# Film Making

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EXCLUSIVE

## HOW THEY MADE SUPERMAN FLY

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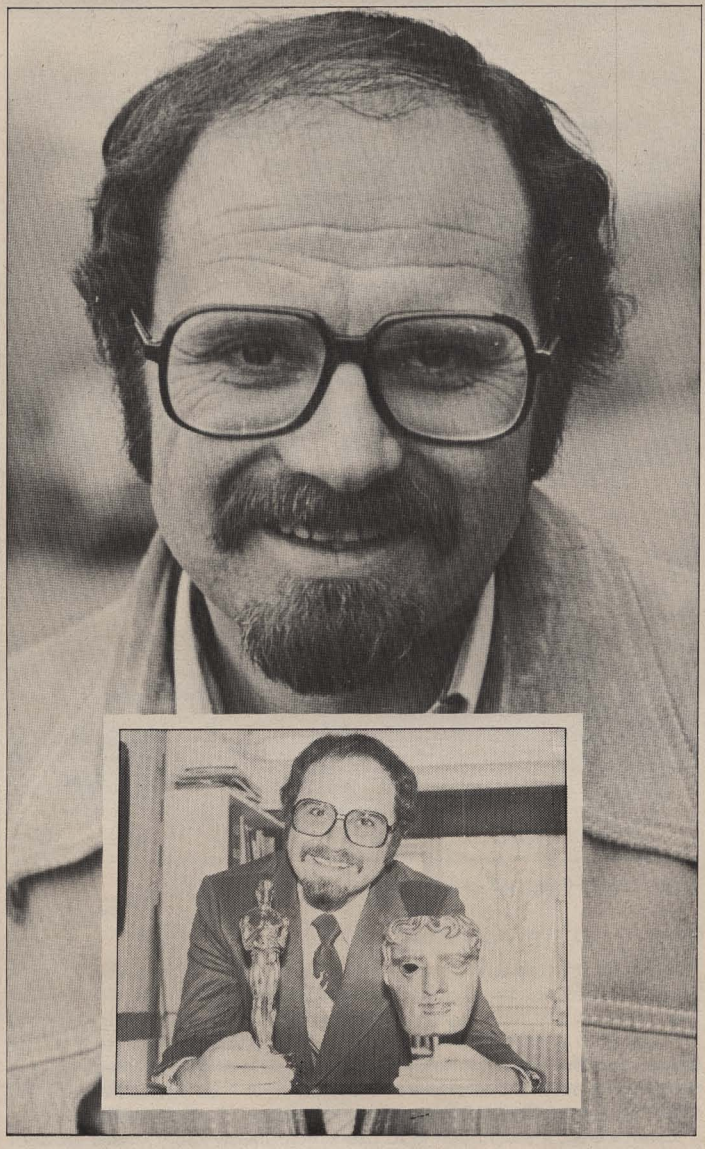
# HOW THEY MADE SUPERMAN F-L-Y!



**We first introduced FM readers to the word ZOPTIC several years ago in an interview with its creator Zoran Perisic. Now Zoptic is very much in the news again. For Zoptic was the major optical device used in the flying sequences for the £30 million blockbuster SUPERMAN. And Zoran, whose life long ambition is to direct a major motion picture, is now the proud possessor of an Academy Award oscar for his work on Superman. Chris Wordsworth talked to Zoran at Pinewood Studios where work on Superman 2 is still in progress . . .**

**CW: Perhaps we can first talk about Superman 1, and your involvement in it and then get on to Superman 2. I think the question that everyone wants answered is exactly what different techniques were used to achieve the flying Superman 1?**

**ZP:** Well the flying used only two basic techniques: front projection and travelling matte. Travelling mattes were used only in the instances where you had to get him very very small in the distance. To get him to look like a dot in the distance with front projection you would have to go on a screen over two or three hundred foot wide. And it'll never be possible to do that really . . . well not quite never, I'm working on something that might do it now.

But basically what you had to do was shoot *that* stuff against blue screen and then optically reduce that result yet again, extending it with the zoom at both ends. Although a lot of these were shot, the number that were actually included in the finished film is very small, compared to the percentage that were front projection.

**CW: How can we recognise the front projection shots?**

ZP: When the figure is not smaller than about a third or a quarter of the picture, that's front projection, because that's as far as we could possibly go. Sometimes when it's very very small it's still front projection but it's a model instead of the real man. The majority of the flying work is in fact front projection.

**CW: The majority of the flying sequences use your Zoptic process?**

**ZP:** All the front projection uses Zoptic. On the front projection itself there were only two projectors that we used all the time on the picture. One was the one that was here before I came which is just a basic small projector, just straightforward but lightweight which could be manoeuvred very easily, and the other one was mine. A lot of the straight stuff was shot with the other one, but later on everything was being shot with mine except when we had to shoot in an inaccessible situation, where my projector was a little bit heavier and less manoeuvreable . . .

**CW: Let's talk about specific examples, for instance when Superman and Lois Lane are flying over New York.**

**ZP:** That's mostly mine on the Zoptic. It is really a question of taking it shot by shot. The travelling matte shot, for example, is when he comes from around the building, he's a dot in the distance and then whips around the building and then whips across. That sort of thing. Every time when he is recognisable as a man and hasn't come to that from a distance — that's Zoptic.

Now the other problem was shooting it forward with a lightweight projector and having the man on wire. Because if you are shooting with a lightweight projector you've got to move the subject in order to get him close to you, although the lightweight projector allows you to pan and tilt and weave about you, to get any real feeling of depth, flying in depth, he actually has to move from one end to the other. So *physically* that meant wires, because there is no other way you can move him away from the screen towards the camera. But the moment you do that and actually physically move the subject, you get screwed up in about three different ways — firstly the wires show up; secondly it restricts his movements, his mobility — he can't spin when he's on wires; and thirdly, it creates technical problems because of the fringe which is the giveaway, when it's badly done on front projection. Fringeing is at its worst if you've got the subject too close to the camera and too far away from the screen. And if you're going to make the man move in depth, this is bound to happen because he is at his worst when he is close to you. And if you are going to get him fairly close to the camera, you must have the screen a long way away so he can travel towards that. But inevitably the moment he's that close to the camera and that far away from the screen, you are working against all the basic principles of front projection and you've got very big problems — you just can't get rid of

problems like that!

The other disadantage here was *speed.* If you are going to get him to move at any speed towards you he's got to physically move at that rate, and by moving the man physically from one end to the other you're reconstructing reality in his movement, although you're putting him against a background which may be unreal. In other words you are *constructing* a reality and the reality must still be there in his movement. And if you are shooting at 24 fps there's nothing you can do but whip him along from one end to the other. Physically speaking you have to move the man along at such an incredible rate that you wouldn't be able to stop him at the other end, he would just go through the wall! Also that particular projector didn't have the facilities for undercranking at the time. It has now, we built it in because we discovered that there is a lot of stuff that you can *deliberately* shoot slower.

But at first everyone was against shooting anything except at real speed because the flapping of the cape had got to be right and the actions had got to be right and so on. But it's incredible how much you could do like that at a deliberately slower speed.

Now with all those problems in view, you had to get him to move — obviously with the front projection as before you could have got him moving left to right across the screen and standing there as the background wizzed away behind him, and all that sort of thing quite easily — but you couldn't get him to come *forward* and without that movement in *depth* it doesn't look realistic at all. He just looks as though he's hanging there.

So this is where this Zoptic process comes in. What it means is that, apart from all the other manoeuvreability, you can actually put him up there in front of the camera and not use wires.

**CW: How was he suspended then?**

**ZP:** Theoretically we are not supposed to talk about it, but as I say it doesn't take much imagination really. I said to the producers "Well you can't stop me talking about my system," and they said, "Well talk about as though it's an aeroplane." So I'll tell you as if we were making an aeroplane fly and you can come to your own conclusions!

## THE SECRET

To avoid using the wires, what you do is you put a pole through the screen and when you set up the camera at the other end, the axis through the camera lens is at the same point as the pole; and the aeroplane in this case which is hanging at the end of that pole is masking off the pole itself, so it's hanging up there in the air with no apparent support. And now at the end of the pole you can have a movement which can swivel like a wrist — which can pan the model left to right and up and down, and apart from that the entire pole can rotate. So you have quite a bit of flexibility. The idea of this flexibility at that end is not so much to give you the movement within the picture, as to change the perspective on the subject. So that it looks as if it's coming towards you and going away, by just panning the aeroplane left to right.

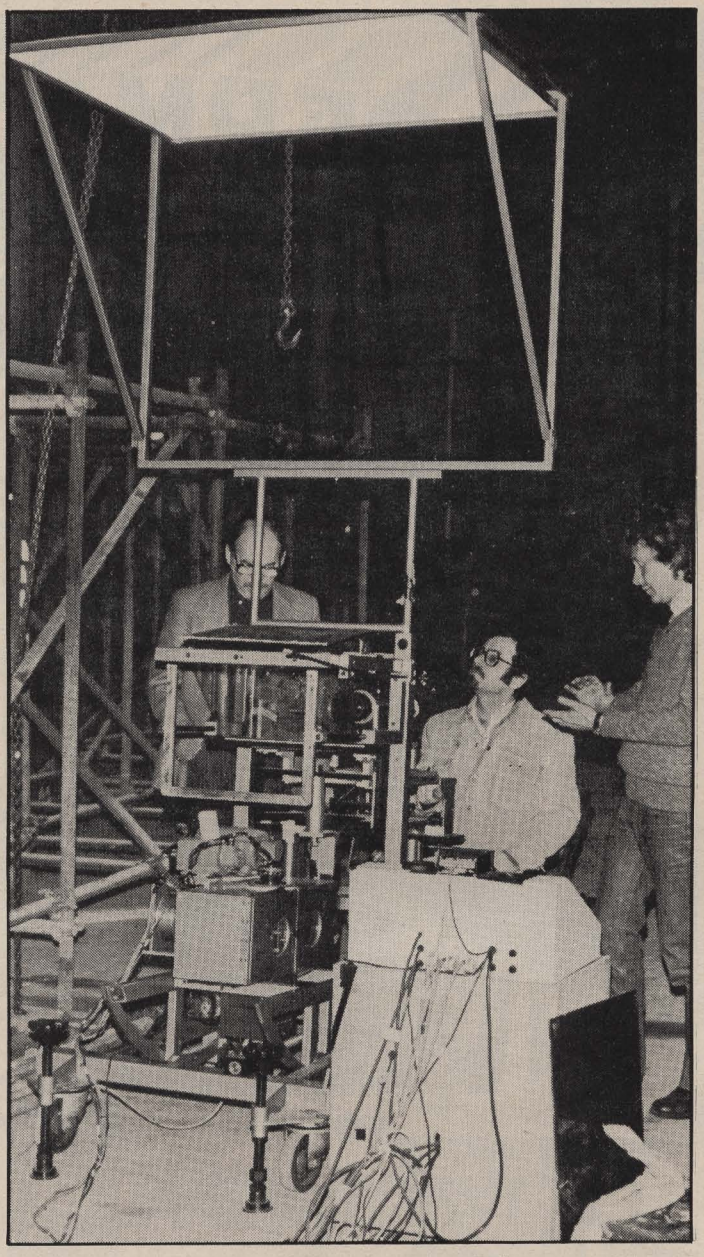
While it's doing all this we can have it *appear* to come closer and then turn round and go away. And all that time the camera rig is maneouvreable itself. It can pan, tilt and rock as well. The greatest thing there is that you can do this at *any* point. You can make the subject quite small at the top of the frame, like in that Statue of Liberty shot: in the original full length of that take they come in from right of frame, then they turn towards the camera and fly towards it and when they get fairly close, they turn round and go away from the camera, and eventually exit out of the picture.

**CW: So all this time the model is in fact in a fixed position?**

**ZP:** The model remains all the time in a fixed position and it's being manipulated so that it's either facing towards the camera or away from the camera, up a bit or down a bit, but all the time the pole is masked off by the subject.

The other advantage of actually moving the subject that's suspended is that the lighting alters. So when they are facing towards you, and if you have the light which is say behind the camera, as they turn away the light, the shadows and everything else move along quite naturally. Whereas if you did it by any other means, if you just moved the projector round behind them or whatever, you get the same lighting all the time and it wouldn't match the background. The main trick, once you've got all this mobility now technically, is to light the subject so that it looks as though it's really part of the background. And the key to that is to match the lighting, so that if the shadows are left to right on the background, you've put exactly the same thing on the foreground. And if the foreground changes relative to the background you do the same sort of changes on the lighting.

For instance, take the sequence when the burglar is falling down the building — though of course he doesn't *really* move much in fact. That particular sequence we did on wires because we wanted him to fall a long way down — we moved him away on wires *and* moved him away



**Denys Coop (left) talks to Zoron about the Zoptic rig.**

## THE ZOPTIC PROCESS

The Zoptic process is a development of front projection which involves placing a two-way mirror at 45 degrees in front of a camera. The camera sees through the mirror whilst the picture from a projector is reflected forward onto a highly reflective screen. The actors work in front of the screen and the camera photographs them as well as the image on the screen. The actor's shadows are hidden by their own bodies because the mirror allows the camera and projector to share an identical angle of view.

Zoran Perisic's adaptation is to use synchronised zoom lenses on both the camera and the projector. Let's assume that both lenses zoom in on a stationary actor. Through the camera, the actors appears to get larger but since the projected background is also being zoomed in (making it smaller on the screen) the view of the background seen through the viewfinder remains the same. Think about it!

If the actor is positioned correctly at the start of a zoom he can be made to fly left or right, up or down, forward or backwards. It all depends on the psychology of perception; we know that huge landscapes cannot rush about and so we believe that the man is doing the flying. In reality, he is fixed on thin wires or on a pole pushed through the screen so that his body hides it from camera.

**— Michael Pearcy**

with the zooms as well. So it looked as if he fell — an awfully long way.

**CW: Physically how far would he have to have gone?**

**ZP:** He moved about 30 ft. As you are doing it on wires and the zooms together all it's doing is really extending the length of the zoom . . .

**CW: So physically he fell . . .**

**ZP:** Physically he was horizontal, he was down on the floor. Virtually everything is shot in a horizontal way, whether it's upside down or not — we just plan it that way.

**CW: So he was moved on wires?**

**ZP:** He was moved on wires *horizontally* away from the camera for that.

**CW: How was the shot lit?**

**ZP:** The lighting was very important, because in that 30 ft he appeared as though he had gone down about 30 floors. So the light from each floor would illuminate him — in other words as he is falling through the darkness he is only lit by a kind of general light that you find in cities. Fill light basically from all around. But the real light is from the windows of the floors as he goes past. There are dark and light patches, so really speaking although he doesn't move that much you can't just line up so many light and dark shadows and move him through that. You actually had to switch lights on and off, while he appears to be whizzing past all those windows.

There were a lot of cases like that, and even when they were flying round the Statue of Liberty and we were doing the close-ups, the light comes on and goes away as he glides from the tops of the buildings and that sort of thing reflected in their faces.

**CW: The other important element in this system presumably is the front projected film itself. Can you tell me something about how that was shot?**

**ZP:** The actual film?

**CW: Yes, bits were animated perhaps . . .**

## HELICOPTER SHOTS

**ZP:** Well there is such an enormous combination of material used there. A lot of it was taken in New York and that's all real. It was actually shot from a helicopter and it was very steady, very good in fact. But as far as I understand it was shot originally as a test on what could be done. The cameraman just went out and shot the stuff. And much later they were supposed to go out and reshoot when the sequence was worked out. But because it is very difficult to get permission in New York to fly at night it became a question of using that stuff or building a model of New York.

Sometimes you *have* to use models — for example in *Superman* number two we have a big battle over Metropolis where half of Metropolis gets destroyed. Most of it gets destroyed in fact. Now you couldn't do that sort of thing for real so we are going to build a model, a big model of Metropolis and shoot all the background stuff with all sorts of back projected pictures.

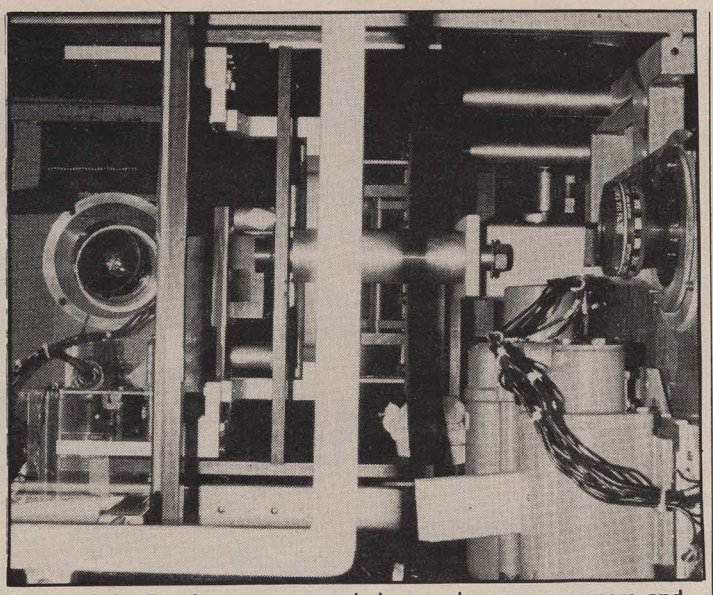
There are *four* flyers this time. Apart from Superman, there's the three "baddies" from Krypton.

**CW: The three that we saw at the beginning of Superman I?**

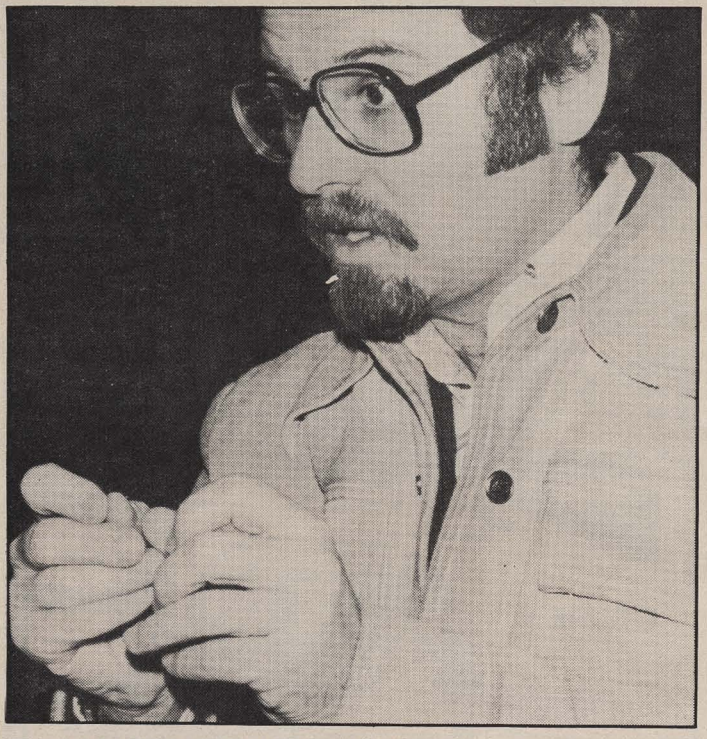
**ZP:** Yes. They arrive and they have the same properties and capabilities as he does and they create havoc!

**CW: Will all that model work be made here at Pinewood?**

**ZP:** Yes it'll all be made here. They haven't actually decided the thing yet. But this is going to hold up the action a little bit because until we get the background shots we can't actually do much. We're getting on without the plates, preparing the new machinery.



Heart of the Zoptic system: coupled zoom lenses on camera and projector.



## ZORAN PERISIC AT PINEWOOD

At Pinewood Studios a few weeks ago, 200 of the film industry's top technicians gathered in theatre seven to hear Zoran Perisic and Denys Coop explain how Superman flies. Denys was Creative Director of Process Photography on *Superman 1.*

Zoran began by explaining the reluctance amongst producers to believe that his Zoptic Process overcame the technical problems he had set himself. The name Zoptic is a child of the original name — Zoom Optic. The Zoptic Process was first used on the modern version of *The Thief of Bagdad* but before being trusted with *Superman,* Zoran had to prove his process by shooting the most impressive flying scene in the film — Lois Lane's first trip with the Big S.

Zoran described his process with film clips including the inevitable props department joke in which the flying man is joined by a stuffed bird on a piece of string! Denys Coop followed Zoran with an explanation of his techniques for photographing the Zoptic process.

**—Michael Pearcy**

## NEW YORK SEQUENCE

**CW: Just one other point about the flying sequence at night round New York city. When they flew past the Statue of Liberty that really was the Statue of Liberty?**

**ZP:** That really was the Statue of Liberty.

**CW: It wasn't a model?**

**ZP:** No, it wasn't. There's only one model shot that you can mistake for the real thing and that's the Golden Gate Bridge in San Francisco. That's a model. That is something that knocks you out! I think the dam later on was obviously a model, it was fairly clear that it was a model.

**CW: I must say that my impression was that Superman was a very realistic film, the backgrounds were very realistic. That would explain why they looked realistic!**

**ZP:** It's virtually all live footage, especially the flying, when he's up in the air, it's virtually all helicopter stuff.

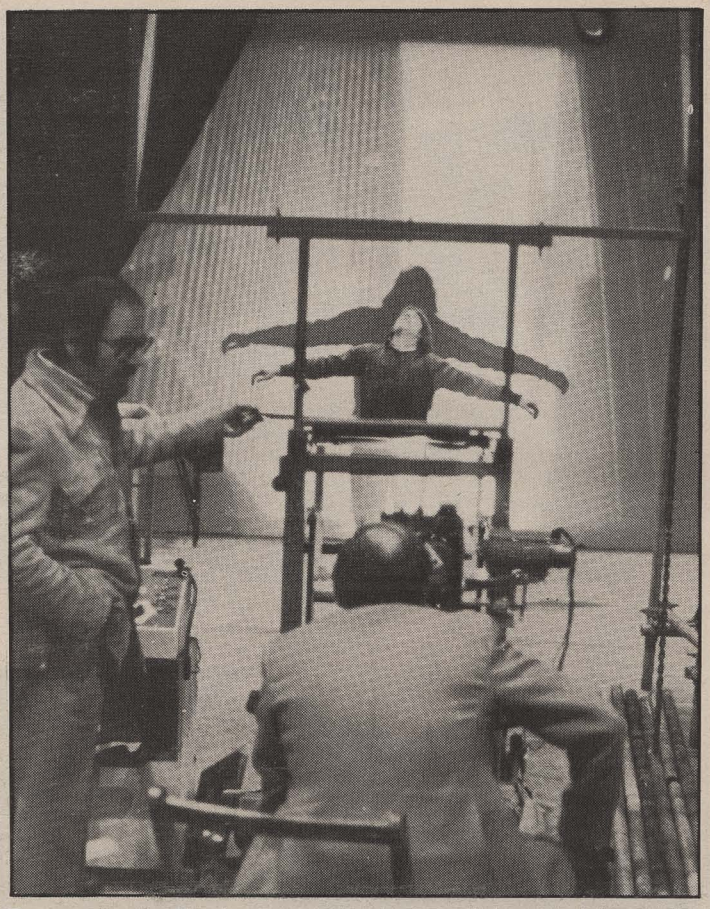
When he's chasing the rockets — that was shot undercranked already at an incredible speed. And then it was printed, speeded up faster and faster so in fact you ended up with some plates which were only five to ten feet long because so many frames had been jumped to get the illusion of flying at an incredible speed. Even though it was shot undercranked, it still didn't look fast enough. Effectively if you'd gone out to shoot it you'd have shot it probably at about 2 fps which you couldn't do, so it had to be a skip frame to get that kind of increase. You just skip frames on the original negative.

**CW: How were the rockets in fact done?**
**ZP:** The rocket sequence again was all on this Zoptic device — they were on the same pole, and they were fairly large. Virtually all the time it was a full size rocket. Very strong light at the back, smoke and dry ice (it was a special combination because dry ice tends to fall as soon as it comes out) pushed out at a very great rate. The special effects guys got up some terrific stuff. There was a very, very powerful light source at the back.

## ANIMATION

**CW: What about the sequence where Superman flies around the earth?**
**ZP:** That *is* animation. Do you mean when you see him small in the distance or when you see him as a figure as a person — that's Zoptic.
**CW: How was the earth done?**
**ZP:** It was a painted model. That was prepared here as well. You can hardly see, but if you look for it you can tell that the world is spinning. Most people don't see it. Really speaking you don't see the world spinning, because it's not a ball. We *know* it spins, but it doesn't mean to say we expect to see it spinning. Because realistically if you're out there in space it *doesn't* do that, unless you are going around it at some incredible rate the opposite way. Now the shots of planets in *2001 Space Odyssey* never move. They're all transparencies. It's so much easier to do it this way and so much more accurate really. You can use real photographs from space, you don't have to make a model. To me that model here is one of the things that doesn't look absolutely right, because there is no diffusion around the edges and the atmosphere doesn't look right and it's too clear, too sharp.
**CW: So in 2001 they used photographs from space.**
**ZP:** Well, as it so happened there were no photographs of space available, so it was a painting, it was actually a painting of the earth. Very, very well painted. I think one of the satellites had gone up, but the quality of the prints wasn't good. Now they can get perfect prints. Things taken from the moon and that sort of thing. Absolutely marvellous quality.

In fact that earth for *2001* was painted by Les Bowie who was the guy who did the paintings here on *Superman*. A lot of them are so good you just can't tell where they are. For example there is a sequence when Superman gets to the North Pole just before he throws the green thing or whatever it is; the majority of that frame was in fact a painting,



Test run for the Zoptic system: the shadow of the technician on the New York background would not be visible through the movie camera due to exact alignment of the projected image.

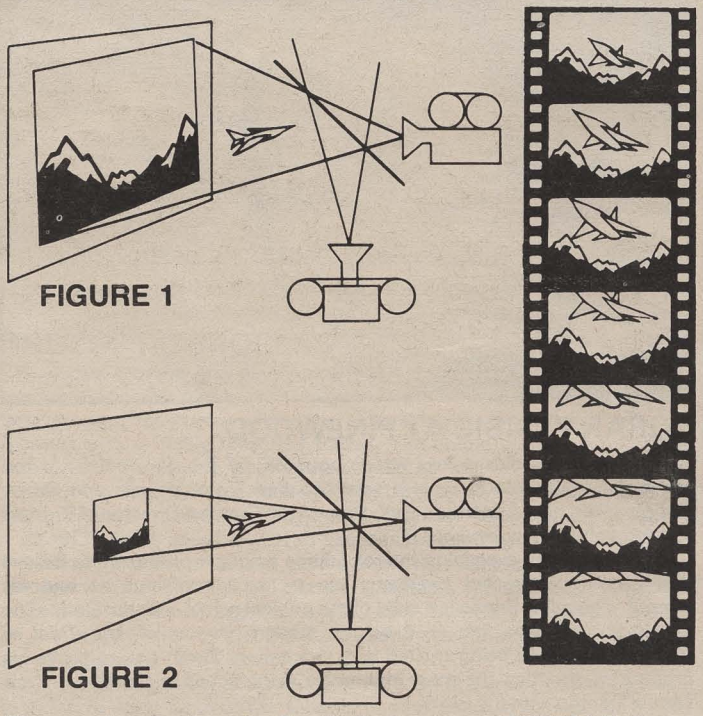



**Diagram showing how the Zoptic device works. FIGURE 1 Projector projecting wide background scene, and position of the model as seen by the camera in relation to background. FIGURE 2 Projector projecting small background scene with lens zoomed to a longer focal length. Effect is that of model moving forward, as shown in film strip**

whereas the actor is just down in the corner on the left, against a piece of real set. The camera is a long way away and the rest of it is painted.
**CW: It occurred to me if a lot of these shots used stills, in other words slides, would it not then be possible for an amateur on 8mm to get some kind of effect?**
**ZP:** Yes, you can either use a slide projector or if you use a big enough slide you can photograph the slide directly for, say, space backgrounds; but for the sort of thing that we're talking about here you can use this same painting process that Les uses.

## NERVE RACKING

**CW: How did you feel about working on Superman, I mean what sort of satisfaction did it give you?**
**ZP:** Not a lot!!
**CW: Why did you say that?**
**ZP:** It was nerve racking really, because the equipment was put together in a hurry. Half the time you were scared stiff whether it was going to work . . . so I was really over anxious to just make sure that it worked.
**CW: How did working on Superman compare say with working on 2001?**
**ZP:** Well on *2001* I enjoyed myself!
**CW: Why was that, I mean what was the difference?**
**ZP:** To be honest really I felt there was a lot of tension.
**CW: Presumably on Superman 2 the whole thing will be much smoother though?**
**ZP:** Oh, yes. Yes, we've got some very good ideas now for Two. Not only ideas we've also got some good hardware — New lenses, we've got new 10 to 1 zooms now that have the same f/stop and everything as the 5 to 1's that we were using before, therefore we don't need any more light to get the longer travel but we are going to build a new lamphouse as well.
**CW: When you talk about the lenses, you're talking about the lenses on the projector?**
**ZP.** Zoom lenses on both projector and camera.
**CW: So you're matching them in fact.**
**ZP:** Yes, you've got to have two matched lenses.
**CW: Can I ask a slightly more general question. Obviously the special effects were very important to the film. What kind of status did the effects people have during the production?**
**ZP:** That is very difficult to judge. If you read some of the things that people have been saying, lately, it seems that the flying was fairly important. That was not always the impression that one got from actually dealing with the people.

Obviously it was known right from the beginning of the film that the special effects would make or break the film. We had so many different people involved in special effects, and so many different categories. Sometimes we had two different people on the same thing.

You had a lot of divisions, you actually had up to about seven units working here at once.

## STANLEY KUBRICK

**CW: If I could go back again to 2001, would you say that perhaps the special effects effort on that film carried more weight during the production?**

**ZP:** Oh yes, there it was very clear. You had an area where you shot all the live action and then you started on special effects. They shot all your live action first and then you went in . . . that was because Kubrick supervised absolutely *everything* all the way down the line. There were several units working at a certain time, one of which he ran himself. So he was supervising all the other units. You actually had a clear cut procedure where you did a test, he approved the test, and then you shot it to that and if you got it wrong . . .!

**CW: So in other words you had a director there who was heavily involved in the special effects side?**

**ZP:** Yes, right from the start. All the way. There's a lot more in some ways, a lot more diverse effects in *Superman* but it wasn't always absolutely clear what was required. Put it this way, Dick Donner works in an entirely different way from Kubrick, an entirely different way.

**CW: How would you describe the way he works?**

**ZP:** He likes to get feed-back from the people. In other words Kubrick has a very clear of not only what he wants but how he's going to go about it. Whereas Donner has a very good idea of what he wants but he wants and gets the feedback from the people who are actually doing the things.

**CW: You wouldn't happen to know I suppose what the shooting ratio was for the whole film?**

**ZP:** No, I'd hate to guess. The only person who can answer that is the editor really. I can tell you that on the flying unit, the takes are always far longer than the actual thing that goes in.

There were at least seven or eight takes each time, even on the good takes. But the number of takes that were not used, the number of scenes that were not used at all in the film that's quite a ratio in itself!

**CW: Superman-2: from what you have been saying, the special effects in that are going to be even more elaborate and exciting.**

**ZP:** Oh yes, they've got to be. There is more scope, because first of all you've got more of the flying throughout the film, right from the very beginning to the end.

Also you've got, as I said before, four people flying now and once one of them is carrying someone on piggyback. So there are five people in the air at the same time . . .

**CW: All in the one shot?**

**ZP:** Yes, all in the one shot. We've obviously got to have intercuts all over the place.

We are also testing out a lot of other methods now where you can mask off certain areas of the frame. You've got a battle you see, when they are not all flying in the same direction. They are flying in opposite directions. This is where we are testing out this Zoptic thing. You can only fly in one direction or the other. You're either zooming in or zooming out. Now the thing is going to be to try and have a system whereby *in the same shot* on that first generation we can zoom in and zoom out without duplicating too much. Split screening and that sort of thing should be the answer.

**CW: Do you have an official title for Superman 2?**

**ZP:** My official title is "Special Effects Director on the Flying Unit"!

**CW: And is that something of a promotion?**

**ZP:** Well it is, on the first one my official title was "Zoptics Co-ordinator" — I never managed to find out what that meant. But I think what it meant was as long as the equipment worked I was alright. I wasn't exactly involved in a lot of the decisions, on how I should have worked or pre-planning because there wasn't all that much pre-planning anyway on the first one.

## RELEASE DATE

**CW: Do they have a release date for Superman 2?**

**ZP:** Officially it is supposed to be next summer.

**CW: Summer 1980?**

**ZP:** Yes.

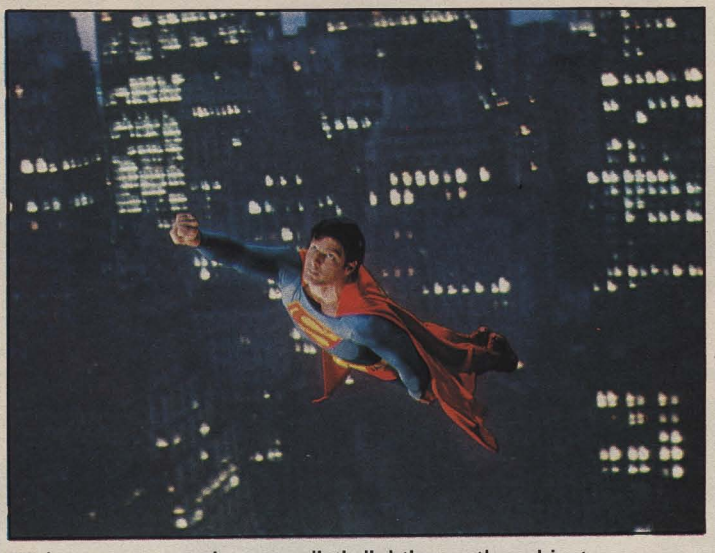
**CW: Does that look likely?**

**ZP:** I don't know. To me it's possible. To a lot of other people they don't think it is. It all depends on how much they are going to change the script. How much more they are going to add to it and how they are going to execute the whole thing. It depends how elaborate you want to go into the battle sequence and all these other things, when they get going.

**CW: After Superman 2, do you think we can look forward to Superman 3?**

**ZP:** Sure, Superman 3, 4, 5, 6, 7 and so on!

Chris Reeve "flies" high above the New York Skyline.



Night sequence: notice naturalistic lighting on the subject.

All glamour aside, "flying" is incredibly hard work but the flying crew all agreed that Chris Reeve was a "natural".