# A DIFFERENT ASPECT ...RATIO

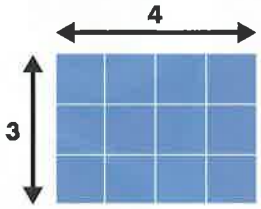
Ah, the early years of TV and film were the good old days (Big sigh …) or, should we say, the easier old days. Our television screen choices were a 4x3 aspect ratio or … nothing. We're sure many of you know someone who still cherishes a console TV, which proudly sits in the living room under a gold swag lamp, adorned with a decorative bunch of large glass grapes resting on a doily. As the old saying goes, "If it ain't broke, don't fix it." Yes, those are the people for which technical progress is an inconvenience.

For the rest of us, though, technical advances strike a wonderful balance of enthusiasm and frustration. Our technical world not only involves different image sizes, but, we must also resolve and justify the differences in format standards, resolutions, conversions, playback options, monitors, and (probably our most difficult task) what it will all cost! These are decisions that can be enough to make your head ache—ah, the price we pay for progress.

So as we are all faced with the choices of which technical direction to take video IFE or even which technologies are available, keep in mind that understanding the differences between, and challenges posed by the 16x9 and 4x3 aspect ratio formats can be confusing even for people who deal with them every day.

We'll do our best to simplify the subject for you here. First, we'll give you a simple definition and explanation of how the 16x9 and 4x3 formats are different, then show examples of how those formats may be modified, and finally we'll consider some questions we may be asking ourselves now and in the future regarding this subject.

First, a definition: *Aspect ratio* is the proportion of width to height of an image, written as "width: height."




Typical, standard television Aspect Ratio is1.33:1 = 4 x 3

Television screen is 1.33 times as wide as it is high.

TELEVISION: Most current televisions in the world have a 4x3 aspect ratio, (also referred to as 1.33:1, or full frame). The following diagram demonstrates that the screen width is 1.33 times wider than it is high, or close to being square.

MOVIE THEATER: Today's movie theaters have a 16x9 aspect ratio (also referred to as 1.78:1 widescreen, 1.85:1 academy and 2.35:1 anamorphic widescreen). The following diagram, as an example, demonstrates that the screen width is 1.78 times as wide as it is high; a rectangular shape, much wider than a current standard television monitor.

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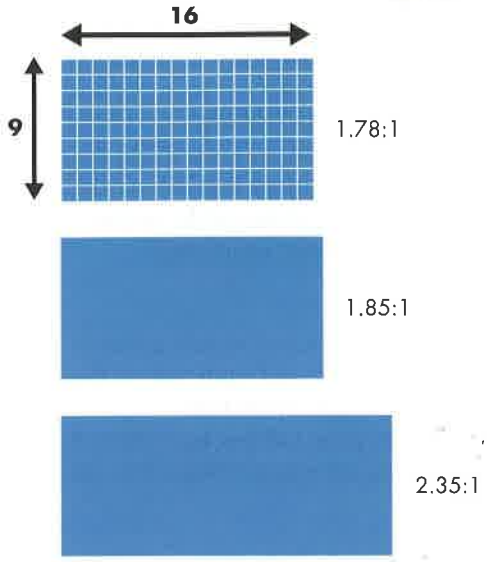


In the beginning of filmed entertainment, the shape of the projection screen was 1.33:1, which is the primary reason original television monitors were developed to meet that same ratio. It made sense! So, you may ask, why did it all change?!

Well, when TV became increasingly popular in the 1950s, people flocked to their living rooms (TV trays and frozen dinners in hand) and the numbers at the neighborhood movie theater dwindled to record lows. Wildly popular, though television had become, filmmakers were not about to let this new "fad" ruin what they knew to be the true, great entertainer: Movies. They knew they must introduce something new, and unavailable at home, to draw their once loyal movie-going public away from the comfort of their own sofas and back into the theater. And, thus, widescreen (and the ongoing battle between television and movies) was born.

Widescreen has been available in a variety of sizes, since its inception, but most noted has been 1.85:1 (or academy widescreen) and super widescreen (2.35:1 or anamorphic – panavision/cinemascope). Widescreen formats enabled the filmmaker to truly capture the vista of a scene, which, in turn, helped to make the audience feel more like a part of the movie, not just a spectator.

But television still wanted to be able to offer it all, so it needed to find a way to make both made-for-TV programming and widescreen films fit on the small screen. And, thus, pan & scan was born.

16x9 Content (Full Frame)


16x9 Content (left screen pan & scan) as displayed on a 4x3 monitor (cuts out 4.5 groomsmen)


16x9 Content (right screen pan & scan) as displayed on a 4x3 monitor (cuts out 3.5 bridesmaids)

## PAN AND SCAN

*Pan and scan* is a technique used to edit a widescreen film image (with a 16x9 aspect ratio) so that it may be displayed on a 4x3 monitor. As a 4x3 monitor is 33% narrower than a 16x9 monitor (and, therefore, 33% less of a 16x9 film may be displayed at one time), the distributor and filmmaker must make critical creative decisions as to which shots of each scene in a film should be chosen as the focal point to most accurately convey the filmmaker's original artistic vision. The screen is first modified to 4x3 and panned left to right to capture as much of the key action as possible. Inevitably, though, key characters are cut off or out of a scene entirely, which sometimes leaves an audience wondering what the scene was truly about.

For example (in the wedding photo example), which 33% would the bride (the filmmaker) choose to eliminate from the picture? Would she cut bridesmaids or the groomsmen? What if the real story in this picture is between the bridesmaid on the far left and the groomsman on the far right! Using pan and scan, they could never be seen together in the same shot.

Understandably filmmakers believe the entire scope of the movie is what must be conveyed to accurately portray their original vision; which is why, while it has been necessary, pan and scan has never been a popular technique with filmmakers.

In today's IFE world (although things are changing), post production facilities (labs) primarily receive movie content on pan and scan masters for display on 4x3 monitors. Other methods of accommodating a 16x9 film to the 4x3 monitor environment do exist, and they are:

## LETTERBOX

*Letterbox* is a term used when the entire 16x9 horizontal theatrical image is preserved so that it may be viewed on a 4x3 monitor. Since the width to height proportion is different and there is not enough picture image to fill the vertical dimension of the screen, the empty space above and below the image is filled with black bars.

The plus side of letterboxing is that the entire image is preserved as the filmmaker envisioned. The negative side is that the actual picture area is smaller, which may be an important consideration depending on the size of the monitor.

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**16x9 Content (Full Frame)**

**16x9 Content (letterbox) as displayed on a 4x3 monitor (reduced in height wedding party)**

Using our photo example, if the 16x9 image happened to be of a large wedding party, when reduced to fit in a 4x3 screen, it might be difficult to pick out an important relative in the back row (although you might prefer that, your mother-in-law might feel differently!). Also, in the real IFE world, subtitles may be difficult to read on a monitor using the smaller letterboxed image.

## CROPPING

A third (though far less acceptable) option of getting that rectangle picture to fit in a square screen is cropping. *Cropping* is accomplished by simply cutting equal amounts off the left and right side of the 16x9 image and only showing the static center of the picture throughout the length of the film.

Keep in mind that if an attempt is made to exhibit the cropped picture on an aircraft that has both 4x3 and 16x9 monitors onboard, the picture will appear fine on the 4x3 monitors, but will have black bars on the sides, (pillars) when it is displayed on the 16x9 monitor.

This option is probably the least popular among filmmakers, because they lose quite a bit of creative control. In our wedding picture example, the first and second bridesmaids and sixth and seventh groomsmen would be eliminated completely using the cropping method.

**16x9 Content (Full Frame)**


**16x9 Content (cropped) as displayed on a 4x3 monitor (cuts out 2 bridesmaids & 2 groomsmen**

While these formatting issues are not unique to the IFE industry, their challenges to the industry are. The home and theatrical markets have (until recently) maintained a clear separation: 16x9 for movies, 4x3 for television. It's true that the terrestrial broadcast world has begun its migration into home-based widescreen entertainment, but the broadcasting of all terrestrial programming is not yet mandated to be 16x9. Although there are currently no mandates, the IFE industry has always tended to set its own standards and may do so once again with 16x9.

So, how does an airline deal with such a huge variety of media formats and monitors?

Again (in the old days), IFE monitors were all the same size. All TV content was 4x3 and all movies were either originally filmed in 4x3 or movie masters were delivered to the labs in the pan and scan 4x3 format. Labs duplicated onto videotapes, delivered them to the airlines and... Voilà!

Today, though, the challenges of mixed media (both filmed and videotaped) have been significant. While television programs continue to be, on large scale, filmed in the 4x3 format, theatrically released and many made-for-TV movies are now filmed in the 16x9 format. Today's IFE challenge is presented when a combination of program formats are required to be played, not only on a variety of systems (videotape, MPEG, DVD), but also on a variety of monitors (4x3 and 16x9, ranging from 5" displays to large projection screens).

AVOD systems (MPEG compression) have increased the need for an airline to carefully consider what type of monitor the content will be displayed on. MPEG continues to be somewhat mysterious to many people and as MPEG formats continue to evolve, their mysteries will grow. To de-mystify (or at least to help clarify) some of the MPEG riddle (without getting too technical), consider these MPEG tidbits:

Today IFE uses two types of MPEG compression: MPEG 1 and MPEG 2.

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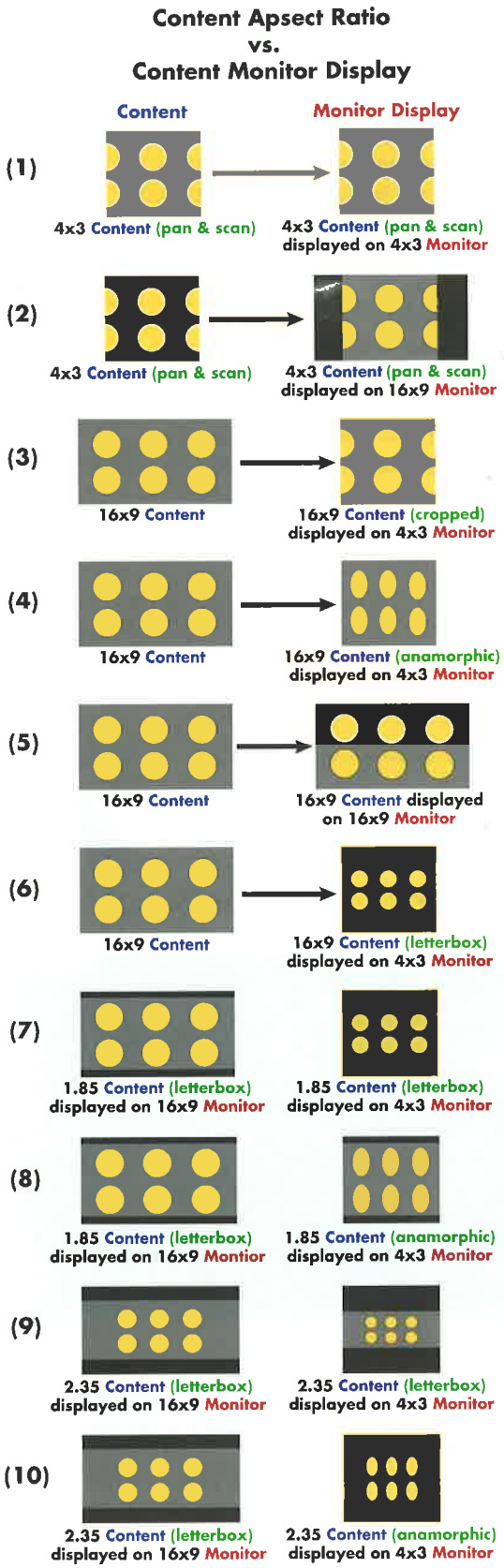
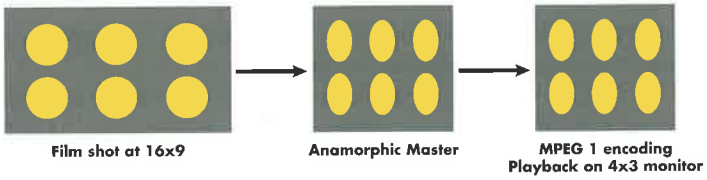


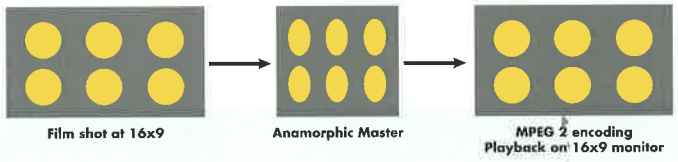

## MPEG 1

MPEG 1 produces a lower-resolution video image, which has been an accepted AVOD format for years, usually for smaller-monitor exhibition. The structure of an MPEG 1 file has (historically) limited its application to the 4x3 format. While a 16x9 (anamorphic) feature film can, in fact, be encoded using MPEG 1, there has not been (historically) a means by which the encoded file can be decoded so that it may properly play on a 16X9 monitor. In other words, an anamorphic feature film, encoded using MPEG 1, would only play back as an anamorphic (squeezed) 4x3 picture. There are advances in modifying MPEG 1 decoding devices, though, so this may change. Keep in mind, however, that an MPEG 1 encoded anamorphic picture at this juncture will not play properly on a 4x3 monitor, so a separate encode would be necessary for both 4x3 and 16x9 displays.




## MPEG 2

MPEG 2, on the other hand, produces a much higher resolution video image and also has the ability to include additional data, which can enable an anamorphic encoded feature film to be properly decoded and displayed on a 16x9 monitor. MPEG 2, therefore, is able to encode both 4x3 and 16x9 content (on a larger variety of monitor sizes), and is able to communicate with the AVOD system as to how it should actually be displayed. Keep in mind again, however, that an anamorphic MPEG 2 encoded picture would only play back properly on a 16x9 monitor.




## ANAMORPHIC

As the word "anamorphic" has been liberally scattered throughout this article, perhaps it's time for a brief definition. This is not a technical explanation, just a simple one, so those of you who are more technically adept, please forgive. *Anamorphic* is a term, that essentially means that a widescreen picture has been squeezed from the sides to vertically fit into a thinner box. With the correct technology, the picture can then be un-squeezed to fit the proper 16x9 screen (see the Content Aspect Ratio chart).

Regardless of the system, though, any picture encoded as a 4x3 will only play back as a 4x3 picture, even when viewed on a 16x9 monitor regardless of whether the original master was a full screen, pan and scan or letterbox. The same would hold true for an encoded 16x9 picture only being able to play properly on a 16x9 monitor.

## ELEMENTS

As mentioned above, most IFE videotape content is already delivered to the labs in 4x3. (TV content is generally already in 4x3 and feature films

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are either filmed in 4x3 [old], or pan and scanned, creating a 4x3 master.) Because of the fact that the labs have historically received 4x3 elements, the bulk of AVOD libraries exist only in the 4x3 format and (to a great degree) in MPEG 1.

So what does the future of providing content for both the 4x3 and 16x9 formats look like?

With current systems, airlines with 16x9 monitors (that order existing library product) will need to understand that the 4x3 content will be displayed on the 16x9 monitor as a 4x3 picture (see Content Aspect Ratio chart, #2). Planes that carry a combination of 4x3 and 16x9 monitors will need to consider that any 16x9 picture, encoded specifically for the 16x9 monitors, may not display properly on the 4x3 monitors and, therefore, a separate 4x3 encoding of the programming may be necessary.

Is there an easy way to satisfy both monitor types with one encode?

Perhaps playing 4x3 content on both 4x3 and 16x9 monitors (with black pillars) would be the best, though not the optimal way to service both worlds.

As we move further down the 16x9 road (or perhaps sky is a better word), however, questions will need to be answered regarding the availability of anamorphic masters (such as when a master will be available). Will it be available as both theatrical and airline edited? What about subtitled versions, etc?

To this point, we have briefly defined and shown a variety of aspect ratios and how those aspect ratios can be displayed. We have also touched on the subject of MPEG and how it may also affect the issue of aspect ratio. But, as mentioned before, there are always more questions!

The following is a sample of questions that may be asked by the IFE industry:

### AIRLINES

- Should 16x9 monitors be installed now or later?
- What content is available and will 4x3 and 16x9 monitors need to be serviced separately?
- How will this affect the bottom line, server space, and timelines?

### DISTRIBUTORS

- How is the airline viewing the content?
- Does the airline want to modify the content in any way?
- What are the financial implications in a world with both 4x3 and 16x9 content?

### LABS

- What elements will be available from the distributors?
- What modifications will the labs be authorized to perform (letterboxing, cropping, etc.)?
- What information needs to be communicated (to properly label and track inventories), and what new hardware will need to be installed to properly accommodate the various formats?

### HARDWARE MANUFACTURERS

- Will systems be able accommodate multiple MPEG formats and mixed aspect ratios in flight?
- How readily available will 16x9 content be for the new systems?

### SERVICE PROVIDERS

- Will airlines accept letterboxing or cropped formats?
- What is the best way to coordinate the product through the aspect ratio maze?
- When creating compilation masters, will there be a combination of 4x3 AND anamorphic content within the same compilation programming?

### A NEW WORLD IN 16x9

In the future, 16x9 will undoubtedly become the standard, just as 4x3 is our standard today. We didn't reach our current standards, though, without some turbulence and many years of experimentation and cooperation. Most assuredly the transition from analog to digital content (ongoing), and from 4x3 to 16x9 will face the same trials. But as overwhelming as emerging technologies may sometimes seem, our industry has a history of tackling challenges and coming out on top.

The best way to minimize the impact, during any transitional phase, is through open communication and discussion. The more we all know and understand, the better we can all serve each other and the industry as a whole.

***These are exciting times! Let's talk ...***