Technical Note:
'Direct view' refers to imaging equipment, operating in the visible or infrared spectrum, that presents a visual image to a human observer without converting the image into an electronic signal for television display, and that cannot record or store the image photographically, electronically or by any other means.

NOTE:
1061.2.c. does not embargo the following equipment incorporating other than GaAs or GaInAs photocathodes:

a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;
b. Medical equipment;
c. Industrial equipment used for inspection, sorting or analysis of the properties of materials;
d. Flame detectors for industrial furnaces;
e. Equipment specially designed for laboratory use.

1061. 2. d. Special support components for optical sensors, as follows:
1. "Space-qualified" cryocoolers;
2. Non-"space-qualified" cryocoolers, as follows:
a. Closed cycle with a specified Mean-Time-To-Failure (MTTF), or Mean-Time-Between-Failures (MTBF), exceeding 2,500 hours;
b. Joule-Thomson (JT) self-regulating minicoolers with bore (outside) diameters of less than 8 mm;
3. Optical sensing fibres:
a. Specially fabricated either compositionally or structurally, or modified by coating, to be acoustically, thermally, inertially, electromagnetically or nuclear radiation sensitive; or
b. Modified structurally to have a "beat length" of less than 50 mm (high birefringence);

1061. 3. CAMERAS

1061. 3. a. Instrumentation cameras, as follows:
1. High-speed cinema recording cameras using any film format from 8 mm to 16 mm inclusive, in which the film is continuously advanced throughout the recording period, and that are capable of recording at framing rates exceeding 13,150 frames per second;
NOTE:
1061.3.a.1. does not embargo cinema recording cameras for normal civil purposes.
2. Mechanical high speed cameras, in which the film does not move, capable of recording at rates exceeding 1,000,000 frames per second for the full framing height of 35 mm film, or at proportionately higher rates for lesser frame heights, or at proportionately lower rates for greater frame heights;
3. Mechanical or electronic streak cameras with writing speeds exceeding 10 mm per microsecond;
4. Electronic framing cameras having a speed exceeding 1,000,000 frames per second;
5. Electronic cameras having:
a. An electronic shutter speed (gating capability) of less than 1 microsecond per full frame; and
b. A read out time allowing a framing rate of more than 125 full frames per second;

1061. 3. b. Imaging cameras, as follows:
NOTE:
1061.3.b. does not embargo television or video cameras specially designed for television broadcasting.
1. Video cameras incorporating solid state sensors, having any of the following:
a. More than 4×10^6 "active pixels" per solid state array for monochrome (black and white) cameras;
b. More than 4×10^6 "active pixels" per solid state array for colour cameras incorporating three solid state arrays; or
c. More than 12×10^6 "active pixels" for solid state array colour cameras incorporating one solid state array;
2. Scanning cameras and scanning camera systems:
a. Incorporating linear detector arrays with more than 8,192 elements per array; and
b. Having mechanical scanning in one direction;
3. Incorporating image intensifiers embargoed by 1061.2.a.2.a.;
4. Incorporating focal plane arrays embargoed by 1061.2.a.3.;

(For cameras specially designed or modified for underwater use, see 1081.2.d. and 1081.2.e.)

1061. 4 OPTICS

a. Optical mirrors (reflectors), as follows:
1. "Deformable mirrors" with either continuous or multi-element surfaces, and specially designed components therefor, capable of dynamically repositioning portions of the surface of the mirror at rates exceeding 100 Hz;
2. Lightweight monolithic mirrors with an average "equivalent density" of less than 30 kg/m^2 and a total weight exceeding 10 kg;
3. Lightweight "composite" or foam mirror structures with an average "equivalent density" of less than 30 kg/m^2 and a total weight exceeding 2 kg;
4. Beam steering mirrors more than 100 mm in diameter or length of major axis with a control bandwidth exceeding 100 Hz;

1061. 4. b. Optical components made from zinc selenide (ZnSe) or zinc sulphide (ZnS) with transmission in the wavelength range exceeding 3,000 nm but not exceeding 25,000 nm and either of the following:
1. Exceeding 100 cm^3 in volume; or
2. Exceeding 80 mm in diameter or length of major axis and 20 mm in thickness (depth);

1061. 4. c. "Space-qualified" components for optical systems, as follows:
1. Lightweighted to less than 20% "equivalent density" compared with a solid blank of the same aperture and thickness;
2. Substrates, substrates with surface coatings (single-layer or multi-layer, metallic or dielectric, conducting, semiconducting or insulating) or with protective films;
3. Segments or assemblies of mirrors designed to be assembled in space into an optical system with a collecting aperture equivalent to or larger than a single optic 1 metre in diameter;
4. Manufactured from "composite" materials having a coefficient of linear thermal expansion equal to or less than 5×10^{-6} in any coordinate direction;

1061. 4. d. Optical filters, as follows:
1. For wavelengths longer than 250 nm, comprised of multi-layer optical coatings and having either of the following:
a. Bandwidths equal to or less than 1 nm Full Width Half Intensity (FWHI) and peak transmission of 90% or more; or
b. Bandwidths equal to or less than 0.1 nm FWHI and peak transmission of 50% or more;
NOTE:
1061.4.d.1. does not embargo optical filters with fixed air gaps or Lyot-type filters.
2. For wavelengths longer than 250 nm, having all of the following:
a. Tunable over a spectral range of 500 nm or more;
b. Instantaneous optical bandpass of 1.25 nm or less;
c. Wavelength reset table within 0.1 ms to an accuracy of 1 nm or better within the tunable spectral range; and
d. A single peak transmission of 91% or more;
3. Optical opacity switches (filters) with a field of view of 30° or wider and a response time equal to or less than 1 ns;

1061. 4. e. Optical control equipment, as follows:
1. Specially designed to maintain the surface figure or orientation of the "space-qualified" components embargoed by 1061.4.c.1. or 3.;
2. Having steering, tracking, stabilization or resonator alignment bandwidths equal to or more than 100 Hz and an accuracy of 10 microradians or less;
3. Gimbals having a maximum slew exceeding 5°, a bandwidth equal to or more than 100 Hz, and either of the following:
a. 1. Exceeding 0.15 m but not exceeding 1 m in diameter or major axis length;
2. Capable of angular accelerations exceeding 2 $radians/s^2$; and