Safe Winch Launches

Hugh Browning
Harlequin House, Lasham, Alton, UK, GU34 5SJ
geq78@dial.pipex.com

Abstract

This paper describes the process by which the British Gliding Association has sought to educate all pilots and instructors in safe winch launching and compares winch accident rates before and after the inception of the educational programme in 2006. In the 7 years from 2006–2012 there were 5 fatal or serious injury winch accidents compared with 21 in the previous 7 years and a 7-year average of 21 from 1974 to 2005. Two of the 5 fatal or serious injury winch accidents from 2006–2012 involved a stall or spin in comparison with 17 in the previous 7 years and a 7-year average of 17 from 1974 to 2005. The other 3 recent accidents were from a wing drop and cartwheel. The educational programme continues, with an emphasis on continuing to avoid stall/spin accidents and avoiding wing drop/cartwheel accidents.

Introduction

Until very recently the British Gliding Association (BGA) was responsible for the regulation of gliding in the UK. It was a requirement that gliding accidents meeting the ICAO definitions had to be reported to the UK Air Accidents Investigation Branch, but all accidents, including minor ones, had to be reported to the BGA. Although the BGA is no longer responsible for regulation, it retains delegated responsibilities for safety, and the historic accident reporting arrangements have continued unchanged. As a result, the BGA possesses data on more than 6000 accidents and incidents since 1974.

In 2004 the author advised the BGA Executive that incomplete winch launches accounted for about 30% of all fatal and serious injury accidents. The Executive called for activities to address this problem.

Winch Launch Hazards and Accidents

An analysis of winch accident data identified the number and the severity of UK winch accidents, and the characteristic hazards at each stage of the launch.

A "winch accident" is one that stems from a winch launch or which takes place immediately after an incomplete winch launch. It does not include accidents which occurred on a winch launch for which there was a prior cause, for example a rigging error, or a canopy that detached because it had not been locked.

It was observed that the main hazards at each stage of the winch launch were

- Wing drop on the ground followed by a groundloop or cartwheel
- An accelerated stall during rotation and a flick roll to inverted flight
- Power loss during rotation and a stall
- Power loss in mid-launch and a spin

The hazards of a wing drop on the ground followed by a cartwheel, and a spin after power failure in mid launch, were already well understood.

Modelling of the forces during rotation and the conditions for a possible stall and flick roll indicated that stalling can occur at any climb angle if the rotation rate is sufficient.

No quantification was available in the literature for the recoverability of combinations of airspeed, climb angle, delay before lowering the nose, recovery dive angle, and other relevant variables after power loss below 100 ft. Modelling work indicated the unrecoverable combinations of these variables.

These findings were presented at the OSTIV meeting in Eskilstuna in 2006 and published in *Technical Soaring* in October 2007 [1]. Computing support from Hills was acknowledged [2].

This accident analysis and modelling permitted the essentials of conducting a safe winch launch and dealing with an emergency to be tabulated as indicated in the Appendix.

It was stated that work will continue under the auspices of the BGA with the objective of ensuring all UK pilots know how to conduct winch launches safely.

The BGA Safe Winch Launch Initiative

This paper provides an account of the process by which the BGA has striven to educate pilots on safe winch launching over the 7 years from 2006 to 2012, and compares the frequency, severity, and nature of UK winch accidents during those 7 years and the previous 32 years.

Reports of the circumstances of winch accidents strongly suggested that in many of the most serious accidents the pilot did not take the correct action in the very limited time available when confronted with an emergency, and that the emergency often arose through having flown an unsafe launch profile.

It seemed, therefore, that a possible route to fewer accidents would be to advise pilots and instructors how to fly a safe launch

Table 1: Booklet editions distributed to UK gliding clubs

Ed.	Date	Remarks
1	Oct 2005	4 pages, with 1 table, and 1 page of further guidance
2	Jan 2007	Same as edition 1 except for minor revision to the table and the further guidance; supplement with more detail placed on BGA website
3	Feb 2009	Same table as edition 2, but expansion to 14 pages to accommodate more detailed advice and the reasons for that advice
4	Feb 2010	Same as edition 3, with minor editing, but including advice to winch drivers and operators
5	Jan 2011	The table from edition 4, spread over a double page (reproduced here as Table A-1); plastic leaflet dispensers were provided for all clubs to facilitate leaflet distribution to members

profile, and the correct action to take in an emergency.

The educational strategy was to

- focus on the main hazards
- provide robust advice to avoid or manage these hazards
- use every available medium and a multiplicity of communications because changes in behaviour were being sought and these are not achieved by occasional and/or isolated communications.
- measure future accident rates and reinforce advice accordingly

The objective of this educational programme was to help the pilot fly safely regardless of cable speed and acceleration. Safety would be enhanced if the pilot were provided with optimal cable speeds and accelerations [3]. A programme of upgrading and modifying winches to ensure cable speed would be adequate in light winds was carried out nationally in 2009–2010.

Communications to pilots and instructors

The educational program began in October 2005 with the publication of a leaflet summarising the hazards of winch launching and how to avoid or manage those hazards. The communications have included:

- **Booklets** Five editions of a leaflet or booklet summarising the hazards of a winch launch and providing advice on safe winch launch technique have been published and distributed to all UK gliding clubs (Table 1). The print runs ranged from 4000–8000. Each edition contains a table showing the hazards at each stage of the launch together with the essential actions to avoid accidents. The covering letters were issued under the auspices of the BGA.

Table 2: Winch safety presentations 2006–2012

BGA forum	number	Remarks
Executive committee	2	To sponsor the winch safety initiative
Instructor's committee	13	Responsible for instructing policy and practices
Regional chief instructor meetings	7	Annual meetings of all chief instructors with their regional member of the BGA instructors committee. The systematic cascading process from this forum has been important in gaining support from the chief instructors of clubs.
Chairmen's conferences	9	Meetings of club chairmen with the BGA Executive
Safety Committee	13	Responsible for safety recommendations
Operations group	7	Responsible for integrating BGA policy across all functions
Clubs	18	Training and supervision
BGA conference	4	Annual conference open to all

- **BGA website** A Safe Winch Launching item was created containing:
  - a summary of the advice for keeping safe
  - a downloadable version of the Feb 2010 edition of the booklet
  - video simulations of a wing drop and cartwheel, a stall and flick roll during rotation, and a spin after power failure in mid-launch
  - a 21 question quiz on safe winch launching, with answers, and the reasons for those answers
- **Articles** Four articles discussing winch launch safety were published in *Sailplane & Gliding* from 2005–2012 (Refs. 4–7).
- **Annual reviews** (of all BGA accidents). BGA publication, print run 4000, distributed to clubs and glider owners for 2006, 2007, 2008, 2009, 2010, 2011 and 2012.
- **Presentations** A number of presentations were made to BGA committees, instructor conferences, clubs, and annual conferences (Table 2)

The focus of these communications has been UK pilots but permission to reproduce the leaflets and/or to use the video simulations has been granted to individuals or gliding associations, subject only to acknowledgement of the BGA source, from Australia (6), Austria, Canada, France (3), Holland (2), Germany (4), Japan, Norway, New Zealand (2), Poland, South Africa, Slovenia, Switzerland (3) and USA (2). Material was provided for an article in *Soaring* [8].

Table 3: All fatal and serious injury accidents

Period	Injury type		
	fatal	serious	fatal/serious
2006–2012	3	2	5
1999–2005	7	14	21
1992–1998	6	12	18
1985–1991	9	16	25
1978–1984	7	16	23
1974–2005	33	63	96
7-year average 1974–2005	7.2	13.8	21.0

Winch Accidents 1974–2005 and 2006–2012

As used in the discussion to follow, "Wing drop" accidents occurred on ground, before take-off. "Rotation" indicates an accelerated stall during rotation. "Below 100 ft" indicates launch failure below 100 ft and "Above 100 ft, stall/ spin" a launch failure above 100 ft followed by uncontrolled flight. "Above 100 ft, circuit" denotes a launch failure above 100 ft followed by controlled flight, landing ahead, or an abbreviated circuit. "Hit cable" indicates that the launching glider encounters its own cable in flight. In "Caught cable" accidents, the launching glider fouls its cable on the ground or another cable. "Other" denotes all other accidents.

Basis of Comparison

Winch accident totals in the 7 years from 2006–2012 are compared with the corresponding totals for each 7-year period from 1978–2005, and the 7-year average from 1974–2005 (i.e. seven times the annual average from 1974–2005). The BGA accident year runs from 1 October of the preceding year to 30 September.

Fatal and Serious Injury Winch Accidents

In the tables and figures to follow, "Injury" indicates the most severe injury in the accident. Injury to 2nd persons is not included.

All fatal/serious injury accidents

Table 3 presents fatal and serious injury accidents during 1974–2005. 36 people died and 72 people were seriously injured in the 96 fatal or serious injury accidents from 1974–2005. There were 3 double fatalities, 5 instances of a fatality with a serious injury, and 4 instances of a double serious injury. In the 7 years from 2006–2012 there were 5 fatal or serious injury winch accidents compared with 21 in the previous 7 years and a 7-year average of 21 from 1974–2005.

Table 4 shows the distribution of fatal or serious injury accidents by stage of launch in each 7-year period.

Figures 1 and 2 draw on the data in Table 4. Figure 1 shows the previous 7-year fatal/serious injury totals of around 20 became 5 in the most recent 7 year period, and it indicates the contributions to each total by each kind of winch accident. Figure 2 compares the accident totals from 2006–2012 with those in the average 7-year period from 1974 to 2005. This highlights the recent overall reduction during rotation and after launch failure but with an increase in wing drop accidents.

Table 4: All fatal/serious injury accidents by stage of launch (see also Figs. 1 and 2)

Period	wing drop	rotation	below 100 ft	above 100 ft, stall/spin	above 100 ft, circuit	hit cable	caught cable	other	all
2006–2012	3	1		1					5
1999–2005	1	7	7	5			1		21
1992–1998		3	6	6		2		1	18
1985–1991		6	7	9	1			2	25
1978–1984	2		6	13		1		1	23
1974–2005	3	17	28	39	1	3	1	4	96
7-year avg. 1974–2005	0.7	3.7	6.1	8.5	0.2	0.7	0.2	0.9	21.0

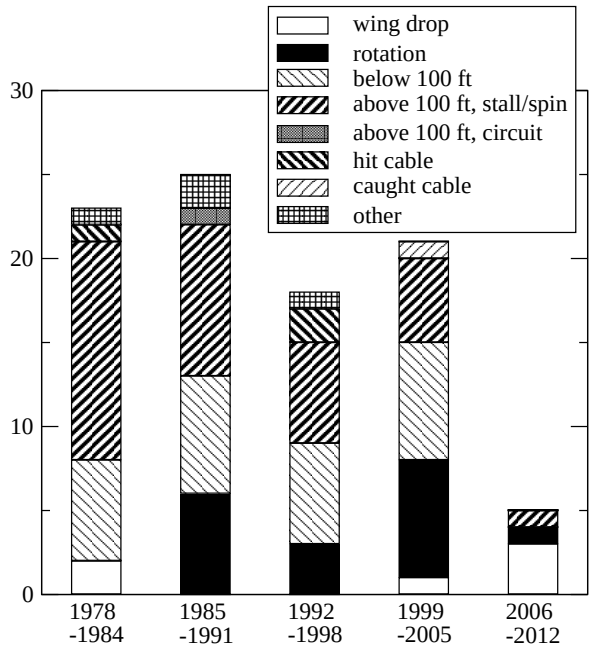

Figure 1: Fatal or serious injury winch accidents in 7-year periods from 1978 to 2012 (see also Table 4)

Fatal/serious injury winch accidents involving a stall or spin

Table 5 indicates that 78 of the 96 fatal or serious injury winch accidents from 1974–2005 involved a stall or spin for an average of 17 in each 7-year period. There were also 17 stall/spin accidents in the 7 years preceding the initiative, from 1999–2005. There were 2 accidents of this kind in the 7 years from 2006–2012.

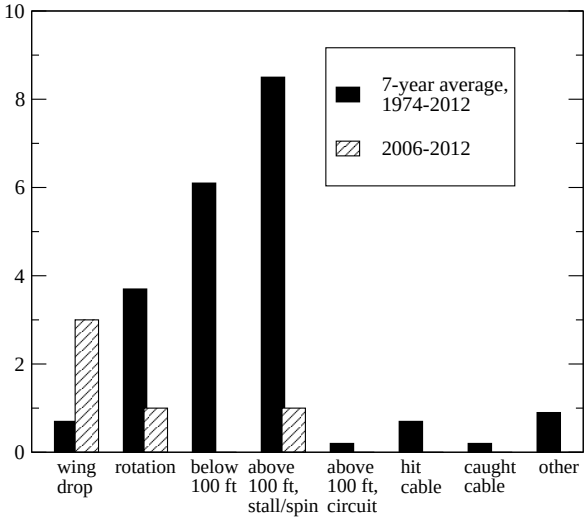

Figure 2: Fatal or serious injury winch accidents by stage of launch. Totals from 2006–2012 compared with 7-year average totals from 1974–2005 (see also Table 4)

Table 5: Fatal and serious injury stall/spin accidents

	injury		
Period	fatal	serious	fatal/serious
2006–2012	1	1	2
1999–2005	7	10	17
1992–1998	4	9	13
1985–1991	8	13	21
1978–1984	7	12	19
1974–2005	30	48	78
7-year average 1974–2005	6.6	10.5	17.1

These stall/spin accidents occurred during rotation, after launch failure below 100 ft, or after launch failure above 100 ft. The distribution of stall/spin accidents between the three categories for each 7 year period is shown in Table 6. Stall/spin accidents account for all 17 "rotation," 25 of the 28 "below 100 ft," and 36 of the 39 "above 100 ft, stall/spin" accidents. The other 6 accidents in the latter two groups were dives into the ground.

Figures 3 and 4 draw on the data of Table 6 and depict the recent reduction in stall/spin accidents.

Civilian fatal and serious injury accident rates

There were fewer winch launches at BGA clubs from 2006–2012 than in the earlier 7-year periods. Table 7 shows how many accidents would have been expected in each 7-year period at civilian clubs if the number of winch launches had been the same as from 2006–2012 and accidents are proportional to the number of launches. Civilian accidents and launches have been employed because accident data for some military clubs are incomplete prior to 1998. Table 8 shows the totals adjusted in this fashion for fatal/serious injury winch accidents involving a stall or spin.

Table 6: Fatal/serious injury stall/spin accidents by stage of launch (see also Figs. 3 and 4)

Period	wing drop	rotation	below 100 ft	above 100 ft, stall/spin	above 100 ft, circuit	hit cable	caught cable	other	all
2006–2012		1		1					2
1999–2005		7	5	5					17
1992–1998		3	5	5					13
1985–1991		6	7	8					21
1978–1984			6	13					19
1974–2005		17	25	36					78
7-year avg. 1974–2005		3.7	5.5	7.9					17.1

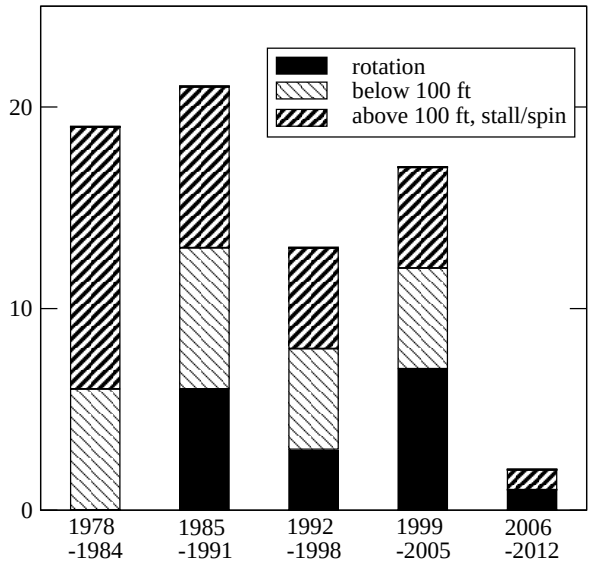

Figure 3: Fatal or serious injury stall/spin winch accidents in 7-year periods from 1978 to 2012 (see also Table 6)

The patterns are unchanged. On an equal launch total basis the expected accident total for the period 2006–2012 would have been 14.3. The actual was 4. For the stall/spin accident component the expected total would have been 11.8. The actual number was 2.

Substantial Damage Winch Accidents

Table 9 shows the distribution of substantial damage accidents by stage of launch in each 7-year period. In the 7 years from 2006–2012 there were 28 substantial damage winch accidents compared with 50 in the previous 7 years and a 7-year average of 60 from 1974–2005. Table 10 contains the corresponding data for the substantial damage accidents that involved a stall or

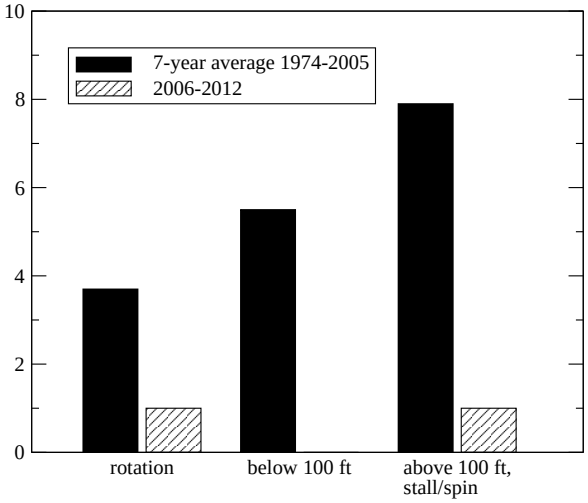

Figure 4: Fatal or serious injury stall/spin winch accidents by stage of launch. Totals from 2006–2012 compared with 7-year average totals from 1974–2005 (see also Table 6)

Table 7: All civilian fatal/serious injury accidents, adjusted to 2006–2012 launches. The adjusted totals are the actual totals reduced by the factor 1124000/winch launches.

Period	winch launches	fatal injury	serious injury	fatal/serious injury	adjusted 7-year fatal/serious injury
2006–2012	1124000	2	2	4	4.0
1999–2005	1362000	6	13	19	15.7
1992–1998	1692000	6	12	18	12.0
1985–1991	1688000	8	15	23	15.3
1978–1984	1492000	6	14	20	15.1
1974–2005	7060000	30	60	90	14.3

spin. In the period 2006–2012 there were 8 of these accidents compared with 25 in the previous 7 years and a 7-year average of 33 from 1974–2005.

Figures 5 and 6 draw on the data in Table 9. Figures 7 and 8 draw on the data in Table 10. The reduction in accidents from 2006–2012 is predominantly during rotation and after launch failure involving a stall or spin. There has been no recent change in the frequency of accidents from a wing drop, or after a launch failure and circuit.

No information is available on the total number of winch launches by each glider type in the period 1974–2012. 70 glider types are represented in the 304 substantial damage accidents. The distribution of these accidents by type does not suggest particular types are especially susceptible to winch accidents.

Table 8: All civilian fatal/serious injury stall/spin accidents, adjusted to 2006–2012 launches. The adjusted totals are the actual totals reduced by the factor 1124000/winch launches.

Period	winch launches	fatal injury	serious injury	fatal/serious injury	adjusted 7-year fatal/serious injury
2006–2012	1124000	1	1	2	2.0
1999–2005	1362000	6	10	16	13.2
1992–1998	1692000	4	9	13	8.6
1985–1991	1688000	7	13	20	13.3
1978–1984	1492000	6	11	17	12.8
1974–2005	7060000	27	47	74	11.8

Table 9: Substantial damage accidents by stage of launch (see also Fig. 5)

Period	wing drop	rotation	below 100 ft	above 100 ft, stall/spin	above 100 ft, circuit	hit cable	caught cable	other	all
2006–2012	10	1	5	3	8			1	28
1999–2005	12	7	18	5	7		1		50
1992–1998	11	6	18	8	12	3	1	3	62
1985–1991	10	6	23	13	6	3		4	65
1978–1984	11	1	23	17	8	2		3	65
1974–2005	46	22	95	54	38	8	2	11	276
7-year avg. 1974–2005	10.1	4.8	20.8	11.8	8.3	1.8	0.4	2.4	60.4

All Winch Accidents

Table 11 shows that in the 7 years from 2006–2012 there were 76 winch accidents compared with 100 in the previous 7 years and a 7-year average of 147 from 1974–2005. Table 12 shows that 13 of the accidents from 2006–2012 involved a stall or spin compared with 34 in the previous 7 years and a 7-year average of 56 from 1974–2005. Once again the pattern is of fewer recent stall/spin accidents but similar numbers of wing drop accidents. Figures 9 and 10 depict the data for all winch accidents in Table 11.

Discussion

Winch Accidents with Fatal/Serious Injury

There has been a reduction in fatal/serious injury winch accidents in the 7 years since the BGA initiative began. The 5 fatal or serious injury accidents from 2006–2012 compares with 21 in the previous 7 years and a 7-year average from 1974–2005 of 21. There is a 99.1% probability that 5 accidents in the 1.33 million

Table 10: Substantial damage stall/spin accidents by stage of launch

Period	wing drop	rotation	below 100 ft	above 100 ft, stall/spin	above 100 ft, circuit	hit cable	caught cable	other	all
2006–2012		1	3	3	1				8
1999–2005		7	13	5					25
1992–1998		6	13	7					26
1985–1991		6	21	12					39
1978–1984		1	21	17					39
1974–2005		22	78	50					150
7-year avg. 1974–2005		4.8	17.1	10.9					32.8

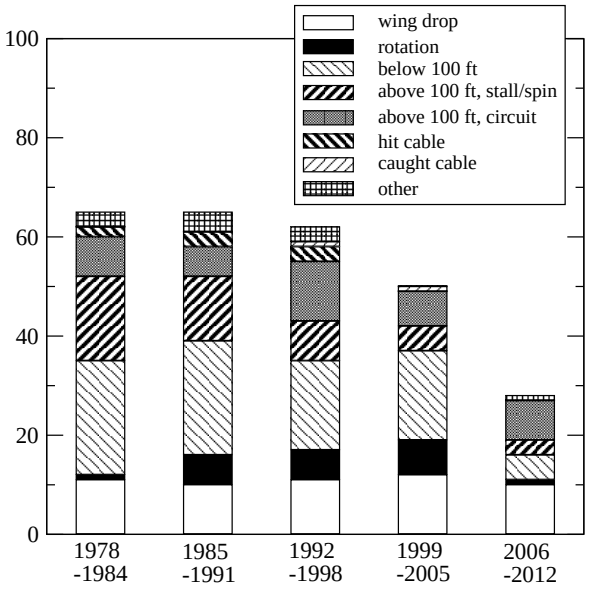

Figure 5: Substantial damage winch accidents in 7-year periods from 1978 to 2012 (see also Table 9)

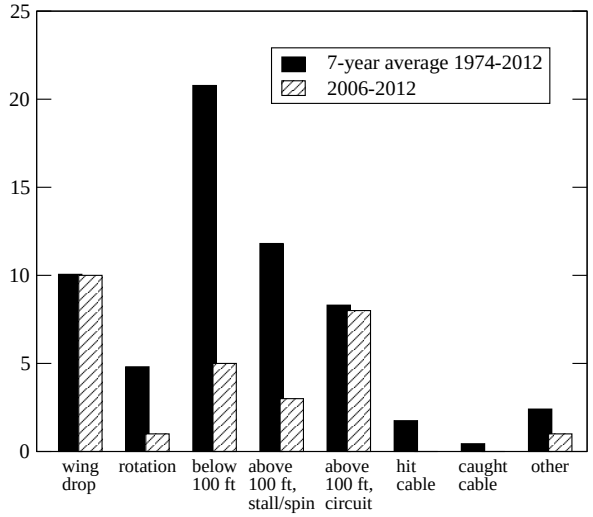

Figure 6: Substantial damage winch accidents by stage of launch. Totals from 2006–2012 compared with 7-year average totals from 1974–2005 (see also Table 9)

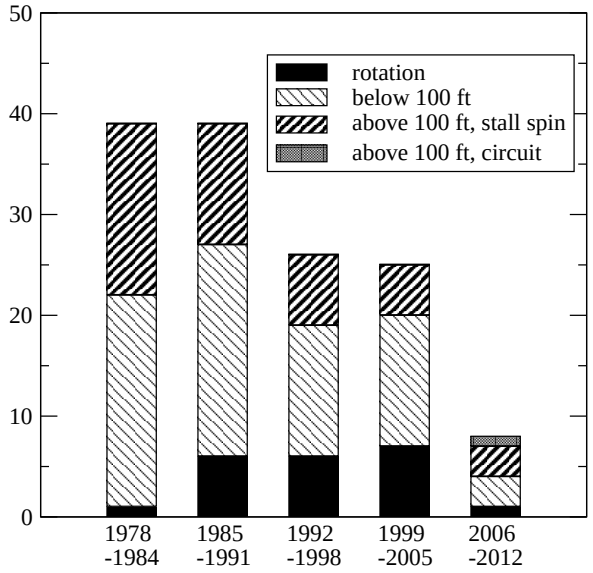

Figure 7: Substantial damage stall/spin winch accidents in 7-year periods from 1978 to 2012 (see also Table 9)

launches from 2006–2012 is a lower rate than 96 fatal/serious injury accidents in 9.28 million launches from 1974–2005 [9, 10]

Winch Accidents Involving a Stall or Spin

The reduction in fatal/serious injury winch accidents in the 7 years from 2006 to 2012 is predominantly because fewer pilots have stalled or spun on the wire or after a launch failure. Two of the fatal/serious injury winch accidents from 2006–2012 involved a stall or spin whereas there were 17 such accidents in the previous 7 years and 17 in the average 7-year period from 1974 to 2005. Table 8 shows that after adjustment to equal numbers of winch launches the 2 civilian fatal/serious injury stall/spin accidents from 2006–2012 compares with 11.8 at the historic rate, and 13.2 from 1999–2005.

The reduction in substantial damage stall/spin accidents was from a 7-year average of 33 in the period 1974–2005 to a total of 8 in the 7 years from 2006–2012. The corresponding reduction for all accidents was from 56 to 13.

The probability that 2 fatal/serious injury stall/spin accidents in 1.33 million launches from 2006–2012 represents a real reduction from 78 in 9.28 million launches from 1974–2005 is 99.8%. The corresponding probabilities for the reductions in substantial damage stall/spin accidents and all stall/spin accidents are 99.9% and 99.99%.

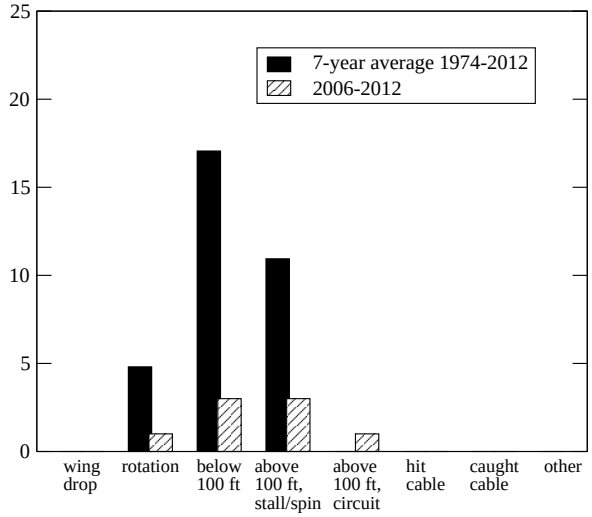

Figure 8: Substantial damage stall/spin winch accidents by stage of launch. Totals from 2006–2012 compared with 7-year average totals from 1974–2005 (see also Table 10)

Table 11: All accidents by stage of launch

Period	wing drop	rotation	below 100 ft	above 100 ft, stall/spin	above 100 ft, circuit	hit cable	caught cable	other	all
2006–2012	16	1	9	5	13	16	3	13	76
1999–2005	18	9	34	7	16	6	4	6	100
1992–1998	18	6	47	10	26	19	7	17	150
1985–1991	17	6	61	15	23	14	3	9	148
1978–1984	25	1	58	19	31	18	18	13	183
1974–2005	82	25	238	64	104	62	42	53	670
7-year avg. 1974–2005	17.9	5.5	52.1	14.0	22.8	13.6	9.2	11.6	147.6

These data adds support to the conclusion that 2006–2012 has seen a dramatic reduction in the frequency of stall/spin accidents associated with winch launches.

An association between fewer accidents and the onset of the initiative does not prove causality, and there could be a spate of accidents at any time. But the consistent reduction of stall/spin accidents of every degree of severity from 2006–2012 strongly suggests that as a result of the initiative pilots have become better equipped to fly a safe winch launch profile and to deal with an emergency.

Stall/spin accidents account for 80% of the winch accidents that kill or maim. Reducing stall/spin accidents was the main thrust of the educational programme.

Fatal/serious injury stall/spin accidents unconnected with winch launches have hardly changed recently. There were 16 in the 7 years from 2006–2012, 16 in the previous 7 years, and 18.8 in the average 7-year period from 1974–2005.

Table 12: All stall/spin accidents by stage of launch

Period	wing drop	rotation	below 100 ft	above 100 ft, stall/spin	above 100 ft, circuit	hit cable	caught cable	other	all
2006–2012		1	6	5	1				13
1999–2005		7	20	7					34
1992–1998		6	35	9					50
1985–1991		6	47	14					67
1978–1984		1	47	19					67
1974–2005		22	176	60					258
7-year avg. 1974–2005		4.8	38.5	13.1					56.4

Winch Accidents Involving a Wing Drop

The frequency of wing drop accidents has not changed since the inception of the safe winch launch initiative in spite of advice to release the cable before the wing touches the ground. The totals from 2006–2012, in the 7 years from 1999–2005, and in the average 7 years from 1974–2005 were respectively 16, 18, 18. The corresponding substantial damage totals were 10, 12, 10, and the corresponding fatal/serious injury totals were 3, 1, 0.7. Every wing drop incident has the potential to be fatal and two were in the period 2006–2012.

Other Winch Accidents

Substantial damage accidents after a power failure in mid launch, recovery to controlled flight, and an accident at the end of the resulting difficult circuit (above 100 ft, circuit) are unchanged but there has been a shift from solo accidents to instructing accidents. The 1974–2005 7-year average was 5 solo and 3 instructing but from 2006–2012 there were 2 solo and 6 instructing. There has been little change in the frequency of cable encounters. Accidents after a circuit or from a cable encounter rarely result in personal injury.

Education for Safe Winch Launching

Characteristics of the initiative to date

The BGA safe winch launch initiative indicates accident rates can be materially lowered by a coherent, sustained, and continually refreshed and expanded educational programme in cases where the hazards and how to avoid them are adequately understood, support is forthcoming from the top of the organisation, and there is support from the instructor community.

The characteristics of the initiative can be summarised as follows:

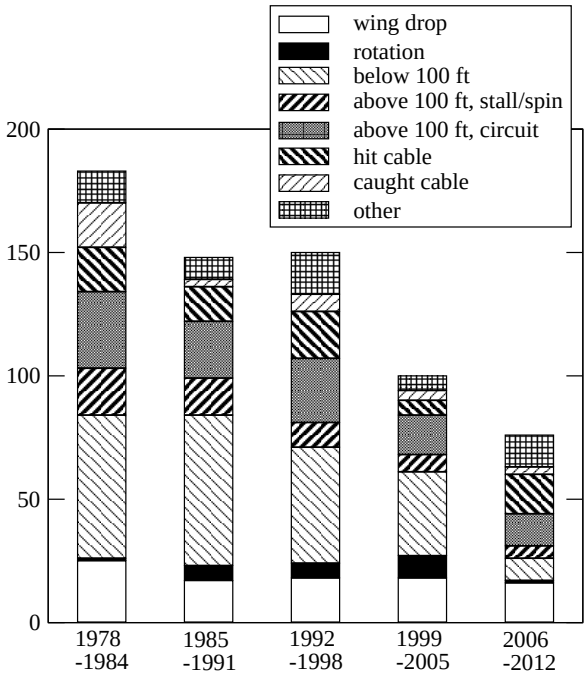

Figure 9: All winch accidents in 7-year periods from 1978 to 2012 (see also Table 11)

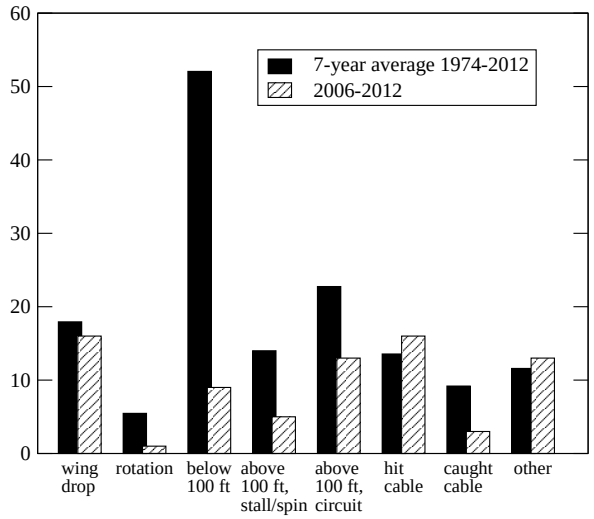

Figure 10: All winch accidents by stage of launch. Totals from 2006–2012 compared with 7-year average totals from 1974–2005 (see also Table 11)

- acquisition of reliable winch accident data
- understanding and interpretation of winch accidents
- a conceptual solution, education in this case
- goodwill and support from the BGA Executive, chairmen, instructor examiners, chief instructors, instructors
- modification of instructor training and pilot training
- use of every available channel for advice
- measurement of new accident rates
- interpretation of new accident rates, feedback, reinforcement of messages, encouragement

It is possible that these are necessary characteristics of any project having the objective of changing glider pilot behaviour as a prerequisite to a reduced accident rate.

Further development of the initiative

Safe winch launch communications have been refreshed every year since the inception of the initiative. These activities continue.

A poster indicating the reduced accident rate and pointing to the sources of safe winch launch advice was distributed to all 85 UK gliding clubs in February 2012 for permanent display on their premises. A progress report with reminders of the essentials for keeping safe was published in the April/May 2012 issue of *Sailplane and Gliding* [7].

The focus of future communications is to:

- reinforce the advice on actions to avoid a stall or spin
- avoid wing drop accidents
- persuade instructors to take over immediately after a simulated launch failure if the trainee makes a serious error
- avoid cable encounters.

A DVD has recently been distributed to clubs and instructors. It offers advice on safe winch launching under the following headings:

- pilot actions to conduct a safe winch launch and to cope with an emergency
- "stop the drop": how the hooker on, the wing tip runner, the signaller, and all other persons involved in the conduct of a winch launch, can help avoid a wing drop
- winch operations including winch specifications and winch driving

The DVD includes video simulations of winch accidents and provides easy access to the safe winch launch booklets and other publications.

Two of the presentations include a voiceover commentary in order to facilitate the use of the DVD for teaching purposes.

Conclusions

The BGA safe winch launch initiative began in 2006. Its purpose has been to ensure all UK pilots and instructors can fly a safe launch profile and can cope safely with an emergency.

From 2006–2012 there were 5 fatal or serious injury accidents (2 stall/spin) compared with a previous 7-year average

of 21 (17 stall/spin). Although the frequency of stall/spin accidents has declined dramatically, there has been no reduction in the frequency of wing drop and cartwheel accidents. Three fatal/serious injury accidents since 2006 were from cartwheels.

This initiative would seem to represent the first case in which advice for achieving fewer gliding accidents of a particular kind has been accompanied by measurement of accident rates and a material reduction in the accident frequency.

The initiative continues with the objectives of achieving even lower winch accident rates.

Acknowledgments

Valuable contributions to the BGA safe winch launch project have been provided by Andy Holmes (cable speed issue and winch operations), Trevor Hills (mathematics and computing), Pete Masson (video simulation), Mike Wilde (leaflet design), Keith Auchterlonie (publications).

References

[1] Browning, H., "Boundaries of Safe Winch Launching," *Technical Soaring*, Vol. 31, No. 4, October 2007, pp. 95–100.

[2] Hills, T., "Safety Analysis of the Winch Launch," *Technical Soaring*, Vol. 31, No. 4, October 2007, pp. 101–106.

[3] Holmes, A., "Presentation to BGA Instructors Committee," September 2008.

[4] Browning, H. and Naegeli, P., "Safe Winch Launching," *Sailplane and Gliding*, Dec.–Jan. 2005–2006.

[5] Browning, H., "Safer Winch Launching," *Sailplane and Gliding*, June–July 2009.

[6] Browning, H., "Five Years On," *Sailplane and Gliding*, June–July 2011.

[7] Browning, H., "The First Six Years," *Sailplane and Gliding*, April–May 2012.

[8] Smith, B., "Winch Launching Revisited," *Soaring*, Vol. 72, No. 2, Feb. 2008, pp. 36.

[9] "Annual winch launching statistics," Annual summaries published in *Sailplane & Gliding*, 1974–1989 and 1993–2012., Data for 1990–1992 taken from BGA yearbooks.

[10] Hills, T., "Statistical tool," March 2009, Personal communication with author.

Appendix: Safe Winch Launching Leaflet

The advice contained in this leaflet highlights the key risk areas in winch launching and offers simple but effective guidance on how to minimise these risks. Site specific factors may need to be taken into account. Your CFI will advise. Pilots should consider the hazards summarised overleaf before every winch launch.

In the first 5 years of the safe winch launching initiative there has been a significant and welcome reduction in winch launch related accidents, particularly those involving a stall or spin. However, there has been no reduction in wing drop accidents to experienced pilots.

During every launch, you are advised to ensure your flight profile is safe, and you are ready to take appropriate action in the event of launch failure or other adverse circumstances.

Table A-1: Winch hazard mitigation (from BGA leaflet)

Phase	Hazard	Avoidance	Practicalities
GROUND RUN	Wing touches the ground, glider cartwheels or ground loops violently.	• Start the launch with your hand on the release. • If you cannot keep the wings level, release immediately.	• Strap in tightly. • Be aware of the second cable. Release if the glider swings too close to it during the ground run. • Anticipate yaw. • Hold correct wing. • Run with tip. • Monitor wings level. • If wing drops, release before the wing touches the ground. • First flight on type in benign conditions
ROTATION	Stall/spin during rotation.	• Avoid taking-off with a significant amount of yaw present. • Maintain a shallow climb until adequate speed is seen with continuing acceleration. • Ensure the transition from level flight at take off to the full climb (typically 35°) is controlled, progressive, and lasts at least 5 seconds.	• Do not pull back to reduce ground run over rough ground or with tail wind. • Be prepared to use whatever forward stick may be necessary to maintain a shallow climb until speed is adequate. • Monitor the airspeed; reduce rate of rotation if appropriate.
	Stall or heavy landing after launch failure below 100 ft.	If the launch fails, immediately lower the nose to the appropriate recovery attitude. Minimising the reaction time is crucial. • Do not use the airbrakes until the glider has attained an appropriate attitude combined with a safe speed. • Instructors: simulated power loss with less than 50ft and 55kt by instructor demonstration only.	• No cross wind correction below 300ft. • If speed is excessive do not release; maintain shallow climb to a few hundred feet and then release or signal. • Beware habitual opening of airbrake; use airbrakes with care or not at all after launch failure. • Do not release the cable; allow it to back release.
CLIMB	Stall or spin, after launch failure.	• Adopt the recovery attitude; do not turn or use the brakes until the approach speed is attained. • Land ahead if it is safe to do so.	• If airspeed reduces, unload the wing; consider releasing if airspeed approaches 1.5 times stalling speed. • It typically takes 5 seconds in the recovery dive to accelerate to the approach speed.
	Controlled flight achieved after launch failure but subsequent stall, undershoot, overshoot, heavy landing, or collision.	• Plan provisional circuit options before taking off.	• If instructing, and P2 makes a mistake, take over early.