HELIFILMS
AUSTRALIA PTY LTD

# Your Guide to Buying a Cineflex.

*MSII*


*V 14*

## An overview of the decisions to be taken, the options to consider, and the process of purchase.

# Contents

## Introduction

If you're planning to buy a Cineflex gyro stabilised High Definition camera system we hope that this guide gives you a clearly understandable overview and some food for thought in your own application.

## About Helifilms

The Cineflex V14 was designed to achieve rock steady images from a moving helicopter. When first released in 2005 it immediately became the industry standard as users became aware of just what an enormous step had been taken when compared to the old technologies of competing systems.

One facet of our work at Helifilms lies in providing the crews, hardware, logistics and management for big live international sporting events such as the Olympics, the Commonwealth Games, the Asian Games and the Soccer World Cup. Our broadcast work obviously demands the very highest standards of aerial camera work, stability and picture quality, so as soon as the Cineflex system first became available in High Definition we invested in our first V14.

Since then we have added five more units to our arsenal and have been so impressed with the new-generation capabilities that we have also opted to become a global distributor for the Cineflex product line.

With nearly forty years' experience in both military and civil aviation, the last thirty of which have focussed on the world of aerial imagery, we feel well qualified to advise on the process of purchasing either a Cineflex V14 for production work, or the powerful Multi-Sensor variant, the MSII, for the huge range of other applications we describe later.

Helifilms Australia Pty Ltd is the contracted and exclusive re-seller, throughout Australasia, South East Asia, South Africa and the Pacific Islands, for the Cineflex range of aerial camera products, as manufactured by Axsys Technologies Inc. We are also a non-exclusive re-seller worldwide.

Axsys have decades of experience in specialised military and civilian optical systems and were the company who fixed the flaw on the Hubble Space Telescope. They have more recently been chosen as prime optical suppliers for the James Webb Space Telescope, the replacement for Hubble.

In 2009 Axsys Technologies were acquired by General Dynamics.

AXSYS TECHNOLOGIES | GENERAL DYNAMICS Advanced Information Systems

# Part One - The Decision Process

**Overview**
A Cineflex V14 comes in two basic variants:-

The **Production V14** is the product that has turned the world of aerial filming in movies and television on its head, by incorporating full High Definition cameras into a gimbal with unrivalled stability. The ability to change lenses in the field is unique and provides directors and cinematographers with the sort of versatility only ever dreamt of before the advent of the Cineflex. The Fujinon 42 x 9.7mm lens is usually selected for broadcast work. Other alternative lens installations are available as follows:-


Fujinon 13 x 4.5mm

Fujinon 42 x 13.5mm

Fujinon 22 x 7.8mm

The V14 can be ordered with more than one of the above lenses but must be balanced at the factory for each lens that will be fitted.

More lens options are being added all the time. For surveillance work that does not require Infra Red, Angenieux have doubled the reach of the Cineflex with the :-

Angenieux 40 x 22mm

Most recently Fujinon have added their “HD Digital Cinema” E Series lenses for high end movie work, particularly the:-

HAe 10 x 10mm (T1.8)

The **V14 Multi Sensor (V14MS)** was launched in August 2005 and immediately became the de facto standard in aerial surveillance. Two years later the Mark 2 (**MSII**) was first demonstrated, bringing together into one powerful package all of the surveillance and utility tools one could ever need.

The V14MS2 comes with a Fujinon 25 x 16.5mm lens which is not interchangeable.

Both the Production V14 and the Multi Sensor MSII feature the Sony HDC1500 High Definition Camera. The MSII additionally includes a 640 x 512 Infra Red sensor for applications requiring thermal or low light imaging. Both are incorporated in a 5 axis gimbal.

**Choosing a Variant**
The aerial imaging role that you service will usually make the choice of variant obvious. However it's important to note that the Production V14 is not just an MSII without an IR sensor. The ability to choose from a number of lenses and then be able to change them in the field means that the Production V14 has more powerful capabilities than the MSII in the world of pure cinematography.

Conversely, the MSII packs a huge range of features that are not available on the V14 and which have been specifically included to facilitate a wide range of roles such as; Search and Rescue, Power and Pipe Line inspection, Law Enforcement, Emergency Management, Maritime Patrol and Surveillance, control and management of Pollution and the Natural Environment, plus Animal Control.

Some customers have specified camera and lens combinations that fall outside those normally offered, but this involves a good deal of time, R&D, and of course cost. It's not something we recommend you undertake lightly! A Cineflex is a "closed" camera platform that's firmly sealed from the effects of dirt and humidity. The gyros within the system are extremely finely tuned, at the time of manufacture, to the specific camera and lens combination you choose. This is how the extraordinary stability advantage of the Cineflex over other "open" camera platforms is achieved. The camera and lens options currently offered are judged to be the best suited to the advanced capabilities of the Cineflex.

## The Core Factory Product

Once having chosen and ordered your Cineflex variant you can expect to take delivery of two shipping boxes containing the following core items:-

- Gimbal
- Auxiliary Control Box (or HDU 900 control system on the MSII)
- Laptop Controller
- 4 x Cables (plus 2 more for the MSII)
- (an additional camera enclosure for the MSII)

The engineers at Axsys Technologies, in Grass Valley, California, will have dedicated their time and effort to ensuring that this core product is fine-tuned and ready to go, straight out of the box. But there are many other considerations during the journey to a fully integrated aerial system on your helicopter of choice.

For experienced operators who are making the move to a Cineflex and away from competitors' products (which many are!) the V14 will be entirely ready to bolt onto the helicopter and begin work from the day it arrives in your hangar. But even for experienced operators the introduction of the full High Definition capability means that there may be some replacement items to consider such as monitors and recorders.

For first-time users the array of choice can be daunting. At Helifilms we've been through the process ourselves many times and our purpose in writing this guide is to help you avoid some of the pitfalls we've encountered ourselves.

## Mounting to the Airframe

Cineflex owners tend to fall into two distinct categories; those who will be permanently mounting to a known airframe and those who want to retain the ability to move freely between different airframes or between multiple aircraft types.

Mounting brackets, whether as temporary or permanent installations, constitute an airframe modification and therefore require certification by the national aviation authority under which the airframe is registered. Most countries in the world accept certification from either the American FAA or the European EASA. Even if the local authorities are required to carry out their own certification procedure it will usually be based on one of these two methodologies. The resultant paperwork is generically known as a Supplemental Type Certificate (or STC). An STC is always accompanied by a Flight Manual Supplement (FMS) for use by the pilot.


The mounts Helifilms recommends are manufactured by Airfilm Camera Systems and distributed through Meeker Aviation. Any items purchased will come with an STC and FMS for the aircraft type selected. Mounts are available for most of the helicopters in use around the world today and for some fixed wing, but more types are being added all the time and bespoke installations can be designed and manufactured. As with all of the options mentioned in this guide you are welcome to use Helifilms' bulk buying advantage as part of the turnkey package we supply, or you can deal direct with the manufacturer if you prefer.

Owners of a Production V14 will usually install a vibration isolator between the end of the helicopter mount and the head of the Cineflex gimbal, as shown on the Bell 206 installation on the next page. The Vibration Isolator reduces the workload on the gimbal's gyros and motors, thus assisting in the stabilisation process. Although this is not an essential item, it does allow the harsher vibrations from rougher airframes to be isolated.


This is the elegant mounting system used on the nose of the Bell 206 and 407 series. On the previous page we illustrated the AS350 pole mount.

A typical total installation for one generic airframe type, such as the AS350/355 series will consist of the following items:-

AFSP 1 Pole mount with STC
A956-Quick Clamp (For Creative Use Installations)
Pelican Flight Case for pole mount
Vibro Isolator Kit with flight case and STC


## Recording the Pictures

The camera lens and optical block are integrated within the externally mounted Cineflex gimbal. Digital and Analog picture information and data is sent and received via cabling to the "Aux Box" which is housed within the helicopter. In the V14 the Aux Box acts as the hub of the Cineflex system and primarily contains the camera "body". In the MSII the Aux Box is replaced by the powerful HDU900 control system and the camera body is housed in a separate enclosure.

Images can be output from the Aux Box/HDU900 in digital and analog formats including HD SDI, SD SDI and Composite Video. The Sony HDC 1500 camera is capable of producing many variant output formats to suit the role.

From there the images might be sent directly to the ground, recorded on board the helicopter, or a combination of the two. There are many options used for recording on board; in the production role either the Sony S280 HDCAM recorder or the Sony SRW1 HDCAM SR (Superior Resolution) recorder is used. But many operators of both the V14 and the MSII are now moving into the pure digital environment and solid state recording media. This provides immense versatility in the way that both still and moving images are stored, replayed and downloaded, and additionally stores the metadata that's captured simultaneously.

The extraordinary true HD resolution of the Sony HDC1500 camera. combined with the stability of the Cineflex gimbal offers unprecedented picture clarity and stability. It's also been proven that SD images recorded from an HD camera are still superior to images originated on an SD camera.

## Monitoring the Pictures

It's all very well generating and recording pristine HD pictures but of course they need to be seen, not least by the camera operator!

At Helifilms we also believe that it's essential that the pilot is able to see the pictures being generated. He/she doesn't need to do so continuously but it's often helpful to be able to glance at the pilot's monitor and see the shot without therefore needing communication with the camera operator in times of high workload.

For broadcast and film work we also like to provide our camera operators with a separate wave form monitor in order that the quality of the images can be more thoroughly analysed and adjusted to the optimum quality.

There is an enormous range of monitor options available and a decision will often take into account the personal preferences of your camera operator. The IR image from the MSII also needs monitoring of course, and this might introduce the need for an additional monitor, a picture switching ability on the main monitor, or the picture-in-picture capability that comes as standard with the MSII.

Once again we can advise on some of these advanced options. For production work we generally recommend from the Panasonic range, but the MSII roles will often demand a more rugged and sophisticated range of monitors which we'd be happy to show you.

## Minor Accessories

During the process of defining our own operational Cineflex kits we've identified a number of items that we've found are well worth the trouble of sourcing. Some have proved to be impossible to find "off the shelf" so we've had them designed and built on our behalf. These include items such as:-

- Ground Power Supply - for when you don't want to power the Cineflex from the helicopter during set-up procedures in the hangar.
- On Board Power Distribution - for when the helicopter auxiliary power supplies provide insufficient power outlets for the equipment you're using.
- Brackets and Arms - for temporarily mounting monitors in the cabin.
- Flight cases – bespoke for the Cineflex kit, in order to keep each item below the airline 32Kg maximum limit.
- Tool kit – containing all the items you might need when taking your Cineflex "on the road".

In the latter stages of your purchase decision process we'd be glad to advise you on these, and more. Once again we can provide them as part of a turnkey road package or we will simply be happy to put you in touch with our own suppliers.

## Other Platform Options

Although the Cineflex range was initially designed for use on helicopters it can also be used just as effectively to achieve remarkable image stability when operating from fixed wing aircraft, cranes, aerostats, airships, tracking vehicles, boats and, very recently, fast jets.


At Helifilms we've developed a wide range of applications and associated options. For working with cranes we can supply extra long (12.5m) control cables for the gimbal. If you need to work from patrol boats or tracking vehicles we have already experienced those punishing environments and can readily offer help, advice and access to our bespoke equipment.

If you need the capability to quickly mount the gimbal on a flat plate, whether it be in the doorway of a large military helicopter or the roof of a ship's bridge, we can supply the Airfilm Unimount package.

As the MSII is expanding into so many roles in the surveillance and utility world that were previously unimaginable, so too is the range of attachment methods to the platform of choice. Every month new options become available and we'd be happy to keep you right up to date on the latest off-the-shelf options. Alternatively we can guide you through the process of defining, manufacturing and installing a bespoke solution.

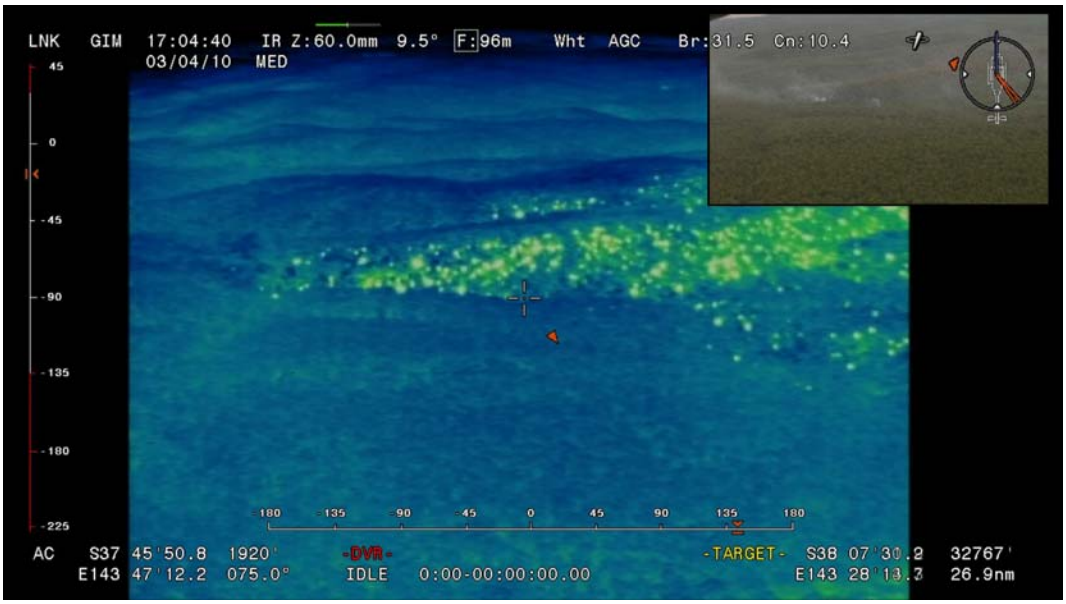
## Surveillance and Utility Options for the MSII

The MSII has been developed to accommodate the demanding needs of a wide range of surveillance applications. One system is even used, full time, for counting deer!

The extraordinary stability, coupled with optical doublers and digital doublers, means that your target will be completely unaware of your surveillance until ultimately confronted with the indisputable evidence against them. The 640 x 512 IR sensor means that these roles can additionally be conducted at night and in poor weather or visibility. A range of standard thermal viewing options allows the IR to be used at the most appropriate setting for the role.

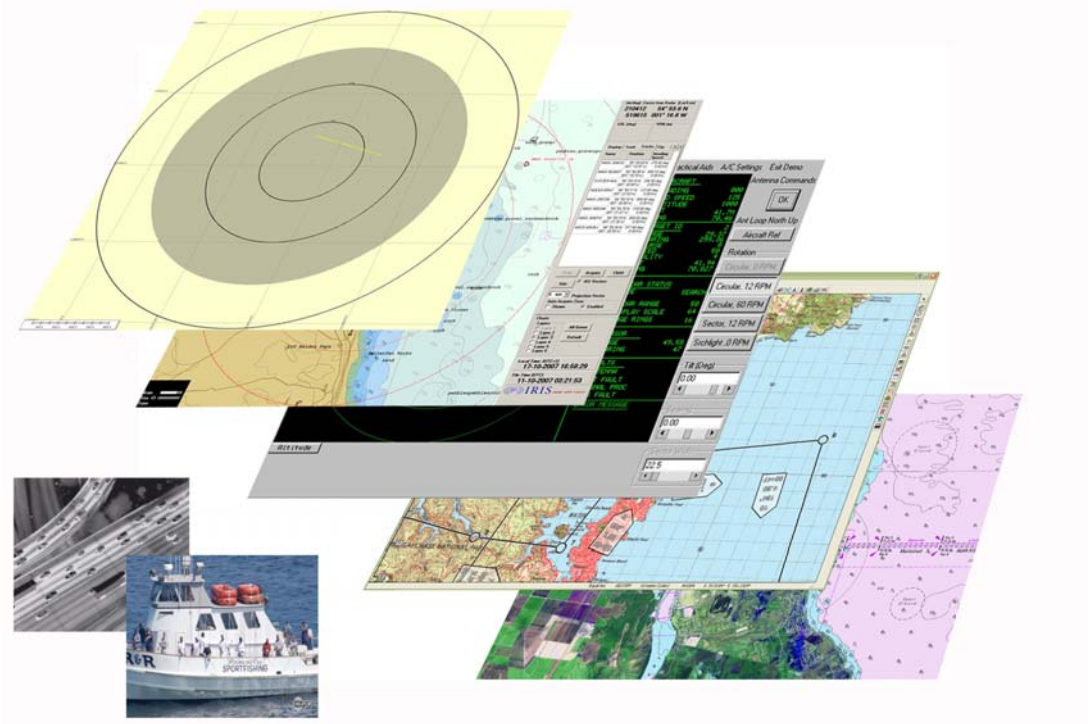
In the world of electricity transmission line inspections the Cineflex range has introduced a new safety standard. No longer is there a need to fly in the dangerous flight environment of “low and slow”. Your inspection helicopters can achieve much more productive results, in a shorter space of time, and from a much safer height. In this image the operator has also used an optical doubler to examine a particular asset in detail. A further 10 x digital zoom is available to him but, unlike our competitors, we use this as a bonus, not as a necessity.

Fire services the world over are turning to Cineflex to provide comprehensive visual information, both in daylight imagery and thermal sensing Infra Red. Real-time images can now be transmitted to the ground, enabling instant analysis, command re-assessment and informed re-tasking. They say that “where there is smoke there is fire”, but the V14MS2 can look through the smoke and tell you exactly where the seat of the fire lies.



With the full suite of options installed the MSII becomes powerfully interactive with your own Geographical Information System (GIS). A database of targets, such as power poles that need inspection, can be uploaded. The combination of aircraft, geographical, and camera parameters are then resolved by the system to point the lens at exactly the right spot on the ground.

Once the visual information has been gathered, either by daylight camera or by IR, this information can then be downloaded to your own GIS, along with its own database of metadata. It all leads to an extremely efficient workflow and can even be accomplished using real-time downlinks if the role requires it.



In order to satisfy the demanding requirements of these roles the MS2 now comes with a full and customisable range of options in addition to the already powerful standard functions. These are described in more detail below.

The MSII has the following **standard functions**:-

**1. HD annotation overlay on video image**.
Entirely selectable and customisable. We can generate anything you like within the graphic layer. Literally anything you can dream up can go on there. It's not just a graphics layer, it's also used as an "asset import" layer where one can compare historic material with what one is seeing in real time

**2. Picture in Picture. (PIP)**
This refers to the ability to select the way in which the HD daylight image and the IR image are perceived on screen at any given moment. For example, one might

normally choose full screen for the HD image with a 1/6th size IR thumbnail in the top right corner as illustrated.

**3. Up-scaling and Down-scaling**
In order to achieve the PIP facility, and the ability to lay one layer over the top of another, there obviously has to be an adjustment to at least one of the layers to bring it into complete compatibility with the others. It also accommodates varying size (in pixel dimensions) of monitors within the aircraft.

**4. Scan conversion**
True HD is 1920 x 1080 (known as 1080i or 1080P, depending on frame refresh type). The other common format, for broadcast or downlink, is 720i or 720P. The HDC1500 captures at full 1080. When considering live downlinks to a command centre there may well be times when one would choose to downlink in 720, not 1080. This is because it takes far more power, bandwidth and expensive equipment to downlink in 1080 than it would in 720.

**5. Video switching**
There are two channels within the aircraft; one with graphics and one without graphics. So, everybody in the aircraft will see the same composite (daylight and IR) image that the operator has chosen at the time, but they could each choose whether or not to see the graphics.

**6. Power conditioning**
The MSII includes a complete power conditioning system that takes in the potentially "dirty" aircraft power, splits it into three separate power channels and conditions each channel to ensure that each facet of the system is getting the amount and quality of power that it likes.

**7. HD digital zoom 10x**
The MSII features a 10 x digital zoom. (An optical zoom is executed within the lens, a digital zoom takes place after the frame has been captured). Of course once one begins to zoom digitally one is beginning to leave the realm of true full HD, but since digital zooming allows for a certain amount of interpolation (what was a boundary between a black pixel and a white pixel will have a grey pixel artificially inserted as one zooms) the quality of the picture does not halve as one doubles the zoom. The 10x digital zoom is in 1% increments.

The MSII has such extraordinary optical zoom capabilities that there are very few occasions when one would use the digital zoom beyond the 3x. It would only really be if there were a very fine detail that one was in doubt about, couldn't resolve visually, and wanted to have a bit of extra confirmation.

**8. TCC500 Laptop Controller**
The principal advantage of the MSII is the way in which it's designed to be totally customisable in the field, through a simplified touch screen menu.

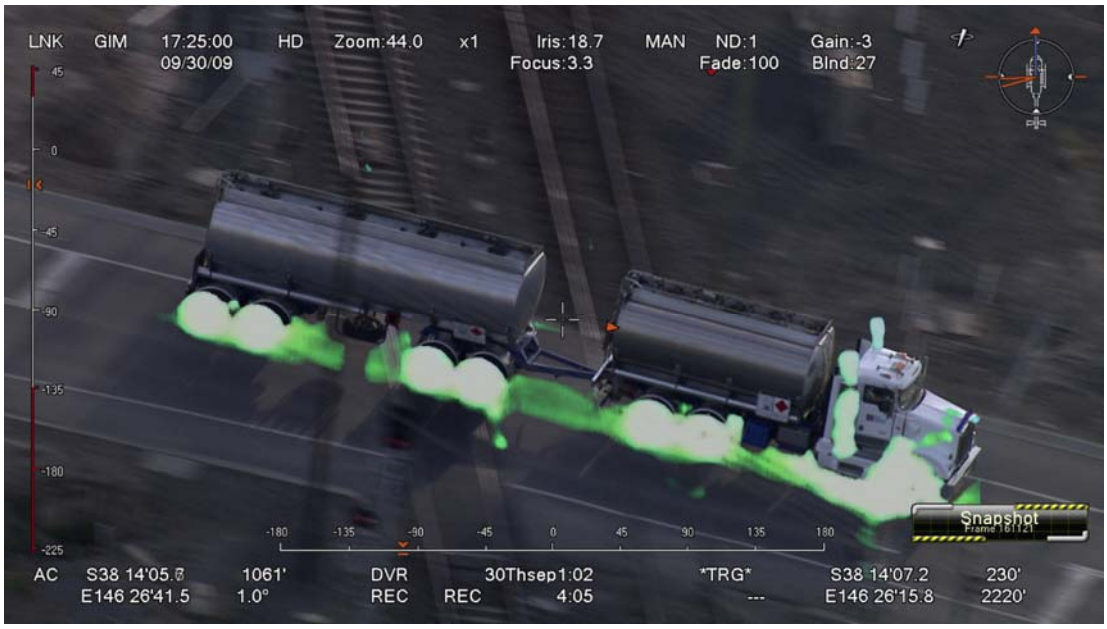
**9. Freeze Frame**
We're all familiar with the ability to freeze the frame when using a recording device but just imagine being able to do so from within the camera system. This enables the main picture to be frozen on screen for as long as a crew member may need it. He might, for example want a little extra time to record the vehicle registration number. In the meantime the camera operator can be using the PIP to continue continuous tracking of the vehicle in question. This capability introduces particularly efficient and time saving work flows in the role of asset inspection.

There is then a range of **optional functions,** with associated extra costs:-

**Option - Geo Pointing**
This gives the ability to ask the gimbal to point the camera at a particular point on the surface of the earth. It's one of the most complex things to achieve as it has to take in so much information from a variety of sources, process them, combine them and resolve the equation to a high standard of accuracy. In order to work there is an additional requirement for an external IMU/GPS.

**Option – Mapping Interface**
This interface is required in order to take advantage of third party mapping equipment. At Helifilms we work closely with Canberra based Analysis & Technology to ensure an entirely seamless workflow for the operator. We have produced a separate guide to how the A&T Asset and Surveillance Management System works hand in hand with the Cineflex Geo-Pointing option. However, with the mapping interface installed you can feed the metadata from the MSII straight into your own mapping system or application.

**Options – Video Blending**
This is the means by which the HD image and the IR image are combined. It's not a stepped process, one has complete control over the opacity between the two layers from 0 – 100%. Note how the IR not only sees the hot tyres and engine, but also the hot air flowing beneath the truck



**Option – Auto Tracker**
This is designed mainly for Law Enforcement applications, particularly in the pursuit role or when the helicopter is required to loiter over a given target. A specific object on the ground, a car for example, can be bracketed on screen. The gimbal will automatically track that object and keep it in centre of frame. It will even predict ahead when the target travels, for example, under a bridge or behind a building. This feature can be useful in briefly releasing the camera operator from full attention to the screen at times of high cockpit workload.

**Option – Remote Gimbal Control**
This is not usually used in a helicopter but may be necessary in UAV applications, on cranes, or in hazardous circumstances.

**Option – Laser Pointer, Laser Rangefinder, Laser Illuminator.**
These products are available but are subject to extra export restrictions and safety regulations, depending on the role they are to be used in. Prices, availability and delivery timescales should be discussed with us at the time of ordering. The laser rangefinder is the most commonly used application in non-military applications

# Part Two - The Purchase Process

We particularly emphasise the importance of planning your purchase process. That way you don't have to make any financial outlay earlier than necessary, and you won't be kept waiting any longer than needed for the delivery of your Cineflex package.

## Orders

The most important thing to get underway is the order of your Cineflex(s) – the "core factory product'. With the wide range of options available in the range, Cineflex build each system to order. When your Purchase Order and your deposit (usually 50%) has been received you will be assigned a place in the production queue. It takes around 6 – 8 weeks to build a Cineflex but the start date will obviously depend on current orders. A V14 generally has an expected delivery around eight weeks after the date of order. The MSII can take longer as it is in heavy demand by government agencies and there are often many orders ahead to be filled.

At Helifilms we alleviate this situation by placing advance generic orders for our future clients in order to establish a place in the queue. This means that we can usually accelerate your order and effectively jump the queue on your behalf. However the build cannot start until your selected specifications have been confirmed and you should expect a minimum delivery time of ten weeks on a Multi Sensor system. Please stay in touch with us for up to date advice on this.

## Licences

Another important consideration is that a Cineflex contains gyros that are of such a high specification that they fall under the International Traffic in Arms Regulations (ITAR) as "significant military equipment". Since a Cineflex originates in the United States of America the rules and laws are administered by the US State Department and a specific licence must be obtained before any Cineflex is allowed to be exported.

Obviously we have no control over the time it takes the State Department to process these licence applications, although we are able to track their progress through an online system. A licence application cannot be speculatively applied for and so it must be accompanied by a Purchase Order. We generally find that the licence takes about the same time to process as it takes to build a system, but this is not always the case. Helifilms therefore encourages its customers to submit a Purchase Order earlier than they might otherwise be considering, (even if not accompanied by a deposit) in order that the licence application can begin. In this way we avoid the irritating scenario where your Cineflex is ready for collection but it cannot be delivered because of State department delays to your export licence.

Please note that there is no need to make all of the ancillary purchase decisions until after the core system build has been initiated, as all of these items have a shorter expectation of delivery time.

## Currency and Cash-flow

We are always happy to supply guide prices.  Prior to order we will give you a formal quote for the package you've specified.

All quotes and transactions will be conducted in US Dollars.  If you prefer to pay us in another currency then we will negotiate a separate arrangement with you that will include a premium to hedge against currency fluctuations.

A deposit of 50% of the core Cineflex purchase price is requested at the time that your Purchase Order is submitted, and the build cannot proceed until we have received that deposit.  Terms thereafter are negotiable but the US Export Licence does not become valid until the final 50% has been received and processed.

For all ancillary orders we have more flexibility and would be pleased to receive your proposal, depending on the delivery dates that we're able to quote at the time.

# Part Three - The Delivery Process

**Overview**
We like to encourage all of our customers to participate in the acceptance and delivery process at the Cineflex factory in Grass Valley, California, USA. This has several advantages:-

- You will have the opportunity to meet the people who have designed and hand-built your system. Whilst a Cineflex does not actually have a signature on it, (like an Aston Martin engine!) it has been guided through the build process by individuals and it's always their pleasure to put faces to names.

- You will get the chance to ask as many technical or operational questions as you like and you will get the opportunity to participate in the final delivery checklist to ensure that everything is exactly as you hoped it would be. At that time you'll pick up many hints and tips on the latest upgrades that have been incorporated into your system.

- Apart from seeing the beautiful conditions under which your Cineflex has been built, you will benefit from meeting the individuals who can deal with any after-sales technical enquiries, via the unique Axsys 24/7 Customer Service and Support Line. We'll always have somebody who can help you from Helifilms, but there's nothing like having direct access to the engineer who built your system.

- You will have the opportunity to flight test your new equipment before it leaves the USA and thus benefit from being able to see it all working in the hands of an experienced operator.

## Freighting and export

When you accept ownership and take delivery of your new Cineflex it's necessary to first prove that you have insurance in place.

Having visited the factory most of our customers like to take their new equipment away with them and export it as accompanied baggage by airline. Freighting can just as easily be arranged but it's extremely important to note that if you intend shipping your Cineflex unaccompanied then it's necessary to nominate, at the time of export licence application, the shipper of your choice who will be responsible for the export.

We will guide you through the process of exporting from the United States. It's a simple procedure but it must be accurately adhered to.

## Local import

Importing your new Cineflex into your home territory is entirely your responsibility, but we will be on hand to help and advise. Different countries have different rules with regard to how this is carried out, whether an import duty is involved in addition to local sales tax and so on. We will happily share any of our own experience with you and we can confirm that a Cineflex system does not invoke any import duty when importing to Australia, just GST at the standard rate.

## Documentation and Training

A full set of documentation will of course be made available at the time of purchase. If you'd like to see any comprehensive user manuals, existing STCs, or any other form of technical documentation prior to ordering, we'd be happy to supply these by email.

Some of our customers prefer to be left alone with their new asset, whilst others like us to be on hand for the first few days of operation. Some customers have asked for a full factory technical training course and Axsys are happy to provide this if desired.

## After Sales Service

As manufacturers of the Cineflex range of products Axsys Technologies are determined to reverse the habit other gimbal suppliers have of ignoring their customers after the purchase process is complete. To this end the company operates a genuine 24 hour, seven days a week, Customer Service Hotline that will always be answered by one of the senior engineers who build the systems. It is a testament to their confidence in their own product that these individuals are prepared to be available throughout day and night, any day of the year.

The core Cineflex product will be in operational service for many decades to come, but enhancements to the way in which the pictures it generates are used and interpreted will be enabled by future technological advances. Axsys Technologies and their representatives around the world believe that these advances can only be effectively harnessed if the company listens clearly to their customers operational requirements and ambitions. Extended warranties are available up to five years.

## ITAR Licence

Although the ITAR regulations at first appear to be daunting they are largely written in order to avoid the extremely sensitive, and therefore controlled, gyros within the Cineflex falling into the hands of unfriendly countries. A copy of the full regulations can be supplied on request. The only practical effect of these regulations on the purchaser will be the need to secure the gimbals when not in use, to the same extent that one would normally consider in any event. When in use, your Cineflex must be accompanied by a member of your company at all times.

## Conclusion

We hope that this guide has proved useful to you, but obviously we haven't been able to cover every option in fine detail. Do please stay in touch with us throughout the process of defining your purchase, in order that we can keep you up to date with the latest developments, improvements to expected delivery times and so on.

We look forward to doing business with you and, from personal experience, we can guarantee that the purchase of a Cineflex will be the best decision you ever make!.

Jerry Grayson AFC
Chairman, Helifilms Australia Pty Ltd

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