

Overdrive

Overdrive

Description

This section begins with a discussion on the general uses of overdrive for driving the simulation with time history files. We will explain how to import time history files to make them suitable for overdrive, such as how to prepare data in the expected units. We will explain the different methods of overdrive, and the procedures for implementing custom overdrive methods. We will then discuss methods of analyzing overdrive results, and work on examples of overdrive usage.

What you will learn

Upon completion of this section, you will be able to:

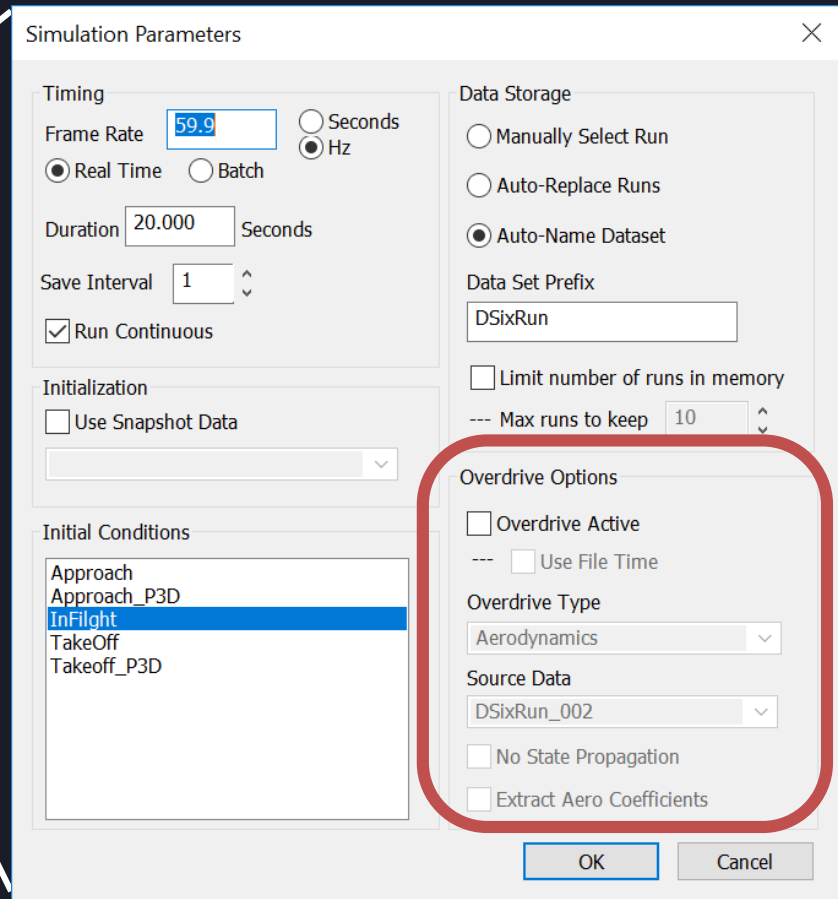
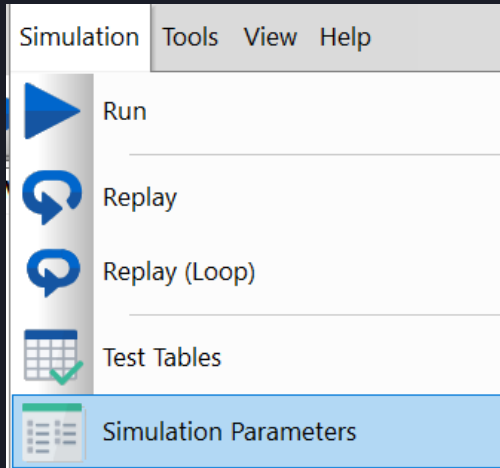
- **Import** time history files into DSix for use with overdrive
- **Overdrive** the simulation with the imported data
- Analyze the results and **compare** the data with expected results
- Implement **custom overdrive methods**.

Overdrive

Common Applications:

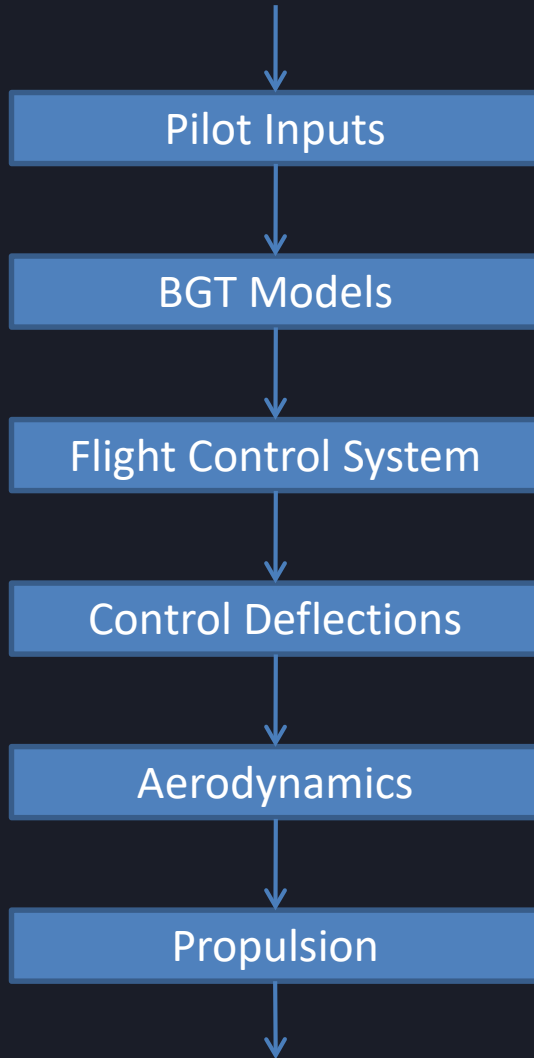
- Commanding control stick inputs
- Commanding control deflection inputs
- Driving the simulation with flight test data
- By-passing simulation flight model components

Overdrive



Accessed through the Simulation Parameters menu .

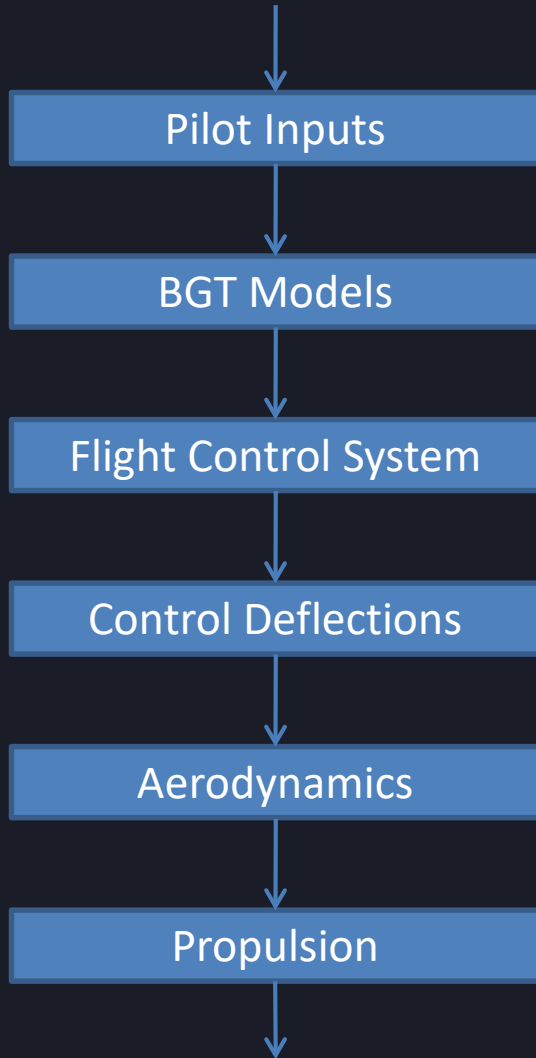
Overdrive Calls



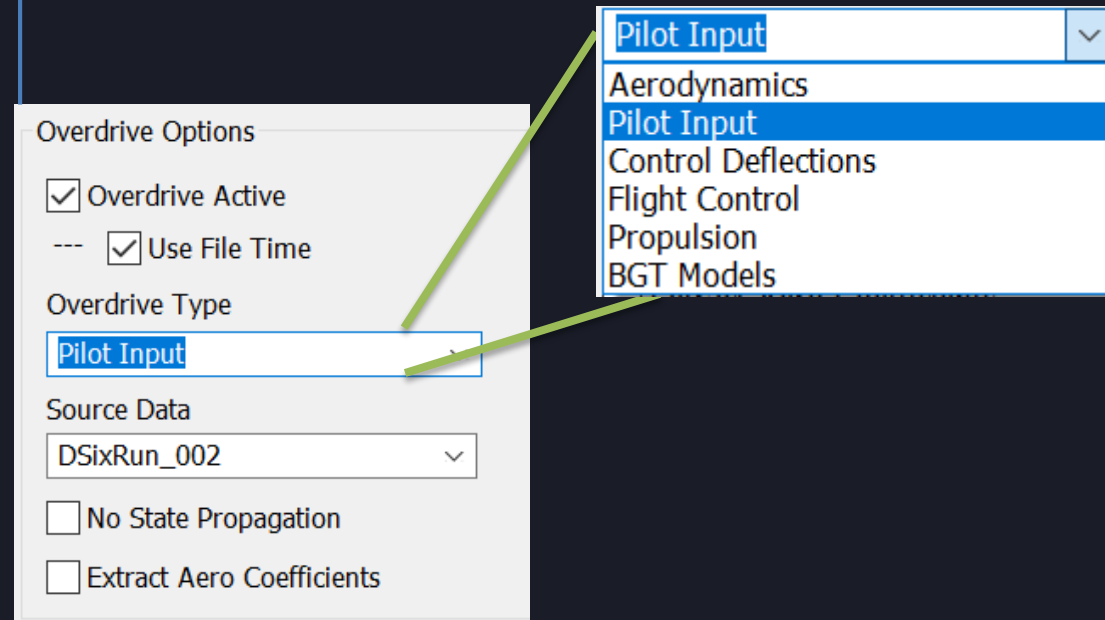
The call order for the overdrive function is defined in `SimulationModel.cpp`

The user can change this order by modifying the source code.

Overdrive Calls



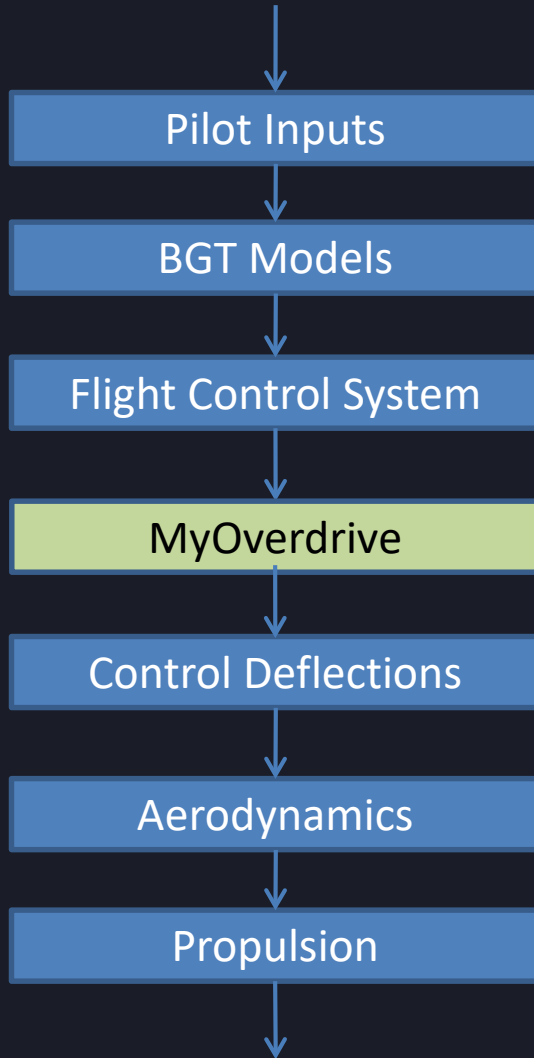
The user selects the insertion point for the overdrive from the **Overdrive Type** menu.



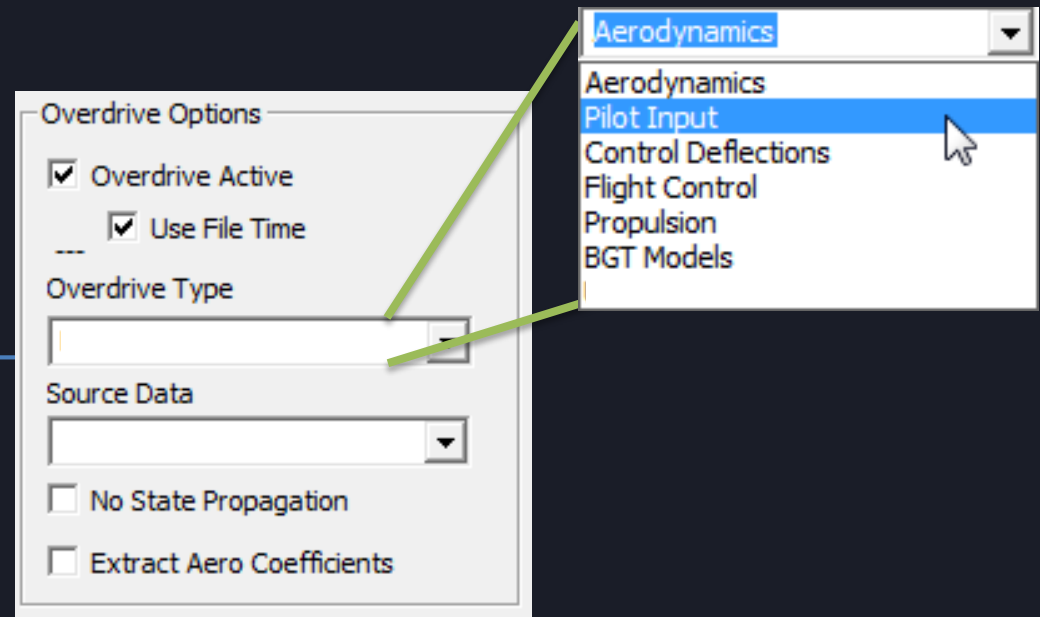
Overdrive Options

- Overdrive Active
- Use File Time
- Overdrive Type: **Pilot Input**
- Source Data: DSixRun_002
- No State Propagation
- Extract Aero Coefficients

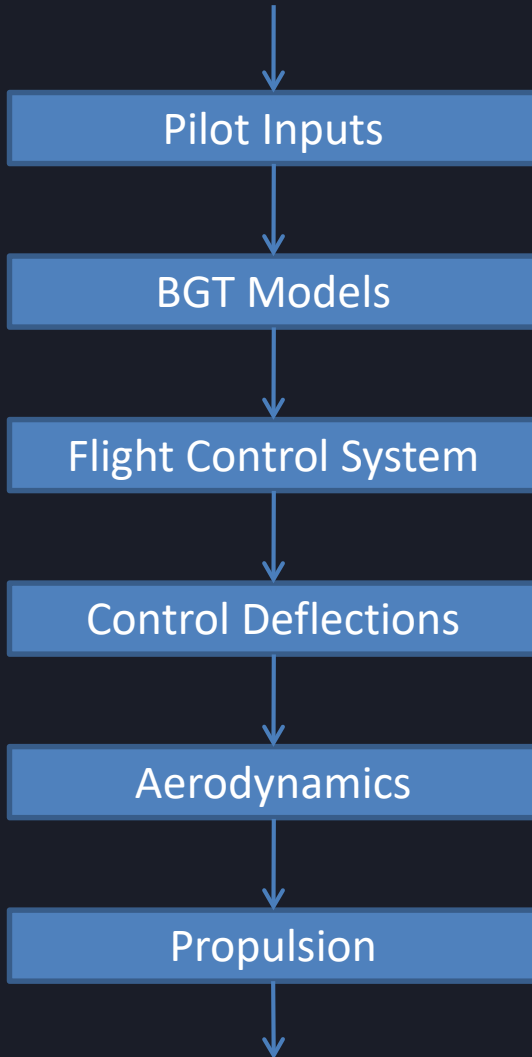
Overdrive Calls



The user can also create their own insertion point for the overdrive.



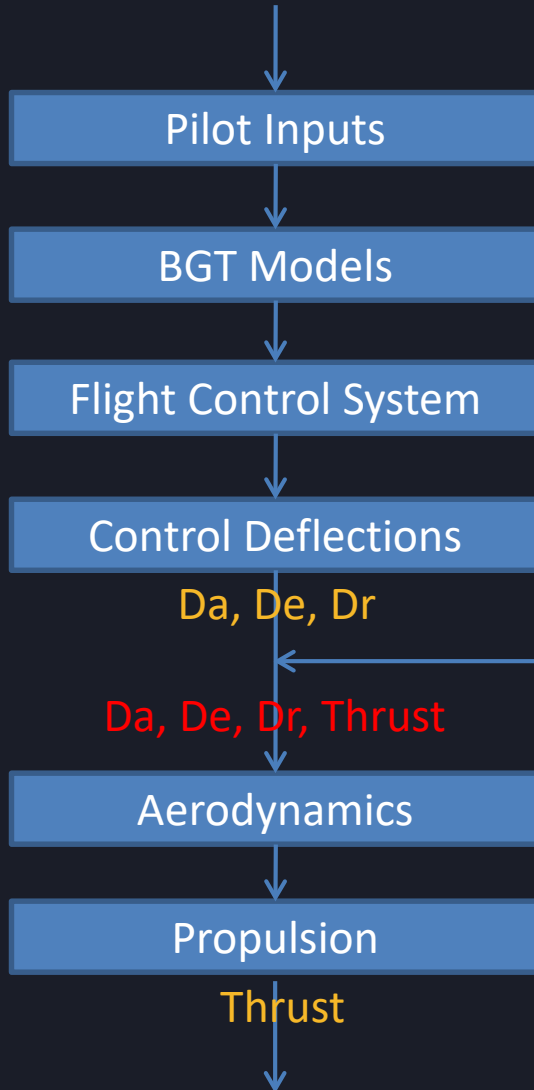
Overdrive Calls



At the point in the call order where OD is applied, the simulation data will get overwritten by the Overdrive data for **ALL** variables that have been mapped to DSix variables.

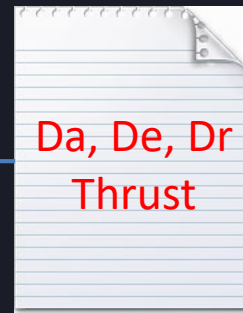
If a variable is calculated in the simulation downstream of the OD point, the calculated variable value will overwrite the OD value for that variable.

Overdrive Calls

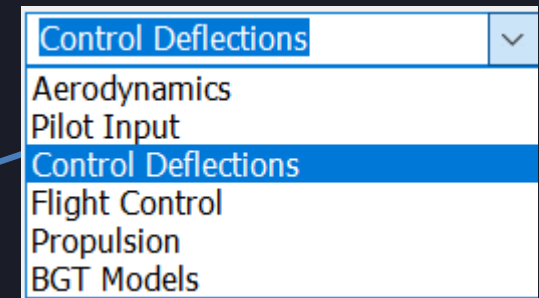


Example:

If **Control Deflections** is specified as the Overdrive Type, then control deflections calculated in the simulation model will be overwritten with overdrive data.



Overdrive Data File

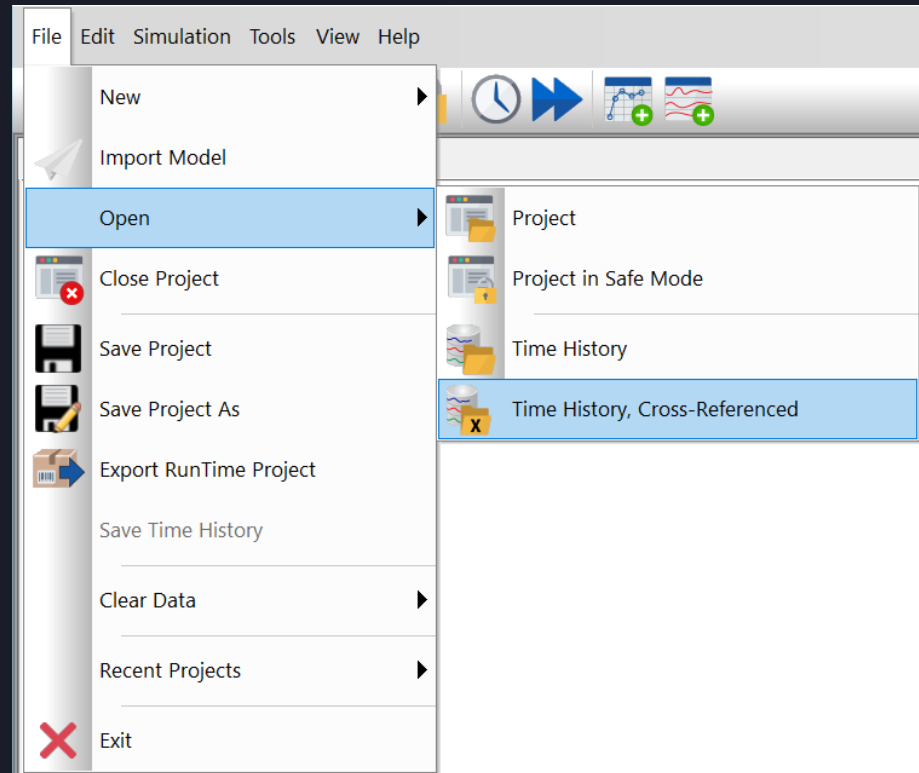


NOTE: If thrust data was available in the overdrive data set, the thrust data would be applied, but the simulation data would be calculated downstream, so the simulation data would result.

Setting up Overdrive

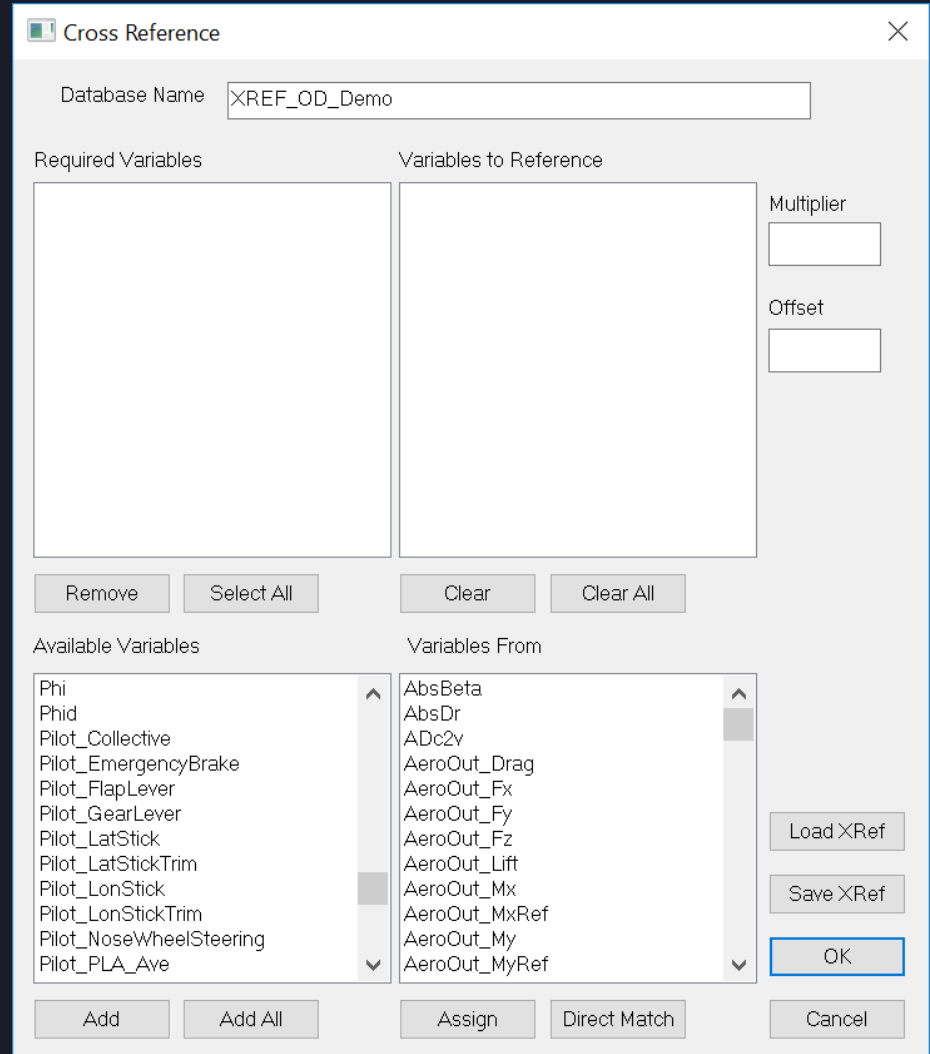
Loading Overdrive Data

The user loads the overdrive data set into the simulation by selecting **Open > Time History** from the **File** menu.



Mapping Overdrive Data

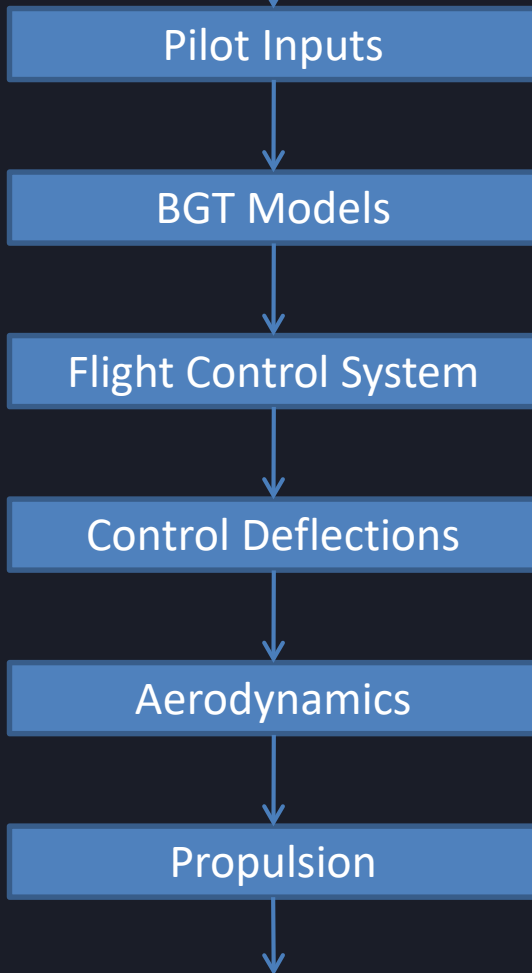
The user maps the variables from the overdrive data set to the simulation variables by using DSix **Cross Reference**.



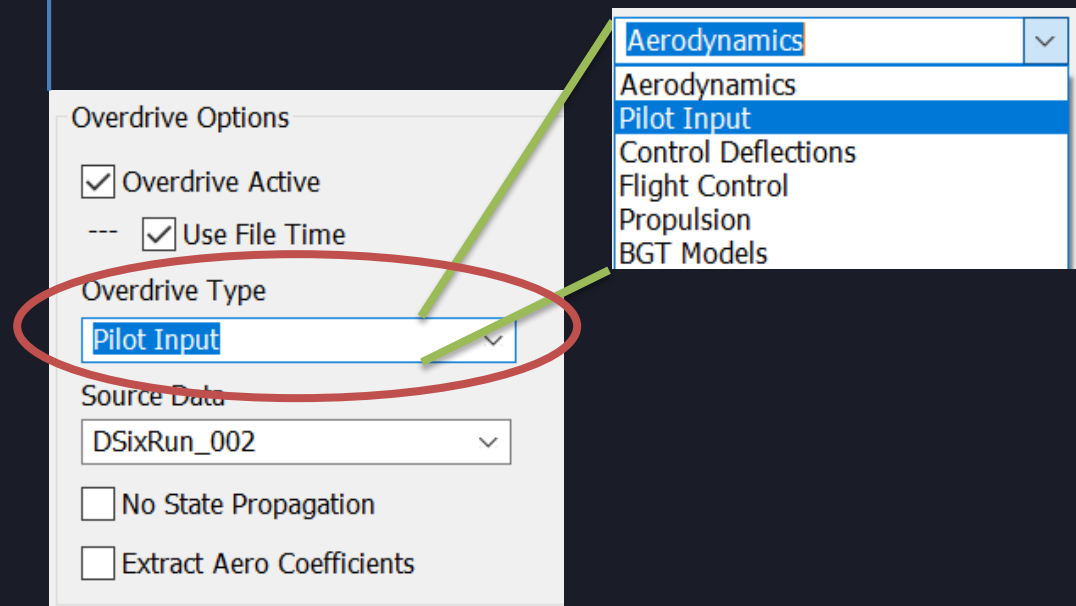
The screenshot shows the 'Cross Reference' dialog box with the following fields and controls:

- Database Name:** XREF_OD_Demo
- Required Variables:** (Empty list)
- Variables to Reference:** (Empty list)
- Multiplier:** (Empty text box)
- Offset:** (Empty text box)
- Buttons:** Remove, Select All, Clear, Clear All
- Available Variables:**
 - Phi
 - Phid
 - Pilot_Collective
 - Pilot_EmergencyBrake
 - Pilot_FlapLever
 - Pilot_GearLever
 - Pilot_LatStick
 - Pilot_LatStickTrim
 - Pilot_LonStick
 - Pilot_LonStickTrim
 - Pilot_NoseWheelSteering
 - Pilot_PLA_Ave
- Variables From:**
 - AbsBeta
 - AbsDr
 - ADc2v
 - AeroOut_Drag
 - AeroOut_Fx
 - AeroOut_Fy
 - AeroOut_Fz
 - AeroOut_Lift
 - AeroOut_Mx
 - AeroOut_MxRef
 - AeroOut_My
 - AeroOut_MyRef
- Buttons:** Load XRef, Save XRef, OK, Add, Add All, Assign, Direct Match, Cancel

Specifying the Overdrive Point



The user selects the insertion point for the overdrive from the **Overdrive Type** menu.



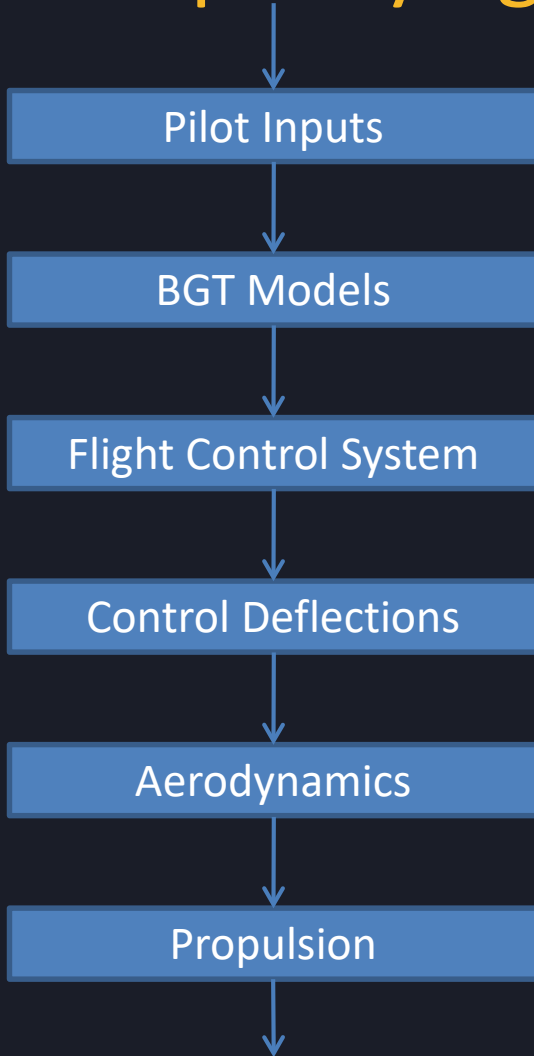
Overdrive Options

- Overdrive Active
- Use File Time
- Overdrive Type: **Pilot Input**
- Source Data: DSixRun_002
- No State Propagation
- Extract Aero Coefficients

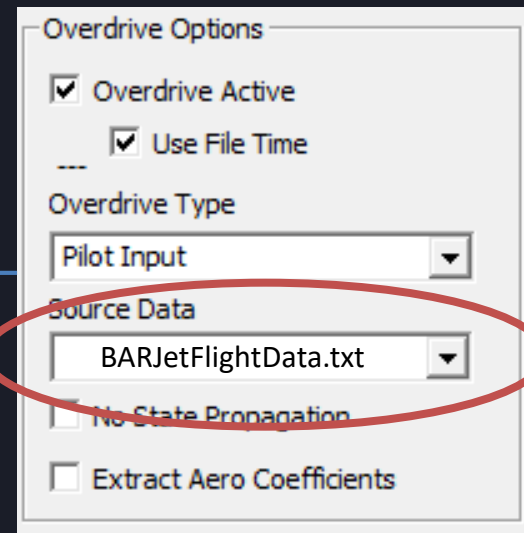
Overdrive Type Menu:

- Aerodynamics
- Aerodynamics
- Pilot Input**
- Control Deflections
- Flight Control
- Propulsion
- BGT Models

Specifying the Overdrive Data Set

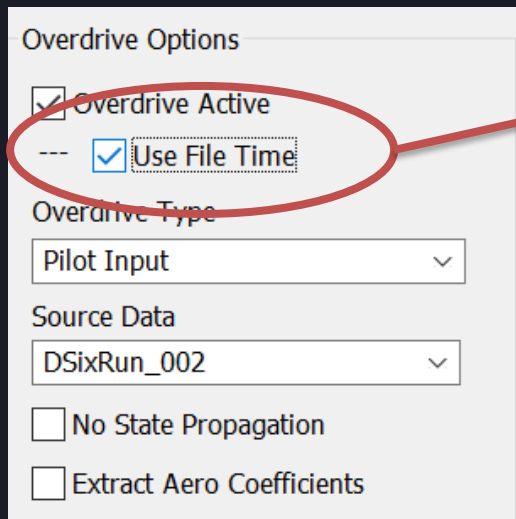


The user selects the overdrive data file from the **Source Data** menu.



Overdrive Calls

If **Use File Time** is selected, then the **time** channel from the overdrive data file will be used in place of DSix time.



Simulation will be run at rate derived from the overdrive data set. For example, if the overdrive data set contains data collected at 30Hz, the simulation will be run at 30Hz.

Overdrive Examples

Overdrive – Shell Properties

Overdrive Options

Overdrive Active

--- Use File Time

Overdrive Type

Pilot Input

Source Data

DSixRun_002

No State Propagation

Extract Aero Coefficients

No State Propagation

Data from overdrive data set overwrites the simulation data, but the time-dependent aircraft state variables are not propagated with time. This mode runs the sections of flight model in reset mode.

Extract Aero Coefficients

Aerodynamic coefficients are extracted from the overdrive data set. These coefficients can be compared to simulation-derived aero coefficients.

Overdrive – Shell Properties

Overdrive Options

Overdrive Active

--- Use File Time

Overdrive Type

Pilot Input

Source Data

DSixRun_002

No State Propagation

Extract Aero Coefficients

The current user interface provides flags for “No State Propagation” and “Extract Aero Coefficients”.

There are “hooks” in the code for these properties, but the implementation is left to the user.

```

void CSimulationModel::OnStepOverDrive ()
{
    // Prepare for Overdrive Run
    if (DSixConnectionsODNoStates ()) {
        // No State Propagation: All Run in Reset
        ResetNoTrim ();
    }
    else {
        // Normal Execution
        OnStep ();
    }
    DSixConnectionsExtractAero ();
}
    
```

These properties may be included in future releases of DSix 2.x.



Flight Simulation Environment