

Enterprise Data Pipeline Portal Presentation

Presented by: Michael Ritchson

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Date: 1/26/2021

DC8 Portal



Program Overview

NASA's DC-8 collects data in support of a variety of earth science research projects sponsored by NASA scientists, federal agencies, non-profit research institutions, and private industry investigators.

DC-8 Airborne Science Laboratory

Based at NASA Armstrong's Building 703 in Palmdale, CA, the unique flying laboratory collects data for experiments in support of scientific projects serving the world's scientific community, including investigators from NASA and other federal, state, academic, and foreign institutions. The DC-8 flies three primary missions - sensor development, satellite sensor verification, and basic research studies of the Earth's surface and atmosphere.

Data gathered by the DC-8 at flight altitude and by remote sensing have been used for scientific studies in archeology, ecology, geography, hydrology, meteorology, oceanography, volcanology, atmospheric chemistry, soil science, and biology.

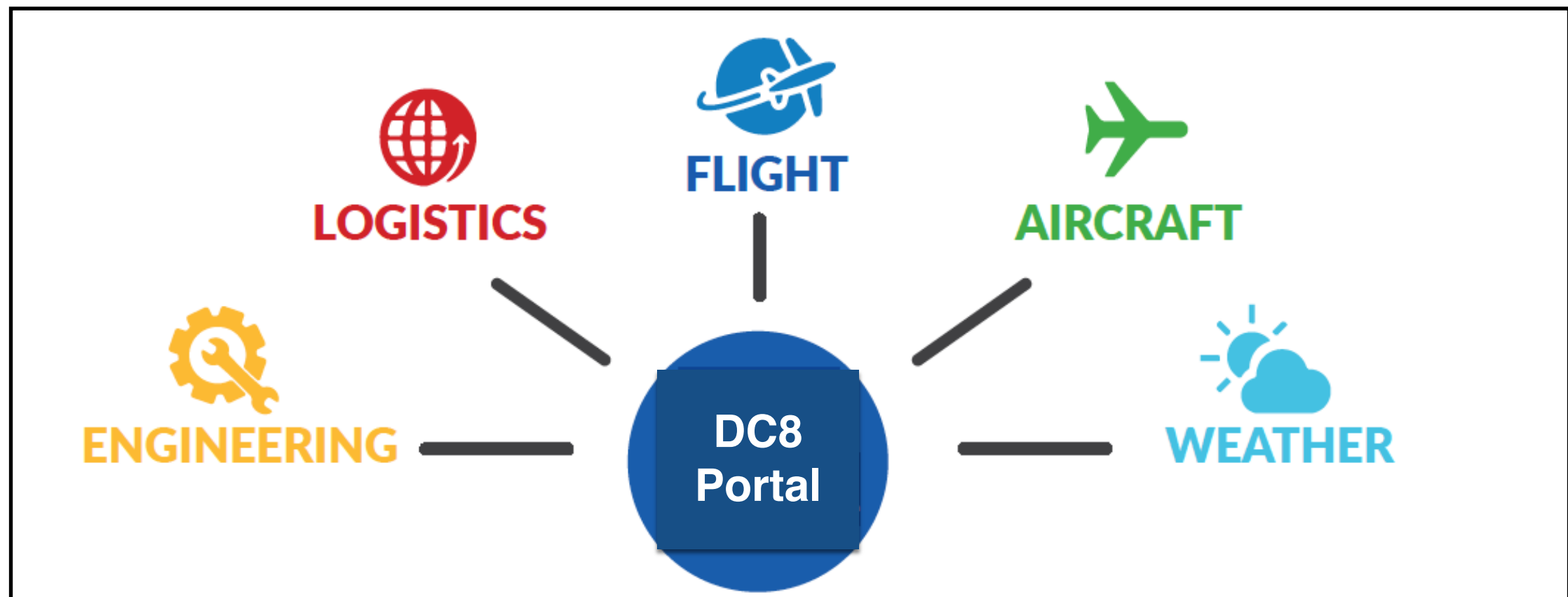
DC8 Portal

CHALLENGE: To develop a system that can provide a central hub for the DC8 program that could collaborate all the documentation for all Aircraft maintenance activities

SOLUTION:

Developed a DC8 Flight Portal in-house to provide a centralized means of collaborating and retrieving flight documentation, weather, engineering, and logistical data which span across various legacy and non legacy systems.

Also, unifying these systems into a single data portal was critical and a major priority for the DC8 project. This architecture has been proven to streamline aircraft maintenance during deployments and scheduled maintenance



DC8 Portal

So what are the features of the DC8 Portal?

- ☑ Enterprise architecture for locating and sharing data
- ☑ Interfaces to several Big Data databases which handle large amounts of data
 - ☑ Apache Solr
 - ☑ MongoDB
- ☑ Built with an Enterprise Architecture that automates the flow of data between systems
 - ☑ Data pipelines
 - ☑ Event driven
 - ☑ Provides data analytics
- ☑ Main focus of this demonstration: Search content of the following aircraft document types
 - ☑ AMM (Aircraft Maintenance manual)
 - ☑ IPC (Illustrated parts catalog)
 - ☑ SRM (Structural repair manual)

DC8 Portal

So what are the capabilities of the DC8 Portal?

- ☑ Retrieves the status of the aircraft
 - ☑ Data from NASA Aircraft Maintenance system (NAMIS)
- ☑ Provide News and alerts to the users
- ☑ Retrieves and displays Weather data
- ☑ Security
 - ☑ SSO (Single Sign On) utilizing CA Site Minder
 - ☑ Cac card authentication
- ☑ Other interface capabilities
 - ☑ Sharepoint
 - ☑ Windchill
 - ☑ JIRA
 - ☑ Flight data across multiple centers? (Thats another project I work on)

DC8 Portal

Home page

Welcome Michael Ritchson to the DC8 Portal

 NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION

HOME

 Aircraft Documentation

 Operations

 Safety

WHAT IS GOING ON

 Links

NASA Main Website

NASA ARC

NASA AFRC

AIRBORNE SCIENCE Tracker

Helpdesk

IT Security

Xnet

Confluence Wiki

JIRA Problem Reporting

703 Hanger CAM

 Mozilla Firefox

 Adobe PDF Reader

 Java JRE

 HIWC 2018 Campaign - Ft. Lauderdale, FL July August 2018



 What is going On? (WIGO)

DATE	What Is Going On?
2018	* July 9 - July 22 HIWC Upload * July 23 Aircraft Weight and Balance * July 24 Instrument Shakedown Flight, Pilot Night Proficiency Flight * July 25 Science Check Flight * July 26 Science Check Flight (Backup) * July 30 - August 19 HIWC Deployment * August 20 - August 23 HIWC Download * August 27 - September 6 1A, 3A LUMP Checks, Center Wing Fuel Tank Work

 News

DC8 Portal Document updates

Date: October 1, 2018

Updates to the Portal: AC DOCUMENTATION TREE-SRM-70 FIX by ATA chapter and reference, OIB 2018 Campaign Checklist

show previous News

DC-8 Portal Hours of Operation



Monday - Sunday
4am to 12 midnight

DC8 Portal

Documentation store and content search

- ☑ **Extracted** editable content text from SRM 50/60, SRM 70, BIPC-60, and BIPC-70 PDF's
 - ☑ Wrote application that extracts each line text from PDF's and then inserts text into big data store
 - ☑ Over 2 million documents created
- ☑ **Apache Solr** utilized to store content text
- ☑ **Micro services containerized / Docker architecture**
 - ☑ Apache Solr
 - ☑ Apache NIFI
 - ☑ Apache Kafka
 - ☑ eXist XML database
- ☑ **eXist XML Database**
 - ☑ Stores the aircraft documentation

Upload process for the DC8 document type content

Add document type line text to local Solr (example: BIPC-60) create docker image



DC8 Portal

DC8 Portal Home page - Search box: Criteria ENGINE NOSE COWL

Welcome Michael Ritchson to the DC8 Portal

 NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

[Home](#) [AIRCRAFT DOCUMENTATION](#)

AC DOCUMENTATION TREE Ground Operations

Chapters

- TEMP_60_SERIES_REVISION_006
- TEMP_70_SERIES_REVISION_006
- INDEX
- CHAPTER_03_CHECKS
- CHAPTER_05_TIME LIMITS
- CHAPTER_06_DIMENSIONS AND AREAS
- CHAPTER_07_LIFTING AND SHORING
- CHAPTER_08_LEVELING AND WEIGHING
- CHAPTER_09_TOWING AND TAXI
- CHAPTER_10_PARKING_MOORING
- CHAPTER_11_PLACARDS AND MARKINGS

Search DC-8 Library

Results returned (15). Total search time (min.sec.ms): 0.4.820

Search:

Limit:

Type: SRM-5060 ☐ SRM-70 ☒ BIPC-60 ☒ BIPC-70 ☐

Link	Name Description	Type
	SRM-70-71-5-3 ENGINE NOSE COWL LIP ASSEMBLY REPAIR [pg.2]	SRM-70
	SRM-70-71-5-3 Engine Nose Cowl Lip Assembly Repair [pg.7]	SRM-70
	SRM-70-FM-0 Engine Nose Cowl Lip Assembly Repair [pg.14]	SRM-70
	SRM-70-71-5-3 Engine Nose Cowl Lip Assembly Repair [pg.4]	SRM-70
	SRM-70-71-5-3 Engine Nose Cowl Lip Assembly Repair [pg.5]	SRM-70
	SRM-70-71-5-3 Engine Nose Cowl Lip Assembly Repair [pg.6]	SRM-70
	30-20 ENGINE NOSE COWL AhTI?ICING [pg.21]	BIPC-60
	30-20 ENGINE NOSE COWL ICE PROTECTION [pg.23]	BIPC-60
	30-20 ENGINE NOSE COWL ANTI-ICING [pg.21]	BIPC-60
	30-20 ENGINE NOSE COWL ICE PROTECTION [pg.23]	BIPC-60
	30-fm ENGINE NOSE COWL ICE PROTECTION [pg.3]	BIPC-60

Total: 15

[Search](#) [Help](#)

Description

Screenshot

DC8 Portal

SRM-70-71-5-3 opened to the page where the text was located

Engine Nose Cowl

15 of 18

Automatic Zoom

Print

Full Screen

Close

Engine Nose Cowl

Highlight all

Match case

1

1-5-2

Nose Cowl Repairs

(DC-8-71,-71F,-72,-72F,-73,-73F Series)

71-5-3

Engine Nose Cowl Link Assembly Repair

(DC-8-71,-71F,-72,-72F,-73,-73F Series)

CONTENT

Page 2

Oct 1/95

70

McDONNELL DOUGLAS CORPORATION PROPRIETARY INFORMATION - Use or disclosure of these data subject to RESTRICTIVE LEGEND on title page or first page.

DOUGLAS AIRCRAFT CO., INC.

DC-8 SEVENTY SERIES

DC-8 STRUCTURAL REPAIR MANUAL

Chapter

Section

Subject

Title

Applicability

Chapter 75

75-30-4

Bleed Air System Link Assemblies
- Wear Tolerances

(DC-8-71,-71F,-72,-72F,-73,-73F Series)

Chapter 78

R 78-2-1

Exhaust Repairs

(DC-8-71,-71F,-72,-72F,-73,-73F Series)

R

78-3-4

Exhaust Materials

(DC-8-71,-71F,-72,-72F,-73,-73F Series)

DC8 Portal

DC8 Portal - Search box: spar

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NASA NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Home

AIRCRAFT DOCUMENTATION

AC DOCUMENTATION TREE

Ground Operations

Chapters

WD-70
BIPC-60
BIPC-70

CHAPTER_73_ENGINE - FUEL AND CONTROLS
IPC-70
IPC-CFM56
AMM-CFM56
MM-70
WD-70
BIPC-60
BIPC-70

CHAPTER_74_IGNITION

CHAPTER_75_BLEED AIR

CHAPTER_76_ENGINE CONTROLS

CHAPTER_77_ENGINE INDICATING

Search DC-8 Library

Results returned (25). Total search time (min.sec.ms): 0.12.800

Search: sparLimit: 200Type: SRM-5060SRM-70BIPC-60BIPC-70

Link	Name Description	Type
[PDF]	SRM-70-57-5-1 SPAR PLANE [pg.3]	SRM-70
[PDF]	SRM-70-57-5-1 SPAR PLANE. [pg.4]	SRM-70
[PDF]	SRM-70-57-6-1 SPAR CAP [pg.3]	SRM-70
[PDF]	SRM-70-57-6-1 SPAR CAP [pg.4]	SRM-70
[PDF]	SRM-70-57-6-1 SPAR CAP [pg.4]	SRM-70
[PDF]	SRM-70-57-6-1 SPAR CAP [pg.6]	SRM-70
[PDF]	SRM-70-57-6-1 SPAR CAP [pg.6]	SRM-70
[PDF]	SRM-70-57-6-1 SPAR CAP [pg.7]	SRM-70
[PDF]	SRM-70-57-6-1 SPAR CAP [pg.7]	SRM-70
[PDF]	SRM-70-57-6-1 WING FRONT SPAR [pg.3]	SRM-70
[PDF]	SRM-70-57-6-1 N SPAR CAP [pg.8]	SRM-70
[PDF]	SRM-70-54-3-1 AD SPAR CAP [pg.10]	SRM-70
[PDF]	SRM-70-57-6-1 Wing Front Spar Structure [pg.3]	SRM-70
[PDF]	SRM-70-57-6-1 Wing Front Spar Structure [pg.4]	SRM-70
[PDF]	SRM-70-57-6-1 E SPAR CAP 2610246 [pg.5]	SRM-70

Total: 25

Search

Reset

Exit

Description

3-00-00-20

3-00-00-20A

R SYSTEM-73-00-00-30

R SYSTEM-73-00-00-40

40-01

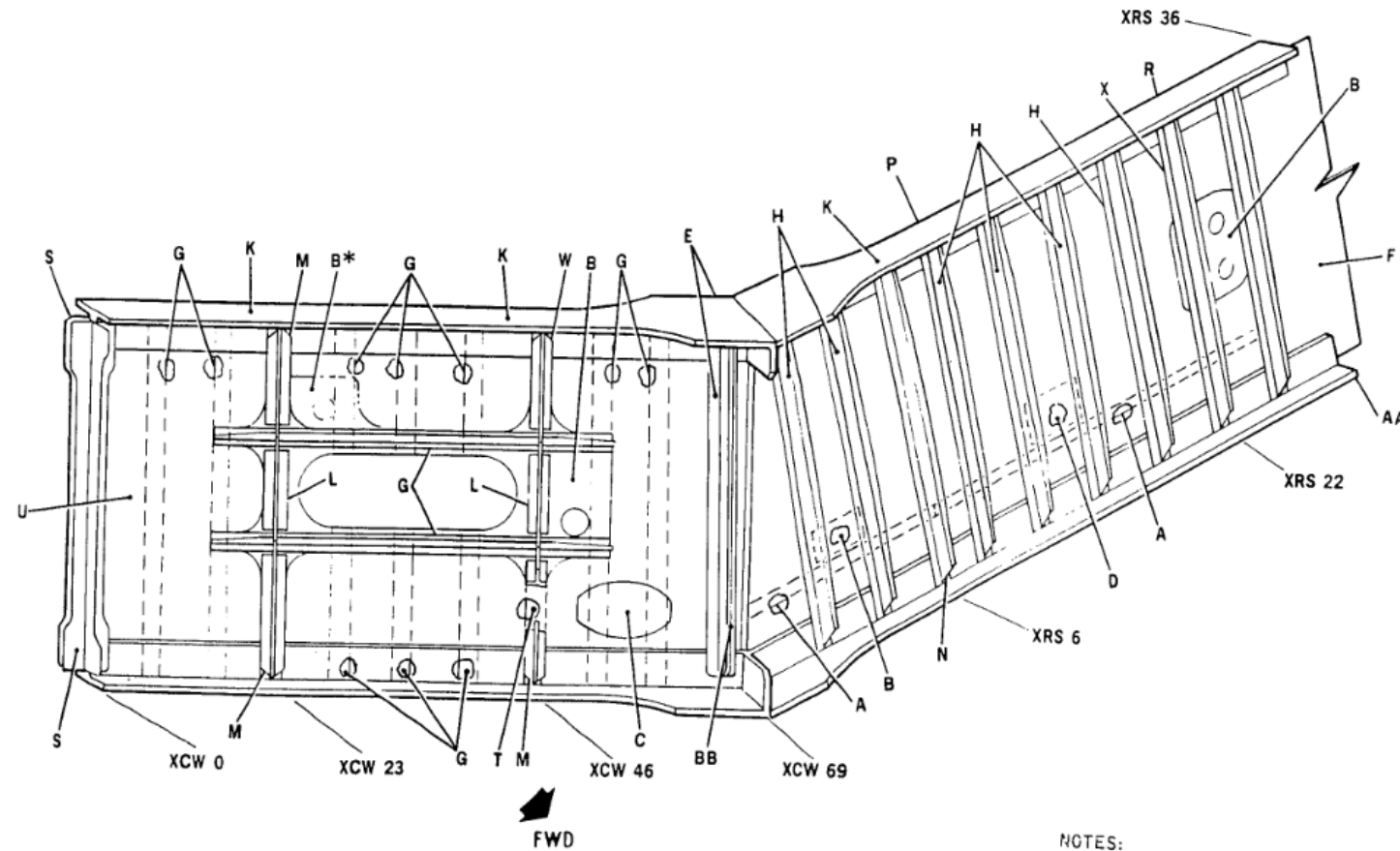
1

Screenshot

DC8 Portal Content Search

6 of 8 Automatic Zoom

SPAR		Highlight all	Match case	13	27	W	TEE	1362783
J	STIFFENER				89	X	TEE	2640548
K	SPAR CAP				1418897	Y	STIFFENER	2641121
L	TEE				7075-T73AL	Z	TEE	2641236
M	TEE				1416793	AA	SPAR CAP	7079-T6AL
N	TEE				2640729	BB	SPAR CAP	4614480
					1643671			



- NOTES:
1. LEFT HAND SHOWN-RIGHT HAND OPPOSITE EXCEPT AS NOTED BY (*).
 2. REFERENCE-DOUGLAS DRAWINGS 5611420 AND 5613911.
 3. ITEM (U) WEB EXTENDS FROM STA. XCW 0 TO STA. XCW 69.
 4. ITEM (F) WEB EXTENDS FROM STA. XRS 6 TO STA. XRS 36.

Wing Center Spar Structure
Figure 2 (Sheet 1)

1 November 1981

57-6-1
Page 7

UA3-16

DC8 Portal

Content Search

DC8 Portal Home page - Search box: 5803995

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NASA NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Home AIRCRAFT DOCUMENTATION

AC DOCUMENTATION TREE Ground Operations

Chapters

- WD-70
- BIPC-60
- BIPC-70
- CHAPTER_73_ENGINE - FUEL AND CONTROL
- IPC-70
- IPC-CFM56
- AMM-CFM56
- MM-70
- WD-70
- BIPC-60
- BIPC-70
- CHAPTER_74_IGNITION
- CHAPTER_75_BLEED AIR
- CHAPTER_76_ENGINE CONTROLS
- CHAPTER_77_ENGINE INDICATING

Search DC-8 Library

Results returned (2). Total search time (min.sec.ms): 0.14.879

Search: 5803995

Limit: 50

Type: SRM-5060 ☐ SRM-70 ☒ BIPC-60 ☐ BIPC-70 ☐

Link	Name	Description	Type
	SRM-70-57-5-1	5803995 [pg.6]	SRM-70
	SRM-70-57-5-1	DRAWING 5803995 AND 5803995. [pg.5]	SRM-70

Total: 2

Search Reset Exit

73-21-40-01 T12 TEMPERATURE SENSOR-73-21-40-01

Screenshot

DC8 Portal

Redirected to page where text occurred

5803995

Highlight all Match case 2

NOTES:

1. SEE SHEET 2 FOR STA XRS 393 TO STA XRS 463.
2. REFERENCE - DOUGLAS DRAWING 5611200 AND 5803995.

STA XRS 358

ITEM	NOMENCLATURE	GAGE	MATERIAL	ITEM	NOMENCLATURE	GAGE	MATERIAL
A	WEB	.063	7075-T6AL	P	BRACKET	.050	6065-T6
B	CAP		3615037	Q	SUPPORT ANGLE		1286816
C	CAP		3615035	R	FITTING	.500	7075-T6AL
D	STIFFENER		2614735	S	STIFFENER		2931033
E	STIFFENER		2614737	T	CLIP		2239105
F	BRACKET	.040	2024-T4AL	U	CLIP		1702466
G	BRACKET	.050	2020-T3AL	V	UPPER CAP		7075-T6 BAR
H	CLIP (FORGING)		7075-T6	W	LOWER CAP		1418680
J	CAP ANGLE		1642846	X	STIFFENER		2614734
K	STIFFENER		2614734	Y	CLIP		2754790
L	SUPPORT ANGLE		1325283	Z	CLIP		2289105
M	ANGLE	.050	2024-T3AL	AA	CLIP		3754459
N	DOUBLER	.071	7075-T6AL				

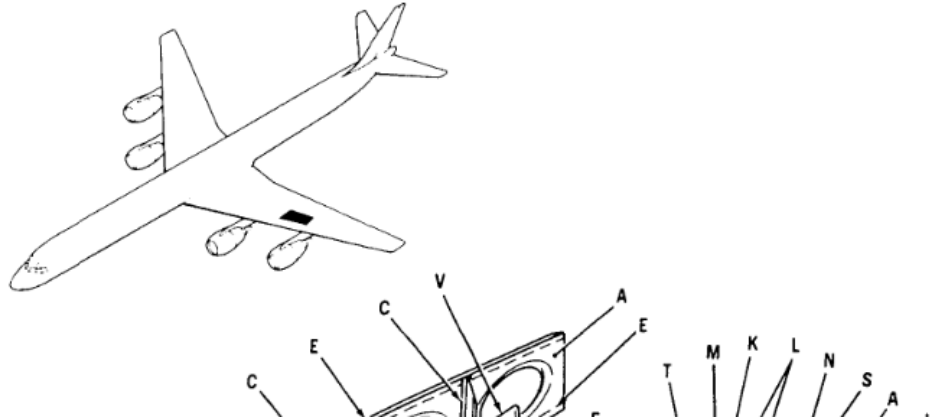
UA3-24

Wing Ribs and Bulkheads, Stations Xrs 252 Cant to Xrs 463
Figure 2 (Sheet 1)

57-5-1
Page 4

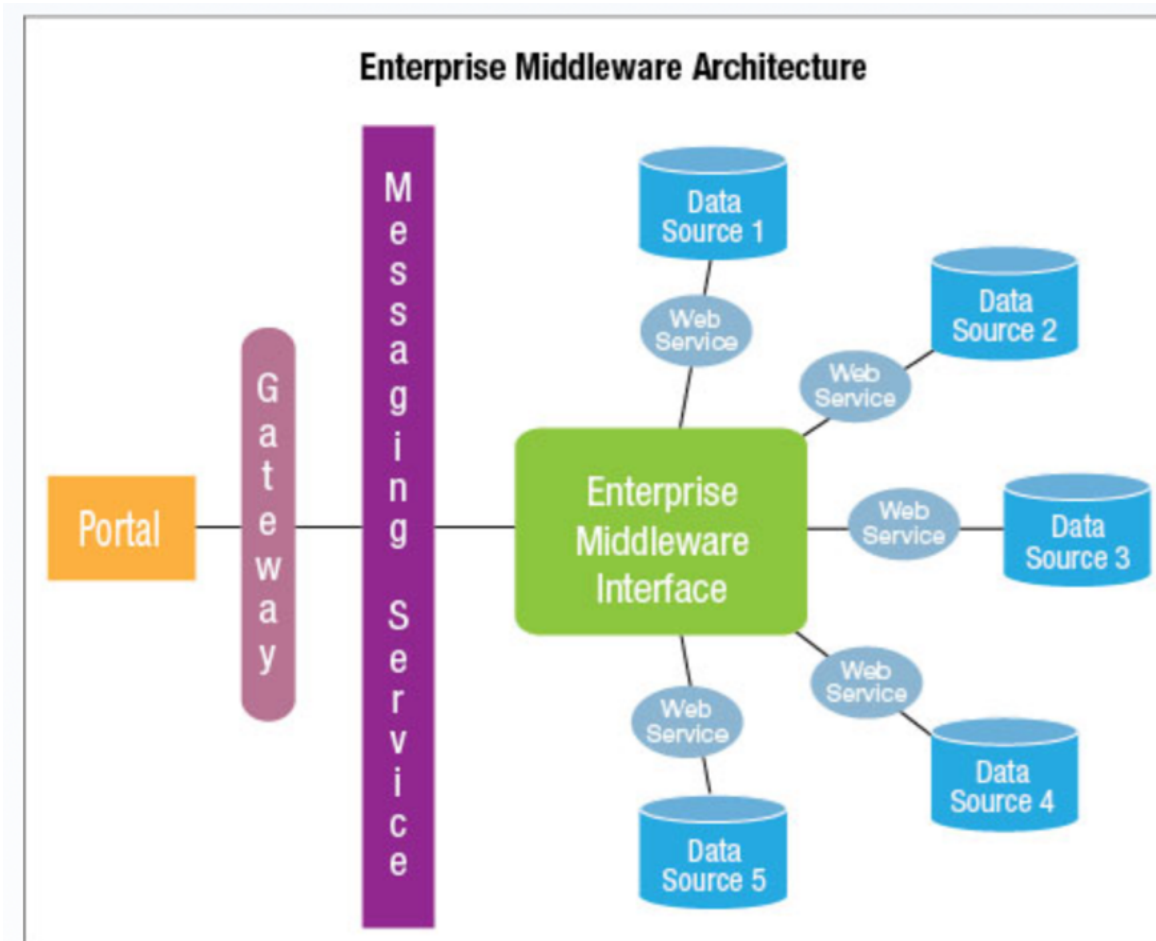
1 November 1981

DOUGLAS AIRCRAFT CO., INC.
DC-8 SEVENTY SERIES
STRUCTURAL REPAIR MANUAL

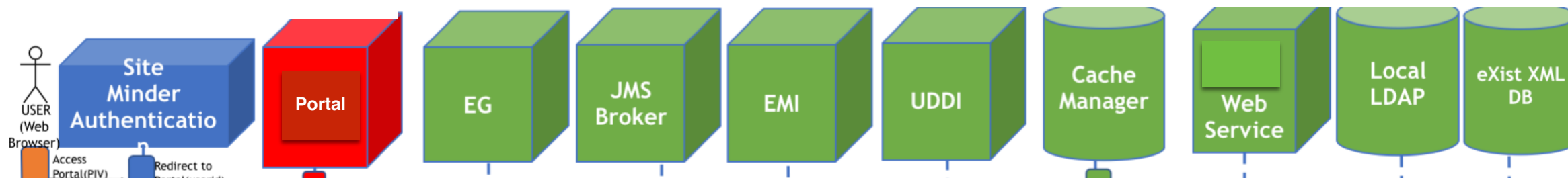


DC8 Portal

Evolution of Enterprise Middleware architectures



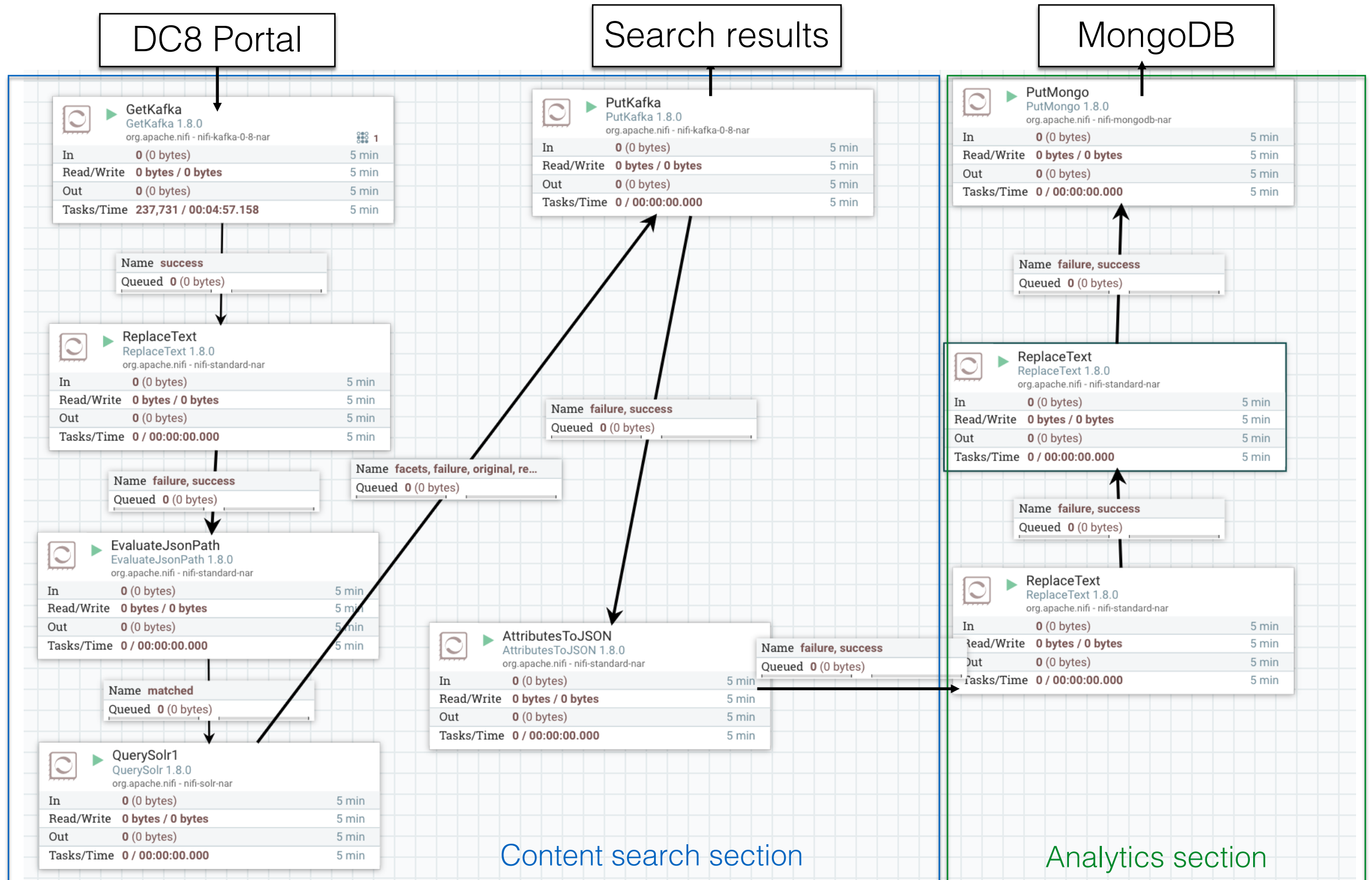
NASA SOFIA Enterprise Middleware Solution
2010



NASA Enterprise Middleware Solution
2016

DC8 Portal

DC8 Portal Enterprise Architecture - 2019 Apache NIFI



DC8 Portal

A little deeper dive into the architecture...

☑ **Apache Solr** utilized to store content text

- ☑ Solr is an open source enterprise search platform utilized to search stored content text

☑ **Apache NIFI**

- ☑ Built by the NSA as a open source solution to automate the flow of data between systems

☑ **Apache Kafka**

- ☑ Apache Kafka is an open-source stream-processing software platform developed by Linkedin and donated to Apache Software Foundation, written in Scala and Java. The project aims to provide a unified, high-throughput, low-latency platform for handling real-time data feeds.

☑ **Docker** containers for Solr, and NIFI

- ☑ Docker is a tool designed to make it easier to create, deploy, and run applications by using containers

DC8 Portal

MongoDB

Sample of analytics collected from each successful content search execution

▶ (14)	ObjectId("5c4243d6c9e77c003230cb2e")	{ 13 fields }	Object
▶ (15)	ObjectId("5c4243d6c9e77c003230cb2f")	{ 9 fields }	Object
▶ (16)	ObjectId("5c424428c9e77c003230cb30")	{ 13 fields }	Object
▶ (17)	ObjectId("5c424457c9e77c003230cb31")	{ 13 fields }	Object
▶ (18)	ObjectId("5c424479c9e77c003230cb32")	{ 13 fields }	Object
▶ (19)	ObjectId("5c424479c9e77c003230cb33")	{ 9 fields }	Object
▼ (20)	ObjectId("5c4244b9c9e77c003230cb34")	{ 13 fields }	Object
	_id	ObjectId("5c4244b9c9e77c003230cb34")	ObjectId
	typerecord	nifi-dataflow	String
	nifitimestampstop	2019-01-18:21:27:21:691	String
	nifitimestampstart	2019-01-18:21:27:21:660	String
	searchText	Exhaust?Nozzle	String
	type	SRM-5060	String
	type2	SRM-70	String
	userId	mritchso	String
	browserInfo	Mozilla/5.0 (Macintosh; Intel Mac OS X 10_14_0) AppleWe...	String
	browsertimestampstart	2019-01-18:13:27:23:455	String
	uuidlink	415c12f5-660b-4e6b-b21c-fb4eccc9ee7b	String
	kafka-topic-out	DC8_OUT	String
	rows	200	String
▼ (21)	ObjectId("5c4244b9c9e77c003230cb35")	{ 9 fields }	Object
	_id	ObjectId("5c4244b9c9e77c003230cb35")	ObjectId
	typerecord	nifi-dataflow-other	String
	kafka-topic-in	DC8_IN	String
	uuidlink	415c12f5-660b-4e6b-b21c-fb4eccc9ee7b	String
	solr-status-code	0	String
	solr-number-results	37	String
	solrserver	http://130.134.170.102:8983/solr/DC8_CORE	String
	kafkaoffset	818	String
	kafkanartition	0	String

DC8 Portal

Aircraft Status

Interfaces to NAMIS@JSC utilizing Web Service

Welcome Michael Ritchson to the DC8 Portal

 NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION

Home

Aircraft Documentation

OPERATIONS

Safety

Search Help

Weather AIRCRAFT STATUS

AIRCRAFT  DC-8 N817NA

Status 

Aircraft Flight Hours: 54993.60

Aircraft Cycles: 19132.00

Aircraft Engine Data

Engine #1	Serial#	692622	Flt. Hrs.	11439.60	Cycles	4550.00	
Engine #2	Serial#	692630	Flt. Hrs.	12166.90	Cycles	4782.00	
Engine #3	Serial#	692632	Flt. Hrs.	12263.90	Cycles	4787.00	
Engine #4	Serial#	692157	Flt. Hrs.	6962.50	Cycles	2616.00	

APU

Serial#	P-36987	Meter	996.50
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NASA Awards and recognition for architecture

☒ **2015 NASA Exceptional space act award**

☒ https://www.nasa.gov/sites/default/files/atoms/files/x-pre ss_feb_2016.pdf

☒ **2015 Software of the year award - Honorable mention**

☒ <https://icb.nasa.gov/featurestory/soy-2015-nominees>



References

☒ **NASA Enterprise Middleware Solution:**

☒ <https://www.nasa.gov/offices/ipp/centers/dfrc/technology/DRC-010-040-Enterprise-Middleware.html>

☒ **NASA Tomitribe use case:**

☒ <https://www.tomitribe.com/resources/nasa-casestudy/>

☒ **NASA AFRC Technology Transfer Office**

☒ Innovator Spotlight: Michael Ritchson - Enterprise Middleware

☒ <https://technology-afrc.ndc.nasa.gov/featured-innovator/ritchson>

☒ **Other references can be provided upon request**

Demo / Questions?

Thanks for your time!!!