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INTERNATIONAL CIVIL AVIATION ORGANIZATION
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Aviation Data Analysis Workshop (AVDATA)

ICAO Statistics Programme

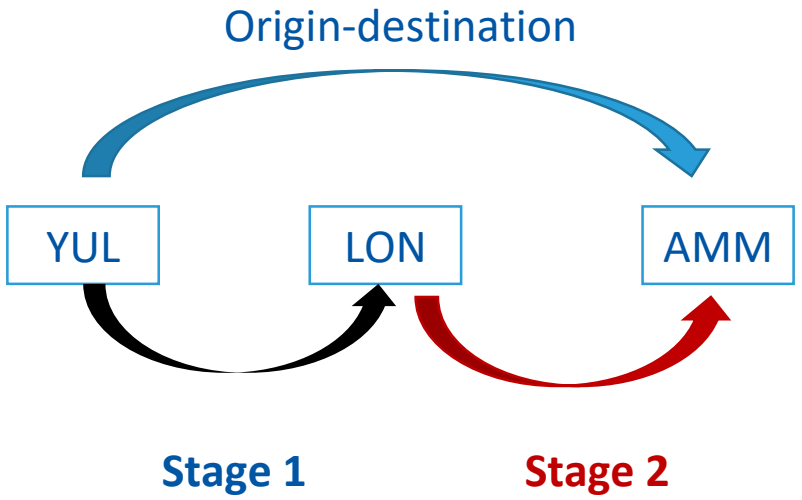
Session 3

Form C

Traffic by flight stage (TFS)

ICAO

Form C – Traffic by flight stage



Definition:

Revenue traffic data (passengers, freight and mail) reported for TFS represents the traffic **on board** the aircraft on each flight stage (regardless of the on-flight origin and destination of the traffic).

Who reports?

Air carriers that performed **international scheduled** services.

When?

Annual basis

Form C – Traffic by flight stage

What should be reported?

All revenue traffic should be reported for the **operating carrier**, including traffic carried under:

- ✓ Code-shared
- ✓ Franchised
- ✓ Pooled
- ✓ Blocked-off charters
- ✓ Blocked-space arrangements
- ✓ Joint services and leased aircraft services

In this context the term operating carrier refers to that carrier whose flight number is being used for air traffic control purposes.

Passengers

- passengers travelling under publicly available promotional offers
- loyalty programmes (for example, redemption of frequent-flyer points);
- passengers travelling as compensation for denied boarding;
- passengers travelling on corporate discounts;
- passengers travelling on preferential fares

Exclude

1. persons travelling free
2. persons travelling at a fare or discount available only to employees of air carriers or their agents or only for travel on business for the carriers;
3. infants who do not occupy a seat.

Freight (exclude baggage)

- express
- diplomatic

Mail

- correspondence and
- other objects tendered by and intended for delivery to postal administrations.

Form C – Traffic by flight stage

Example of good reporting

FORM C

INTERNATIONAL CIVIL AVIATION ORGANIZATION
AIR TRANSPORT REPORTING FORM
TRAFFIC BY FLIGHT STAGE (TFS)
Scheduled Services (Revenue) - International Operations

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State: Latvia
Airline: BT

Year: 2014

Stations		Type of aircraft	Number of flights	Capacity available		Revenue traffic		
From	To			Passenger seats (number)	Total payload capacity (tonnes)	Passengers (number)	Freight (tonnes)	Mail (tonnes)
a	b	c	d	e	f	g	h	i
PLQ	RIX	B737-500	30	3,420	405	2,099	0.01	0.00
PLQ	RIX	DHC8-400	216	15,768	1,728	10,169	0.04	0.00
RIX	PLQ	B737-500	30	3,420	405	1,794	0.48	0.00
RIX	PLQ	DHC8-400	217	15,841	1,736	10,196	2.08	0.00
RIX	KUN	DHC8-400	14	1,022	112	338	0.00	0.00
RIX	KUN	B737-300	2	272	28	57	0.00	0.00
KUN	RIX	DHC8-400	14	1,022	112	396	0.00	0.00
KUN	RIX	B737-300	2	272	28	47	0.00	0.00
RIX	ARN	B737-500	178	20,292	2,403	11,492	3.17	20.52
RIX	ARN	DHC8-400	883	64,459	7,064	41,030	9.31	60.32
RIX	ARN	B737-300	186	25,296	2,604	13,050	3.43	22.23
ARN	RIX	B737-500	178	20,292	2,403	10,906	11.27	15.87
ARN	RIX	DHC8-400	882	64,386	7,056	40,781	33.11	46.60
ARN	RIX	B737-300	186	25,296	2,604	14,835	12.22	17.20
RIX	CPH	DHC8-400	787	57,451	6,296	38,857	124.35	150.54
RIX	CPH	B737-500	89	10,146	1,202	6,472	23.73	28.73
RIX	CPH	B737-300	125	17,000	1,750	11,499	34.56	41.84
CPH	RIX	DHC8-400	785	57,305	6,280	37,520	126.97	70.91
CPH	RIX	B737-500	89	10,146	1,202	5,779	24.29	13.57
CPH	RIX	B737-300	125	17,000	1,750	9,023	35.38	19.76
RIX	BLL	DHC8-400	269	19,637	2,152	13,398	3.25	0.00
RIX	BLL	B737-500	6	684	81	489	0.12	0.00

What you should report?

- One form per air carrier
- Seat capacity and payload capacity
- Revenue traffic: passenger, freight and mail
- City pairs. Identifyed with IATA code.
- List each city-pair twice: first in one direction and then in the reverse direction
- Identify the aircraft type with model and series number. Ex. B737-800; 332; B787-800
- To report all-cargo services
- Same features as Form B

Form C – Traffic by flight stage

Key Performance Indicators (KPIs)

- Number of departures
- Aircraft kilometers performed
- Revenue passenger kilometre (RPK) = revenue passengers * distance (km)
- Available seat kilometre (ASK) = available seats * distance (km)
- Passenger Load factor (%) = RPK/ASK
- Passenger Tonne-kilometre performed (PTK) = RPK * passenger average weight
- Freight Tonne-kilometre performed (FTK) = cargo tones * distance (km)
- Mail Tonne-kilometre performed (MTK) = mail tones * distance (km)
- Revenue Tonne kilometre (RTK) = PTK+FTK+MTK
- Available tonne kilometre (ATK) = payload * distance (km)
- Weight Factor (%)= RTK/ATK

Form C – Traffic by flight stage

When more than **one type of aircraft** has been used in operating a flight stage, the capacity and revenue traffic data must be shown disaggregated by aircraft type.

AIR CANADA

ICAO - FORM C — YEAR TO DATE THRU DECEMBER 2014

ROUTE	STATIONS	-----EQUIPMENT----	-NO. OF FLIGHTS-	SEATSAV	---MPSA---	PSGRS-Y	PSGRS-O	PSGRS-J	PSGRS	FREIGHT	MAIL
355	YYC-LAX	E190/ B767/ A320	239/ 1/ 2	23679	3095.873	19481		1617	21098	1.35	0
355	LAX-YYC	E190/ B767/ A320	241/ 1/ 1	23727	3120.562	18908		1502	20410	31.315	0
335	YYZ-SFO	B767/ A320/ A321	30/1404/ 121								
		A319/	85/	242272	26264.16	187661		18053	205714	145.388	0
335	SFO-YYZ	B767/ A320/ A321	30/1404/ 121								
		A319/	85/	242298	26251.242	187230		18313	205543	296.964	14.6715
347	YVR-SFO	E190/ B767/ A320	545/ 1/ 28								
		A321/ A319/	1/ 11/	58633	7678.558	41656		3517	45173	8.734	0
347	SFO-YVR	E190/ B767/ A320	545/ 1/ 28								
		A321/ A319/	1/ 11/	58645	7674.785	42393		3481	45874	39.175	24.945
758	ANC-YVR	A320/ A319/	1/ 1/	266	34.401	229		7	236	0.1	0
758	YVR-ANC	A320/ A319/	1/ 1/	266	34.206	190		15	205	0.014	0
412	YYZ-EWR	E190/ A320/ A321	73/ 24/ 4								
		A319/	3/	11641	838.743	8809		604	9413	0	0
412	EWR-YYZ	E190/ A320/ A321	73/ 24/ 4								
		A319/	3/	11641	837.404	9242		691	9933	0	0.506
413	YUL-EWR	E190/ A319/	2/ 1/	314	42.433	161		2	163	0	0

The **number of flights** is equivalent to the number of departures performed per aircraft type during the reporting period for the corresponding stage.

Form C – Traffic by flight stage

Do not!!

AIR CANADA

ICAO - FORM C — YEAR TO DATE THRU DECEMBER 2014

ROUTE	STATIONS	-----EQUIPMENT----	-NO. OF FLIGHTS-	SEATSAV	---MPSA---	PSGRS-Y	PSGRS-C	PSGRS-J	PSGRS	FREIGHT	MAIL
355	YYC-LAX	E190/ B767/ A320	239/ 1/ 2	23679	3095,873	19481		1617	21098	1,35	0
355	LAX-YYC	E190/ B767/ A320	241/ 1/ 1	23727	3120,562	18908		1502	20410	31,315	0
335	YYZ-SFO	B767/ A320/ A321 A319/	30/1404/ 121 85/	242272	26264,16	187661		18053	205714	145,388	0

Аэропорты		Тип воздуш. судна	Кол-во полетов	Располагаемая емкость		Коммерческие перевозки		
Из	В			Пассажиро-места(кол-во)	Общая коммерческая загрузка	Пассажиры (кол-во)	Груз (тонны)	Почта (тонны)
a		b	c	d	e	f	g	h
Бишкек	Урумчи	Б735	12	1 464	100.15	481	0.282	0.068
Урумчи	Бишкек	Б735	12	1 464	156.25	556	4.149	0.000
Бишкек	Белгород	Б735	11	1 342	73.26	662	0.223	0.000
Белгород	Бишкек	Б735	11	1 342	92.34	717	0.104	0.000
Бишкек	Краснодар	Б735	14	1 708	115.58	1 191	0.453	0.000
Краснодар	Бишкек	Б735	14	1 708	127.28	1 296	0.467	0.000
Бишкек	Красноярск	Б735	15	1 830	168.06	1 473	0.320	0.000
Красноярск	Бишкек	Б735	15	1 830	164.49	1 649	0.694	0.000
Бишкек	Сургут	Б735	16	1 952	173.47	1 577	0.331	0.000
Сургут	Бишкек	Б735	16	1 952	173.40	1 609	0.343	0.000
Бишкек	Челябинск	Б735	13	1 586	146.71	1 304	0.126	0.000
Челябинск	Бишкек	Б735	13	1 586	150.43	1 342	0.086	0.000
Бишкек	Москва	Б735	10	1 220	79.51	876	0.118	0.000
Москва	Бишкек	Б735	10	1 220	88.96	939	0.025	0.000
Бишкек	Екатеринбург	Б735	7	854	76.82	829	0.116	0.000
Екатеринбург	Бишкек	Б735	7	854	75.85	753	0.000	0.000
Ош	Красноярск	Б735	19	2 318	200.92	2 125	0.202	0.000
Красноярск	Ош	Б735	19	2 318	198.27	2 166	1.565	0.000
Ош	Сургут	Б735	21	2 562	215.18	2 260	0.012	0.000
Сургут	Ош	Б735	21	2 562	218.89	2 312	1.365	0.000
ИТОГО			**276**	**33 672**	**2 795.81**	**26 117**	**10.981**	**0.068**

FORM C

INTERNATIONAL CIVIL AVIATION ORGANIZATION

AIR TRANSPORT REPORTING FORM

TRAFFIC BY FLIGHT STAGE

Scheduled Services (Revenue) - International Operations

Contact person: Carla Tamele
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State: Mozambique
Airline: TM
Year: 2016

Stations		Type of aircraft	Number of flights	Capacity available		Revenue traffic		
From	To			Passenger seats (number)	Total payload capacity (tonnes)	Passengers (number)	Freight (tonnes)	Mail (tonnes)
a		b	c	d	e	f	g	h
Maputo	Johannesburg					36505	42667	2651
Maputo	Dar-Es-Salaam					1796	1669	13
Maputo	Nairobi					932	179	10
Maputo	Luanda					1658	1093	42
Maputo	Harare					1964	260	39
Vilanculos	Johannesburg					1043	76	1
Inhambane	Johannesburg					3226	0	0
Beira	Johannesburg					5249	7716	0

Form C – Traffic by flight stage

Most common mistakes in Form C reporting

- Aircraft type identified and the other data reported are not compatible. Checks with published schedules and fleet data indicate that the wrong aircraft type code was used.
- Under one city-pair label, traffic and capacity data are aggregated for two or more aircraft types.
- Identifying the aircraft type as “miscellaneous”.
- The reported traffic appears to be too low for the aircraft capacity shown; suggesting that the traffic for the marketing carrier may not be included.
- The traffic reported exceeds the aircraft capacity shown; suggesting that on those city-pairs where the reporting carrier is both an operator and a marketing carrier, it is erroneously including the traffic for those flights when it is a marketing carrier.
- Freight and mail are reported using the wrong unit, for example, in kg instead of metric tonnes.

Form C – Traffic by flight stage

What to do when the payload is missing or unknown?

How to estimate the payload???

It was not reported by the airline!!!!

What should I do??

Form C – Traffic by flight stage

Payload estimation

Description	Airbus A320-200
Number of passenger seats	150
Maximum cargo volume available (m^3)	37.4
Maximum structural payload (kg)	19,200
Av. passenger mass plus checked baggage (kg)	100
Av. checked baggage mass (kg)	20
Checked baggage density (kg/m^3)	161
Freight density (kg/m^3)	161
Available capacity (kg)	
Freight capacity available (kg)	3,027
Total payload available (kg)	**18,027**

1. Volume required for baggage (m3)= 20 x150 /161 = 18.6 m3

2. Volume available for freight (m3)= 37.4 -18.6 = 18.8 m3

3. Total passenger mass plus their baggage (kg) = 150 x 100 = 15000 kg

4. Freight capacity available= 18.8 x 161 = 3027 kg

4. Sum up = 3 + 4 = 15,000+3,027=
Total payload available = 18,027 kg

- Air carriers are encouraged to use the mass figures which are most representative of their operations. However, if these figures are not available, ICAO suggests carriers use 100kg for the average passenger mass plus checked baggage, and a density of 161kg/m3 for freight and checked baggage density.

- The resultant payload needs to be compared with the maximum structural payload which is the value which cannot be exceeded.

*** In this case no restrictions in payload due to operational or marketing consideration were assumed.*

Form C – Traffic by flight stage

Revision of the validation of Form C

Form C – example of validation of Form C

Form C validation

Open the following files:

- Form C
- Macro of Form C
- Validation sheet

Form C – example of validation of Form C

Form C Validation Analysis Croatia Airlines - 2017

ITEMS	FORM C 2017	Form A 2017	Ratio
DEPARTURES	19,402	19,416	-0.07%
SEATS	2,096,231		--
PAX	1,532,735	1,531,776	0.06%
FREIGHT	555.16	552.46	0.49%
MAIL	1,223.16		--
DISTANCE	15,216,086	15,243,660	-0.18%
RPK	1,335,337,126	1,337,528,340	-0.16%
ASK	1,795,328,765	1,798,420,120	-0.17%
LF	74%	74%	0.01%
FTK	434,487	435,590	-0.25%
MTK	1,014,295	1,017,060	-0.27%
PTK	133,533,713	133,752,850	-0.16%
RTK	134,982,494	135,205,500	-0.16%
ATK	215,438,253	190,411,240	13.14%
WF	63%	71%	-11.76%

ITEMS	Form C 2017	Form C 2016	Ratio
DEPARTURES	19,402	18,619	4.21%
SEATS	2,096,231	2,018,885	3.83%
PAX	1,532,735	1,383,759	10.77%
FREIGHT	555.16	604.44	-8.15%
MAIL	1,223.16	1,405.54	-12.98%
DISTANCE	15,216,086	14,103,972	7.89%
RPK	1,335,337,126	1,169,187,387	14.21%
ASK	1,795,328,765	1,677,354,676	7.03%
LF	74%	70%	6.71%
FTK	434,487	484,665	-10.35%
MTK	1,014,295	1,162,599	-12.76%
PTK	133,533,713	116,918,739	14.21%
RTK	134,982,494	118,566,003	13.85%
ATK	215,438,253	164,567,346	30.91%
WF	63%	72%	-13.04%

Seats

Aircraft	Series No	Air carrier Web	Manufact	ICAO's ref	Form C	JP Fleet	Conclusion
E319			140 - 160	124 - 145	138-144		
EA32			165 - 189	150 - 181	109-174		
CRJ	1000		-	86 - 104	100		
DHC8	400		-	70 - 80	76		

Payload

Aircraft	Series No	Air carrier	Manufact	ICAO's ref	Form C	Conclusion
E319			13.2 - 13.2	13 - 17	17	
EA32			-	16 - 21	21	
CRJ	1000		-	9 - 12	12	
DHC8	400		-	6 - 9	9	

Form C – exercise of validation of Form C and estimation of payload

Form C validation

Open the following files:

- Form C
- Macro of Form C
- Validation sheet

Payload estimation

Used the data provided by Boeing 777-200LR and complete the available capacity in the table

Form C – Traffic by flight stage

Validation of Form C

Form C Validation Analysis

ITEMS	FORM C Analysis year	Form A Analysis Year	Ratio
DEPARTURES	8,786	8,786	0.00%
SEATS	1,435,202	--	
PAX	1,079,351	1,079,351	0.00%
FREIGHT	2,429.99	2,430.63	-0.03%
MAIL	0.00	--	
DISTANCE	15,260,745	14,126,383	8.03%
RPK	2,032,648,010	2,032,745,143	0.00%
ASK	2,754,554,944	2,754,643,726	0.00%
LF	74%	74%	0.00%
FTK	4,727,155	4,720,943	0.13%
MTK	0	0 --	
PTK	203,264,801	152,455,893	33.33%
RTK	207,991,956	157,176,836	32.33%
ATK	245,712,087	234,265,303	4.89%
WF	85%	67%	26.17%

ITEMS	FORM C Analysis year	FORM C Previous year	Ratio
DEPARTURES	8,786	3,151	178.83%
SEATS	1,435,202	498,464	187.92%
PAX	1,079,351	411,350	162.39%
FREIGHT	2,429.99	1,317.49	84.44%
MAIL	0.00	0.00	#DIV/0!
DISTANCE	15,260,745	9,919,485	53.85%
RPK	2,032,648,010	1,150,478,774	76.68%
ASK	2,754,554,944	1,476,441,450	86.57%
LF	74%	40.9%	80.51%
FTK	4,727,155	2,774,840	70.36%
MTK	0	0	#DIV/0!
PTK	203,264,801	107,323,815	89.39%
RTK	207,991,956	110,098,655	88.91%
ATK	245,712,087	162,661,402	51.06%
WF	85%	68%	25.06%

Seats

Aircraft	Series No	Air carrier Website	Manufacturer	ICAO's reference file	Form C	JP Fleet	Conclusion
737-800			162 - 189	162 - 189	189		
737-900ER			-	177 - 215	212		
DHC8	400		-	70 - 80	78		

Payload

Aircraft	Series No	Air carrier Website	Manufacturer	ICAO's reference file	Form C	Conclusion
737-800				15 - 20	16-21	
737-900ER				15 - 23	19-21	
DHC8	400			6 - 9	8	

- KPIs should be close to Form A
- Passenger load factor and Weight Factor less than 100%
- Compare form C current year vs last year

Form C – Traffic by flight stage

Payload exercise – Boeing 777-200LR

CHARACTERISTICS	UNITS	777-200LR	777-300ER	777-F
MAX DESIGN	POUNDS	768,000	777,000	768,800
TAXI WEIGHT	KILOGRAMS	348,358	352,442	348,722
MAX DESIGN	POUNDS	766,000	775,000	766,800
TAKEOFF WEIGHT	KILOGRAMS	347,452	351,535	347,815
MAX DESIGN	POUNDS	492,000	554,000	575,000
LANDING WEIGHT	KILOGRAMS	223,168	251,290	260,816
MAX DESIGN ZERO	POUNDS	461,000	524,000	547,000
FUEL WEIGHT	KILOGRAMS	209,106	237,683	248,115
OPERATING	POUNDS	320,000	370,000	318,300
EMPTY WEIGHT (1)	KILOGRAMS	145,150	167,829	144,379
MAX STRUCTURAL	POUNDS	141,000	154,000	228,700
PAYLOAD	KILOGRAMS	63,957	69,853	103,737
TYPICAL SEATING	TWO-CLASS	279 (4)	339 (6)	N/A
CAPACITY	THREE-CLASS	301 (5)	370 (7)	N/A
MAX CARGO	CUBIC FEET	5,656 (2)	7,552 (2)	22,371 (3)
--LOWER DECK	CUBIC METERS	160.2 (2)	213.8 (2)	633.5 (3)
USABLE FUEL	US GALLONS	47,890	47,890	47,890
	LITERS	181,283	181,283	181,283

Form C – Traffic by flight stage

Payload exercise – Boeing 777-200LR

Description	Boeing 777-200ER
Number of passenger seats	301
Maximum cargo volume available (m^3)	160.2
Maximum structural payload (kg)	63,957
Av. passenger mass plus checked baggage (kg)	100
Av. checked baggage mass (kg)	20
Checked baggage density (kg/m3)	161
Freight density (kg/m3)	161
Available capacity (kg)	
Freight capacity available (kg)	19,771
Total payload available (kg)	49,871

1. Volume required for baggage (m3)= 20 x301 /161 = 37.4 m3

2. Volume available for freight (m3)= 160.2 -37.4 = 122.8 m3

3. Total passenger mass plus their baggage (kg) = 301 x 100 = 30,100 kg

4. Freight capacity available= 122.8 x 161 = 19,771 kg

4. Sum up = 3 + 4 = 30,100+19,771=
Total payload available = 49,871 kg

Thank You

ICAO