

Impact of type of rostering on crew requirements

Ian Evans

Constraint Technologies International

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Abstract:

This paper describes the advantages and disadvantages of different rostering types. It is intended as a basis for recommendations for new crew agreements or changes to existing crew agreements.

Introduction

There are several overall types of rostering that can be performed, for example:

- fair share rostering to provide an equal share of patterns between crew based on one or more attributes of the patterns,
- preferential fair share rostering to provide an equal share of patterns between crew based on the number of satisfied preferences. Pattern attributes from normal fair share rostering can be considered at the same time, with weightings used to define the relative impact of the crew preferences,
- preferential bidding to award patterns to crew according to crew preference bids in a strict priority order, or
- bidline rostering to create a set of anonymous roster lines, then award entire lines to crew according to crew preference bids in a strict priority order.

The choice of the type of rostering can have a large effect on crew lifestyle and the number of crew required to crew the flying, but this effect can vary based on details such as:

- crew employment conditions,
- variations in patterns to be rostered,
- allowable crew preferences, and
- lifestyle preferences of the crew.

A common case that highlights the differences between types of rostering is where crew are paid a fixed amount per roster period, and in return the company may roster the crew up to a certain amount of work hours (e.g. flying hours) before overtime payments are required.

In this case, the ideal roster from the point of view of the company is where all crew end up with exactly the maximum number of hours on their roster lines without any overtime being paid. This crews the flying with the minimum cost using the minimum number of crew. The closest achievable roster to this is the optimal roster from the point of view of the company.

Fair share rostering

If there is a reasonable mix of flying, then fair share rostering should be able to come fairly close to achieving this ideal goal. Much depends on the definition of "fair share", however. It might be the case that particular types of patterns that fit well together in a line are all of a particular fairness category, and spreading them evenly between crewmembers could result in extra crew being required to crew the flying.

Certainly, if the definition of "fair" is to have an equal amount of flying per crewmember, then an optimal fair share roster is the optimal company roster.

Preferential fair share rostering

Preferential fair share allows crew preferences to be taken into account when determining fairness. The amount that this affects the optimality of the roster depends on the type of preferences allowed and the weighting given to these preferences.

A sensible strategy from the point of view of the company is to cap the extra cost that satisfaction of preferences is allowed to incur. This can be enforced by varying the weighting in an optimisation run.

The success of a preferential fair share system then rests on careful selection of the attributes for which the crew can specify preferences. The best attributes are those for which there is a spread of preference across crew members that roughly matches that in the flying.

For instance, if some crew prefer early starts and others prefer late starts and these proportions roughly match the flying, then it is likely that a roster can be produced that satisfies most preferences while not incurring many extra costs. In contrast, if most crew prefer patterns that have a high number of work hours per day away, then allowing crew to specify preferences for this will not increase crew satisfaction.

Preferential bidding

Depending on the pairings to be rostered and employment conditions, preferential bidding can have a large impact on the number of crew required to crew the flying.

For example, consider a typical situation where there is a spread in the number of work hours per day away (i.e. density) in the patterns to be rostered, and that a roster line containing the least dense patterns and the minimum number of days off would not achieve the number of work hours that the company is entitled to allocate to a crewmember.

If crew are allowed to bid directly or using attributes for high density patterns, and if this is considered desirable by the crew because it maximises their days off, then the highest priority bidders will starve the lower priority bidders of high density patterns. This will result in the highest priority bidders having extra days off, while the utilisation of the lowest priority bidders will be low and thus more crew would be needed to crew the flying.

Even if the lowest density patterns can achieve the required work hours, preferential bidding also can favour the quartile of the crew with the highest priority, with the preferences of the other three-quarters of the crew having much less effect.

It is also highly desirable to allow bidding for attributes of patterns rather than for exact patterns in order to allow the maximum flexibility in allocating patterns.

The possible drawbacks of preferential bidding can be minimised by only allowing bidding based on attributes that will not be considered desirable or undesirable by the majority of the crew, or to limit the number of bids for patterns with desirable attributes. Examples might be to allow bids for

patterns starting or finishing before or after midday, or to allow a maximum of 1 bid for a high density pattern.

Bidline rostering

The aim of bidline rostering is to counter the possible crew utilisation problems with the above techniques by first producing an anonymous roster that is optimal from the company's point of view, and to then allow bidding in the knowledge that the bidding will not affect the number of crew required to crew the flying.

There are two problems with this theory:

- it is not possible to allocate a full bid line to crew members who have leave or other commitments during part of the roster period, and
- interaction between awarded bidlines and a crewmember's carry in patterns can result in a less efficient roster.

In practise, a not-insignificant proportion of crew will have leave periods that partially overlap the current roster period, and coping with these will require the use of one of the other rostering techniques.

It is also possible for crewmembers to preferentially bid for bidlines that interact with their carry in in such a way as to get the maximum number of days off, and this can have an impact on the number of crew required to crew the flying. This can be minimised if crew are only allowed to bid for lines that fit in with their carry in.

Summary

In summary, it is possible to minimise the number of crew required to crew the flying with all of the above rostering techniques, but more care must be taken with the types of preferences and fairness allowed in some techniques than with others.

In general:

- Fair share rostering tends to naturally allow crewing of a roster with the minimum number of crew.
 - Preferential fair share can be easily tuned to limit any extra crew requirements compared with fair share. Good selections of allowable preferences can enhance crew satisfaction without requiring extra crew.
 - Preferential bidding requires care in choosing the types of bids that are allowed, and can cause extra crew to be required to crew the flying if this is not done.
 - Bidline rostering is not a universal cure for problems with preferential bidding, and can result in extra crew being required if carry in and partial roster period availability are not handled well.
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