Boulder. DATA-CHASER is a science payload, with a primary focus on solar observation. The main activities for the payload involve science instrument observations, data storage, communication, and control of the power subsystem. Science is performed using three solar observing instruments, Far Ultraviolet Spectrometer (FARUS), Soft X-ray and Extreme Ultraviolet Experiment (SXEE), and Lyman-alpha Solar Imaging Telescope (LASIT), that are imaging devices at various spectra.

The payload resources include power, tape storage, local memory, the three instruments, and the communication bus. DATA-CHASER is also constrained by externally-driven states such as the shuttle orientation, which affects when certain science activities can be scheduled. Payload activities must be sequenced while avoiding or resolving conflicts with resources and temporal constraints.

When using the DCAPS system, there are three modes of operation. First, by simply providing a small set of high-level science and engineering goals, an initial schedule can be generated. The goals, which describe high-level mission objectives, are automatically translated into a sequence of executable activities. The second phase offers an interactive scheduling session. Using the repair-based scheduler, the user can work with the low-level activities while maintaining consistency with resources and constraints.

After making any change in the schedule, the user can give one simple command to resolve all conflicts in the current schedule. A schedule free of conflicts, however, may not be the highest quality schedule. In the final stage, the user can call on the optimizer to generate several additional solutions based on preference information and select the best.

The main scheduling algorithm of the planner/scheduler is the repair-based search algorithm. Using this algorithm, the scheduler first collects all of the conflicts in the current schedule and classifies them based on the resource being violated and the culprit activities associated with the conflict. After choosing a conflict to repair, the scheduler must select an action to perform in an attempt to resolve the conflict. Actions include moving, adding, and deleting activities. If the action resolves the conflict, the scheduler iterates on the resulting schedule. Otherwise, the scheduler tries a different action for resolving the persistent conflict.

The remainder of this paper is organized as follows. First, we describe the DATA-CHASER shuttle payload and mission objectives. Next, we discuss the different ways in which the DCAPS system can be used to command the DATA-CHASER payload. Next, we describe the model representation. We then go into detail about the DCAPS approach to automated command generation. Then, we describe how DCAPS fits in to the overall flight and ground system architecture for the DATA-CHASER mission. Finally, we discuss related work and conclusions.

2. DATA-CHASER PAYLOAD

DATA-CHASER consists of two synergetic projects (see Figure 1), DATA and CHASER, which will fly as a Hitchhiker (HH) payload aboard STS-85 on the International Extreme

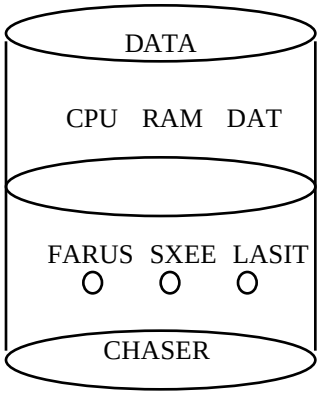

Figure 1: DATA-CHASER payload

Ultraviolet Hitchhiker Bridge (IEH-2) in July 1997 [2]. A technology experiment, DATA (Distribution and Automation Technology Advancement) seeks to advance semi-autonomous, supervisory operations. CHASER (Colorado Hitchhiker and Student Experiment of Solar Radiation) is a solar science experiment that serves to test DATA. The DATA technologies support cooperative operations distributed between different geographic sites as well as between humans