STAT

Mailing Address

STAT

November 30, 1965

Re: Task I, Item 1, Visitation to

STAT

STAT

Dear John:

Enclosed are 3 copies of the report on a visitation to In addition 2 copies have been sent direct to the Contracting Officer.

STAT

Regards,

STAT

WAS:ws
Enclosures

Declass Review by NGA.

STAT [redacted]

November 30, 1965

Post Office Box 8043
Southwest Station
Washington, D.C. 20024

Subject: Contract [redacted] STAT

Dear Sir:

Enclosed are two copies of a technical report on a visitation to [redacted] STAT made at the request of the Technical Representative of the Contracting Officer. STAT

Additional copies have been sent directly to the Technical Representative of the Contracting Officer.

Very truly yours,

[redacted] STAT

WAS:ws

Enclosures

November 30, 1965

High Resolution Screen

STAT [redacted]

Background

STAT [redacted] originally conceived a technique for use on a rear projection viewer to obtain:

a.) Very high screen resolution
b.) Uniform brightness from all viewing angles (true Lambertian distribution)
c.) Good brightness in well lighted rooms

His technique consisted of coating a transparent screen with a transparent phosphor. The phosphor emits visible light when flooded with ultraviolet light. A rear projection viewer is obtained by projecting an ultraviolet light image on the screen. The phosphor then glows in visible light making the image visible. The first contract work was highly successful in demonstrating feasibility and 450 lines/mm screen resolution was achieved. Present work is devoted to ways of getting greater brightness and exploring phosphors for higher conversion efficiency and desirable color.

Summary

The CVC D.C. sputtering unit and the [redacted] Spectrophotometer were received. The CVC A.C. sputtering unit is due December 15. STAT

The necessity for a visible light projected aerial image was reviewed. The requirement for a zoom lens was reviewed.

Spectral variations in transmittance of the density steps in step wedges is being measured.

Discussion

The Consolidated Vacuum Corporation D.C. sputtering units, AST-100, have been received. The [redacted] Spectrophotometer Model 450 and attachments were received but the lens in the fluorescence attachment was broken. A replacement lens is being obtained from the manufacturer. The basic spectrophotometer is in operation. The Consolidated Vacuum Corporation A.C. sputtering unit, AST-200 is due December 15, 1965. STAT

STAT I reviewed with [redacted] the necessity for a visible light projected aerial image along with the ultraviolet light projected image. The requirement greatly complicates the projection lens design. The visible light aerial image is not needed to improve resolution as the screen resolution is exceptionally high. The visible light aerial image does provide a definite increase in brightness which is highly desirable. In my opinion, however, it would be more economic at this point in the program to work only with ultraviolet light. When a phosphor has been selected and design of a prototype rear projection viewer is initiated, it can then be determined whether the brightness of the phosphor needs augmenting and a decision made as to whether a visible light image should be included.

The requirement for a zoom type projection lens was STAT also reviewed with [redacted] has been attempting to get quotations on design and manufacture of a high performance zoom projection lens. From the responses, it appears that his performance requirements may be beyond the present state of the art. It seems to me that the attributes of the phosphor screen make a zoom lens unnecessary. In actual usage, I would expect that a fixed magnification would be used which would fill the screen with the width of the film. The full width of the film could be reviewed by continuous one-axis scan. To see more detail of an object of interest, the observer could pick up a hand magnifier or auxilliary enlarging lens to magnify a localized area of the screen.

It is the ease and flexibility of overall scanning and detail examination that makes the phosphor screen especially attractive. A fixed magnification lens is perfectly adequate for this purpose and better image quality can be obtained at lesser cost. In my opinion a zoom lens does not add to the effectiveness of the phosphor screen.

STAT [redacted] has been making spectral transmission measurements of density step tablets on the [redacted] Model 450 Spectrophotometer. He has been having difficulty with light dispersion producing large random variations in the readings from step to step. At each density step, however, he has been STAT

able to get good transmission data over a wide spectral range. It is expected that the spectral variation data can be combined with diffuse densitometer readings in visible light and in ultraviolet light to obtain the spectral variation of transmittance at varying densities. The limited brightness range of the instrument limits the measurements to density steps 1 through 8 (density .05 to 1.09).

STAT

STAT

[redacted]

our information
and.

December 1, 1965

Post Office Box 8043
Southwest Station
Washington, D.C. 20024

STAT

Re: Contract [redacted]

Reference: Telecon [redacted] Dec. 1, 1965 STAT

Dear Sir:

In accordance with instructions in the Conflict of Interest article of the subject contract, [redacted] STAT
STAT [redacted] requests authorization to perform services for:

STAT

[redacted]

The work will be concerned with a study program on Advanced Sensors. In the reference telecon, [redacted] indicated STAT there was no obvious conflict of interest but further investigation would be necessary.

It will be appreciated if we can receive an answer to our request by Friday, Dec. 10 while [redacted] is in STAT Washington, D.C.

Very truly yours,

[redacted] STAT

WAS:ws

STAT

826-5

11/3/65

attached is from the I.E.S. Handbook.

Note that the rare earth flame arc has 75.5 lumens per watt. This is 2½ times the output of the best Tungsten and Xenon lamps.

Ref.

Fig. 8-89. FLAME-TYPE CARBON ARCS

	Application Number[a]									
	1	2	3	4	5	6	7[b]	8[c,g]	9[d,g]	10[e]
Type of Carbons	"C"	"E"	"Sunshine"	"Sunshine"	"W"	Enclosed arc	Photo[b]	"Sunshine"[c]	Photo[d]	Studio[e]
Flame Materials	Polymetallic	Strontium	Rare earth	Rare earth	Polymetallic	None	Rare earth	Rare earth	Rare earth	Rare earth
Burning Position[f]	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical	Horizontal	Horizontal	Vertical
Upper Carbon[g]										
Diameter	22 mm	22 mm	22 mm	22 mm	22 mm	½ in.	½ in.	6 mm	9 mm	8 mm
Length	12 in.	12 in.	12 in.	12 in.	12 in.	3 to 16 in.	12 in.	6⅝ in.	8 in.	12 in.
Lower Carbon[g]										
Diameter	13 mm	13 mm	13 mm	13 mm	13 mm	½ in.	½ in.	6 mm	9 mm	7 mm
Length	12 in.	12 in.	12 in.	12 in.	12 in.	3 to 16 in.	12 in.	6⅝ in.	8 in.	9 in.
Arc Current, amperes	60	60	60	80	80	16	38	40	95	40
Arc Voltage, a-c[h]	50	50	50	50	50	138	50	24	30	37d-c[h]
Arc Power, kw	3.0	3.0	3.0	4.0	4.0	2.2	1.9	1.0	2.85	1.5
Candlepower[i]	2,100	6,300	9,100	10,000	8,400	1,170	6,700	4,830	14,200	11,000
Lumens	23,000	69,000	100,000	110,000	92,000	13,000	74,000	53,000	156,000	110,000
Lumens per Arc Watt	7.6	23.0	33.3	27.5	23.0	5.9	39.8	53.0	54.8	73.5
Color Temperature, °K	[j]	[j]	12,800[j]	24,000[j]	[j]	[j]	7,420[j]	6,590	8,150	4,700
Spectral Intensity (microwatts/cm² one meter from arc axis[k])										
Below 270mμ	540	180	102	140	1,020	—	95	11	—	12
270–320 mμ	540	150	186	244	1,860	—	76	49	100	48
320–400 mμ	1,800	1,200	2,046	2,816	3,120	1,700	684	415	1,590	464
400–450 mμ	390	1,100	1,704	2,306	1,480	177	722	405	844	726
450–700 mμ	600	4,050	3,210	3,520	2,600	442	2,223	1,602	3,671	3,965
700–1125 mμ	1,580	2,480	3,032	3,500	3,220	1,681	1,264	1,368	5,632	2,123
Above 1125 mμ	9,480	10,290	9,820	11,420	14,500	6,600	5,189	3,290	8,763	4,593
Total	14,930	19,460	20,100	24,000	27,800	10,600	10,253	7,140	20,600	11,930
Spectral Radiation (per cent of input power)										
Below 270 mμ	1.8	.6	.34	.35	2.55	—	.5	.11	—	.08
270–320 mμ	1.8	.5	.62	.61	4 65	—	.4	.49	.35	.32
320–400 mμ	6.0	4.0	6.82	7.04	7.80	7.7	3.6	4.15	5.59	3.09
400–450 mμ	1.3	3.7	5.68	5.90	3.70	.8	3.8	4.05	2.96	4.84
450–700 mμ	2.0	13.5	10.70	8.80	6.50	2.0	11.7	16.02	12.86	26.43
700–1125 mμ	5.27	8.27	10.10	8.75	8.05	7.6	6.7	13.68	19.75	14.15
Above 1125 mμ	31.6	34.3	32.70	28.55	36.25	29.9	27.3	32.90	30.69	30.62
Total	49.77	64.87	67.00	60.00	69.50	48.0	54.0	71.40	72.20	79.53

[a] Typical applications: 1, 2, 3, 4, 5, and 8, photochemical, therapeutic, accelerated exposure testing, or accelerated plant growth; 6 7, and 9 blueprinting diazo printing, photo copying, and graphic arts; 10, motion picture and television studio lighting.
[b] Photographic white flame carbons.
[c] High intensity copper coated sunshine carbons.
[d] High intensity photo 98 carbons.
[e] Motion picture studio carbons.
[f] All combinations shown are operated coaxially.
[g] Both carbons are same in horizontal, coaxial a-c arcs.
[h] All operated on alternating current except Item 10.
[i] Horizontal candlepower, transverse to arc axis.
[j] Deviate enough from blackbody colors to make color temperature of doubtful meaning.
[k] See Section 24 for spectral energy distribution curves.

Intended Sheath Temperature (degrees F)	Heated Length (inches)	Mould Size (inches)	electrically conducting
850	70	1¼ x 1¼	
1500	46	1¼ x 1¼	
1300	17	1¼ x 1¼	
1450	17	1¼ x 1¼	
1400	23	1¼ x 1¼	
1340	39	1¼ x 1¼	
1450	53	1¼ x 1¼	
1450	65	1¼ x 1¼	
1450	77	1¼ x 1¼	

4,000 mμ)

Fig. 8-88. Direct-Current Carbon Arc

	Low Intensity	Non-rotating High Intensity	Rotating High Intensity					
	Application Number*							
	1	2	3	4	5	6	7	8	9
Type of Carbon	Microscope	Projector	Projector	Projector	Projector	Projector	Projector	Searchlight	Studio "Yellow Flame"
Positive Carbon									
Diameter, mm	5	7	8	10	11	13.6	13.6	16	16
Length, inches	8	12–14	12–14	20	20	22	22	22	22
[illegible]ative Carbon									
Diameter	6mm	6mm	7mm	11/32 in.	3/8 in.	½ in.	½ in.	11mm	17/32 in.
Length, nches	4½	9	9	9	9	9	9	12	9
Arc Current, amperes	5	50	70	105	120	150	180	150	225
Arc Volts, d-c	59	40	42	59	68	78	74	78	70
Arc Power, watts	295	2000	2940	6200	8160	11700	13300	11700	15800
Burning Rate, inches per hour									
Positive Carbon	4.5	11.6	13.6	21.5	20.5	17.0	21.5	8.9	20.2
Negative Carbon	2.1	4.3	4.3	2.9	2.6	1.9	2.5	3.9	2.2
Approximate Crater Diameter, inches	.12	.23	.28	.36	.39	.50	.50	.55	.59
Maximum Brightness of Crater, candles per sq cm	15000	55000	83000	90000	85000	87500	95000	65000	68000
Forward Crater Candlepower	975	10500	22000	36000	44000	63000	78000	68000	99000
Crater Lumens**	3100	36800	77000	126000	154000	221000	273000	250000	347000
Total Lumens†	3100	55000	115000	189000	231000	368000	410000	374000	521000
Total Lumens per Arc Watt	10.4	29.7	39.1	30.5	28.3	31.4	30.8	32.0	33.0
Color Temperature, degrees Kelvin‡	3600	5950	5500–6500	5500–6500	5500–6500	5500–6500	5500–6500	5400	4100

* Typical applications: 1, microscope illumination and projection; 2, 3, 4, 5, 6 and 7, motion picture projection; 8, searchlight projection; 9, motion picture set lighting and motion picture and television background projection.
** Includes light radiated in forward hemisphere.
† Includes light from crater and arc flame in forward hemisphere.
‡ Crater radiation only.

FIG. 8-88

8-101

STAT

Mailing Address

October 31, 1965

STAT

Monthly letter progress report, Contract

STAT

Comments on Status

Task I - Item 1 "Special Investigations"

There were no specific requests for visitations this period.

Task II - Item 1 "Submicron Measurement Error Analysis"

Two specific areas have been investigated and reported under item 1 since its initiation. They are: a) Physical and metallurgical properties of materials and b) Structural rigidity and vibration control.

Reports No. 1 and No. 2 dealt with the physical and metallurgical properties of materials. Reports No. 3 and No. 4 dealt with structural rigidity and vibration control. The aspects that require further work are:

a.) Search for data on the internal damping coefficients of materials (especially granite)

b.) Further information on development status of Owens-Illinois Cer-Vit C-100 glass which has zero coefficient of thermal expansion.

c.) Transmissibility of vibration through an air bearing in a direction normal to the air cushion.

d.) When some of the basic dimensions of the precision stereo comparator have been established, a dynamic model of its vibration characteristics can be analyzed.

e.) Investigation of the availability of an 8 cps pneumatic isolator.

STAT [redacted]

October 31, 1965

Comments on Status (Continued)

In the computer analysis of the building floor slab submitted in report No. 4, the fundamental frequency was found to be 15.6 cps. The analysis was based on 2,000 psi concrete. The architects drawings of the building indicated that 3,000 psi concrete was used in the floor. The fundamental floor slab frequency varies as the square root of the concrete strength. Therefore the frequency should be:

$$15.6 \sqrt{\frac{3,000}{2,000}} = 19.1 \text{ cps}$$

The increase of the floor slab fundamental frequency to 19.1 cps does not materially alter our previous conclusions.

We were advised that the Bureau of Standards had been requested to measure vibration levels in the particular building areas of interest. I believe the most useful data would be a vibration power spectrum plot with coordinates of G^2/cps vs cps.

Our concern over use of a 2 cps pneumatic isolator centers on the large excursions an operator will encounter in his normal work sequence. I suggest the technical staff examine the optical bench in the Laboratory Branch which is mounted on 2 cps "Serva-levl" pneumatic isolators. I also suggest that a trial installation of the 2 cps "Serva-levl" isolators on an existing piece mensuration equipment be considered.

Task II - Item 4 "Automatic Target Recognition"

Over the past few months the General Motors Defense Research Laboratory at Santa Barbara, California, has done further work on the transformation of aerial photo imagery by generating the fraunhofer diffraction pattern with coherent light from a laser. They were encouraged by the distinctiveness of the signatures of various terrain features and culture. I suggest a visit by the technical staff to GMDRL in the near future is in order to examine the recent work.

Task II - Item 5 "Lamps for Rear Projection Viewers"

Considerable data has been collected on carbon arcs and also on some new enclosed gaseous arc discharge lamps under development. Preparation of the second technical report on this subject has been initiated. Services of [redacted] STAT will be needed for the preparation of the report. STAT

[redacted]