Finding Closure with 3M Command Adhesive Strips

by Steven Prins

The closure of tears is a procedure often required in the repair of damaged paintings on canvas. In the following pages a novel method of closure developed over the past five years in the conservation studio of Steven Prins & Company is described as a practical guide for its application by other conservators. The technique makes use of tractors (tensioners) and stators (stabilizers) made in the studio from readily available materials: 3M Command Clear Adhesive Strips and 2-mil (0.002") clear polyester film. While this article describes a protocol developed specifically for use in the repair of torn canvas, the materials and methodology can also be applied to repairs of other materials where temporary traction and/or stabilization are required.

Background

Many readers are no doubt familiar with 3M Command Adhesive Strips (CAS). They are widely used in a variety of applications and contexts where reversibility without adhesive residue or damage to either substrate or adherent is desirable. They are essentially double-sided, pressure sensitive tape tabs that reverse by elongation of the carrier.

The technology is based on a proprietary, fairly aggressive, pressure-sensitive "rubber" adhesive capable of forming strong bonds with high shear strength and low tensile strength when used with appropriate substrates and adherents. Elongation of the carrier results in tensile failure of the bond to both substrate and adherent. Consequently, the adhesive remains on and is removed with the carrier.

This technology greatly reduces, if not completely eliminates, the likelihood of damage to the substrate posed by peeling of other pressure sensitive adhesive tapes. It also proves to be far more convenient in day-to-day use than other adhesives that might be used for the temporary attachment of secondary materials to canvases and/or painted surfaces, the removal of which require heat or solvents, i.e. BEVA 371, or water, i.e. glue/paste. It also greatly reduces, if not alleviates any risk of adhesive residue left on/in the substrate after removal.

The use of CAS in tear repair is not entirely novel. Their German equivalent, Tesa Powerstips (white foam), were used by Winfried Heiber for the temporary attachment of tapes and tensioners in his pioneering work on tear repair in the late 20th and early 21stcentury for these very reasons.

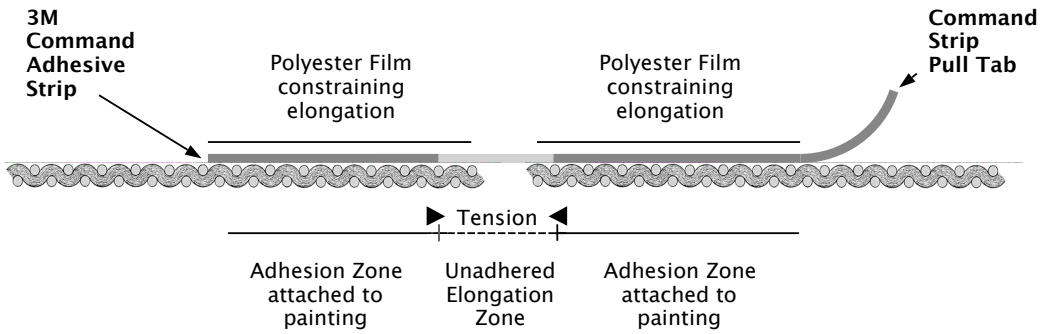
Through practical workshops led by Heiber himself during his lifetime (d. 2009) and perpetuated by his protégé Petra Demuth, and summarized and illustrated in *The Conservation of Easel Painting* (2012), his methodology has been widely disseminated in America, where 3M's CAS superseded the German Tesa brand.

It was in the course of experimenting with Heiber's materials and methods that the author came to wonder if, rather than simply acting as a reversible adhesive for the attachment of tensioners, the elastic properties of the CAS itself could be exploited as the source of traction across the tear? A simple test was carried out, and it turned out that a CAS stretched between two taborets in the studio retained sufficient elasticity to contract and actually move the two pieces of furniture together.

This empirical observation motivated experiments which led, after various refinements and adaptations, to the technique described here. However, the basic principle remains the same: a sufficient number of prepared strips are stretched across a tear to gradually pull the edges together.

This technology has become the default method for tear closure in the studio at Seven Prins & Company. Chief among its observed desirable characteristics are:

- Use is simple, straightforward, and expeditious.
- Low risk of damage to supporting fabric or painted surface when properly deployed.
- No adhesive residue, no use of solvents or heat.
- Exploits common, readily available materials.
- No additional mechanical devises are required and nothing else need be attached to the painting to effect necessary tension.
- All attachments are in close proximity to area of the damage
- Treatment is generally carried out with the canvas on its stretcher, making it easier to alternate working from the front or the reverse.
- The thinness of the CAS means the presence of tractors/stators on the obverse generally will not affect the ability to work with the canvas on a solid support, i.e. face down on a table or blocked up from the reverse.



Preparation of the CAS

The preparation of CAS tractors and stators is simple and straightforward. It entails the application of non-elastic backing to one side of a CAS. For general use in the studio we prepare them in bulk from medium-sized, clear CAS sheets.

1. Remove the release paper from one side of the CAS.

While one can work with a single strip, it's more practical to do full, or even multiple, sheets at one time.

The polyester film can be applied to either side of the strip. The adhesive area on the blue side is slightly smaller than the black. Attaching the polyester film to the blue side provides a larger adhesive area in contact with the substrate during application and use; applying it to the black side allows greater control during removal.

2. Attach polyester film to the adhesive side.

The non-elastic backing provides the important function of preventing elongation and release of the CAS while in use.

The backing can be any dimensionally stable sheet material, i.e. paper, Hollytex, etc. However, in practice 2-mil (0.002") clear polyester film is almost always used in the studio as it provides visibility of the substrate during application, progress of traction and union, and adhesive release during removal. 1"-wide strips, which work well for Medium-size CAS, can either be hand made or obtained in 500' spools from University Products.

For the stators, used to secure closures, a single continuous backing is applied to the entire adhesive area.

For the tractors, two parallel strips of film are applied across the strip / sheet(s), leaving a small break/gap between the two. This gap will allow for localized elongation and contraction, creating tension across the tear. For general use, the size of the gap between the polyester strips is generally small: less than 1/16". However, a larger gap is often desirable to span a larger tear without effecting too much tension.

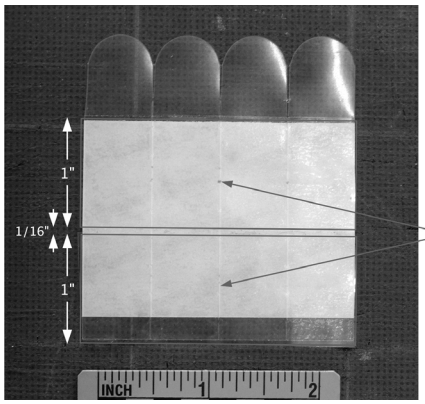
When applying the film start at the center, swipe outwards across the polyester with pressure sufficient to establish an initial bond between the film and the CAS sheet while allowing for extrusion of any entrapped air pockets. Any excess polyester film at the edges should be trimmed flush with the CAS.

In practice strips are seldom used in their full width, but cut into halves, thirds, and even quarters depending on the size and characteristics of a particular tear, the degree of traction required, and the specific topographical features encountered on a given substrate.

3. Securing the adhesion.

After initial attachment of the films, the strips should be placed under weight for at least 30 seconds, the time recommended by 3M to form a durable bond.

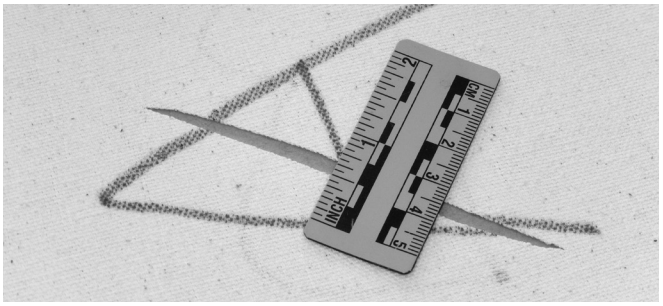
The finished sheets will look like this:



Application

The application of CAS tractors is also simple and straightforward. One half of the tractor is adhered to one side of the tear, the strip is stretched out across the gap in the canvas and the other half is secured to the opposite side of the tear. The elongation of the adhesive carrier results in elastic tension between the two halves of the strip, resulting in traction across the tear.

A small mock up was prepared and is presented by way of illustration.



Step by Step

1. Prepare strips.

Cut a number of strips for use, the width and count to be determined by the size of the tear and the surface characteristics of the substrate to which they are to be applied. A number of smaller strips is often more advantageous than full-width strips. Narrower strips are easier to work around and under where the tractor spans the tear. When the strips are applied to the face of the painting, narrow strips often make it easier to accommodate the irregular topographical features on the painted surface.

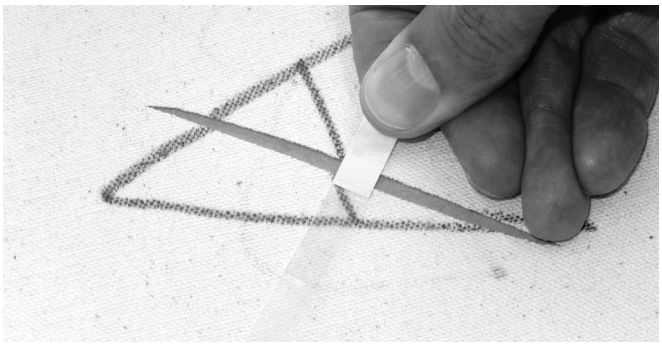
2. Peel back release paper and position strip.

Peel the release paper back from one end of the strip, and fold it back on itself just beyond the gap in the polyester. I usually peel back from the tab end. It is easiest. Generally, it makes little practical difference, unless one has to trim a tractor to accommodate some topographical feature on the painted surface or other previously attached tractors. In this

case, the trailing end of the tractor, opposite the pull-tab, is trimmed and applied first. **Under no circumstances should the pull-tab be trimmed or removed.**

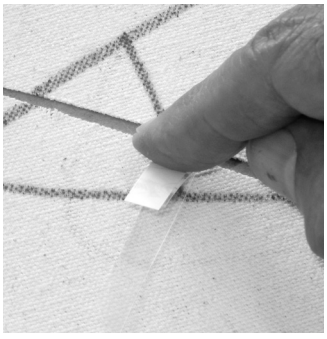
With the strip oriented so that the unexposed adhesive side extends over the gap, the exposed adhesive side is set down on one side of the tear with the leading edge of the polyester film as close to the edge of the tear as is comfortable. Apply brief pressure to establish the initial bond.

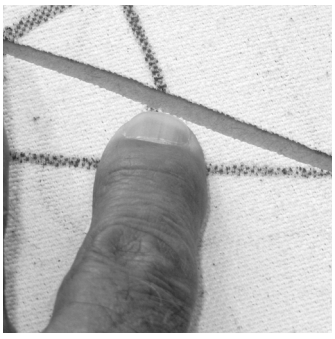
If applied to the painted surface, the polyester should not overlap fragments of paint and ground that might require manipulation during the closure process.



3. Secure one half of strip.

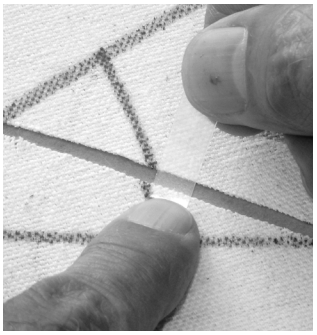
Once initial contact has been made, the tractor strip is folded back on itself, so that the release paper is on top, and the strip placed under pressure for 20-30 seconds. It is helpful to apply the pressure with a fingertip oriented so that full pressure is exerted on the folded edge of the Tractor strip. This optimizes adhesion of the CAS to both segments of polyester film at the points of most likely potential detachment in advance of elongation.

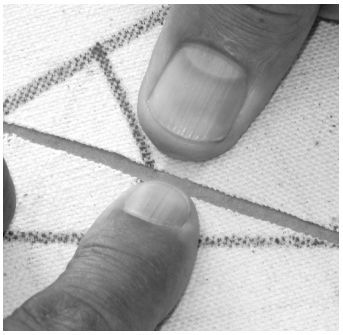




4. Elongate and secure other half of strip.

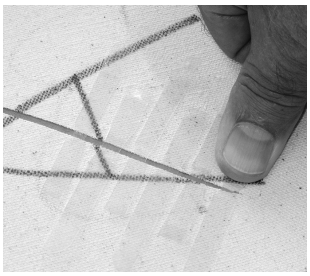
Once the first side is secure the remaining release paper is removed from the tractor. Securing the attached side with pressure at the leading edge to minimize elongation and detachment beneath the polyester film, the free end of the tractor is gently pulled, as much as possible in the plane of the canvas, until it has elongated across the tear to a point where it can be comfortably secured to the opposite side. Pressure is applied along the entire length of this end of the tractor for 30 seconds to form a strong bond to the substrate.

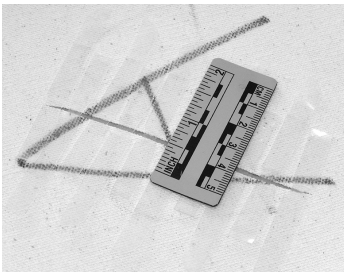




5. Finish application of strips.

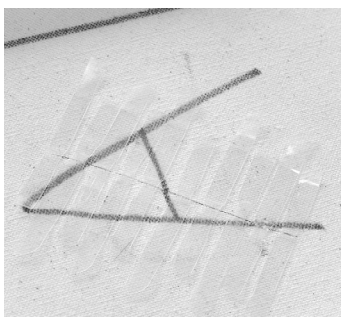
This process is repeated until tractors have been placed along the entire length of the tear. Often, as traction is applied in the course of application, the tear will close significantly, almost by half in this instance, by the time the process is complete.





6. Allow time for tear to close.

The painting is then placed upright and left overnight. The next day, if one is lucky, the tear will have miraculously closed itself. If one is less fortunate, the process is repeated as necessary, achieving incremental steps in each round until satisfactory results are achieved. In practice, with large or complex tears two or three bouts may be required, as well as numerous local adjustments.



At this point the closure can be secured on the opposite side of the painting (recto/verso) with 3M CAS stators, as described above, or stout tissue paper facing, BEVA Band-Aids, etc. One can then remove the tractors and proceed with further refinement of the repair of the painted surface and/or the mending of the canvas.

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Additional notes based on the author's experience

The tractors can be applied to either the recto or the verso of the painting. In practice it is often done alternately on both. Which and in what order is a matter determined by the nature of the painting and requirements of the damage, and the preference of the practitioner acquired with practice and experience. However, initial closure is often achieved with tractors applied to the painted surface, leaving the canvas on the obverse open to unencumbered mending.

The use of heat for thread-by-thread repairs will not affect attachment of tractors (or stators), provided that it is confined more/less to the ruptured portion of the canvas where the tear is spanned by an unsupported length of the CAS. Heating farther afield, above 125ºF, may cause adhered portions of the tractors to release.

Caveat: Before use on any painted surface the ability of the substrate to withstand the application and removal of 3M CAS should be determined by careful testing in a representative, preferably discrete location. Friable surfaces may need to be consolidated before treatment. In the area of the damage, fractured paint and ground should be consolidated and stabilized as necessary to prevent further damage or loss. In some instances it may be necessary to move the points of attachment back from the edge of the tear, beyond the zone of proximate damage to the painted surface.

Dislodged fragments of paint and ground along the tear should be restored to their original location and secured as necessary to provide for the most effective, seamless union of the two sides of the tear as they come together. Initial relocation and stabilization is often augmented by mini- or micro-facing to secure and safeguard damaged areas during traction.

When applying tractors / stators to canvas, especially older canvases with friable surfaces, it may be advantageous to size the area of attachment beforehand to assure a secure bond. As seen in the case of the mock up, this is not generally necessary with relatively recent canvases encountered on modern paintings.

It sometimes happens that the canvas does not properly align after the first traction treatment. This can be resolved by placing tractors at appropriate angles to correct translation along the tear, either augmenting the initial tractors as necessary or in subsequent rounds of traction.

The order in which the tractors are applied can make a difference in both the effectiveness of traction and the correction of distortions in the damaged canvas. Heiber has suggested that starting at the center where the opposed threads often remain parallel, if not properly aligned, and working out towards the ends of the tear, where one often encounters some Gaussian distortion of the weave, may be preferable as far as reversal of distortion in the weave and minimizing puckering at the termini of the tear. On the other hand, by starting at the ends of the tear and working inward, each added Tractor supplements the traction of the former, and closure proceeds more rapidly and effectively.

How one applies each tractor seems fairly arbitrary. However, I tend to alternate the direction of the tractors and the side of the tear to which each is attached first so that one is alternately tensioning from one side to the other, both in application and removal.

Likewise, which end of the tractor gets peeled and set down first is a matter of preference. My own has come to be to peel down from the pull-tab and apply this side first. It is simply easiest. However, there are exceptions, in which it is necessary to cut the tractor down to fit in some confined space. In such instances the blunt, trailing end of the tractor is cut to length and the short side is set down first. Under no circumstance should one ever remove the pull-tab.

Some elongation and release behind the polyester on the side being drawn out, and sometimes on the secured side as well, is normal and unavoidable, but does not adversely affect the effectiveness of the tractor. One simply elongates until one feels that sufficient tension is attained, which sense only comes with some practice and experience, and varies from painting to painting.

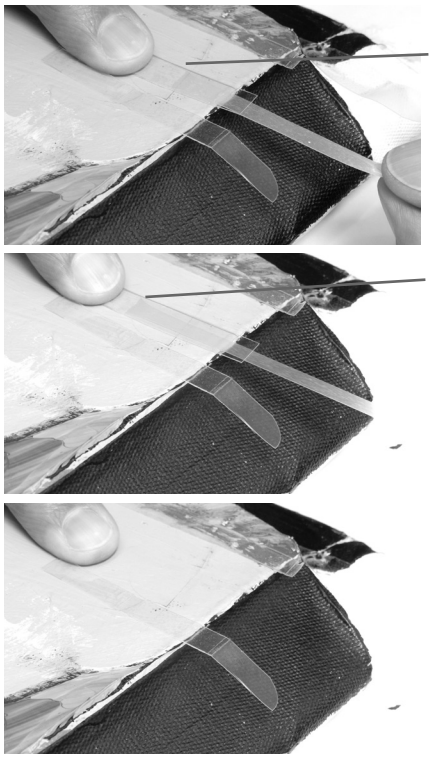
One should not overestimate the amount of elongation or tension required. Especially on larger paintings, where the tension on the canvas is widely distributed, it is easy to overestimate the traction required, resulting in tenting or overlapping where the opposed edges of the tear have butted up together too forcefully.

Removal

The removal of CAS tractors is also, not surprisingly, usually simple and straightforward. In essence they are removed in exactly the same manner as any other 3M CAS: by pulling steadily on the tab provided, the CAS elongates and the adhesive releases.

If the mend is not finalized, it is necessary to otherwise secure it before removal of tractors or the lateral tension on the CAS might undo the closure. The closed tear in the mock up was secured on the verso with a large size CAS stator before removal of the tractors.

Another benefit of using the clear strips and clear polyester film is the ability to monitor the progress of the release as it proceeds along the CAS with elongation. As one pulls on the strip, the polyester backing will start moving and one will also see the line of release in front of the adhesive moving away from the tear. This procedure is repeated with each tab until they are all removed.



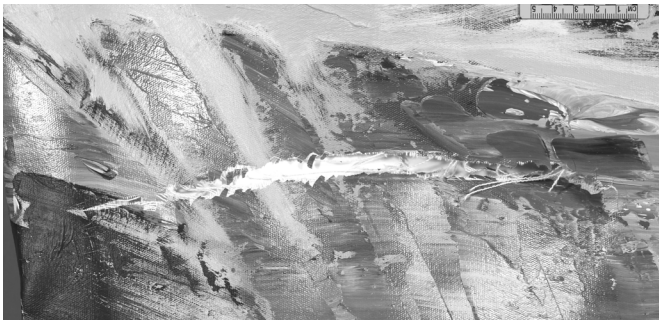
I have yet to encounter an instance in which, if the surface of the substrate was properly prepared and the tractor / stator judiciously applied, the CAS ever failed to release as intended. This is probably due in no small part to the usual small scale of the pieces being bonded. In case of the tractors the greatest contiguous length of adhered interface is usually 1". So, on the rare occasion that a CAS tears / breaks before complete release is effected, the leading piece of polyester can be removed and the exposed CAS used as a tab by which to pull, elongate, and separate the remaining portion of the tractor.

In the event that the tab or the CAS breaks in such a way that some portion of the CAS is not accessible, the adhesive can be released with heat. CAS "Temperature Resistance" reported by 3M in their published literature is 15-120ºF (-10-50ºC), with a caveat that "Adhesive could soften and lose adhesion above 105ºF (40ºC)." Thus they can be removed with a warm tacking iron at temperatures that would not be expected to adversely affect other thermoplastic, hot-melt adhesives in general use in painting conservation.

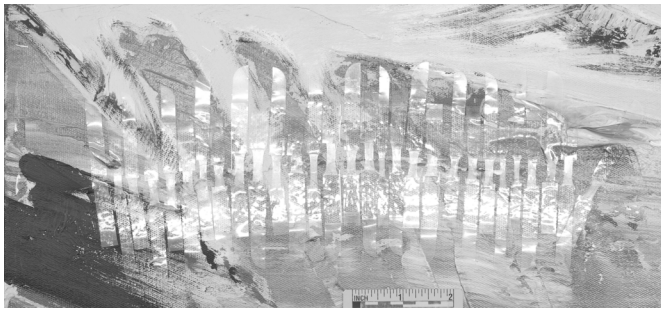
Alternatively, 3M also warns that the adhesive is "not for use in wet environments." This characteristic is exploited to release any undesirable adhesion of a CAS where it spans a tear under tension by simply introducing water beneath the elongated portion of the tractor. It might also be used to induce failure of the adhesive to remove a tractor in an emergency. However, aqueous reversal has not been tested to date. It obviously poses potential risks of damage to any paintings comprised of water sensitive materials and should only be attempted as a last resort after thorough and cautious testing on a case-by-case basis.

Practical Example

The efficacy and effectiveness of this technology is illustrated with images of its actual application on a 12-inch tear in a 44" x 96" canvas.



Tractor arrangement at the end of round three of traction, in which final adjustments are being made to the painted surface before final fixing of mend on verso.



Area of damage after treatment, raking (oblique) light.

Resources

3M Command Adhesive Strips: The Binding Source (bindingsource.com)
Command™ Clear Medium Refill Strips 17021CLR - 9 strips/pack - Refill and Mounting Strips
Command™ Clear Small Refill Strips 17024CLR - 12 strips/pack - Refill and Mounting Strips
Command™ Clear Assorted Refill Strips Value Pack

Clear Polyester 2 mil 1" x 500' spools from University Products (cat #415-0010)

References

The Conservation of Easel Painting (2012): Stoner, J. H., & Rushfield, R., eds., Routledge, London, 2102, pp. 384ff.