

T10 2024



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www.facebook.com/p/Chicago-Yacht-Rigging-

<https://www.youtube.com/@kristianmartincic3011>

Rope

Cordage Construction

- **3 strand-twisted rope** : Usually Nylon or Polyester

dock lines, anchor lines



- **Double Braid rope**: 2-Layer construction

Polyester or high modulus fibers

Braided cover over inner core

Core usually takes load, cover for handling



- **Single Braid rope**: 1-Layer

Not for handling, used with added cover



- **Single Braid blend**: 1-Layer, blend of load carrying and handling fibers



Polyester

- Traditional sailing rope
- Moderate stretch and strength
- Good value
- Long lasting



EX: 5/16" polyester: 3000lb break, 1.8" % stretch, 1.40c / foot

- Tip: Polyester floats, feels “fluffy” and will burn/melt when exposed to flame.

Dyneema



- Ultra high molecular weight polyethylene
- Extremely strong
- Dyneema is the toughest and lightest fiber
- Usually used in high-tech single braids, or as core
- Used in racing and cruising as an all purpose high-tech line
- Dyneema and Spectra are trade names for the same type of fiber
- Ex: 5/16" double braid Dyneema: 7000lb break, .3% stretch, ~\$2.99 foot
- Creeps, which means that if left under constant load for long period of time, will appear to stretch
- Tip: You can tell a Dyneema line in several ways: it floats, it won't burn but will "curdle" and melt, and it feels extremely slippery. The line is naturally white, but can be color-coated.

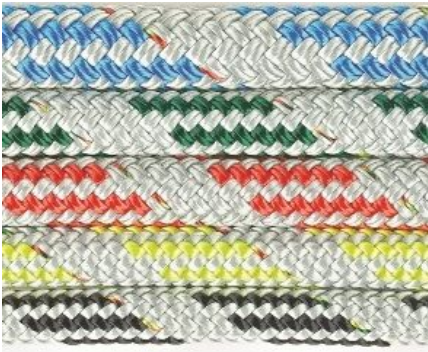
Vectran



- Came into use as reaction to “creep” in Dyneema
- Very low stretch, zero creep
- Very strong, slightly heavier than Dyneema
- UV resistance is low, so the line must be covered, or coated
- Ex: 5/16” double braid, Vectran core, 5500lb breaking strength, .4% stretch, ~\$2.99/ft
- Not as tough as Dyneema, will not tolerate sharp bends (do not ring hitch!)
- Naturally gold/yellow, can be color coated, but coating wears relatively quickly (can dip)
- How to tell Vectran fiber: Gold, or gold color visible under coating. Wont melt, but will blacken edges. Sinks. Feels stiff and wants to straighten out

Blends

- Combine high tech and low tech fibers
- Good for boats that need a bigger line than necessary
- Good for boats that want upgrade without full high tech price
- Cost between Poly and Dyneema
- Blended together fibers like vectran, Dyneema, Technora with fibers like Polyester, Polypropylene, Polyolefin.
- Names are New England VPC, T900, Alpha Ropes Top Cruiser MAX, Samson MLX...



PBO

- Grand prix only!
- Lowest stretch and highest strength fiber
- BUT... sensitive to light, water, particulates... most other things on boats
- Reddish gold, will not burn or melt
- Ex: 5/16 double braid, PBO core, \$14.20

-



Why PBO isnt for all...

3 Years old, rated at 17.5k



Heat Set Dyneema

- Treated Dyneema, addresses constructional stretch problem
- Stretched to approx 50% break load and heated to just below melt
- This takes initial stretch out of rope, and aligns fibers on molecular level
- PBO-like performance, with Dyneema durability
- EX 5/16" double braid HSR core, 10000lb break, negligible stretch, 3.06/ foot
- Recognize Heat Set Dyneema by very stiff handling and firm braid with tightly angled strands
- Marlow MAX, New England HSR, Alpha Ropes XTM, Dynice DUX



Dyneema Blends

- Blend of Dyneema and other fibers like Technora, Cordura, Polyester, PBO, Technora
 - Dyneema gives low stretch and high strength
 - Nylon/Cordura gives great grip, Technora adds grip
- And durability, PBO adds durability, Polyester adds color
- Handles well, runs through blocks fast
 - Great control line and sheet
 - Single Braid (SSR, Swiftcord, Salsa)
 - Double Braid (SSC, Superswift, Excel Matrix/Fusion)
 - Ex: Alpha SSR 5/16" 4700lb break, 2% stretch, \$3.10





ROPE	Stretch @1000lb	Stretch @ 1000lb 2	Stretch @ 1000lb after 2000lb load
Yale Vectrus	55.25	31.37	26.99
Marlow MAX SK78	21.64	19.52	11.64
Alpha Ropes D Core XTM 78	24.32	17.53	9.78
New England STS78	29.9	22.93	14.33
New England HSR	20.35	14.42	8.84



ROPE	LENGTH CHANGE IN MM	REMAINING LOAD @ 45 MINUTES
Yale Vectrus	0	978
Marlow MAX SK78	0	982
Alpha Ropes D Core XTM 78	0	982
New England STS78	0	980
New England HSR	0	986

Covers

- “Standard” cover for most lines is Polyester: cheap, handles well, moderate grip and toughness
- Add higher tech covers to improve abrasion resistance, toughness, heat resistance and grip
- **Technora, Vectran, PBO** offer varying levels of **grip** and **heat** resistance
- **Dyneema** covers add **toughness** and slickness to ropes, great **chafe** guard



SEM Picture of LCP filament

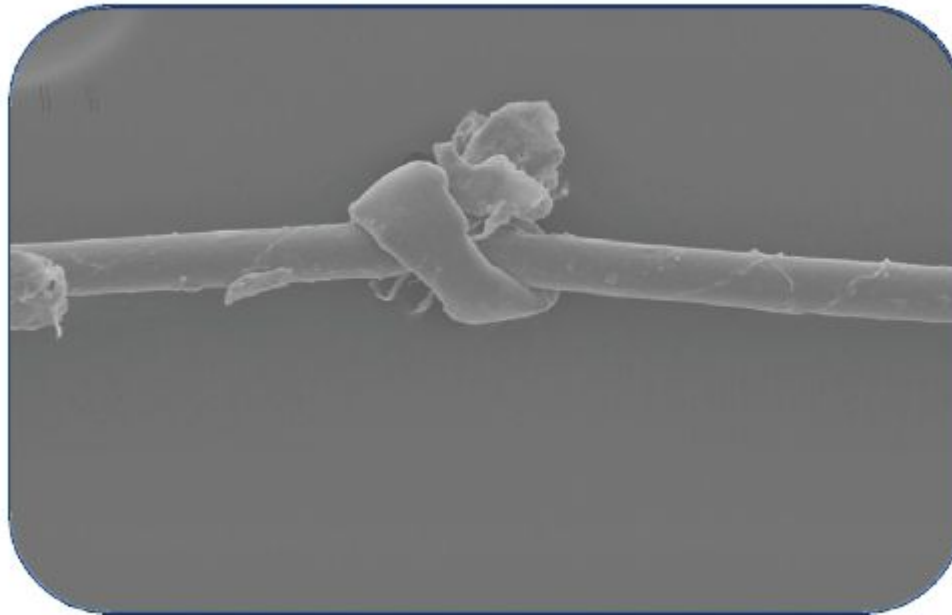


a **DSM**Brand

Confidential Information

 **Dyneema®**

SEM Picture of Aramid filament

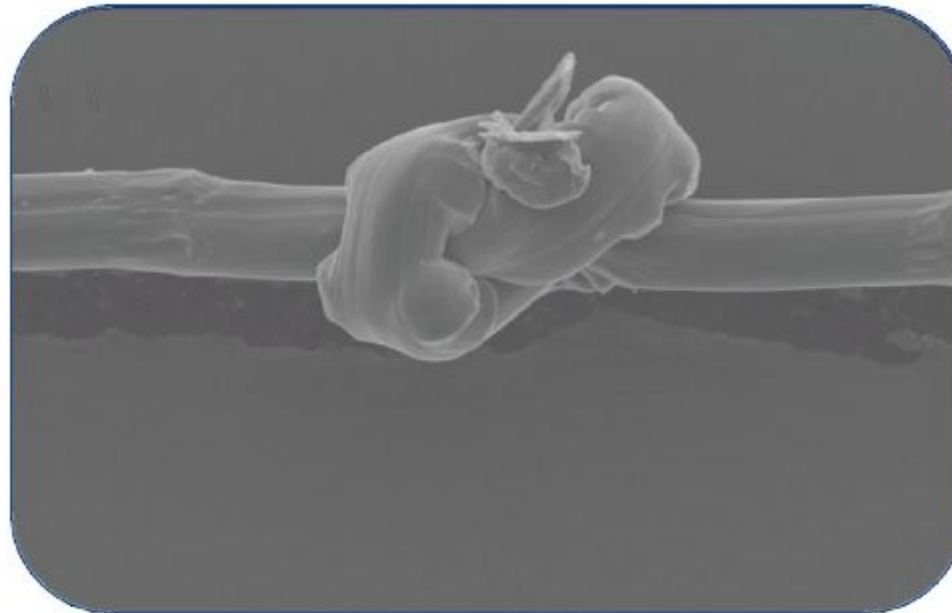


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SEM Picture of PBO filament



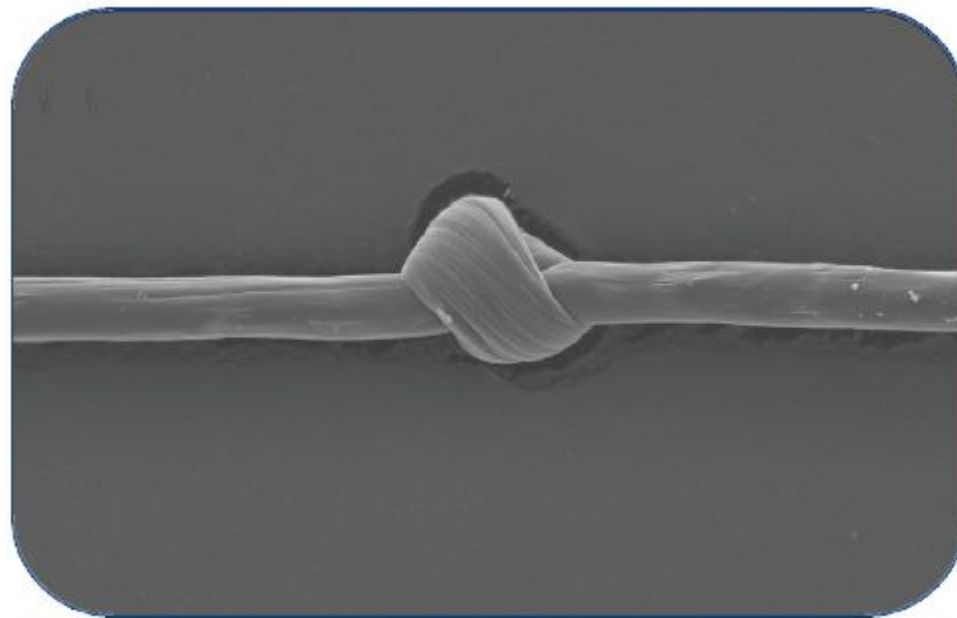
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SEM Picture of Dyneema® filament



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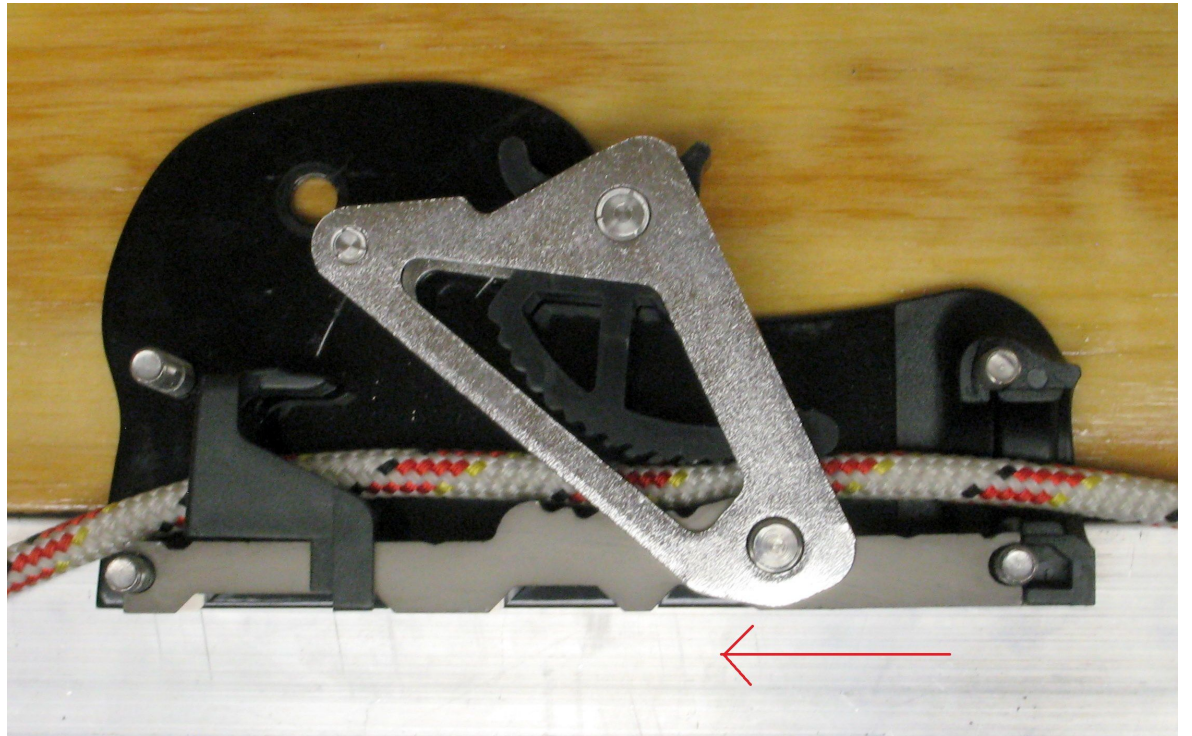


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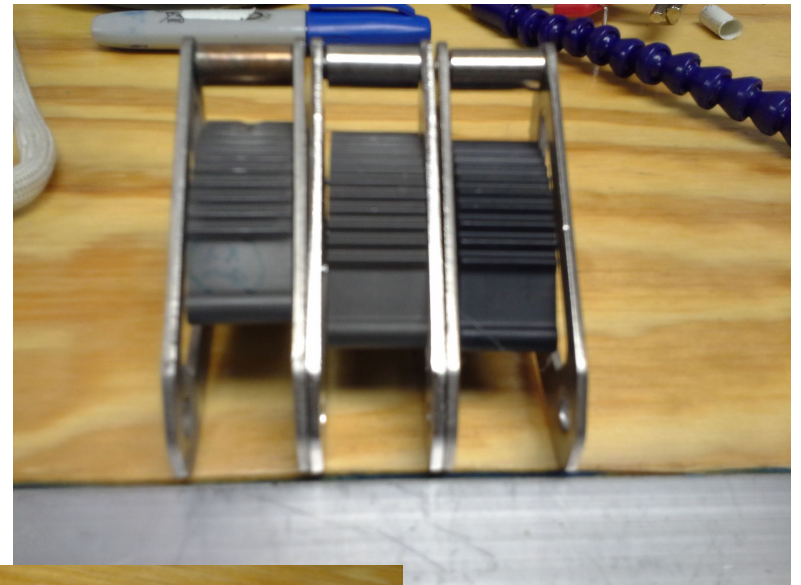
Clutch Slip

-All clutches and jammers slip: how they work



Size and Condition

- Rope should be at top end of rope size range for cam
- Cams must show no wear



Which Clutch?



Racing Over 35' Spinlock XX

Racing Under 35' Spinlock XTS/XCS

Option for less wear: Ronstan Constrictor

Slip Test

Testing with 10mm Poly Tec

Clutch	Remain after release (kg)	Release Loss (mm)	Return to 500kg in mm
XX	102	5.33	8
XTS0610C	76	6	12
Constrictor	66.33	8	14.66
XTS0610	36.33	7.33	15
Lewmar D2 10mm	44.33	16	17.33
Antal V Cam 0814	37	22	18.66

*Also tested with V100; results were universally worse but clutches still performed similarly relative to each other

Clutch Slip: Rope Factor

-Use higher quality line: V100 slipped less than Crystalline: truer size, firmer rope



-Use specialty cover: Poly Tec had ~20% less slip than v-100 in same size



-Make the rope firmer and right size: add internal or external bulk



T10 Standing Rigging

- Class rules mean few options for setup (good 1D)
- Above-deck shroud conversions:
 - Seal deck/replace rotted core
 - Hand tension only for tie rods before mast up
 - Re-use old shrouds? It depends...
- Required:
 - New shroud/shortened shroud (chance to set shrouds right length)
 - New 1/2" open-body turnbuckle
 - 1/2" right hand thread toggle jaw

T10 Standing Rigging Replacement

-No universal answer

-Based on age and inspection, should check every year, deep inspection every 5/40k mi

-Inspection should check:

- Wire: breaks, kinks, corrosion
- T-balls: can crack in “armpit” of fitting
- Swage fittings: check for cracks in barrel or corrosion at entry



-Remove taped areas, check/prevent corrosion. Stainless needs air!

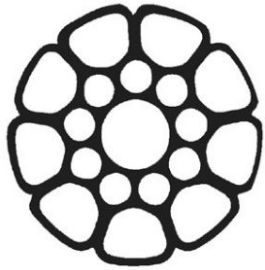
-Backstay legs are high wear: make sure toggles at bottom!

Ok, seriously, when do I have to replace it?

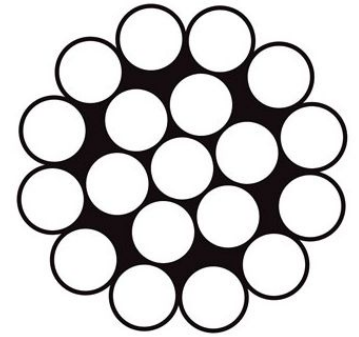
We can use general guidelines to estimate life, adjusted by local environmental factors and sailing conditions. Assume a baseline “average” of 10 yrs for a raced boat

- Low salinity, low temperature extends the service life
- Light air
- Short season
- Shroud loads: tuning to 46 on Loos B means you're at 35% of the wires breaking strength. Recommended max is 25%
- T-Ball fittings: prone to failure before other fittings
- Wave size/amplitude higher than average





The Dyform Debate*



Dyform is wire rope with polished and compacted strands.

Stronger, stiffer, less stretch, longer lasting, more expensive, requires specialty swaging

[illegible]

- CYR recommendation: Dyform forestay only
- Forestay is wrong size
- 7/32" 1x19 is ~5800lb break, SWL ~1160lbs
- T10 Upper Shroud Loads can exceed 2200lbs at tuning guide tension, PLUS mainsheet load, PLUS backstay load...
- Would be safer with stronger wire, toggle
- T-ball fitting angled for shrouds, not forestay. Need wider angle tball.



- 1). RE: Standing Rigging; How frequently does one have to "check" the tension ("tune") one's vessel's Standing Rigging?
- 2). Is it possible/advisable to "tune" one's Standing Rigging on one's own using available "tuning gauges" (proper name?), linked to the "turnbuckles"; especially how frequently as well as "how tightly?"
- 3). How difficult is it to "tune" one's Standing Rigging? (I believe I've seen the gauge for tuning the Standing Rigging; it doesn't seem to be so sophisticated a job?).
- 4). I've heard/understand (from a Florida-based, Ocean Harbor's Repair Shop personnel), Standing Rigging, even "anything" of "stainless steel" in salt water areas; (even when "stainless steel"), has the tendency of becoming destroyed (breaking periodically) by the "salt water" atmosphere in "Ocean-going Vessels?"
- 5). Is there anything able to be added (painted onto?; oiling the Rigging?) to the Standing Rigging in order to prevent this "salt water caused destruction of Standing Rigging?"
- 6). How does one "locate"/"measure" the strength/weakness (from "salt water" use of a sailboat) of Standing Rigging?

- 7). How quickly does the "salt water destruction" of Standing Rigging occur to a typical vessel (with "new" Standing Rigging)?
- 8). Is it always necessary for Standing Rigging to be "metal?"
- 9). Is it allowed/advisable to have Standing Rigging as "other" varieties of material aside from "metal," e.g., "some sort of 'tarred'/'non-tarred' heavy gauge rope" as on "older vessels" (Centuries ago?) for one's vessel's Standing Rigging?
- 10). Given "Heavy Thunderstorms," especially "Electrical Thunderstorms" (should one be accidentally caught in one; even more importantly, "in the harbor" where it's more likely to have a "lightning bolt" strike the tip top"); is there some mechanism available akin to a "lightning rod" at the "tip top" then able to be "run to the waterline" through rubber grommets without contacting the hull of a vessel? (This would theoretically prevent hull damage by Electrical Storm's strikes).
- 11). Regarding shackles/blocks (especially given the above described "salt water" problems), is there any variety of shackle/block more well suited to "Ocean Sailing?"
- 12). Does one need to "re-bed" Standing Rigging's "bedding?"
- 13). Should the answer be yes, how frequently?
- 14). Given the above knowledge/wisdom, should a "Sweet Water (Fresh Water) Sailer/Boat Owner," never buy a "Salt Water Vessel?"
- 15). Is it expensive to change a "salt water vessel's entire "Rigging" (Standing, Running) upon buying a saltwater vessel when moved to Sweet Water?

1. What is the correct spreader angle to a shroud? i.e.: Should it bisect the angle of the shroud or be 90 degrees from the mast.
2. If spreaders should bisect the angle of the shroud, is there a formula to calculate the exact point on the shroud?
3. My Catalina 380 masthead rig is a two spreader, non-bending mast with 5/16" 1x19 rigging except for the Intermediates that are 1/4". Percentage wise, how tight should the forward and aft lowers be vs the Uppers and Intermediates?
4. How much headstay sag in heavy conditions is considered normal? (It always seems to have excessive sag.)
5. Should a rig be relaxed when wintered on the hard with mast up?
6. Do you have any tuning tips for a Hunter 37 Legend, swept back spreaders and a backstay? How tight should the shrouds be?
7. Just out of curiosity, with a fully deployed mainsail, have you ever heard of a catastrophic mast failure due to a loose/slowly applied running back?

Question for extra donut: what is the optimal number of wraps around a winch? Is it weather dependent? Boat type? Or skipper preference?

My question is what do I need for the mast as it goes through the deck? Do I need special wedges? I have a J/105.

Thanks,

T10 Running Rigging Loads

-Loads at 25kts

- Used to spec running rigging
- Harken load calcs (in catalog and online)
- Use 5:1 safety factor for non lifeline rigging
- Sheet and car loads fairly accurate
- Halyard load is tougher to calc

	T10 18kts	T10 25kts	40' GP 25kts	65' RC 25kts
Main Sheet	731	1411	2057	5808
Genoa Sheet	391	754	2341	4138
Main Halyard	643	1242	1984	4050
Genoa Halyard	313	603	1874	4016
Spin Halyard	150	200	1548	3320
Spin Sheet			928	980
Traveler	146	282	411	1376
Outhaul	292	564	823	3286
C0 Halyard	illegal!		4409	7405
C0 Sheet			1305	1900

T10 Running Rigging

Main Halyard 8mm Dyneema Double Braid GP Heat Set Core

Jib Halyard 8mm Dyneema Double Braid GP Heat Set Core

Spin Halyard 8mm Dyneema Double Braid, Dyneema blend cover DB

Spin Sheet 8mm Dyneema Blend Cover DB

Jib Sheet 8 or 10mm Dyneema Double Braid, GP Tech Cover

Mainsheet 9 or 10mm Dyneema Blend Single Braid

Mainsheet Fine 8mm Dyneema Blend Single Braid

Traveler, Outhaul, Topper, Downhaul 6mm Dyneema Double Braid

Reef Line 8mm Polyester

T10 Rigging Trouble Areas

- Spinnaker halyard fairlead
- Mast fittings and attachments
- T-Balls
- Sheave boxes (Ronstan gear=run away)
- Backstay Blocks
- Traveler cars
- Headstay lengths
- Winch drums
- Clutch slippage
- Topping lift vs Rigid Vang vs Boomkicker
- Halyard exits

Backstay Update

- Standing Backstay now 5mm SK99 with Black Dyneema cover.
Increased strength, slicker for mainsail, longer life, same size
- Legs: Pinch System Best: less line to pull
- Pull tested an original 5 year old Dux backstay, broke @ 5640lbs middle.
(Approx 54% original rating, or %120 of new 3/16" wire...)
-