TEAM FLYING AND GAGGLES IN SOARING CHAMPIONSHIPS
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Introduction

This paper deals with two particular aspects of soaring championships; Team Flying and Gaggles. The purpose is to describe the mechanisms of Team Flying and Gaggles, how they have developed and the impacts of Soaring as a sport.

The paper is the result of personal observations as a competitor in Soaring Championships since 1966, including 14 World Championships 1970--1999. Some observations originated from reports of World Championships from 1960 and onwards.

There may be some minor errors in the results stated, please let me know and I will correct them.

Team flying and gaggles are two fundamentally different aspects, but they are inter-related in some ways, and it feels practical to cover both aspects in the same paper.

History of Team Flying

WGC 1960, the birth of team flying

Soaring started as an individual sport. Strong teamwork was necessary to support the pilots before and after the flights, but in the air, the pilot was on his own, fighting the elements and his fellow competitors.

In the WGC 1960 in Cologne, Germany, the Polish team entered a new generation of sailplanes, the open class Zefir and the standard class Foka. These new sailplanes were greatly admired, and so were the new team-flying tactics of the two open class pilots Edward Makula and Jerzy Popiel. They flew close together and communicated closely. When the standard class and open class shared the same task, the standard class pilot Adam Witek joined his open class comrades and flew with them. At that time, use of radio was prohibited in the standard class, but the excellent co-operation within the team enabled Witek to take part in the team flying anyway. The architects of the Polish team flying were the leaders Tadeusz Rejniak and Josef Dankowski.

In spite of the excellent Polish effort, the winners in 1960 were individuals. Rolf Hossinger (Argentina) won the open class and Heinz Huth (Germany) the Standard class. Witek was second.

WGC 1962, success for team flying

1962 the WGC was held in Argentina. The Polish team continued the team flying, and had a great success, with Makula winning and Popiel second in their Zefirs. Huth won the standard class, again an individual effort.

WGC 1965

1965 saw a WGC in England. The Polish team flying tactics were again successful, with Jan Wroblewski winning the open class in a standard class Foka and his team mate Franciszek Kepka in third place. Rolf Spänig in the D-36, the forerunner of the new generation of GRP

gliders managed only second, despite the superior performance of his next generation sailplane.

There were some reactions about whether or not team flying was fair in an individual competition, but no measures were taken by IGC. Similar reactions have been aired at times ever since.

WGC 1968
The 1968 WGC went to Poland. National pride demanded victory, but this time the Polish team machine did not work out. No other country had yet mastered the team flying, but the wooden Polish gliders were now surpassed by German made GRP in the hands of Austrian Harro Wödl, winning the open class in a Cirrus, and Swiss-crafted wood, an Elfe flown by American A-J Smith, both of them individualists by all means.

WGC 1970
By 1970, the advantage of team flying was well known, but still only the Polish pilots were proficient at it. Others tried it, often with disappointing results, because the pilots were on their own without proper coaching, lack of strong leadership and lack of opportunities for training together.

To the WGC 1970 in Texas, the Polish pilots entered with wooden gliders inferior to the GRP that was now flown by almost every other country. In spite of this, Wroblewski managed second place in the standard class. The winner, Helmut Reichmann of Germany said he practised *loose team flying* with his teammate Gerhard Waibel. The Open class winner, George Moffat, praised the very good and sometimes close co-operation with Wally Scott, although the two flew gliders of different performance.

WGC 1972
The WGC 1972 in Yugoslavia suffered from poor weather. A lot of cloud flying took place, which limited the opportunities for close team flying. Loose team flying and co-operation via radio was practised by many teams. The Polish pilots again had success, with Wroblewski winning the standard class and Kepka third. The Soviet pilots Kusznetzov and Rudensky were also close team flyers with high placings. Also in the Open class, high placings were taken by Polish pilots Kluk and Muzsynski. But the top two in the Open, Ax from Sweden and Viitanen from Finland, were individual flyers.

WGC 1974
The 1974 event in Australia was not won by team flying, but it nevertheless had an impact as IGC decided on a rule change following the Polish tactics on the last day. The Polish team captain sent out one of his open class pilots, Mariusz Pozniak, to lead for the standard class pilots on their task. In his 19-metre Jantar, he could mark the best thermals for the standard class pilots, and Kepka won the day heavily and advanced to third place overall. Other pilots who noticed what was going on managed to hang on to this very fast group, and this helped Helmuth Reichmann to advance to first place overall ahead of Ingo Renner, who was flying on his own and had a poor day. Renner had led the field for several days. Pozniak subsequently took off again and completed the open class task.

The Polish tactics on this day were seen as unsporting by IGC, and the rules were changed. After 1974 a pilot was not longer permitted to fly along the task of another class than his own.

WGC 1976
In the WGC 1976 in Finland, the close team flyers did not do well in the standard class, but the Polish pilots Julian Ziobro and Henryk Muzynsky scored well team flying in the Open Class.

WGC 1978
France held the 1978 WGC. Close team flying was now also practised by the French standard class pilots. There was no success for close team flying in this WGC, and Poland did not take part.

WGC 1981
In Paderborn 1981 Sweden had great success in the 15M class, Ax and Pettersson placing first and second, and France had a similar success in the standard class with Schroeder first and Chenevoy third. It is well known that this success was not possible without co-operation between the pilots. Schroeder even publicly gave his team-mates credit for his victory. The successful pilots did not fly closely together, but were in continuous radio contact and reported the ever changing weather conditions, thus helping each other to stay aloft and complete the tasks in the difficult conditions.

WGC 1983
The 1983 WGC in Hobbs did not show any advantage for team flyers. The pilots who had great success in Paderborn by loose team-flying tried to do the same, but it did not pay off in the very strong Texas soaring conditions, so the winners were individual flyers.

WGC 1985
Another WGC, mountain flying in Italy, where the top pilots were individualists.

WGC 1987
Again a WGC dominated by individualists. But things were to change. France now had a new coach in the team, Jacky Clairbeaux, who was observing closely what was going on in gliding championships. A country with great resources to spend on gliding and excellent soaring pilots, France had had its share of success, but this was now to improve and make France the top country. The roadmap to success was strong coaching and team flying that was almost forgotten following the success of individuals in 1983-85.

WGC/EGC 1989-1998
The French team, by using team-flying, won more medals in gliding championships than any other country. This resulted from team flying controlled by strong coaching. CFHN, the new centre for high level competition in St Auban, became the hotbed for the success. Jacky Clairbeaux managed to bring forwards several pairs of pilots, for example Lopitaux/Lherm, Napoleon/Gerbaud, Napoleon/Navas, and Caillard/Lopitaux. In the WGC 1992, a first was recorded as Napoleon and Gerbaud shared first place with the same score for the 11-day championship. Teams of three were also tried. Sometimes the number three pilot was allocated to hang on to the fiercest contender among the competing pilots/teams and report their progress. In 1997, the French pilot Regis Kunz was seen following the German leader Michael Grund for a large part of the championships and reporting Grund's progress to his fellow team-mates.

The Germans also developed team flying tactics during this time. This seems to have resulted more from the choice of the pilots than by the coaching efforts on the management level. In

the EGC 1994 in Rieti, three German standard class pilots managed to share first place by co-operation to obtain the same score. Uli Schwenk and Robert Schroeder cooperated trying (but failing) to beat Ray Lynskey in Omarama 1995. Successful team flying was also developed by Michael Grund together with Werner Meuser in the 15 metre class, resulting in first and second places in the 15M class in the 1997 WGC. In the EGC 1998, Grund led a team of four 15M pilots, using a special method. Grund was apparently flying in the lead, and Hans Obermeier was trailing to pick up anyone who happened to fall behind. Being a flying coach is not without risk, as Grund found out as his teams successfully produced a World Champion, Meuser and an European Champion, Obermeier, while Grund placed second on both occasions. Nevertheless, Grund declared that team-flying with his friends was an essential part of competition flying for him, and that he would quit if it was banned (statement of Grund in an open discussion on collision risks in Bayreuth 1998). Other pilots who he has coached in championships have given enthusiastic support for this kind of flying, and it seems to be a means to promote the interest for competition flying among young pilots in Germany.

WGC/EGC 1999-2001

More teams became proficient in team-flying. Great Britain formed several teams who had overwhelming success in many international championships in the club class, women's and junior's. A team from Italy, Galetto, Ghiorzo and Gostner placed 1st, 2nd and 4th in the WGC 1999.

Measures taken by IGC against team flying

In IGC, team flying has been an ongoing issue. The countries who are proficient in team-flying and those who are working on improving their team-flying skills do not want IGC to take action. The countries who don't have the resources to develop team-flying would like to have a change.

The following measures have been decided or discussed but have not been carried through:

1. A decision was taken, on the initiative by IGC president Tor Johannessen, to reduce the number of participants per class to one per country. The number of classes in one WGC would be increased to four or five so the total number of participants would remain unchanged. This decision has de facto been overruled by other decisions that now allow even more than the previously allowed maximum of two per class per country.

2. FAI vice-president Alvaro de Orleans Borbon suggested that team flying, like cloud-flying, be prohibited.

3. Multiple start-points. This is a new method in WGCs. Reports indicate that it has been effective in reducing gaggles in National championships (Australia), but it has not been efficient in reducing team-flying (WGC Australia 2001) because the pilots quickly learn to adjust their start times so they can get together after their starts.

Use of radio

Some countries only allow only one radio frequency for all competitors in their National Championships, *Mono-frequency*. As continuous radio communication is necessary for team-flying this rule minimises the possibilities to team-fly.

The current Annex A has a ruling that limits radio communication for other purposes than safety, but it has not been possible to enforce this Rule in championships.

The Swedish board for accident investigations blamed the competition direction for a landing accident in the Swedish National Championships 1988. The blame (that was not followed by a lawsuit) was for not making sure that all pilots were on the same radio frequency.

It is not clear if the way VHF aircraft radios are used to facilitate team flying by competitors is legal. The procedures for identification when calling and responding are certainly not complied with by the competitors, who tend to use their names or recognise each other solely by voice.

There are other possible potentials for lawsuits if collisions occur between gliders on different radio frequencies, in particular if third party liability becomes an issue. This could happen if property damage or personal injury occurs to people on the ground from falling wreckage if a collision can be attributed to lack of communication because the colliding gliders were on different radio frequencies.

For and Against Team Flying

Arguments in favour of team-flying	**Arguments against team-flying**
Team-flying helps young pilots to get into competition flying and makes it more fun. Statements from Michael Grund (Bayreuth 1998), Axel Reich, Fred Gai (Lausanne 2001)	By definitions in Sporting Code, Champions are individuals.
Other sports, for example bicycle racing and Formula 1 car racing, use team techniques to produce individual winners. Statement of Axel Reich (Lausanne 2001)	There are no Championships for teams, and IGC has several times rejected team scoring for assigning Champions.
If the nations are prohibited from forming teams, they will appear anyway, as pilots will form "teams" between nations. This already takes place, for example German and Italian Pilots team-flew during the WGC in St Auban. Statement of Axel Reich (Lausanne 2001)	An excellent pilot flying on his own stands a poor chance to win against a pilot of a lower standard who participates in a competent team.
	Team-flying elevates the performance of a pilot above his actual ability. Statement by Justin Wills, 1997.
Team-flying favours pilots from economically strong countries against pilots from small countries.	Team-flying favours pilots from economically strong countries against pilots from small countries.

Gaggles and Leeching
A *gaggle* is the term for a large number of gliders sharing the same thermal. *Leeching* means that a pilot follows another pilot. Gaggles often form through one, or a few, pilots leading and the rest leeching on these leaders.

Slow gaggles
When the author begun competition flying in the 60's gaggles were usually formed when thermals were weak and unpredictable. More often than not, a gaggle was an indication of weak soaring conditions. Some skilled pilots took detours around gaggles because they felt they would do better on their own rather than by struggling in weak lift in thermals filled with other gliders.

Small, fast gaggles
In the early and mid 80's, the author on several occasions noted that a few skilled pilots, usually 5-6 of them, could get along faster than one skilled pilot on his own. If anyone in such a group gained an altitude advantage and tried to pull away from the group, he would soon find himself somewhat lower and see the group disappear ahead of him. With some luck he would be able to rejoin the group again. Often such a group was formed by pilots from different countries, who were competing against each other but took advantage of each other to gain points on those who did not take part in a fast group.

Big fast gaggles
In the pre-worlds 1986 and WGC 1987 in Australia, big and fast gaggles appeared. The size of such a gaggle could be 30 or more sailplanes. It appeared that leeching had become an art of itself. A pilot could score well just by hanging on to the big gaggle.

IGC has tried to reduce the number of participants per class to reduce the gaggles, but in reality, the number of participants has remained at 35-50 per class, and the member countries often try to get in more participants, so these attempts have failed.

Basic leeching
An early leeching strategy was to stay near the departure point and listen to the start-gate frequency. When a good pilot announced his start, the leech tried to start immediately behind him and hang on to him.

IGC recognized this problem early, and while many methods were tried to get away from the problem, most of the methods were not efficient. The following methods have been tried:

1. *Silent start*. The need for announcing the start in advance by radio was eliminated when ground clocks and later camera clocks allowed the competitors to provide the start evidence by photography instead by timing from the ground. This proved inefficient in reducing gaggles, because all pilots keep hanging around the start-point and as soon the best pilots left, the leeches observed this and followed. The result was the opposite to the objective; larger gaggles than ever.

2. *Start time interval*. The rule specifies that there must be 15 minutes between starts. This means that a pilot can shake off leeches by making a fake start and then a real start a few minutes later. The leeches then have to proceed or to wait for 15 minutes. This method has sometimes been efficient, but is somewhat complicated to apply. With GNSS starts, an event marker is necessary to indicate the real starts, and the pilots have some problems in

remembering to use it in the, sometimes complex, situation involving monitoring of speed and altitude when crossing the start-line.

Advanced leeching tactics

Skilled pilots often use the strategy of starting late and using the earlier starters as thermal markers. By this strategy, they usually manage to catch up and form a fast gaggle. Being the last to start, the skilled pilot can have a rest and let the gaggle do the work until the final glide or until the last climb before final glide, where the final element of success is achieved by managing to beat the gaggle home. This can be done by staying slightly behind the bulk of gliders and observing where the lift and sink is on the way home, and avoid the sink and use the lift to gain an altitude advantage that is converted to speed for the last 10-20 kilometres of final glide.

A problem with this strategy is that all of the best pilots want to be the last one to start. This delays the starts considerably. Usually it means that flying the task takes place somewhat later than the best soaring conditions. It has even happened that all pilots on a task landed out because everybody wanted to be the last one to start.

Another advanced method is to carefully keep track of the progress of other pilots. On a poor day, if some of the best competitors have had early outlandings, a wise strategy is to invite other pilots to join together and make as much distance as possible by using the invitees to help getting a high day-factor for the day.

A new idea…

It is well known that many pilots use leeching to elevate their performance. Leeching is considered unsporting, but there has been no way to measure the effect or to control leeching. A new idea that could be discussed within IGC is to analyze the flight logs for leeching and make the result public. It would even be possible to give a bonus to the leaders who find the thermals and penalise those pilots who use the lift found by others.

For example: Every pilot who uses a thermal found by another pilot would have to pay a penalty, say 5 points, to the pilot who found that thermal.

Such a system would, no doubt, change the behaviour of pilots and the way flights are conducted. It would reduce the urge to be the last one to cross the start-line, and using a thermal found by another pilot would no longer be tempting. A published penalty of just one point per thermal found in this way would probably be sufficiently embarrassing for the leeches.

Safety in gaggles

Debates in IGC have often focussed on the safety aspect of gaggles. It appears that some 30 gliders in one thermal would incur a high collision risk. In practice, the few fatal accidents that have occurred in WGCs and pre-WGCs happened during cruising flight (Uvalde 1991) or when only a few sailplanes were thermalling together (Bayreuth 1998). Although there have been a few additional instances of collisions with only minor damage, it seems that pilots on this experience level are proficient in gaggle flying and that it is not as unsafe as one might believe.

Still, most pilots feel there is a large risk in gaggles, and some pilots even stop flying in competitions because they are scared by the collision risk in gaggles. This means competition gliding is likely to be more popular if we can reduce gaggles.

Summary of Tried and Untried Methods to Counter Team-Flying and Gaggles

Method	Comment
Prohibit a pilot in a Class from flying along the task of another Class.	Successfully prohibited by IGC after occurrence in the 1974 WGC.
Silent start (ground clock or camera clock or GNSS clock/event marker to mark the start).	Tried without success.
Mono-frequency.	Discussed in IGC but not tried in international championships. Seems to be efficient on national level.
Prohibit team-flying.	Suggested by Alvaro Orleans de Borbon, but never taken to vote.
Limit participants to one per Class in individual competitions, with a separate "Class" for team-flying.	Decided by IGC for deployment completed by the year 2007, but other decisions are now working against this decision.
Limit the possibility to use VHF radio for tactical communication.	Ruled in Annex A, but the rule has not been possible to enforce, except by using mono-frequency.
Multiple start-points.	Reduces gaggles but not team-flying.
Every pilot who uses a thermal found by another pilot would have to pay a penalty, say 5 points, to the pilot who found that thermal.	New idea to be discussed. A complex method that needs clear definitions/specifications, a new computer program and a careful balance of penalties.
Bonus for: • early starts • being first at turn points • being first home	Tried in some Master competitions.

Further Ideas

Idea	Comment
Have separate *Team Champions* and *Individual Champions* for the Standard and 15m Classes. One *Team* and one *Individual* Entry to be permitted per Class and Country. Separate tasks to be set for the Team and the Individual Championships, but they would be parts of the same venue.	This would solve the problem that many countries want to enter more than just two pilots per class. The number of teams/individual pilots flying the same task would be less than in current championships, probably about 20 teams and 20 individuals per class. There is no easy method to completely prevent pilots from assisting each other. The current continuous communication on dedicated frequencies is the key to successful team flying. Monofrequency is likely to be the most efficient method to obtain more individual flying. It also enhances safety because a pilot can warn another pilot of a danger without having to search for a radio frequency.
Use imposed start time.	If one imposed start time is used, the winner needs to be the first finisher (for AST). This method is unfair in handicapped competitions, because the lower performance gliders will take advantage of the higher performance gliders. (This could be the case already today; the team uses gliders of slightly different performance, and the pilot chosen to win flies the glider with poor performance and lets team-mate(s) with better performance lead for him.)
The start times for each individual pilot could be imposed, say at one-minute intervals. The leading pilot could be the first to start with the others following according to their rank.	Similar methods have been tried (for example timing from the release) but were not popular, and deemed unfair.