



PLADS plus ALAN:

Provided clustering of the ICAC data set consisting of 179 ASRS reports. Operational experts characterized the clusters.

Preliminary data results, cluster description (number of reports)

Widebody conflict (7)	Commuter conflict (6)
Braking/stopping (5)	Wake turbulence (5)
Tower instructions (7)	Landing gear (4)
SFO bay approach (3)	Visibility (11)
Wrong runway/approach (6)	Separation (5)
Traffic/TCAS (22)	ILS/beacon (21)
Briefing issues (3)	Multiple change instructions (15)
Communication confusion (8)	Land & hold short (11)
Fuel & other emerg. (6)	FMS programming/display (16)
ILS freq. Tuning (11)	Runway visibility (7)

Vivisimo Clusters Generated from ASRS Keywords Field in ICAC Report Set

OPERATIONAL CONTEXT

- Weather Factor and Visibility (23)
- Visual Approach (19)
- ATC Multiple Runway / Parallel Runway Operation (3)
- Runway Change in Progress; Runway Selection Procedure (2)
- Multiple runway operation; Parallel Runway Assignment (7)
- Night operation (3)
- Fuel and Potential Conflict (4)
- Last Minute Runway Change (2)

ATC HANDLING

- Tower-Tracon Coordination (18)
- Tower Controller Technique (16)
- Tower Controller Technique Communication (7)
- TRACON Controller (4)
- TRACON Controller Planning (5)
- TRACON Controller Technique (3)
- TRACON Controller Technique Communication and Multiple Runway Operation (2)
- ATC Technique Response (5)
- Controller Planning (2)
- Controller Technique Communication and Vigilance (2)

FLIGHT CREW

- Familiarity with Aeronautical Chart (5)
- Program and Hand (4)
- Planning (2)
- Vigilance and Planning (2)
- Technique Communication (2)
- Resource Utilization and Familiarity (2)
- Cockpit Coordination and Management (2)
- Resource Utilization and Cockpit Coordination (2)
- Distraction Traffic Watch (2)

AMBIGUOUS

- Runways (13)
- Runway Assignment (5)
- Behavior Factor Technique (4)
- Communication Approach (2)
- Runway Clear (2)
- Change Miss (2)
- Judgement of Traffic Spacing Perception and Planning (2)

OTHER

- Airline Management Policy (6)
- Other topics (27)

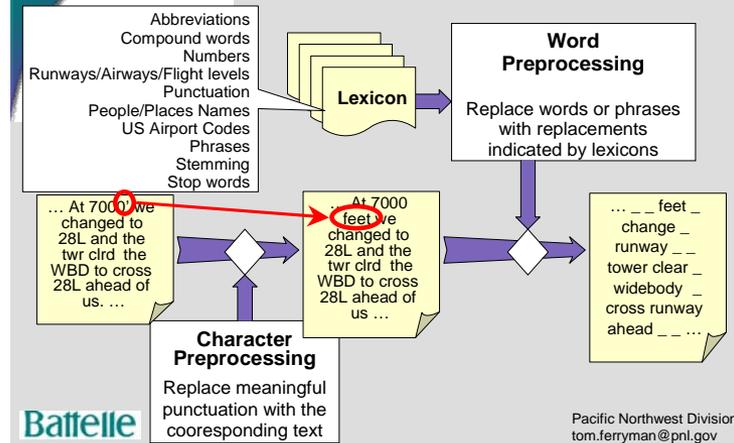
Machine Comprehension of Text

- ▶ Approximately 100,000 ASRS reports were processed to identify a 179 probable ICAC events at Battelle Mountain View.
- ▶ The unstructured text data was processed at Battelle PNWD.
 - PLADS, to standardize the text for processing
 - Matlab clustering, to identify clusters and superclusters
 - ALAN software, to navigate through the hierarchical structure



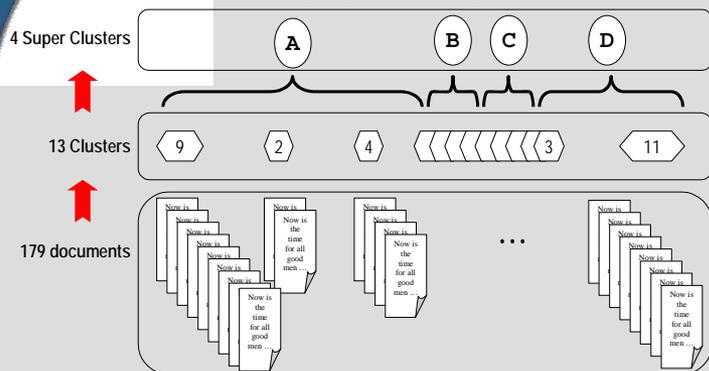
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PLADS Processing to Standardize Vocabulary



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179 documents from ASRS that relate to ICAC were grouped into 13 clusters. Then 13 clusters grouped into 4 super clusters.



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Higher-level Fact

Data Unit = ARRIVALS
(with Total Arrivals During Response Period for 7,623 respondents)

(1) Arrivals last 60 days	1.000	(296,165)
[Extracted from Section A]		
IC1 # of ICACs requested for these arrivals		
(2^) No Requests	0.939	(278,222)
(2) Request	0.060	(17,943)
IC1A ICACs accepted or declined for these arrivals		
(3^) Declined	0.064	(1,141)
(3) Accepted	0.936	(16,802)

Event Count

Event Rate
(marginal probability)

Subordinate Facts

Subordinate facts that include a “hatted” (^) item are mutually exclusive and complementary. The sum of the event counts in the subordinate facts should always equal the event count of the higher-level fact to which they relate. Their collective event rates should always sum to 1.

Data Unit = ARRIVALS

(starting with Total Arrivals During Response Period for 7,623 respondents)

(1) Arrivals last 60 days 1.000 (296,165)
[Extracted from Section A]

IC1 # of ICACs requested for these arrivals

- (2^) No Requests/DK/RF 0.939 (278,222)
- (2) Request 0.060 (17,943)

IC1A ICACs accepted or declined for these arrivals

- (3^) Declined/DK/RF 0.064 (1,141)
- (3) Accepted 0.936 (16,802)

IC1B ICACs followed by one or more undesirable events

- (4^) No Problem Arrivals/DK/RF 0.936 (15,719)
- (4) Problem arrivals 0.064 (1,083)

IC1B1 Unstabilized approach

- (5) YES 0.583 (631)
- (5^) NO/RF/DK 0.417 (452)

IC1B3 Airborne conflict

- (7) YES 0.046 (50)
- (7^) NO/RF/DK 0.954 (1,033)

IC1B5 Out-of-limits winds

- (9) YES 0.030 (33)
- (9^) NO/RF/DK 0.970 (1,050)

IC1B7 Long or fast landing

- (11) YES 0.546 (591)
- (11^) NO/RF/DK 0.454 (492)

IC1B9 Ground conflict

- (13) YES 0.048 (52)
- (13^) NO/RF/DK 0.952 (1,031)

IC1B2 Missed approach

- (6) YES 0.195 (211)
- (6^) NO/RF/DK 0.805 (872)

IC1B4 Wake turbulence

- (8) YES 0.197 (213)
- (8^) NO/RF/DK 0.803 (870)

IC1B6 Wrong runway landing

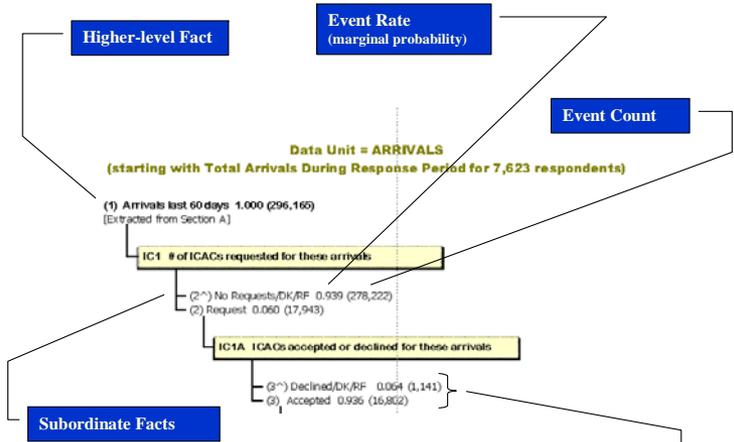
- (10) YES 0.000 (0)
- (10^) NO/RF/DK 1.000 (1,083)

IC1B8 Landing w/o clearance

- (12) YES 0.006 (7)
- (12^) NO/RF/DK 0.994 (1,076)

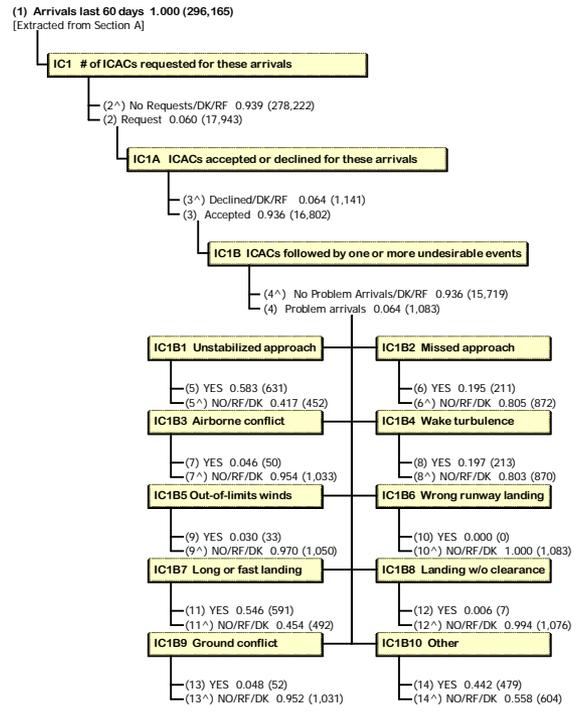
IC1B10 Other

- (14) YES 0.442 (479)
- (14^) NO/RF/DK 0.558 (604)



Subordinate facts that include a "hatted" (^) item are mutually exclusive and complementary. The sum of the event counts in the subordinate facts should always equal the event count of the higher-level fact to which they relate. Their collective event rates should always sum to 1.

Data Unit = ARRIVALS
(starting with Total Arrivals During Response Period for 7,623 respondents)



(3) ICACs Accepted 1.000 (16,802)

<prompt> [Focus on most recent ICAC accepted]

- (15^~) Earlier ICACs Accepted 0.764 (12,830)
- (15) Most Recent ICAC Accepted 0.236 (3,972)

IC4 FMS/C equipped

- (16^~) NO/RF/DK 0.279 (1,108)
- (16) YES 0.721 (2,864)

IC4A Can store multiple routes

- (17^~) NO/RF/DK 0.132 (379)
- (17) YES 0.868 (2,485)

IC5 Attempted to Reprogram FMS/C

- (19^~) NO/RF/DK 0.559 (1,389)
- (19) YES 0.441 (1,096)

IC6 - Programming difficulties encountered

- (20^~) NO/RF/DK 0.609 (668)
- (20) YES 0.391 (428)

IC6A - Inputs loaded properly

- (21^~) NO/RF/DK 0.157 (67)
- (21) YES 0.843 (363)

IC6B Programming completed in time

- (22^~) NO/RF/DK 0.231 (99)
- (22) YES 0.769 (329)

IC6C Inputs cross-checked

- (23^~) NO/RF/DK 0.818 (350)
- (23) YES 0.182 (78)

IC6D - Other programming problems

- (24) YES 0.229 (98)
- (24^~) NO/RF/DK 0.771 (330)

IC4B Nav/Com changeable thru FMS/C

- (18) YES 0.306 (876)
- (18^~) NO/RF/DK 0.694 (1,988)

IC7 FMS/C helped overall

- (25) YES 0.734 (804)
- (25^~) NO/RF/DK 0.266 (292)

(15) Most Recent ICAC Accepted 0.236 (3,972)

IC8 Aircraft on instrument approach

- (26) YES 0.453 (1,798)

IC8A Change from instrument to visual

- (27) YES 0.467 (840)
- (27^~) NO/RF/DK 0.533 (958)

- (26^~) NO/RF/DK 0.547 (2,174)

IC9 Change from visual to instrument

- (28) YES 0.021 (46)
- (28^~) NO/RF/DK 0.979 (2,128)

IC10 Programmed for an Auto-Coupled Approach

- (29) YES 0.159 (631)
- (29^~) NO/RF/DK 0.841 (3,341)

IC11 Change of runway assignment

- (30^~) NO/RF/DK 0.279 (1,107)
- (30) YES 0.721 (2,865)

IC11A - Change from one parallel to another

- (31) YES 0.878 (2,515)
- (31^~) NO/RF/DK 0.122 (350)

IC12 - Change altitude assignment

- (32) YES 0.146 (582)
- (32^~) NO/RF/DK 0.854 (3,390)

IC13 - Change airspeed assignment

- (33) YES 0.325 (1,291)
- (33^~) NO/RF/DK 0.675 (2,681)

(15) Most Recent ICAC Accepted 0.236 (3,972)

IC14A thru E One or more responses to clearance changes

(34^[^]) NO/RF/DK 0.127 (505)
(34) YES 0.873 (3,467)

IC14B Change of ATC frequency

(37) YES 0.260 (899)
(37^[^]) NO/RF/DK 0.740 (2,568)

IC14A Change of navaid frequency

(35^[^]) NO/RF/DK 0.313 (1,084)
(35) YES 0.687 (2,383)

IC14A1 - New navaid identity was confirmed

(36) Yes 0.754 (1,797)
(36^[^]) NO/RF/DK 0.246 (586)

IC14C Revision to approach briefing

(38) YES 0.580 (2,012)
(38^[^]) NO/RF/DK 0.420 (1,455)

IC14D - Change to aircraft configuration

(39) YES 0.220 (761)
(39^[^]) NO/RF/DK 0.780 (2,706)

IC14E - Disconnection of one or more auto-control systems

(40) YES 0.412 (1,429)
(40^[^]) NO/RF/DK 0.588 (2,038)

(15) Most Recent ICAC Accepted 0.236 (3,972)

IC15 - One or more reasons given for change

(41^[^]) NO/RF/DK 0.595 (2,282)
(41) YES 0.425 (1,690)

IC15A - Wake turbulence avoidance

(42) YES 0.047 (79)
(42^[^]) NO/RF/DK 0.953 (1,611)

IC15B - Maintaining traffic flow & separation

(43) YES 0.850 (1,436)
(43^[^]) NO/RF/DK 0.150 (254)

IC15C - Providing a runway favorable to gate

(44) YES 0.164 (277)
(44^[^]) NO/RF/DK 0.836 (1,413)

IC15D - Change in active runways

(45) YES 0.086 (146)
(45^[^]) NO/RF/DK 0.914 (1,494)

IC15E - Weather or wind factors

(46) YES 0.053 (90)
(46^[^]) NO/RF/DK 0.947 (1,600)

IC15F - Noise abatement factors

(47) YES 0.011 (19)
(47^[^]) NO/RF/DK 0.989 (1,671)

IC15G - ATC equipment problems

(48) YES 0.004 (6)
(48^[^]) NO/RF/DK 0.996 (1,684)

IC15H - Other reasons

(49) YES 0.096 (163)
(49^[^]) NO/RF/DK 0.904 (1,527)