

Slot Credit Substitution Benefits Smaller Airlines

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Slot Credit Substitution (SCS) is one of the most recent and most successful developments in the industry initiative called Collaborative Decision Making (CDM). After only a year of deployment, SCS is providing tangible benefits to CDM-member airlines in the form of reduced delays and increased flexibility during Ground Delay Programs (GDPs). A recent FAA study projects annual SCS savings of an estimated 85 million dollars.

SCS is designed to benefit airlines with a smaller presence at an airport. It does this by allowing anonymous transfer of arrival slots between different airlines. To better understand this process, a description of the mechanics of substitution is necessary.

When a GDP is issued, ATC rations limited airport capacity by assigning specific arrival slots to flights in their scheduled order. These arrival slots regulate the traffic into the airport by imposing delay on the flights. Each airline may then internally rearrange its slot assignments to best meet its operational objectives. This exchange of slots, called substitution, transfers delay from flights moving into earlier slots to flights moving into later slots. If the later-moving flights are canceled, this results in a net reduction of delay.

Direct slot swaps are, unfortunately, not always possible for airlines with fewer, widely-spaced flights at an airport. One flight's slot time may be too early for any of the airline's later flights to feasibly arrive. SCS addresses this issue by allowing an airline to request a new slot assignment that the later flight can use. This SCS request is handled by the central CDM data processor, which searches for other airlines' flights, or sequences of flights, that might be able to use the requestor's earlier slot, a process referred to as bridging. If a bridge is found, the caller gets a later slot that can be used with normal substitutions. The bridging flight benefits as well by receiving the requestor's earlier slot.

Figure 1 shows a simple model of a flight schedule as affected by a GDP. The resultant delay spacing is such that only limited direct substitutions are available. With only one exception, each flight's slot is earlier than the scheduled arrival time of the airline's next flight. As seen in column 3, this leaves a canceled flight such as B1 with no mechanism to move later, wasting the available resource. SCS, however, enables another airline's flight to bridge that open slot. Column 4 shows the sequence of SCS and normal substitutions that could be used to move the canceled flight to the end of the schedule.

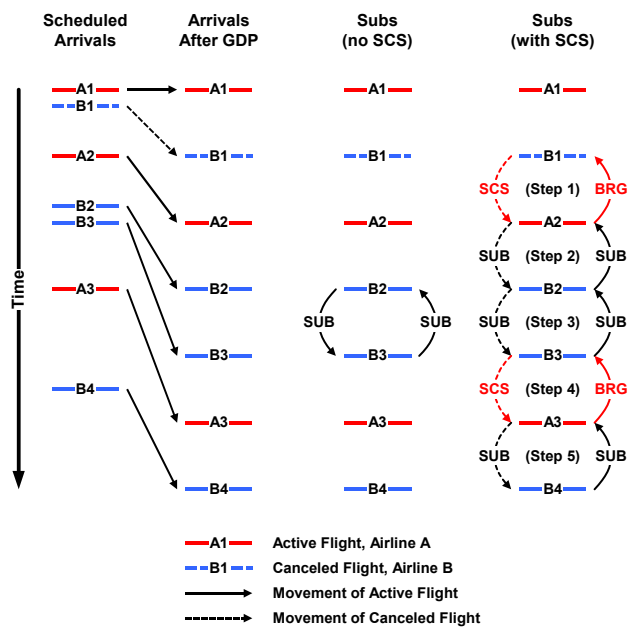


Figure 1: ATC delayed flights and substitution options with and without SCS

The results of the modeled slot credit substitutions are depicted in Figure 2. Although airline B accepts two later slots from airline A, all its remaining, active flights are able to move earlier, and its total delay is reduced. Airline A also benefits significantly. One of its flights is again on time, and the other has had its delay reduced by half. This is all made possible by a single cancellation.

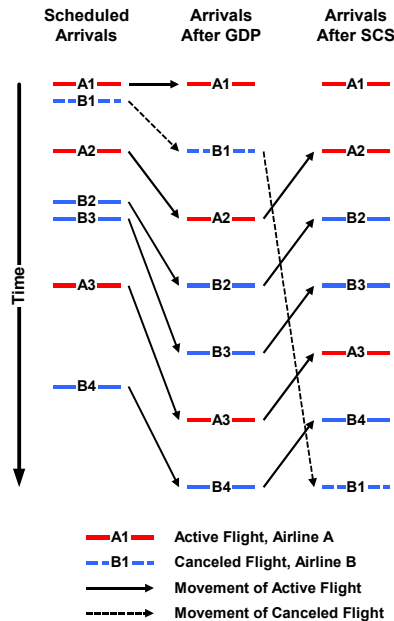


Figure 2: Delays reduced through SCS substitution

The complete SCS protocol is more elaborate to provide safeguards for both the requesting and bridging airlines. The SCS request is not open-ended; it specifies a specific time range, so that a caller can limit the lateness of any granted slot. Each airline may also temporarily remove its slots from the bridging pool so that the passive nature of bridging does not disrupt its own substitutions. Additionally, the SCS processing uses minimum notification times and airline-submitted delay information to ensure that bridging flights are able to accept the earlier slots.

Real-world use of this technology has had impressive results. Metron Aviation performed an analysis for the FAA of SCS benefits for a six-week data period from late February to early April, 2004. Over 1500 SCS requests produced more than 3000 bridging opportunities, with average savings of nearly 20 minutes per bridging flight. Total delay reductions exceeded 120,000 minutes, saving an estimated 6 million dollars for the participating airlines. These numbers are likely to increase as existing users become more adept and as new users begin to take advantage of these opportunities.

Information on becoming a CDM member is available on the web: <http://www.metronaviation.com/cdm/join.html>.