Physics Is Your Friend

The birth of Flyman

Two friends of mine have a daughter with an IQ of 199 or so. At the age of two she had taught herself to read. She asks lots of questions and demands good answers. She wonders why mirrors flip images right to left but not up and down. When things get too complicated, the parents simply tell her, “Physics is your friend.” It’s an important concept for Steadicam operators.

The versatility and precision of Steadicam operating has expanded greatly in the past few years because of our clearer knowledge of static and dynamic balance and other aspects of the Steadicam system. New devices, such as Buddycam, Slavecam, and Skyman, were the result of understanding how each part of the Steadicam system works and then wondering about the implications of that knowledge. What follows is a history of the development of one new “flying Steadicam” device.

Flyman was born during a lunch conversation. An abstract statement was made that Skyman is a useful tool, but it can’t fly everywhere and every way a stabilized camera should fly. For instance, Skyman can’t be readily rigged for purely vertical shots. What to do?

At first Garrett and I surmised that a simple device that allowed a Steadicam operator to fly vertically would be useful. Within a few minutes, the desired performance characteristics of this new contraption expanded to allow an operator to walk along and fly in the same shot. Soon we were dreaming that a Steadicam operator might fly in any manner that a stuntman can fly on wires. But what would Flyman look like? How to make it safe? What problems had others encountered and how could they be avoided?

Physics, continued on page 8

Chrosziel's New Monitor

Author's note: This article was based on my observations while at the October SMPTE show in Los Angeles and my subsequent use of the monitor. - S. C.

Leave it to those clever folks in Germany to invent yet another well designed product for the Steadicam. This time, Alfred Chrosziel, well known for his extensive line of matte boxes, sunshades, servo-focus gear and motor bracketry, and other film accessories, has designed a high-intensity green screen replacement monitor for the EFP. It operates on 12 volts and also can be used as a back-up monitor for the Model I, II, or III.

The monitor measures 5” x 5” x 8.5” and is finished in a velvet grey matte with black trim and it sports purple anodized knobs. On the left rear are five knurled knobs to control the built-in frameline generator.

Four of the knobs allow for independent control of the left, right, top, and bottom framelines, and the fifth knob is used to vary the intensity and type of frameline. It can vary from a bright hashed border down to solid black to completely off. Two purple knobs on the front of the monitor control brightness and contrast.

Chrosziel, continued on page 4
The business of this business

It's 4:00 p.m. Saturday afternoon, my father died yesterday, and the phone is ringing. A desperate wannabe producer/director, Brett Carr, is looking for a replacement operator on his job, someone who can fly the BL through shots destined for film immortality. I explain about the funeral and recommend three other Steadicam owners. An hour later, another call from Brett begging and pleading that no one's available.

He talks me into driving to NYC from Philly as soon as I can pack the gear. I'd have an IATSE assistant, and with only three hours of shooting, I'd be heading home with plenty of time to prepare for the funeral. No Saturday overtime in the rate, "Heh, it'll only be three hours," but payment in two weeks.

Of course the job took all night, but no problem; I take estimates of time during negotiations of rate with a grain of salt. But it's been three and a half years and no payment. Apologies, then promises (only after tracking down the weasel who escaped to LA avoiding infamy and seeking his fortune). Finally a tape showing off great shots and $100, but no real money.

This experience, combined with two production company bankruptcies that yielded me 15 cents on the dollar and a gorgeous blonde PA who crashed a dining room table into what had been a perfectly functioning, docked, undamaged Steadicam, led me to an incontrovertible fact: We are at risk.

In fact, we frequently are at risk with unknown producers because our specialty isn't required by a small number of regular clients. I'm hired by unknowns (to me) most every month, many of them from out of state.

Fortunately, it's rare that I have problems, but what other business commits so much on a phone call with unknown clients? Camera rental houses use written contracts, demand insurance certificates, and often money up front. How many of us do?

A couple of years ago I started using a written agreement. Thus far it hasn't offended any new clients, and it has greatly helped me in two difficult situations. In one case I was the only cameraman of seven to be paid in 30 days; the others went more than 120. I'd like feedback from our members on this agreement, which, by the way, has not been reviewed by a lawyer. Peter Abraham is the only other operator who has told me he uses a written agreement. Maybe agents handle written agreements for some. Would it be worth having a standardized, "official SOA," one-page agreement we could all plug our rates into?

By the way, if you bump into Brett Carr, I'd pay a 50% collection fee . . .

Robin Buernki

Freelance Rate Agreement

This agreement is entered by and between ____________ (hereinafter "Contractor") acting as independent contractor, and ____________ (hereinafter "Production Company"), acting as producer.

Contractor and Production Company, intending to be legally bound, hereby agree as follows:

1. Contractor's Services. Contractor shall work in the position of ____________ on the following project: Project title: ___________________________
   Date(s): ___________________________
   Project location: ___________________________

2. Compensation. Production Company shall pay Contractor at the rate of $__________ per day for work performed during regular hours; $__________ for work performed during overtime hours; and $__________ for pre-production preparation and meetings. A payment of $__________ will be made to Contractor prior to commencement of work on the project, and payment of the balance due shall be made within thirty (30) calendar days after submission of an invoice to Production Company by Contractor. Any amounts not paid within 30 days shall bear interest at the rate of one percent (1%) per month until paid.

3. Changes and Cancellations. The dates specified above for the performance of services by Contractor may be changed by Production Company with reasonable prior notice to Contractor, provided however, that if notice of change or cancellation is given less than 48 hours prior to the anticipated hour and date of work or later than Friday at 1:00 p.m. before a scheduled date on the following Monday or Tuesday, Contractor will be paid a cancellation fee equal to one day's rate of compensation. Further, Contractor shall be paid for all preparations, pre-production work, and other work performed by Contractor prior to notice of cancellation.

4. Insurance. Production Company shall carry liability insurance and all-risk insurance covering all equipment connected with the project, and such insurance shall be considered the primary coverage in the event of any loss or claim. Production Company shall, upon request of Contractor, provide Contractor with a certificate of insurance evidencing the required coverage. If, prior to commencement of the project, Contractor arranges to carry insurance on such equipment as he will provide, he will be compensated at the rate of $__________ per month until paid. Such insurance coverage provided by the Production Company shall also include coverage for all equipment owned or rented by Contractor during shipment to and from the project location, as well as any and all situations when a camera is attached to a Steadicam.

5. Expenses. Expenses such as travel, meals, and hotel for out-of-town projects shall be paid for Contractor by Production Company either prior to travel or as they are incurred.

6. Additional Crew Members. Any and all additional crew members brought into this project by Contractor for the Production Company shall be paid directly by the Production Company as independent contractors. They shall be paid in accordance with the above 30 day agreement, also subject to interest penalty.

7. Commencement of Work. Upon execution of this agreement, Contractor will begin such production and pre-production work as he deems necessary.

Contractor and Production Company, having agreed to the terms above, have signed this Agreement on this ___ day of ____________, 199__.

Contractor: ___________________________
   By: ___________________________
   Address: ___________________________

Production Company: ___________________________
   By: ___________________________
   Address: ___________________________

Robin Buernki
Commentary

Robin asked me to comment on the deal memo idea in general and on the form opposite — Ed.

In the past, I've signed deal memos provided by production companies, and I've demanded insurance certificates for both equipment and liability. Most small jobs, however, have been done on a handshake, and, until now, I've never had my own form to use.

I don't think it's outrageous that a producer should sign a piece of paper that stipulates what is verbally agreed to over the phone and what are generally considered to be industry standards in this country.

On the other hand, I'm not sure how much help this deal memo will be if someone really doesn't want to pay. And is it worth the time and lawsuit to get what you're owed, even if you can now "prove it"? I'm not sure.

Like Robin, I also have a few slow-paying clients (I still have hope that they will pay me), and maybe the net-due-in-30-days and the 1%-interest-on-the-balance will make things go more smoothly and quickly the next time.

My major interest in a deal memo form has to do with the insurance clause. While I can survive a delay in payment for a day of work now and then, I can't afford to have my gear trashed and/or a lawsuit taking away everything I own.

Suggestions: There should be a definition of regular and overtime hours. I'd also like to have a paragraph that describes the rate(s) for equipment, as my gear tends to work harder than I do and doesn't get overtime.

I am going to have my lawyer look at this form and see what protection, if any, the deal memo really provides. I will also be asking if the language needs to be more "legal" (without ever becoming alarming).

Would an "official SOA" deal memo help anyone out there? Write and let us know.

Lose A Few Pounds

Another in a series of modifications

For some time I have been fussing with the inherent flexing and instability of the electronics fore-aft plate in the Model IIIA. Although I used Bernard Wuthrich's "Magic Slice" (Letter, Volume 3, #1) and made a couple of tiny clamps to reduce the flexing between the two plates, I still felt that the standard CP unit left a lot to be desired.

Here's another attempt to really fix it. Remove the tube and clamp assembly from inside the electronics box. Drill and countersink four holes in the bottom fore-aft plate. Using the plate as a template, drill four corresponding holes into the top of the electronics box, being careful not to spray aluminum filings all over your circuit boards. Tip: back up the holes with gaffer tape!!

If necessary, add washers to keep the bottom plate flat (the top of the electronics box may not be all that flat). Bolt the lower fore-aft plate to the top of the electronics box, then slide the top plate and post into position.

While you're at it, add a couple of small stops (bolts) to the safety channel of the lower plate (before attaching the plate to the Steadicam). The new stops prevent the locking clamp from overrunning the lower plate, which is another annoyance with the current design.

The modification has several beneficial effects. One is to stiffen the lower plate and help keep it flat, making the Steadicam more rigid and easier to trim fore-and-aft. Another advantage is losing the extra weight in the electronics box, and simultaneously creating enough room to facilitate stuffing all the wiring to the J-box up inside the post (more about that in another issue of the Letter).

A third benefit is that the electronics and battery are forever locked perfectly square to the camera. And, because the locking clamp on the electronics package has been removed, the clearance problem between the fore-aft control knob and the locking clamp has been eliminated.

The fore-aft plate was slightly offset from dead center on the electronics box (1/16 to 1/8th of an inch to the right side), thereby more nearly centering the electronics weight side-to-side. This aids dynamic trim.

The only disadvantages are that the monitor must be removed from its bracket to get the sled to fit into its case and some foam cutting and gluing must be made to facilitate this new packing arrangement.

Jerry Holway

Detail of plate bolted to top of electronics box
An important, additional benefit is the increased picture area, one inch larger than the standard EFP monitor and two inches bigger than the Model IIIA monitor. The only sacrifice for EFP owners is the color image, but hey, who needs color anyway? We're composing shots and framing, not painting pictures.

For Model I, II, III owners, enthusiasm might not be as quick in coming as from us previously ill-equipped EFP owners. The Chrosziel monitor is a much bigger picture, which can be a significant advantage when shooting anamorphic. However, the monitor is no brighter than the current display.

At the SMPTE show, Dave Emmerichs and I had the IIIA and Chrosziel monitors side-by-side. We utilized the output of an Arri III equipped with a XC-77 video tap to feed each monitor. With the camera running and lens anywhere from wide open to about T11, both monitors yielded good images. However, with the lens stopped down to T16, the Chrosziel’s image was not as bright as the Model IIIA’s. We concluded that IIIA owners probably would not permanently replace their existing monitors, but the Chrosziel’s ability to run off 12 volts and bypass most of the sled electronics definitely make it a perfect back-up.

The monitor weighs 1.6 kg or about 3.54 pounds, which is about 1.5 pounds more than the Model IIIA monitor. Although it doesn’t add much extra weight, the effect on dynamic balance is severe. One must compensate for this additional forward mass or the rig will not dynamically balance (see the April ’91 Letter for more insight on dynamic balance for the EFP).

Fortunately for EFP owners, Chrosziel was thoughtful enough to include four “extension pegs” which are mounted between the EFP battery plate and sled. This enables the battery to shift back far enough to compensate for the additional forward weight of the new monitor. This is necessary even for EFP owners who have fore-aft plates for their rigs.

I don’t have any specific numbers on power consumption for the monitor, but comparatively speaking, its draw is fairly low. A 14 Volt Anton Bauer battery powered the EFP sled, monitor, and servo receiver/amplifier with one Heden motor for about 4 to 5 hours of continuous use at the SMPTE show. With the old LCD screen, this battery generally lasted all day. Under normal conditions, I’m sure battery life would be extended significantly with Chrosziel’s monitor.

Enthusiasm for the monitor at the SMPTE show was quite high. About a dozen different Steadicam operators and related folk saw the monitor and were duly impressed. All the EFP owners...
owners said they were immediately placing orders and most Model I, II, III owners said they probably would purchase one as a back-up monitor or for use when a larger image size or lower battery consumption were important to the shoot.

About the only drawback to the monitor is its price - about $3,800. But then again, everything in this business is expensive, and if it really makes a significant improvement in the ability to get the shot (which it absolutely does for EFP owners) then it’s worth every penny. Just think of it as insurance on the thousand you could lose because you blew a shot and lost a client when you couldn’t see any image in your LCD screen. Enough said.

The whole shooting match

For more information or feedback on the monitor, feel free to call me at (203) 438-4460 day or evening (EST). The monitor is available for immediate purchase from Chrosziel’s exclusive U.S. distributor — Band Pro Film/Video Inc. at (818) 841-9655 or (800) 835-5360.

Stephen Consentino

Next Issue Highlights

Another "State of the Art" article, updates on the ESOA, the Moviecam Compact, and the Aaton 35; more opportunities for modifications, including putting wires up the IIIA post and completely remaking the J-box. Also a Panavision rig for a 10 minute 35mm take, Skyman update, and more!!

Also promised was a "Hot Rigs" series which would analyse and review a highly-modified Steadicam system in each issue.

We’d like to get enough material together to get another issue out in February, but we need your materials and ideas to make the best Letter possible.

Please send articles and pictures directly to: Jerry Holway at 448 Spruce Drive, Exton, PA 19341, or call (215) 524-5979. If you can, please send your articles on a Mac 800k disk in any popular word-processing format.

ESOA News

Almost two years has passed and the ESOA hasn’t seen light yet!

When we met for the first European Masters in October 1989 the energy was high. The future was bright. Despite the absence of the British we all did agree: We had to build a European branch of the SOA. We had to tighten the relationships, to establish common rates, to get more attention from CP, etc.

I waited months before getting a reasonable amount of information to start coordinating the project. Last year I summed them up and sent the results to all the original promoters (participants in the Masters) and to all the European members of the SOA in order to proceed with the second phase. We needed to define the terms and start the actual organization and birth of the ESOA.

I never had any answer from anyone.

Maybe the problem is competition, fear of losing a job. Maybe it’s pure laziness or jealousy, but I never received any answer about the proposals about fees, logistics, etc. Strange but true, the only aspect that improved was the increased CP presence in Europe.

Marcel Groos in Lausanne is now the unique coordinator of CP business in Europe. There are exclusive representatives for each country, and, even if I don’t agree with some of the choices (especially for Italy, a pirate!), I must admit that at least it is a good improvement to have somebody who hopefully will have better service.

Being overtaken by CP in innovations and dynamics is nothing to be proud of. I believe that a lot of our delay is due to the competitive attitude we must have to afford our job. This attitude is imposed by the rules of the market and is totally organic to the market. It is the same old story, keep the labour divided (even sophisticated labour as we are), and productions can take advantage of our skills and work.

The fear of losing a job in favour of a colleague, the fear of confrontations produce diffidence towards any kind of association. The SOA is in Philadelphia, far enough not to intrude

ESOA, continued on page 12
The Great Battery Debate

Are some of your batteries tired and listless? Or stressed out by their relationship to a fast charger? Even after quality time and a hug are they barely making 13 volts under load? Maybe fresh batteries are the perfect Christmas present for your sled.

This was my thought during last year’s holiday season, but I was in a quandary over the 4 amp hour vs. 5 amp hour batteries, because of the significant price difference and slightly different weight. Both batteries are NiCads, but with differing chemistry and plates. Fortunately, both of my concerns have diminished in the past year.

Note that the contacts are welded. Do not attempt to solder new cells together!!

Frezzolini was kind enough to help and provide me with considerable information and a 5 amp hour battery pack to test against a Seitz rebuild and a new CP battery, both of which were rated at 4 amp hours.

Traditionally the 4 amp hour rating was the output obtained when discharging the battery at a load of 4 amps for an hour. It seems that manufacturers are now rating the 5 amp hour batteries by discharging them at 1 amp for five hours.

The truth is, we don’t get a 25% improvement at a high current draw of 5 amps. Additionally, the Seitz and CP batteries I tested were closer to 4.4 amp hours by the traditional method, thus reducing the potential difference in performance.

Using a strip chart recorder at Seitz Technical, batteries fresh off the charger, and a discharge rate of 6 amps (about the draw of an Arri BL at 24 fps, CCD video, and a servo motor), I found that the 5 amp hour battery gave about 3 minutes more power than the 4 amp hour battery before the voltage dropped below 11.2 volts. The Steadicam battery indicator line appears at about 11.4 volts.

For a practical test at a minimum current draw, I fired up the rig with monitor, frameline generator, and video transmitter (about 2 amps). The 5 amp hour battery lasted 155 minutes before the onset of the black line. The CP and Seitz lasted 120 to 130 minutes. Field testing under uniform conditions of a live-on-tape video series, powering the monitor and servo motor, proved the 5 amp hour battery lasts 15 to 20 minutes longer than the 4 amp hour one. As I was getting 75 to 85 minutes with the 5 amp hour battery, I could do a whole show without a battery change.

I still want to test how much footage can be run through the Moviemac Compact with the 12-24 volt converter, but for now, quantifying the performance beyond the above seems pointless. Various manufacturers of the cells (Gates, Sanyo, Varta) deliver products of varying specs and our suppliers (CP, Frezzi, and Seitz) don’t buy from just one manufacturer.

The good news is that the suppliers take the time to match specs on the individual cells to maximize life and performance. CP and Frezzi both offer complete batteries (Frezzi’s latest are fully compatible and very close to the original CP batteries, and are available in 4 and 5 amp hour configurations). Chuck Jackson says that CP has gone to the 5 amp hour cells (not yet confirmed). I ordered one several weeks ago, but it hasn’t shown up yet.

If you opt to buy replacement packs, be sure they have the new thermal fuse and thermistor (thermal sensor for fast charger), or use your old thermistor with fresh white heat sink compound. At Seitz’s, they test the thermistor with the rebuild. If you are using the Frezzi-PAG fast charger, as I am, the thermistor is not as important, because the charger doesn’t reference the thermistor.

"The truth is, we don’t get a 25% improvement at a high current draw of 5 amps. The batteries I tested were closer to 4.4 amp hours by the traditional method."

I like the Frezzi-PAG charger because of its weight, and because it can be used to charge other types of batteries. However, it can overheat batteries under some circumstances. Jack Frezzolini says this occurs with batteries having worn contacts, thus giving the charger false references for impedance changes (which is how the charger senses the battery).

Therefore, when rebuilding a battery, it’s a good idea to use a new connector block (about $58) or, for the do-it-yourselfer, replace the contacts in the block (I don’t recommend this). Be prepared with special tools and a steady hand with the drill to remove the old contacts. I rebuilt one block and wished if it had been healthier before surgery. Several types of contacts are available; if using the Pomona style, be sure to drill through the back of the two center contacts to allow for clearance of the two long center support pins in the Model III and IIIA battery housing. Speaking of that housing, be sure to check the male banana plugs now and then, just to be sure they’re making good contact with their mates.

I’ve decided to move into the 5 amp hour batteries slowly as I replace my most tired ones. (#3 from September 1984 will see its final Thanksgiving this year.) Still a big question, especially in Jack Frezzolini’s mind, is whether the 5 amp hour batteries will have nearly as many serviceable cycles as the field-proven standard cells. The manufacturers aren’t making claims of equal longevity. Call Jack Frezzolini or Jim Crawford for more information at (800) 345-1030.

Robin Buernki
A long time ago I reviewed the PAG fastcharger for the Letter (Vol. 1, #2). In that article I raved about the charger but I warned people about using the charger above 40°C (104°F). When the charger is too hot, something inside the computer brain causes it to continue to fastcharge, which will destroy a battery if you're not careful.

The charger also begins a new cycle of fastcharging if the power supply is interrupted or the unit is unplugged briefly. As these are unavoidable situations on many sets, special care must be taken to be sure the batteries don't overcharge and overheat.

Since that warning, I've also lost a battery while using the charger because the connectors on the battery were old and possibly intermittent or corroded. Again the charger's brain was fooled and the unit continued fastcharging long after the battery was fully charged. By the time I got to it, the battery was literally too hot to touch and in NiCad hell.

Something had to be done. My first efforts were to be sure that all my battery connectors were in good order, and that all charger-to-battery cables were in perfect condition. For a while I made a habit of "laying hands" on my batteries as often as I could while they charged to feel if they were hot. But, of course, this was not a solution at all, nor did it inspire confidence on the set.

What to do? Bob DeRose’s adaptor system for the PAG chargers (see ad in last issue of the Letter) will help eliminate bad connectors and wires (and is slick as well), but it doesn’t address the charger’s other deficiencies. A user-friendly, fail-safe, if-it-gets-too-hot-shut-it-off-and-keep-it-off magic box is what is really needed.

The safety unit makes use of the thermistor (temperature sensor) built into the Steadicam battery. Inside is a circuit that senses the battery temperature and shuts off charging current to the battery when it gets too hot. This safety circuit also remains "invisible" to the charger's sensing circuitry.

The deluxe model has bells, whistles, sirens, and flashing lights. Well, almost. When you plug in the charger (120 or 240 volts), the safety unit also is turned on. The PAG charger doesn’t know the safety unit is there, and all the PAG’s features and LED’s function as before.

Three LED’s on the safety device indicate battery temperature: cool, warm, and hot. If the battery gets hot, a relay trips and shuts off the charge current, saving the battery.

A second red LED indicates that the relay has actually tripped and that the safety unit is really working. Assurances! Assurances! Next to the second red LED is a restart button which only works if the battery is warm or cool. Removing a battery from the charger "fools" the safety device into thinking it has a hot battery, and it trips the safety relay, again providing assurance that the unit is working!

When a new battery is inserted into the charger, the restart button must be pushed to start the charge cycle.

Beware of old, worn contacts

Some batteries lack thermistors, some thermistors are damaged, or maybe one needs to fastcharge that battery even if it is 110° in the shade. There’s an "override" mode to allow charging the battery under these conditions. A third red LED blinks if the "override" mode is chosen, warning that the safety system is off for that battery. Additionally, the warm, cool, hot, and tripped LED’s are turned off.

Other features: a fuse and a rugged system similar to DeRose’s for mounting the battery on the charger.

My reasons for describing the charger safety device are twofold. One is to (once again!) alert people to the hazards of using PAG chargers. The other is to indicate that there is a fool-proof solution that has been proved in the field. Perhaps if there’s interest, the device could be manufactured and made available to other operators.

There’s over $100 of parts inside the magic box (not counting the circuit board), so I estimate a "dual" production unit would have to be sold for four or five hundred dollars, and a "single" unit for $50 to $75 less than that.

I think it’s worth that much to protect my batteries, have some piece of mind, and have yet another gadget to explain to the assistants.

If interested, please contact me at (215) 524-5979.

Jerry Holway
Our experience with the Slavecam, vehicle mounts, stuntman rigging, and most importantly, Skyman, as well as information gleaned from other operators and flying systems, gave us some important design clues.

"If one wants to pivot during a shot, it is practically impossible to do so unless the Steadicam-and-operator system is balanced horizontally around the pivoting point."

A reliable source claims that Nicola Pecorini at one time had a rope wrapped around his vest. At the back, the wire from a construction crane was attached, and Nicola was hoisted over 100 feet in the air. Sometime during the shot he was upside down, but (of course) still operating. Did he get the shot? "No problem."

To be able to walk and fly right-side-up in one shot, it was clear that a modification of the current vest was needed. The entire system had to be light (under 5 pounds) and small so that an operator could continue to operate normally in the walking portions of the shots.

One important "lesson" from Skyman and other pivoting vehicle mounting systems is that the support and pivot point must be at the common center of gravity of the Steadicam and operator system. If not at the common center of gravity, the unit will tend to rotate (and/or tilt), especially under acceleration or deceleration. Stated another way, if one wants to pivot during a shot, it is practically impossible to do so unless the Steadicam-and-operator system is balanced horizontally around the pivoting point.

An example: A friend built a wonderful motorcycle and sidecar hardmount rig, complete with a comfortable chair. This chair swiveled (with the pivot under the center of gravity of the usual occupant). Alas, with a Steadicam hardmounted in front of the chair, most of the mass of the operator-and-Steadicam was to one side of the chair’s swivel.

"Some tricks are required for operating (besides convincing yourself that it’s fun)."

At the top, the two lifting wires are attached either to a two-wire stuntman flying contraption or to a small triangular, pivoting hanger and then to a single-wire support. Single lifting wires twist under load, but a thrust bearing in the Flyman hanger allows the lifting wire to twist independently of the operator. By simply attaching a rope to the hanger, a grip can hold the unit at a desired angle or rotate it as needed. Because the operator is using a Steadicam, any slight twist in the system isn’t translated to the image.
Other harness options were tried (parasail harness, bosun’s chair) but they failed to allow the operator to operate normally and then shift into the flying mode. They required relocating and sitting down on a board that couldn’t be underneath a walking or running operator.

Finally, like the unmodified climbing harness, a “board-system” placed the operator’s legs forward into the path of a downward-looking lens. Quite naturally, directors often get the idea to make the camera look straight down.

Some tricks are required for operating (besides convincing yourself that it’s fun). I recently did a shot for a feature in Montreal that started on an over-the-shoulder of a boy lying on the bathroom floor and reading a magazine. I was slowly pulled up sixteen feet by a simple system of pulleys and counterweights, my speed controlled by a grip.

I was able to tilt downward in complete control, maintaining precise headroom, but only if my feet were off the ground at the head of the shot and I didn’t move as I was hauled up. Any slight shift in my balance would cause me to swing on the end of the wire, ruining the take.

On a commercial for Blue Cross/Blue Shield, I was asked to walk backwards along a line of people (some of them talking!) and then be hoisted (rocketed?) 100 feet up in the air in 7 seconds to reveal that 300 people had organized themselves into an outline of the company logo.

For the shot to work, the Flyman hanger had to be safely attached to the construction crane’s cable simultaneously with my own arrival at the lift-off mark. The crew also had to worry about the tailing of the rope required to keep me from twisting, communication with the construction crane operator, slate, sound mike, cue cards, etc. “No problem.”

“A mattebox falling out of the sky could be unpleasant.”

Safety is critical to any sort of flying. For this shot, clear communication lines and well-defined procedures limited the risks. Everything was attempted in stages: First without the operator, then lifting the operator, then flying the operator and Steadicam, then the extras were brought in. A competent key grip was in charge of signalling to the crane, and all accessories were carefully safetied to the rig. (A mattebox falling out of the sky could be unpleasant.)

Landing and walking away from a flying section of a shot seems to be a lot easier (and safer) than taking off. One big advantage to landing-and-walking shots is that the flying is over when one separates from the fitting wire. Another is that one automatically hits the landing mark. In addition, descending is a very pleasant feeling, but I’m not sure why.

Another shot used a combination of Skyman and Flyman. I ran along a forest path and then jumped like a deer over a piano and stream. Amusing. An advantage to this type of shot: framing towards the horizon isn’t as critical as looking downwards; the slight pendular action doesn’t show up on the screen.

What’s next in the flying Steadicam world? Probably some accessories to quickly connect Skyman and Flyman, rather than the ad hoc ropes and webbing I’ve used so far. I’d also like to make some vehicle mounts based on the Skyman patent.

The Skyman puts the operator in a uniquely wonderful universe to counteract the forces of acceleration and deceleration, as well as to spin around to look to one side or the other.

I know there are more Steadicam gadgets and mods to be made than are dreamt of in my philosophy, but the knowledge and understanding gained in the last few years should make finding the solutions easier.

Jerry Holway

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Small Microwave Unit for Steadicam

Riki Burks has made a miniaturized microwave transmission system for the Steadicam, called Steadwave. The 250mW transmitter is FCC approved, and frequencies are available between 1.7 and 2.7 Ghz. The unit can work with NTSC, PAL, or SECAM video signals. Various antenna configurations and mounts are available to maximize performance, up to two miles or more in some cases.

The transmitter weighs in at 18 oz. (0.4 kg), and it measures 2.7” x 1.25” x 6.25” (width, height, and depth). The receiver weighs 11.1 lbs. (5 kg) and measures 6.7” x 5.0” x 8.8”. An even smaller unit is on the way.

Accessories include battery bracket kits, antennas and antenna mounting kits, remote control pan and tilt for a parabolic receiving antenna, and power packs.

Units can be rented, leased, or purchased from Riki Burks at (908) 287-3626.

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Detail of transmitter mounting
Steadicam
State of the Art: Static Balancing

This is first in a series of articles on the mechanics and art of operating

If Foucault had owned a Steadicam with perfectly friction-free bearings in the gimbal, he could have observed the 360 degree rotation of the device in 24 hours and predicted the motion of the earth!! Really. But don't invite some friends over, pop the Steadicam on a stand, and watch it slowly turn as the earth moves under it. There's a caveat: Our gimbals are too sticky and the effect can't be observed. And there's no point in trying this experiment with a Panaglide. How can it be possible??

The First Theorem of Steadicam Balance: The rigid arrangement of camera and sled masses and the high degree of isolation from angular influences provided by the three-axis gimbal produces angular stabilization of the camera and image. And the Corollary: If untouched by human hand or the wind, the Steadicam will not move.

In past issues of the Letter we published several articles, letters, and suggestions regarding dynamic trim. While those articles dealt with the correct arrangement of masses around the gimbal to enable flat pans, even at high rotational rates, this article attempts to examine other aspects of balancing the rig. Some of this information is contained in Steadicam operating manuals, videos, and training workshops; some of it may be new.

Proper trim of the Steadicam enables the operator to achieve the maximum amount of stability in the image. Any force applied by the operator across the isolating gimbal will induce angular movement in the camera. Some of that movement is desired (pans and tilts), but often a shot has sections when the attitude of the camera should not change.

When the Steadicam can attain a desired attitude via its balance, the image will be the most stable. It should also be noted that human beings cannot produce a constant force and hence, cannot force the Steadicam into a static condition. Stated another way, the least work an operator has to do to keep the proper frame, the more stable the image will be.

A general rule is to trim or balance the Steadicam for headroom or for a frame that must be held for a long time. This is usually achieved by moving the camera fore-and-ast until the camera hangs at the proper frame. Sometimes overlooked (and critical for fine work) is the need for all cables and auxiliary devices to be rigidly tied or attached to the sled or camera. Movement of these cables or accessories can upset the desired balance of the rig and ruin a shot.

"A neutrally balanced rig has two important characteristics: it will remain wherever it is placed, and it is immune from the effects of acceleration."

Movement of the film in the magazine can make trimming the rig difficult. Often the best that one can do is to estimate what the balance will be like by the time one reaches the critical part of the shot and trim accordingly. Fortunately, film moves through the camera in a linear way, and the shift of balance in the magazine is smooth.

The "roll" effect produced by Arri BL co-axial magazines is perhaps the most annoying, showing up as a tilted horizon, but other film mags play minor havoc with balance as well. From a balance perspective, the new 35 Aaton "zero displacement" mags may be the best available.

Proper balance of the Steadicam also involves top-to-bottom balance (or bottom-heavyness). This aspect of balance is probably the least understood and most misused. A neutrally balanced rig has two important characteristics: it will remain wherever it is placed, and it is immune from the effects of acceleration (and deceleration).

Conversely, a bottom-heavy rig will seek a single attitude and exhibit a force if not at that attitude. This force becomes part of the "human servo feedback loop" that keeps the Steadicam upright. However, if the Steadicam is moved (or stopped), a bottom-heavy rig will act like a pendulum and the operator must apply a force to prevent the unit from swinging wildly.

The amount of bottom-heaviness is at first a compromise between the need to have the unit seek an attitude (the desired trim and a level horizon) and the need to counteract the unwanted pendular effects of a bottom-heavy unit. Strongly bottom-heavy Steadicams quickly seek vertical, but the resultant forces required by the operator to stabilize the unit during acceleration and deceleration also are large and consequently upset the image.

Sometimes operators will make a unit more bottom-heavy in windy situations, thinking that the unit is more stable. Unfortunately, the forces required by the operator to keep the unit upright when it is moved by the wind are very large, and forces required by accelerations and decelerations also are inherently large. The best advice is to keep the wind off the unit, and let other aspects of the shot dictate the top-to-bottom balance.

A more neutrally top-to-bottom balanced Steadicam is useful in three basic situations. The first is when the shot has several sections that require the unit be tilted and held both upright and down. A bottom-heavy unit with a strong tendency to one attitude makes it too hard to achieve another part of the shot. The second situation is when the Steadicam needs to be accelerated in tilt (or roll) rapidly in both directions, such as a quick look down a staircase and then quickly back to level.

The third situation requiring neutral balance is shooting from a vehicle. A neutrally balanced Steadicam is immune from the effects of acceleration. When operators are walking with the Steadicam, the duration of any acceleration is generally shorter than the pendular period, and consequently the rig is largely immune from these effects. However, the duration of acceleration in a vehicle can be very long (say, accelerating to 60 m.p.h.), and even a
slightly bottom-heavy rig will pendularize. In addition, accelerations can be strong and, if the unit is too bottom-heavy, the resultant pendular motion hard to correct.

Are there any situations requiring a very bottom-heavy rig? Perhaps a completely static shot (but then why are we shooting with a Steadicam?) or a shot in which a rolling, pendular action is desired. A third case is when more bottom-heaviness may help the unit accelerate smoothly in tilt or yaw. A shot which starts looking up at a tall building and then drops to eye level smoothly and quickly may benefit from a heavier than normal bottom-heaviness, even though stopping the tilt is more difficult.

Average bottom-heaviness varies from operator to operator, depending on skill. Operators requiring more “feedback” from the unit will generally have more bottom-heavy units, and, as a consequence, less stability and control of the image. More skilled operators tend to have more tightly balanced units,

A good starting place is to balance the rig so that it tilts from horizontal through vertical in two seconds, and then practice with the unit balanced both more and less bottom-heavy. Practice shots and situations as described above, and note how the rig behaves.

Another balancing consideration: How fast or responsive do you want your rig to be in pan or tilt? The more the various masses of the camera, monitor, electronics, and battery are spread out, the more inert the Steadicam will be. But if you want a Model II or III to pan ultra-quickly, detach the monitor and the battery and strap them to the post.

To slow down the inherent quick-panning action of the EFP, add and/or move some weight away from the post. If you want your rig to tilt quickly, compress the post and/or move the masses closer to the c.g. Conversely, to make languid tilts, extend the post as much as possible.

Good shooting!

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**Classifieds**

**For Sale: Steadicam EFP**

Package: IIIA Vest, 24-43 lb. arm, modified EFP sled w/ IIIA gimbal/ yoke, Paddock fore/aft plate, DeRose 2" & 5" wrap grips, monitor swivel bracket, dual battery assembly, 2 DeRose post rings, 2 DeRose docking rings, extra dovetail plate, J bracket, F bracket, 1-7 zoom w/ Fujinon lens cable, CP low-mode cage, DeRose docking stand, 2 Anion Bauer Magnum 14 batteries, Anton Bauer Quad charger, support tubes, screws, Zero Haliburton sled case and battery case, 2 CP weight plates, 1 Heden M26 motor, RSB video gear, Preston Micro-Servo w/cables, Preston idler gear w/ 15mm Arri rod, DeRose (motor bracket, idler gear and 30 degree bracket) anodized green, 15mm bracket assembly, Coherent 2 channel video and audio transmitter, IIIA to transmitter cable, EFP to trans/ power cable. $33,000 or best offer. Leave message (401) 861-3655.

**For Sale: Arriflex camera parts.**

35 BL 400ft mags, $2,195 ea. 35IIIC w/sync generator 24fps motor, $3,495. 35III/35IIIC F/R magazine, $950. IIC periscope finder, $850. IIC metal matte box, $150. IIC bellows matte box, $395. IIC high speed 32v motor, $395. Zastarri, LTD. (804) 741-4151, fax (804) 741-9890.

**For Sale: Camera Products**

WRC-4, Digital 4 channel wireless servo-control system. Includes WRC-4 4 channel transmitter for zoom/ focus/iris/camera start/stop, receiver, 3 channel Heden motor amplifier, cables, 2 batteries, charger, hard carrying case. Nine months old. Has digital modification done to transmitter and amplifier. List $4,700 transmitter + $1,500 amplifier. Sell $5,600 for both. Also 16mm Canon 12.5-75mm T2.1 macro zoom lens with Arri B & CP16 mounts. Extremely sharp, smooth lens, w/ Zeiss zoom and focus rings. Mint. List $2,200, sell $900 or best offer. Stephen Consentino, (203) 458-4460.

**For Sale: LDH-26 Russel full conversion, new tube, $900. Russel 35 III low mode bracket, $500. JKE 79D Low mode, replaces handle, $75.**

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**Roadbalance fastchargers. I have two. Made in Germany, slightly heavier than Frezzi-PAG’s, but they do have a thermal sensor. New, each: $1,200. Sell for $700 each or $1,300 for the pair. Robin Buerci, (215) 896-0239.**

**For Sale: Arri IIB body, magazines, and lenses, Worrel head, and new Arri tools. Contact Michael at Temner Film and Video, (212) 206-1475, fax (212) 929-9082. Equipment Brokerage.**
in my world but close enough to keep me informed. So, why bother?

I remember at the Masters that we discussed all of this, that we analyzed (very sharply, too) what our role is and should be, what Europe is going to be. And I remember we came to the conclusion that we needed the ESOA. But it seems that once back home everybody started considering his own little garden.

I must admit I got very disappointed, so disappointed that I considered giving up the whole idea. The heck with them, I have plenty of work. What do I care if the Steadicam would slow its growth?

But unfortunately (or fortunately!) my consideration for this amazing piece of technology, and for the possibilities of expression offered by the Steadicam is so high that I cannot give up the idea of putting together all European operators who have a chance of earning their living, to share experiences, to grow professionally.

All considered, I believe the ESOA should start in the most simple way possible: a secretarial service on this side of the Atlantic. To avoid any possible mistrust and jealousy, it should be handled by somebody who is not an operator, is not related to an operator. We thought of Marcel Grooss. He is Mr. CP and he has a constant eye on the Steadicam world in Europe. He also is a good man, he listens, and he gave us a great deal of help at our workshop in February.

Marcel Grooss accepted. He is going to give the most help. His new office in Lausanne will become the SOA number for Europe. Data, information, and procedures will be the same as in Philadelphia. For the moment the fees will be paid to the SOA. In the future, we will consider possible changes according to the needs and balance. All the great projects and plans, (spares, backups, blacklist, etc.) will be reconsidered in the future.

The immediate goal is to improve the participation of all the European members, to associate new operators, to establish the existence of a European branch of the SOA. I hope in the future we will be able to raise our goals.

I know the Scandinavians will form their own association. I wish them all the best, and I hope they will participate in the ESOA project.

Marcel is still coordinating the new office. As soon as possible we will let you know the address and phone numbers. We are planning some advertising in magazines and film guides.

"My consideration for this amazing piece of technology, and for the possibilities of expression offered by the Steadicam is so high that I cannot give up the idea of putting together all European operators."

Last but absolutely not least! I'm convinced that to start the ESOA for good, we need to rediscover the enthusiasm and energy we had at the Masters. Let's do another one in 1992!!! We are checking for a luxurious hotel in Tuscany that could host up to 40 operators (and their lovers)!! We will let you know more in the next issue but start considering that in November 1992 you could be part of a historical event: The 2nd European Masters. The British are welcome, as well as the Americans, Africans, Asians, and from down under. You can't say we didn't tell you in advance.

Meanwhile, good work to everybody and enjoy life!

Nicola Pecorini

Letters

I recently had a Steadicam problem to which I've found the solution, and I'd like to share it with all Steadipersons.

"There I was, 5,000 feet up..."

OK, the real problem was that I was working with a Sony BVP-7 camera. (Usually this camera has a Beta recorder on the back). On plugging from the video out of the BVP-7 to the video in on my Steadicam Model I (original steam powered model), I got no picture, although the green screen did light up. I was able to get a picture by connecting the same video out to a normal field monitor. After checking every board connection and fuse I could find (nothing wrong), an assistant carried the field monitor next to me for the whole day so I could do the shoot. What a pain!!

I sent the Steadicam for repairs to Terry "Mr. Steadicam" West and he was unable to find anything wrong. I'm used to this sort of thing happening as I drive a Chrysler mini van.

After getting the Steadicam back, I was on a shoot and experienced the same problem with another BVP-7 camera. With a field monitor hooked up to the camera's video out, I tried connecting the Steadicam once again, this time to the test out of the BVP-7. This time I got a picture. But when I unplugged the monitor, I immediately lost the picture on the Steadicam. I then replaced the field monitor with a 75 ohm terminator (it's easier on the assistant) and was able to do the shoot like a normal, cool Steadicam operator.

I have never had this Steadicam problem with other video cameras that have two video outputs, but now I know what else to try before pitching a hissy fit on location.

Robert Billings