

DAVID FLORIDA LABORATORY DATA DOCUMENT

The David Florida Laboratory ("DFL") is Canada's world-class spacecraft assembly, integration and testing centre. It is named in honour of one of Canada's pioneers in space research, C. David Florida.

At present, on a fee-for-service basis, the DFL is available for use by Canadian and foreign aerospace and telecommunications companies and organizations for qualifying hardware. It is registered as ISO 9001:2015 for radio frequency, structural and thermal qualification testing of space bound and terrestrial hardware. Support facilities include offices, conference rooms, storage areas, check out rooms and in house mechanical, electrical and electronic shops.

For more information, visit the website, <https://www.asc-csa.gc.ca/eng/laboratories-and-warehouse/david-florida/about.asp>

The information in this document corresponds with the actual historical operations of the DFL, in the experience of the Canadian Space Agency. It consists of the following data:

- A. Testbeds and associated equipment highlights;
- B. Organizational structure and annual salaries;
- C. Test operations annual expenses;
- D. Building operations annual expenses;
- E. Annual revenues; and
- F. Annual number of tests performed.

The future for such information can differ significantly, depending on the business and operating models of whatever private sector entity becomes potentially the lessee of the DFL, and the industries/sectors that it serves.

A. Testbeds and Associated Equipment Highlights

Test Category	Testbeds and Associated Equipment Highlights	Status
Thermal	Thermal Vacuum Chamber (TVAC) - TV1	Operational
	Thermal Vacuum Chamber (TVAC) - TV2	
	Thermal Vacuum Chamber (TVAC) - TV3	
	Thermal Vacuum Chamber (TVAC) - TV4	
	Thermal Vacuum Chamber (TVAC) - TV5	
	Outgassing Station	
	Thermal Chamber - TP1	
	Temperature Altitude Chamber - TA1	
	Temperature Humidity Chamber - TH1	
	Dusty Thermal Vacuum Chamber - DTVAC (pre-commission stage)	
	Large Area Pulse Solar Simulator System	
	Bell Jar Low Vacuum System	
	GIIRO System (spacecraft IR radiation measurement)	
	Emissivity Tester	
	Air Leak Detection System	
	Thermal Response & Power System (TRAPS) Rack + NG	
	Helium Shroud & Pumping System	
	Control Room & Data Acquisition Systems	
	Thermal Vacuum Auxiliary Eqpt (cables, port plates, etc)	
Vibration	Shaker - LD4000 (excluding seismic block)	Operational (near end of life)
	Shaker - LDS V9 (excluding seismic block)	Operational
	Shaker Ling C150 (excluding seismic block)	Operational
Shock	Kinetic Shock Table	Operational
	Air Cannon with Table	In Construction
	MTS Drop Machine	Operational
Modal	Modal Test Facility (excluding seismic block)	Operational
Static Load	Static Load Test Facility (excluding seismic block)	Operational
Mass Properties	Large Mass Property Measurement Facility	Operational
	Small Mass Property Measurement Facility	In Construction
Metrology	3x Laser Trackers	Operational
	Photogrammetric Measurement System	
	Theodolites	
	Metrology Hardware	
	Force Limited Vibration (FLV) Hardware	
	Hydrasets	
	Load Cells	
Data & Instrumentation	Accelerometers	Operational
	Accelerometer Calibration System	
	Backup Recorders & Data System	
	Control & Data Acquisition Systems (for Vibration, Shock, Modal)	
Antenna Characterization	Cylindrical Near Field (CNF)	Operational
	Spherical Near Field (SNF)	
	Reference Antenna Inventory for RF Testing	
	Anechoic ATF1	
	Anechoic ATF2 (including HVAC, fire suppression, etc / excluding isolation block)	
Control & Data Acquisition Systems (for CNF, SNF, ATF2)		
EMC	EMC Chamber and Ante-Chamber	Operational
	Reference Antenna Inventory for EMC	
	Control & Data Acquisition Systems and Instrumentation	
Antenna & EMC Instrumentation	Spectrum analyzers, network analyzers, synthesizers, power meters, power amplifiers, generators, filters, diplexers, RF cables, etc	Operational
Auxiliary	9x various cranes	Operational
	2x Portable Clean Room Tent (Class 1000 / MG.5)	
	2x Laminar Clean Room Flow Benches	
	3x Forklifts and an Electric Pallet Truck	
Machine Shop	Various Equipment (lathe, milling, drill press, welding, etc)	Operational

B. Organizational Structure and Annual Salaries

<u>Function</u>		<u>Canada Public Service Occupational Group / Level</u>
<u>Directorate</u>		
1	Director	EX 02
2	Administration Mgr	AS 02
3	Operations Support	AS 01
4	Administration Support	CR 04
5	Risk Management	EN-ENG 05
6	Simulations R&D	EN-ENG 05
<u>Structural</u>		
7	Structural Facility Mgr	EN-ENG 05
8	Structural Engineer	EN-ENG 03
9	Structural Technician / Machinist	EG 05
<u>Technical Support</u>		
10	Technical Support Mgr	AS 06
11	Technical Support	EG 04
12	Technical Support	GT 02
13	Technical Support	GT 02
<u>Thermal</u>		
14	Thermal Facility Mgr	EN-ENG 05
15	Thermal Engineer	EG 06
16	Thermal Facility Supervisor	EG 06
17	Thermal Facility Supervisor	EG 06
18	Thermal Sr. Technician	EG 05
19	Thermal Technician	EG 04
20	Thermal Technician	EG 04
21	Thermal Auxiliaries Technician	EG 04
<u>RF / Antenna</u>		
22	RF Facility Mgr	EN-ENG 05
23	RF Engineer	EN-ENG 04
24	EMC Sr. Technician	EL 06
25	EMC Technician	EL 05
26	RF Technician	EL 04
<u>Facility Operations</u>		
27	Facility Operations Mgr	EN-ENG 04
28	Sr. Designer & Project Mgr	EG 06
29	Facility Ops & Maint Specialist	EG 05
30	Facility Ops Admin Support	CR 04
<u>Facility Strategic Planning</u>		
31	Sr. Strategic Planning Mgr	EN-ENG 04
32	RP Project Manager	EN-ENG-03
33	RP Project Coordinator	EG 05
34	RP Program Coordinator	EG 04
35	Facility Ops Admin Support	CR 04
<u>Security</u>		
36	Sr. Security Officer	AS 2
<u>Approximate Annual Total Salaries: \$3M</u>		

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C. Test Operations Annual Expenses

(In thousands of dollars)								
<u>ADMINISTRATION</u>		5-Year Average (FY-19/20 to FY-23/24)	FY-19/20	FY-20/21	FY-21/22	FY-22/23	FY-23/24	
Capital	Total Capital	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
O&M	Travel, Training, Conferences, Awards	\$ 63	\$ 93	\$ 53	\$ 31	\$ 52	\$ 86	
	Stationary, Printing, Translations, Software	\$ 12	\$ 37	\$ 6	\$ 3	\$ 8	\$ 6	
	ISO Certification	\$ 3	\$ -	\$ -	\$ 6	\$ 3	\$ 4	
	Facilities & Furniture	\$ 2	\$ 4	\$ -	\$ -	\$ 1	\$ 5	
	Clients Credit Check	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	
	IT Services	\$ 1	\$ 8	\$ -	\$ -	\$ -	\$ -	
	Co-op student (for AIT development)	\$ 8	\$ 41	\$ -	\$ -	\$ -	\$ -	
Total O&M		\$ 91	\$ 185	\$ 61	\$ 42	\$ 66	\$ 103	
ADMIN TOTAL:		\$ 91	\$ 185	\$ 61	\$ 42	\$ 66	\$ 103	
<u>STRUCTURAL QUALIFICATION FACILITIES</u> <u>(SQF)</u>		5-Year Average (FY-19/20 to FY-23/24)	FY-19/20	FY-20/21	FY-21/22	FY-22/23	FY-23/24	
Capital	Fabricating a small mass properties measurement system (Mass Small MPMS AUC)	\$ 8	\$ 3	\$ 18	\$ -	\$ -	\$ 19	
	Fabricating a new shock test table (for use with air cannon)	\$ 6	\$ -	\$ -	\$ -	\$ 25	\$ 2	
Total Capital:		\$ 14	\$ 3	\$ 18	\$ -	\$ 25	\$ 21	
O&M	Computerized Maintenance Management System Support (Siemens LMS, Test Lab)	\$ 90	\$ 86	\$ 92	\$ 82	\$ 92	\$ 95	
	Spatial Analyzer Software Support (for metrology, laser trackers, theodolites)	\$ 19	\$ 18	\$ 18	\$ 17	\$ 20	\$ 20	
	Control System for Mass Properties, TVAC, Shock testing (NI LabVIEW Developer S	\$ 4	\$ -	\$ -	\$ -	\$ 8	\$ 13	
	Computer-Aided Design (CAD) Software (Javelin Solidworks)	\$ 3	\$ -	\$ -	\$ 5	\$ 5	\$ 5	
	Finite Element Method (FEM) Software (Femap, Maya HTT)	\$ 5	\$ 3	\$ 4	\$ 5	\$ 5	\$ 6	
	Structural & Thermal Analysis Software (Nastran License)	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	\$ -	
	Project Management Software (MS Project)	\$ -	\$ -	\$ -	\$ -	\$ 1	\$ -	
	Software Sub-Total:		\$ 122	\$ 108	\$ 115	\$ 110	\$ 132	\$ 139
	Control & Data Acquisition Systems Calibration (Siemens LMS)	\$ 30	\$ 29	\$ 31	\$ 28	\$ 30	\$ 30	
	Accelerometers Calibration System Support (PCB 9155)	\$ 6	\$ 9	\$ 5	\$ 6	\$ 6	\$ 6	
	Laser Trackers Calibration	\$ 3	\$ -	\$ 5	\$ -	\$ 10	\$ -	
	Backup Data Recorder Calibration (DSPCon)	\$ 2	\$ -	\$ 2	\$ 3	\$ 2	\$ 2	
	Metrology Reference Calibration (Brunson Scale Bar)	\$ -	\$ -	\$ -	\$ -	\$ 2	\$ -	
	Calibration Sub-Total:		\$ 41	\$ 38	\$ 43	\$ 37	\$ 50	\$ 38
	Co-op Students	\$ 22	\$ 33	\$ 12	\$ -	\$ 24	\$ 41	
Miscellaneous Materials & Supplies	\$ 5	\$ 2	\$ 2	\$ 11	\$ 6	\$ 6		
Control Computers x3 (for vibration/shock)	\$ 4	\$ -	\$ 20	\$ -	\$ -	\$ -		
Accelerometers	\$ 6	\$ -	\$ -	\$ 30	\$ -	\$ -		
Spare Parts and Repairs (LDS V9 armature, LDS V9 coil, UD4000 Bearing Assembly)	\$ 25	\$ -	\$ 38	\$ 74	\$ 15	\$ -		
Total O&M:		\$ 225	\$ 181	\$ 230	\$ 262	\$ 227	\$ 224	
SQF TOTAL:		\$ 239	\$ 184	\$ 248	\$ 262	\$ 252	\$ 245	

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<u>THERMAL QUALIFICATION FACILITIES (TQF)</u>		<u>5-Year Average</u> (FY-19/20 to FY-23/24)	FY-19/20	FY-20/21	FY-21/22	FY-22/23	FY-23/24
Capital	Refurbishing Thermal Vacuum Chamber (TV3) (Thermal Conditioning Unit (TCU))	\$ 117	\$ 30	\$ 323	\$ 141	\$ 90	\$ -
	Miscellaneous Electronic Parts	\$ 26	\$ 11	\$ -	\$ 116	\$ -	\$ -
	Test Support Materials for the Solar wind Magnetosphere Ionosphere Link Explorer	\$ 11	\$ -	\$ 38	\$ 17	\$ -	\$ -
	Test Support Materials for the Quantum Encryption & Science Satellite (QEYSSat)	\$ 2	\$ -	\$ -	\$ 6	\$ 5	\$ -
	Dusty Thermal Vacuum Chamber (DTVAC) Commissioning	\$ 1	\$ -	\$ 4	\$ 2	\$ -	\$ -
	Total Capital:	\$ 157	\$ 41	\$ 365	\$ 282	\$ 95	\$ -
O&M	Thermal Vacuum Control Software (LabView)	\$ 9	\$ 4	\$ 15	\$ 12	\$ 5	\$ 8
	Computer-Aided Design Software (AutoDesk, PTC, Javelin SolidWorks)	\$ 6	\$ 6	\$ 6	\$ 2	\$ 7	\$ 7
	Instrument Calibrations Support Software (Fluke MET, Allen-Bradley)	\$ 3	\$ -	\$ -	\$ -	\$ 14	\$ -
	Server Software (VMware)	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1
	Software Sub-Total:	\$ 19	\$ 11	\$ 22	\$ 15	\$ 27	\$ 16
	Liquid Nitrogen (i.e., tanks rental, gas consumption)	\$ 83	\$ 69	\$ 35	\$ 69	\$ 117	\$ 124
	Miscellaneous Materials & Supplies (e.g., lab supplies, safety equipment)	\$ 58	\$ 60	\$ 30	\$ 71	\$ 90	\$ 43
	Instrumentation Repairs & Calibration (e.g., O ₂ monitors, TVACs, electronics)	\$ 30	\$ 34	\$ 35	\$ 18	\$ 31	\$ 32
	Co-op Students	\$ 13	\$ 15	\$ -	\$ -	\$ 10	\$ 40
	Dusty Thermal Vacuum Chamber (DTVAC) Shipping	\$ 6	\$ 4	\$ 24	\$ -	\$ -	\$ -
	ISO Certification Audit	\$ -	\$ -	\$ 3	\$ -	\$ -	\$ -
Total O&M:	\$ 209	\$ 193	\$ 149	\$ 173	\$ 275	\$ 255	
TQF TOTAL:		\$ 366	\$ 234	\$ 514	\$ 455	\$ 370	\$ 255
<u>RF QUALIFICATION FACILITIES (RFQF)</u>		<u>5-Year Average</u> (FY-19/20 to FY-23/24)	FY-19/20	FY-20/21	FY-21/22	FY-22/23	FY-23/24
Capital	Antenna Test Facility (ATF2) Absorber Refurbishment	\$ 236	\$ 1,180	\$ -	\$ -	\$ -	\$ -
	Electromagnetic Compatibility (EMC) Equipment (oscilloscope, magnetometers, LCR meter)	\$ 94	\$ 38	\$ 20	\$ 12	\$ 15	\$ 386
	Antenna Test Facility (ATF2) Equipment (network analyzer, antenna positioner, load adapter)	\$ 58	\$ -	\$ -	\$ 198	\$ 71	\$ 21
	Spherical Near-Field Facility (SNF) Equipment (Panther 9000 Computer)	\$ 3	\$ -	\$ -	\$ 14	\$ -	\$ -
	Cylindrical Near-Field Facility (CNF) Equipment (Panther 9000 Computer)	\$ 3	\$ -	\$ -	\$ 14	\$ -	\$ -
	Total Capital:	\$ 394	\$ 1,218	\$ 20	\$ 238	\$ 86	\$ 407
O&M	Instrumentation Repairs & Calibration (Keysight, NSI, etc)	\$ 114	\$ 64	\$ 100	\$ 120	\$ 155	\$ 130
	Miscellaneous Tools & Consumables (e.g., RF-microwave/ethernet cables, monitors, electronic parts and components, calibration kits, IT network switches, RF adapters, E-field probes, LNAs, PCs for the RFQF network, antenna mast for EMC)	\$ 39	\$ 35	\$ 34	\$ 70	\$ 36	\$ 18
	RF Testing Software	\$ 22	\$ 24	\$ 28	\$ 21	\$ 20	\$ 19
	Co-op Students	\$ 15	\$ 10	\$ 16	\$ 9	\$ 26	\$ 12
	ATF2 Operations and Maintenance (antenna positioners relocation, laser alignment, software consultation)	\$ 8	\$ 13	\$ 18	\$ -	\$ -	\$ 6
	Miscellaneous Materials & Supplies (e.g., network cameras, batteries, power cables and connectors, lab carts, bins, shelving)	\$ 5	\$ 13	\$ 5	\$ 4	\$ 1	\$ 4
	Employee Relocations and Training	\$ 1	\$ -	\$ 5	\$ 2	\$ -	\$ -
	Total O&M:	\$ 204	\$ 159	\$ 206	\$ 226	\$ 238	\$ 189
RFQF TOTAL:		\$ 598	\$ 1,377	\$ 226	\$ 464	\$ 324	\$ 596

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<u>TECHNICAL SUPPORT SERVICES (TSS)</u>		5-Year Average (FY-19/20 to FY-23/24)	FY-19/20	FY-20/21	FY-21/22	FY-22/23	FY-23/24
Capital	Total Capital:	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
O&M	Machine Shop Supplies & Consumables	\$ 14	\$ 20	\$ 11	\$ 15	\$ 14	\$ 11
	Equipment Maintenance & Repairs (e.g., batteries, AEDs, machine shop brackets, dr	\$ 11	\$ 10	\$ 10	\$ 13	\$ 10	\$ 10
	Embedded Contractors Support	\$ 7	\$ 35	\$ -	\$ -	\$ -	\$ -
	Freight / Shipping (sending equipment out for repairs/calibration)	\$ 7	\$ 5	\$ 5	\$ 6	\$ 10	\$ 9
	Gas Cylinders Rental (e.g., GN ₂ , Ar, He)	\$ 7	\$ 2	\$ 6	\$ 10	\$ 11	\$ 7
	Vehicle Maintenance & Repairs (e.g., forklifts, vehicles)	\$ 5	\$ 6	\$ 2	\$ 5	\$ 3	\$ 8
	Cleanroom Clothing (lab coats purchase and dry cleaning)	\$ 4	\$ 5	\$ 6	\$ 6	\$ 3	\$ 2
	Emergency Apparatuses Maintenance (breathing apparatus tanks)	\$ 2	\$ 4	\$ 1	\$ 1	\$ 2	\$ 2
	Equipment Calibrations (e.g., portable cleanroom tents, laminar flow benches)	\$ 2	\$ 2	\$ 2	\$ -	\$ 1	\$ 2
		Total O&M:	\$ 59	\$ 89	\$ 43	\$ 56	\$ 54
	TSS TOTAL:	\$ 59	\$ 89	\$ 43	\$ 56	\$ 54	\$ 51
	CAPITAL + O&M TOTAL:	\$ 1,200	\$ 2,100	\$ 1,000	\$ 1,300	\$ 1,100	\$ 1,200

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D. Building Operations Annual Expenses

(In thousands of dollars)						
<u>Categories:</u>	<u>FY-19/20</u>	<u>FY-20/21</u>	<u>FY-21/22</u>	<u>FY-22/23</u>	<u>FY-23/24</u>	<u>5 Year Average</u>
Asset Lifecycle Investment (Capital)	\$ 900	\$ 2,100	\$ 370	\$ 1,100	\$ 400	\$ 990
Campus MOU (Capital)	\$ 1,700	\$ 1,800	\$ 2,200	\$ 2,300	\$ 2,400	\$ 2,100
Admin Expense	\$ 10	\$ 90	\$ 180	\$ 100	\$ 20	\$ 80
Building Cleaning	\$ 190	\$ 180	\$ 180	\$ 190	\$ 240	\$ 200
Consumables & Tools	\$ 20	\$ 20	\$ 40	\$ 20	\$ 10	\$ 20
Information Tech.	\$ 10	\$ 6	\$ 10	\$ 40	\$ 20	\$ 20
Mech - Maintenance	\$ 220	\$ 220	\$ 240	\$ 180	\$ 180	\$ 210
Elec - Maintenance	\$ 210	\$ 170	\$ 260	\$ 220	\$ 230	\$ 220
Arch - Maintenance	\$ 50	\$ 70	\$ 90	\$ 70	\$ 60	\$ 70
Inspections and Certifications	\$ 90	\$ 70	\$ 60	\$ 30	\$ 40	\$ 60
Miscellaneous	\$ -	\$ -	\$ 3	\$ -	\$ -	\$ 1
Construction	\$ 50	\$ 910	\$ 10	\$ -	\$ 110	\$ 210
Travel	\$ 3	\$ -	\$ -	\$ 1	\$ 2	\$ 1
Professional Services	\$ 30	\$ 7	\$ 60	\$ 10	\$ 8	\$ 20
Security	\$ 380	\$ 350	\$ 360	\$ 400	\$ 450	\$ 390
Utilities	\$ 50	\$ 50	\$ 70	\$ 100	\$ 80	\$ 70
Sub-Total (Non- Capital)	\$ 1,300	\$ 2,100	\$ 1,500	\$ 1,300	\$ 1,500	\$ 1,600
TOTAL	\$ 3,900	\$ 6,000	\$ 4,100	\$ 4,700	\$ 4,300	\$ 4,600

Utilities: Natural gas, fuel oil for generator. Does not include Electricity, Water or Sewer as these items are part of the Campus MOU.

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E. Annual Revenues

(In thousands of dollars)

<u>Fiscal Year</u>	<u>Structural Qualification Facility (SQF)</u>	<u>Thermal Qualification Facility (TQF)</u>	<u>RF Qualification Facility (RFQF)</u>	<u>Assembly Integration Test (AIT) Facility</u>	<u>Total</u>
2009-2010	\$ 410	\$ 1,100	\$ 650	\$ 210	\$ 2,400
2010-2011	\$ 250	\$ 3,000	\$ 620	\$ 470	\$ 4,300
2011-2012	\$ 760	\$ 4,000	\$ 590	\$ 750	\$ 6,100
2012-2013	\$ 310	\$ 1,800	\$ 660	\$ 300	\$ 3,000
2013-2014	\$ 100	\$ 1,400	\$ 570	\$ 80	\$ 2,200
2014-2015	\$ 190	\$ 400	\$ 730	\$ 70	\$ 1,400
2015-2016	\$ 140	\$ 800	\$ 180	\$ 110	\$ 1,200
2016-2017	\$ 230	\$ 1,800	\$ 250	\$ 200	\$ 2,500
2017-2018	\$ 180	\$ 1,800	\$ 280	\$ 160	\$ 2,400
2018-2019	\$ 170	\$ 160	\$ 130	\$ 90	\$ 550
2019-2020	\$ 200	\$ 170	\$ 150	\$ 10	\$ 530
2020-2021	\$ 100	\$ 210	\$ 200	\$ 40	\$ 500
2021-2022	\$ 140	\$ 110	\$ 400	\$ -	\$ 640
2022-2023	\$ 130	\$ 150	\$ 360	\$ 2	\$ 640
2023-2024	\$ 370	\$ 220	\$ 220	\$ -	\$ 810
15-Year Average	\$ 250	\$ 1,100	\$ 400	\$ 170	\$ 2,000

F. Annual Number of Tests Performed

<u># of Tests</u>	<u>5-Year Average</u> (FY-18/19 to FY-22/23)	<u>FY-18/19</u>	<u>FY-19/20</u>	<u>FY-20/21</u>	<u>FY-21/22</u>	<u>FY-22/23</u>	<u>FY-23/24</u>
RF Qualification Facilities (RFQF)	14	13	17	9	16	15	13
Thermal Qualification Facilities (TQF)	10	10	16	10	6	10	12
Structural Qualification Facilities (SQF)	16	23	18	9	18	13	27
Assembly & Integration Facilities (badges; offices)	2	7	1	1	0	1	0
	43	53	52	29	40	39	52
* Note: Each test can range from a few days to a couple months in duration.							