The Bone Tool is arguably the simplest of tools to use for creating complex animations. But in the real world, many of us do not have the need or desire to create complex designs or animations on a day to day basis. Not all Flash users are designers and in many cases their ability to create complex animations is limited. But that does not mean professional level animation is unachievable using Flash. For this example I chose a very simple vector image from iheartvector.com.

1. The first step is to determine and isolate what areas of the image you want to animate individually. Select these areas and convert them to symbols.

2. The bones themselves should not rotate. The Jeeps are suspended by cables at fixed locations. Select each bone and then disable their rotation property in the Properties panel.

3. It is true that you don’t even need the Bone tool for this particular example. The same rigging could be done by editing the center point of a symbol to achieve the same rotation.
Select the Bone tool and create your armature by dragging from the parent symbol to the symbols you will be animating. Here the parent symbol is the helicopter itself while the suspended Jeeps are the children.

This armature requires only 2 bones, both originating from the same point. This is more like setting up a hinging mechanism than an Inverse Kinematic bone structure.

With all of the objects prepared for animation, all that is left to do is right click over the symbols containing the Jeeps and apply Motion tweens. The distance each Jeep sways is a matter of personal preference. The more they sway, the windier the conditions they are in.

For some added realism, apply some easing in and easing out by selecting the Motion tween span and then the Stop and Start (Slow) ease. Set the strength to -100.

Try nesting the entire animation in a symbol so you can then apply a Motion tween to make the entire helicopter hover up and down or move across the scene horizontally.
WHEN IT COMES TO CHARACTER animation, the Bone tool can be quite useful. Applying bones to a character is often referred to as “rigging.” The first step is designing the character so that each body part is a separate object that can be articulated with a bone armature. The next step is adjusting the rotation and translation of each bone to limit how much it rotates and moves along its X and Y axis. This is the most critical detail of the Bone tool because you don’t want the character’s limbs and joints to bend past their anatomical limits.

Here’s the exploded view of the character and all its various body parts. Notice the arms and legs have elbows and knee caps to help eliminate gaps between objects when rotated.

The first bone is the root (sometimes referred to as a “parent” bone) in the chain. It seems logical to assign the main torso or chest object to this root bone. Here I have linked the torso and the pelvis objects together.

When adding bones to symbols, the stacking order can often change based on the original design. To correct this, right click over the necessary symbols, go to Arrange and then select the appropriate action.

Next, constrain the rotation and translation for each bone. Select a bone and in the Properties panel check the Constrain boxes for each of these properties and use the hot text sliders to set each value.
3 Working downwards, I branch off from the pelvis symbol to both upper leg symbols. The pelvis symbol is important because it increases articulation while hiding any potential gaps between the legs and torso when rotated.

4 The lower portion of the character rigging is complete. Bones were added from the upper leg symbols to each knee cap, then to each lower leg symbol and then ultimately each foot symbol.

5 Continuing from the root bone, connect both upper arms, elbows forearms and hands. The final step in the armature is adding the last bone from the root to the head symbol.

8 By default, bone translation for the X and Y axis is disabled. When each translation is enabled, a bone can move along the X or Y axis to an unlimited degree. Select Enable in the Joint: X Translation or Joint: Y Translation section in the Properties panel. A two-headed arrow appears perpendicular to the bone on the joint to indicate that X axis motion is enabled. Adjusting the minimum and maximum values helps you control the position of the bone, especially when rotation is disabled as well.

9 Another technique I have been playing with is having the root bone start on a “ghost” symbol. A ghost symbol is not part of the character design. Its sole purpose is to separate the root bone from the actual character for even more articulation.
The Bone Tool is great for creating cool armatures that can be easily animated by articulating them. To create more realistic motion, you can control the movement of your armature by constraining its rotation and translation. For example, two bones that are part of an arm could be constrained so that the elbow cannot bend in the wrong direction. You can enable, disable, and constrain the rotation of a bone and its motion along the X or Y axis. When X or Y axis motion is enabled, a bone can move along the X or Y axis to an unlimited degree, and the length of the parent bone changes to accommodate the motion.

1. Insects make perfect Bone tool examples because of their segmented body styles. Here I have applied an armature using the Bone tool to one of the legs.

2. In its current state, the bone chain will allow each segment to rotate 360 degrees without any constraints or limitations. From an anatomical perspective, this may not be the desired behavior.

6. Repeat the same procedure for the opposite direction.

7. You may want to set different constraints for each bone within the same armature. For accuracy’s sake, it might be a good idea to do a little research and find out just how an insect like this one actually moves in the real world.
Select the root bone and in the Properties panel check the "Enable" and "Constrain" options in the Joint: Rotation category. Use the hot text sliders to change the value based on the amount of constraint you want for the root bone.

Rotational constraint is represented graphically by an arc at the end of the bone. Any adjustment to the value of the constraint will affect the arc and how much the bone can move in either direction.

You will likely decide through trial and error how much constraint to apply. Change the value, rotate the bone in 1 direction and check to see if the right amount of constraint has been applied.

With 4 different segments per leg, it can get complicated quickly. Setting rotational constraints should help keep each movement under control.

In addition to rotation constraints, you can also set constraints to the X and Y translation of each bone. This will set limitations on the amount of movement the bone has along the X and Y axes. In some situations you may want to set the value(s) to "0" to eliminate any movement along these axes.

HOT TIP
To limit the speed of motion of a selected bone, enter a value in the Joint Speed field in the Property inspector. Joint speed gives the bone the effect of weight. The maximum value of 100% is equivalent to unlimited speed.
Easing is always the icing on the cake for me when I am producing animations. It's usually the final step in my process. Once all key poses are created and Motion tweens applied, the final step is applying easing for that extra touch of realism. Easing is usually applied in 2 ways: easing in and easing out. Easing in calculates the rate of each frame so that the animation starts slow and gradually increases speed. Easing out is the opposite where the rate of speed is reduced as the animation plays. A perfect example of easing is when a ball is thrown towards the sky. Gravity's constant force gradually slows the ball down until it changes direction, returning to Earth with a gradual increase in speed. With easing, you can adjust the rate of change to the values for more natural or more complex animation.

Using an image of a crane is about as basic as it gets. The armature consists of only 2 bones since all we need to move is the cable with the ball attached. The animation requires that the ball travels back and forth much like a pendulum. To imply gravity we need to apply an ease in and an ease out for each direction the ball moves. Position the ball to the far right or far left in the first keyframe. Move the playhead to the middle of the span and position the ball in the opposite direction. **Ctrl** + click the first keyframe, right click and select Copy Pose. **Ctrl** + click the last frame and right click and select Paste Pose. You now have a swinging ball on a crane that loops back and forth seamlessly.

To add the easing, select any frame between the first 2 keyframes. In the Properties panel use the Ease drop down menu to select Slow and Stop (Slow). Adjust the easing strength to -100 using the hot text slider. You can also click on this value to select it and type in “-100”. Repeat this same procedure for the 2nd half of the armature span.
Here's a slightly more complex Bone armature involving a cartoon figure with a head and 4 limbs. I used an extra symbol that was not a part of the character's design for the root bone to be attached to. You can see this root bone start between the character's feet. The concept here was to assign the root bone to an object not integrated into the character's design. This allows for all of the character's symbols to be assigned non-root bones, allowing more articulation.

Once all the key poses have been created, all that is left to do is to add some easing from pose to pose. This helps create a more natural movement for the character. Just like with the crane example, select any frame between the keyframes and in the Properties panel use the Ease drop down menu to select a preset ease. Adjust the easing strength to -100 or 100 depending on your needs. If you want the preset to ease in, then use a negative value. A positive value will apply easing out to the animation. The value refers to the strength of the ease.

HOT TIP
The Motion Editor does not support IK spans. Therefore, you can not apply custom easing to armatures. The only easing for IK armatures is the presets available in the Properties panel. Having the ability to create custom eases and possibly edit the property curves of an armature span may be a valid feature request for a future version of Flash.
Bones are not limited to symbols. You can apply a bone armature to a single shape. The difference between symbols and shapes when working with the Bone tool is, you can add multiple bones to the interior of a single shape. This is different from symbols because you can have only one bone per instance. Once bones are added to the selection, Flash converts the shape and bones into an IK shape object and moves the object to a new pose layer. Once a shape is converted to an IK shape, it can no longer merge with other shapes outside the IK shape.

Manipulating a shape with an armature can produce more organic looking animation. Case in point, here I need to animate the tail of a cat waving back and forth. With the Bone tool I am able to quickly and easily produce a very natural and realistic looking tail-like motion.

Before applying a bone structure to the tail, it is best to start with the tail drawn without any curves. The reason is, if we start with a curved tail and apply the bone armature, then it becomes much more difficult to curve the tail in the opposite direction without the integrity of the shape becoming compromised. A straight position is neutral and can be easily manipulated in either direction. For this animation we will make the tail move from left to right in a whip-like fashion.

We want the tip of the tail to have the most flexibility and the bottom of the tail to be the most rigid. The root bone is the very first bone created in the chain and all subsequent bones are its children. Select the Bone tool and drag inside the tail shape from the very bottom in an upward direction. Once the root bone has been applied, Flash will automatically place the shape in a container called an IK shape object. This new object is automatically moved to a new pose layer.

Insert several frames in the armature pose layer and then move the play head somewhere in the middle of the span. Articulate the tail in the opposite direction simulating an “S” curve again. Use your best judgement as to how much curve you want your tail to have. There are no rules here when it comes to artistic license.
3 Continue adding bones to the shape, working your way upwards until the entire armature spans the entire tail. What may be the most important detail of this technique is making each bone slightly shorter than the previous bone moving up the tail. The reason for this is to allow the tail to become more articulated towards the tip. If you were to create longer bones towards the tip, articulation would suffer and you would end up with severe 90 degree bends instead of several softer bends representing a more curvy tail overall.

4 Once the armature is complete, position the tail in the desired starting shape in frame 1. Here I have grabbed the tip of the tail and articulated it into an “S” curve.

6 The key to creating a realistic wavy tail is to add a little secondary animation. Place the play head a few frames after the initial starting pose and curl the tip of the tail in the opposite direction it is traveling in. This provides more of a “whip” effect as the tail begins to change direction.

7 To make this tail loop seamlessly, +click frame 1 and then right click over it. Select Copy Pose.

HOT TIP
You can also add bones to shapes created in Object Drawing mode.
Motion techniques

Bones and shapes (cont.)

8 +click the last frame in the armature span and right click again. This time select Paste Pose.

9 Next, add the secondary animation as we did in step 6 by placing the play head a few frames before the last frame and creating a more dramatic curve in the opposite direction the tail is moving.

12 Create a new symbol in the Library using the drop down menu in the upper right corner of the Library panel. The symbol can be a Movie Clip or a Graphic symbol but for this example I recommend Graphic behavior so you can see the animation inside the Flash authoring environment.

13 Once the symbol is created you will be inside this symbol and ready to add the armature you copied earlier. Right click over the stage area and select Paste. The entire armature and its animation will now be nested inside your new symbol.
10 Without easing, the tail feels too rigid and mechanical. Select any frame between the first 2 keyframes and from the Properties panel select an ease preset using the drop down menu in the Ease category. To ease in and then out between these 2 keyframes, set the strength of the ease to a negative value using the hot text slider. Repeat this step for each keyframed pose.

11 In most situations you could consider the animation complete. For all intents and purposes it is, but for this particular character I want to make sure the tail animation is as visible as possible. Therefore I want to Motion tween it back and forth along the X axis. To do this, it is best to tween the entire tail animation inside a symbol. Right click over the tail armature and select Copy.

14 Navigate back to the main timeline and create a new layer below your character. Drag an instance of the symbol containing the animated tail to the stage and position it relative to the character. The tail animation starts with the tail pointing to the left, so favor the left side of the character when positioning the symbol. Right click over the symbol and select Create Motion Tween.

15 Scrub the timeline and watch the tail animation reaches the halfway point where the tail is pointing to the right. Hold down Shift and use the right arrow key to position the tail symbol towards the right side of the character. Copy the first frame of this Motion tween and paste it into the last frame creating a seamless loop. Now the tail is comprised of 2 simultaneous animations.