Figure 12 - The UK Aviation routes.....	55
Figure 13 - UK Passengers Carried by Air Transport [M] – 2005-2013.....	57
Figure 14 - UK Air Passenger Demand 2010 & 2040	58
Figure 15 - The UK Air Passengers 1984-2012 by Contribution Sources	59
Figure 16 - UK Passengers Share [%] by Airport.....	64
Figure 17 - UK Airport Security Market [\$M] by Revenue Segment – 2011- 2020.....	65
Figure 18 - UK Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	66
Figure 19 - UK Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	67
Figure 20 - Sweden Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	70
Figure 21 - Sweden Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	71
Figure 22 - Sweden Airport Security Market Share [%] by Revenue Segment – 2011-2020	72
Figure 23 - Denmark Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	74
Figure 24 - Denmark Airport Security Market AGR [%] by Revenue Segment – 2011-2020	75
Figure 25 - Denmark Airport Security Market Share [%] by Revenue Segment – 2011-2020	76
Figure 26 - Amsterdam Annual Passengers [M] Traffic 2000-2012	77
Figure 27 - Netherlands (excl. AMS) Annual Passengers [M] Traffic 2003- 2012.....	78
Figure 28 - Netherlands Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	80

Figure 29 - Netherlands Airport Security Market AGR [%] by Revenue Segment – 2011-2020	81
Figure 30 - Netherlands Airport Security Market Share [%] by Revenue Segment – 2011-2020	82
Figure 31 - Belgium Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	84
Figure 32 - Belgium Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	85
Figure 33 - Belgium Airport Security Market Share [%] by Revenue Segment – 2011-2020	86
Figure 34 - Germany Air Passengers [M] – 2005-2013.....	89
Figure 35 - The German Federal Aviation Office Organization Chart	94
Figure 36 - Germany Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	98
Figure 37 - Germany Airport Security Market AGR [%] by Revenue Segment – 2011-2020	99
Figure 38 - Germany Airport Security Market Share [%] by Revenue Segment – 2011-2020	100
Figure 39 - France Passengers Carried by Air Transport [M] – 2005-2013	102
Figure 40 - France Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	106
Figure 41 - France Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	107
Figure 42 - France Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	108
Figure 43 - Spain Passengers Carried by Air Transport [M] – 2005-2013	111
Figure 44 - Spain Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	114
Figure 45 - Spain Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	115
Figure 46 - Spain Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	116
Figure 47 - Italy Passengers Carried by Air Transport [M] – 2005-2013.....	118
Figure 48 - Italy Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	121
Figure 49 - Italy Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	122
Figure 50 - Italy Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	123
Figure 51 - Passengers [M] to & from Austria Airports 1996-2013.....	124
Figure 52 - Austria Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	126
Figure 53 - Austria Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	127

Figure 54 - Austria Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	128
Figure 55 - Air Passengers [M] per Month 2011-2014	129
Figure 56 - Czech Republic Airport Security Market [\$M] by Revenue Segment – 2011-2020	131
Figure 57 - Czech Republic Airport Security Market AGR [%] by Revenue Segment – 2011-2020	132
Figure 58 - Czech Republic Airport Security Market Share [%] by Revenue Segment – 2011-2020	133
Figure 59 - Airport Passenger Growth [%] in Poland	135
Figure 60 - Airport Passenger Traffic in Poland 2011-2013.....	136
Figure 61 - Poland Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	138
Figure 62 - Poland Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	139
Figure 63 - Poland Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	140
Figure 64 - Russia Passengers Carried by Air Transport [M] – 2005-2013.....	142
Figure 65 - Russia Airport Security Market [\$M] by Revenue Segment – 2011-2020.....	147
Figure 66 - Russia Airport Security Market AGR [%] by Revenue Segment – 2011-2020.....	148
Figure 67 - Russia Airport Security Market Share [%] by Revenue Segment – 2011-2020.....	149
Figure 68 - Europe Security Related ICT & Cybersecurity Airport Security Market [\$M] - 2011-2020.....	151
Figure 69 - Europe Security Related ICT & Cybersecurity Airport Security Market AGR [%] - 2011-2020.....	151
Figure 70 - Europe Explosive Detection Systems (EDS) Airport Security Market [\$M] - 2011-2020.....	153
Figure 71 - Europe Explosive Detection Systems (EDS) Airport Security Market AGR [%] - 2011-2020.....	153
Figure 72 - Europe Security Related Baggage Handling Systems (BHS) Airport Security Market [\$M] - 2011-2020	155
Figure 73 - Europe Security Related Baggage Handling Systems (BHS) Airport Security Market AGR [%] - 2011-2020	155
Figure 74 - Europe Explosives Trace Detectors (ETD) Airport Security Market [\$M] - 2011-2020.....	157
Figure 75 - Europe Explosives Trace Detectors (ETD) Airport Security Market AGR [%] - 2011-2020.....	157
Figure 76 - Europe Metal Detectors Airport Security Market [\$M] - 2011-2020.....	159
Figure 77 - Europe Metal Detectors Airport Security Market AGR [%] - 2011-2020.....	159

Figure 78 - Europe Liquid Explosives Detectors Airport Security Market [\$M] - 2011-2020	161
Figure 79 - Europe Liquid Explosives Detectors Airport Security Market AGR [%] - 2011-2020.....	161
Figure 80 - Europe Shoe Scanners Airport Security Market [\$M] - 2011- 2020.....	163
Figure 81 - Europe Shoe Scanners Airport Security Market AGR [%] - 2011-2020.....	163
Figure 82 - Europe Workforce ID Documents Screening Systems Airport Security Market [\$M] - 2011-2020.....	165
Figure 83 - Europe Workforce ID Documents Screening Systems Airport Security Market AGR [%] - 2011-2020.....	165
Figure 84 - Europe Automated Border Control Airport Security Market [\$M] - 2011-2020	167
Figure 85 - Europe Automated Border Control Airport Security Market AGR [%] - 2011-2020	167
Figure 86 - Europe CCTV & Radar Surveillance Airport Security Market [\$M] - 2011-2020	169
Figure 87 - Europe CCTV & Radar Surveillance Airport Security Market AGR [%] - 2011-2020.....	169
Figure 88 - Europe Airport Perimeter Fencing Market [\$M] - 2011-2020	171
Figure 89 - Europe Airport Perimeter Fencing Market AGR [%] - 2011-2020 ...	171
Figure 90 - Europe Multi-modal Security Systems and Other Modalities Airport Security Market [\$M] - 2011-2020	173
Figure 91 - Europe Multi-modal Security Systems and Other Modalities Airport Security Market AGR [%] - 2011-2020	173

2015-2020

European Airport Security: Technologies, Industry & Markets

Volume 2

Think Before You Pack

New EU regulations for carrying liquids
in your Hand Luggage through Security

SECURITY
CONTROL

✓ Allowed

- ✓ Liquids up to a maximum size of 100ml each
- ✓ Pack liquids in a transparent re-sealable bag
- ✓ Bag size no larger than 20cm x 20cm
- ✓ One bag per person
- ✓ Sealed bag must be presented separately at security check



Exceptions

- ✓ Essential medicines, baby food/milk must also be presented separately

✗ Not Allowed

- ✗ Liquids, Gels, Pastes and Lotions over 100mls
- ✗ Containers over 100mls even if partially full
- ✗ Overpacked 'open bags'
- ✗ Sharp items

(Source: Shannon Airport 2015)

***European Airport Security:
Technologies, Industry &
Markets
2015-2020***

Volume 2

March 2015

Table of Contents

INDUSTRY	16
1 Aviation Security Industry: Overview	16
1.1 Economic Turmoil Effects on the Aviation Security Market	16
1.2 Globalization of the Aviation Security Industry	17
1.3 Classification of the Aviation Security Industry Business & Industrial Activities	17
1.4 Forces that Shape the Aviation Security Industry & Markets	18
1.5 Aviation Security Vendor – Government Relationship	20
1.6 Barriers to the Aviation Security Market Entry.....	23
1.7 Aviation Security Industry: Supply-Side & Demand-Side Analysis	24
2 Airport Security Industry: Business Models & Strategies	27
2.1 Variable Economic Conditions	27
2.2 Airport Security Market Tiers.....	27
2.3 Defense Primes & Mega Corporations’ Inroads into the Airport Security Market	28
2.4 Entry Strategies toward the Airport Security Arena.....	28
2.5 Price Elasticity.....	30
2.6 Mergers and Acquisitions (M&A).....	31
3 Aviation Security Standards and Regulations	32
3.1 Aviation Security Standards.....	32
3.2 ICAO Airport Security & Safety Regulations	32
3.3 EU ACC3 Air Cargo Security Regulations	33
4 Leading Vendors: Profile, Products & Contact Info	39
4.1 Vendors & Product Lines Summary	39
4.2 American Science and Engineering, Inc.	41
4.3 Auto Clear	42
4.4 ADANI.....	44
4.5 Red X Defense.....	44
4.6 Syagen Technology	45
4.7 Thermo Electron Corporation.....	46
4.8 Biosensor Applications.....	47
4.9 Hitachi.....	48
4.10 Scent Detection Technologies	49
4.11 Ketech Defence	50
4.12 Mistral Security Inc.....	50
4.13 Appealing Products, Inc. (API)/ChemSee	51
4.14 DetectaChem LLC	52
4.15 Scintrex Trace.....	52
4.16 Flir Systems	53
4.17 Ion Applications Inc.....	53

4.18	BAHIA Corp (Sibel Ltd.)	54
4.19	CEIA	54
4.20	Fisher Labs	55
4.21	Brijot Imaging Systems	55
4.22	TeraView.....	56
4.23	ThruVision Systems	57
4.24	Gilardoni SpA.....	58
4.25	L-3 Communications Security & Detection Systems	59
4.26	QinetiQ Ltd.....	60
4.27	Westminster International Ltd.	60
4.28	LIXI, Inc.....	61
4.29	MilliVision.....	63
4.30	MINXRAY, Inc.....	64
4.31	Morpho Detection Inc.....	65
4.32	Nuctech Co. Ltd.	66
4.33	Rapiscan Security Products, Inc.	67
4.34	Scanna MSC Ltd.....	68
4.35	Smiths Detection.....	69
4.36	Vidisco Ltd.	70

TECHNOLOGIES 71

5 X-ray Baggage & Cargo Screening: Present & Pipeline Technologies 71

5.1	Aviation Security X-ray Baggage & Cargo Screening Market Background.....	71
5.2	Aviation Security Explosives Screening Technologies.....	73
5.2.1	X-ray Systems - Characteristics	74
5.2.2	X-ray Systems - Principles of Operation.....	75
5.2.3	2D X-ray, EDS and ETD Explosives Detection Technologies - Pros and Cons	76
5.3	X-ray Baggage & Cargo Screening Present & Pipeline Technologies.....	77
5.3.1	Overview	77
5.3.2	Threat Image Projection (TIP)	77
5.3.3	Conventional 2D X-ray	78
5.3.4	Dual Energy X-ray	79
5.3.5	Variable View X-ray	83
5.3.6	Quasi 3-D Dual View Dual-Energy X-ray Imaging.....	84
5.3.7	TSA “Advanced Technology” (AT) X-ray Systems	85
5.3.8	Backscatter Screening X-ray	86
5.3.9	Coherent Scatter X-ray.....	88
5.3.10	Cast & Artificial Limbs Screening: X-ray Backscatter Technologies	90
5.3.11	Fused X-ray and ETD Screening.....	91

5.3.12	Fused Baggage X-ray and RFID Screening	91
5.3.13	Multi-Threat Multi-Modal X-ray Screening	92
5.3.14	Advanced 2D Coherent X-ray Baggage Screening	93
5.3.15	Stereoscopic “3D X-ray” Imaging	93
5.4	Operational Considerations	95
5.5	X-ray Screening Technologies: Performance Comparison	97
6	Air Cargo Screening Market & Technologies	98
6.1.1	Air Cargo Industry Outlook	98
6.1.2	Air-Cargo Traffic and Capacity	99
6.1.3	Trend in Global Air-Freight Traffic by Region	99
6.1.4	Air Cargo Related Security Risks.....	100
6.1.5	Air-Cargo Supply Chain Security	100
7	Whole Body Scanners (AIT) - Present & Pipeline Technologies	105
7.1	Passenger Screening Process Using Advanced Imaging Technology	105
7.2	Whole Body Scanning Present & Pipeline Technologies	106
7.2.1	X-ray Backscatter AIT Portals	106
7.2.1.1	Backscatter Imaging Technology - Principles of Operation.....	106
7.2.2	Risks/Benefits of X-ray AIT Systems	107
7.2.3	Active MMWave Whole Body AIT Scanners.....	110
7.2.3.1	Principles of Operation	110
7.2.3.2	MMWave AIT: Techno-Tactical & Economic Considerations.....	114
7.2.4	Passive MMWave Whole Body Scanners	114
7.2.4.1	Principle of Operation	114
7.2.4.2	System Example: Millivision 350 Portal	115
7.2.5	Terahertz Whole Body Scanners.....	117
7.2.5.1	Terahertz Weapon Detection Portals Technology	117
7.2.5.2	Terahertz Time Domain Spectroscopy (TTDS) Technology	118
7.2.6	Comparison of MMWave/Terahertz vs. Backscatter X-ray Portals	119
7.3	Next Generation AIT	119
7.3.1	AIT-2 Systems Deployment.....	119
7.3.2	Next Generation AIT R&D Program	120
7.3.3	The DHS S&T Covert “Screen while Walk” Program.....	121
7.4	Whole Body Scanning Vendors and Products	122
8	Explosive Detection Systems (EDS) – Present & Pipeline Technologies	123
8.1	Explosive Detection Systems (EDS): Market Background	123
8.2	Explosive Detection Systems (EDS): Technologies.....	125
8.2.1	EDS Principle of Operation.....	125

8.2.2	Hybrid Tomographic EDS & 2D X-ray Screening	126
8.2.3	Explosive Detection Systems: Throughput	127
8.2.4	EDS Throughput vs. Price	127
8.3	EDT & ETD Checked Luggage Screening	129
8.3.1	EDS-based Screening Systems Deployment Strategy	130
8.3.2	Coherent X-ray Scatter Based Multi-level Screening	133
8.3.3	Checked Luggage Covert Testing Procedures	133
8.4	EDS Technology Outlook – 2015-2020	137
8.4.1	Advanced Coherent X-ray Scattering EDS	137
8.4.2	Stationary EDS	138
8.4.3	EDS Liquid and Homemade Explosives Detection	140
8.4.4	MagViz Distinguishes Potential-Threat Liquids	141
8.4.5	Superconducting Quantum Interference Device (SQUID)	142
8.4.6	Quasi Tomographic EDS – 3D X-ray	143
9	Explosives Trace Detectors (ETD) - Present & Pipeline Technologies	145
9.1	Explosives Trace Detectors (ETD): Market background	145
9.2	ETD Technologies	147
9.2.1	Explosive Materials	147
9.2.2	ETD Principles of Operation	149
9.2.3	ETD Core Technologies	150
9.2.4	Ion Mobility Spectroscopy (IMS)	153
9.2.5	ChemiLuminescence (CL)	154
9.2.6	Electron Capture Detectors (ECD)	155
9.2.7	Surface Acoustic Wave (SAW)	156
9.3	ETD Devices	157
9.3.1	Explosives Trace Detectors Configuration	157
9.3.2	Hand-held & Desktop ETD Devices	158
9.3.2.1	Sample Collection Methods	159
9.3.3	Desktop and Portable ETD Devices – Technology Challenges	159
9.3.4	Hand-held, Desktop ETD – Cost Performance Analysis	161
9.3.5	ETD Vendors, Products & Prices	162
9.3.6	TD Alarm Resolution	164
9.4	ETD Technology Outlook - 2015-2020	165
9.4.1	ETD of the Future: Techno-Tactical Challenges	165
9.4.2	ETD of the Future: Performance & Operational Goals	166
9.4.3	Advanced Sample Collection	166
9.4.4	Dual Technology ETD	167
9.4.5	Nano Technology Systems	167
9.4.6	ETD MicroChemLab on a Chip	167
9.4.7	Coated Micro-Cantilever ETD Detector	168
9.4.8	Nanotechnology Platform Based ETD Detector	169

9.4.9	TSA, Next Generation ETD Technologies R&D	170
9.4.10	Integrated Explosives, Chemical Warfare and Narcotics Trace Detectors.....	170
10	Metal Detectors - Present & Pipeline Technologies	171
10.1	Metal Detectors Market Background.....	171
10.2	Metal Detectors Technologies.....	171
10.3	Hand-held Metal Detectors	172
10.3.1	Hand-held Metal Detectors – Vendors.....	173
10.4	Walk-through Metal Detection Portals.....	173
10.4.1	Introduction.....	173
10.4.2	Walk-through Electromagnetic Portals: Glossary	174
10.4.3	Overview	174
10.4.4	Walk-through Metal-Detection Portals: Principles of Operation.....	175
10.4.5	Walk-through Metal Detection Portals Throughput.....	177
10.4.6	Walk-through Metal Detection Portals – Vendors, Products & Prices.....	177
11	Liquid Explosives Detectors - Present & Pipeline Technologies	180
11.1	Liquid Explosives Screening Market Background	180
11.2	Liquid Explosives Scanners	180
11.3	Liquid Explosives Screening	181
11.4	DHS’s SENSIT Program.....	181
11.5	Liquid Detection: Techno-Tactical Considerations.....	182
11.6	Liquid Explosives Scanners – Vendors, Products & Prices	182
12	Shoe Scanners - Present & Pipeline Technologies	183
12.1	Shoe Scanners Market Background	183
12.2	Shoe Scanners Technologies.....	183
12.3	Shoe Scanners: Vendors, Products & Prices.....	184
13	Airport Workforce & Visitors ID Documents Screening Systems - Present & Pipeline Technologies	185
13.1	Airport Workforce & Visitors Identification Market.....	185
13.1.1	Airport Workforce & Visitors Identification Market Drivers.....	185
13.1.2	Airport Workforce & Visitors Identification Market Inhibitors.....	185
13.2	Fused Biometric, Document Authentication & Interrogation Portals.....	186
14	Airport Automated Border Control - Present & Pipeline Technologies	187
14.1	Airport Automated Border Control Market Background.....	187
14.2	The Concept of Airport Automated Border Control	189
14.3	Function of Airport Automated Border Control	190

15	Airport CCTV & RADAR Surveillance - Present & Pipeline Technologies	192
15.1	Airport CCTV Surveillance	192
15.2	Airport Surface Movement Radar	194
15.2.1	Airport Surface Movement Radar Technology	194
15.2.2	Digital Airport Surveillance Radar (DASR) Technology	198
16	Aviation Security C2/C4ISR Systems - Present & Pipeline Technologies	199
16.1	Aviation Security C2/C4ISR Market Background	199
16.2	Aviation Security C2/C4ISR Technologies	200
17	Aviation Security ICT & Cybersecurity - Present & Pipeline Technologies	206
17.1	Security-related Aviation ICT Market & Technology	206
17.2	Civil Aviation Related Cybersecurity	209
17.2.1	Cyber Terror & Crime	209
17.2.2	Denial of Aviation Service	210
17.2.3	Air Traffic Control Cybersecurity	210
17.2.4	Deliberate Manipulation of Aviation Sector Information	211
17.2.5	Detection of Unauthorized Aviation Cyber Activity	212
17.2.6	Key Cyber Security Vendors	214
18	Airport Perimeter Fencing - Present & Pipeline Technologies	215
18.1	Airport Perimeter Security Market Background	215
18.1.1	Airport Perimeter Security Technology Background	218
18.1.2	Airport Perimeter Security Challenges	219
18.1.3	Airport Perimeter Security: Risk Management	221
18.2	Perimeter Security Technologies	228
18.2.1	Intrusion Detection Sensors	228
18.2.2	Multi-layered Airport Perimeter Security	230
18.2.3	Multi-Sensor Airport Perimeter Security Fusion	230
18.2.4	Airport Perimeter: CCTV Surveillance	231
18.2.5	Automatic Perimeter: Intrusion Assessment	232
18.2.6	Airport Perimeter Security: Command and Control	232
18.2.7	Airport Perimeter Security: Communications	233
18.2.8	Airport Perimeter Security: Command and Control Systems	234
18.2.9	Pipeline Technologies	235
19	Workforce & Visitors ID Documents Screening - Present & Pipeline Technologies	236
19.1	Biometric ID Systems	236
19.2	Biometric ID Challenges	237
20	Airport Security-related Baggage Handling Systems (BHS) - Present & Pipeline Technologies	238
20.1	Security-related Airport Baggage Handling Systems (BHS)	238

20.2	Checked Luggage Configurations.....	239
20.2.1	High-Volume In-Line Checked Luggage BHS Systems.....	239
20.2.2	Checked Luggage Configuration – 2: Medium-Volume In-Line BHS.....	240
20.2.3	Checked Luggage BHS Configuration – 3: Mini In-Line Checked Luggage Screening System.....	241
20.2.4	Checked Luggage BHS Configuration – 4: Stand-Alone EDS.....	243
21	Multi-modal Aviation Security Systems and Other Modalities - Present & Pipeline Technologies.....	244
21.1	Multi-Modal & Multi-Threat Screening Portals.....	244
21.1.1	Multi-modal Aviation Security Systems: Overview.....	244
21.1.2	Multi-modal Aviation Security Systems: Technology Status.....	245
21.1.3	Multi-modal Aviation Security: Core Technologies.....	245
21.1.4	Example: Detection Systems Fusion Protocol (DSFP).....	246
21.1.5	Market Needs.....	247
21.1.6	HSRC High Throughput Multi-Threat People Screening Portal Vision.....	249
21.2	Qylatron Multi-Modal Multi Threat Automated Screening Checkpoint.....	252
21.2.1	Future People Screening Portals - Technology Essentials.....	253
21.3	Future Multi-Threat Detection Technologies.....	255
21.3.1	Molecularly Imprinted Polymer (MIP) Sensors.....	255
21.3.2	MOS-Based Electro-Chemical Sensor Networks.....	257
21.3.3	Future Shoe Scanners.....	257
21.3.4	Hand-held Weapons and CBRNE Detectors.....	257
21.3.5	Evolving Hand-held MMWave Wand – Sample.....	258
22	Counter – MANPAD Technology.....	259
22.1	MANPAD Threats.....	259
22.2	Counter – MANPAD Strategies.....	261
22.3	Counter – MANPAD Technologies.....	262
22.3.1	Flare-based Countermeasures.....	262
22.3.2	Directed Infrared Countermeasures (DIRCM) systems.....	263
22.4	Civilian Aviation Security Counter MANPAD RDT&E Programs.....	266
22.5	Market Forecast.....	268

APPENDICES.....	269
23 Appendix A: IATA & ICAO “Checkpoint of the Future”	269
23.1 Present People Screening Checkpoint Performance	269
23.2 IATA-ICAO Checkpoint of the Future.....	270
24 Appendix B: Airport Passenger Screening Checkpoints.....	274
25 Appendix C: IATA Passenger Growth Forecast.....	279
25.1 Forecast Summary.....	279
25.2 Future Growth Trend Highlights	279
25.3 Analysis of the 10 Largest Air Passenger Markets.....	280
25.4 Growth by Regions	281
25.5 Domestic Air Passengers Markets Trends.....	281
25.6 Global Passenger Demand Drivers.....	282
26 Appendix D: Abbreviations.....	283
27 The Report Research Methodology	302
27.1 Report Structure.....	302
27.2 Assumptions	302
27.3 Research Methodology	303
27.4 Who Is This Report For?.....	304
27.5 Terms of Reference	304
28 Disclaimer & Copyright.....	306

List of Tables

Table 1 - People Screening Vendors and Product Lines	39
Table 2 - EDS, ETD and 2D X-ray Technologies - Pros and Cons	76
Table 3 - Pros and Cons of Multi-Modal X-ray Technology.....	92
Table 4 - Comparison of X-ray Detection Technologies.....	97
Table 5 - Backscatter People Screening AIT Portals – Advantages & Disadvantages	108
Table 6 - Backscatter Body X-ray Dose vs. other Common Radiation Exposure Sources.....	109
Table 7 - MMWave Reflectivity of Basic Explosives and Human Tissue.....	111
Table 8 - Examples of Object Emissivity.....	111
Table 9 - Active MMWave Screening: Advantages & Disadvantages	114
Table 10 - Whole Body Scanners: Products, Vendors and Technologies.....	122
Table 11 - Product Comparison of High-Volume EDS Machines.....	136
Table 12 - Trace vs. Bulk Explosives Detection Technologies.....	152
Table 13 - Trace Explosive Detection Technologies	152
Table 14 - Trace Detection – Pros and Cons.....	160
Table 15 - Hand-held Trace Explosives Detectors – IMS & GC/IMS Price & Performance Comparison	161
Table 16 - TSA Approved Tabletop ETD Systems Performance: by Products.....	161
Table 17 - Eight Desktop ETD Systems: Vendors, Products, Technology & Prices.....	162
Table 18 - Portable - Swab ETD: Vendors, Products, Technology and Prices.....	163
Table 19 - Hand-held ETD Systems: Vendors, Products, Technology and Prices.....	163
Table 20 - Trace Detection Document Scanners	163
Table 21 - Potential ETD Machines-Equipment Assumptions.....	164
Table 22 - Magnetism and Detection Capabilities.....	175
Table 23 - Conductivity and Detection Capabilities.....	175
Table 24 - 50 Metal Detection Portals: Products, Vendors, Prices.....	178
Table 25 - Liquid Explosives Scanners – Vendors/Products/Prices.....	182
Table 26 - Shoe Scanners: Vendors, Products & Prices.....	184
Table 27 - Perimeter Security Technologies Performance, Device Cost, Installation & Aftersales Costs Comparison	227

List of Figures

Figure 1 - Government Industry Aviation Security Life Cycle	20
Figure 2 - Government – Private Sector Aviation Security Techno-Tactical Technology Assessment Process	21
Figure 3 - Aviation Security Industry - Government Relationship.....	22
Figure 4 - A New Product Technology Assessment Process	29
Figure 5 - Timeline for Implementing the EU ACC3 Regulation.....	34
Figure 6 - Transport of Cargo & Mail into the EU from a Third Country - ACC3 Designation	35
Figure 7 - EU Aviation Security Validation of Regulated Agents or Known Consignors.....	36
Figure 8 - Secure Supply Chain within the ACC3 Regulation	37
Figure 9 - Scheme of Multi-Level Protection of a Civil Airport against Acts of Unlawful Interference	38
Figure 10 - Major Explosives Detection Technologies: Bulk vs. Trace.....	73
Figure 11 - X-ray Conveyor-Based Screening Systems – Principles of Operation	75
Figure 12 - Conventional X-ray	78
Figure 13 - Dual Energy X-ray	80
Figure 14 - Screened Cabin Bag Dual Energy X-ray Image	81
Figure 15 - Material Differentiation by Dual Energy X-ray.....	82
Figure 16 - Dual Energy Z Map.....	82
Figure 17 - Variable View X-ray System	83
Figure 18 - Multi-View Dual Energy Baggage X-ray Screening.....	84
Figure 19 - Convectional 2D Image (Left) vs. Quasi 3D Image (Right).....	84
Figure 20 - A Dual View Advanced Technology X-ray System	86
Figure 21 - Backscatter X-ray Technology.....	87
Figure 22 - Coherent X-ray Technology	88
Figure 23 - Cast and Artificial Limbs Screening System	90
Figure 24 - A Prosthetic Limbs Backscatter Image Showing a Gun Hidden Underneath a Cast.....	91
Figure 25 - Fused Dual-Modality Explosives & Nuclear Screening System	92
Figure 26 - 3D Stereoscopic X-ray Camera and Images	94
Figure 27 - 3D Stereoscopic Baggage X-ray Luggage Inspection Scheme	95
Figure 28 - Global Air Cargo Size [Million Tons]: 2001-2020	98
Figure 29 - Air Cargo Supply Chain	101
Figure 30 - Canadian Air-Cargo Security Screening Process	102
Figure 31 - Flow of Cargo from Shipper to Air Carrier.....	103
Figure 32 - Global Freight Traffic Forecast until 2029.....	104
Figure 33 - Air-Cargo Container X-ray Screening System	104
Figure 34 - Advanced Imaging Technology Passenger Screening Process	105
Figure 35 - People Backscatter Imaging Technology.....	106
Figure 36 - Dose Comparison: Environmental Radiation vs. Backscatter Scan.....	108

Figure 37 - Spectrum of MMWave Technologies	110
Figure 38 - Active MM-Wave Imaging Technology – Block Diagram	112
Figure 39 - MM-Wave AIT Principal of Operation	113
Figure 40 - A Passive MMWave Whole-Body Scanner Layout	115
Figure 41 - Passive MMWave Scanner: Typical Threat Images	116
Figure 42 - Electromagnetic Spectrum of the THz-Region.....	117
Figure 43 - Whole-Object EDS Scheme	125
Figure 44 - Tomographic EDS Principle of Operation	126
Figure 45 - EDS Throughput [BPH] vs. System Price [\$K].....	128
Figure 46 - Checked Baggage Inspection System & Three Levels of Screening.....	130
Figure 47 - 100% Tomographic EDS & ETD Screening Flow Scheme	131
Figure 48 - “Fractional Tomographic EDS & ETS” Screening Flow Scheme	132
Figure 49 - 100% Multi-Level (EDS, X-ray & Coherent X-ray Scatter) Screening	133
Figure 50 - Aviation Security: “100% EDS” Screening Flow Scheme	135
Figure 51 - Conventional Rotary Gantry EDS	139
Figure 52 - Stationary Gantry EDS	139
Figure 53 - The RTT Prototype X-ray Source	139
Figure 54 - The RTT EDS Prototype.....	139
Figure 55 - MagViz Images.....	141
Figure 56 - ULF-MRI RDT&E Program Timeline.....	142
Figure 57 - 3D Stereoscopic X-ray Camera and Images	144
Figure 58 - 3D Stereoscopic X-ray Luggage Inspection Scheme.....	144
Figure 59 - Explosive Materials Classification.....	147
Figure 60 - The Most Commonly Used Explosives Classification	148
Figure 61 - Trace Detection General Principle of Operation	149
Figure 62 - Tabletop ETD: Operational Workflow	150
Figure 63 - Explosives Trace Detection Technologies	151
Figure 64 - Ion Mobility Spectroscopy (IMS)	153
Figure 65 - Electron Capture Detectors (ECD).....	155
Figure 66 - Surface Acoustic Wave (SAW) Detectors.....	156
Figure 67 - Explosives Trace Detection Configuration: Hand-held ETD, Tabletop ETD, & Boarding Card Screening ETD	157
Figure 68 - The Airborne Concentration of Various Explosives	157
Figure 69 - Typical Sensitivity of Various Explosive Trace Detection Technologies	158
Figure 70 - Tabletop ETD Devices.....	159
Figure 71 - SNL - ETD MicroChemLab on a Chip.....	168
Figure 72 - Components of SNL MicroHound Trace Explosives Detection System.....	168
Figure 73 - Ames “Conductive CNT Explosives Detector”	169
Figure 74 - Hand-held Weapon Detector – Proper Scanning Path	172
Figure 75 - Walk-through Metal-Detection Portals Technologies.....	176
Figure 76 - The EU Airport Automated Border Control Concept	188

Figure 77 - Automated Border Control Process	191
Figure 78 - Face Recognition Based Automated Border Control	191
Figure 79 - Airport Surface Movement Radar	196
Figure 80 - Airport Surface Movement Radar Imaging Field	197
Figure 81 - An Airport Security Command, Control & Communication Meta-System.....	203
Figure 82 - Airport Perimeter Security C2/C4ISR System Topology	204
Figure 83 - Airport Security C2/C4ISR System Block diagram	205
Figure 84 - Airport Emergency Communication: Technologies	206
Figure 85 - Airport Security Communication: Obstacles to Interoperability	208
Figure 86 - Air Traffic Control system	211
Figure 87 - The European “Computer Emergency Response Teams & Command Centre” (CERTs .CERT/CCs).....	213
Figure 88 - Airport Perimeter Security Systems	215
Figure 89 - Airport Perimeter, Security Layers	216
Figure 90 - Dumb Perimeter Barriers	217
Figure 91 - Airport Perimeter.....	218
Figure 92 - Airport Perimeter Security Infrastructure.....	220
Figure 93 - Intersection of Risk Assessment.....	224
Figure 94 - Checked Luggage ETD, EDS & X-ray Screening Configuration – 1.....	239
Figure 95 - Checked Luggage ETD, EDS & X-ray Screening Configuration – 2.....	241
Figure 96 - Schematic Visualization of a Mini in-Line System.....	241
Figure 97 - Checked Luggage ETD, EDS & X-ray Screening Configuration – 3: Mini In-Line System with Light Integration	242
Figure 98 - Checked Luggage ETD, EDS & X-ray Screening Configuration – 4: Stand-Alone EDS.....	243
Figure 99 - Artist View of a Checkpoint of the Future.....	246
Figure 100 - Future Screening Checkpoint (HSRC 2002 Forecast)	250
Figure 101 - Future Multi-Threat People Screening Checkpoint - (HSRC 2002 Concept)	250
Figure 102 - Airport Pre-Screening Program Process.....	251
Figure 103 - Airport CBP Pre-Screening Systems and Data Flow	252
Figure 104 - Qylatron Multi-Modal Multi Threat Passenger Screening Portal ...	253
Figure 105 - Fused Technologies - Concealed Weapons Detection	255
Figure 106 - Molecular Imprinting Technique.....	256
Figure 107 - Map of MANPADS Attacks on Civil Aircraft – 1975-2012	259
Figure 108 - An IR MANPAD View of a Civilian Aircraft.....	260
Figure 109 - Overview of MANPADS	260
Figure 110 - Flare-based MANPAD Countermeasures.....	263
Figure 111 - DIRCAM CONOPS	264
Figure 112 - The “Skyshield” Counter MANPADS	265
Figure 113 - BAE Systems and Northrop Grumman Counter MANPAD Systems	266

Figure 114 - Average X-ray Screening Rate [Passengers per Hour] by Region.	269
Figure 115 - The IATA “Checkpoint of the Future” Lanes	271
Figure 116 - IATA “Checkpoint of the Future” Concept.....	271
Figure 117 - Single Queue Serving Multiple People Screening Checkpoints....	276
Figure 118 - A Single Queue Serving Multiple Screening Positions.....	276
Figure 119 - Two Single Lanes Serving Multiple Screening Positions	277
Figure 120 - Separated Lines in Single Queue Serving Multiple Screening Positions	277
Figure 121 - Checkpoint Staff Allocation.....	278