# Autonomous Sciencecraft Experiment

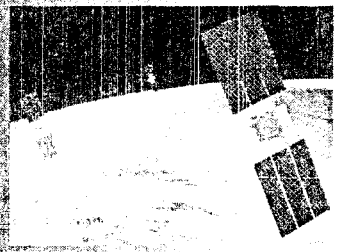
## NASA New Millennium Program

http://ase.jpl.nasa.gov

Description

In 2006, the Air Force TechSat 21 mission will fly the Autonomous Sciencecraft Experiment (ASE). ASE will perform onboard: *science analysis, mission re-planning, and robust execution.* These technologies will enable TechSat 21 to respond onboard to science opportunities by retargeting future science observations and returning only the most important science data. This capability can dramatically increase science return and is central to future mission concepts to monitor dynamic phenomena such as Io volcanoes, the Europa ice crust, and Martian sandstorms.

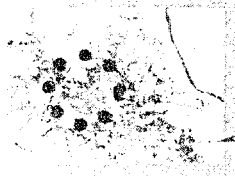
### Target Image with Autonomous Spacecraft Constellation



The initial set of targets will be generated on the ground and uplinked as high level goals for the onboard planning software. These goals will be expanded into command scripts for execution by the 3 satellites operating in a master/slave architecture. The TechSat 21 mission includes *robust execution management software* using the Spacecraft Command Language (SCL) package to enable event-driven processing and low-level autonomy.

### New Science Images

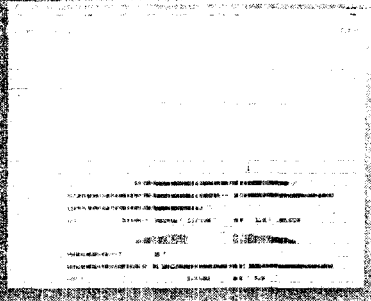
New science data will be taken of the area of interest based on goals submitted to the planner by the science algorithms.



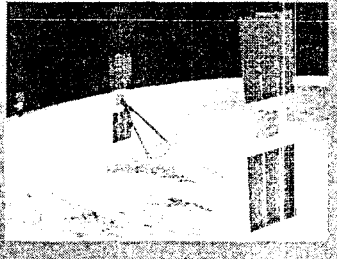
### Onboard Science Processing and Event Detection

The radar image will be processed onboard. *Onboard science algorithms* will analyze the image to detect trigger conditions such as "interesting" features and change relative to previous observations. The onboard science software will then generate derived science products such as the region of the image with interesting features or the changed area of the image. In addition, new image goals can be sent to the planning software to target areas with high science value.

### Onboard Replanning



The Continuous Activity Scheduling, Planning, Execution and Replanning (CASPER) software will enable ground commanding using high-level goals, then replan activities onboard, including downlink, based on science observations in the previous orbit cycles. The CASPER software plans continuously, always maintaining a current plan.



# Autonomous Sciencecraft Experiment

## NASA New Millennium Program

http://ase.jpl.nasa.gov

Description

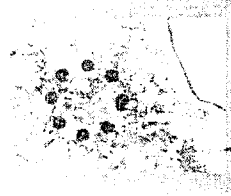
In 2006, the Air Force TechSat 21 mission will fly the Autonomous Sciencecraft Experiment (ASE). ASE will perform onboard: *science analysis, mission re-planning*, and *robust execution*. These technologies will enable TechSat 21 to respond onboard to science opportunities by retargeting future science observations and returning only the most important science data. This capability can dramatically increase science return and is central to future mission concepts to monitor dynamic phenomena such as Io volcanoes, the Europa ice crust, and Martian sandstorms.

### Target Image with Autonomous Spacecraft Constellation

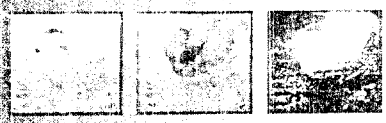
The initial set of targets will be generated on the ground and uplinked as high level goals for the onboard planning software. These goals will be expanded into command scripts for execution by the 3 satellites operating in a master/slave architecture. The TechSat 21 mission includes *robust execution management software* using the Spacecraft Command Language (SCL) package to enable event-driven processing and low-level autonomy.

### New Science Images

New science data will be taken of the area of interest based on goals submitted to the planner by the science algorithms.

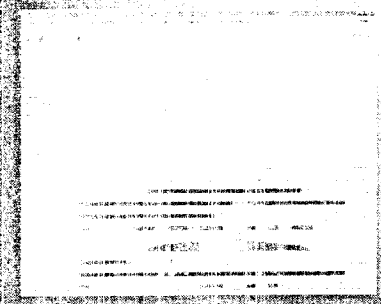


### Onboard Science Processing and Event Detection

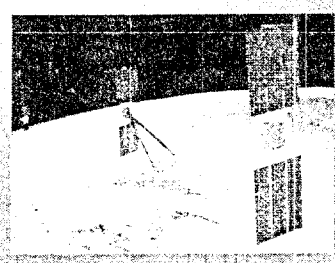


The radar image will be processed onboard. *Onboard science algorithms* will analyze the image to detect trigger conditions such as "interesting" features and change relative to previous observations. The onboard science software will then generate derived science products such as the region of the image with interesting features or the changed area of the image. In addition, new image goals can be sent to the planning software to target areas with high science value.

### Onboard Replanning



The Continuous Activity Scheduling, Planning, Execution and Replanning (CASPER) software will enable ground commanding using high-level goals, then replan activities onboard, including downlink, based on science observations in the previous orbit cycles. The CASPER software plans continuously, always maintaining a current plan.



# Autonomous Sciencecraft Experiment

## NASA New Millennium Program

http://ase.jpl.nasa.gov

Description

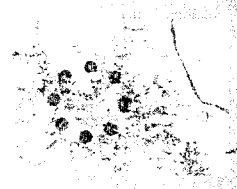
In 2006, the Air Force TechSat 21 mission will fly the Autonomous Sciencecraft Experiment (ASE). ASE will perform onboard: *science analysis, mission re-planning,* and *robust execution.* These technologies will enable TechSat 21 to respond onboard to science opportunities by retargeting future science observations and returning only the most important science data. This capability can dramatically increase science return and is central to future mission concepts to monitor dynamic phenomena such as Io volcanoes, the Europa ice crust, and Martian sandstorms.

### Target Image with Autonomous Spacecraft Constellation

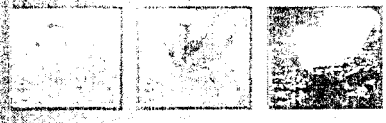
The initial set of targets will be generated on the ground and uplinked as high level goals for the onboard planning software. These goals will be expanded into command scripts for execution by the 3 satellites operating in a master/slave architecture. The TechSat 21 mission includes robust execution management software using the Spacecraft Command Language (SCL) package to enable event-driven processing and low-level autonomy.

### New Science Images

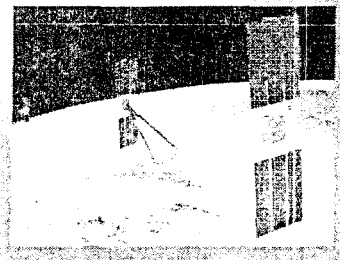
New science data will be taken of the area of interest based on goals submitted to the planner by the science algorithms.



### Onboard Science Processing and Event Detection



The radar image will be processed onboard. *Onboard science algorithms* will analyze the image to detect trigger conditions such as "interesting" features and change relative to previous observations. The onboard science software will then generate derived science products such as the region of the image with interesting features or the changed area of the image. In addition, new image goals can be sent to the planning software to target areas with high science value.

### Onboard Replanning

The Continuous Activity Scheduling, Planning, Execution and Replanning (CASPER) software will enable ground commanding using high-level goals, then replan activities onboard, including downlink, based on science observations in the previous orbit cycles. The CASPER software plans continuously, always maintaining a current plan.