The Many Methods of Making Mirrored, Mostly Mirrored, and Moderately Mirrored Models

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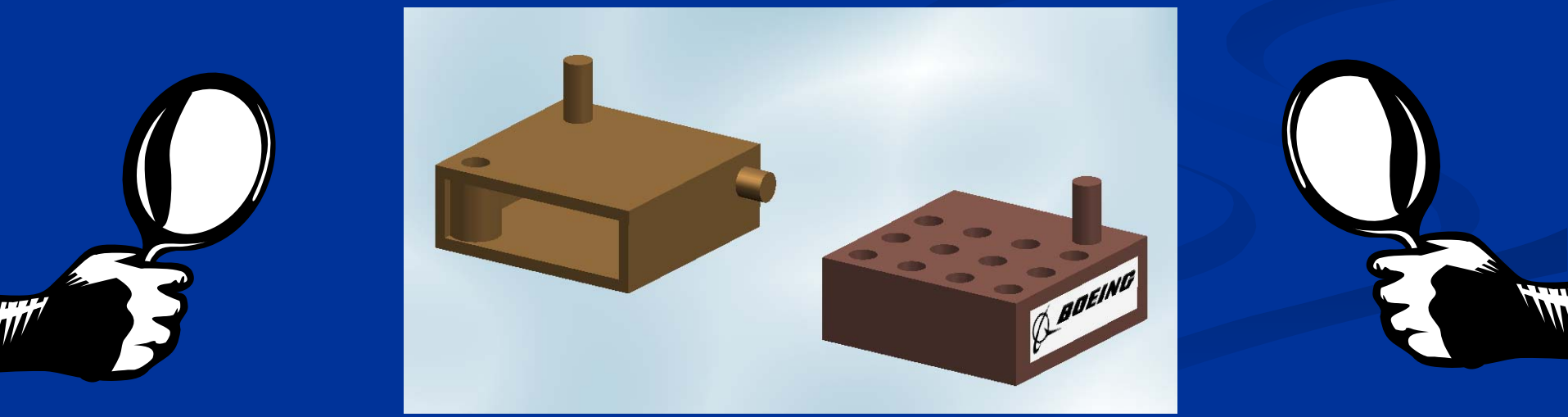

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NX gives us a an abundance of ways (at least 10) to mirror geometry…

WAVE at end of feature list

Instance feature - mirror body

Direct modeling - pattern face

Mirror Assemblies Wizard

WAVE from common base model

WAVE at a timestamp

Mirror display

Instance feature - mirror feature

Part Families

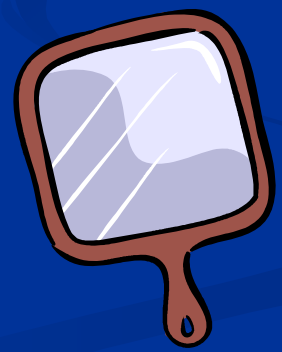
Assembly-independent WAVE

Types of mirrored geometry

- Geometry mirrored within a part
  - A feature in a part is a mirror of another feature in the same part
- Geometry mirrored from one part to another
  - One part is a complete or partial mirror of another part
- Geometry mirrored from one assembly to another
  - One assembly is a complete or partial mirror of another assembly

Degrees of 'mirroredness'

- Mirrored – the geometry is an exact mirror image (completely mirrored)
- Mostly mirrored – the geometry is mostly a mirror image, but not completely
- Moderately mirrored – only a minority of the geometry is mirrored



Factors that may affect your choices

- What are your needs?
  - Mirrored geometry or just visualizations of mirrored geometry?
  - Automatic updates of mirrored geometry or controlled updates?
- What are you modeling?
  - Geometry within parts, parts, or assemblies?
  - Degree of 'mirroredness' (completely mirrored, mostly mirrored, moderately mirrored)?
  - Starting with parametric or non-parametric parts?

Factors that may affect your choice (cont.)

- What are your capabilities?
  - Which UG tools do you have?
  - What training do your users have?
  - What experience do your users have?
  - How well do your users communicate?
- How adventurous are you?
  - Conservative approach for minimum risk?
  - More aggressive approach for maximum gains?

Methods vs. Applications

Method	Recommended Application								
	Mirror within a part			Mirror of another part			Mirror of an assembly		
	Completely	Mostly	Moderately	Completely	Mostly	Moderately	Completely	Mostly	Moderately
Mirror Display*	✓			✓			✓		
Instance Feature - Mirror Feature			✓						
Instance Feature - Mirror Body	✓	✓							
Direct Modeling - Pattern Face -		✓	✓						
Part Families				✓	✓	✓			
WAVE at end of feature list				✓					
WAVE at a timestamp					✓	✓			
WAVE from a common base model					✓	✓			
Assembly-independent WAVE				✓	✓	✓			
Mirror Assemblies Wizard							✓	✓	✓

* Mirror Display creates only a temporary display of mirrored geometry

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Mirror Display: Overview

Description	Creates a temporary mirrored display ("smoke & mirrors") & no permanent geometry
UG licenses needed	Modeling Shape Studio  
UG functions used	Analyze Face → Mirror Display 
Advantages	No need to create additional part files. Allows dynamic change of mirror plane.
Disadvantages	No actual mirrored geometry created. Studio Display license required.

It's just a graphical thing!

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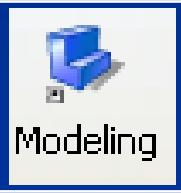
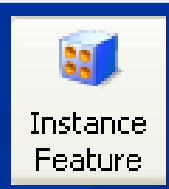
Mirror Display: Recommended applications

Mirror within a part	Completely	
	Mostly	
	Moderately	
Mirror of another part	Completely	
	Mostly	
	Moderately	
Mirror of an assembly	Completely	
	Mostly	
	Moderately	

Instance Feature – Mirror Feature: Overview

Description	Mirrors features within a part file
UG licenses needed	Modeling  
UG functions used	Instance Feature → Mirror Feature 
Advantages	Creates parametric mirrored features. Don't need to mirror the entire body.
Disadvantages	If additional mirrored features are added to part, must remember to add them to Mirror Feature.

Instance Feature – Mirror Feature: Recommended applications

Mirror within a part	Completely	
	Mostly	*
	Moderately	✓
Mirror of another part	Completely	
	Mostly	
	Moderately	
Mirror of an assembly	Completely	
	Mostly	
	Moderately	

* Could be used for this application, but Instance Feature – Mirror Body would make more sense in most cases

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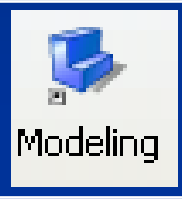
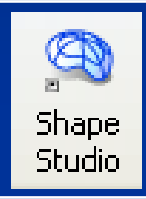
Instance Feature - Mirror Body: Overview

Description	Mirrors bodies within a part file
UG licenses needed	Modeling  
UG functions used	Instance Feature → Mirror Body 
Advantages	Creates a parametric mirrored body. Mirrored geometry automatically updates if features are added before mirror feature.
Disadvantages	Cannot mirror individual features.

Instance Feature – Mirror Body: Overview

Mirror within a part	Completely	
	Mostly	
	Moderately	
Mirror of another part	Completely	
	Mostly	
	Moderately	
Mirror of an assembly	Completely	
	Mostly	
	Moderately	

Direct Modeling - Pattern Face - Reflection: Overview

Description	Parametric or non-parametric features are mirrored
UG licenses needed	Modeling 
UG functions used	Direct Modeling → Pattern Face → Reflect 
Advantages	Allows mirroring of non-parametric features.
Disadvantages	For parametric features, more difficult to use than Instance Feature.

Direct Modeling - Pattern Face - Reflection:
Recommended applications

Mirror within a part	Completely	
	Mostly	
	Moderately	
Mirror of another part	Completely	
	Mostly	
	Moderately	
Mirror of an assembly	Completely	
	Mostly	
	Moderately	

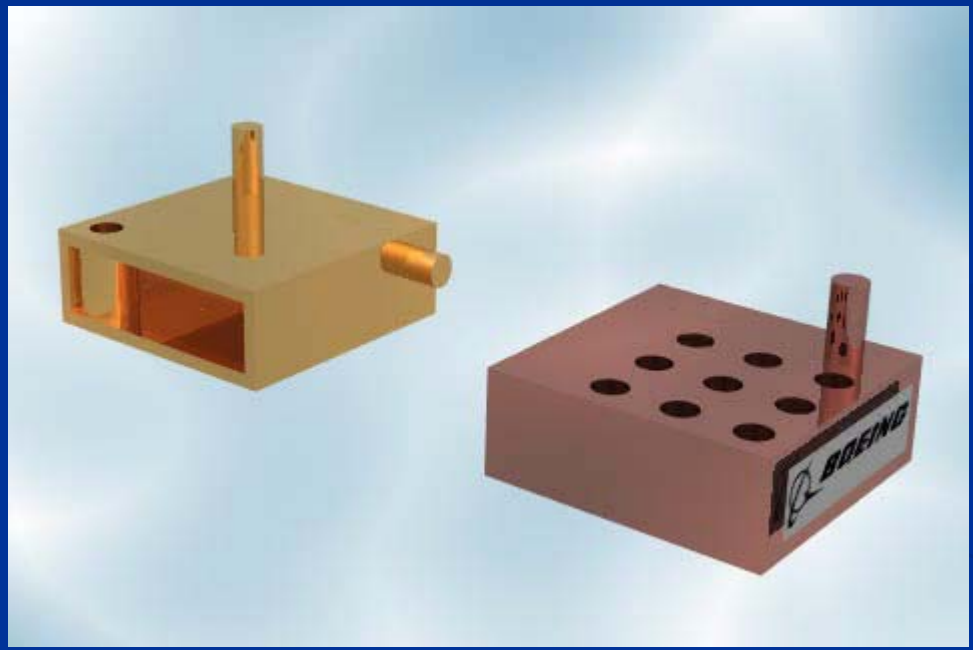
Part Families:
Overview

Description	Mirrored parts are created using a Part Family Table
UG licenses needed	Modeling Assemblies 
UG functions used	Tools → Part Families
Advantages	Complete control over mirrored geometry update – no unintentional updates. Easy to see differences between mostly mirrored parts.
Disadvantages	Mirrored geometry does not update automatically – must remember to update part.

Part Families:
Recommended applications

Mirror within a part	Completely	
	Mostly	
	Moderately	
Mirror of another part	Completely	
	Mostly	
	Moderately	
Mirror of an assembly	Completely	
	Mostly	
	Moderately	

Parametric Animation of Part Family



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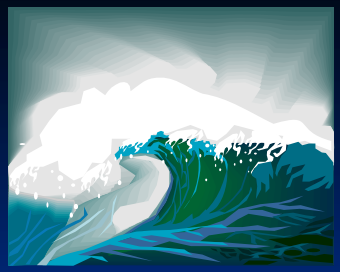


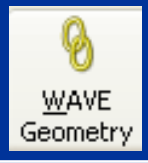
WAVE: Overview

- Essence: Allows geometry to be copied from one part to another
- May be used associatively (linked geometry) or non-associatively (extracted geometry)
- If used associatively, be careful of unintentional updates!
- License info
  - WAVE Geometry Linker is included with Modeling license
  - WAVE license gives additional features & controls

WAVE – to maintain links or not?

- Some companies break WAVE links before parts or assemblies are released.
- Broken WAVE links, in general, may be reestablished later if needed.
- WAVE links may be 'frozen' if desired.
  - Session freeze – only frozen in current UG session
  - Persistent freeze – remains frozen until unfrozen
  - Requires WAVE license

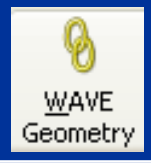
WAVE at end of feature list:
Overview

Description	A mirror-type WAVE link is created to another part, including all features of that part
UG licenses needed	Modeling Assemblies 
UG functions used	Insert → Associative Copy → WAVE Geometry Linker 
Advantages	Simplest and easiest to understand of the WAVE techniques.
Disadvantages	Potential for unintentional or unwanted updates when the base part is modified. Released parts can appear to be modified.

WAVE at end of feature list:
Recommended applications

Mirror within a part	Completely	
	Mostly	
	Moderately	
Mirror of another part	Completely	
	Mostly	
	Moderately	
Mirror of an assembly	Completely	
	Mostly	
	Moderately	

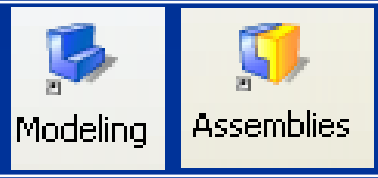
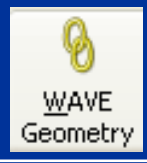
WAVE at a timestamp:
Overview

Description	A mirror-type WAVE link is created to another part, at a chosen point in the feature history of that part
UG licenses needed	Modeling Assemblies 
UG functions used	Insert → Associative Copy → WAVE Geometry Linker 
Advantages	Allows the use of WAVE for mostly mirrored parts (unlike WAVE at end of feature list).
Disadvantages	Not necessarily easy to see differences between mostly mirrored parts. Potential for unintentional updates and released parts appearing updated.

WAVE at a timestamp:
Recommended applications

Mirror within a part	Completely	
	Mostly	
	Moderately	
Mirror of another part	Completely	
	Mostly	
	Moderately	
Mirror of an assembly	Completely	
	Mostly	
	Moderately	

WAVE from a common base model: Overview

Description	A common model is created with the mirrored features and WAVE linked into separate models containing the non-mirrored features
UG licenses needed	Modeling Assemblies 
UG functions used	Insert → Associative Copy → WAVE Geometry Linker 
Advantages	Easy to see which features are non-mirrored.
Disadvantages	Extra model to manage. Potential for unintentional updates and released parts appearing updated.

WAVE from a common base model: Recommended applications

Mirror within a part	Completely	
	Mostly	
	Moderately	
Mirror of another part	Completely	
	Mostly	
	Moderately	
Mirror of an assembly	Completely	
	Mostly	
	Moderately	

Assembly-Independent WAVE: Overview

Description	WAVE links are independent of the assembly relationship between linked parts
UG licenses needed	Modeling Assemblies WAVE 
UG functions used	Assy Navigator → WAVE Geometry Linker → Copy Geometry to Part (or Copy Geometry to New Part)
Advantages	WAVE link is not dependent on assembly position relationship (unlike normal WAVE links).
Disadvantages	Difficult to see relationships between parts Potential for unintentional updates and released parts appearing updated.

Assembly-Independent WAVE: Recommended applications

Mirror within a part	Completely	
	Mostly	
	Moderately	
Mirror of another part	Completely	
	Mostly	 *
	Moderately	 *
Mirror of an assembly	Completely	
	Mostly	
	Moderately	

* Requires the use of WAVE at a timestamp in conjunction with assembly-independent WAVE

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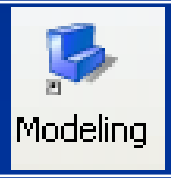
Mirror Assemblies Wizard: Overview

Description	WAVE links are independent of the assembly relationship between linked parts
UG licenses needed	Modeling Assemblies  
UG functions used	Assy Navigator → WAVE Geometry Linker → Copy Geometry to Part (or Copy Geometry to New Part)
Advantages	WAVE link is not dependent on assembly position relationship (unlike normal WAVE links).
Disadvantages	Difficult to see relationships between parts. Potential for unintentional updates and released parts appearing updated.

Mirror Assemblies Wizard: Recommended applications

Mirror within a part	Completely	
	Mostly	
	Moderately	
Mirror of another part	Completely	
	Mostly	
	Moderately	
Mirror of an assembly	Completely	
	Mostly	
	Moderately	

The end