After its first significant downturn in 2012, the Uncooled Thermal Camera market continued to decline in 2013 (-5%), plumbed by the ever shrinking military market (-15% revenues in 2013) which is the historical and most profitable business for uncooled infrared. Nevertheless, 2013 overall sales in total shipments have surged again (+15%) because of the dynamic commercial market where sales have grown by +24%.

For the next several years, thermal camera shipments will continue to grow rapidly, at +25% CAGR in volume between 2014 and 2019 to reach more than 1.4 M. Shipments will be driven by the existing commercial markets which are expanding quickly:

- Thermography: the market will be driven by ultra-low-end cameras with very attractive pricing (below $1000) that widen the audience of thermal technology. Leaders FLIR and Fluke have added many new models in 2013-2014 and will continue to lead the price war due to their vertical business model.
- Automotive: Autoliv, the market leader, will continue to introduce its Night vision 3rd generation on new car models. New EuroNCAP tests could boost the market by promoting, in 2018, night time pedestrian collision mitigation solutions potentially using a thermal solution, but only if the cost is sufficiently low.
- Surveillance: new visible CCTV players have entered the market recently (Panasonic, Mobotix) and will participate in thermal technology democratization. Price erosion will continue (-12%/year) and will enlarge the scope of commercial applications like traffic, parking, and power stations.

Those 3 markets are analyzed in detail in the report (more than 20 slides/application).

Consumer applications have moved to a new phase of growth in 2013-2014 and will be the high growth applications over the next few years, especially in terms of shipments (+61% CAGR):

- Personal Vision Systems (goggles, sight for security, hunting, outdoor observation): first successfully pioneered by FLIR and will continue to grow due to many new entrants arriving from the outdoor visible business.
- Smartphones: First smartphone modules (FLIR One, Opgal Android) have been introduced at the ground breaking price of $349 by FLIR in 2014. A high number of pre-release reservations for the FLIR One (> 30k units) already proves the commercial success of this smartphone platform. An additional scenario (see illustration) envisions an aggressive rapid ramp up of the smartphone application based on a huge price erosion and the integration of the IR core inside the phone. Indeed, smartphone business is an almost 1 B units market in 2013, and any new sensor adopted induces high volumes produced. Those high volumes will only be possible if a huge cost reduction is obtained by the IR imaging industry.
Main technological trends to reduce size and cost at the sensor level

<table>
<thead>
<tr>
<th>Year</th>
<th>Low-resolution/low-cost sensor technologies</th>
<th>Pixel pitch reduction</th>
<th>Core electronics Integration</th>
<th>Wafer Level techniques</th>
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<tr>
<td>2012</td>
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**GROWING VOLUMES AND PRICE EROSION INCREASE COST PRESSURE ON SENSOR AND CAMERA MANUFACTURERS: WHAT IS THE BEST STRATEGY TO SURVIVE?**

Military market downturn and high price erosion have deeply affected traditional infrared imaging margins for the past few years at both the sensor and the camera level. Low-end applications now drive overall growth, thus requiring much higher cost reduction at both material and manufacturing levels. In addition to technological developments to reduce material costs (see next paragraph), economies of scale have become a key competitive advantage. Thus, FLIR, the market leader, and many players at both sensor and camera levels try to target as many commercial markets as possible to aggregate volumes.

In order to react to the strong price pressure, we see various trends depending on the business models of the companies:

- Vertically integrated players: with internal sensor manufacturing, these companies have an efficient cost structure to lead the price war happening in commercial camera markets: DRS and FLIR in the surveillance market, and FLIR and Fluke (for pyroelectric) in the thermography market. Those camera makers focus on core and camera manufacturing and have outsourced sensor manufacturing to foundries (FLIR, DRS, Raytheon) in order to reduce the sensor cost and benefit from the wafer level techniques of the foundries. Other vertically integrated companies (BAE, L3com and Lumasense ITC) will probably follow this path in the future.

- For sensor merchant suppliers: these players are under pressure because their camera customers can not follow the price war led by vertically integrated manufacturers. In order to maintain their competitiveness in front of the semiconductor foundries used by vertical companies, they have upgraded their production line to 8", climbed up in the value chain by providing cores with increased integration, and they have also develop innovative MEMS technologies customized for infrared imaging.

In the report you will find detailed analysis of the status of current and future infrared imaging technologies.
OBJECTIVES OF THE REPORT

- Market data on key uncooled infrared imaging market metrics & dynamics:
  - Uncooled infrared imaging system sales in units & revenue by market segment: 18 market segments
  - Uncooled infrared imager sales in units & revenue by market segment: 5 segments
  - Market share at uncooled infrared imager level
- In-depth analysis of traditional uncooled IR imaging applications: thermography, automotive, surveillance, and military.
- Key technical insights into future technology trends and challenges.
- An in-depth understanding of IR imaging value chain, infrastructure and players:
  - Who are the industrial IR sensor players (IDMs, foundries) and what is their market and technological position?
  - More generally, who are the key players to watch and how will the IR imaging market evolve?

COMPANIES CITED IN THE REPORT (non exhaustive list)

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MARKET & TECHNOLOGY REPORT

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