Aircraft Meteorological Data Standardization Working Group
Path Ahead

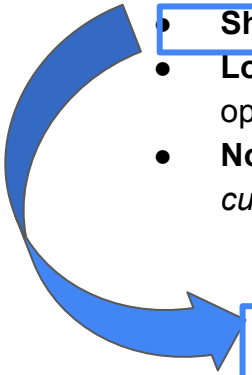




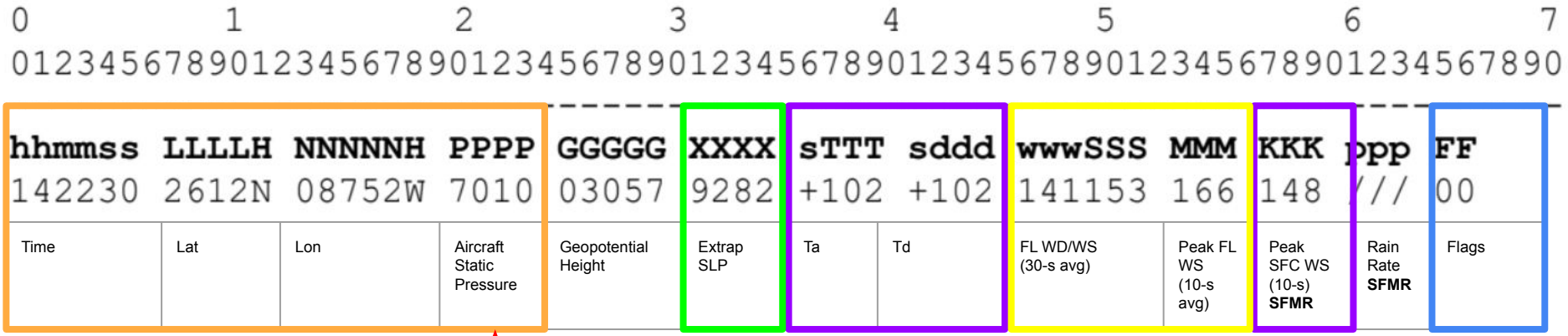
Pictures by Randy Bynon @ Keesler AFB 2019 AOC-53rd WRS Meeting

Aircraft Meteorological Data Standardization Working Group

- **Immediate Goal**: Identify the discrepancies between the data transmitted from the WC-130J and WP-3D during tropical cyclone operations
- **Short-term Goal**: Develop a plan for standardization.
- **Long-term Goal**: Standardize the data transmitted from the WC-130J and WP-3D during tropical cyclone operations to conform with customer requirements. Focus on standard messages transmitted from all aircraft.
- **Note**: *100% standardization will never be achieved due to differences in platforms, sensors and research customer requirements on AOC*

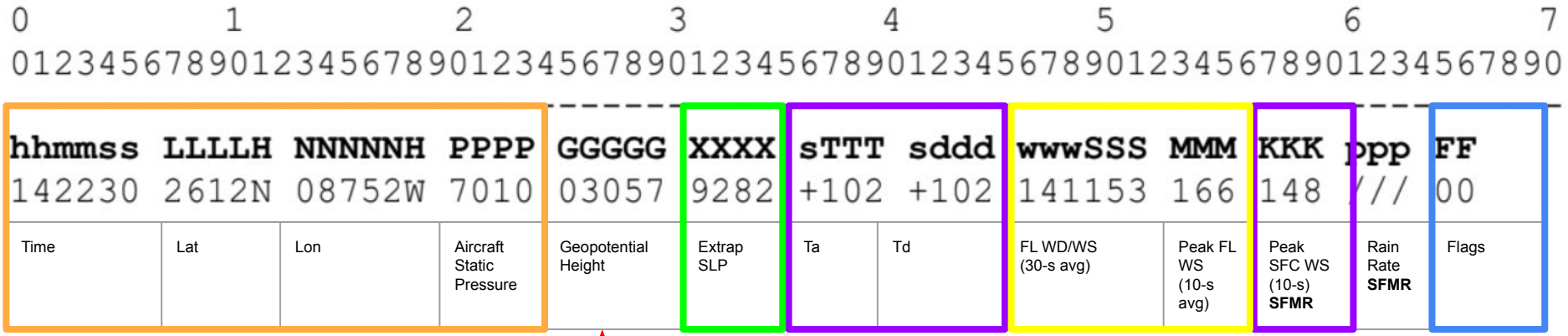


- Start with HDOBs (*one VDM item - Extrap SLP)
- Prioritize items that need standardization
- Understand the algorithms and the differences between them
- Come to an agreement on which equations/methods to accept as the standard



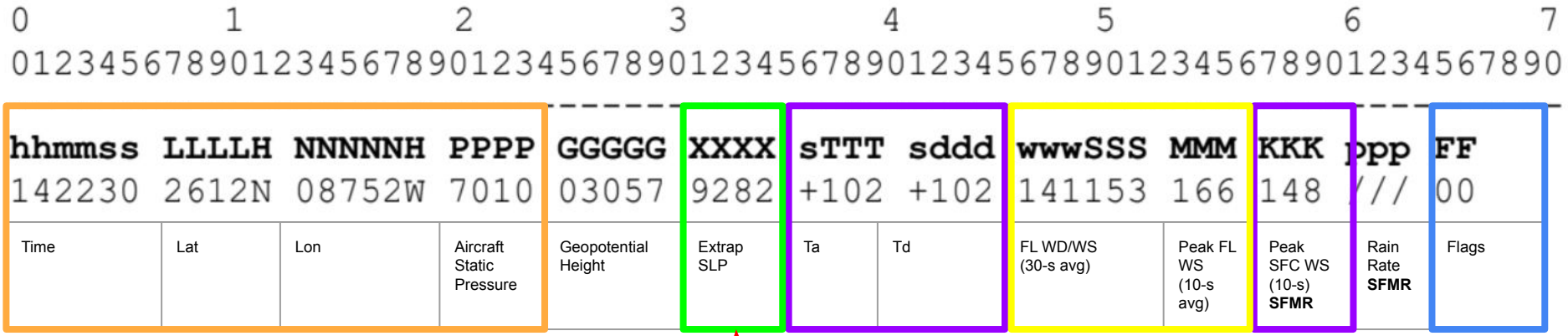
- Different calculations per aircraft - calculation for WC-130J is proprietary and will take at least 2 years to get an answer on how it is calculated.

Reference to time/space coordinate	Assimilated	Assimilated - needs clarification	Impacts if data is assimilated	Used by forecasters



- Same equation, different altimeter source.

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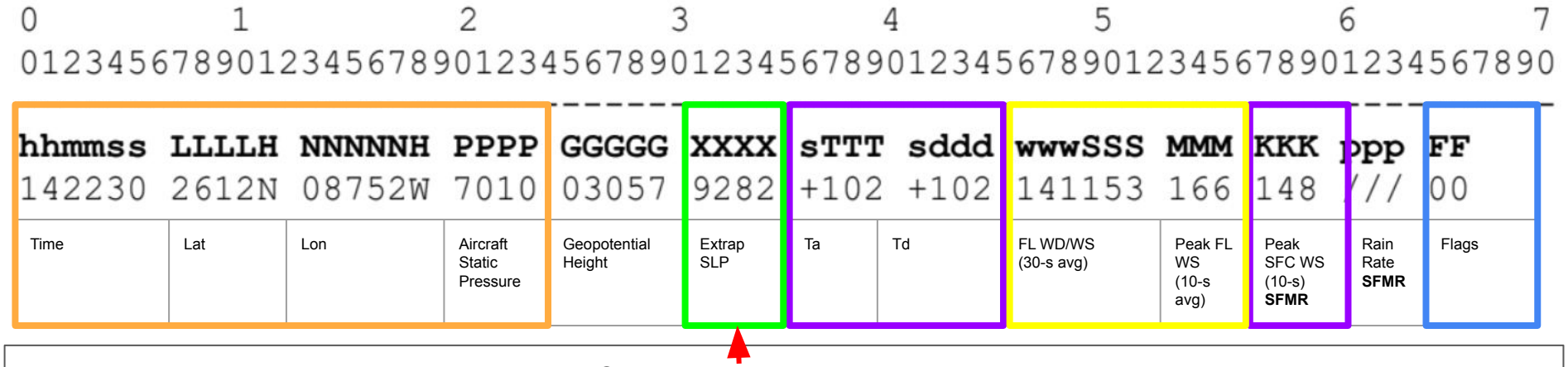
- AOC used the standard equation for Extrap SLP in both HDOBs and VDM
  - Extrapolated sea level pressure is derived from the ICAO Standard Atmosphere definition as follows:

$$TSA = 288.15 - 0.0065 * Pres\ Alt$$

$$PAS = Pres\ Alt - Geo\ Alt * TSA / TV$$

$$Sfc\ Pres = 1013.25 * (1 - PAS / 44331)^{5.255883}$$

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- 53rd uses the standard equation in the HDOBs
  - ARWO selection of RA for heights was adding error to SLP equation due to software using raw value, not corrected value.
  - Flight level virtual temperature hold over from H model (additional error - need to research more).
- 53rd uses a recommended equation from Dr. Willoughby in the VDM
  - Implemented without verifying against sondes
  - Odd surface virtual temperature calculations coded into equation - not part of Dr. Willoughby's suggestion
  - Incorrect height reference (additional error - need to research more).
  - Flight level virtual temperature hold over from H model (same as mentioned above).
- Do both agencies implement the **correct** version of Dr. Willoughby's equation for the VDM/standard equation for HDOBs (**after verification**) or do both agencies implement the standard extrap SLP equation for both HDOBs and VDMs.
  - **NOTE: Dr. Willoughby's equation cannot be applied outside of the eye.**

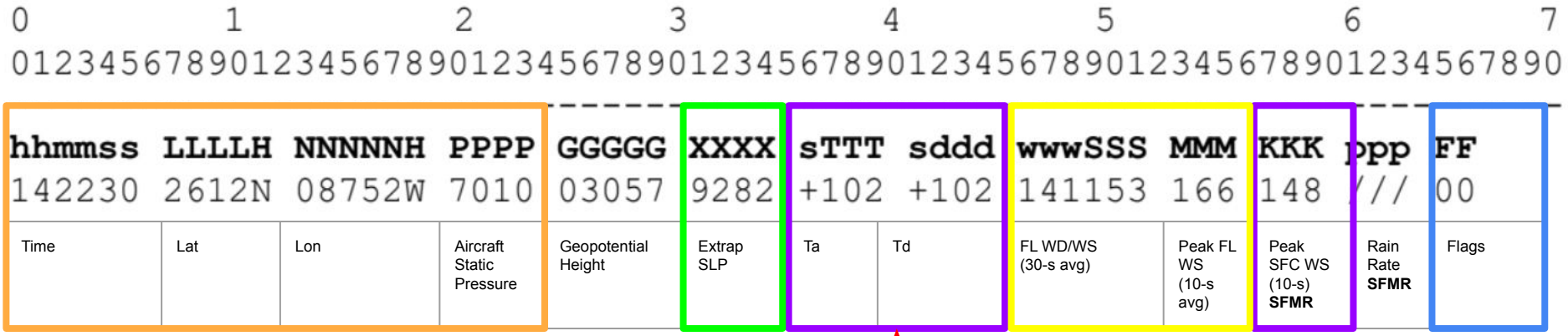
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0         1         2         3         4         5         6         7
01234567890123456789012345678901234567890123456789012345678901234567890
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hhmmss	LLLLH	NNNNNH	PPPP	GGGGG	XXXX	sTTT	sddd	wwwSSS	MMM	KKK	ppp	FF
142230	2612N	08752W	7010	03057	9282	+102	+102	141153	166	148	///	00
Time	Lat	Lon	Aircraft Static Pressure	Geopotential Height	Extrap SLP	Ta	Td	FL WD/WS (30-s avg)	Peak FL WS (10-s avg)	Peak SFC WS (10-s) **SFMR**	Rain Rate **SFMR**	Flags

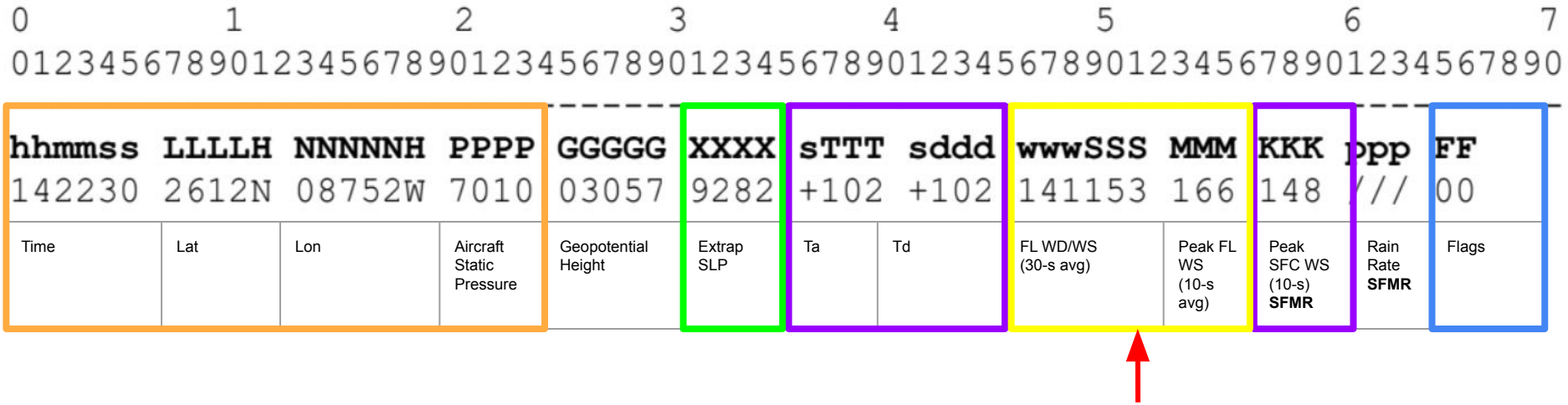
- **53rd:** Sensor wetting algorithm applied to Ta and Td values
  - If Td < TA, everything is good (**why not Td≤ TA?**)
  - If Td≥ TA
    - AND PA is higher than 11,380 feet (700mb standard level of 9880 plus 1500 feet)
      - TA is okay and TD is bad
    - AND PA is ≤ 11,380 feet
      - AND Rain Rate is > 5mm/hr and rain rate is valid or rain rate is invalid AND roll is >10 degrees
        - TA and Td will both equal TA(1 sec)*.3 +Td(1 sec)*.7
    - AND Rain Rate is < 5 mm/hr or invalid AND roll is < 10 degrees
      - TD is bad
    - **Note: Values are not flagged when algorithm is applied, so these values are going into HDOBs**

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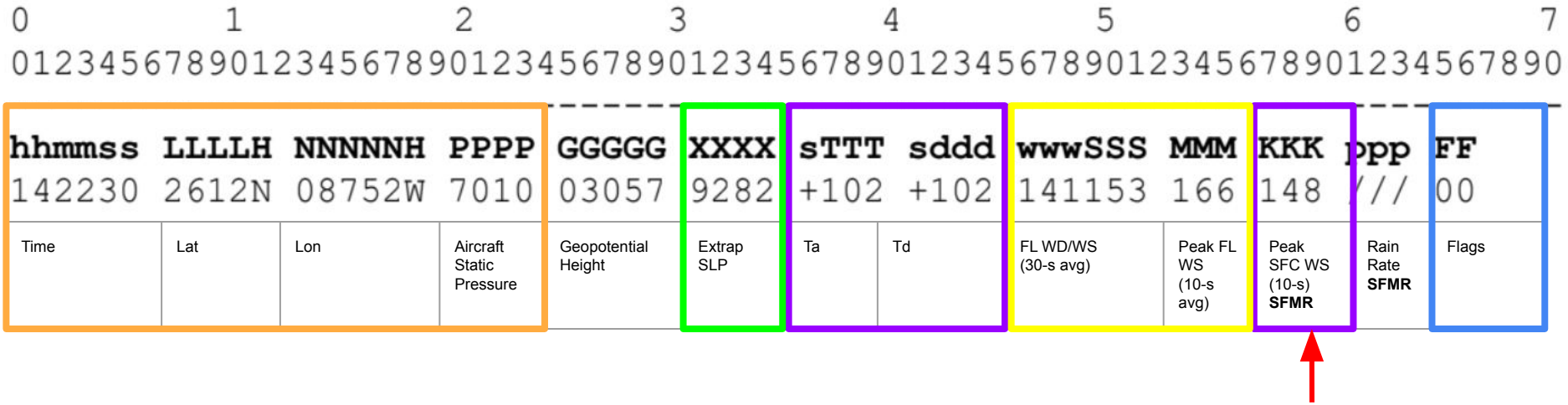
- **AOC:** If Td>Ta both values are flagged as questionable
  - Additionally, for extrap SLP equation ONLY values are set equal to each other to reduce error on corresponding extrap SLP.
    - Note this is a temporary fix to account for possible runaway Td
    - (Need to find out if Td is being set to Ta or Ta is set Td)

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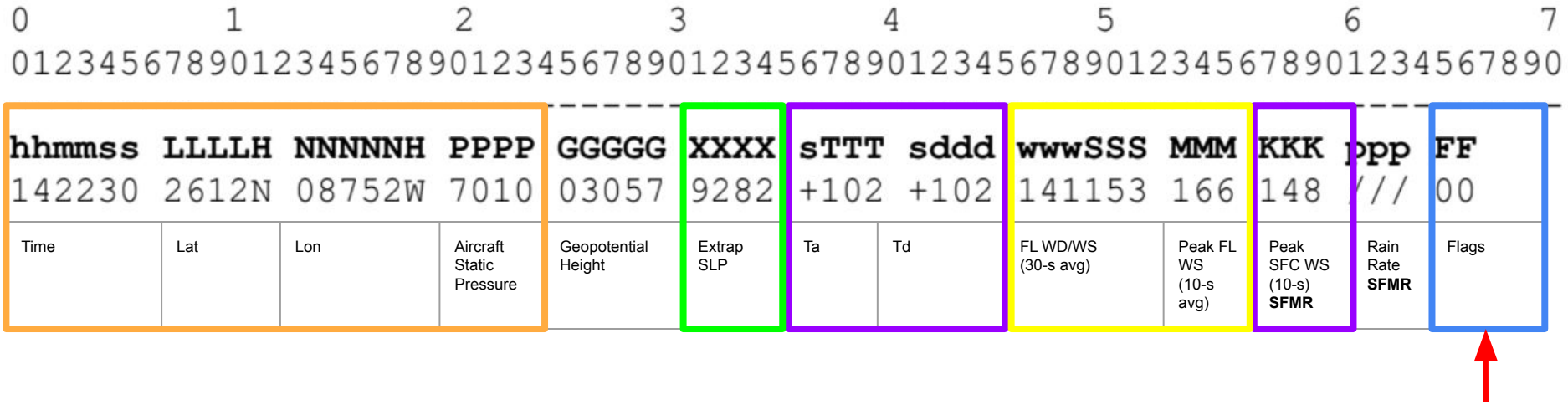
- Winds will never be standard due to additional sensors on WP-3D and ability to calibration flight level winds

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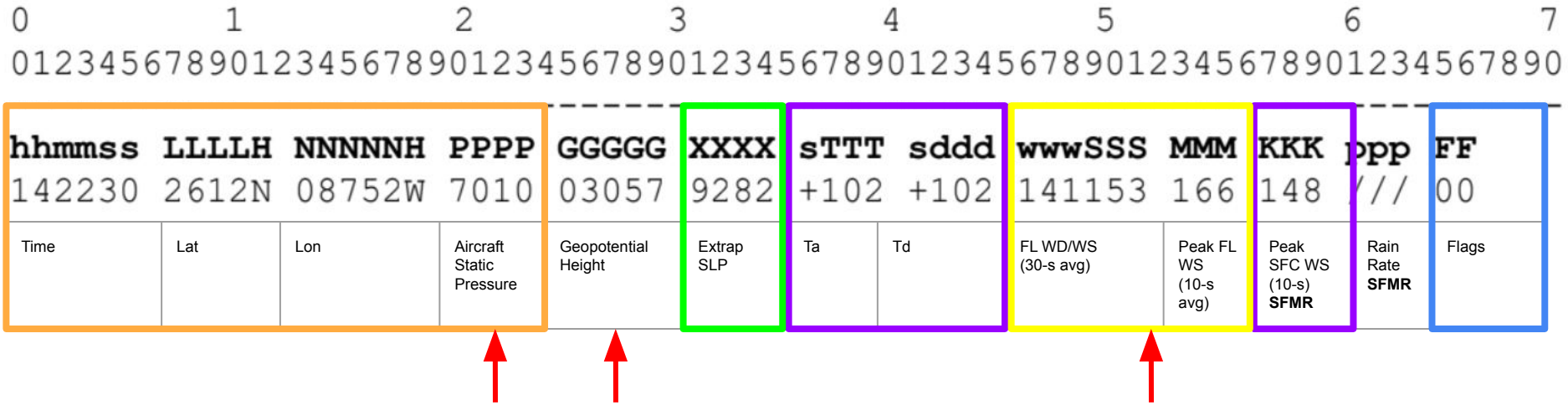
- Needs discussion on max altitude to transmit winds
  - Should there be a flag within the algorithm, FD/ARWO discretion, allow all values to be transmitted.
- PREVIOUS averaging difference resolved
- Ongoing issue with delay between %R going into HDOB and flight level data (i.e. SFMR and other FL data do not match up - SFMR data is about ¼ to ½ nm behind aircraft for 53rd WRS)

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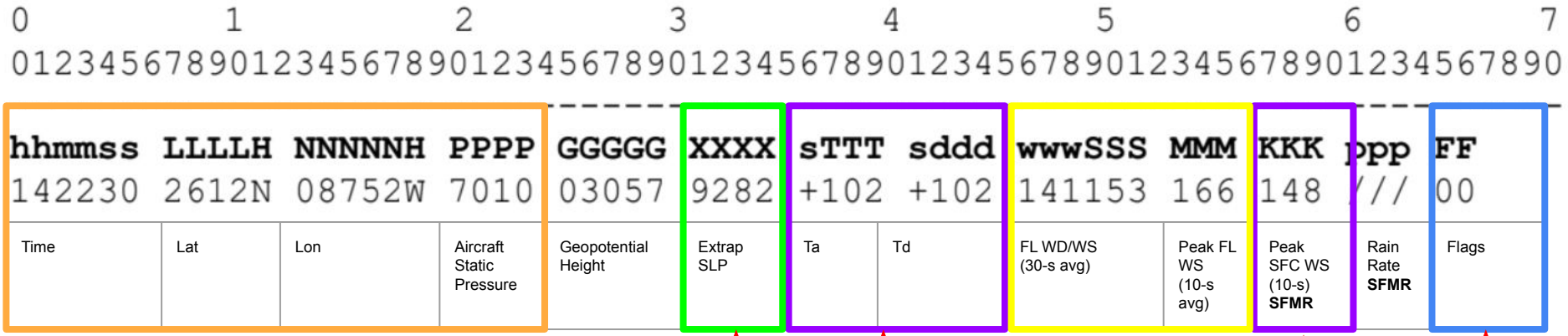
- Inconsistencies in which data is flagged and data validity checks for deciding if it is questionable or “///”
  - Break points between valid, questionable and non valid data are not standardized
  - Should non valid data be “///” or reported
    - Data that is flagged does not go into models, so why dash out bad data?
    - Could customer accidentally miss flag and interpret bad data as good?

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- Standardization not possible due to difference in platforms, sensors and research customer requirements on AOC.
- Full standardization not possible for Ta/Td due to difference in sensor, however how to handle different scenarios may have room for standardization (i.e. runaway hygrometer)

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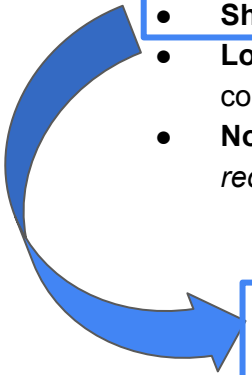


Variable	Issue	Priority (Forecaster)	Priority (Models)	Overall Priority
Extrap SLP	Equation standardization/algorithm corrections			
Ta/Td	Sensor wetting/flagging/runaway hygrometer			
SFMR Winds	Should there be an altitude limitation?			
HDOB Flags	Difference between valid, questionable, non valid groupings.			

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Summary

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